



CELBRIDGE HAZELHATCH MOBILITY CORRIDOR

Section 177AE Environmental Report



MDT0902-RPS-00-XX-RP-Z-0067
A1 C01
November 2025

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
A1 C01	For Planning Approval	Various	CR	SF	03/11/2025

Approval for issue

SF

3 November 2025

© Copyright RPS Group Limited. All rights reserved.

The report has been prepared for the exclusive use of our client and unless otherwise agreed in writing by RPS Group Limited no other party may use, make use of or rely on the contents of this report.

The report has been compiled using the resources agreed with the client and in accordance with the scope of work agreed with the client. No liability is accepted by RPS Group Limited for any use of this report, other than the purpose for which it was prepared.

RPS Group Limited accepts no responsibility for any documents or information supplied to RPS Group Limited by others and no legal liability arising from the use by others of opinions or data contained in this report. It is expressly stated that no independent verification of any documents or information supplied by others has been made.

RPS Group Limited has used reasonable skill, care and diligence in compiling this report and no warranty is provided as to the report's accuracy.

No part of this report may be copied or reproduced, by any means, without the written permission of RPS Group Limited.

Prepared by:

RPS

Prepared for:

Kildare County Council

Dublin | Cork | Galway | Sligo
rpsgroup.com

RPS Group Limited, registered in Ireland No. 91911
RPS Consulting Engineers Limited, registered in Ireland No. 161581
RPS Planning & Environment Limited, registered in Ireland No. 160191
RPS Engineering Services Limited, registered in Ireland No. 99795
The Registered office of each of the above companies is West Pier
Business Campus, Dun Laoghaire, Co. Dublin, A96 N6T7



Contents

1	INTRODUCTION	1
2	DESCRIPTION OF THE PROPOSED DEVELOPMENT.....	3
3	SCOPE OF ENVIRONMENTAL ASSESSMENT	19
4	TRAFFIC AND TRANSPORT	26
5	NOISE & VIBRATION	39
6	AIR QUALITY.....	69
7	CLIMATE.....	84
8	LANDSCAPE & VISUAL	100
9	BIODIVERSITY	121
10	CULTURAL HERITAGE (ARCHAEOLOGICAL, CULTURAL AND ARCHITECTURAL HERITAGE).....	157
11	MATERIAL ASSETS: AGRICULTURAL PROPERTIES	175
12	MATERIAL ASSETS: NON-AGRICULTURAL PROPERTIES	184
13	ENVIRONMENTAL COMMITMENTS.....	193
14	CONCLUSION	194

Tables

Table 3.1: Key issues for Further Consideration	20
Table 3-2: Projects Screened for Potential Cumulative Effects	24
Table 4.1: Level of Service Criteria	30
Table 4.2: Operational Phase Traffic Impacts – 2040	33
Table 4.3: Capacity Analysis for Junctions Impacted by the Scheme – 2040 AM and PM Peak Hour Flows	35
Table 5.1: Summary of Key Datasets and Data Sources Used	39
Table 5.2: Criteria to Define Receptor Sensitivity.....	41
Table 5.3: Maximum Permissible Noise Levels at the Façade of Dwellings During Construction	42
Table 5.4: Threshold of Potential Significant Effect at Nearest Sensitive Receptors.....	42
Table 5.5: Noise Level – Magnitude of Impact (Highway Agency, UK).....	43
Table 5.6: Construction Vibration Guidelines	43
Table 5.7: Guidance on Human Perception of Vibration Levels	43
Table 5.8: Construction Noise – Significance Rating	46
Table 5.9: Construction Traffic Noise – Significance Rating	46
Table 5.10: Construction Vibration – Significance Rating	47
Table 5.11: Operational Noise – Significance Rating	48
Table 5.12: Baseline Noise Monitoring Locations	50
Table 5.13: Baseline Noise Survey Results – Long-term Measurements.....	50
Table 5.14: Baseline Noise Survey Results – Short-term Measurements	50
Table 5.15: Construction Activities – Description	51
Table 5.16: Predicted Noise Levels for Site Enabling Works – Site Compounds at Nearest NSLs.....	53
Table 5.17: Predicted Noise Levels for Site Enabling Works – Site Clearance and Fencing at Nearest NSLs.....	53
Table 5.18: Predicted Noise Levels for Demolitions at Nearest NSLs	54
Table 5.19: Predicted Noise Levels for Earthworks at Nearest NSLs	55
Table 5.20: Predicted Noise Levels for Culvert Works at Nearest NSLs	55

Table 5.21: Predicted Noise Levels for Drainage and Utilities at Nearest NSLs.....	55
Table 5.22: Predicted Noise Levels for Road Formation and Road Pavement at Nearest NSLs	56
Table 5.23: Predicted Noise Levels for Cycle Tracks and Footpaths at Nearest NSLs	57
Table 5.24: Predicted Noise Levels for Bridge Construction at Nearest NSLs	57
Table 5.25: Predicted Noise Levels for Signage, Road Marking, Lighting and Traffic Signals at Nearest NSLs.....	58
Table 5.26: Predicted Noise Levels for Landscaping at Nearest NSLs	58
Table 5.27: Vibration source levels for Construction Equipment	59
Table 5.28: Predicted Vibration Levels at the Nearest NSL	59
Table 5.29: Typical Vibration Levels in a Modern Residence	60
Table 5.30: Predicted Traffic Noise Levels.....	61
Table 5.31: Details of Noise Mitigation Measures	67
Table 6.1: Air Quality Regulations (based on the CAFE Directive).....	71
Table 6.2: TII Quality of Effect Criteria	72
Table 6.3: TII Impact Descriptors	72
Table 6.4: TII Assessment Criteria for Sensitive Designated Habitats.....	72
Table 6.5: Trends in Zone C Air Quality – Nitrogen Dioxide ($\mu\text{g}/\text{m}^3$)	73
Table 6.6: Trends in Zone C Air Quality – PM_{10} ($\mu\text{g}/\text{m}^3$)	74
Table 6.7: Trends in Zone C Air Quality $\text{PM}_{2.5}$ ($\mu\text{g}/\text{m}^3$).....	74
Table 6.8: Summary of Sensitivity of the Area to Dust.....	75
Table 6.9: Summary of Dust Emission Magnitude	76
Table 6.10: Summary of Demolition Risk to Define Site-Specific Mitigation	76
Table 6.11: Summary of Earthworks Risk to Define Site-Specific Mitigation	77
Table 6.12: Summary of Construction Risk to Define Site-Specific Mitigation.....	77
Table 6.13: Summary of Track out Risk to Define Site-Specific Mitigation	77
Table 6.14: Summary Overall Dust Impact Risk to Define Site-Specific Mitigation	77
Table 6.15: Regional Impact of Changes to Traffic Patterns as a result of Proposed Scheme	78
Table 6.16: Local Impact to Air Quality as a result of Operational Traffic.....	81
Table 7-1: Summary of Key Desktop Reports	85
Table 7-2: Key Targets for GHG Emissions Reductions by 2030	86
Table 7-3: TII Significance Matrix for the GHG Assessment.....	87
Table 7-4: Sensitivity Definition and Scoring	87
Table 7-5: Exposure Definition and Scoring.....	88
Table 7-6: Vulnerability Matrix	88
Table 7-7 Likelihood Analysis Key.....	88
Table 7-8: Consequence Analysis Key.....	88
Table 7-9 Climate Risk Matrix	89
Table 7-10: 30 Year Average Meteorological Data Casement.....	90
Table 7-11: 30- Year Average Data for Weather Events at Casement (Values from 1991-2020).....	90
Table 7-12: Observed Hazard Level in the area of the Proposed Scheme.....	91
Table 7-13: Sensitivity Analysis of Climate Hazards to the Construction of the Proposed Scheme.....	93
Table 7-14: Exposure Analysis based on Past and Predicted Climate Events	94
Table 7-15: Vulnerability Analysis for the Construction Phase	94
Table 7-16: Estimated Carbon associated with the Operational and Maintenance of the Proposed Scheme over the total design life	95
Table 7-17: Sensitivity Analysis of Climate Hazards to the Operation of the Proposed Scheme	95
Table 7-18: Vulnerability Analysis for the Operation Phase	96
Table 7-19: Predicted Annual GHG Emissions from Road Transport from the Proposed Scheme.....	97
Table 8.1: Summary of Key Data Sources Used.....	102
Table 8.2: Landscape Significance.....	103
Table 8.3: Landscape Sensitivity.....	103
Table 8.3: Magnitude of Landscape Effect.....	104
Table 8.5: Visual Resource Sensitivity	104

Table 8.6: Magnitude of Visual Effect.....	105
Table 8.7: Significance of Effect	106
Table 8.8: Northern Lowlands – Construction Phase Impact Assessment	110
Table 8.9: River Liffey - Construction Phase Impact Assessment	111
Table 8.10: Northern Lowlands – Operational Phase Impact Assessment.....	112
Table 8.11: River Liffey - Operational Phase Impact Assessment.....	112
Table 8.12: Summary of Predicted Landscape Effects	113
Table 8.13: Summary of Predicted Visual Effects	114
Table 8.14: Summary of Predicted Operational Residential Effects – Pre Establishment.....	116
Table 8.15: Specific Landscape Measures (SLM).....	118
Table 9.1: Study Area and Zone of Influence for different Ecological Features.....	122
Table 9.2: Summary of Field Surveys Completed	123
Table 9.3: Areas of Habitats on site	129
Table 9.4: Residual Effects during the Construction Phase	152
Table 9.5: Residual Effects during the Operational Phase.....	155
Table 10.1: Field Work Areas of Archaeological Potential	162
Table 10.2: Areas of Archaeological Potential	163
Table 10.3: Areas of Archaeological Potential	166
Table 10.4: RMP sites within the 250m Cultural Heritage Study Area.....	166
Table 10.5: Protected Structures and NIAH sites within the Cultural Heritage Study Area	167
Table 11.1: Baseline Rating Criteria.....	176
Table 11.2: Magnitude of Impact Rating Criteria	177
Table 11.3: Significance of Impact	178
Table 11.4: Baseline Rating For Agricultural Properties along the Proposed Scheme.....	179
Table 11.5: Assessment of the Impact of Land take on Agricultural Properties.....	181
Table 11.6: Summary of Residual Impact	183
Table 12.1: Baseline Rating Criteria.....	185
Table 12.2: Magnitude of Impact Rating Criteria	186
Table 12.3: Significance of Impact	186
Table 12.4: Baseline Rating for Non-agricultural Properties along the Proposed Scheme	187
Table 12.5: Assessment of the Impact of Land take on Non-agricultural Properties	189
Table 12.6: Summary of Residual Impact	192

Figures

Figure 2-1 Site Location.....	3
Figure 2-2 Typical Silt Bag	15
Figure 2-3 Typical Silt Fence	16
Figure 4-1 Zone of Influence	27
Figure 4-2 Turning Count Locations	28
Figure 4-3 7-Day Traffic Count ATC Locations	28
Figure 4-4 Journey Time Survey Site Locations	29
Figure 4-5 Existing Road Network in Celbridge	31
Figure 4-6 Locations with Traffic Flow Changes	32
Figure 4-7 Location of Junctions Assessed for Capacity	35
Figure 5-1 Noise Monitoring Locations.....	49
Figure 5-2 NSLs Referenced in the Construction and Operational Noise Assessments.....	52
Figure 5-3 NSLs Requiring Mitigation Measures and Those with Residual Impacts Post-Mitigation (Page 1 of 2)	63
Figure 5-4 NSLs Requiring Mitigation Measures and Those with Residual Impacts Post-Mitigation (Page 2 of 2)	64
Figure 6-1 Zone of Influence for Air Quality Assessment.....	70
Figure 6-2 Location of Human Receptors	80

Figure 7-1	CHMC Project Baseline Emissions by Lifecycle Stage	93
Figure 8-1	Zone of Theoretical Visibility	101
Figure 8-2	Landscape Character Areas	107
Figure 8-3	Landscape Designations.....	108
Figure 8-4	Viewpoint Location Plan.....	115
Figure 10-1	Assessment Study Area.....	157
Figure 10-2	Location of Fields 1-14 and areas of archaeological potential AP1–AP4	161
Figure 10-3	Geophysical Survey Areas, Overlaid on the Land Acquisition Areas	163
Figure 10-4	Geophysical Survey interpretation with GS1 and GS2 indicated.....	164
Figure 10-5	Location of the proposed development compound area (in light blue) and land acquisition boundary (blue line) in relation to the Circular Enclosure (GS1)	165
Figure 10-6	Location of the proposed development and land acquisition boundary (blue line) in relation to the Pit-like features (GS2).....	165
Figure 10-7	RMP sites within the Cultural Heritage Study Area	167
Figure 10-8	RPS sites within the Cultural Heritage Study Area (Note the blue arrow showing the correct location of B11-126).....	168
Figure 10-9	Celbridge Abbey former demesne lands and the proposed development.....	169
Figure 10-10	Location of panoramic photographs taken from within Celbridge Abbey, the proposed route and RPS sites	170
Figure 10-11	Celbridge and Temple Mills ACAs	171

1 INTRODUCTION

1.1 Introduction

Kildare County Council propose to develop the Celbridge to Hazelhatch Mobility Corridor Scheme (hereafter referred to as the “Proposed Scheme”) between Celbridge and Hazelhatch Co. Kildare.

Kildare County Council is now applying for approval under section 177AE of the Planning and Development Act, 2000, as amended (hereafter referred to as the PDA) for the Proposed Scheme.

The proposed development involves constructing a new bridge over the River Liffey, which will carry a single carriageway, cycleways, and footpaths as part of the Celbridge Hazelhatch Mobility Corridor. This bridge will connect the R403/Clane Road and Celbridge Town Centre with Hazelhatch Train Station, serving as a crucial link in the mobility corridor for vehicles, pedestrians, and cyclists, thereby enhancing connectivity and accessibility throughout the region.

The proposed development involves the compulsory acquisition of approximately 13.1 hectares of land.

1.2 Purpose of this Report

This document consists of an Environmental Report and has been developed in support of an application to An Coimisiún Pleanála under Section 177AE of the Planning and Development Act 2000, as amended. This Environment Report has been prepared to ensure that the planning application is sufficiently detailed and that all potential relevant environmental impacts are appropriately assessed and mitigated.

This Environmental Report has been prepared by RPS on behalf of Kildare County Council.

1.3 Structure of the Report

The Environmental Report is structured as follows:

- Chapter 1: Introduction - provides details on the purpose and structure of this Environmental Report;
- Chapter 2: Description of the Proposed Development – provides information on the design of the Proposed Scheme and the construction and operational phase activities;
- Chapter 3: Scope of Environmental Assessment – provides a summary of the key issues for further consideration and assessment;
- Chapter 4: Traffic and Transport – provides an assessment of the Proposed Scheme to identify potential effects on traffic and the road network in the study area;
- Chapter 5: Noise & Vibration – provides an assessment of the potential noise and vibration impacts that are expected to arise during the construction and operation of the Proposed Scheme;
- Chapter 6: Air Quality - provides an assessment of the construction and operation of the Proposed Scheme on air quality;
- Chapter 7: Climate - provides an assessment of the construction and operation of the Proposed Scheme on Climate;
- Chapter 8: Landscape & Visual – provides an assessment of the proposed Scheme on Landscape and Visual resources during both the construction and operational phase;
- Chapter 9: Biodiversity - provides an Ecological Impact Assessment (EclA) of the construction and operation of the Proposed Scheme;
- Chapter 10: Cultural Heritage (Archaeological, Cultural and Architectural Heritage) – provides an assessment of the construction and operation of the Proposed Scheme on cultural heritage.
- Chapter 11: Material Assets: Agricultural Properties – provides an assessment of the construction and operation of the Proposed Scheme on Agricultural Properties;

Section 177AE Environmental Report

- Chapter 12: Material Assets: Non-Agricultural Properties - provides an assessment of the construction and operation of the Proposed Scheme on Non-Agricultural Properties;
- Chapter 13: Schedule of Environmental Commitments – sets out a summary of the mitigation measures detailed within the environmental assessments in Chapters 4 – 12.
- Chapter 14: Conclusions - this chapter provides an outline of the conclusions following completion of the above environmental assessments.

This Environmental Report should be read in conjunction with the Section 177AE Appendices to the Environmental Report (including Application for Derogation), Section 177AE / CPO Planning Report, Planning Drawings, EIA Screening Report, AA Screening Report, Natura Impact Statement, Outline Construction Environmental Management Plan (CEMP) and the Flood Risk Assessment (FRA) Report, which accompany the planning application.

2 DESCRIPTION OF THE PROPOSED DEVELOPMENT

2.1 Site Location

The project is situated in the south west of Celbridge, County Kildare. Refer to drawing **MDT0902-RPS-01-XX-DR-Z-IX0001** (Location Plan) and **Figure 2-1** below.

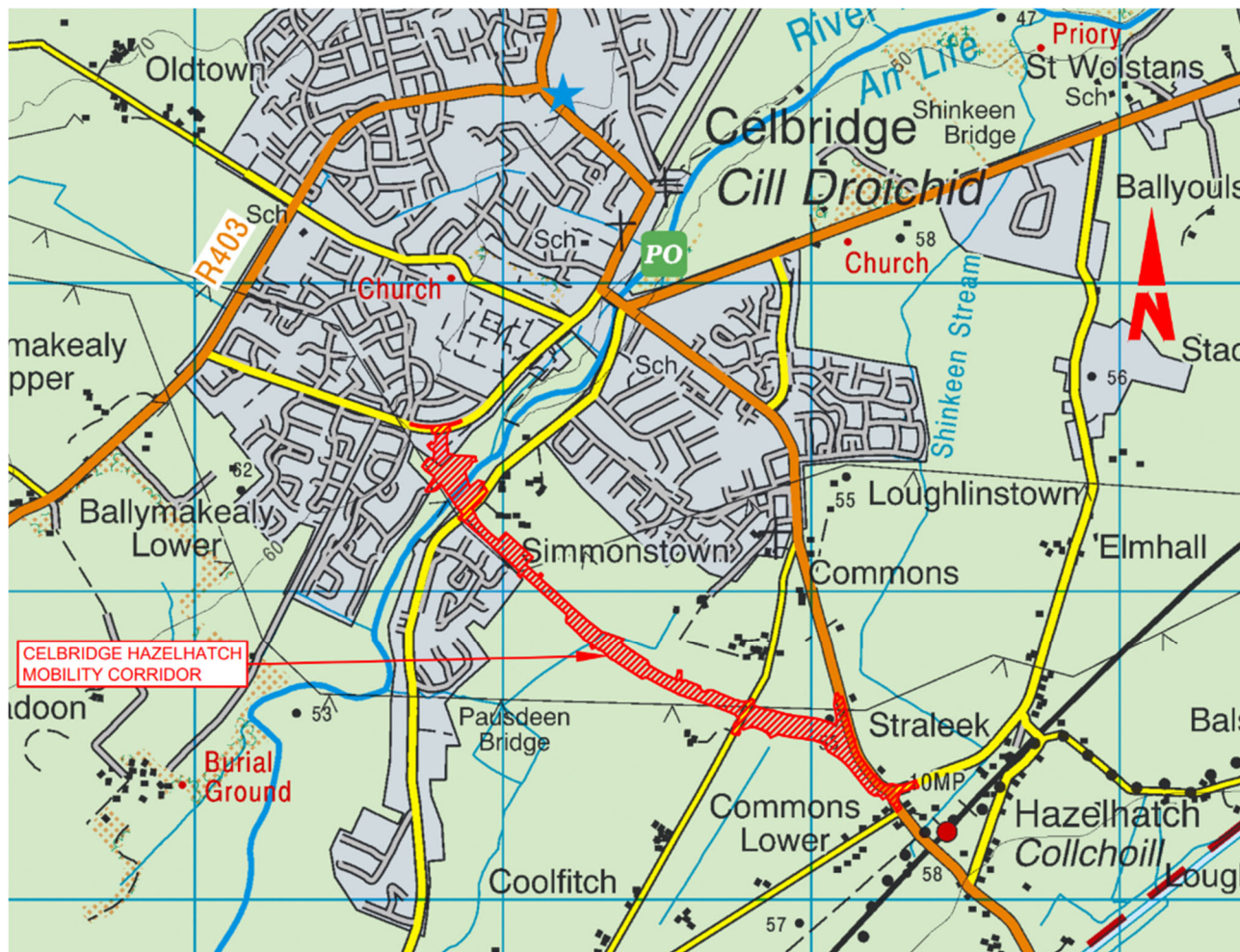


Figure 2-1 Site Location

2.2 Description of Route

The proposed route is approximately 2km long, beginning at a proposed junction with Clane Road and heading in a south easterly direction, predominantly through greenfield lands until it ties into the existing R405 Hazelhatch Road, before terminating at the existing Loughlinstown Road Roundabout near Hazelhatch Train Station. The route also includes proposed junctions with Newtown Road, Simmonstown Manor Road and R405 Hazelhatch Road. A new bridge crossing is required over the River Liffey, located approximately 200m south of the beginning of the route at Clane Road.

2.3 Road Cross-Section

The proposed road cross-section for the project's mainline is a single carriageway with 3.5m wide lanes in each direction for a total pavement width of 7.0m.

The majority of the route includes 2.0m wide one-way cycle tracks and 2.0m wide footpaths on both sides of the road. The portion of the route between Hazelhatch Road Junction and Loughlinstown Road roundabout includes a 2.0m wide footpath and 3.0m wide two-way cycleway on the northbound side of the road only due to space restrictions and desire line requirements.

On both sides of the mainline, it is typically proposed to provide a 2.0m wide grassed verge between the cycle facility and the carriageway, and 1.0m wide grassed verge between the back of the footpath and adjacent earthwork slopes. The exception to this is across the proposed River Liffey Bridge, where no additional verge width is proposed between the cycle tracks and the carriageway or between the footpaths and bridge parapets.

2.4 Design Speed, Speed Limit and Geometry

The design speeds and corresponding posted speed limits proposed for the new road are as follows:

- Ch. 0+000 to Ch. 0+350: 50km/h
- Ch. 0+000 to Ch. 1+1959: 60km/h

The road geometry is designed to the standards contained in the Design Manual for Urban Roads and Streets May 2019.

The proposed geometric design for the new road is illustrated on drawings **MDT0902-RPS-01-XX-DR-Z-GE0000-GE0003**.

2.5 Junctions

Junctions are proposed where the new road interfaces with the following existing roads:

- **Clane Road (R403):** At the start of the route, a 3-arm signalised junction is proposed with the existing regional road.
- **Newtown Road (L1016):** At approximately Ch. 0+285, a 4-arm signalised junction is proposed with the existing local road.
- **Simmonstown Manor Road (L5062):** At approximately Ch. 1+420, a priority junction is proposed with the existing local road on the northbound side of the proposed new road. On the southbound side of the road it is proposed to terminate the existing road with a turning head to be provided at the end of the cul-de-sac.
- **Hazelhatch Road (R405):** At approximately Ch. 1+730, a 3-arm signalised junction is proposed with the existing regional road.
- **Loughlinstown Road (L5061):** At the end of the route, minor improvements are proposed to the existing roundabout junction.

All junctions include facilities for pedestrians and cyclists.

2.6 River Liffey Bridge Crossing

A new bridge crossing over the River Liffey is required between approximately Ch.0+170 to Ch. 0+265.

The location of the proposed bridge is illustrated on drawing **MDT0902-RPS-01-XX-DR-Z-BR0001**. The primary function of the bridge is to carry the Celbridge to Hazelhatch Mobility Corridor over the River Liffey. The design life of the structure shall be 120 years.

The proposed River Liffey Bridge will be an integral Single Span Varying Depth Steel Composite Plate Girder Bridge. Being an integral structure, the superstructure is connected monolithically to the substructure. This design enhances durability and reduces maintenance by eliminating expansion joints and bearings. The substructure consists of cast in-situ reinforced concrete abutments, integral with the steel girders and a bridge deck.

The bridge comprises of a single span arrangement with an overall length of 65.5m. It will span across the CFRAM 0.1% Annual Exceedance Probability (AEP) predicted peak flood level (50.53mOD). The 0.1% AEP flood extents are contained within the river's steep bank slopes in the vicinity of the proposed crossing, and the proposed bridge is designed to span above the top of the riverbanks. Hence the proposed structure will not have any impact on the predicted flooding from the River Liffey.

The superstructure consists of weathering steel plate girders, varying in depth (meaning their height changes across the span of the bridge), that act compositely with an in-situ concrete deck slab. Weathering steel

offers significant advantages in terms of durability and maintenance, as it develops a protective rust layer that prevents further corrosion, reducing the need for repainting and extensive upkeep. Fibre Reinforced Concrete (FRC) permanent formwork will span between the girders to support the deck slab, which will be poured in-situ to form the integral structure. Transverse concrete cantilevers will extend from the deck edges to support the parapet and edge beam.

The clear span between abutments is 63.4m, with an out-to-out width of 16.03m and skew angle of 17.5°. The substructure consists of reinforced concrete abutments on shallow footing foundations, reflecting the underlying geotechnical conditions. The design of the bridge structure includes for sufficient headroom (2.7m) for a future active travel route under the bridge for both pedestrians and cyclists on the northern bank of the river (note – this route is not part of Proposed Scheme).

A 1.4m high bespoke parapet system will be implemented, serving as both a vehicle restraint and pedestrian parapet, with N2 Containment Level and mesh infill. These combined systems will be installed on the precast concrete parapet edge beams at the deck edges.

The River Liffey Bridge has the following cross-sectional dimensions as outlined in **Table 2-1** below.

Table 2-1: Proposed Cross-sectional Dimensions of the River Liffey Bridge Crossing

Location	Width (m)
Parapet Edge beam	0.5
Walkway	2.0
Cycleway	2.0
Carriageway westbound	3.5
Carriageway eastbound	3.5
Cycleway	2.0
Walkway	2.0
Parapet Edge beam	0.5
Total	16.0

As this is a single span structure, no works will be required within the river channel.

The proposed bridge design is illustrated on drawings **MDT0902-RPS-01-XX-DR-Z-BR1010-BR1012**.

2.7 Land Take

The approximate land take required for the scheme is as follows:

- Permanent land take (including roadbed): 12.4ha
- Temporary land take: 0.7ha

Approximately 15 no. landowners are impacted by this land take as illustrated on drawings **MDT0902-RPS-01-XX-DR-Z-LH0001-LH0003**.

2.8 Access Arrangements

Where lands are severed or existing access arrangements are impacted by the project, appropriate measures will be provided to maintain vehicle access. These Include:

- Ch. 0+060: Junction provided on mainline for replacement access to service station.
- Ch. 0+090: Direct access provided to maintain access to foul water pumping station.
- Ch. 0+105: Junction provided on mainline for access to severed commercial lands.

- Ch. 0+550: Field access provided on mainline for access to severed agricultural lands.
- Ch. 0+605: Field access provided on mainline for access to severed agricultural lands.
- Ch. 0+890: Field access provided on maintenance access road for access to severed agricultural lands. The portion of this maintenance access road between the mainline and field access shall be subject to shared use with the landowner and KCC.
- Ch. 1+175: Field access provided on mainline for access to severed agricultural lands.
- Ch. 1+415: Field accesses provided on either side of Simmonstown Manor Road to severed agricultural lands.
- Ch. 1+490: Culvert to be extended and access track provided to maintain access across watercourse.

Where the project interfaces with existing roads, existing accesses will be retained wherever possible. Works will be carried out as necessary to tie in these existing accesses with the new road surface.

Vehicle access for maintenance of drainage attenuation and pollution control facilities are proposed at the following locations:

- Ch. 0+090: Access provided on mainline (shared with foul water pumping station access) for maintenance of Attenuation Basin 1 and associated pollution control facilities.
- Ch. 0+270: Access provided on Newtown Road for maintenance of Attenuation Basin 2 and associated pollution control facilities.
- Ch. 0+890: Access provided on mainline for maintenance of Attenuation Basin 3, Attenuation Swale 4A and associated pollution control facilities.
- Ch. 0+935: Access provided on mainline for maintenance of Attenuation Swale 4B and associated pollution control facilities.
- Ch. 1+415: Access provided at end of Simmonstown Manor Road for maintenance of Attenuation Basin 5 and associated pollution control facilities.
- Ch. 1+425: Access provided at end of Simmonstown Manor Road for maintenance of Attenuation Swale 6A and associated pollution control facilities.
- Ch. 1+835: Access provided on mainline for maintenance of Attenuation Swale 6B and associated pollution control facilities.

2.9 Drainage

The proposed surface water drainage layouts are illustrated on the drawings **MDT0902-RPS-01-XX-DR-C-DR0000 to DR0007**.

2.9.1 Edge Drainage Systems

The proposed road cross section limits the ability to utilise soft SuDS features at the road edge (filter strips, grass channels) as the primary surface water collection method. As the carriageway is kerbed, the surface water will be collected from the carriageway using kerb and gully drainage systems which may include traditional gully systems, or by combined kerb & drainage systems (CKDS). However, once the surface water is collected, various SuDS features (bio-retention trenches, swales, attenuation basins, infiltration trenches) will treat and attenuate the surface water run-off before it discharges to the receiving watercourse at greenfield run-off rates.

On large embankments, once the surface water is collected, it will discharge to a carrier pipe system beneath the verge and/or footpath and cycle track, and continue through the system where it will eventually discharge to attenuation and treatment basins.

In other locations of large embankments where the attenuation feature is a swale at the base of the road earthworks, the kerb and gully drainage system will discharge directly to the swales without connecting to a carrier pipe system first.

In areas of shallow embankment or cut, or areas where the proposed road is at grade, the kerb and gully drainage systems will discharge to a bio-retention trench (BRT) as shown on **MDT0902-RPS-01-XX-DR-C-DR2001**. During average rainfall events, the surface water in the trench will primarily discharge via infiltration as the outlet pipe from the BRT is at a higher level than the trench invert. During intense rainfall events, the water in the trench will fill to the outlet level, and discharge through the pipe ensuring the BRT does not become saturated and/or flooded. The water will also be discharged by evapotranspiration where the surface of the trench is planted with vegetation. The BRT will be located beneath the verge behind the kerb. Any water that does not infiltrate, or that is not absorbed by the vegetation, will discharge to the outlet of the BRT and into the carrier pipe system before discharging to an attenuation feature (basin/swale/infiltration trench). Where a carrier pipe in a large embankment continues to an area where the road is at-grade or in cut, the carrier pipe will discharge to a BRT to allow infiltration and evapotranspiration (subject to minimum separation distances being provided).

In areas where rock is at or near the surface and the minimum separation distances to bedrock or groundwater cannot be achieved, the trench shall be lined with an impermeable liner, meaning evapotranspiration will be the only discharge method for the water before the level reaches the outlet pipe invert. Alternatively in such areas, the BRT may be omitted where the environmental or landscaping risks outweigh the benefits.

Where levels prohibit connections to the mainline drainage the kerb and gully drainage systems will discharge to infiltration trenches.

2.9.2 Attenuation Systems

At the discharge locations it is proposed that, where possible and where required as a condition of the drainage design, attenuation ponds/swales are to be constructed to control the discharge of water to the receiving watercourse. As well as controlling the discharge, these allow sediments to settle from the water prior to the road drainage being discharged to the receiving watercourse. Attenuation ponds/swales have an environmental benefit in that they assist in improving the quality of the water being discharged to the watercourse.

Once the surface water enters the attenuation basin or attenuation swale, it will travel through the system to the outlet where the outfall discharge rate will be limited to the pre-development greenfield runoff rate. The attenuation features are designed to attenuate the runoff during the 100-year rainfall event to the equivalent Q_{bar} greenfield runoff rate.

All attenuation ponds (Ponds 1, 2, 3 & 5) will have a permanent depth of water beneath the outlet invert to aid water treatment prior to discharge. The permanent water depths will be 500mm and an aquatic bench, shall be provided just below the permanent water depth to deter unintentional entry.

Subsequently, the attenuated surface water will then pass through a hydrocarbon interceptor prior to discharge to the receiving watercourse. A summary of the outfalls where attenuation systems are required is provided in **Table 2-2** below.

Table 2-2: Proposed Drainage Outfalls

Drainage Network Ref. No	Attenuation System Ref. No	Contributing Catchment Area (ha)	Max Discharge Rate (l/s)	Attenuation System - Volume of Storage (m ³)	Outfall
1	Attenuation Basin 1	0.41	1.10	277.00	River Liffey
2	Attenuation Basin 2	0.66	1.70	455.00	River Liffey
3	Attenuation Basin 3	0.59	1.50	411.00	Loughlinstown Watercourse
4A	Attenuation Swale 4A	0.30	0.80	206.00	Loughlinstown Watercourse
4B	Attenuation Swale 4B	0.30	0.80	203.00	Loughlinstown Watercourse
5	Attenuation Basin 5	0.39	1.00	239.00	Hazelhatch River

Drainage Network Ref. No	Attenuation System Ref. No	Contributing Catchment Area (ha)	Max Discharge Rate (l/s)	Attenuation System - Volume of Storage (m ³)	Outfall
6A	Attenuation Swale 6A	0.34	0.90	245.00	Hazelhatch River
6B	Attenuation Swale 6B	0.35	0.90	252.00	Stream Diversion
7	N/A	N/A	N/A	N/A	3 No. Outfalls to Infiltration Trenches
8	N/A	N/A	N/A	N/A	Stream Diversion
9	N/A	N/A	N/A	N/A	5 No. Outfalls to existing drainage network

The details of the proposed watercourse crossing structures are outlined in **Table 2-3**.

Table 2-3: Proposed Watercourse Crossings

Structure Ref.	Chainage	Location	Watercourse	Type	Span/Length (m)	Size (m)	Embedment (m)
River Liffey Crossing	0+230	Mainline Corridor	River Liffey	Single Span Bridge	65.50	-	-
Cul-01	0+880	Mainline Corridor	Loughlinstown Stream	Pipe	35.11	1.2mØ	0.300
Cul-02	1+490	Mainline Corridor	Hazelhatch River	Box	37.40	4.0m (W) x 2.7m (H)	0.500
Cul-03	1+710	Mainline Corridor	Stream Diversion	Box	31.20	3.5m (W) x 2.6m (H)	0.500

2.10 Project Specific Flood Alleviation Proposals

In accordance with the requirements of “*The Planning System and Flood Risk Management, Guidelines for Planning Authorities*” and associated Technical Appendices (DoEHLG & OPW, 2009), a separate Flood Risk Assessment (FRA) has been carried out.

The Guidelines outline the key principles that should be considered when assessing flood risk to proposed sites. It recommends a staged approach to the assessment of flood risk. The FRA may conclude at any stage if criteria are not met to progress to the next stage. The stages are listed below:

- Stage I Flood Risk Identification – to identify whether there may be any flooding or surface water management issues.
- Stage II Initial Flood Risk Assessment – to confirm sources of flooding that may affect an area or proposed development, to appraise the adequacy of existing information and to scope the extent of the risk of flooding which may involve preparing indicative flood zone maps.
- Stage III Detailed Flood Risk Assessment – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development or land to be zoned, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures.

The Flooding Risk Assessment is provided under separate cover as part of the planning application and a summary is provided below:

- The desktop study undertaken identified fluvial flooding from the Hazelhatch Rivers as the primary source of flood risk to the proposed CHMC site. Potential fluvial flood risk was also identified for the River Liffey and Loughlinstown River Crossing. Fluvial Flooding caused by insufficient channel and/or hydraulic structures capacity contributing to out-of-bank flooding. Pluvial flooding was identified as a possible risk to the site due to the extent of the hardstanding area proposed for the

development, and also due to GSI Synthetic Aperture Radar (SAR) seasonal flood map showing a low probability of localised pluvial flooding intersecting the proposed CHMC.

- The Stage 2 Initial Flood Risk Assessment concludes the design for the River Liffey and Loughlinstown River Crossings are adequate and does not pose a fluvial flood risk. The proposed CHMC drainage design improves the existing pluvial flood risk and it also caters for the run-off from hardstanding areas and the discharge to receiving watercourses are limited to greenfield runoff rates. The fluvial flood risk from the Hazelhatch Rivers required further assessment and was progressed to Stage 3 Detailed Flood Risk Assessment.
- The Stage 3 Detailed Flood Risk Assessment concluded that mitigation was required to ensure no increase to flood risk adjacent to the Scheme due to flooding from the Hazelhatch Rivers.

The following measures are proposed between Ch. 1+440 to Ch. 1+710, where the proposed road crosses through an area subject to existing flooding, to mitigate potential increases in flood levels upstream of the project:

- Proposed 15 no. 0.9m diameter floodplain culverts (60m length each)
- Proposed 4 no. 1m deep ditches (500m total length)
- The Stage 3 Detailed Flood Risk Assessment concludes that the proposed CHMC with mitigation does not increase flood risk elsewhere. The results of the analysis showed the proposed CHMC provide an improved freeboard for a number of residential dwellings located downstream of the proposed CHMC.

The proposed CHMC is considered an appropriate development of the site in accordance with the requirements of the Justification Test and the Planning Guidelines for Flood Risk Management (DoEHLG & OPW 2009).

2.11 Utilities

Utility providers were contacted and requested to provide all relevant information on any existing utilities located within the study area for the Celbridge to Hazelhatch Mobility Corridor. Responses received indicated that GNI, ESB, Eir, Virgin Media and Uisce Éireann (formerly known as Irish Water) have utilities in the study area. Most of the other utility companies responded confirming that they do not currently own any plant within the study area and have no plans to construct any new plant within the study area in the foreseeable future.

A Utilities Report has been prepared for the scheme (Reference **MDT0902-RPS-00-XX-RP-Z-0032**) which provides a summary of the existing utilities encountered along the scheme and outlines the proposed measures for addressing any conflicts with existing services. A summary of the utility conflicts expected to be encountered and the recommended measures for each conflict are provided in **Table 2-4** below.

The proposed utility works are illustrated on drawings **MDT0902-RPS-01-XX-DR-Z-UT1001-UT1007**.

Table 2-4: Summary of Proposed Measures for Utility Conflicts

Location	Description of Service	Conflict	Proposed Measures
Gas Networks Ireland (GNI)			
Ch. 0	Gas Distribution Pipe	Pipe runs along the R403 Clane Road where the project ties in with the existing road.	Pipeline to be retained and protected in place.
Ch. 50 to Ch. 100	Gas Distribution Pipe	Pipe crosses the proposed road alignment.	Pipeline to be decommissioned.
Ch. 290	Gas Distribution Pipe	Pipe runs along Newtown Road where the project interfaces with the existing road.	Pipeline to be retained and protected in place.
ESB / ESB International (ESBI)			

Location	Description of Service	Conflict	Proposed Measures
Ch. 100	HV 110KV Overhead Line	Overhead powerline crosses over proposed access to severed lands.	Overhead powerline to be retained and protected in place.
Ch. 150	HV 110KV Overhead Line	Overhead powerline crosses over proposed footpath link.	Overhead powerline to be retained and protected in place.
Ch. 290	HV 110KV Overhead Line	Overhead powerline crosses over Newtown Road where the project interfaces with the existing road.	Overhead powerline to be retained and protected in place.
Ch. 540 to Ch. 570	HV 110KV Overhead Line	Overhead powerline crosses over proposed road alignment.	Overhead powerline to be retained and protected in place.
Ch. 1250 to Ch. 1450	HV 220KV Overhead Line	Overhead powerline crosses over proposed road alignment.	Overhead powerline to be retained and protected in place.
Ch. 1700 to Ch. 1750	HV 220KV Overhead Line	Overhead powerline crosses over realignment of R405 Hazelhatch Road.	Overhead powerline to be retained and protected in place.
Ch. 0 to Ch. 75	HV 38KV Underground Cable	Underground power cable crosses the proposed road alignment.	Underground power cable to be retained and protected in place.
Ch 0.	MV/LV Underground Cables	Underground power cables run along the R403 Clane Road where the project ties in with the existing road.	Underground power cables to be retained and protected in place.
Ch. 290	MV/LV Underground Cables	Underground power cables run along Newtown Road where the project interfaces with the existing road.	Underground power cables to be retained and protected in place.
Ch. 360	MV 10KV/20KV Overhead Line	Overhead powerline crosses the proposed road alignment.	Overhead powerline to be retained and protected in place.
Ch. 1960	LV 400V/230V Overhead Line	Overhead powerline located near where the proposed road alignment ties in with the Loughlinstown Road Roundabout at Chainage 1960.	Overhead powerline to be diverted with new overhead line.
Uisce Éireann			
Ch.0	Watermain	Watermain runs along the R403 Clane Road where the project ties in with the existing road.	Watermain to be retained and protected in place.
Ch. 290	Watermain	Watermain runs along Newtown Road where the project interfaces with the existing road.	Watermain to be retained and protected in place.
Ch. 1700 to Ch. 1960	Watermain	Watermain runs along the R405 Hazelhatch Road where the project interfaces with the existing road.	Watermain to be retained and protected in place.

Location	Description of Service	Conflict	Proposed Measures
Ch. 100 to Ch. 150	Foul Sewer	Foul sewer crosses the proposed road alignment between Chainage 100 to 150.	Foul sewer to be retained and protected in place. Manhole covers to be adjusted where required.
Ch. 150 to Ch. 200	Foul Sewer	Foul sewer crosses under the north west side of the proposed River Liffey bridge crossing.	Foul sewer to be retained and protected in place. Manhole covers to be adjusted where required. Additional 300mm diameter pipe to be provided under bridge crossing for potential future use. Manholes to be provided at ends of new pipe to allow future connection.
Ch. 200 to Ch. 250	Foul Sewer	Foul sewer crosses under the south east side of the proposed River Liffey bridge crossing.	Foul sewer to be retained and protected in place. Manhole covers to be adjusted where required. Additional 450mm diameter pipe to be provided under bridge crossing for potential future use. Manholes to be provided at ends of new pipe to allow future connection.
Ch. 0	Eir Underground Cables	Underground cables run along the R403 Clane Road where the project ties in with the existing road.	Underground cables to be retained and protected in place. Chamber covers to be adjusted where required.
Ch. 290	Eir Underground Cable	Underground cable runs along Newtown Road where the project interfaces with the existing road.	Underground cable to be retained and protected in place. Chamber covers to be adjusted where required.
Ch. 1420	Eir Overhead Line and Underground Cable	Overhead line and underground cable run along Simmonstown Manor Road where the project interfaces with the existing road.	Overhead line and underground cable to be diverted underground.
Ch. 1700 to Ch. 1960	Eir Underground Cable	Underground cable runs along the R405 Hazelhatch Road where the project interfaces with the existing road.	Underground cable to be retained and protected in place. Chamber to be relocated so situated in proposed road verge rather than proposed carriageway. Chamber covers to be adjusted where required.
Ch. 1890	Eir Overhead line	Overhead line crosses the proposed road alignment.	Overhead line to be diverted underground.
Ch. 1960	Eir Underground Cable	Underground cable runs along Loughlinstown Road where the project ties in with the existing road.	Underground cable to be retained and protected in place. Chamber covers to be adjusted where required.
Virgin Media			
Ch. 0	Virgin Media Underground Cable	Underground cable runs along the R403 Clane Road where the project ties in with the existing road.	Underground cables to be retained and protected in place. Chamber covers to be adjusted where required.

2.12 Pavement

The following pavement construction is proposed for the new road:

- Surface Course: 40mm SMA 14 surf PMB 65/105-60 DES
- Binder Course: 60mm AC 20 DENSE BIN 40/60 DES
- Base Course: 80mm AC 32 DENSE BASE 40/60 DES
- Subbase: 150mm UGM A

It is generally proposed that 300mm of 6F2 capping is provided beneath the pavement construction.

The pavement design is illustrated on drawings **MDT0902-RPS-01-XX-DR-Z-PV0000-PV0007** and **MDT0902-RPS-01-XX-DR-Z-PV1001**.

2.13 Earthworks

The proposed road is predominantly constructed on embankment. The approximate quantities of earthworks material to be imported are as follows:

- General Fill: 56,000m³
- Capping (Class 6F2): 6,000m³

For road embankment construction in area prone to flooding between Ch. 1+400 to Ch. 1+960, starter layers of Class 6B or Class 6C granular material shall be deposited as the first layers of fill above existing ground level.

Any existing topsoil shall be stripped from ground over the entire footprint of the project. This excavated topsoil shall be appropriately stored for reuse in construction of grassed verges, embankment slopes, and vegetated drainage systems.

Given deep excavations are generally not required for the construction of the road, it is expected that interactions with groundwater bodies shall be minimal for the majority of the works. However, excavations will be required adjacent to the River Liffey for construction of the bridge structure foundations. Groundwater will likely be encountered in these excavations requiring dewatering for construction of the foundations.

The following earthworks quantities have been estimated for the construction of the proposed attenuation basins, attenuation swales, drainage ditches and stream diversions:

- Total Excavation: 10,000m³
- Total Fill: 7,100m³

2.14 Lighting

New public lighting will be provided for the full extent of the proposed project. The proposed lighting columns are illustrated on drawings **MDT902- RPS-01-XX-DR-Z-GA0001 – GA0015**.

The lighting will be provided by energy efficient light emitting diode (LED) lanterns providing a neutral white output with each mounted on lighting columns that will be designed to the minimum height required. All lanterns will be fully cut-off type to minimise light spill and ensure that light is concentrated on the proposed roads, cycleways and footpaths. The lighting will be designed to the appropriate Lighting Class in compliance with BS 5489-1: Code of Practice for the Design of Road Lighting.

All cables for the lighting installation will be ducted underground.

2.15 Site Clearance

The site shall be cleared of any obstructions to the construction of the project.

Existing buildings and polytunnels currently used for horticulture purposes will be demolished between approximately Ch. 0+050 to Ch. 0+150.

The following lengths of existing walls are to be removed:

- Approximately 23m of stone wall to be removed at R403 Clane Road.
- Approximately 92m of stone and blockwork walls to be removed at Newtown Road.

An Arboricultural Survey was carried out in accordance with BS5837:2012 *Trees in Relation to design, demolition and construction* for a study area covering the full extent of the proposed Project. Following completion of the survey, a Tree Constraints Plan and a Tree Schedule were produced identifying the locations of the trees, their assessment category, their crown spreads and their Root Protection Areas (RPAs). A check was carried out to confirm that no trees within the study area were subject to any statutory designations e.g. Tree Protection Orders.

Subsequently an Arboricultural Impact Assessment (AIA) was carried out to evaluate the impact of the proposed project on the trees in the study area and determine required tree removals, required pruning works and recommended measures to mitigate impacts. A Tree Protection and Removal Plan was produced identifying the trees to be removed, trees to be retained and recommended locations of temporary tree protection fencing. A Tree Removal Schedule was also produced listing the trees to be removed.

The AIA has identified the following quantities of trees and hedgerows that require removal:

- Individual Trees: 126 No.
- Groups of Trees: 4,446 m²
- Length of Hedgerow: 445 m
- Scrub: 135 m²

The trees protection and removal plan are illustrated on drawings **MDT0902-RPS-01-XX-DR-Z-LA1000-LA1007**.

No contaminated land was identified during the ground investigation works.

2.16 Fencing

The proposed fencing and environmental barrier design is illustrated on drawings **MDT0902-RPS-01-XX-DR-Z-FE0000-FE0007**.

Mammal-resistant fencing will be required to prevent badgers and otter crossing the new roadway and guide them to the proposed mammal underpasses and mammal ledges in box culverts. The specification for mammal-resistant fencing for badgers and otters is outlined in the NRA “Guidelines for the Treatment of Badgers prior to the construction of National Road Schemes” and “Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes” respectively.

The mammal resistant fencing will be constructed as per TII standard details [CC-SCD-00319](#) or [CC-SCD-00324](#). At some locations it will be necessary to incorporate mammal-resistant measures into the construction of the proposed noise barriers and security fencing.

Where mammal-resistant measures are not required, boundary fencing for the project will generally be timber post and rails fence as per TII standard details [CC-SCD-00301](#).

Paladin style security fencing is proposed where required to prevent unauthorised access such as around proposed attenuation basins.

Steel field gates will be provided where required for landowner accesses and maintenance accesses. These gates will be constructed as per TII standard details [CC-SCD-00309](#) (steel single field gate) and [CC-SCD-00310](#) (steel double field gate). Paladin style security gates are proposed where required to prevent unauthorised access. At some locations it will be necessary to incorporate mammal-resistant measures into the construction of the proposed gates.

2.17 Landscaping

A preliminary landscape design has been prepared for the scheme and is illustrated on drawings **MDT0902-RPS-01-XX-DR-Z-LA0000-LA0008**. A detailed Landscape Design Plan will be prepared at the detailed design stage.

The landscape design for the Celbridge to Hazelhatch Mobility Corridor was developed, having regard for the baseline landscape character and to mitigate adverse landscape and visual effects. The scheme features native species woodland and hedgerow planting along with standard trees and was designed to link in with existing retained vegetation. The proposed Scheme as a whole sought to minimise vegetation losses. The landscape scheme details serve to enhance biodiversity and incorporate sustainable drainage features.

Where the drainage bio-retention trenches are proposed, trees will be planted at circa 25m spacing within the grassed verge between the proposed road and cycleways. It is also proposed to provide tree and vegetation planting in other available green spaces, so long as it does not impact on sightlines and safe operation of the scheme, or maintenance requirements.

The proposed planting is as follows:

Standard Trees: 219 No.

Hedge (linear metres): 2,207m

Woodland (square metres): 7,152m²

Woodland (damp conditions, square metres): 4,191m²

Shrub mix near overhead lines (square metres): 1,411m²

2.18 Construction of the Proposed Development

2.18.1 Site Access

The site will likely be accessible from each existing road that interfaces with the project.

It is expected that HGV site access, e.g. for import of earthworks material, shall generally be limited to the R403 Clane Road for site access north of the River Liffey, and the R405 Hazelhatch Road for site access south of the river.

2.18.2 Compound

It is proposed that main compound will be located on the south east side of Newtown Road between approximately Ch. 0+425 to Ch. 0+545. This compound will include welfare facilities and vehicle parking for site staff and will allow for the storage of materials. Temporary land take has been included to accommodate this compound and the compound will remain in place for the duration of the works. The compound will have appropriate levels of security. The Contractor will be required to manage parking and deliveries at the compound and other areas in such a manner as to ensure that there is no obstruction to general traffic or sightlines during construction.

It is likely that an additional smaller compound will be required for the site to the north of the River Liffey. Also, localised welfare facilities and vehicle parking for site staff may be provided along the scheme.

Following completion of the proposed scheme, the site compounds will be decommissioned and all materials removed from the site. The temporary land take will be returned back to its original use.

The expected locations of the site compounds are indicated on the drawings **MDT0902-RPS-01-XX-DR-Z-LH0001-LH0003**.

2.18.3 Advance Works

Kildare County Council may decide for some works to be carried out under advance works contracts. These works could include:

- Archaeological test trenching
- Site clearance including demolition of structures and vegetation/ tree removal
- Invasive species management
- Boundary fencing
- Utilities diversions
- Site compound set-up
- Natural catchment drainage including watercourse culverts and flood relief measures
- Landowner access arrangements.

2.18.4 Main Construction

It is expected that the bridge construction will begin early in the programme due to the need for construction space in the area of Attenuation Pond 2. This will include construction of working platforms for operation of cranes. The working platforms will likely be constructed of stone fill and will be located outside the extent of the fluvial flooding from the River Liffey.

The earthworks for the remainder of the project will predominately involve stripping topsoil and subsequent import, laying and compaction of embankment fill. As the earthworks does not include significant cuttings, dewatering of excavations will generally not be required. However, suitable sediment and erosion controls will be implemented for the runoff from the earthworks to ensure that the sediment load in water discharging to the receiving watercourses is kept below permissible levels.

2.18.5 Construction Works in Proximity to River Liffey

Proposed construction works in proximity to the River Liffey include:

- Bridge construction including temporary working platform for crane operation
- Construction of earthworks embankments approaching bridge crossing
- Construction of drainage attenuation basins
- Drainage outfalls construction
- Construction of foul sewer pipes and manholes for potential future use.

The northern bridge abutment has been set back a minimum of 12 metres from the top of northern river bank. The minimum distance between the southern bridge abutment and the top of the southern river bank is approximately 9.5 metres. It is considered that these set back distances are sufficient to allow the bridge foundations and abutments to be constructed without impacting the river banks. There is also sufficient space to construct the proposed foul sewer pipes and manholes without impacting the river banks.

The proposed bridge abutments, bridge foundations, temporary working platform, earthworks embankments, drainage attenuation basins, and foul sewers, are all sited outside the River Liffey's predicted 0.1% AEP flood extents. The drainage outfalls will encroach areas which may be prone to fluvial flooding, however, these works can be timed to take place when the river's water levels are low.

Due to potential ingress of groundwater, excavations for construction of bridge foundations, drainage outfalls, and foul sewers, may require dewatering. The water extracted from the excavations would likely be discharged to the river. Sediment control measures would be implemented to reduce the sediment load in this water prior to discharging to the watercourse. This could include fitting silt bags to outlet pipes. When the water flows through these silt bags, the tightly woven fabric traps sediment particles down to a size of 100 microns (μm). Once the bag is filled with sediment it will be removed and replaced. **Figure 2-2** illustrates an example of a silt bag installed on an outlet pipe.



Figure 2-2 Typical Silt Bag

Sediment control measures will also be implemented to prevent laden surface water runoff from earthworks reaching the river. This could include silt fences which comprise a geotextile filter fabric installed in the path of sheet flow run-off to filter out heavy sediments. Posts support the filter fabric and the fabric itself is buried in the ground to ensure sediment is trapped behind it and doesn't breach the fence. The selection of the type of filter fabric depends on the expected volume of run-off and the characteristics of the sediment. It is sized to retain sediment particles but also have openings large enough to permit water to drain through and avoid clogging. When silt fences are used as sediment control measures, they will be subject to regular rigorous inspections to ensure they remain well constructed and functional. Any silt trapped during rainfall events will be promptly removed and any damage to the fences will be repaired to ensure they continue to function as effective silt barriers. **Figure 2-3** illustrates an example of a silt fence.



Figure 2-3 Typical Silt Fence

2.18.6 Construction Timeline

It is estimated that the overall duration of the construction programme will be approximately 24 months. The exact sequencing of the works will be dictated by the Contractor's methodology and programme.

The sequence of works is expected to be as follows, noting that many of these elements will progress in parallel:

- Establish site compounds
- Site clearance and fencing
- Demolition works
- Bridge Construction
- Drainage culverts construction
- Earthworks
- Drainage and utilities works
- Road pavement construction
- Cycle tracks and footpaths construction
- Landscaping works
- Signage, road markings, lighting and traffic signals works

2.18.7 Hours of Works

Construction activities will be undertaken during daylight hours. It is proposed that the normal permitted working times will be 07.00 to 19.00 hours Monday to Friday and 08.00 to 16.30 hours on Saturdays, with no

working on Sundays and Public Holidays, unless otherwise agreed between the Contractor and the local authority (Kildare County Council).

Works other than the pumping out of excavations, security and emergency works will not be undertaken outside these working hours without the written permission of the local authority. This permission, if granted, can be withdrawn at any time should the working regulations be breached.

There are certain works that may benefit from being undertaken outside of normal working hours e.g. delivery and lifting of bridge beams or any other works that require traffic management on existing roads. The bridge beams will be manufactured off-site but will need to be craned into position. This activity will benefit from being undertaken outside of normal working hours. Temporary lighting will be required for any works outside of daylight hours and details on temporary lighting requirements are provided in **Section 2.18.8** below.

2.18.8 Site Lighting

Site lighting will typically be provided by tower mounted temporary portable construction floodlights. The floodlights will be cowled and angled downwards to minimise light spillage outside of works areas and to surrounding properties. Lighting will be provided with the minimum luminosity sufficient for safety and security purposes and will be shut off at night when not in use or when works cease at the end of the day in order to minimise the effects of light pollution and disturbance to nocturnal species.

2.19 Operational Phase

2.19.1 Maintenance of Bridge Structure

The use of weathering steel for the fabrication of the steel plate girders will ensure that maintenance painting will not be required over the lifetime of the structure. The deck surfacing will need maintenance and replacement after 20 years.

As noted in **Section 2.6**, the integral bridge design does not require expansion joint or bridge bearings, significantly reducing the maintenance requirements for the structure.

2.19.2 Maintenance of Drainage

The vegetated attenuation systems (basins and swales) will need regular inspection as the growth of vegetation will need to be inspected and controlled to ensure the system continues to operate as designed.

Inspections will be carried out at regular intervals and after any significant storm events (greater than a 1-in-1 year event) to check for signs of erosion or flooding, which would indicate whether the system has been affected by the storm. The maintenance regime will ensure that the hydraulic and treatment performance of the ponds is operating as designed.

Any sediment which is not collected upstream of the ponds is likely to settle in the base of the retention pond. This sediment, along with any plant waste, will be removed with care to avoid damage to the pond liner (if part of the pond design) and any vegetation. Information will be provided to operatives on the presence and depth of liners and on the existence of any depth markers. Consideration will be given to the impact that disturbance of the sediment will have on the short-term migration of fines and contaminants from the system and maintenance operations planned accordingly.

Sediment removal will take place at least every ten-years, but this will vary by location and shall be determined by inspection during operation. The removal may need to be phased to protect the existing vegetation. As the ponds are designed to collect and treat contaminants associated with run-off, the area in and around the pond will be considered contaminated and the maintenance regime will take account of this during the disposal of any sediment or plant waste from the ponds, as well as the de-contamination of the pond when it has reached the end of its useful life.

The hydrocarbon interceptors' maintenance will be carried out in accordance with the manufacturer's recommendations and BS EN 858-2:2003 Separator systems for light liquids (e.g. oil and petrol) – Part 2.

It is normally recommended that cleaning of the interceptor takes place every three to six months, but this may vary depending on location and catchment area. Additional cleaning and maintenance will be undertaken after any major events that may have caused additional debris to collect in the system.

The regular maintenance schedule will include, but not be limited to:

- Check the integrity of the interceptor and all its mechanical parts;
- Inspect the filters and repair or replace, where required;
- Assess the volume of contaminants collected in the tank;
- Service all electrical systems, interceptor management systems and alarms etc.;
- Have all silt and contaminants removed and disposed in accordance with environmental regulations;
- Keep logs of any inspections, maintenance, incidents, services and contaminant removal activities; and
- Ensure any contaminants are removed and transported in accordance with relevant legislation.

2.19.3 Maintenance of Road Pavement

The new road pavement will require ongoing inspection, testing and maintenance. This will be carried out in accordance with Kildare County Council's pavement management requirements. Temporary traffic management will be provided where required to facilitate inspection, testing and maintenance.

It is expected that the pavement surface course will require to be replaced every 8 to 10 years.

3 SCOPE OF ENVIRONMENTAL ASSESSMENT

3.1 Introduction

Whilst the need for the preparation of an EIAR for the proposed scheme has been screened out as detailed separately within the EIA Screening Report (provided under separate cover) prepared to accompany this Section 177AE Planning Application (RPS, 2024), in order to inform the Environment Report, a scoping exercise was undertaken to establish the key aspects of the environment to be considered and addressed further, and to subsequently provide sufficient information to the competent authority to determine the planning application for the proposed Scheme.

The information in the report is supplemental to the information including mitigation measures and restrictions contained within the Natura Impact Statements, the CEMP and Flood Risk Assessment. Thus the information in this report is part of the overall proposals for consideration and assessment by the competent authority.

3.2 Identification of Potential Environmental Effects

Table 3.1 outlines the consideration given to the identification of potential environmental effects. Each of the topics was considered in terms of potential pathways for environmental effects in the context of the proposed scheme in **Chapter 2: Description of Proposed Development and** identifies those topics that have been scoped in for further detailed assessment as well as those that have been scoped out (and the reasons why).

Table 3.1: Key issues for Further Consideration

Topic	Key Issues for consideration	Scoped In for Further Consideration	Rationale
Population	Potential for nuisance to arise during the construction works as a result dust and noise emissions generated from construction activity causing a disturbance to sensitive receptors; Potential for Land use change and demographic patterns.	No	Air Quality and Noise & Vibration is addressed below. Significant impacts on population in terms of changes in demographic profile or settlement patterns during the construction phase as a result of the proposed works are unlikely. The proposed Scheme will have a long-term beneficial effect on the population of the wider area by enabling delivery of the KDA 5 Simmonstown site that provides for the sustainable expansion of Celbridge town centre and the development of new residential neighbourhoods. While the Scheme will assist in unlocking the development potential of the KDA, any proposals for the development of the KDA will be subject to its own future separate planning applications and supporting environmental assessments.
Human Health	Changes to air quality (road and construction traffic emissions and potential dust nuisance). Changes in noise and vibration exposure (including night-time and day-time noise associated with construction activities).	No	Changes to local Air Quality road traffic emissions and potential dust nuisance) will be addressed under Air Quality. Changes in Noise exposure will be addressed under Noise & Vibration. No significant adverse effects are predicted during the construction phase and good practice measures during the construction phase will reduce the potential impacts arising from the environment pathways of air, water, soil and noise. Overall the Proposed Scheme will have a positive impact on human health and climate as it supports sustainable transport modes.
Traffic & Transport	Potential effects on traffic and the surrounding road network as a result of the construction and operation of the Proposed Scheme	Yes	The Proposed Scheme will provide a high quality pedestrian and cycle route connecting the town with the train station. Further consideration of potential changes in traffic flow and congestion on the surrounding road network is required for the future operational phase of the Proposed Scheme and traffic reassignment across the surrounding local network. In addition the proposed scheme will create new junctions which need to be considered. This topic is scoped in for further consideration.
Biodiversity	Potential biodiversity impacts include Biodiversity loss, fragmentation and alteration; disturbance from noise, vibration, lighting and human presence; pollution to water, air,	Yes	The following impact pathways have been identified and further consideration is required for the construction and operational phases of the Proposed Scheme: ○ Biodiversity loss, fragmentation, and alteration; ○ Disturbance from noise, vibration, lighting, and human presence; ○ Pollution to water, air, and/or soil; and ○ Spread of invasive alien species.

Section 177AE Environmental Report

Topic	Key Issues for consideration	Scoped In for Further Consideration	Rationale
	and/or soil and spread of invasive alien species.		This topic is scoped in for further consideration.
Water	Potential impacts on water quality of the River Liffey due to sediments or pollutants	No	No in-stream construction works are proposed for the new crossing of the River Liffey which will be fully spanned by the new road. The construction works are not anticipated to result in a significant amount of run-off into the River Liffey or its tributaries. The working platforms for the construction of the bridge will be located outside the extent of the fluvial flooding from the River Liffey. Pollution prevention control measures and surface water management measures at the River Liffey Crossing will be implemented to ensure that significant effects on surface waters do not arise during construction. Various SuDS features are incorporated into the design of the Scheme (including attenuation basins, attenuation swales, bio-retention trenches, infiltration trenches and hydrocarbon interceptors) which will treat and attenuate the surface water run-off before it discharges to the receiving watercourse at greenfield run-off rates. This will reduce operational phase pollutant run-off into watercourses, pollutant infiltration into groundwater and potential hydraulic changes. Therefore, impacts on surface waterbodies during operation are not deemed significant.
Soils, Geology & Hydrogeology	Loss of soil reserves through the construction of hardstanding, piling and structures; Accidental emissions and release of potentially hazardous substances during construction that may affect the quality of soils, particularly where below ground excavations are required.	No	The Proposed Scheme will be predominantly constructed on embankment. Given deep excavations are generally not required for the construction of the road, it is expected that interactions with groundwater bodies shall be minimal for the majority of the works. Excavations will be required adjacent to the River Liffey for construction of the bridge structure foundations. Groundwater will likely be encountered in these excavations requiring dewatering for construction of the foundations. The implementation of a CEMP by the appointed contractor will ensure standard best practice measures are adhered to in relation to dewatering of excavations, storage and handling of hazardous substances and emergency response procedures and that there will be no significant effects on Soils, Geology and Hydrogeology during construction.
Landscape & Visual	Effects on landscape character, landscape features, visual receptors, and visual amenity associated with the	Yes	The Proposed Scheme traverses a single Principal Landscape Character Area (LCA), Northern Lowlands and traverses a single Sub-ordinate LCA identified as River Liffey. The Northern Lowlands LCA is categorised as class 1 low sensitivity according to the published landscape character assessment and determines the impact of development (Chapter 13, Section 13.3.2) on the Northern Lowlands LCA as being highly compatible

Section 177AE Environmental Report

Topic	Key Issues for consideration	Scoped In for Further Consideration	Rationale
	construction and operation of the Proposed Scheme		with a range of development types that include Urbanisation and Infrastructure. The River Liffey LCA is categorised as Class 4 – Special Sensitivity and has low compatibility with a range of development types that include Urbanisation and Infrastructure. Further consideration and assessment is required. This topic is scoped in for further consideration.
Air Quality	Traffic-related emissions and dust during the construction of the scheme; Road traffic-derived pollution during the operational phase of the scheme.	Yes	The main source of impact are expected to occur during the construction phase. There is potential for dust generation from earthworks, plant and construction traffic leading to potential for nuisance impacts on receptors in proximity to the works. There is also potential for transport related emissions from construction traffic. The benefits of the Proposed Scheme will be considered, particularly the redistribution of traffic from the wider area and the integration of active travel modes into the overall scheme. This topic is scoped in for further consideration.
Climate	GHG emissions and embodied carbon associated with the proposed construction materials and activities for the Proposed Scheme; Potential for impacts on climate from the scheme during the operational phase is from road traffic derived pollution.	Yes	During the construction stage the main source of climate impacts will be as a result of GHG emissions and embodied carbon associated with the proposed construction materials and activities for the proposed development. The use of these low embodied carbon materials in construction will reduce the construction phase emissions and as such this topic is scoped in for further consideration. The vulnerability of the proposed scheme to climate change is also considered under the topic of Climate.
Noise & Vibration	Construction noise and vibration; and Road traffic noise during the operational phase.	Yes	The main potential source of noise and vibration impacts from the scheme will be from potential traffic-related emissions. The potential for impacts from construction associated machinery required during the construction stage will also be assessed. This topic is scoped in for further consideration.
Archaeology, Architecture and Culture Heritage	Potential impacts to heritage or setting for national and recorded monuments, areas of archaeological potential, architectural heritage, buildings/features on the RPS, demesne houses/ garden landscapes, or architectural conservation areas	Yes	The proposed route of the scheme passes through the former demesne lands associated with Celbridge Abbey. Temple Mills Architectural Conservation Area is also located in the vicinity of the scheme. Further consideration is required in relation to potential for visual changes to the setting of Celbridge Abbey and the setting and visual amenity of the Temple Mills ACA. This topic is scoped in for further consideration.

Section 177AE Environmental Report

Topic	Key Issues for consideration	Scoped In for Further Consideration	Rationale
	and unrecorded cultural/ industrial heritage features.		
Material Assets: Agricultural Properties	Landtake from agricultural properties; Impacts to agricultural properties and practices	Yes	There are four agricultural properties impacted by the Proposed Scheme. There will be impacts on the individual landowners depending on the specific extent of land take required (permanent or temporary). This topic is scoped in for further consideration.
Material Assets: Non-Agricultural Properties	Landtake from non-agricultural properties	Yes	There are eleven non-agricultural properties impacted by the Proposed Scheme. There will be impacts on the individual landowners depending on the specific extent of land take required (permanent or temporary). This topic is scoped in for further consideration.
Resource & Waste Management	Waste emissions arising from the construction of the Proposed Scheme	No	The key phase for the potential production of waste is the construction phase. The Proposed Scheme will be predominantly constructed on embankment. All waste materials arising from the construction and operation of the Proposed Scheme will be dealt with in a sustainable manner and in accordance with all relevant environmental legislation, guidance and policy documents. The contractor will develop and implement a Construction Waste Management Plan (CWMP) to ensure that waste arising on-site during the construction phase will be managed and disposed of in a way that ensures the provisions of the Waste Management Acts, 1996-2011 and associated Regulations (1996-2011) are complied with. The implementation of a CEMP by the appointed contractor will ensure standard best practice measures are adhered to.
Major Accidents & Disasters	Vulnerability of the Proposed Scheme to risks of major accidents and/or disasters	No	There are no Seveso Sites in proximity to the Proposed Scheme. The Proposed Scheme is not at risk of major accidents, nor is the development as designed likely to increase the risk of a major accident in this location. A separate Flood Risk Assessment has been prepared for the Proposed Scheme. In addition, the vulnerability of the proposed scheme to climate change will be further considered under the topic of Climate.

Key environmental topics have been considered as part of scoping and further consideration is considered necessary for some aspects. Environmental assessments have therefore been prepared for those topics that have been scoped for further assessment:

Chapter 4: Traffic & Transport

Chapter 5: Noise & Vibration

Chapter 6: Air Quality

Chapter 7: Climate

Chapter 8: Landscape & Visual

Chapter 9: Biodiversity

Chapter 10: Cultural Heritage

Chapter 11: Material Assets: Agricultural Properties

Chapter 12: Material Assets: Non-Agricultural Properties

3.3 Cumulative Impact

A cumulative impact assessment (CIA) has been undertaken to consider potential for cumulative impact of the Proposed Scheme with other approved development. A desktop planning search of My Plan and ABP's planning enquiry system was undertaken to review granted planning applications and those currently under consideration within the last 5 years, and within a 1km buffer the proposed development.

Table 3.2: Projects Screened for Potential Cumulative Effects

Ref. No.	Description of Development	Date Granted	Screen in for Cumulative Impact Assessment
ABP Ref. 316119	DART+ South West Electrified Heavy Railway Order - Hazelhatch & Celbridge Station to Heuston Station, and Heuston Station to Glasnevin	Nov 2024	Yes
24113	Conversion of existing attic space at 56 Priory Lodge, St. Raphael's Manor , Celbridge	May 2024	No
19581	Roof alterations for the conversion of the attic space to comprise the construction of a new gable wall to the side elevation at 48 Priory Lodge, Saint Raphael's Manor, Celbridge.	Oct 2019	No
24145	Development will consist of single storey extension to side and rear of existing house at 11 The Crescent, Temple Manor, Celbridge.	June 2024	No
23984	The conversion of the attic space into storage use with a projecting dormer window to the rear at 39 Priory Lodge, St Raphael's Manor, Celbridge.	Dec 2023	No
Not yet in planning system	Future residential development associated with Simmonstown KDA.	-	Yes

Most of the applications relate to small scale residential development within Celbridge and having regard to the nature and scale there is no real likelihood of significant adverse effects on the environment.

The Projects which have been identified which might have the potential for cumulative impact with the Proposed Scheme are the DART+ South West Project and future residential development associated with Simmonstown KDA. These are described below:

Iarnród Éireann DART+ South West Project

The Railway Order Application for the Project was submitted in March 2023 and approved in November 2024. The DART+ South West will significantly increase train capacity from the current 12 trains per hour per direction to 23 trains per hour per direction (i.e. maintain the existing 12 services, with an additional 11 train

services provided by DART+ South West - four will finish service at Heuston and seven will follow the Phoenix Park Tunnel Branch Line towards the Docklands area.). This will increase passenger capacity from the current peak capacity of approximately 5,000 passengers per hour per direction to approximately 20,000 passengers per hour per direction.

There is no direct interface between the Proposed Scheme and the proposed DART+ South West Project. The Proposed Scheme ties into the Loughlinstown Road Roundabout at Hazelhatch train station. The construction works for the overall DART+ South West Project is 50 months, however work will not be continuous in the area but there will be discrete period of construction activity required. Where construction stage of both projects occurs within the same timeframe the potential exists for cumulative effects.

Long-term positive cumulative effects are likely during the operation stage as both projects will support the development and improvement of sustainable transport, the Celbridge Hazelhatch Mobility Corridor will improve connectivity to the train station and access to sustainable transport modes of improved rail services.

Future Residential Development (Simmonstown KDA)

The Proposed Scheme will traverse lands identified as a Key Development Area 5 (KDA) in the Celbridge Local Area Plan 2017 – 2023. The CHMC project does not in itself deliver housing, however it does support the Housing for All objective of increasing new housing supply by providing sustainable access and opening KDAs south of the river Liffey in Celbridge. The lands at KDA Simmonstown cannot be developed without the proposed road and second river crossing as stated in the Celbridge LAP. Providing a second bridge along the River Liffey as well as providing a high quality pedestrian / cycle / vehicle route through the KDA will facilitate the use of the 35ha of zoned lands for provision of estimated 1,050 residential units.

Traffic modelling and consequently, the traffic noise modelling for the Proposed Scheme has considered the future provision of the residential units which represents a worst-case scenario. The delivery of any future residential development for the KDA will be subject to a separate planning application.

4 TRAFFIC AND TRANSPORT

4.1 Introduction

This Chapter of the Environmental Report describes and presents an assessment of the potential effects of the Proposed Scheme on Traffic during both the construction and operational phases of the scheme.

4.2 Assessment Methodology

The assessment of effects has been undertaken in accordance with the Traffic and Transport Assessment Guidelines (TII 2014). In developing the scheme, the following networks have been developed, and assessed against future forecast demand:

- Do-Minimum: small changes to the network associated with development proposals;
- Do-Something: the Do-Minimum scenario plus the Proposed Scheme.

A Do-Nothing scenario has been rejected as unrealistic.

The forecast demand scenarios include background traffic growth taking account of proposed growth due to Key Development Areas set out in the Local Plan.

4.2.1 Relevant Guidelines, Policy and Legislation

There is no relevant legislation or policy applied to the assessment of traffic impacts. The traffic and transportation assessment has been undertaken having regard to the Transport Infrastructure Ireland (TII) document Traffic and Transport Impact Assessment Guidelines (May 2014) and the Institution of Highways and Transportation's (IHT) document, Guidelines for Traffic Impact Assessment (September 1994).

Guidance provided in the Transport Infrastructure Ireland (TII) Project Appraisal Guidelines (PAG 2024) has been followed in the development of a traffic model for the Proposed Scheme. An equilibrium assignment model using VISUM modelling software has been developed for the study area, for the purpose of economic and environmental appraisal of the scheme. The model covers AM peak, interpeak and PM peak time periods, and uses evidence-based conversion factors to estimate Annual Average Daily Traffic (AADT) on road links throughout the study area.

Future year traffic predictions draw on published sources including Project Appraisal Guidelines (TII 2024) forecast traffic growth rates for a Low, Central, and High Growth Scenario. The Central Growth Scenario is considered to represent the most likely level of traffic growth.

Alongside the scheme traffic model, a VISSIM microsimulation model has been developed for operational appraisal of key junctions.

4.2.2 Study Area and Zone of Influence

The study area is defined by the extent of the road network that will experience a significant change in traffic flow as a result of the Proposed Scheme.

In order to ensure a robust zone of influence, a traffic model was developed to ensure that all roads likely to be impacted by the Proposed Scheme were fully represented. This was determined by cordoning the TII's National Traffic Model (NTM), for the AM peak period. The cordon model was enhanced by disaggregating some of the NTM zones into a small number of subzones and adding some significant minor roads. This model was then used to assess the likely areas of significant traffic impact from an indicative scheme.

The conclusion from this task was that the proposed Link Road may have a significant effect on route choices to/from Celbridge from/to the north and east, but that wider-area impacts to the south and west would be negligible.

Informed by this, the study area was developed to include:

- A core area covering the extent of the Celbridge Local Area Plan and the corridor from Celbridge to Hazelhatch Train Station;

- A buffer area to the north and east, extended back to the point at which drivers decide which route to Celbridge they will take; and
- A number of external zones representing routes to/from this study area.

The zone of influence for traffic impacts is presented below.

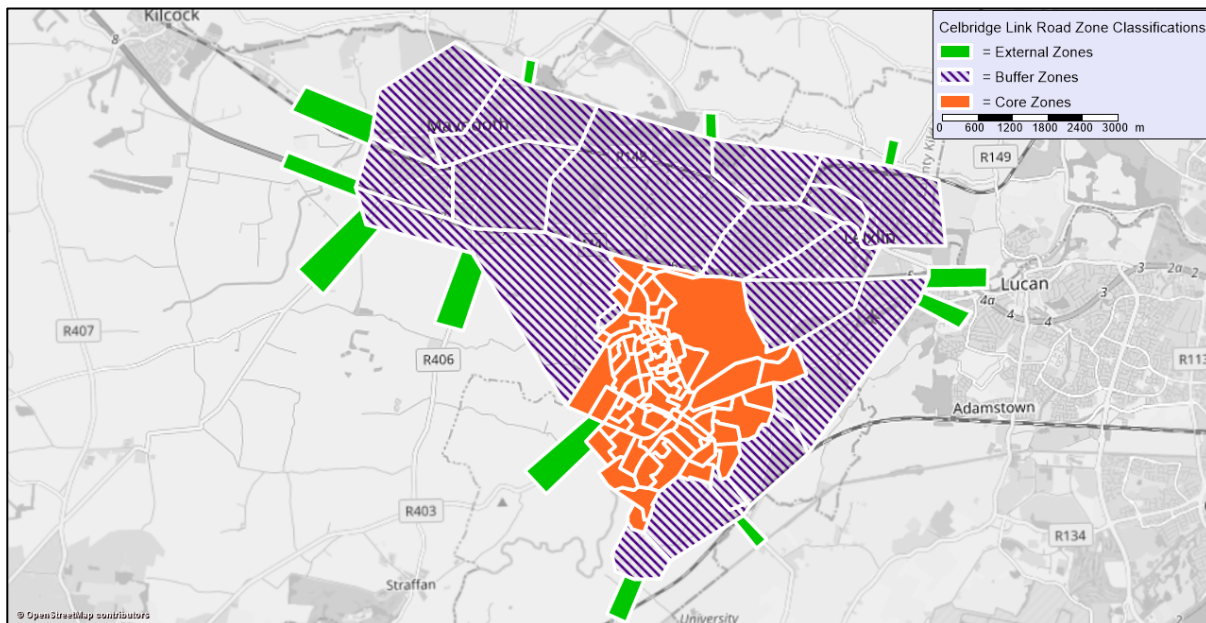


Figure 4-1 Zone of Influence

4.2.3 Source of Information to Inform the Assessment

The traffic assessment has used traffic data from a variety of sources, which are briefly described below.

Junction Turning Counts:

Classified video turning counts at key junctions were undertaken for Kildare County Council on Wednesday 10th April 2019 at 16 road junctions as shown below in **Figure 4-2**.

High-mast telescopic video camera systems were used to record the operation of each junction between 07:00 and 19:00. 15-minute survey intervals were used, and vehicles were classified as: Motorcycles, Taxis, Other Cars, Light Goods Vehicles (LGV), Medium Goods Vehicles (OGV1), Heavy Goods Vehicles (OGV2), Buses & Coaches (PSV).

Automatic Traffic Counts:

Automatic traffic counts were undertaken at eleven sites as shown below in **Figure 4-3**. The surveys were carried out for the period between Thursday 4th April to Wednesday 10th April 2019. The results were recorded at 15-minute intervals for 24 hours.

TII Permanent Count Site

Additional traffic flow data for the survey day Wednesday 10th April was downloaded from the TII Traffic Data Site along sections of the M4 in the vicinity of Celbridge. Data relating to annual variation in traffic flows was downloaded from the same site, for 2019, being the most recent full year of data.

Journey Time Surveys

Journey Time Surveys were carried out on Tuesday 30th April 2019 as shown in **Figure 4-4**. These surveys used Automatic Number Plate Recognition (ANPR) software applied to video footage from eleven sites around Celbridge, recording the exact times at which each detected vehicle passed each site, with the difference between the timestamps being the observed journey time.

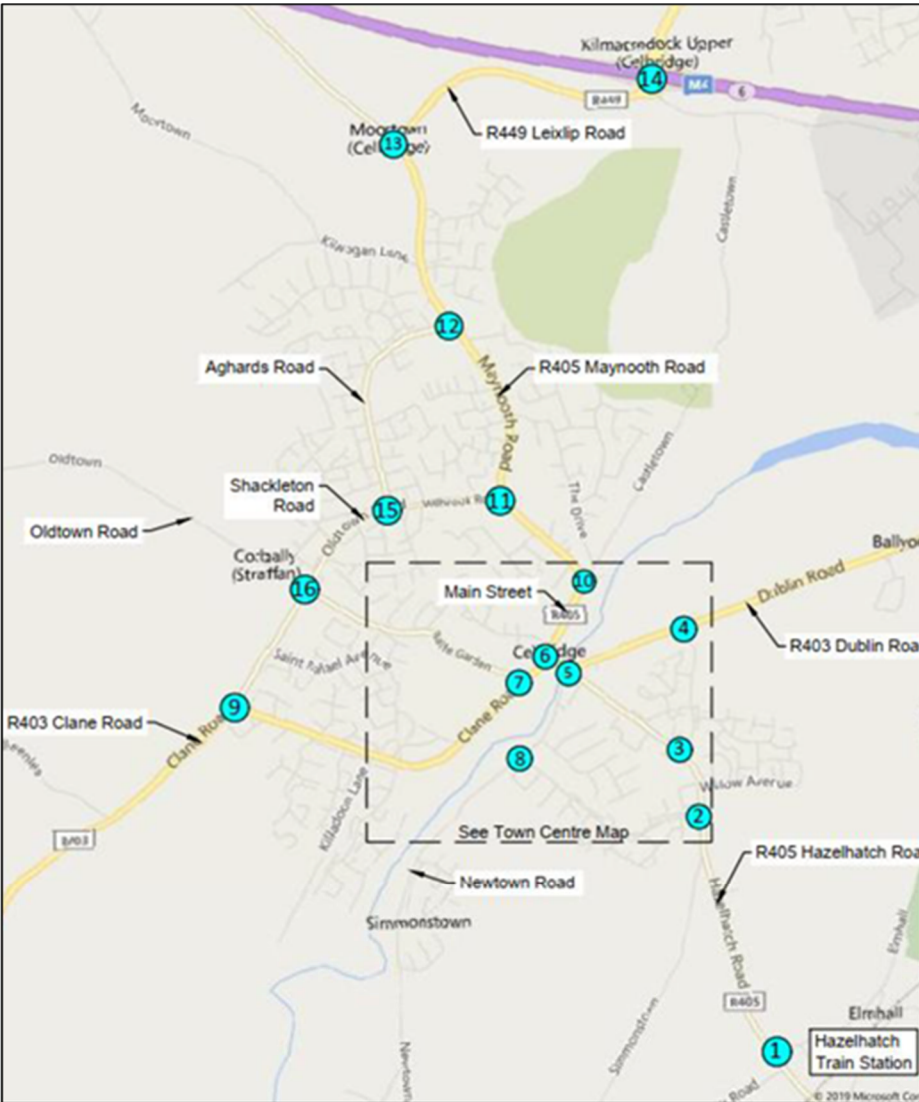


Figure 4-2 Turning Count Locations

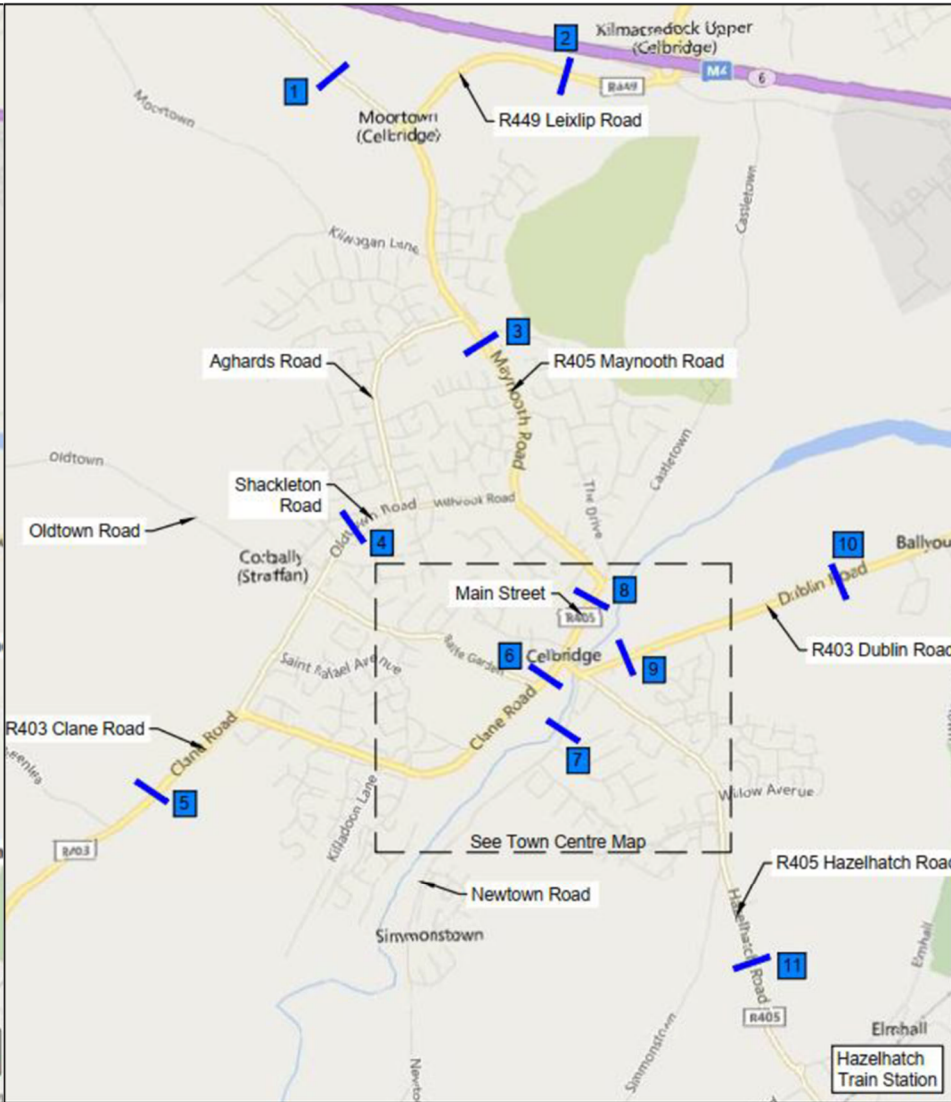


Figure 4-3 7-Day Traffic Count ATC Locations

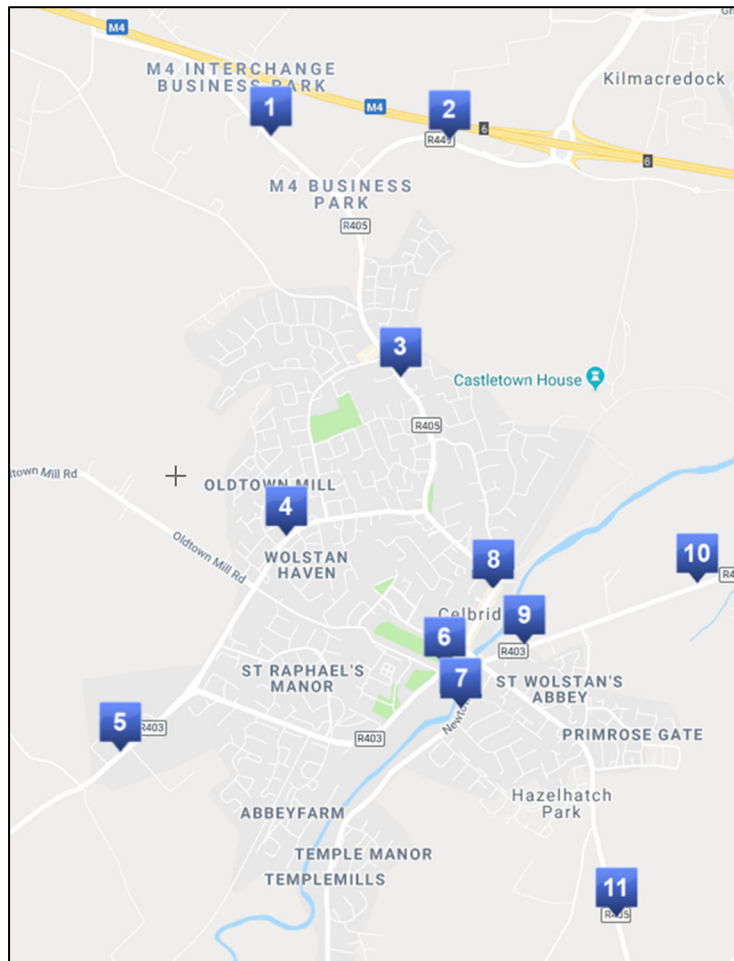


Figure 4-4 Journey Time Survey Site Locations

4.2.4 Key Parameters for Assessment

The parameters for assessment are based on the traffic modelling carried out to inform the Proposed Scheme design. Parameters include AADT (Annual Average Daily Traffic) flows, junction performance, and pedestrian/cyclist facilities.

For the operational and construction phases, link AADT (on a section of road) is used as the key parameter for assessment. Junction performance is assessed using Level of Service.

4.2.5 Assessment Criteria and Significance

The criteria for determining the significance of impacts in terms of changes in traffic flows are as follows:

Congested Areas:

- Change in AADT of less than 5% - no significant impact.
- Change in AADT of between 5% and 10% - minor beneficial or minor adverse impact.
- Change in AADT of between 10% and 30% - moderate beneficial or moderate adverse impact.
- Change in AADT of greater than 30% - major beneficial or major adverse impact.

Uncongested Areas:

- Change in AADT of less than 10% - no significant impact.
- Change in AADT of between 10% and 30% - minor beneficial or minor adverse impact.
- Change in AADT of between 30% and 50% - moderate beneficial or moderate adverse impact.

- Change in AADT of greater than 30% - major beneficial or major adverse impact.

The analysis of impact will also take account the absolute change in vehicle numbers, capacity issues, and vulnerable users.

The threshold for significant impact of 5% is taken from IHT (Institute of Highways and Transportation, 1994) and guidance (TII, 2014) on carrying out transport assessments. The criteria for differentiating between minor, moderate and major impacts are rules of thumb based on previous professional experience. They are primarily for guidance and the assessed impact may differ based on the type of road and the presence of any sensitive receptors such as schools.

Junction performance is assessed using Level of Service, which is determined by the junction delay. Level of Service is a recognised international standard (Highway Capacity Manual). Level of Service for a junction is rated from A to F based on the following criteria:

Table 4.1: Level of Service Criteria

Level of Service	Signalised Junction Delay	Unsignalised Junction Delay
A	≤ 10 sec	≤ 10 sec
B	10-20 sec	10-15 sec
C	20-35 sec	15-25 sec
D	35-55 sec	25-35 sec
E	55-80 sec	35-50 sec
F	> 80 sec	> 50 sec

An acceptable Level of Service is on a junction where D or above is achieved. An unacceptable Level of Service is represented by an E and an F.

4.2.6 Data Limitations

The Traffic and Transport Assessment has been prepared based upon the best possible information and in accordance with current best practice and relevant guidelines.

Issues have been identified with the initial processing of the Automatic Number Plate Recognition data by the survey contractor. The identification of valid times uses a simple cut-off so that, for example, a driver who parks on Main Street for 5 minutes to use one of the shops has their time included in the average value, leading to an upward bias on the observed journey time data. Consistency checks have been undertaken to improve the quality of the results as far as possible given the available information.

It is concluded that the data used is appropriate for developing the traffic model.

4.3 Description of Receiving Environment

The key link roads that lead to and from the existing River Liffey Bridge in Celbridge are the R403, R405 and the L1016. The speed limits reduce from 60km/h to 50km/h as they approach Celbridge. The Maynooth Road has a speed limit of 50km/h from its starting point at the northern roundabout. These roads are reflecting their origins, era of construction and the staged nature of road improvements over the years. The existing cross sections vary from narrow carriageway lanes bound by kerbed footpaths to wider lanes with hard strips and advisory cycle lanes in places. Pedestrian facilities are also inconsistent in width and finish, often pinch pointed by the historic boundary walls. The existing Celbridge road network is illustrated in **Figure 4-5**. Further details and a description of the Existing Road Network is presented in **Appendix 4.1A (Description of Existing Road Network)**.

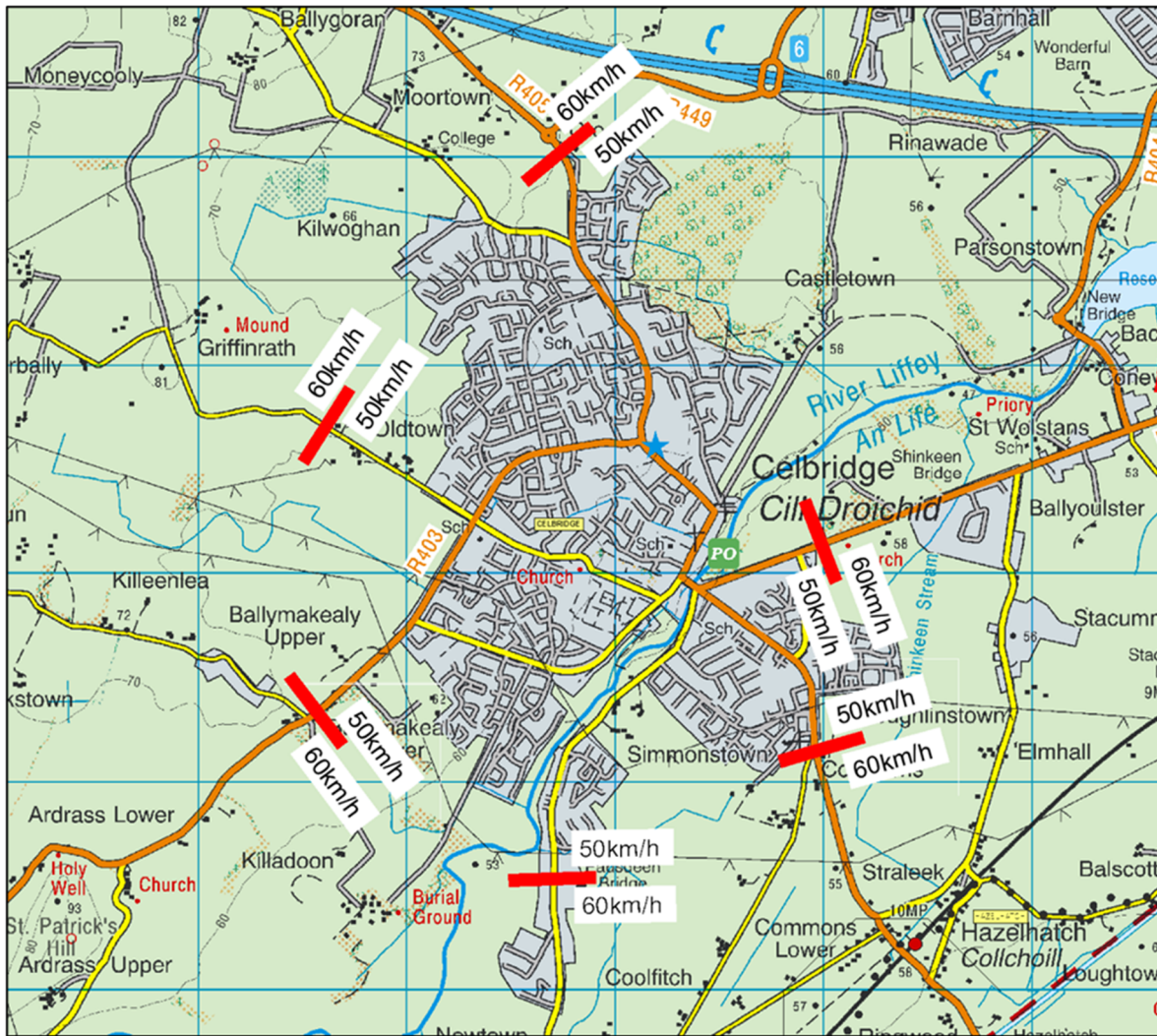


Figure 4-5 Existing Road Network in Celbridge

4.4 Predicted Impacts

4.4.1 Pre-Construction Phase

The pre-construction phase, comprising mobilisation / site preparation / enabling work will generate only minimal amounts of additional traffic. Given that the volume of traffic generated is expected to be below 5% / 10% of the baseline traffic, the impact is considered to be negligible.

4.4.2 Construction Phase

The transport of material to and from the site will generate additional temporary traffic on the existing road network – moving earthworks, removing waste, site staff etc.

The majority of construction traffic is likely to use regional roads and be prohibited from travelling through the town centre, avoiding congested locations. The total volume of traffic generated per day is expected to be below the 10% of baseline traffic and is considered to be negligible.

4.4.3 Operational Phase

Traffic Flow Changes

The proposed Celbridge to Hazelhatch Link Road scheme consists of a mainline carriageway with cycle and pedestrian facilities connecting Celbridge town with Hazelhatch Train Station. A second river crossing of the

River Liffey in Celbridge forms part of the Proposed Scheme. The proposed mobility corridor provides access to Key Development Areas and educational lands south of the River Liffey.

In order to determine the impact of the Proposed Scheme on traffic in the study area, a Visum macro-simulation traffic model was developed for a 2019 (pre-COVID impacts) base year. Traffic forecasts were developed for a scheme opening year of 2025 and a design year of 2040. The model covered three time periods – AM peak hour, Inter-peak hour and PM peak hour. The 2025 and 2040 output data from the model has then been converted to AADT forecasts.

In addition junction capacity analysis has been carried out at 5 locations, one existing junction and 4 locations where the Proposed Scheme creates new junctions with existing roads.

Traffic Flow Impacts

Analysis of the with scheme (Do-Something) and without scheme (Do-Minimum) models has identified locations where the Proposed Scheme will result in potentially significant changes in traffic flows. These locations, together with the location of the Proposed Scheme are presented in **Figure 4-6**.

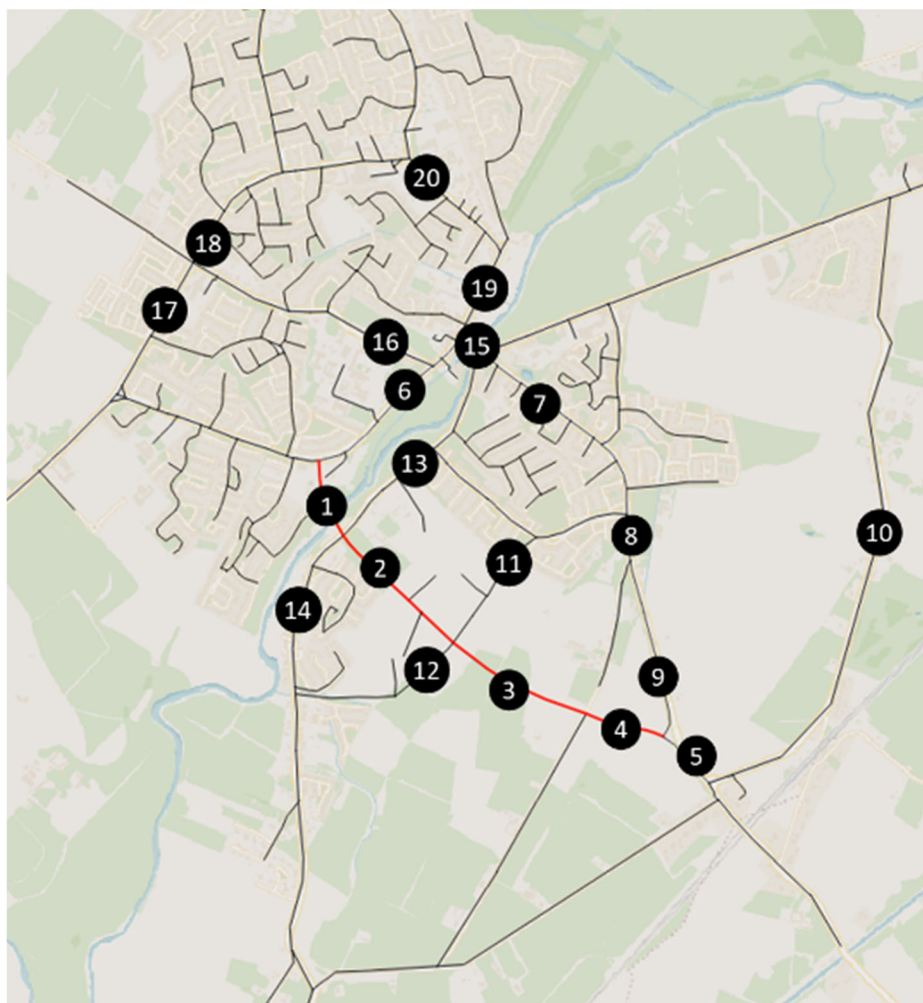


Figure 4-6 Locations with Traffic Flow Changes

The impact of the Proposed Scheme on traffic flows together with the assessment of impacts is presented in **Table 4.2**.

Section 177AE Environmental Report

Table 4.2: Operational Phase Traffic Impacts – 2040

Link	Description	Congested?	Do-Minimum AADT	Do-Something AADT	Change in AADT	Discussion/ Notes	Impact
1	Scheme – between Clane Rd and Newtown Rd	No	N/A	5,284	N/A	New Links created as part of the Proposed Scheme	N/A
2	Scheme – between Newtown Rd and new link to The Way	No	N/A	3,991	N/A		N/A
3	Scheme - between new link to The Way and Simmonstown Manor	No	N/A	5,370	N/A		N/A
4	Scheme – between Simmonstown Manor and Hazelhatch Rd	No	N/A	5,695	N/A		N/A
5	R405 Hazelhatch Rd – between scheme and Loughlinstown Road	No	9,778	13,434	+3,556 +37%	The level of increase indicates moderate adverse impact. However there are no sensitive receptors on this section of road and facilities for cyclists and pedestrian will be provided	Minor Adverse
6	R403 Clane Rd – south of Celbridge bridge	Yes	8,331	5,972	-2,359 -28%	Significant decrease in flow on a busy road in the town centre	Moderate Beneficial
7	R405 – between Celbridge bridge and Shinkhen Rd	Yes	7,191	6,490	-700 -10%	Significant decrease in flow on a busy road in the town centre	Moderate Beneficial
8	R405 – north of Simmonstown Manor	No	11,281	9,398	-1,883 -17%	Significant decrease in flow. However few frontages on this section of road	Minor Beneficial
9	R405 – between Simmonstown Rd and scheme	No	9,529	8,807	-722 -8%	Minor reduction on uncongested road	Not significant
10	Loughlinstown Road – north of R405	No	7,324	7,629	+305 +4%	Minor increase on uncongested road	Not significant
11	Connection between the scheme and Hazelhatch Avenue	No	N/A	1,839	N/A	New notional Links ¹	N/A
12	Connection between the scheme and Causdeen	No	N/A	1,440	N/A		N/A
13	Newtown Rd – south of Celbridge bridge	Yes	4,238	3,298	-940	Significant reduction on a congested road. Limited number of frontages	Moderate Beneficial

¹ For the purpose of development of a traffic model, new notional future links were added to assess the distribution of traffic from the future development of the Simmonstown KDA 5. The links are purely indicative and are not part of this planning application. Any future road links for the development of the KDA will be subject to a separate planning application.

Section 177AE Environmental Report

Link	Description	Congested?	Do-Minimum AADT	Do-Something AADT	Change in AADT	Discussion/ Notes	Impact
					-22%		
14	Newtown Rd – south of scheme	No	2,938	2,015	-923 -31%	The level of increase just indicates moderate adverse impact. However, there are few frontages on this section of road	Minor Beneficial
15	Celbridge bridge	Yes	21,839	19,277	-2,561 -12%	Reduction in flow on the main capacity bottleneck in the town	Moderate Beneficial
16	Tea Lane – west of English Row	Yes	5,258	4,996	-261 -5%	Reduction just indicates minor beneficial. Significant number of residential property frontages.	Minor Beneficial
17	Shackleton Rd – south of Bother an Teampaill	Yes	7,627	8,548	+921 +12%	Significant increase on a congested road with limited frontages. Good segregated facilities for pedestrians and cyclists	Minor Adverse
18	Shackleton Rd – north of Bother an Teampaill	Yes	11,743	11,204	-539 -5%	Small decrease on a congested road with limited frontages. Good segregated facilities for pedestrians and cyclists	Not significant
19	R405 Main St – north of Celbridge bridge	Yes	8,209	9,770	+1,561 +19%	Significant increase on congested road with numerous frontages	Moderate Adverse
20	R405 Maynooth Rd – between Shackleton Rd and Main St	Yes	8,399	8,916	+517 +6%	Minor increase on congested road with numerous frontages	Minor Adverse

Overall, it is concluded that the Proposed Scheme has a net benefit in terms of traffic changes as it reduces flow on key built up locations in the town, particularly: Celbridge Bridge, R403 Clane Road, south of Celbridge Bridge, R405 Hazelhatch Road, east of Celbridge Bridge, and Newtown Road, south of Celbridge Bridge.

Junction Performance

The Proposed Scheme will create new junctions with existing roads at four locations: Clane Road (R403), Newtown Road (L1016), Simmonstown Manor Road (L5062) and Hazelhatch Road (R405).

In addition the Proposed Scheme will result in significant changes in traffic flow at the existing Hazelhatch Road / Loughlinstown Road junction. The location of these junctions is presented in **Figure 4-7** below.

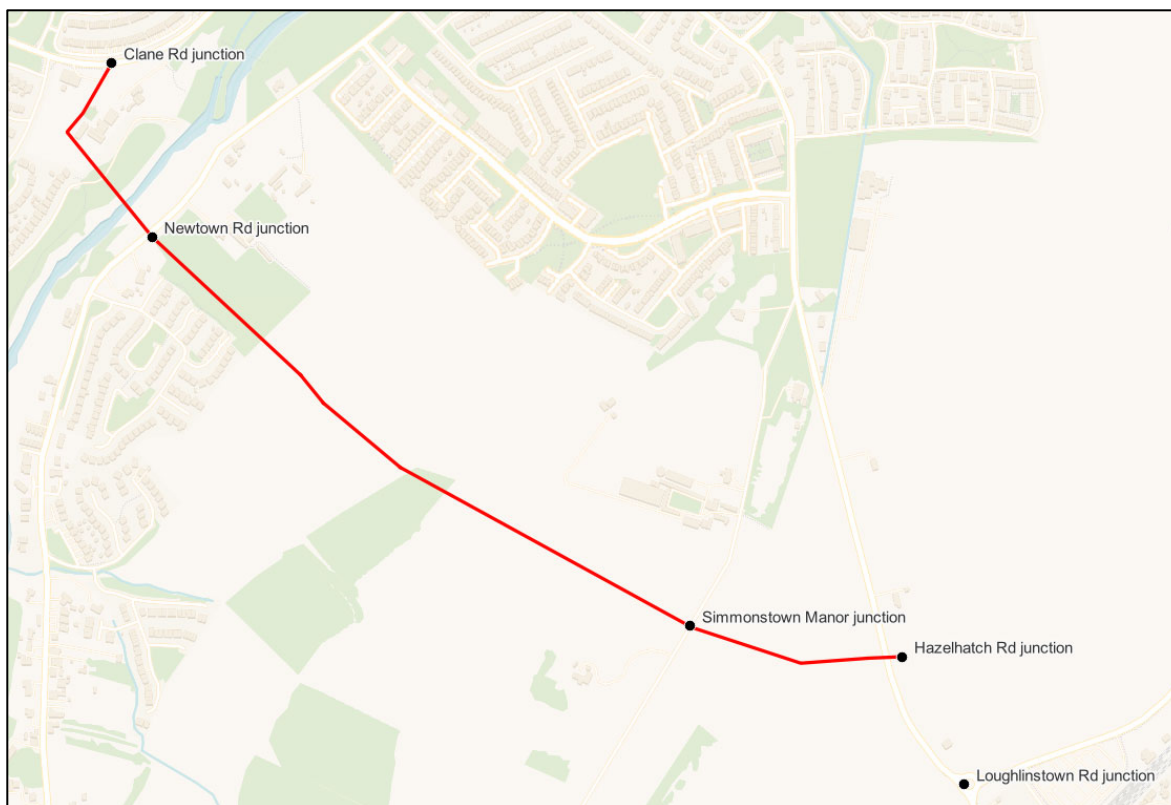


Figure 4-7 Location of Junctions Assessed for Capacity

All of the 5 selected junctions were assessed for detailed delay analysis using VISSIM Micro-Simulation software.

Forecast flows were taken from the Visum strategic model and input into individual Vissim models to determine average delays during the AM and PM Peak periods. The analysis was carried using 2040 forecast flows and the results are summarised below in **Table 4.3**.

The results are presented for delays on each approach arm and for the junction as a whole and Level of Service (LOS). Any junction that achieves a Level of Service of D or above is considered to be operating within capacity and with acceptable levels of delay.

Table 4.3: Capacity Analysis for Junctions Impacted by the Scheme – 2040 AM and PM Peak Hour Flows

Junction	Junction Type	AM Peak Delay	PM Peak delay	Average Delay	Level of Service
Clane Road Junction	Priority	4	6	5	A
Newtown Junction	Signalised	32	27	29	C
Simmonstown Manor Rd Junction	Priority	1	0	1	A
Hazelhatch Road Junction	Priority	15	11	13	C
Loughlinstown Rd Junction	Roundabout	7	21	14	C

From **Table 4.3** it can be seen that all of the junctions directly impacted by the Proposed Scheme will operate within capacity, limiting delay to users to acceptable levels.

Pedestrians and Cyclists

The impact of the Proposed Scheme on pedestrians and cyclists has not been modelled and as a result there are no forecasts of mode switch.

As discussed previously in **Section 4.3** and **Appendix 4.1A** the existing network has limited provision for cyclists and pedestrians wishing to travel between the town centre and the rail station. This makes the route unattractive for commuters to access Train services, particularly for residents living north of the River Liffey.

The proposed road cross-section for the Proposed Scheme's mainline is a single carriageway with 3.5m wide lanes in each direction for a total pavement width of 7.0m. Pedestrian and cyclist facilities are proposed alongside the new road as follows:

- Ch. 0+000 to Ch. 1+720: 2.0m wide one-way cycle tracks and 2.0m wide footpaths on both sides of the road.
- Ch. 1+720 to Ch. 1+1959: 2.0m wide footpath and 3.0m wide two-way cycleway on the northbound side of the road.

On both sides of the mainline, it is typically proposed to provide a 2.0m wide grassed verge between the cycle facility and the carriageway, and 1.0m wide grassed verge between the back of the footpath and adjacent earthwork slopes. The exception to this is across the proposed new River Liffey Bridge, where no additional verge width is proposed between the cycle tracks and the carriageway or between the footpaths and bridge parapets.

The Proposed Scheme will therefore provide a high quality pedestrian and cycle route connecting the town with the train station.

4.4.4 Cumulative Impact

At present there are no known proposals that might impact on traffic flows in the study area at the same time as the Proposed Scheme is being constructed. Recent permissions along the route relate to domestic extensions and are screened out for potential cumulative effects.

There is one permitted Project that has been screened in for potential cumulative effects, that is the Iarnród Éireann DART+ South West Project as identified in **Section 3.3**. This impact may be an increase in the number of construction vehicles on the road network. This could potentially have a negative effect on traffic and transport due to potential delays within the study areas of both projects if constructed simultaneously. Mitigation has however been assigned to both projects and mitigation measures are proposed in the DART+ South West Project's EIAR and CEMP which will be implemented.

Long-term positive cumulative effects are likely during the operation stage as both projects will support the development and improvement of sustainable transport, the Celbridge Hazelhatch Mobility Corridor will improve connectivity to the train station and access to sustainable transport modes of improved rail services.

4.5 Proposed Mitigation Measures

4.5.1 Construction Phase

Before the construction phase, a Construction Traffic Management Plan (CTMP) will be developed setting out how traffic flow will be managed to mitigate potentially negative impacts. It will be the Contractor's responsibility to develop the CTMP, in compliance with the employer's requirements.

The CTMP will be agreed with Planning Authority before commencement of development. It shall be the responsibility of the Contractor to ensure that an agreed CTMP is in place before construction commences and that clear structures/arrangements are in place for full compliance during the course of construction.

Potential controls that are typically incorporated into the CTMP include:

- No construction related traffic to be permitted to use the road network during peak traffic periods on a 5-day week basis. Any necessary exceptions to this to be agreed in writing with the Planning Authority and in advance, as variations of the CTMP.

- Restrictions to apply to all movements; i.e. construction employees, supervisory staff and construction vehicles alike.
- If construction related employees are to access or leave construction sites during the specified peak traffic periods than they shall only do so by walking, cycling or bus.

Other road related restrictions that are typically included in a CTMP are:

- Measures to prevent blocking of roads/inappropriate parking etc.
- Truck wheel washing.
- Road soiling prevention/road cleaning as required.
- Hours of operation.
- Pavement damage.
- Noise, dust and other nuisance issues.
- Advance signage.

The CTMP is to be dynamic in nature and varied as required in the light of conditions in the receiving environment.

4.5.2 Operational Phase

No mitigation measures are proposed for the operational phase.

4.6 Residual Impacts

4.6.1 Construction Phase

The CTMP will be developed to prevent any transport issues arising during construction and will evolve to address any issues that might arise.

Given that the expected construction traffic volumes will be below the impact thresholds (5% and 10%) the impact is considered to be negligible.

4.6.2 Operational Phase

The following residual impacts will be introduced by the Proposed Scheme:

- The quality of cycling and pedestrian infrastructure connecting the centre of Celbridge to the Hazelhatch and Celbridge Train Station will have significantly improved.
- Reduce congestion at the main capacity bottleneck in Celbridge – junction at both ends of Celbridge Bridge.
- The development of the proposed Simmonstown KDA (1,000 houses) will be enabled by a second river crossing.
- Reduction in traffic flows on the following roads:
 - R403 Clane Rd – south of Celbridge Bridge;
 - R405 – between Celbridge Bridge and Shinkeen Rd;
 - R405 – north of Simmonstown Manor;
 - R405 – between Simmonstown Rd and scheme;
 - Newtown Rd – south of Celbridge Bridge
 - Newtown Rd – south of Scheme.
 - Celbridge Bridge.
- Increase in traffic flow on the following roads:

- R405 Hazelhatch Rd – between scheme and Loughlinstown Road;
- Shackleton Rd – south of Bother an Teampaill;
- R405 Main St – north of Celbridge Bridge;
- R405 Maynooth Rd – between Shackleton Rd and Main St.

4.7 Monitoring

4.7.1 Construction Phase

Construction traffic management measures will be monitored throughout the construction phase by the appointed contractor to respond to dynamic conditions in the receiving environment and measures will be adjusted to match construction sequencing where appropriate and necessary.

4.7.2 Operational Phase

No specific monitoring is proposed for the operational phase. A review of scheme impacts will be carried out 5-years post opening.

5 NOISE & VIBRATION

5.1 Introduction

This Chapter of the Environmental Report identifies, describes and presents an assessment of the potential noise and vibration effects of the Proposed Scheme on the receiving environment during the construction and operational phases of the scheme.

5.2 Assessment Methodology

The impact of the Proposed Scheme arising from noise and vibration effects has been assessed for both the construction and operational phases by considering the requirement to use heavy plant and machinery during the Proposed Scheme construction works as well from construction traffic off-site.

Although the Proposed Scheme is not a National Road Scheme, the methodology adopted is based on the NRA Guidelines for the Treatment of Noise and Vibration in National Road Schemes (NRA, 2004) and in the EPA's "Guidelines on the information to be contained in Environmental Impact Assessment Reports" (EPA, 2022).

Impacts arising from road traffic on the Proposed alignment once operational as well as roads in proximity to the Proposed Scheme where traffic flows may change as a result of the Proposed Scheme have also been considered.

5.2.1 Relevant Guidelines, Policy and Legislation

The principal European and National legislation, policy and guidance documents which are relevant to the Noise and Vibration assessment are presented in **Appendix 5.1A (Relevant Noise Legislation, Policy and Guidance)**. There is no specific legislation relating to road traffic noise and vibration. However, there is a considerable body of standards and guidance which apply to the measurement and treatment of noise and vibration for roads developments and these are listed in **Appendix 5.1A**.

5.2.2 Study Area and Zone of Influence

The noise and vibration Study Area for the purposes of this assessment is predominantly focused on areas likely to be affected by the Proposed Scheme. The NRA Guidelines (2004) recognise this to include noise and vibration sensitive receptors within 300 m of the road centrelines and noise and vibration sensitive receptors adjacent to existing roads in proximity to the Proposed Scheme. It also includes locations adjacent to roads where traffic flows are reduced by 20% or more, and where existing flows are increased by 25% or more as a result of the Proposed Scheme.

The most sensitive noise sensitive locations (NSLs) for the purpose of this assessment are residential dwellings and care facilities where people are present for day, evening and night periods and thereby continuously exposed to road traffic noise. Residences, pre-schools/schools and places of worship are also regarded as more sensitive than sporting grounds or commercial operations.

5.2.3 Source of Information to Inform the Assessment

The information to inform the assessment has been obtained through a combination of desk study of publicly available datasets and literature, GeoDirectory data, field survey and modelling. The key datasets used to inform the noise and vibration assessment are outlined in **Table 5.1**.

Table 5.1: Summary of Key Datasets and Data Sources Used

Title	Source	Year
Terrain data	OSi mapping	2023
Traffic flow data	Traffic and Transport Assessment	2024
Property information	GeoDirectory (Q3 2024)	2024
Kildare County Development Plan 2023-2029	Kildare County Council	2023

Title	Source	Year
Dublin Agglomeration Noise Action Plan 2024-2028	Dublin City Council	2024
Kildare County Council Draft Noise Action Plan 2024-2028	Kildare County Council	2024

Site Specific Surveys

Site-specific baseline noise surveys were undertaken on the 24th of June and the 30th of July 2024 to quantify the existing noise environment. Measurements were undertaken in accordance ISO 1996, the NRA Guidelines for the Treatment of Noise and Vibration in National Road Developments (2004) and the supplemental Good Practice Guidance for the Treatment of Noise during the Planning of National Road Developments (2014). The sound level meters and acoustical calibrator used for the surveys were within specified manufacturer periods of calibration.

The survey comprised of:

- Unattended measurements were undertaken at two locations for a period of 24 hours;
- Attended short-term measurements were undertaken at five locations in accordance with the NRA Guidelines (2004) and NRA Good Practice Guidance (2014).

Further details on the baseline noise survey methodology is presented in **Appendix 5.1B (Baseline Noise Survey Methodology)**. Details on the noise monitoring locations are presented in **Section 5.3.3.1**.

Noise Modelling

Predictor LimA 7810 noise modelling software was used to predict the noise impact from the operational and construction phases of Proposed Scheme. For the construction phase, noise levels were predicted using the methodology set out in ISO 9613 parts 1 and 2.

Traffic noise levels were predicted using the methodology set out in the Calculation of Road Traffic Noise (CRTN) with the application of the relevant conversion factors as detailed in the NRA Guidelines (2004) and the updated advice on using CRTN recommended in the NRA *Good Practice Guidance* (2014).

Noise predictions were undertaken for 503 receptor locations. At some of these locations, predictions were undertaken adjacent to multiple façades and elevations (depending on the number of storeys) as the most exposed façade is not obvious.

The prediction method took the following factors into account: hourly traffic flow rate, traffic speed (speed limit), percentage of heavy commercial vehicles. Other information required for the calculation included road surface and gradient; ground type; height of noise source; shielding of barriers and cuttings; reflections at facades and from nearby buildings; angle of view of the road.

In accordance with the NRA Good Practice Guidance (2014) the extent of the noise model not only includes the Proposed Scheme, but it also included areas where traffic flows were shown to be reduced by 20% or more, and where existing flows were shown to be increased by 25% or more.

Further details on the Noise Modelling Methodology including inputs to the noise model and noise model verification are presented in **Appendix 5.1D (Noise Modelling Methodology)**.

Noise Modelling Scenarios

The following scenarios were modelled:

- Opening Year 2025: Do-Minimum and Do-Something scenarios;
- Design Year 2040: Do-Minimum and Do-Something scenarios;
- Opening Year 2025: Do-Something scenario with mitigation; and
- Design Year 2040: Do-Something scenario with mitigation.

The NRA Guidelines (2004) require predictions to be reported for the Opening Year (2025) and for a Design Year (2040), 15 years after opening. Noise levels in the Design Year differ from those in the Opening Year by different amounts at some receptor locations and hence, the predicted noise levels from both the opening year and design year are considered.

Free-field traffic noise levels were predicted at a total of 503 receptors. For some receptors, several locations around the building have been modelled, given their proximity to both existing roads and the Proposed Scheme. All receptors were modelled at heights of 1.5 and 4.0 m above ground level at a minimum corresponding to ground floor and first floor levels, respectively. Some receptor locations had a higher number of floors and these were modelled as appropriate. Conversely, some receptors were single-storey and only results at ground floor height were considered for those locations. For all other locations, the highest predicted noise level from each case (i.e. 1.5 m and 4.0 m height receiver point) have been presented.

5.2.4 Key Parameters for Assessment

5.2.4.1 Noise and Vibration Sensitive Receptors

The NRA Guidelines (2004)² provide a characterisation of a sensitive receptor and state “*Receptors that are, or have the potential to be, particularly sensitive to noise and/or vibration should be identified. Examples of such receptors are schools, hospitals, places of worship, heritage buildings, special habitats, amenity areas in common use and designated quiet areas*”.

This definition has been broadened by best practice and the sensitivities for different receptor types are described in **Table 5.2**. However, certain circumstances may justify a receptor-specific sensitivity.

Table 5.2: Criteria to Define Receptor Sensitivity

Sensitivity	Description	Examples of Receptors
High	Receptors where people or operations are particularly susceptible to noise	- Residential, including private gardens where appropriate - Hospitals/residential care homes - Schools during the daytime - Quiet outdoor areas used for recreation - Places of worship
Medium	Receptors moderately sensitive to noise, where it may cause some distraction or disturbance and wildlife sensitive areas	- Offices - Bars/Cafes/Restaurants where external noise may be intrusive - Community facilities and amenity areas - Sports grounds when spectator noise is not a normal part of the event and where quiet conditions are necessary (e.g. tennis, fishing and golf) - Wildlife refuges or areas identified by the ecology team as having general sensitivity for wildlife. - Recording studios and some concert halls are also included in this category
Low	Receptors where distraction or disturbance from noise is low	- Buildings not occupied during the daytime - Sports grounds when spectator noise is a normal part of the event. - Nightclubs
Negligible	Receptors where distraction or disturbance from noise is negligible	All other areas such as those used primarily for industrial or agricultural purposes

The majority of receptors which have the potential to be affected by noise and vibration impacts arising from the Proposed Scheme are the residents of dwellings in the vicinity of the Proposed Scheme.

Residents, due to the nature and use of residential receptors, are deemed to have ‘High’ sensitivity. Hotels and commercial accommodation have a ‘High’ sensitivity at night and a ‘Medium’ sensitivity during the daytime period. Commercial developments, such as offices (including those co-located with warehouses), are considered ‘Medium’ sensitivity during daytime periods with the sensitivity reducing to ‘Low’ during the evening. During night-time periods, both community facilities and commercial developments are considered to have ‘Low’ sensitivity, as they have reduced occupancy or are unoccupied.

² All references to NRA Guidelines (2004) and NRA Good Practice Guidance (2014) and their content acknowledge that the NRA was reformed as part of TII in 2015, however the publication of both documents pre-date this.

5.2.4.2 Construction Noise Criteria

Guidelines relating to construction noise and vibration thresholds are set out within the NRA guidance documents and other relevant national and international documentation for the control of noise and vibration from construction sites. The noise thresholds from the NRA Guidelines (2004) during given times are set out in **Table 5.3**. The working hours for the Proposed Scheme are set out in **Section 2.18.7** of the **Project Description**.

Table 5.3: Maximum Permissible Noise Levels at the Façade of Dwellings During Construction

Days	Times	Noise Levels	
		$L_{Aeq}(1hr)$ dB	$L_{pA(max)slow}$ dB
Monday to Friday – normal working hours	07:00 to 19:00 hrs	70	80
Monday to Friday - out of hours work (subject to agreement in advance)	19:00 to 22:00 hrs	60*	65*
Saturdays	08:00 to 16:30 hrs	65	75
Sundays & Bank Holidays	08:00 to 16:30 hrs	60*	65*

* Construction activity at these times, other than that required for emergency works, will normally require the explicit permission of the relevant authority.

Given the nature of the Proposed Scheme, it is expected that the mainline works will predominately be undertaken during daytime periods. However, work outside these hours to facilitate construction activities that would otherwise result in serious traffic disruptions or, by their nature, cannot be completed during a normal working day (such as the delivery from oversized vehicles or major concrete pours) may occur.

For periods outside of the days and hours identified in **Table 5.3**, reference is made to the ABC method in Annex E of British Standard BS 5228 – 1: 2009 +A1 2014: Code of practice for noise and vibration control on construction and open sites – Part 1: Noise. This standard provides guidance on controlling the effect of construction noise based on existing ambient noise levels. For the purpose of this assessment, the ABC method in Annex E of BS 5228 will be applied where NRA guidance is not applicable, i.e. when works are being carried out at night. **Table 5.4** outlines the applicable noise threshold of potential significant effect at the nearest NSLs during the periods not covered by the NRA guidelines.

Table 5.4: Threshold of Potential Significant Effect at Nearest Sensitive Receptors

Assessment Category and Threshold Value Period (L_{Aeq})	Noise Threshold Value, in decibels (dB)		
	Category A ^A	Category B ^B	Category C ^C
Night-time (23.00 – 07.00)	45	50	55
Evenings and weekends ^D	55	60	65
Daytime (07.00 – 19.00) and Saturdays (07.00 – 13.00)	65	70	75

NOTE 1: A potential significant effect is indicated if the $L_{Aeq, T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level.

NOTE 2: If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq, T}$ noise level for the period increases by more than 3 dB due to site noise.

NOTE 3: Applied to residential receptors only.

A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.

B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.

C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.

D) 19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays.

Using the baseline noise measurement data, it was determined that the appropriate construction noise threshold value for determining the potential significant effects for residential receptors in the vicinity of the Proposed Scheme is **Category A** (i.e. 45 dB L_{Aeq} during night-time periods). The thresholds apply to

residential buildings and receptors with a high sensitivity as described in **Table 5.2**. For commercial buildings (offices, industrial facilities, sport clubs etc.) which are less noise sensitive, a minimum of Category C values from **Table 5.4** apply.

Over-runs/emergencies may occur on occasion particularly where, for health and safety reasons or due to engineering requirements, a specific work item needs to be completed before the worksite can be left in a safe state, or there is a risk of an engineering or structural failure if the works are not completed.

5.2.4.3 Construction Traffic Noise Criteria

There is currently no Irish legislation that restricts noise levels from construction traffic to a limit value. Therefore, the impact of off-site traffic associated with construction phase of the Proposed Scheme has been assessed with respect to the UK Highways Agency publication, Design Manual for Roads and Bridges LA111 – Noise and Vibration Revision 2, UK Highways Agency (2020). This document presents details on the classification of magnitude of noise impacts and noise level changes and associated magnitude of impact are presented in **Table 5.5**.

Table 5.5: Noise Level – Magnitude of Impact (Highway Agency, UK)

Magnitude of Impact	Increase in Baseline Noise Level of Closest Public Road Used for Construction Traffic
Major	Greater than or equal to 5.0
Moderate	Greater than or equal to 3.0 and less than 5.0
Minor	Greater than or equal to 1.0 and less than 3.0
Negligible	Less than 1.0

The magnitude of impact classifications in **Table 5.5** will apply to residential buildings and receptors with a high sensitivity as described in **Table 5.2**. Commercial buildings (offices, industrial facilities, sport clubs etc.) are considered less noise sensitive and can tolerate greater increases in baseline noise level.

5.2.4.4 Construction Vibration Criteria

There is no statutory Irish guidance relating to the maximum permissible vibration level that may be generated during the construction phase of a road development. In the absence of specific vibration limits, appropriate vibration emission criteria relating to permissible construction vibration levels for a development of this scale may be found in NRA Guidelines (2004). **Table 5.6** presents the vibration levels recommended in the NRA guidelines and compliance with the values ensures that there is little to no risk of even cosmetic damage to buildings.

Table 5.6: Construction Vibration Guidelines

Allowable vibration (Peak Particle Velocity) at the closest part of any sensitive property			
Vibration Frequency (Hz)	Less than 10 Hz	10 to 50 Hz	50 to 100 Hz (and above)
Peak Particle Velocity (mm/s)	8 mm/s	12.5 mm/s	20 mm/s

These guidelines are stricter than those outlined in BS 5228 which states that “*buildings of historical value should not (unless it is structurally unsound) be assumed to be more sensitive*”. Good practice on national road developments in Ireland has led to the adoption of lower thresholds for older properties, such as recorded structures.

Human beings are known to be sensitive to vibration, the threshold of perception typically being in the Peak Particle Velocity (PPV) range of 0.14 mm/s to 0.3 mm/s. Vibrations above these values can disturb, startle, cause annoyance or interfere with work activities. At higher levels they can be described as unpleasant or even painful. In residential accommodation, vibrations can promote concerns about possible structural damage. Guidance on effects of vibration levels is illustrated in **Table 5.7**.

Table 5.7: Guidance on Human Perception of Vibration Levels

Vibration Level	Effect
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.

Vibration Level	Effect
0.3 mm/s	Vibration might be just perceptible in residential environments.
1.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.
10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

5.2.4.5 Operational Noise Criteria

NRA Guidelines

There are no statutory guidelines relating to noise from road Developments in Ireland. In the absence of statutory guidance, the most commonly applied standard is that in the NRA Guidelines (2004). The document specifies that the following absolute noise design criterion for new national road schemes in Ireland is appropriate: Day-evening-night value of **60dB L_{den}** free field façade level. In EIA terms, this means that it is to be applied to existing sensitive receptors in respect of both the year of opening and the design year (i.e. 15 years after projected year of opening). Whilst it is acknowledged the Proposed Scheme is not a new national road, it is a new road scheme and implementation of the guidelines is appropriate as it provides a robust a structured approach to ameliorate as far as practicable road traffic noise.

The NRA Guidelines (2004) states that: *“The Authority accepts that it may not always be sustainable to provide adequate mitigation in order to achieve the design goal. Therefore, a structured approach should be taken in order to ameliorate as far as practicable road traffic noise through the consideration of measures such as alignment changes, barrier type (e.g. earth mounds), low noise road surfaces etc.”*

Mitigation measures are only deemed necessary when the following three conditions in the NRA Guidelines (2004) are satisfied at designated sensitive receptors:

- (a) *the combined expected maximum traffic noise level, i.e. the relevant noise level, from the proposed road scheme together with other traffic in the vicinity is greater than the design goal;*
- (b) *the relevant noise level is at least 1dB more than the expected traffic noise level without the proposed road scheme in place;*
- (c) *the contribution to the increase in the relevant noise level from the proposed road scheme is at least 1dB.*

Dublin Agglomeration Noise Action Plan 2024–2028

For the first time, the Dublin Agglomeration Noise Action Plan includes the urban areas of Celbridge and Leixlip. The reason for doing so is *“to ensure the continuity of noise mapping considering the proximity of Celbridge and Leixlip to the general urban area of Dublin.”* The Kildare County Council Draft Noise Action Plan 2024–2028 covers *“the administrative area of Kildare County Council which falls outside Dublin Agglomeration”*, i.e. areas other than Celbridge or Leixlip. Therefore, any criteria outlined in the Dublin Agglomeration Noise Action Plan 2024–2028 will be applicable to Celbridge.

The Dublin Agglomeration Noise Action Plan 2024–2028 (NAP) states that *“there are no Irish statutory noise limits or standards governing road traffic noise for new or existing roads”* and that *“at present there is no national policy relating specifically to noise other than specific objectives set out within a range of national plans and strategies such as Policy Objective 65 from the National Planning Framework 2040. Furthermore, there is no adopted consistent national approach for Local Authorities to apply in the evaluation of noise issues at the planning application stage.”*

The Dublin Agglomeration NAP does not specify any particular noise limit values in relation to road traffic noise and focuses on the identification of Important Areas, referring to the WHO Environmental Noise Guidelines for the European Region (2018) and relevant guidance published by the EPA. Further details can be found in the NAP.

WHO Environmental Noise Guidelines for the European Region

The World Health Organisation (WHO) published Environmental Noise Guidelines for the European Region in October 2018. The objective of these guidelines is to provide recommendations for protecting human health from exposure to environmental noise from transportation (road traffic, railway and aircraft), wind turbine noise and leisure noise. The guidelines set out recommended exposure levels for environmental

noise in order to protect population health. The guidelines recommend L_{den} and L_{night} levels above which there is risk of adverse health risks for each source type.

The WHO guideline values are recommended to serve as the basis for a policy-making process to allow evidence based public health orientated recommendations. They are not intended to be noise limits and the WHO document states the following regarding the implementation of the guidelines:

“The WHO guideline values are evidence-based public health-oriented recommendations. As such, they are recommended to serve as the basis for a policy-making process in which policy options are considered. In the policy decisions on reference values, such as noise limits for a possible standard or legislation, additional considerations – such as feasibility, costs, preferences and so on – feature in and can influence the ultimate value chosen as a noise limit. WHO acknowledges that implementing the guideline recommendations will require coordinated effort from ministries, public and private sectors and nongovernmental organizations, as well as possible input from international development and finance organizations. WHO will work with Member States and support the implementation process through its regional and country offices.”

Noise at continuously high levels, in excess of 80 dB(A) (General Application Regulations 2007, Chapter 1 of Part 5: Control of Noise at Work), can cause hearing impairment. It is rare however for road traffic noise to reach this level. Road traffic noise has been linked to increased risk of direct and indirect health effects such as ischemic heart disease (IHD), high levels of annoyance and sleep disturbance. WHO (2018) found that a 5% relevant risk increase of the incidence of IHD occurs at a noise exposure level of 59.3 dB L_{den} a level that is consistent with the NRA Guidelines set out earlier in this section.

WHO (2018) cites moderate quality evidence that there is an absolute risk of 10% of the population being ‘highly annoyed’ by road traffic noise at a level of 53.3 dB L_{den} . Annoyance is an indirect health effect, and this threshold has not been adopted by any country for road traffic noise. It will be a decision for national and local policy makers to adopt the WHO guidelines and propose noise limits. The current NRA Guidelines for operational noise set out above is therefore considered appropriate for this assessment.

5.2.4.6 Operational Vibration Criteria

The rubber tires and suspension systems of vehicles provide vibration isolation and it is not usual for traffic to cause ground-borne vibration problems on well-maintained road surfaces. For most issues with HGV-related vibration, such as rattling of windows, the cause is almost always directly related to running surface conditions such as potholes, bumps, expansion joints, or other discontinuities in the road surface. This is usually resolved by smoothing such discontinuities and this will not be an issue for the Proposed Scheme.

The NRA Guidelines (2004) state: *“It has been found that ground vibrations produced by road traffic are unlikely to cause perceptible structural vibration in properties located near to well-maintained and smooth road surfaces. The Authority does not therefore consider it necessary to set limits for vibration during the operational phase of a road scheme.”* The statement above concurs with scientific literature as well as our experience. Hence, vibration during the operational phase of the Proposed Scheme will not be considered further in this assessment.

5.2.5 Assessment Criteria and Significance

The following terminology and definitions are defined:

- **Noise Impact:** The difference in the acoustic environment before and after the implementation of the proposals (also known as the magnitude of change). This includes any change in noise level and in other characteristics/features, and the relationship of the resulting noise level to any standard benchmarks;
- **Noise Effect:** The consequence of the noise impact. This may be in the form of a change in the annoyance caused, a change in the degree of intrusion or disturbance caused by the acoustic environment, or the potential for the change to alter the character of an area such that there is a perceived change in quality of life. This will be dependent on the receptor and its sensitivity; and
- **Significance of Effect:** The evaluation of the noise effect and, particularly if the noise impact assessment is part of a formal EIA, deciding whether or not that impact is significant.

5.2.5.1 EPA Guidance

The significance of noise and vibration effects means the importance of the outcome of the noise and vibration effects on the receptors. The significance is a function of the magnitude and quality of the effect, positive or adverse, the geographical extent and duration of the effect, the frequency and likelihood of the effect occurring and the sensitivity of the receptor. The significance is assessed by weighing up these attributes and categorising it according to the generalised degree of impact significance set out in the EPA 2022 guidance.

5.2.5.2 Construction Noise

Section 5.2.4.2 outlined that the maximum permissible construction noise levels in the NRA Guidelines are used to determine the construction noise impact during all periods except night-time periods. The 'ABC' method in BS 5228 is to determine the construction noise impact during night-time periods. **Table 5.8** presents the construction noise significance rating.

For assessing the significance of effect, reference has been made to the EPA Guidelines (2022) and specifically the DMRB which states:

“Construction noise and construction traffic noise shall constitute a significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:

- 1) 10 or more days or nights in any 15 consecutive days or nights;*
- 2) A total number of days exceeding 40 in any 6 consecutive months.”*

Table 5.8: Construction Noise – Significance Rating

Noise Levels	EPA Magnitude of Impact	Initial Significance Rating	Modifier
≤ Baseline noise level	Negligible	Imperceptible / Not Significant	Depends on NRA / BS 5228 threshold value, baseline noise levels, duration and frequency and public attitudes to, and acceptability of, the project itself.
> Baseline noise level and ≤ NRA/BS 5228 threshold	Low	Slight/ Moderate	
> NRA/BS 5228 threshold to ≤NRA/BS 5228 threshold + 5 dB	Medium	Moderate/ Significant	
> NRA/BS 5228 threshold +5 to + 10 dB	High	Significant – Profound	
> NRA/BS 5228 threshold + 10 dB			

Due to the nature and duration of the Proposed Scheme, the maximum permissible construction noise levels will be exceeded during certain construction phases, particularly at receptor locations which form the boundary with work sites or where night-time works are required.

5.2.5.3 Construction Traffic Noise

Section 5.2.4.3 outlined the DMRB magnitude of impact criteria used to determine the construction traffic noise impact. For assessing the significance of effect, reference is made to the EPA Guidelines (2022) and the DMRB with the same criteria used for construction noise and construction traffic noise. **Table 5.9** presents the construction traffic noise significance rating.

Table 5.9: Construction Traffic Noise – Significance Rating

Noise Level Increase	DMRB Magnitude	EPA Magnitude of Impact	Initial Significance Rating	Modifier
Less than 1.0	Negligible	Negligible	Imperceptible / Not Significant	
1.0 to 2.9	Minor	Low	Slight / Moderate	Depends on baseline noise levels, duration, and frequency.
3.0 to 4.9	Moderate	Medium	Moderate / Significant	
Greater than or equal to 5.0	Major	High	Significant – Profound	

5.2.5.4 Construction Vibration

Section 5.2.4.4 outlined guidance on effects of vibration levels on humans and limits of transient vibration, above which cosmetic damage to structures could occur. For assessing the significance of effect, reference is made to the DMRB which states:

“Construction vibration shall constitute a significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:

- 1) 10 or more days or nights in any 15 consecutive days or nights;*
- 2) a total number of days exceeding 40 in any 6 consecutive months.”*

The construction vibration significance rating is presented in **Table 5.10** below.

Table 5.10: Construction Vibration – Significance Rating

Vibration Level	DMRB Magnitude	EPA Magnitude of Impact	Initial Significance Rating	Modifier
Less than 0.3 mm/s	Negligible	Negligible	Imperceptible/ Not Significant	
Greater than or equal to 0.3 mm/s and less than 1.0 mm/s	Minor	Low	Slight/ Moderate	Depends on duration, occurrence, and frequency.
Greater than or equal to 1.0 mm/s and less than 10 mm/s	Moderate	Medium	Moderate/ Significant	
Greater than or equal to 10 mm/s	Major	High	Significant – Profound	

5.2.5.5 Operational Noise

As outlined in **Section 5.2.4.5**, the 2004 and 2014 NRA guidance documents specifies a 60 dB L_{den} design goal for receptors.

Road traffic noise can result in direct health effects at high levels but is more prevalent at levels that cause annoyance and sleep disturbance. There is strong evidence that both annoyance and sleep disturbance increase with increasing noise levels. The nature of road traffic noise is such that significant changes in road traffic are required on existing roads to change noise levels. Conversely, the introduction of a new road in a greenfield area can result in a significant change in noise levels. The UK DMRB distinguishes between short-term and long-term impacts on the basis that receptors habituate to road traffic noise and annoyance/sleep disturbance effects reduce over time. The short-term effects will be assessed by comparing the Do-Minimum scenario with the Do-Something scenario for the year of opening and the long-term effects will be compared with the Do-Something in the design year.

The aim is to avoid significant adverse impacts on health and quality of life from noise as a result of the Proposed Scheme. Where operational road traffic noise is below the NRA design goal of 60 dB L_{den} in respect of both the year of opening and the design year, the initial significance rating is determined to be not significant. Where operational traffic noise levels are above the design goal, the impact rating is dependent on the magnitude above the design goal and the increase above the baseline noise environment.

Where pre-existing noise levels are already high (well above the design goal), a small change in noise levels will not be noticeable, while a larger change may cause disturbance and be significant. The scale of the impact will depend on the degree of the noise change. If the ambient noise level is currently low (below the threshold), then the scale of impact is dependent on the extent to which the predicted noise levels exceed the thresholds. The noise level criteria associated magnitude of impact and initial significance rating for high sensitivity receptors is summarised in **Table 5.11**.

Table 5.11: Operational Noise – Significance Rating

Predicted Noise Level above the NRA Design Goal / Baseline		DMRB Magnitude	EPA Magnitude of Impact	Initial Significance Rating	Modifier
Short-Term	Long-Term				
Less than 1.0	Less than 3.0	Negligible	Negligible	Not Significant	Depends on the absolute level, acoustic context, difference in noise level and likely perception of change by residents.
1.0 to 2.9	3.0 to 4.9	Minor	Low	Slight/ Moderate	
3.0 to 4.9	5.0 to 9.9	Moderate	Medium	Moderate/Significant	
Greater than or equal to 5.0	Greater than or equal to 10.0	Major	High	Significant – Profound	

Where the sensitivity of a receptor is medium or low, the magnitude of impact reduces and initial significance rating changes.

5.2.6 Data Limitations

This noise and vibration assessment of the Proposed Scheme has been prepared based upon the best available information and in accordance with current best practice and relevant guidelines. There were no technical difficulties or otherwise encountered in its preparation.

5.3 Description of Receiving Environment

5.3.1 Kildare County Development Plan 2023-2029

The Kildare County Development Plan (CDP) recognises environmental noise obligations and refers to the National Planning Framework, European Communities (Environmental Noise) Regulations (2018) and the Kildare Noise Action Plan 2019–2023 (now superseded by the Kildare County Council Draft Noise Action Plan 2024–2028 and the Dublin Agglomeration Noise Action Plan 2024–2028). A number of policies and objectives contained in the CDP relate to noise in general. There are no road traffic noise policies or objectives in the Kildare CDP that are specific to the Celbridge or Hazelhatch areas.

5.3.2 Dublin Agglomeration Noise Action Plan 2024 – 2028

The Dublin Agglomeration Noise Action Plan 2024–2028 includes the urban areas of Celbridge and Leixlip. Round 4 noise exposure statistics and harmful effects assessments were undertaken as part of the NAP, which present the total number of people in dwellings that are exposed to varying levels of road traffic noise. For the Kildare County Council administrative area within the Dublin Agglomeration:

- 7,100 people are exposed to road traffic noise in the range of 55-59 dB L_{den}.
- 3,000 people are exposed to road traffic noise in the range of 60-64 dB L_{den}.
- 700 people are exposed to road traffic noise in the range of 65-69 dB L_{den}.
- 200 people are exposed to road traffic noise in the range of 70-74 dB L_{den}.
- 0 people are exposed to road traffic noise in excess of 75 dB L_{den}.

Specific to the area surrounding the Proposed Scheme, the NAP identifies Celbridge Abbey and the green area in front of residential properties associated with the Abbeyfarm residential estate (along Riverview and River Lawns) (adjacent to the River Liffey) as Candidate Quiet Areas.

5.3.3 Existing Environment and Receptors

The existing noise environment comprises traffic noise and distant traffic noise from the R405 Hazelhatch Road, Loughlinstown Road, Newtown Road, R403 Dublin Road, R403 Clane Road and local roads. Parts of the Proposed Scheme travel through more rural areas and at these locations, noise from farming activity, livestock and distant aircraft activity was noted.

A total of 503 receptors were considered in the model including residential receptors, schools, places of worship and commercial premises. The most sensitive NSL for the purpose of this assessment were residential dwellings where people are present for day, evening and night periods and thereby continuously exposed to road traffic noise.

5.3.3.1 Baseline Noise Monitoring

Baseline noise monitoring was undertaken on the 24th of June and the 30th of July 2024 at seven noise monitoring locations (NMLs) which were chosen to inform the assessment as illustrated in **Figure 5-1**. These locations are in close proximity to the Proposed Scheme as well as the existing R403 and R405.

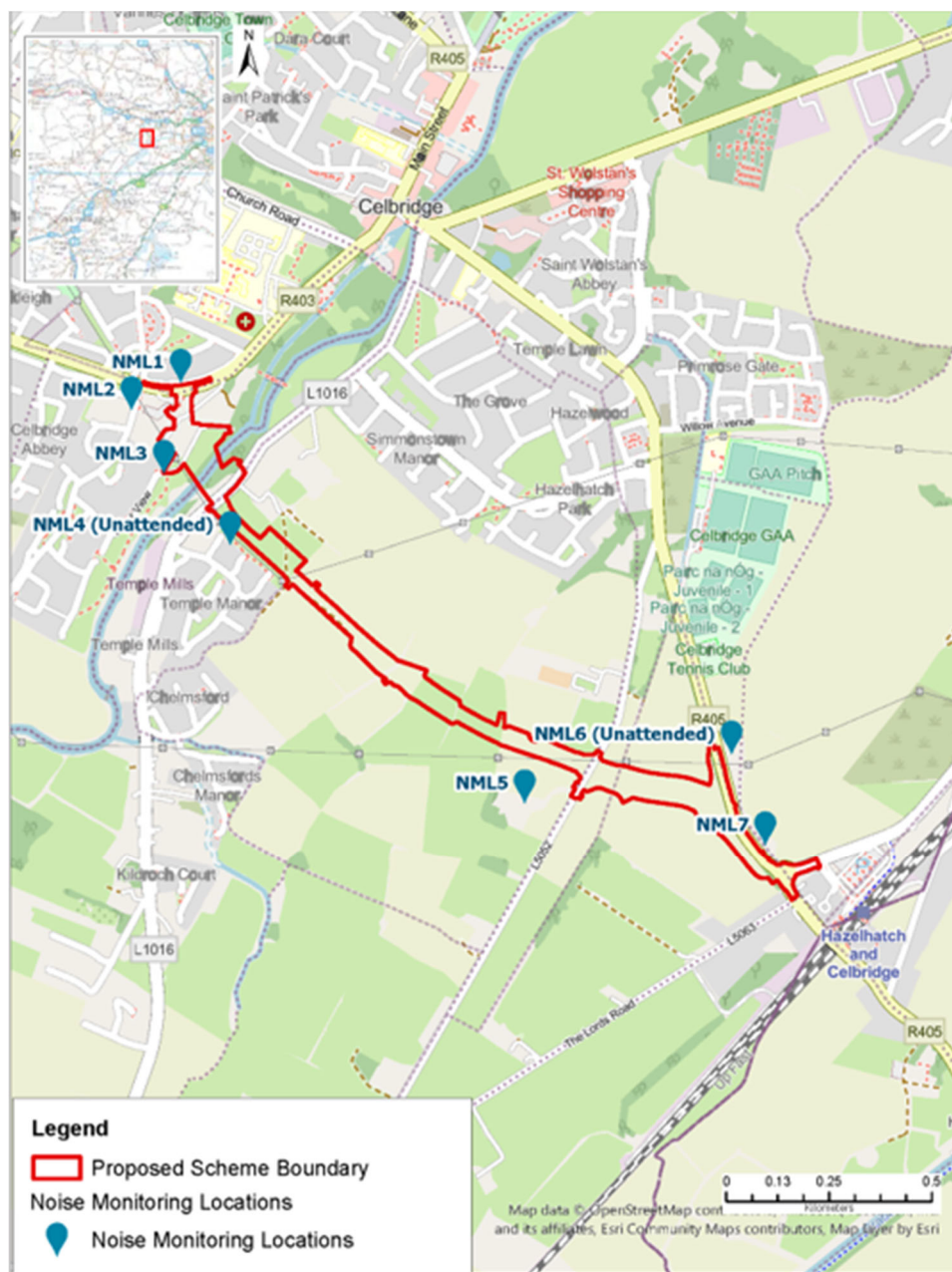


Figure 5-1 Noise Monitoring Locations

Details on the NMLs are presented in **Table 5.12**. NML1, 2 and 4 were surveyed on the 24th of June and the remaining NMLs were surveyed on the 30th of July. Noise monitoring was carried out using a 24-hour noise monitoring station at two locations (NML4 and 6) and the shortened measurement procedure in the NRA 2014 Good Practice Guidance at five locations. Photographs of each NML and a summary of the meteorological conditions are provided in **Appendix 5.1B**.

Table 5.12: Baseline Noise Monitoring Locations

NML	Coordinates (ITM)		Location Description	Survey Type
	X	Y		
NML1	696722	732571	Outside a dwelling on Priory Lodge approx. 20 m from the junction between the R403 road and the Texaco service station.	Attended
NML2	696602	732505	Outside a dwelling in a residential estate along Abbey Green.	Attended
NML3	696681	732350	At the end of a cul-de-sac in a residential estate along Riverview, Abbey Farm.	Attended
NML4	696843	732176	In the rear garden of a dwelling on The Court, Temple Manor residential estate.	Unattended
NML5	697559	731548	In the garden of a dwelling off Simmonstown Manor.	Attended
NML6	698063	731667	In the garden of a dwelling along Hazelhatch Road.	Unattended
NML7	698144	731446	In the garden of a dwelling along Hazelhatch Road approx. 70 m from the roundabout linking Hazelhatch Road and Loughlinstown Road.	Attended

Baseline Noise Survey Results

The measured L_{den} noise levels for the measurements undertaken at the long-term (24-hour) measurement locations are presented in **Table 5.13**. Full details of the baseline survey results are presented in **Appendix 5.1C (Baseline Noise Survey Data)**.

Table 5.13: Baseline Noise Survey Results – Long-term Measurements

Noise Monitoring Location (NML)	Measured L_{den}
NML4	53
NML6*	57

* Noise data likely attributable to local sources (i.e. activity at the residence) was removed from the baseline measurements.

The derived L_{den} noise levels for the measurements for the short-term measurement locations are presented in **Table 5.14**. Full details of the baseline survey results are presented in **Appendix 5.1C**.

Table 5.14: Baseline Noise Survey Results – Short-term Measurements

Noise Monitoring Location (NML)	Derived L_{den}
NML1	59
NML2	60
NML3	49
NML5	43
NML7	58

5.4 Predicted Impacts

Noise levels at NSLs from both the construction and operational phases are below the threshold of hearing damage and are assessed on the basis of annoyance. When considering the potential noise impacts on the surrounding environment, it must be considered for each of the two phases: the temporary or short-term impact of the construction phase and the longer-term impact of the operational phase.

5.4.1 Construction Phase

Short-term increases in noise impacts will occur during the construction phase of the works due to the requirement to use heavy plant and machinery. There is generally a higher tolerance for short-term

construction related noise than that which causes annoyance over the long-term. This is reflected in Section 6.7 of the NRA Guidelines.

The Proposed Scheme is linear in nature and the construction activity will be mobile over the course of the proposed works i.e. works will not be taking place at any one location permanently. Activities will vary in intensity and duration throughout the course of the works. This variation in location, intensity and duration results in significant variation in the noise levels at any noise sensitive location.

Noise levels at an NSL are influenced by the intensity of the source, proximity to the source and any screening effect between the source and the receiver. For the purpose of this assessment, specific works which are 'quasi-mobile' e.g. road formation and landscaping and 'static' works such as demolition works and works at structures have been considered. The construction activities considered for the purpose of this assessment are summarised in **Table 5.15**. The list of expected plant items required as part of these activities and associated noise levels are presented in **Appendix 5.1E (Construction Noise Source Data)**.

Table 5.15: Construction Activities – Description

Activity	Description	Classification
Site Enabling Works – Site Compounds	The proposed works will include for a full site clearance of vegetation within the lands required for establishment of the two site compounds. By their nature, these works must be complete before the main works start. Equipment includes chainsaws, excavators, lorries, dozers, vibratory rollers, and dump trucks.	Static works
Site Enabling Works – Site Clearance and Fencing	The site will be cleared of any vegetation and trees obstructing the Proposed Scheme prior to the commencement of the main constructions works. Timber post and rail boundary fencing, steel field gates for access and paladin style security fencing around attenuation basins will be erected. Equipment includes chainsaws, woodchippers, mulchers, excavators, lorries, dump trucks and dozers.	Mobile works
Demolition works	Existing buildings and polytunnels currently used for horticulture purposes will be demolished between approximately Ch. 0+050 to Ch. 0+150. In addition to this, 23 m of stone wall and 92 m of stone and blockwork wall is to be removed at R403 Clane Road and Newtown Road, respectively. Equipment includes an excavator, lorry and concrete breaking equipment.	Static works
Earthworks	The Proposed Scheme entails considerable earthworks as the preferred alignment is predominantly constructed on embankment. Equipment includes excavators, lorries, dump trucks, vibratory rollers and dozers.	Mobile works
Culverts	A number of culverts are proposed along the scheme to mitigate potential increases in flood levels upstream. Equipment includes excavators, vibratory rollers, lorries with lifting booms, concrete mixer trucks, mobile cranes and vibratory plates.	Static works
Drainage and Utilities	The Proposed Scheme utilises kerb and gully drainage systems and sees the construction of attenuation basins and swales. Equipment includes excavators, lorries and rolling and compaction equipment.	Mobile works / Static works
Road Formation and Road Pavement	The road formation works comprise of surface finished earthworks on which a road pavement is constructed. Equipment includes dozers, lorries, graders, excavators, rollers, pavers, planers and road sweepers.	Mobile works
Cycle Tracks and Footpaths	The majority of the Proposed Scheme includes 2 m wide cycle tracks and footpaths on both sides of the road. Equipment includes lorries, excavators, vibratory rollers, concrete pumps, and paving trains.	Mobile works
Bridge Construction	A new bridge crossing is required over the River Liffey. There are several construction stages including the preparation of hardstanding areas and the construction of the substructure and superstructure. Equipment includes lorries, excavators, dozers, rollers, concrete breaking equipment, a piling rig, lifting equipment including cranes, concreting equipment and circular saws.	Static works
Signage, Road Marking, Lighting and Traffic Signals	Signage, lighting and traffic signals include the erection of road signs and lighting columns and traffic signals works. Road marking will require the application of road marking thermoplastics. Equipment includes lifting equipment, excavators and road marking equipment.	Mobile works
Landscaping	Landscaping is usually completed towards the end of a project when heavy construction is completed. Equipment includes tractors, excavators and dump trucks.	Mobile works

The noisiest activities have been considered as part of the assessment and if compliance can be demonstrated for these activities, compliance will be demonstrated for other less intrusive activities. Plant items such as generators, pumps, temporary lighting, and hand tools amongst others have the potential to generate noise albeit at much lower levels than the plant items modelled in the construction tasks described in the subsequent sections. Nonetheless, mitigation measures are outlined to mitigate the noise from these items of plant and these are discussed in **Section 5.5.1**. For ease of reference, all NSLs described in the following sections are presented in **Figure 5-2** below.



5.4.1.1 Predicted Construction Activity Noise Levels

A description of the construction activities are provided in **Table 5.15** and are not repeated here. The list of expected plant items required as part of these activities and associated noise levels are presented in **Appendix 5.1E** and are not repeated here. The predicted noise levels are presented below. In practice noise levels are likely to be lower than predicted. For some of the modelled activities, it is unlikely that all items of plant listed will be operational at the same time in a given hour (refer to Landscaping). For other modelled activities, the activity will be mobile along the length of the Proposed Scheme over a prolonged duration (refer to the individual modelled activities below), meaning activities will not be taking place at any one NSL for extended periods of time. As works progress along the mainline, noise levels experienced by NSLs will reduce as the distance between the works and NSL increases (refer to Earthworks, Carriageway drainage works, Road formation and pavement, cycletracks and footpaths, signage and landscaping works).

Site Enabling Works – Site Compounds

Details on the site compound are provided in **Section 2.18.2 of Chapter 2**. Works associated with the establishment of these compounds is anticipated to last one month. The predicted noise levels at the nearest NSLs are presented in **Table 5.16**.

Table 5.16: Predicted Noise Levels for Site Enabling Works – Site Compounds at Nearest NSLs

Location / Activity (Receptor ID)	Distance to Activity (m)	Predicted Façade Noise Level	Initial Magnitude of Impact
Nearest NSL to Main Site Compound (R38)	54	62	Low
Next Nearest NSL to Main Site Compound (R47)	55	62	Low
Nearest NSL to Satellite Site Compound (R163)	48	62	Low
Next Nearest NSLs to Satellite Site Compound (R123)	99	58	Low

At all modelled NSLs, predicted noise levels generated by site enabling works at the main site compound and the satellite compound are below the NRA/TII 70 dB LAeq,1hr construction noise threshold. In practice, noise levels experienced at NSLs will likely be lower than those predicted, as not all plant items will be operating at the same time in a given hour.

Once the site compounds have been established, they will be used to provide welfare facilities and vehicle parking for site staff and will allow for the storage of materials. The noise emissions from these activities will be less than that associated with the site enabling works.

Overall, the magnitude of impact is low, indicating a **slight** significance of effect. It is proposed to install hoarding along the site compound boundaries facing nearest NSLs, which is further described in **Section 5.5.1**. In summary there are **no significant** effects associated with the establishment of the site compounds.

Site Enabling Works – Site Clearance and Fencing

This is a mobile activity that will be carried out over the length of the scheme and is anticipated to last two months. Predicted noise levels at the worst-case nearest NSLs where vegetation and tree removal are both present and absent are presented in **Table 5.17**.

Table 5.17: Predicted Noise Levels for Site Enabling Works – Site Clearance and Fencing at Nearest NSLs

Location / Activity (Receptor ID)	Distance to Activity (m)	Predicted Façade Noise Level	Initial Magnitude of Impact
Nearest NSL to Site Clearance and Fencing (R442)	23	79	High
Next Nearest NSL to Site Clearance and Fencing (R441)	29	76	High
Next Nearest NSL to Site Clearance and Fencing (R444)	31	78	High

Location / Activity (Receptor ID)	Distance to Activity (m)	Predicted Façade Noise Level	Initial Magnitude of Impact
Next Nearest NSL to Site Clearance and Fencing (R58)	33	71	Medium
Next Nearest NSL to Site Clearance and Fencing (R58)*	33	65	Low

* Same scenario with no vegetation or tree removal plant.

Predicted noise levels as a result of site clearance and fencing exceed the NRA/TII construction noise threshold at a number of modelled NSLs along the scheme. As presented in **Table 5.17**, a scenario in the three noisiest plant items (chainsaw, woodchipper and mulcher) are not operational was modelled, which reduces predicted noise levels at NSLs by approximately 6 dB, depending on location.

It can be calculated that for NSLs within approximately 95 m of site clearance and fencing activities where vegetation and tree removal are required, predicted noise levels will exceed the NRA/TII construction noise threshold. This will not be the case for all NSLs located within this range, as unique screening from topography and other buildings will decrease the incident noise level. For NSLs outside of this range, predicted noise levels are below the construction noise threshold. Where vegetation and tree removal are not required, and the three noisiest plant items are not operational, the TII/NRA construction noise threshold is expected to be exceeded at NSLs within approximately 15 m of the activities.

In practice, noise levels are likely to be lower than those predicted. The site clearance and fencing phase of construction will be mobile along the entire footprint of the Proposed Scheme and for the majority of this footprint, vegetation and tree removal will not be required. It is likely that where removal is required, durations of elevated noise levels at NSLs will be relatively short.

When vegetation and tree removal are required, the magnitude of impact for site clearance and fencing for NSLs within approximately 95 m of the activity ranges from medium to high, depending on location, indicating a **potential significant** significance of effect. For NSLs outside this range, the magnitude of impact is low, indicating a **slight to moderate** significance of effect, depending on location.

Where vegetation and tree removal are not required, the magnitude of impact for site clearance and fencing for NSLs within approximately 15 m ranges from medium to high, depending location, indicating a **significant** significance of effect. For NSLs outside this range, the magnitude of impact is low, indicating a **slight to moderate** significance of effect, depending on location. Mitigation measures for site clearance and fencing are provided in **Section 5.4.1**.

Demolition Works

This is a static activity and is anticipated to last one month. The nearest NSL to the buildings demolitions works is R163, located 22 m away. This will be the main area for the demolition activity, as the proposed wall removals will likely be short in duration and require minimal plant items to complete. The predicted noise levels at the nearest NSLs to the building demolitions are presented in **Table 5.18** below.

Table 5.18: Predicted Noise Levels for Demolitions at Nearest NSLs

Location / Activity (Receptor ID)	Distance to Activity (m)	Predicted Façade Noise Level	Initial Magnitude of Impact
Nearest NSL to Buildings Demolitions (R163)	22	66	Low
Next Nearest NSL to Buildings Demolitions (R111)	38	65	Low

At all modelled NSLs, predicted noise levels are below the NRA/TII 70 dB $L_{Aeq,1hr}$ construction noise threshold for buildings demolitions. In practice, noise levels are likely to be lower than those predicted as not all plant will be operating at the same time in a given hour. As noted, the proposed wall removals will likely be short in duration and require minimal plant items to complete. In addition to this, the distance between the nearest NSLs to the two removal areas are greater than the distance between the nearest NSLs to the buildings demolitions.

Overall, the magnitude of impact for demolitions works is low, indicating a **slight to moderate** significance of effect, depending on location. In summary, there are **no significant** effects associated with this activity.

Earthworks

This activity is anticipated to last 10 months. The predicted noise levels at the nearest NSLs are presented in **Table 5.19** below.

Table 5.19: Predicted Noise Levels for Earthworks at Nearest NSLs

Location / Activity (Receptor ID)	Distance to Activity (m)	Predicted Façade Noise Level	Initial Magnitude of Impact
Nearest NSL to Earthworks (R444)	23	72	Medium
Next Nearest NSL to Earthworks (R58)	33	71	Medium

At the nearest modelled NSLs, the predicted noise levels for the earthworks activities exceed the NRA/TII 70 dB $L_{Aeq,1hr}$ construction noise threshold. It can be calculated that the construction noise threshold is likely to be exceeded at NSLs located within approximately 40 m of the earthworks activities. For NSLs outside of this range, predicted noise levels are likely to be equal to or below the threshold.

Overall, the magnitude of impact for earthworks for NSLs within 40 m of the activity is medium, indicating a **moderate** significance of effect. For NSLs outside this range, the magnitude of impact is low, indicating a **slight to moderate** significance of effect, depending on location. Mitigation measures for earthworks are provided in **Section 5.4.1**.

Culverts

This is a static activity which will be undertaken at set points along the Proposed Scheme. The culvert works are anticipated to be completed within six months. Three culverts works areas were modelled as part of the assessment of this activity, CUL-01, CUL-02 and CUL-03. Works areas for CUL-02 and CUL-03 are located within 180 m of the nearest NSLs while the CUL-01 works area is located further away. The predicted noise levels at the nearest NSLs to each of these three works areas are presented in **Table 5.20** below.

Table 5.20: Predicted Noise Levels for Culvert Works at Nearest NSLs

Location / Activity (Receptor ID)	Distance to Activity (m)	Predicted Façade Noise Level	Initial Magnitude of Impact
Nearest NSL to CUL-01 Works Area (R473)	325	54	Low
Nearest NSL to CUL-02 Works Area (R446)	179	61	Low
Nearest NSL to CUL-03 Works Area (R449)	113	63	Low

At all modelled NSLs, predicted noise levels are below the NRA/TII 70 dB $L_{Aeq,1hr}$ construction noise threshold for the culvert works due to the large separation distances present. Overall, the magnitude of impact from this activity is low and the significance of effect is deemed to be **slight**. There are **no significant** effects associated with the culvert works element of the Proposed Scheme.

Drainage and Utilities

Drainage works along the carriageway of the Proposed Scheme are mobile works, while the construction of attenuation basins and swales and stream diversions are static. These activities are anticipated to take 12 months to complete. For the purposes of this assessment, attenuation basins, swales and stream diversions closest to NSLs were modelled. The predicted noise levels at the nearest NSLs to each of these elements are presented in **Table 5.21** below.

Table 5.21: Predicted Noise Levels for Drainage and Utilities at Nearest NSLs

Location / Activity (Receptor ID)	Distance to Activity (m)	Predicted Façade Noise Level	Initial Magnitude of Impact
Nearest NSL to Carriageway Drainage Works (R441)	5	76	High
Next Nearest NSL to Carriageway Drainage Works (R442)	22	69	Low

Location / Activity (Receptor ID)	Distance to Activity (m)	Predicted Façade Noise Level	Initial Magnitude of Impact
Nearest NSL to Attenuation Basins (R105)	41	61	Low
Nearest NSL to Attenuation Swales (R444)	32	62	Low
Nearest NSL to Stream Diversions (R449)	30	63	Low

For the mobile carriageway drainage works, it can be calculated that for NSLs within approximately 20 m of the carriageway works, predicted noise levels are in excess of 70 dB, while NSLs outside this range are likely to experience levels equal to or below this level. Overall, the magnitude of impact for the carriageway drainage works for NSLs within 22 m of the activity is high, indicating a **moderate** significance of effect. For NSLs outside this range, the magnitude of impact is low, indicating a **slight to moderate** significance of effect, depending on location. Mitigation measures for the carriageway drainage works are provided in **Section 5.5.1**.

For the proposed attenuation basins, swales and stream diversions, predicted noise levels are below the construction noise threshold at all modelled NSLs. The magnitude of impact for the construction of the proposed attenuation basins, swales and stream diversions is low, indicating a **slight** significance of effect.

Road Formation and Road Pavement

This is a mobile activity which will take place across the entire length of the scheme. The anticipated timeline for completion of this activity is 12 months (total), with an estimated 200 m of road pavement planned to be constructed per month. Predicted noise levels at the worst-case nearest NSLs are presented in **Table 5.22** below.

Table 5.22: Predicted Noise Levels for Road Formation and Road Pavement at Nearest NSLs

Location / Activity (Receptor ID)	Distance to Activity (m)	Predicted Façade Noise Level	Initial Magnitude of Impact
Nearest NSL to Road Formation and Road Pavement (R441)	5	83	High
Next Nearest NSL to Road Formation and Road Pavement (R442)	22	77	High
Next Nearest NSL to Road Formation and Road Pavement (R444)	23	77	High
Next Nearest NSL to Road Formation and Road Pavement (R54)	31	73	Medium

Predicted noise levels for road formation and road pavement exceed the NRA/TII 70 dB LAeq,1hr construction noise threshold at several modelled NSLs along the Proposed Scheme. It can be calculated that for NSLs less than approximately 59 m away from the activities, predicted noise levels are likely to exceed the construction noise threshold. For NSLs outside of this range, predicted noise levels are expected to be equal to or below the threshold.

Overall, the magnitude of impact for NSLs located within 59 m of the road formation and road pavement activities is medium to high, depending on location, indicated a **significant** significance of effect. For NSLs outside of this range, the magnitude of impact is low, indicating a **slight to moderate** significance of effect, depending on location. Mitigation measures for road formation and road pavement are provided in **Section 5.5.1**.

Cycle Tracks and Footpaths

Works associated with the construction of the cycle tracks and footpaths are anticipated to take 14 months to complete. The predicted noise levels at the worst-case nearest NSLs are presented in **Table 5.23**.

Table 5.23: Predicted Noise Levels for Cycle Tracks and Footpaths at Nearest NSLs

Location / Activity (Receptor ID)	Distance to Activity (m)	Predicted Façade Noise Level	Initial Magnitude of Impact
Nearest NSL to Cycle Tracks and Footpaths (R441)	5	81	High
Next Nearest NSL to Cycle Tracks and Footpaths (R442)	22	74	Medium
Next Nearest NSL to Cycle Tracks and Footpaths (R444)	23	74	Medium
Next Nearest NSL to Cycle Tracks and Footpaths (R54)	31	70	Low

Predicted noise levels for the cycle tracks and footpaths activities exceed the TII/NRA 70 dB LAeq,1hr construction noise threshold at three modelled locations along the Proposed Scheme. It can be calculated that for NSLs within approximately 45 m of the activity, predicted noise levels exceed the construction noise threshold. Outside of this range, predicted noise levels at NSLs are expected to be equal to or below the threshold.

Overall, the magnitude of impact for NSLs located within 45 m of the cycle tracks and footpaths activities is medium to high, depending on location, indicated a **significant** significance of effect. For NSLs outside of this range, the magnitude of impact is low, indicating a **slight to moderate** significance of effect, depending on location. Mitigation measures for cycle tracks and footpaths are provided in **Section 5.5.1**.

Bridge Construction

There will be two works areas associated with this activity, one north of the River Liffey and one south. It is expected that the bridge construction will begin early in the construction programme and be completed within 13 months. Specifically, hardstanding works are anticipated to take one month and substructure and superstructure works are anticipated to take six months each. The predicted noise levels at the nearest NSLs to each phase of the bridge construction activity are presented in **Table 5.24** below.

Table 5.24: Predicted Noise Levels for Bridge Construction at Nearest NSLs

Location / Activity (Receptor ID)	Distance to Activity (m)	Phase of Construction	Predicted Façade Noise Level	Initial Magnitude of Impact
Nearest NSL to Bridge Construction (R111)	77	Hardstandings Works	58	Low
		Substructure Works	65	Low
		Superstructure Works	63	Low
Next Nearest NSL to Bridge Construction (R61)	81	Hardstandings Works	58	Low
		Substructure Works	64	Low
		Superstructure Works	62	Low

The noisiest phase of the bridge construction activity is the substructure works. However, the nearest NSLs are at a sufficient distance from the works so that the NRA/TII 70 dB LAeq,1hr construction noise threshold is not predicted to be exceeded during any of the bridge construction phases. It is possible that construction works at both works areas may occur simultaneously at various points throughout this activity. However, this scenario has been modelled and does not exceed the construction noise limit.

Overall, the magnitude of impact from this activity is low and the significance of effect is deemed to be **slight**. In summary, there are **no significant effects** associated with the bridge construction element of the Proposed Scheme.

Signage, Road Marking, Lighting and Traffic Signals

This is a mobile activity which will take place along the length of the Proposed Scheme. This activity is expected to be completed in the final three months of the construction programme. The predicted noise levels at the worst-case nearest NSLs are presented in **Table 5.25** below.

Table 5.25: Predicted Noise Levels for Signage, Road Marking, Lighting and Traffic Signals at Nearest NSLs

Location / Activity (Receptor ID)	Distance to Activity (m)	Predicted Façade Noise Level	Initial Magnitude of Impact
Nearest NSL to Signage, Road Marking, Lighting and Traffic Signals (R441)	5	73	Medium
Next Nearest NSL to Signage, Road Marking, Lighting and Traffic Signals (R442)	22	66	Low
Next Nearest NSL to Signage, Road Marking, Lighting and Traffic Signals (R444)	23	67	Low

It can be calculated that for NSLs within approximately 15 m of the activity, predicted noise levels exceed the construction noise threshold. Outside of this range, predicted noise levels at NSLs are likely to be equal to or below the threshold.

Overall, for NSLs located within 15 m of this activity, the magnitude of impact is medium. However, given the short duration of this activity, the significance of effect is assessed to be **moderate**. For NSLs outside this range, the magnitude of impact is low, indicating a **slight to moderate** significance of effect, depending on distance to the activity. In summary, there are **no significant** effects associated with the signage, road marking, lighting and traffic signals element of the Proposed Scheme. Mitigation measures for this activity are provided in **Section 5.5.1**.

Landscaping

The landscaping element of the Proposed Scheme is a mobile activity along the length of the scheme featuring native species woodland and hedgerow planting along with standard trees. This activity is anticipated to be completed over the final 12 months of the construction programme due to seasonal planting constraints. At some locations, there is insufficient space for an articulated dump truck or tractor to operate and in these instances, landscaping works are likely to be limited to a tracked excavator and a dumper. The predicted noise levels at the nearest NSLs are presented in **Table 5.26** below.

Table 5.26: Predicted Noise Levels for Landscaping at Nearest NSLs

Location / Activity (Receptor ID)	Distance to Activity (m)	Predicted Façade Noise Level	Initial Magnitude of Impact
Nearest NSL to Landscaping (R441)*	5	69	Low
Next Nearest NSL to Landscaping (R442)*	22	63	Low
Next Nearest NSL to Landscaping (R444)*	23	63	Low
Next Nearest NSL to Landscaping (R58)	33	69	Low

* Confined working conditions. Dumper and tracked excavator only.

At the nearest locations to the landscaping activity, R441, R442 and R444, space is limited, and it is unlikely that an articulated dump truck or a tractor would be able to operate. As such, when the plant items are limited to the dumper and the tracked excavator, predicted noise levels are below the NRA/TII 70 dB $L_{Aeq,1hr}$ construction noise threshold at all modelled NSLs.

At R58, the nearest modelled NSL to the works where space is not limited and the articulated dump truck and tractor can feasibly operate, predicted noise levels are below the construction noise threshold. It can be calculated that when these larger items of plant can operate, predicted noise levels at NSLs within approximately 30 m of the landscaping activities are likely to exceed the construction noise threshold. For NSLs outside of this range, predicted noise levels will be equal to or below the threshold.

Overall, the magnitude of impact is low, indicating a **slight to moderate** significance of effect, depending on distance to the activity. No specific mitigations are required but mitigation measures proposed for other activities will also have benefit for this activity.

5.4.1.2 Construction Traffic

During the construction phase, additional traffic will need to be generated to enable site staff and plant/materials to access and egress the construction site. This will temporarily increase traffic on the existing road network.

The majority of construction traffic is likely to use regional roads and be prohibited from travelling through the town centre, avoiding congested locations. The total volume of traffic generated per day is expected to be below 10% of the baseline traffic, implying a negligible noise level of increase of less than 1 dB. As a result, there are no significant effects predicted for construction traffic noise or vibration associated with the Proposed Scheme.

5.4.1.3 Construction Vibration

Construction vibrations arise during piling, rock breaking and use of heavy construction equipment close to sensitive properties. Construction vibrations propagate through the ground to a receiver by means of surface and, to a lesser extent, shear and compressional waves. The amplitude of the waves decreases rapidly with distance from the source due to geometrical spreading and energy losses within the ground (material damping). This means that construction-related vibration is only significant close to the source.

Further details on the Construction Vibration methodology is presented in **Appendix 5.1F (Construction Vibration)**. Consideration of potential vibration impacts has been limited to properties within 50 m of the site boundary, or in the case of structures of significant intrinsic value (i.e. protected structures), a radius of 300 m has been considered.

Typical construction activities as part of the Proposed Scheme include rock-breaking, rolling, compaction and earthmoving. **Table 5.27** shows a range of vibration source levels at 7.6 m.

Table 5.27: Vibration source levels for Construction Equipment³

Equipment	PPV at 7.6 m (mm/s)
Vibratory Roller	5.3
Large Rock-Breaker	2.3
Large Bulldozer	2.3
Auger piling	2.3
Loaded trucks	1.9
Jackhammer	0.9
Small bulldozer	0.1

As outlined in **Section 5.2.4.4**, construction vibrations need to be assessed for property damage and the impact on humans. The usual criteria applied for construction vibration effects on buildings from roads projects are those published in the NRA Guidelines and shown in **Section 5.2.4.4**. Given the distance between plant items and the vast majority of NSLs, construction vibration levels from the Proposed Scheme are below the NRA criteria and are likely to be below the threshold of perception at the nearest sensitive locations.

Construction works adjacent to the roundabout at Hazelhatch Road and Loughlinstown Road occur at short distances to sensitive NSLs, the closest being 7 m from the mainline. The vibratory roller used for rolling and compaction are the plant items with the greatest potential to generate vibration. Predicted vibration levels at the nearest NSL are provided in **Table 5.28**. Vibration levels are predicted to be 6 mm/s for the vibratory roller at the nearest NSL.

Table 5.28: Predicted Vibration Levels at the Nearest NSL

Vibration Source	Predicted PPV (mm/s)
Vibratory roller	6 mm/s

³ Compiled from: Quagliata, A., ed., Transit Noise and Vibration Impact Assessment Manual, FTA Report No. 0123, September 2018 and BS 5228

The magnitude of impact for these activities is predicted to be **medium** and given the limited duration, the significance of effect is **moderate**. It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents. Vibration levels at other more distant dwellings will be considerably lower.

To put the vibration levels presented in **Table 5.27** in context, some examples of PPV levels in a modern masonry dwelling house are presented in New (1986)⁴. The PPV levels are reproduced in **Table 5.29**. It is also important to note that a similar activity would have taken place in the past during the instatement of the current road surface adjacent to the dwelling.

Table 5.29: Typical Vibration Levels in a Modern Residence

Vibration Source	Resultant PPV (mm/s)
Normal footfalls	0.05 – 0.5
Foot stamping	0.3 – 3.0
Door slams	11 – 17
Percussive drilling	10 – 20

5.4.2 Operational Phase

Noise modelling was undertaken at 503 receptor locations within the study area. Given the large number of receptor locations modelled, only receptors where mitigation is required are presented in the main assessment. All results are presented in **Appendix 5.1G (Operational Noise Predictions)**. Mitigation measures are only deemed necessary when the three conditions for noise mitigation as outlined in the NRA Guidelines (2004) have been satisfied (as previously presented in **Section 5.2.4.5**).

Table 5.30 presents the predicted noise levels for the Do-Minimum and Do-Something Opening Year (2025) and Design Year (2040) for the Proposed Scheme and compares the calculated results against the three conditions for noise mitigation as outlined in the NRA Guidelines (2004).

Twenty-seven receptor locations have been identified as meeting the NRA criteria for mitigation. These are concentrated at some residential properties in the Temple Manor Estate directly adjacent to the Proposed Scheme and some residential properties at Priory Lodge where the Proposed Scheme joins with the R403 Regional Road. The NSLs where mitigation measures are required are shown in **Figure 5-3** and **Figure 5-4**. The figures also show locations where residual impacts occur following mitigation.

Further details on the operational phase mitigation measures are discussed in **Section 5.5.2** including the suitability and/or practicality of noise mitigation for each location.

⁴ New, B. M. (1986) Ground Vibration caused by civil engineering works, Traffic Research Laboratory Report 53, UK.

Section 177AE Environmental Report

Table 5.30: Predicted Traffic Noise Levels

Receptor ID*	Description	Predicted Noise Levels: Opening Year (2025)		Condition for Noise Mitigation Satisfied?			Mitigation Required?	Predicted Noise Levels: Design Year (2040)		Conditions for Noise Mitigation Satisfied?			Mitigation Required?
		Do-Minimum	Do-Something	(a)	(b)	(c)		Do-Minimum	Do-Something	(a)	(b)	(c)	
R38	Residential	49	60	No	Yes	Yes	No	49	61	Yes	Yes	Yes	Yes
R38a	Residential	50	61	Yes	Yes	Yes	Yes	50	61	Yes	Yes	Yes	Yes
R38b	Residential	48	59	No	Yes	Yes	No	48	59	No	Yes	Yes	No
R38c	Residential	47	58	No	Yes	Yes	No	47	58	No	Yes	Yes	No
R47	Residential	51	61	Yes	Yes	Yes	Yes	50	62	Yes	Yes	Yes	Yes
R47a	Residential	50	61	Yes	Yes	Yes	Yes	49	61	Yes	Yes	Yes	Yes
R47b	Residential	49	59	No	Yes	Yes	No	49	60	No	Yes	Yes	No
R54	Residential	52	62	Yes	Yes	Yes	Yes	52	62	Yes	Yes	Yes	Yes
R54a	Residential	51	61	Yes	Yes	Yes	Yes	51	61	Yes	Yes	Yes	Yes
R54b	Residential	52	59	No	Yes	Yes	No	51	60	No	Yes	Yes	No
R58	Residential	54	61	Yes	Yes	Yes	Yes	54	61	Yes	Yes	Yes	Yes
R58a	Residential	54	58	No	Yes	Yes	No	54	59	No	Yes	Yes	No
R61	Residential	60	61	Yes	Yes	Yes	Yes	59	60	No	Yes	Yes	No
R61a	Residential	59	60	No	Yes	Yes	No	59	60	No	Yes	Yes	No
R185	Residential	60	62	Yes	Yes	Yes	Yes	60	63	Yes	Yes	Yes	Yes
R185a	Residential	58	61	Yes	Yes	Yes	Yes	58	61	Yes	Yes	Yes	Yes
R186	Residential	60	63	Yes	Yes	Yes	Yes	60	63	Yes	Yes	Yes	Yes
R186a	Residential	58	61	Yes	Yes	Yes	Yes	58	62	Yes	Yes	Yes	Yes
R187	Residential	60	63	Yes	Yes	Yes	Yes	60	64	Yes	Yes	Yes	Yes
R187a	Residential	58	62	Yes	Yes	Yes	Yes	58	62	Yes	Yes	Yes	Yes
R188	Residential	60	63	Yes	Yes	Yes	Yes	60	64	Yes	Yes	Yes	Yes
R188a	Residential	58	62	Yes	Yes	Yes	Yes	58	62	Yes	Yes	Yes	Yes
R189	Residential	60	63	Yes	Yes	Yes	Yes	60	63	Yes	Yes	Yes	Yes
R189a	Residential	58	62	Yes	Yes	Yes	Yes	58	62	Yes	Yes	Yes	Yes
R190	Residential	60	63	Yes	Yes	Yes	Yes	60	63	Yes	Yes	Yes	Yes
R190a	Residential	58	62	Yes	Yes	Yes	Yes	58	62	Yes	Yes	Yes	Yes
R191	Residential	59	62	Yes	Yes	Yes	Yes	60	62	Yes	Yes	Yes	Yes

Section 177AE Environmental Report

Receptor ID*	Description	Predicted Noise Levels: Opening Year (2025)		Condition for Noise Mitigation Satisfied?			Mitigation Required?	Predicted Noise Levels: Design Year (2040)		Conditions for Noise Mitigation Satisfied?			Mitigation Required?
		Do-Minimum	Do-Something	(a)	(b)	(c)		Do-Minimum	Do-Something	(a)	(b)	(c)	
R191a	Residential	57	60	No	Yes	Yes	No	57	61	Yes	Yes	Yes	Yes
R192	Residential	60	63	Yes	Yes	Yes	Yes	60	63	Yes	Yes	Yes	Yes
R192a	Residential	58	62	Yes	Yes	Yes	Yes	58	62	Yes	Yes	Yes	Yes
R193	Residential	59	63	Yes	Yes	Yes	Yes	60	63	Yes	Yes	Yes	Yes
R193a	Residential	58	62	Yes	Yes	Yes	Yes	58	62	Yes	Yes	Yes	Yes
R194	Residential	61	63	Yes	Yes	Yes	Yes	61	63	Yes	Yes	Yes	Yes
R194a	Residential	59	62	Yes	Yes	Yes	Yes	59	62	Yes	Yes	Yes	Yes
R195	Residential	61	63	Yes	Yes	Yes	Yes	61	64	Yes	Yes	Yes	Yes
R195a	Residential	60	62	Yes	Yes	Yes	Yes	60	62	Yes	Yes	Yes	Yes
R196	Residential	59	62	Yes	Yes	Yes	Yes	59	63	Yes	Yes	Yes	Yes
R196a	Residential	57	61	Yes	Yes	Yes	Yes	58	62	Yes	Yes	Yes	Yes
R197	Residential	61	63	Yes	Yes	Yes	Yes	61	64	Yes	Yes	Yes	Yes
R197a	Residential	60	62	Yes	Yes	Yes	Yes	60	62	Yes	Yes	Yes	Yes
R198	Residential	62	63	Yes	Yes	Yes	Yes	62	64	Yes	Yes	Yes	Yes
R198a	Residential	60	62	Yes	Yes	Yes	Yes	60	62	Yes	Yes	Yes	Yes
R199	Residential	60	63	Yes	Yes	Yes	Yes	60	63	Yes	Yes	Yes	Yes
R199a	Residential	58	61	Yes	Yes	Yes	Yes	58	62	Yes	Yes	Yes	Yes
R200	Residential	62	64	Yes	Yes	Yes	Yes	62	64	Yes	Yes	Yes	Yes
R200a	Residential	60	62	Yes	Yes	Yes	Yes	60	62	Yes	Yes	Yes	Yes
R202	Residential	60	62	Yes	Yes	Yes	Yes	60	62	Yes	Yes	Yes	Yes
R202a	Residential	58	61	Yes	Yes	Yes	Yes	58	61	Yes	Yes	Yes	Yes
R204	Residential	60	62	Yes	Yes	Yes	Yes	60	62	Yes	Yes	Yes	Yes
R204a	Residential	58	61	Yes	Yes	Yes	Yes	58	61	Yes	Yes	Yes	Yes
R206	Residential	60	62	Yes	Yes	Yes	Yes	60	62	Yes	Yes	Yes	Yes
R207	Residential	60	62	Yes	Yes	Yes	Yes	60	62	Yes	Yes	Yes	Yes
R208	Residential	60	61	Yes	Yes	Yes	Yes	60	61	Yes	Yes	Yes	Yes
R209	Residential	59	60	No	Yes	Yes	No	59	61	Yes	Yes	Yes	Yes

* For some receptors, several locations around the building have been modelled, given their proximity to both existing roads and the Proposed Scheme. These locations have been denoted with letters 'a' and 'b'.



Figure 5-3 NSLs Requiring Mitigation Measures and Those with Residual Impacts Post-Mitigation (Page 1 of 2)



5.4.3 Cumulative Impact

As outlined in **Section 3.3**, the Iarnród Éireann DART+ South West Project has been screened in for potential cumulative effects where the project has the scope to potentially alter the traffic volumes and/or flows assessed in this chapter for determination of noise and vibration impact.

With regard to the DART+ South West Project the ZOI for the construction phase noise/ vibration impacts for this project was set at 300 m from the temporary land take boundary. As part of the DART+ South West project, works are proposed at and in proximity to Hazelhatch & Celbridge station. There will be modifications to the track layout commencing approximately 750m to the west of the station, the works include new Points and Crossings (P&C), track realignment, provision of a new siding to facilitate the DART services on the electrified Slow lines to the north side of the corridor. It is also proposed that a 38kV substation adjacent to the Hazelhatch & Celbridge station car park. There will also be the electrification of the northern lines. Whilst there is potential for noise impacts from these activities, it is expected that they will be localised to NSLs in close proximity the Celbridge & Hazelhatch Station and railway tracks. Whilst there is potential for cumulative effects, given the distance between the works on the Proposed Scheme and the proposed DART+ South West Project, the cumulative effects will not be significant.

5.5 Proposed Mitigation Measures

5.5.1 Construction Phase

The following mitigation measures will be implemented during the construction works:

- Noise barriers (reflective) of at least 2.4 m height up to 3.6 m height shall be installed and maintained at both site compounds for the duration of the construction phase. The noise barriers will, at a minimum, block line of sight between the construction activities and NSLs. Noise barriers at the site compounds will be installed as early as practicable within the construction programme;
- Noise barriers (reflective) of at least 2.4 m height up to 3.6 m height shall be installed and maintained for the duration of the construction phase along the site boundary adjacent to residential properties in the housing estate off Newtown Road to the west of the Proposed Scheme;
- Noise barriers (reflective) of at least 2.4 m height up to 3.6 m height shall be installed and maintained for the duration of the construction phase along the southern boundary of the Proposed Scheme along works areas adjacent to the roundabout at Hazelhatch Road and Loughlinstown Road. The noise barriers will, at a minimum, block line of sight between the construction activities and NSLs;
- When undertaking vegetation and tree removal and subsequent processing during site clearance works, the distance between removal and processing plant required for site clearance and the nearest NSLs shall be maximised;
- Where a hydraulic breaker is required, the following measures shall be implemented:
 - Fit suitably designed muffler or sound reduction equipment to reduce noise without impairing machine efficiency.
 - Use dampened bit to eliminate ringing.
 - Where works are occurring over an extended period, the use of temporary noise barriers/screens or enclosure shall be implemented;
- Haul routes shall be well maintained to minimise impulsive noise and vibration from vehicles running over discontinuities in the running surfaces;
- Where works (outside of emergency works) need to be completed outside normal working hours or where proposed works indicate that the noise or vibration levels set out in **Section 5.2.5.2** (Construction Noise Criteria) or **Section 5.2.5.4** (Construction Vibration Criteria) may be exceeded, permission for these works shall be sought from the County Council in advance of any works taking place. The application for such works shall require a detailed noise control plan and follow up report to be prepared by the Contractor. This plan shall include (i) a justification for the works being carried out in the manner proposed, (ii) an assessment indicating what alternatives have been considered, (iii) a statement of the noise control measures from BS 5228 to be adopted and how Best Practicable Means will be used to control noise, (iv) an activity specific noise monitoring programme including contact details for persons

with the authority to cease working if required by the County Council. Each follow up report will include details of any complaints received and the action taken to address such complaints;

- A noise and vibration monitoring programme shall be implemented for the duration of the construction phase. Monitoring will assess compliance of the construction works with the noise thresholds set out in **Table 5.3** and **Table 5.4**. The noise and vibration programme shall also include actions for exceedances in the noise thresholds should they arise;
- Full details of the Contractor's provision for noise and vibration monitoring and procedures including provisions for publication of monitoring results shall be submitted to and approved by the County Council prior to commencement of work. The County Council shall have discretion to vary the monitoring requirements and publication of results during the course of construction; and
- Works will be carried out using Best Practicable Means (BPM) to minimise noise and vibration, such measures shall include:
 - Limiting the hours of construction set out in **Section 2.18.7Hours of Work** in the **Project Description**, except in certain circumstances as set out in **Section 5.2.5.2**.
 - Work practices, equipment noise control and screening shall be in compliance with BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise, and BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration (together referred to as BS 5228). Typical work practices which shall be implemented include:
 - Noisy works shall be scheduled to normal working hours;
 - Quiet working methods, using plant with lower noise emission levels shall be used;
 - Working methods that minimise vibration generation particularly with regard to demolition activities and piling shall be adopted;
 - Plant such as pumps and generators used on or near sensitive locations will be contained within an acoustic enclosure and comply with the noise levels in **Table 5.3** and **Table 5.4**.
 - Plant and machinery used on-site will comply with the EC (Construction Plant and Equipment) Permissible, Noise Levels Regulations, 1988 (S.I. No. 320 of 1988);
 - All noise producing equipment will comply with S.I. No 632 of 2001 European Communities (Noise Emission by Equipment for Use Outdoors) Regulations 2001 and S.I. No. 241/2006 - European Communities (Noise Emission by Equipment for Use Outdoors) (Amendment) Regulations 2006;
 - All plant shall be properly maintained, (mechanisms properly lubricated, faulty silencers replaced, worn bearings replaced, cutting tools sharpened etc.);
 - Acoustic covers to engines shall be closed when in use or idling;
 - For electricity generation at the construction compounds, hydrogen generators or electrified plant shall be utilised over traditional diesel generators. This will also apply to lower powered mobile plant as appropriate;
 - Hydraulic equipment shall be used in preference to pneumatic equipment;
 - Wheeled plant shall be used in preference to tracked plant;
 - Plant shall be located as far away from noise and vibration sensitive receptors as practicable;
 - Site hoardings or perimeter noise barriers shall be installed;
 - Temporary acoustic enclosures or screens around specific noisy static plant shall be used;
 - The unnecessary revving of engines shall be avoided and equipment shall be switched off when not in use;
 - Starting-up plant and vehicles sequentially shall be used rather than at the same time;
 - Internal haul routes shall be well maintained to minimise impulsive noise and vibration from vehicles running over discontinuities in the running surfaces;

- Rubber linings shall be fitted to chutes, hoppers and dumper vehicles to reduce impact noise from material transfer;
- Drop heights of materials shall be minimised;
- Regular inspections of mitigation measures (BPM audits) shall be carried out to ensure compliance with noise and vibration commitments;
- Regular briefings shall be provided for all site-based personnel so that noise and vibration issues (including the requirement to employ BPM at all locations at all times) are understood and that generic and site-specific mitigation measures are explained and adhered to;
- Unloading shall be carried out within the worksite rather than on adjacent roads or laybys;
- Phasing of materials deliveries shall be controlled on a 'just in time' basis to minimise noise and congestion on roads around the site;
- A formal stakeholder engagement process shall be put in place for the duration of the construction phase, including the provision of information to local residents about noise and vibration monitoring results, works likely to cause significant noise or vibration and/or works planned to take place outside of core working hours;
- Channels of communication between the Contractor, Kildare County Council Planning Section (County Council) and residents shall be established at project commencement; and
- Records of any noise complaints relating to the construction operations will be investigated as soon as possible and reported to the County Council.

5.5.2 Operational Phase

In **Section 5.4.2, Table 5.30**, 27 receptor locations were identified as meeting the criteria for mitigation either in the opening year, the design year or both as defined in the NRA Guidelines (2004).

In order to reduce road traffic noise for as many properties as possible, all newly constructed roads will be constructed using low noise road surfaces. A low noise road surface is defined as a road surface that can provide a minimum noise reduction of 2.5dB(A) when compared to a standard Hot Rolled Asphalt road surface. However, even with a low noise road surface installed, the requirement for further mitigation was identified at many of the receptor locations.

Drawing MDT0902-RPS-01-XX-DR-Z-FE0000-FE0007 (refer to sheets 1 and 2), provided under separate cover.

Table 5.31 presents the details of noise reducing measures that shall be required in addition to the use of a low noise road surface within the scheme boundary. The height and length of the noise barriers proposed are detailed in **Drawing MDT0902-RPS-01-XX-DR-Z-FE0000-FE0007** (refer to sheets 1 and 2), provided under separate cover.

Table 5.31. The table refers to 'Noise Barriers'; this may take the form of walls, earthen berms and other landscaping features providing the required acoustic screening and meeting all other technical specifications. The locations of noise mitigation measures are shown on **Drawing MDT0902-RPS-01-XX-DR-Z-FE0000-FE0007** (refer to sheets 1 and 2), provided under separate cover.

Table 5.31: Details of Noise Mitigation Measures

Receptor Details	Location	Chainage	Description	Length	Height
Temple Manor Estate	Proposed Alignment	Ch. 295 – 551	Noise barrier	274 m	2.5 m
		Ch. 558 – 601	Noise barrier	43 m	2.5 m
Priory Lodge	R403	-	Noise barrier atop of existing stone wall.	163 m	1.5 m

There are residual effects at 14 locations with noise levels above the Do-Minimum noise levels and these are discussed further in **Section 5.6**. These exceedances are limited to first floor level. At ground floor level there is either no change between the Do-Minimum and Do-Something noise levels or a small reduction in noise level. The magnitude of impact is **negligible** and the significance rating is **not significant** for the design year. The predicted traffic noise levels at the NSLs following mitigation is presented in **Appendix 5.1G**.

5.6 Residual Impacts

The results of the assessment indicate the majority of the receptors adjacent to the Proposed Scheme have traffic noise levels at or below 60dB Lden, and/or where existing noise levels are above 60 dB Lden, the Do-Something noise levels can be reduced to the equivalent Do-Minimum traffic noise levels at the majority of locations with the recommended mitigation measures in place.

The NRA Guidelines (2004) states that: *“The Authority accepts that it may not always be sustainable to provide adequate mitigation in order to achieve the design goal. Therefore, a structured approach should be taken in order to ameliorate as far as practicable road traffic noise through the consideration of measures such as alignment changes, barrier type (e.g. earth mounds), low noise road surfaces etc.”*

A limited number of properties at Priory Lodge (overlooking the existing Clane Road near the junction with the Proposed Scheme) will experience a residual noise effect at first floor level, despite the application of a structured approach through the consideration of various mitigation measures.

With respect to achieving the 60 dB Lden design goal, the NRA Best Practice Guidance (2014) states that *“... in some cases the attainment of the design goal may not be possible by sustainable means”*. The guidance goes on to state *“... It may be unsustainable to increase barrier dimensions significantly where the result would be a reduction of 1dB or less, as such a reduction would be close to imperceptible in a laboratory situation and would not result in a difference in public response in the real world environment.”* The same is also true of the difference between the Do-Minimum and Do-Something noise levels.

Reducing traffic noise levels at or below the Do-Minimum noise levels at these properties would require substantial additional mitigation (e.g. installing a 3m high noise barrier on top of the existing boundary wall adjacent to the receptors) over and above those already proposed in order to achieve a negligible change in the overall noise level at these properties.

The application of these additional measures is not considered a viable solution at this location. A 3m high noise barrier as a mitigation measure was considered, however the operational road traffic noise level predicted resulted in a negligible reduction in noise level. As such the effectiveness of this mitigation measure was found to be limited and disproportionate to the benefits the mitigation would deliver. It would result in additional tree loss, and visual impacts for residential properties.

5.7 Monitoring

5.7.1 Construction Phase

During the construction phase, a noise and vibration monitoring programme shall be implemented to assess compliance of the construction works with the noise criteria set out in **Section 5.2.5.2**.

Full details of the Contractor's provision for noise and vibration monitoring and procedures including provisions for publication of monitoring results will be submitted to and approved by the County Council prior to commencement of work.

The appointed Contractor's Construction Environmental Management Plan (CEMP) for the Proposed Scheme will detail channels of communication between the Contractor, Kildare County Council and residents including a system for recording and investigating noise complaints relating to the construction operations.

5.7.2 Operational Phase

No specific noise or vibration monitoring is proposed.

6 AIR QUALITY

6.1 Introduction

This Chapter of the Environmental Report identifies, describes, and assesses the potential effects of the Proposed Scheme on Air Quality during the construction and operational phases of the scheme.

6.2 Assessment Methodology

The impact of the Proposed Scheme on air quality has been assessed for both the construction and operational phases by considering the pollutant background concentrations, emissions from road traffic, potential for construction dust and emissions from construction traffic and machinery. Predicted concentrations have been compared to the relevant statutory limit values and the WHO guidelines for the protection of human health.

The assessment utilises the predictive approaches of the following TII guidance documents:

- TII Air Quality Assessment of Specified Infrastructure Projects – Overarching Technical Document PE-ENV-01106 (December 2022) (TII, 2022a);
- TII Air Quality Assessment of Proposed National Roads - Standard PE-ENV-01107 (December 2022) (TII, 2022b);
- TII Road Emissions Model (REM): Model Development Report GE-ENV-01107 (December 2022) (TII, 2022c).

In addition, the following non-legislative guidance is applied to this assessment:

- Institute of Air Quality Management (IAQM) (2024) Guidance on the assessment of dust from demolition and construction;
- World Health Organization (WHO) (2021). WHO global air quality guidelines: particulate matter (PM_{2.5} and PM₁₀), ozone, nitrogen dioxide, sulphur dioxide and carbon monoxide;
- Technical Instructions on Air Quality Control – TA Luft, German Federal Ministry for Environment, Nature Conservation and Nuclear Safety, (July 2002).

Further details on the assessment methodology is provided in **Appendix 6.1B (Assessment Methodology)**.

Road Traffic

Emissions from road transport when the road is operational have been calculated using the TII Road Emissions Model (REM). Under EU and national policy on electric vehicles and fuel and engine technology, the proportions of the different vehicle classifications (EURO classification) will change over time because it is expected the fleet will move towards increased adoption of newer and relatively lower emission vehicles in the future, including greater uptake of hybrid (HEV), battery-electric (BEV) and alternative fuelled vehicles. The extent of this change is unknown, so the results are generated for three separate Fleet Databased scenarios within the REM model which are described in **Appendix 6.1B**. Results for all three scenarios are presented within this assessment.

6.2.1 Relevant Guidelines, Policy and Legislation

Specific legislation relating to air quality which has been considered within this assessment includes the following:

- Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe;
- Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011) as amended;
- Ambient Air Quality Standards Regulations 2022 (S.I. No. 739 of 2022);
- Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants;

- Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC; and
- S.I. No. 232 of 2018 - European Union (National Emission Ceilings) Regulations 2018.

The details of the limit values expressed in this legislation is provided in **Section 6.2.5.1**(ambient air quality). Further details on legislation, policy and guidance which has informed the assessment is provided in **Appendix 6.1A (Relevant Guidelines, Policy and Legislation)**.

6.2.2 Study Area and Zone of Influence

The study area for construction dust assessment impacts is defined within the IAQM 2024 Guidance and includes all dust sensitive receptors (such as residential properties, commercial properties, areas of amenity and designated ecological sites) within 250m of the site boundary and those within 50m of a public road used by construction traffic that is within 250m of a site access point.

To ensure a robust assessment the zone of influence (Zoi) for the construction phase dust impacts is set at 250m from the temporary land acquisition boundary, as can be seen in **Figure 6-1** below.

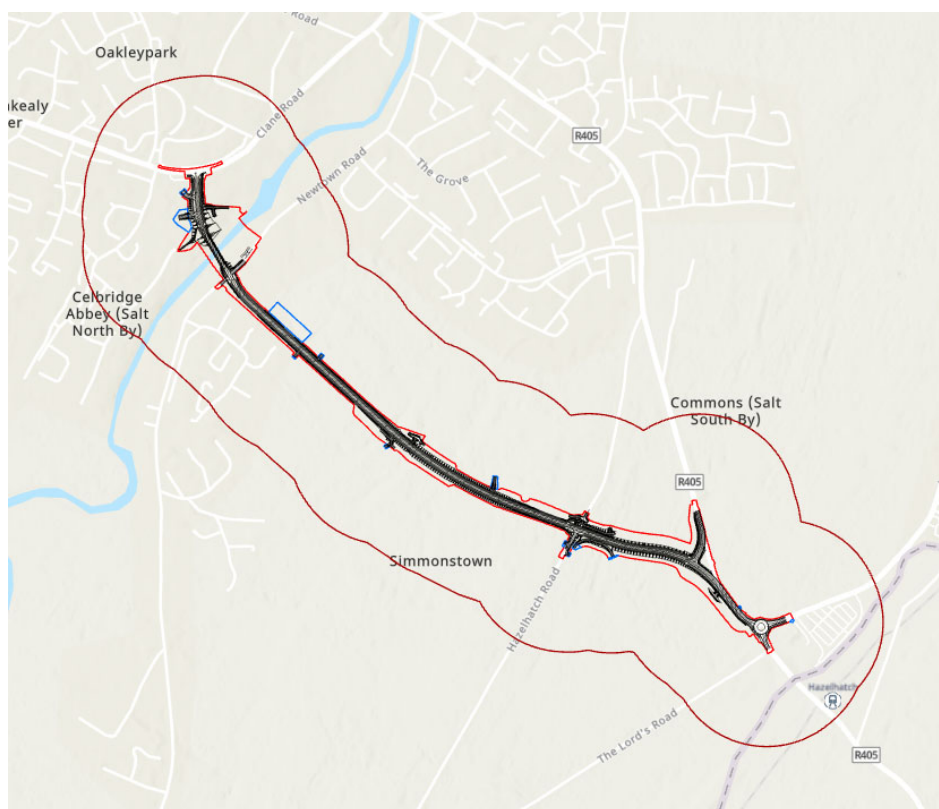


Figure 6-1 Zone of Influence for Air Quality Assessment

6.2.3 Sources of Information to Inform the Assessment

A desk-based air quality assessment was carried out following TII's guidelines. The guideline states that wherever possible, use should be made of existing quality assured air quality data such as that undertaken by the EPA. As such, the baseline ambient air quality environment has been characterised through a desk study of publicly available published data sources and baseline ambient monitoring surveys undertaken in the area by the EPA. The most recent EPA Annual Air Quality in Ireland reports detail the range and scope of monitoring undertaken throughout Ireland and data from these reports is referenced to inform the baseline air quality.

A review of potentially sensitive ecological areas has also been conducted using the National Parks and Wildlife Services (NPWS) online mapping services.

6.2.4 Key Parameters for Assessment

The following aspects were considered in the assessment of potential effects of the Proposed Scheme on air quality:

Construction Phase

- Fugitive dust emissions at the sites and compounds during ground investigations, demolitions, excavations, construction and track-out of the proposed Scheme.
- Plant emissions from diesel use on mobile and fixed plant engaged in the construction phase.
- Road traffic emissions from transport of personnel and materials to and from site for construction activities.

Operational Phase

- Road traffic emissions from traffic volumes using the scheme once operational – this parameter is assessed at national level, within the wider Celbridge area and at a local level for individual properties.

6.2.5 Assessment Criteria and Significance

6.2.5.1 Ambient Air Quality Limits

The Air Quality Regulations set limit values for the pollutants nitrogen dioxide (NO₂) and nitrogen oxides (NO_x), particulate matter (PM) with an aerodynamic diameter of less than 10 microns (PM₁₀), PM with an aerodynamic diameter of less than 2.5 microns (PM_{2.5}), lead (Pb), sulphur dioxide (SO₂), benzene and carbon monoxide (CO) as presented in **Table 6.1**.

Table 6.1: Air Quality Regulations (based on the CAFE Directive)

Pollutant	Regulation	Limit Type	Value
Nitrogen Dioxide	S.I. 180 of 2011	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200µg/m ³ NO ₂
		Annual limit for protection of human health	40µg/m ³ NO ₂
Nitrogen Oxides (NO + NO ₂)		Critical limit for the protection of vegetation and natural ecosystems	30µg/m ³ NO + NO ₂
Lead	S.I. 180 of 2011	Annual limit for protection of human health	0.5µg/m ³
Sulphur Dioxide	S.I. 180 of 2011	Hourly limit for protection of human health - not to be exceeded more than 24 times/year	350µg/m ³
		Daily limit for protection of human health - not to be exceeded more than three times/year	125µg/m ³
		Critical limit for the protection of vegetation and natural ecosystems (calendar year and winter)	20µg/m ³
Particulate Matter (as PM ₁₀)	S.I. 180 of 2011	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50µg/m ³
		Annual limit for protection of human health	40µg/m ³
Particulate Matter (as PM _{2.5})	S.I. 180 of 2011	Annual limit for protection of human health	25µg/m ³
Benzene	S.I. 180 of 2011	Annual limit for protection of human health	5µg/m ³
Carbon Monoxide	S.I. 180 of 2011	8-hour limit (on a rolling basis) for protection of human health	10mg/m ³

6.2.5.2 Construction Dust Assessment Criteria

During the Construction Phase, the focus is on air quality sensitive receptors adjacent to dust generating activities or roads impacted due to construction activities. Sensitivity to dust depends on the duration of the dust deposition, the dust generating activity, and the nature of the deposit. Due to the scale of the proposed Scheme, construction sites are likely to be in operation for extended periods and therefore detailed consideration of potential dust impacts and how to mitigate impacts is required.

The Construction Dust Assessment Methodology including the assessment criteria is provided in **Appendix 6.1C (Construction Dust Assessment Methodology)**. This includes the criteria for appraisal of the magnitude of dust emissions under the headings of demolition, earthworks, construction and track-out.

The risk of potential for dust impacts with respect to dust nuisance, human health and ecology are a function of magnitude of the dust generation at each construction site in combination with the sensitivity of the surrounding area as detailed in **Appendix 6.1C**.

6.2.5.3 Human Receptors (Road Traffic)

The TII Guidance (PE-ENV-01106) states that the magnitude of change from road traffic emissions should be used to describe the quality of the effect as positive, negative, or neutral using the criteria in **Table 6.2**. In addition, the impact descriptors in **Table 6.3** should be used to describe the impact at each receptor location, which takes into consideration the percentage change in concentration relative to the air quality standards of the pollutant.

Table 6.2: TII Quality of Effect Criteria

Quality of Effect	Description
Positive Effect	Where there is a decrease in annual mean concentration at a receptor which does not constitute a neutral effect.
Neutral Effect	Where there is a change in concentration at a receptor of: 5% or less where the opening year, without the proposed scheme annual mean concentration is 75% or less of the standard; or 1% or less where the opening year, without the proposed scheme annual mean concentration is 94% or less of the standard.
Negative Effect	Where there is an increase in annual mean concentration at a receptor which does not constitute a neutral effect.

Table 6.3: TII Impact Descriptors

Long term average concentration at receptor in assessment year	% Change in concentration relative to Air Quality Standard Value (AQLV)			
	1	2-5	6-10	>10
75% or less of AQLV	Neutral	Neutral	Slight	Moderate
76 – 94% of AQLV	Neutral	Slight	Moderate	Moderate
95 – 102% of AQLV	Slight	Moderate	Moderate	Substantial
103 – 109% of AQLV	Moderate	Moderate	Substantial	Substantial
110% or more of AQLV	Moderate	Substantial	Substantial	Substantial

6.2.5.4 Ecological Receptors

The impact of nitrogen deposition from traffic emissions is also considered in the assessment at ecologically sensitive areas such as European or Nationally designated sites. The relevant assessment criteria employed in the TII guidance is summarised in **Table 6.4**, which is largely based around the critical loads for nitrogen.

Table 6.4: TII Assessment Criteria for Sensitive Designated Habitats

Description of Results	Significance
Total N deposition and acid deposition are more than 1% of the critical load	Discuss further with project biodiversity practitioners
The total N deposition and acid deposition are less than 1% of the critical load.	Not significant

Where total N deposition and acid deposition are more than 1% of the critical load, the project biodiversity practitioner should consider the following:

- Factors such as the nature of site management;
- Other factors such as regular flooding in maintaining a suitable habitat;
- The degree of sensitivity to fauna to relatively subtle changes in botanical composition;
- Whether nitrogen or phosphorous is the key limiting nutrient; and
- The extent of the sensitive designated site that is negatively affected should be taken into consideration.

Where significant effects are determined, site survey information is required to determine if the sensitive habitat of relevance is actually present in the affected area and to inform potential mitigation measures that may be required.

The proposed Scheme is not located within or adjoining any internationally or nationally designated sites for nature conservation. The closest European site to the proposed Project is the Rye Water Valley/Carton SAC (site code 001398), located approximately 4.7km north of Proposed Scheme. This SAC contains the habitat Petrifying springs with tufa formation (Cratoneurion) [7220]. The critical loads for this habitat are 15-25 kg/ha/year⁵.

6.2.6 Data Limitations

This air quality assessment has been prepared based upon the best available information and in accordance with current best practice and relevant guidelines. There were no technical difficulties or otherwise encountered in the preparation of this assessment.

6.3 Description of Receiving Environment

6.3.1 Baseline Air Quality

As part of the implementation of the Air Quality Standards Regulations 2011, four air quality zones have been defined in Ireland for air quality management and assessment purposes. In terms of air monitoring zoning, the area of the Proposed Scheme (refer to **Section 6.2.2**) is located within air quality Zone C that is Other cities and large towns. The nearest representative Zone C air quality monitoring sites with historic data available are located in Navan and Portlaoise and data for a range of air pollutants from these sites is discussed below.

Oxides of Nitrogen

Nitrogen Dioxide (NO₂) is classed as both a primary and a secondary pollutant. As a primary pollutant, NO₂ is emitted from all combustion processes (such as a gas/oil fired boiler or a car engine). The EPA report that in Ireland⁶, the main source of NO₂ is from road transport. As a secondary pollutant NO₂ is derived from atmospheric reactions of pollutants that are themselves, derived mainly from traffic sources.

Long term NO₂ monitoring was carried out at Navan (c.36km away), and Portlaoise (c.65km away), as can be seen in **Table 6.5** below.

Table 6.5: Trends in Zone C Air Quality – Nitrogen Dioxide (µg/m³)

Station	Averaging Period	2018	2019	Year 2020	2021	2022	2023
Navan	Annual Mean NO ₂ µg/m ²	-	23	19	21.9	21	22.2

⁵ EPA, 2021. https://www.epa.ie/publications/research/air/Research_Report_390.pdf

⁶ Air Quality in Ireland Report 2023 (EPA, 2024)

Station	Averaging Period	Year					
		2018	2019	2020	2021	2022	2023
Portlaoise	Annual Mean NO ₂ µg/m ²	11	11	11	7.9	9	8.3

Particulate Matter

Particulate Matter (PM₁₀ and PM_{2.5}) may be emitted as a primary pollutant from road vehicle exhausts and brake and tyre wear, as well as from the combustion of solid fuels (coal, peat, wood) and the EPA report that the main source (especially of the smaller and more dangerous PM_{2.5} particles) is solid fuel burning for home heating.

Continuous PM₁₀ monitoring was carried out by the EPA at Navan (c.36km away), and Portlaoise (c.65km away), as can be seen in **Table 6.6** below.

Table 6.6: Trends in Zone C Air Quality – PM₁₀ (µg/m³)

Station	Averaging Period	Year					
		2018	2019	2020	2021	2022	2023
Navan	Annual Mean PM ₁₀ µg/m ²	-	-	14	13.5	14.2	13.2
Portlaoise	Annual Mean PM ₁₀ µg/m ²	11	15	12	11.4	12	11

PM_{2.5}

EPA annual mean concentrations of PM_{2.5} at the Zone C Station in Bray, c.37km away, and Navan, c.36km away (see **Table 6.7**). Bray is used instead of Portlaoise for this assessment, as there is very limited PM_{2.5} data available for Portlaoise.

Table 6.7: Trends in Zone C Air Quality PM_{2.5} (µg/m³)

Station	Averaging Period	Year					
		2018	2019	2020	2021	2022	2023
Bray	Annual Mean PM _{2.5} µg/m ²	6	7	5	5.6	5.7	5.7
Navan	Annual Mean PM _{2.5} µg/m ²	-	11	8	8.2	8.3	7.5

6.3.2 Baseline Dust Sensitivity Assessment

An appraisal has been carried out to assess sensitivity of receptors to dust soiling, health impacts and ecological impacts due to the construction phase in accordance with the IAQM Guidance. This appraisal reviews the sensitivity of the site's location with respect to dust nuisance, human health and ecological impacts and then calculates a risk of impact using the magnitude of site activities.

The Construction Dust Assessment Methodology which includes the assessment criteria is provided in **Appendix 6.1C**. Prior to assessing the impact from dust emissions, the sensitivity of the area must be established using the headings:

- Dust Soiling Effects on People and Property;
- Human Health Impacts; and
- Ecological Impacts.

The sensitivity of the area is considered as per the criteria outlined in the IAQM Guidance and referenced in **Appendix 6.1C** (refer to **Tables 1, 2 and 3**). In terms of the sensitivity of the area to dust soiling effects on people and property, the receptor sensitivity, number of receptors and their distance from the source are considered. Using these criteria, the sensitivity of the area to dust soiling can be established. For the

purpose of this assessment, the project was divided into three distinct areas that were identified as most likely to create dust emissions as follows:

- Area 1: Main Alignment for Mobility Corridor (Single carriageway),
- Area 2: New River Liffey Bridge Crossing and
- Area 3: Compound (Main compound).

An assessment of the Proposed Scheme was completed with respect to the sensitivity criteria presented in **Appendix 6.1C (refer to Table 1 and Table 2)**. Where the number of receptors was not clear, conservative sensitivities were assumed. In addition, when calculating the sensitivity with respect to human health, the background concentrations of particulates were reviewed (**Section 6.3.1**). This found concentrations for the representative Zone C monitoring sites to be between 12 and 14.2 $\mu\text{g}/\text{m}^3$ in 2022, corresponding to a “Low” background measurement of PM_{10} .

An overall summary of the baseline to dust nuisance, human health and ecological impacts is shown in **Table 6.8**.

Table 6.8: Summary of Sensitivity of the Area to Dust

Location	Description of Works	Nuisance Sensitivity	Human Health Sensitivity	Ecology Sensitivity
Area 1: Main Alignment for Mobility Corridor (Single carriageway)	• Construction of 2.1km section of single carriageway (includes footpaths and cycle lanes on both sides) • Construction to include site enabling works, site clearance & fencing, demolition, earthworks, culverts, drainage, utilities, road construction and landscaping	High	Medium	Low
Area 2: New River Liffey Bridge Crossing	• Construction of second crossing of the River Liffey in Celbridge • Single Span Varying Depth Steel Composite Plate Girder Bridge • Construction to include site setup, excavation for foundation works, diversion of services, foundation and abutment installation, lifting and assembling girders, concrete deck pouring, installation of raised verge, surfacing, and parapets.	Medium	Low	Low
Area 3: Compound (Main compound)	• Compound accessed from Newtown Road. • Includes welfare facilities and vehicle parking for site staff and will allow for the storage of materials.	Medium	Low	Low

For Nuisance Sensitivity, Area 1 is classed as ‘High’ as there are >100 high sensitivity receptors < 20m away from source. Area 2 is classed as ‘Medium’ as a medium sensitivity receptor (park) is <20m from the source. Area 3 is classed as ‘Medium’ as there are >100 High sensitivity receptors <100m from the source.

For Human Health Sensitivity, Area 1 is classed as ‘Medium’, as there are >100 high sensitivity receptors <100m from source. Area 2 is classed as ‘Low’ as between 10-100 high sensitivity receptors (dwellings and a school) are <100m away from source. Area 3 is classed as ‘Low’ as there are >100 high sensitivity receptors, <100m from the source. All areas have a ‘Low’ background measurement of PM_{10} .

For Ecological Sensitivity, Areas 1,2 and 3 are classed as ‘Low’, as ‘Low’ sensitivity receptors are <50m away from the source. There are no protected sites within 50m of the boundary of the site, 50m of routes used by construction vehicles on the public highway, or up to 250m from the site entrance as per the IAQM guidance.

6.4 Predicted Impacts

6.4.1 Construction Phase

6.4.1.1 Construction Dust

The greatest potential impact on air quality during the construction phase is from construction dust emissions, PM₁₀ and PM_{2.5} emissions and the potential for nuisance dust. This section provides an overview of the typical activities that have potential for dust impacts during the construction phase of the Proposed Scheme.

The potential for dust emissions due to construction can vary substantially day to day and are strongly influenced by the level of activity, the specific operations, and the prevailing meteorological conditions. While each individual site compound will differ, the processes that have the potential for the generation of construction dust will be similar. The following operations are the main dust generating sources or activities:

- Vegetation clearance – removes grass and other soil covering;
- Demolition – detailed demolition plans will be required to minimise dust generation;
- Movement of trucks along paved public roads – potential of track-out of dust on vehicle tyres from construction sites or resuspension of dust;
- Movement of trucks along unpaved haul roads – potential for resuspension of dust as vehicles move around the site;
- Extraction of material – works will be broken down into different types however all will involve the movement of potentially dusty material which has the potential to generate dust; and
- Stockpiling of material – stockpiles have the potential to generate dust due to dry material movement and wind erosion.

In order to determine the level of dust mitigation required during the proposed works, the potential dust emission magnitude for dust generation at each site needs to be taken into account in conjunction with the previously established sensitivity of the area (refer to **Section 6.3.2, Table 6.8**). Using the appraisal criteria for the assessment of risk at sensitive receptors as detailed in **Appendix 6.1C (Table 4 to Table 7)**, a summary of dust emission magnitudes from the main construction sites is shown in **Table 6.9**.

Table 6.9: Summary of Dust Emission Magnitude

Location	Demolition	Earthworks	Construction	Track-out
Area 1: Main Alignment for Mobility Corridor (Single carriageway)	Small	Medium	Medium	Medium
Area 2: New River Liffey Bridge Crossing	Small	Medium	Medium	Medium
Area 3: Compound (Main compound)	Small	Medium	Medium	Medium

The dust emission magnitude from each construction site determined in **Table 6.9** have been combined with the sensitivity assessment in **Table 6.8** to define the risk of dust impacts under the headings of demolition, earthworks, construction and track-out. The resultant requirement levels (i.e. high, medium or low levels of mitigation) for mitigation with respect to nuisance dust, health impacts and ecological impacts are shown in **Table 6.10 to Table 6.13**.

Table 6.10: Summary of Demolition Risk to Define Site-Specific Mitigation

Location	Dust Nuisance Risk	Human Health Risk	Sensitive Ecology Risk
Area 1: Main Alignment for Mobility Corridor (Single carriageway)	Medium	Low	Negligible

Location	Dust Nuisance Risk	Human Health Risk	Sensitive Ecology Risk
Area 2: New River Liffey Bridge Crossing	Low	Negligible	Negligible
Area 3: Compound (Main compound)	Low	Negligible	Negligible

Table 6.11: Summary of Earthworks Risk to Define Site-Specific Mitigation

Location	Dust Nuisance Risk	Human Health Risk	Sensitive Ecology Risk
Area 1: Main Alignment for Mobility Corridor (Single carriageway)	Medium	Medium	Low
Area 2: New River Liffey Bridge Crossing	Medium	Low	Low
Area 3: Compound (Main compound)	Medium	Low	Low

Table 6.12: Summary of Construction Risk to Define Site-Specific Mitigation

Location	Dust Nuisance Risk	Human Health Risk	Sensitive Ecology Risk
Area 1: Main Alignment for Mobility Corridor (Single carriageway)	Medium	Medium	Low
Area 2: New River Liffey Bridge Crossing	Medium	Low	Low
Area 3: Compound (Main compound)	Medium	Low	Low

Table 6.13: Summary of Track out Risk to Define Site-Specific Mitigation

Location	Dust Nuisance Risk	Human Health Risk	Sensitive Ecology Risk
Area 1: Main Alignment for Mobility Corridor (Single carriageway)	Medium	Medium	Low
Area 2: New River Liffey Bridge Crossing	Medium	Low	Low
Area 3: Compound (Main compound)	Medium	Low	Low

The risk of dust impacts arising from the Proposed Scheme are summarised in **Table 6.14**. The magnitude of risk determined is used to prescribe the level of site-specific mitigation required for each activity to prevent significant impacts occurring. The impacts associated with construction phase dust emissions are considered to pose at worst, a medium risk, and therefore represent a short term moderate negative impact without mitigation.

Table 6.14: Summary Overall Dust Impact Risk to Define Site-Specific Mitigation

Location	Worst Case Risk
Area 1: Main Alignment for Mobility Corridor (Single carriageway)	Medium

Location	Worst Case Risk
Area 2: New River Liffey Bridge Crossing	Medium
Area 3: Compound (Main compound)	Medium

6.4.1.2 Construction Traffic

The transport of material to and from the site will generate additional temporary traffic on the existing road network. In particular, there will be a large volume of earthworks to be brought on-site. The removal of waste material off site by road and regular deliveries to site will, where appropriate, be generally confined to outside of peak traffic hours, and will only be undertaken by appropriately permitted hauliers and disposed of in appropriately permitted facilities.

The TII guidelines state that increases in Annual Average Daily Traffic (AADT) flows of less than 10% during the construction phase are unlikely to result in significant air quality effects. Given that the expected peak traffic volumes will be below the 10% of baseline traffic, the impact to air quality from construction traffic is considered negligible.

6.4.2 Operational Phase

Regional Assessment

Using TII's Road Emissions Model and traffic data four models were assessed, the Base year (2024), Opening year (2025), Do Minimum (2040) and the Do Something (2040) for the design year. The Do Minimum assesses emissions based on the Proposed Scheme not being developed, and the Do Something assesses emissions based on if the Proposed Scheme is developed. Note that the base year scenario employed the BAU emissions of the REM model while the Opening year, Do Minimum and Do Something are predicted based on the CAP emissions in the REM model. The results of the assessment are presented in **Table 6.15**.

Table 6.15: Regional Impact of Changes to Traffic Patterns as a result of Proposed Scheme

Scenario	Total NO _x (kg/year)	Total PM ₁₀ (kg/year)
Base Year	203,167	22,887
Opening Year (2025)	177,738	22,565
2040 Do Minimum	57,118	26,750
2040 Do Something	56,846	26,584
Total Potential Decrease in Emissions Between the Do Minimum and the Do something (kg/year)	-0.48%	-0.62%

The results show a decrease in emissions from the base and opening years under both scenarios - Do Minimum and the Do Something. This is due to the impacts of the Climate Action Plan and associated policies. There is a 0.48% reduction in total NO_x when comparing the Do Minimum to the Do Something, and a 0.62% reduction in total PM₁₀ when comparing the Do Minimum to the Do Something, suggesting the Proposed Scheme will improve air quality compared to the base and opening years.

The impacts associated with operational phase regional traffic emissions within the study area are considered long term slight beneficial impacts for air quality.

Local Impact on Human Receptors

In addition to the regional emissions, the Proposed Scheme may also have implications for local receptors such as residential properties or other sensitive receptors. The closest sensitive receptors to the proposed Scheme are St. John of Gods Kildare services Celbridge (Clane Rd), the Hazelhatch residential estates, Abbey Farm housing estate, Temple Manor housing estate, a residential property along Simmonstown road and Saint Patricks Primary School as illustrated in

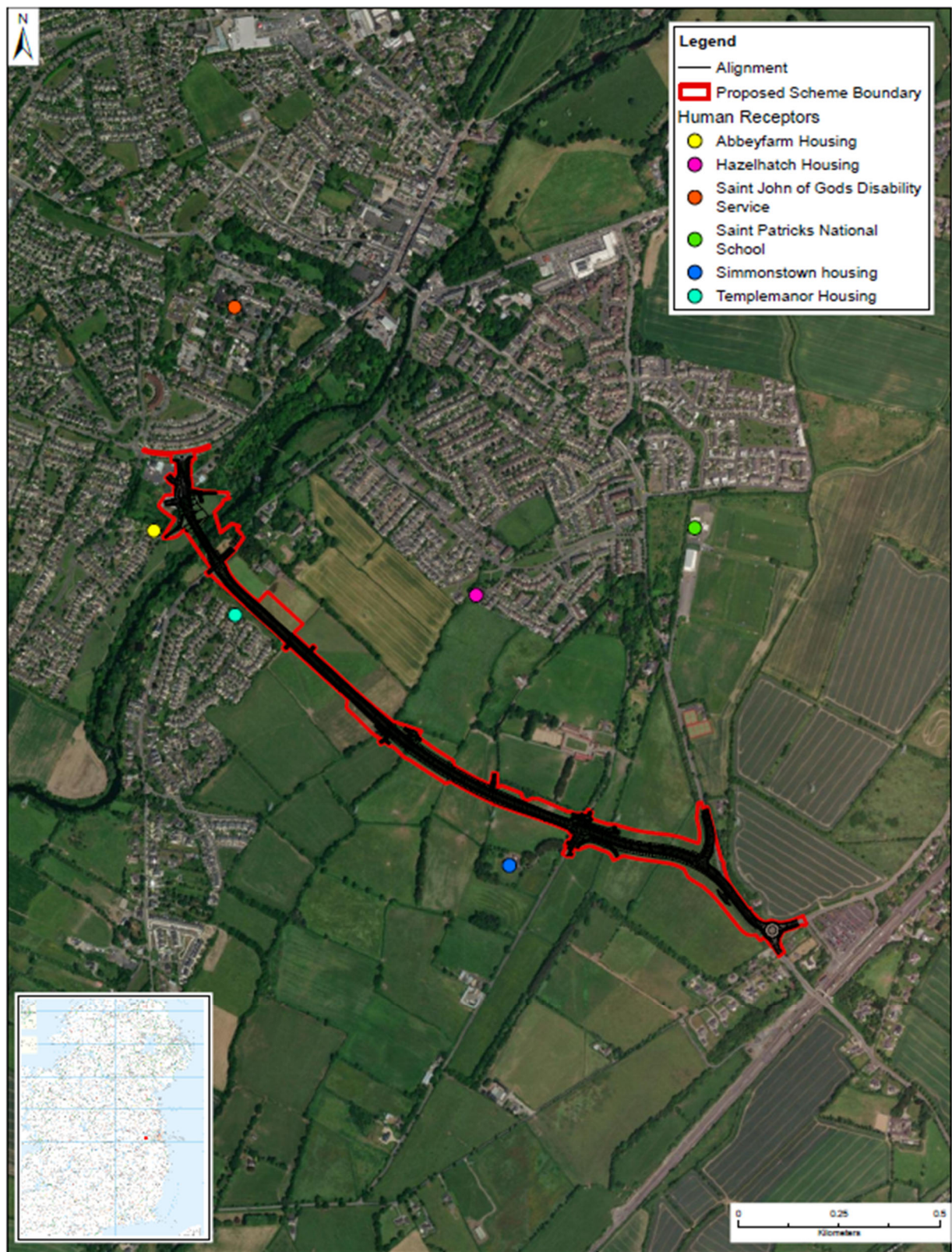


Figure 6-2.

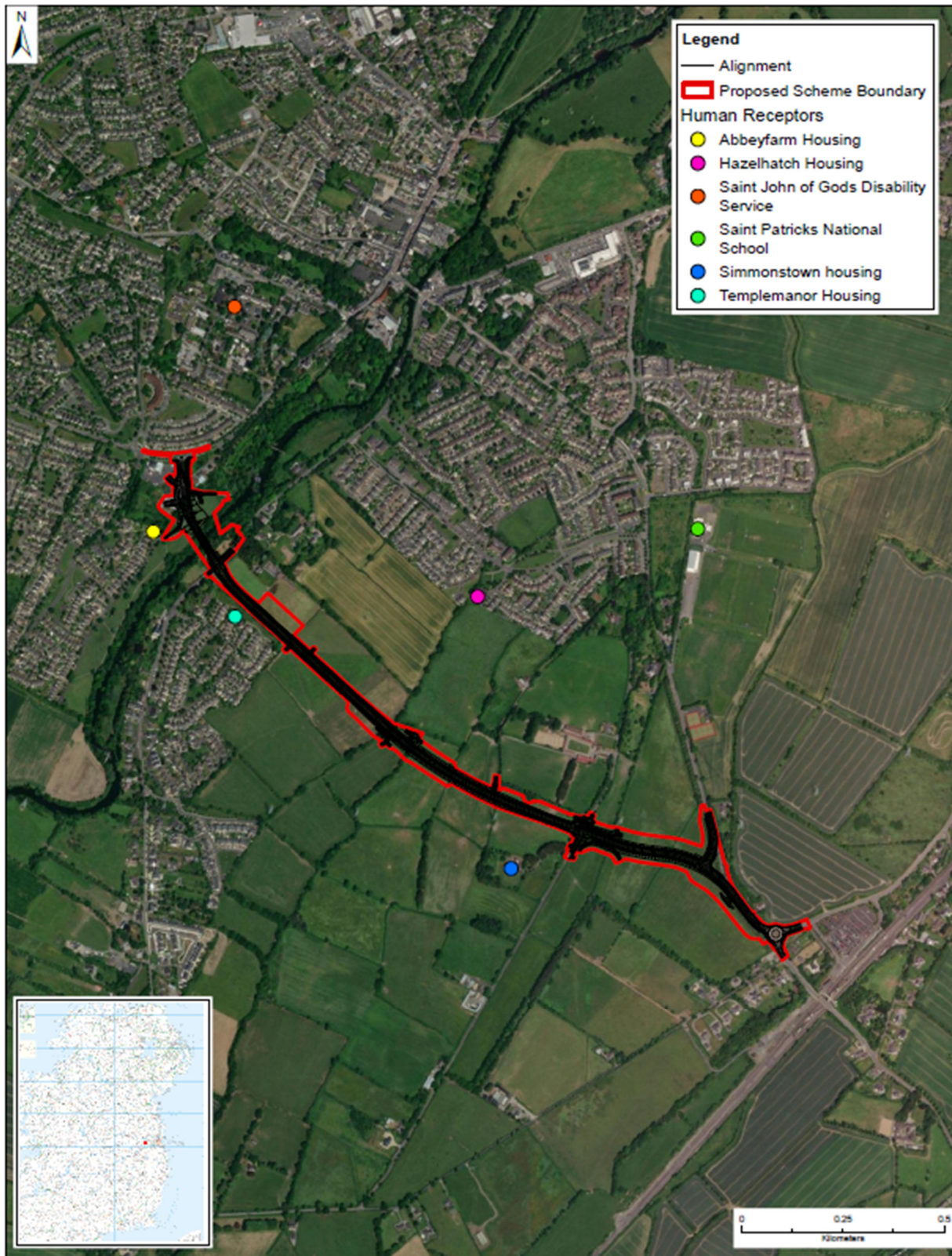


Figure 6-2 Location of Human Receptors

The REM model has been employed to quantify these changes for each of the above receptor groups. As with the regional assessment, the base year scenario employed the BAU emissions of the REM model while the Do Minimum and Do Something are predicted based on the CAP emissions in the REM model. The results of the assessment are presented in **Table 6.16**.

Table 6.16: Local Impact to Air Quality as a result of Operational Traffic

Scenario	Nitrogen Dioxide (NO ₂) (µg/m ³)	Particulate Matter PM10 (µg/m ³)	Particulate Matter PM2.5 (µg/m ³)
Background	21	14.2	5.7
Base Year	21.67	14.8	6.04
Saint John of Gods			
2040 Do Minimum	21.1	14.42	5.82
2040 Do Something	21.1	14.42	5.82
% Change	0%	0%	0%
Hazelhatch Housing			
2040 Do Minimum	21.19	14.6	5.92
2040 Do Something	21.34	14.92	6.09
% Change	+0.7%	+2%	+2.9%
Temple Manor Housing			
2040 Do Minimum	21	14.2	5.7
2040 Do Something	21.27	15.02	6.15
% Change	+1.3%	+5.8%	+7.9%
Abbey Farm Housing			
2040 Do Minimum	21	14.2	5.7
2040 Do Something	21.1	14.51	5.87
% Change	+0.47%	+2%	+3%
Simmonstown Housing			
2040 Do Minimum	21	14.2	5.7
2040 Do Something	21.03	14.3	5.75
% Change	+0.1%	+0.7%	+0.9%
Saint Patricks Primary School			
2040 Do Minimum	21.07	14.41	5.82
2040 Do Something	21.06	14.37	5.79
% Change	-0.05%	-0.3%	-0.5%
Statutory Limit (Annual Limit for Protection of Human Health)	40	40	25
WHO Air Quality Guideline (AQG)	10	15	5

The results vary depending on location. Levels for all receptors will remain below the statutory limits for the protection of human health but will remain above the WHO guidelines assuming the current background levels are retained. The updated WHO air quality guideline levels published in 2021 provide greater ambition in terms of ambient concentration reductions to decrease health impacts. These are more stringent than the current EU limits for some pollutants – however they are not legal limits. They set an ambitious direction for future policy development to ensure even greater improvements in air quality. Employing the significance criteria in **Table 6.3**, this equates to a neutral or negligible effect for air quality when employing the statutory limits as the comparator.

Local Impacts on Ecological Receptors

As outlined in **Section 6.2.5.4**, the closest European site to the proposed Project is the Rye Water Valley/Carton SAC, located approximately 4.7km north of Proposed Scheme. Given the distance, it was determined that operational traffic will have no impact on ecological receptors, as they are located well outside the study area. The impacts from air quality on this habitat is considered negligible.

6.4.3 Cumulative Impact

According to the IAQM guidance (2024), there is the potential for cumulative dust impacts to any nearby sensitive receptors should the construction phase of the proposed Scheme coincide with the construction phase of any other permitted projects within 250m of the site. If a simultaneous construction phase were to occur this would result in cumulative dust soiling and dust-related human health and ecological effects associated with the proposed works localised to the works area. Recent permissions along the route relate to domestic extensions and are screened out for potential cumulative effects.

There is one permitted Project that has been screened in for potential cumulative effects, that is the Iarnród Éireann DART+ South West Project. Where construction stage of both projects occurs within the same timeframe the potential exists for cumulative effects. This impact may be an increased level of exposure for

receptors within the study areas of both projects if constructed simultaneously. Mitigation has however been assigned to both projects and dust mitigation measures are proposed in the DART+ South West Project's EIAR and CEMP which will be implemented. Long-term positive cumulative effects are likely during the operation stage as both projects will support the development and improvement of sustainable transport.

6.5 Proposed Mitigation Measures

6.5.1 Construction Phase

Before commencing relevant works, a Dust Management Plan (DMP) shall be prepared by the appointed main contractor and submitted for approval to the relevant planning authority. The plan shall include all appropriate dust and emissions mitigation measures, applicable to the circumstances of the relevant site, based on the mitigation in this assessment and local authority requirements and industry best practices.

The plan will be developed by the main contractor and for each worksite shall include:

- An inventory and timetable of activities which may give rise to emissions or dust;
- Alert levels;
- Alert system to be used (including notification process);
- Details of control measures;
- Details of dust monitoring arrangements, including the location of sensitive receptors, monitoring locations, and monitoring equipment to be used.
- Details of the air quality reporting requirements.

To reduce dust nuisance, a series of measures will be implemented including:

- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.
- Liaison with local authorities and community groups.
- Hoarding will be provided around the construction compounds.
- It is anticipated that methods of collecting rainwater and recycling for general site use, will be adopted where practical.

Strict dust prevention will be always in place, to minimise any potential emissions and these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust will be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

Monitoring of construction dust deposition at nearby sensitive receptors that are identified based on potential risk of dust nuisance during the construction phase of the Proposed Scheme is recommended to ensure mitigation measures are working satisfactorily. This can be carried out using the Bergerhoff method in accordance with the requirements of the German Standard VDI 2119.

6.5.2 Operational Phase

As all ambient air pollutants will remain in compliance with the ambient air quality standards and the Proposed Scheme has imperceptible effects at all modelled receptors no specific operation phase mitigation measures are required.

6.6 Residual Impacts

6.6.1 Construction Phase

When the dust minimisation measures detailed in the mitigation section of this assessment are implemented, fugitive emissions of dust from the site are not predicted to be significant and pose no nuisance, human

health or ecological risk to nearby receptors. Thus, there will be no residual construction phase dust impacts. Consistent implementation of good dust minimisation practices will ensure that the impact from construction dust is localised and a short term slight adverse impact.

Given that the expected peak traffic construction traffic volumes will be below the 10% of baseline traffic on the existing road network, the impact to air quality from this traffic is considered negligible.

6.6.2 Operational Phase

The impacts associated with operational phase traffic emissions on a regional basis are considered long term slight beneficial impact given the net reductions in kilometres travelled on the network within the study area.

The changes in traffic in the network are predicted to have a neutral or negligible effect for air quality on local residents and on St. John of Gods Services and the houses on Hazelhatch avenue. Similarly, in terms of potential for road traffic impacts on ecological receptors, the impacts have been discussed through interaction with the project ecologist and are considered negligible.

6.7 Monitoring

6.7.1 Construction Phase

Monthly monitoring of dust deposition levels will be undertaken for the duration of construction for comparison with the guideline of 350 mg/m²/day (for non-hazardous dusts). This monitoring shall be carried out at a series of locations based on potential risk of dust nuisance during the construction phase of the Proposed Scheme. This monitoring should be carried out at a minimum of three locations at construction compounds with medium to high risk of dust nuisance and further monitoring locations at sensitive receptors around the proposed works.

Where dust levels are measured to be above the guideline of 350 mg/m²/day, the mitigation measures in the area shall be reviewed and improved to ensure that dust deposition is reduced to below 350 mg/m²/day. Should high dust levels continue to occur following these improvements, the contractor will provide alternative mitigation measures and/or will modify the construction works taking place.

6.7.2 Operational Phase

No monitoring measures are proposed for the operational phase.

7 CLIMATE

7.1 Introduction

This Chapter of the Environmental Report identifies, describes, and presents an assessment of the potential effects of the Proposed Scheme on climate during the construction and operation phases of the scheme.

7.2 Assessment Methodology

The TII Standard Document PE-ENV-01105 requires that the climate impact assessment must report the project's impact on greenhouse gas emissions and the project's risk and resilience to climate change through a climate assessment through the following separate assessments:

- Greenhouse Gas Emissions (GHG) assessment: the assessment of GHG emissions identifies the impact of GHGs arising from a proposed development during its lifetime and addresses how the project will affect the ability of the Government to meet its carbon reduction targets.
- Climate Change Risk (CCR) Assessment: The CCR assessment identifies the vulnerability of a proposed development to climate change and considers adaptation measures to increase the resilience of the project.

The GHG assessment has been undertaken for the construction and operational maintenance phases by considering the GHG emissions associated with materials (embodied carbon⁷), import and transport of construction materials to site, on site plant and equipment and management of materials arising. This assessment has been undertaken using the TII Carbon Tool for Road and Light Rail Projects.

Emissions from road transport when the road is operational have been calculated using the TII Road Emissions Model (REM).

The Climate Change Risk (CCR) Assessment identifies the impact of a changing climate on the proposed Scheme and receiving environment. The assessment considers the Proposed Scheme's vulnerability to climate change and identifies adaptation measures to accommodate climate change impacts. The CCR methodology is guided by the principles set out in the overarching best practice guidance documents. The purpose of the CCR assessment is to reduce or manage the adverse impacts of climate change on the Proposed Scheme and develop the projects resilience to climate change.

7.2.1 Relevant Guidelines, Policy and Legislation

In relation to climate, the following legislation is relevant for this assessment:

- Climate Action and Low Carbon Development Act 2015 ('the 2015 Act'); and
- Climate Action and Low Carbon Development (Amendment) Act 2021 ('the 2021 Amendment Act').

Further details on the legislative and policy context relating to Climate is provided in **Appendix 7.1A (Relevant Guidelines, Policy and Legislation)**.

Specifically in relation to the climate impact assessment, although the Proposed Scheme is not a National Road Scheme, the methodology adopted is based on the following guidance:

- Transport Infrastructure Ireland (TII) Climate Assessment of Proposed National Road Projects – Standard PE-ENV-01105 (December 2022) (TII, 2022d);
- TII Climate Guidance for National Roads, Light Rail, and Rural Cycleways (Offline and Greenways) – Overarching Technical Document PE-ENV-01104 (December 2022) (TII, 2022a);
- TII Road Emissions Model (REM): Model Development Report GE-ENV-01107 (December 2022) (TII, 2022c);

⁷ Embodied carbon refers to the sum of the carbon needed to produce a good or service. It incorporates the energy needed in the mining or processing of raw materials, the manufacturing of products and the delivery of these products to site

- TII Carbon Tool for Road and Light Rail Projects: User Guidance Document GE-ENV-01106 (December 2022) (TII, 2022b);
- EU (2021) Technical guidance on the climate proofing of Infrastructure in the Period 2021-2027 (European Commission, 2021) as noted in the TII CCR methodology guidance.

7.2.2 Study Area and Zone of Influence

The Zone of Influence (Zoi) for climate includes the national environment (Ireland), where the receptor is the climate and the global atmosphere. Effects arising from the potential impacts on climate are considered to impact on a national level. National, regional, and local data has been considered where relevant and available. Carbon dioxide (CO₂) emissions have a global climate warming effect. This is regardless of their rate of release, location, or the weather when released into the atmosphere. This is unlike pollutants that affect local air quality where the rate of release, location, and prevailing weather, as well as the amount of pollutant, determines the local concentrations and the impact.

Local ambient concentrations of CO₂ are not relevant and there are no limits or thresholds that can be applied to particular sources of carbon emissions. Any amount of CO₂ released into the atmosphere will contribute to climate warming, the extent of which is determined by the magnitude of the release. Although CO₂ emissions are typically expressed as kilograms or tonnes per year, there is a cumulative effect of these emissions because CO₂ emissions have a warming effect which lasts for 100 years or more.

7.2.3 Sources of Information to Inform the Assessment

This analysis was undertaken by means of a desktop assessment based on available relevant guidance and information sources including:

- Environmental Protection Agency (EPA) Greenhouse Gas Emissions Inventories and Projections;
- Global Facility for Disaster Reduction and Recovery 'Think Hazard!' tool (<https://thinkhazard.org/en/>);
- Met Éireann Major Weather Event Database (<https://www.met.ie/climate/major-weather-events>); and
- Climate Data Tool from Climate Ireland (<https://www.climateireland.ie/#/tools/climateDataExplorer>).

Table 7.1 outlines the existing studies, datasets and information used to inform the assessment on climate that was collected through a detailed desktop review. No site-specific baseline surveys were undertaken as part of the assessment for climate. The baseline data presented in this section is derived from EPA inventories and projections, and Met Éireann monitoring network, and may be taken as representative of the background conditions.

Table 7.1: Summary of Key Desktop Reports

Title	Source	Year
Ireland's Greenhouse Gas Emissions Inventory 1990-2022	EPA	2024
Ireland's Greenhouse Gas Emissions Projections 2022-2040	EPA	2023
30 Year Averages: Dublin Airport	Met Éireann	2022
Met Éireann Monthly Values for Dublin Airport and Casement	Met Éireann	2024
Climatological Note No. 14: A Summary of Climate Averages for Ireland 1981-2010	Met Éireann	2012
ICCA, Volume 1, Irelands Climate Change Assessment Report	EPA	2024
ICCA, Volume 2, Irelands Climate Change Assessment Report	EPA	2024
ICCA, Volume 3, Irelands Climate Change Assessment Report	EPA	2024

7.2.4 Key Parameters for Assessment

During the construction phase the main source of climate impacts will be as a result of GHG emissions and embodied carbon associated with the proposed construction materials and activities for the Proposed Scheme. The embodied carbon of the Proposed Scheme has been quantified as part of the construction phase assessment. It is not predicted that maintenance vehicle or plant emissions will have a significant impact on GHG emissions and climate.

7.2.4.1 GHG Assessment: Construction and Maintenance Phase Climate Emissions

As per the EU guidance document Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (European Commission, 2013) the climate baseline is first established with reference to EPA data on annual GHG emissions. The impact of the Proposed Scheme on climate is determined in relation to this baseline.

PE-ENV-01104 (TII, 2022a) recommends the calculation of the construction stage embodied carbon using the TII Online Carbon Tool (TII, 2022b). The TII Online Carbon Tool uses emission factors from recognised sources including the Civil Engineering Standard Method of Measurement (CESSM) Carbon and Price Book database (CESSM, 2013), UK National Highways Carbon Tool v2.4 and UK Government 2021 Greenhouse Gas Reporting Conversion Factors.

Information on the material quantities employed and waste products generated were provided by the design team and input into the carbon tool. This information was used to determine an estimate of the GHG emissions associated with the construction phase and the maintenance phase of the Proposed Scheme. Where detailed information regarding the proposed construction materials or material sources was not available best estimates were used to provide an estimate of the GHG associated with the Proposed Scheme.

7.2.4.2 Climate Change Risk (CCR) Assessment: Vulnerability of the proposed Scheme to Climate Change

The TII guidelines for CCRA outlines an approach for undertaking a risk assessment where there is a potentially significant impact on the Proposed Scheme due to climate change. The risk assessment assesses the sensitivity and exposure of the impact occurring to a receptor, leading to the evaluation of the significance of the impact.

The assessment methodology is a two-stage process, with the first stage being a climate vulnerability assessment. If the results of this first phase indicate the climate hazard is a vulnerability, then the second stage of the assessment is carried out and referred to as a climate change risk assessment.

7.2.5 Assessment Criteria and Significance

7.2.5.1 EU and National Targets and Objectives

Information on EU and National Targets and Objectives is presented in **Appendix 7.1B (EU and National Targets and Objectives)**. A key target for Ireland is a 42% reduction in GHG emissions which is required under the Effort Sharing Regulation. **Table 7.2** compares Ireland's ESR share with the broader EU-wide GHG emissions reduction targets.

Table 7.2: Key Targets for GHG Emissions Reductions by 2030

By 2030	Previous (pre-Fit for 55 Package)	Current	Relative to
EU economy-wide target	40%	At least 55%	1990
EU ETS contribution	43%	62%	2005
EU ESR contribution	30%	40%	2005
<i>Ireland's legally binding ESR target</i>	30%	42%	2005

7.2.5.2 Assessment Criteria for GHG Assessment

The 2022 TII guidelines state that the climate assessment is not solely based on whether a project emits GHG emissions alone but how it makes a relative contribution towards achieving a science based 1.5°C aligned transition towards net zero (as recommended in the 2022 IEMA guidance). The guidance states that the impact assessment must give regard to two major considerations when assessing the significance of a project GHG emissions including:

- The extent to which the trajectory of GHG emissions from the project aligns with Ireland's GHG trajectory to net zero by 2050; and
- The level of mitigation taking place.

The TII criteria for defining magnitude in this climate assessment for the GHG Assessment are outlined in **Table 7.3**. The CAP target of greatest relevance to the construction and maintenance phases is the commitment to decrease embodied carbon in construction materials produced and used in Ireland by at least 30% by 2030. As such, the impacts of both construction and operation/maintenance phases are compared against the criteria in **Table 7.3**.

Table 7.3: TII Significance Matrix for the GHG Assessment

Effects	Magnitude of Impact	Definition
Significant Adverse	Major Adverse	The project's GHG impacts are not mitigated; The project has not complied with do-minimum standards set through regulation, nor provide reductions required by local or national policies; and No meaningful absolute contribution to Ireland's trajectory towards net zero.
	Moderate Adverse	The project's GHG impacts are partially mitigated; The project has partially complied with do-minimum standards set through regulation, and have not fully complied with local or national policies; and Falls short of full contribution to Ireland's trajectory towards net zero.
Not significant	Minor Adverse	The project's GHG impacts are mitigated through 'good practice' measures; The project has complied with existing and emerging policy requirements; and Fully in line to achieve Ireland's trajectory towards net zero.
	Negligible	The project's GHG impacts are mitigated beyond design standards; The project has gone well beyond existing and emerging policy requirements; and Well 'ahead of the curve' for Ireland's trajectory towards net zero.
Beneficial	Beneficial	The project's net GHG impacts are below zero and it causes a reduction in atmosphere GHG concentration; The project has gone well beyond existing and emerging policy requirements; and Well 'ahead of the curve' for Ireland's trajectory towards net zero, provides a positive climate impact.

7.2.5.3 Assessment Criteria for CCR Assessment

As outlined in **Section 7.2.4.2**, the CCR Assessment is undertaken in two phases with an initial climate screening phase followed by a more detailed analysis. The screening is broken down into three steps: a sensitivity analysis; an exposure analysis; and when combined make up the vulnerability assessment.

To undertake the sensitivity analysis, a score is applied for each asset category (embankments, walls, etc.) against each climate hazard (flooding, extreme temperature, etc.). **Table 7.4** provides the definitions and scoring used when assessing sensitivity.

Table 7.4: Sensitivity Definition and Scoring

Level	Definition	Scoring
High sensitivity	The climate hazard will or is likely to have a major impact on the asset category.	3
Medium sensitivity	It is possible or likely the climate hazard will have a moderate impact on the asset category.	2

Low sensitivity It is possible the climate hazard will have a low or negligible impact on the asset category.

1

The aim of the exposure analysis is to identify which climate hazards are relevant to the Proposed Scheme location e.g., flooding could represent a significant hazard for a project located next to a river in a floodplain. Therefore, whilst sensitivity analysis focuses on the type of project, exposure focuses on location. The hazards assessed are the same as those used for the sensitivity analysis.

To undertake the exposure analysis, an exposure score is applied for each climate hazard at the project location. The allocation of exposure level is informed by the high-level climate data collected. **Table 7.5** shows the exposure definitions and scoring.

Table 7.5: Exposure Definition and Scoring

Level	Definition	Scoring
High exposure	It is almost certain or likely this climate hazard will occur at the project location i.e., might arise once to several times per year.	3
Medium exposure	It is possible this climate hazard will occur at the project location i.e., might arise a number of times in a decade.	2
Low exposure	It is unlikely or rare this climate hazard will occur at the project location i.e., might arise a number of times in a generation or in a lifetime.	1

The vulnerability assessment combines the outcomes of the sensitivity and exposure analysis with the aim to identify the key vulnerabilities and the potentially significant climate hazards associated with the proposed Scheme. To complete the vulnerability assessment, the product of sensitivity and exposure for each climate hazard and each asset category identified and mapped as per **Table 7.6**.

Table 7.6: Vulnerability Matrix

Sensitivity	Exposure		
	Low (1)	Medium (2)	High (3)
Low (1)	1	2	3
Medium (2)	2	4	6
High (3)	3	6	9

Any high vulnerabilities (score >5) are then subjected to the second stage - a climate risk assessment using a combination of likelihood analysis and impact analysis. The likelihood analysis looks at how likely the identified climate hazards are to occur within a given timescale. **Table 7.7** presents the likelihood analysis key used for this assessment.

Table 7.7: Likelihood Analysis Key

Term	Qualitative	Quantitative
Rare	Highly unlikely to occur	5%
Unlikely	Unlikely to occur	20%
Moderate	As likely to occur as not	50%
Likely	Likely to occur	80%
Almost certain	Very likely to occur	95%

The impact analysis investigates the consequences of the climate hazards and also refers to the severity and magnitude. **Table 7.8** provides guidance to ranking the risk areas and this table was taken from the European Commission (2021) technical guidance on the climate-proofing of infrastructure in the period 2021-2027.

Table 7.8: Consequence Analysis Key

Risk areas	Insignificant	Minor	Moderate	Major	Catastrophic
Asset damage, engineering, operational	Impact can be absorbed through normal activity	Adverse event that can be absorbed by	A serious event that requires additional emergency	A critical event that requires extraordinary / emergency business continuity action	Disaster with the potential to lead to shut down or collapse or loss

Risk areas	Insignificant	Minor	Moderate	Major	Catastrophic
		taking business continuity actions	business continuity actions		of the asset / network
Health and safety	First aid case	Minor injury, medical treatment	Serious injury or lost work	Major or multiple injuries, permanent injury, or disability	Single or multiple fatalities
Environment	No impact on baseline environment. Localised in the source area. No recovery required	Localised within site boundaries. Recovery measurable within one month of impact	Moderate harm with possible wider effect. Recovery in one year	Significant harm with local effect. Recovery longer than one year. Failure to comply with environmental regulations / consent	Significant harm with widespread effect. Recovery longer than one year. Limited prospect of full recovery
Social	No negative social impact	Localised, temporary social impacts	Localised, long-term social impacts	Failure to protect poor or vulnerable groups. National, long-term social impacts	Loss of social license to operate. Community protests
Financial	x % internal rate of return (IRR) < 2% of turnover	x % IRR 2-10% of turnover	x % IRR 10-25% of turnover	x % IRR 25-50% of turnover	x % IRR > 50% of turnover
Reputational	Localised, temporary impact on public opinion	Localised, short-term impact on public opinion	Local, long-term impact on public opinion with adverse local media coverage	National, short-term impact on public opinion. negative national media coverage	National, long-term impact with potential to affect the stability of the government
Cultural Heritage and cultural premises	Insignificant impact	Short-term impact. Possible recovery or repair	Serious damage with a wider impact to tourism industry	Significant damage with national and international impact	Permanent loss with resulting impact on society

Table 7.9 presents summary outcome of the assessment of likelihood and consequence of each climate hazard in the form of a climate risk matrix.

Table 7.9: Climate Risk Matrix

Likelihood	Magnitude of Consequence					
		Insignificant	Minor	Moderate	Major	Catastrophic
	Rare	Low	Low	Medium	High	Extreme
	Unlikely	Low	Medium	Medium	High	Extreme
	Moderate	Low	High	High	Extreme	Extreme
	Likely	Medium	High	High	Extreme	Extreme
	Almost Certain	High	High	Extreme	Extreme	Extreme

7.2.6 Data Limitations

The assessment has been prepared based on the best available information in order to assess the embodied construction carbon. The exact volumes and sourcing of materials will be finalised during the detailed design phase and by the appointed contractor.

7.3 Description of Receiving Environment

PE-ENV-01104 (TII, 2022a) states that a baseline climate scenario should identify, consistent with the study area for the project, GHG emissions without the project for both the current and future baseline.

7.3.1 Microclimate

The World Meteorological Organisation (WMO) defines climate as the average weather over an extended period of 30 years. This period is used as it is considered long enough to account for year-to-year variations.

Met Éireann updates Ireland's 30-year climate averages every ten years, in accordance with World Meteorological Organisation (WMO) guidelines. By applying the WMO data requirements and criteria, Met Éireann has compiled a set of climate averages for the period 1991-2020 for a range of parameters including air temperature, precipitation, sunshine and wind. Annual, seasonal, and monthly averages for the period 1991-2020 were compiled using high-quality data obtained from Met Éireann's observation network.

The 30-year average meteorological data from Casement station (c.17 km away) is presented in **Table 7.10**. The station at Casement was chosen as it is the closest station with 30 year averages data available. The prevailing wind direction for the area is south-west⁸.

Table 7.10: 30 Year Average Meteorological Data Casement

Parameter	30-Year Average
Mean Temperature (°C)	9.9
Mean Relative Humidity at 09:00 UTC* (%)	84.2
Mean Daily Sunshine Duration (Hours)	3.8
Mean Monthly Total Rainfall (mm)	783.5
Mean Monthly Wind Speed (knots)	10.1

Source: Met Éireann. Available at: https://www.met.ie/cms/assets/uploads/2023/09/www_met_ie_casement_9120.htm (Accessed March 2024) * UTC: International abbreviation for 'Coordinated Universal Time', the successor to Greenwich Meantime (GMT).

The scheme must consider weather events relating to extreme temperatures, wind, rain, and events (storms, snow etc.) that may disrupt operations. **Table 7.11** displays the mean number of days per annum on average across the 30-year average a weather event occurs.

Snow lying at 09:00 UTC is most infrequent, occurring on average 3.4 days per annum, posing a low risk to operations. Fog is the most frequent weather event, occurring on average 19.8 days per annum. Snow/sleet is the second most frequent weather event observed at the Casement monitoring location during the 30-year average records, occurring on average 11.9 days per annum.

Table 7.11: 30- Year Average Data for Weather Events at Casement (Values from 1991-2020)

Weather (mean No. of days with)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Snow/Sleet	3.2	3.1	2.2	0.7	0.1	0	0	0	0	0	0.6	2	11.9
Snow lying at 09:00 UTC	1	0.9	0.6	0	0	0	0	0	0	0	0.1	0.7	3.4
Hail	1.1	1.8	2.3	2.7	1.5	0.3	0.2	0	0.1	0.1	0.5	0.7	11.3
Thunder	0.1	0.1	0.2	0.6	0.8	0.9	1.2	1.1	0.4	0.4	0.1	0	6.1
Fog	1.7	1.4	1.8	1.3	1.1	1.1	0.9	1.4	2.6	2.3	1.8	2.2	19.8

Source: Met Éireann. Available at: https://www.met.ie/cms/assets/uploads/2023/09/www_met_ie_casement_9120.htm (Accessed March 2024)

⁸ Wind-rose for the Casement Meteorological Station (1962-2014) Source: Met Éireann. Available at: <https://www.met.ie/climate/what-we-measure/wind>

7.3.2 Existing Carbon Sources in the Area (Baseline National Emissions)

Ireland's greenhouse gas emissions decreased by 6.8 per cent (4.0 Mt CO₂eq) in 2023 with reductions in almost all sectors. The assessment shows that Ireland complied with its EU Effort Sharing Regulation (ESR) commitments for 2021-2023, with the use of allowed flexibilities. However, these latest data show that 2023 greenhouse gas emissions were still only 10.1 per cent below 2005 levels, well short of Ireland's EU Effort Sharing reduction commitment of 42 per cent by 2030.

The sectoral breakdown of 2023 GHG emissions⁹ was reviewed. The sector with the highest emissions was agriculture at 34% of the total, followed by transport at 19%. Total national emissions (excluding LULUCF) were estimated to be 60.62 Mt CO₂e.

The future baseline with respect to the GHGA can be considered in relation to the future climate targets which the assessment results will be compared against. In line with TII (TII, 2022) and IEMA Guidance (IEMA, 2022) the future baseline is a trajectory towards net zero by 2050, '*whether it [the project] contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050*'.

The future baseline will be determined by Ireland meeting its targets set out in the CAP24, and future CAPs, alongside binding 2030 EU targets. Ireland must now limit its greenhouse gas emissions by at least 42% by 2030.

7.3.3 Climate Vulnerability

Details of current climate hazards impacting the area have been derived from the Global Facility for Disaster Reduction and Recovery 'Think Hazard!' tool with data specific to the area extracted from the tool. This data is supplemented as required with information from the Office of Public Works (OPW) FloodInfo.ie resource. This data is summarised in **Table 7.12** to illustrate the current climate hazard threat to the area of the Proposed Scheme.

Table 7.12: Observed Hazard Level in the area of the Proposed Scheme

Hazard Type	Hazard Level
Coastal Flood	No risk of coastal flooding associated with the Proposed Scheme.
Urban Flood	In Kildare urban flood hazard is classified as low based on modelled flood information currently available to this tool. This means that there is a chance of more than 1% that potentially damaging and life-threatening river floods occur in the coming 10 years (return period of c. 1 in 1000 years). Project planning decisions, project design, and construction methods should take into account the level of urban flood hazard. Climate change impacts: High confidence in more frequent and intense precipitation days and an increase in the number of extreme rainfall events. The present hazard level is expected to increase in the future due to the effects of climate change. It would be prudent to design projects in this area to be robust to river flood hazard in the long-term.
Fluvial Flood	In Kildare the river flood hazard is classified as medium based on modelled flood information currently available to this tool. This means that there is a chance of more than 20% that potentially damaging and life-threatening river floods occur in the coming 10 years. Project planning decisions, project design, and construction methods must take into account the level of river flood hazard. Surface flood hazard in urban and rural areas is not included in this hazard classification, and may also be possible in this location. Please see 'Urban Flood' for consideration of urban surface and river flooding. Climate change impacts: High confidence in more frequent and intense precipitation days and an increase in the number of extreme rainfall events. The present hazard level is expected to increase in the future due to the effects of climate change. It would be prudent to design projects in this area to be robust to river flood hazard in the long-term.
Extreme Heat	In Kildare extreme heat hazard is classified as low based on modelled heat information currently available to this tool. This means that there is between a 5% and 25% chance that at least one period of prolonged exposure to extreme heat, resulting in heat stress, will occur in the next five years. Project planning decisions, project design, and construction methods should seek

⁹ Ireland's Provisional Greenhouse Gas Emissions 1990-2022 (July 2023). Available at: https://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/2023-EPA-Provisional-GHG-Report_Final_v3.pdf

Hazard Type	Hazard Level
	further information on whether the level of extreme hazard needs to be taken into account in the lifetime of the project. According to the most recent assessment report of the Intergovernmental panel on Climate Change (IPCC, 2013), continued emissions of greenhouse gases will cause further warming, and it is virtually certain that there will be more frequent hot temperature extremes over most land areas during the next fifty years. Warming will not be regionally uniform. The temperature increase in the next fifty years will be much lower than the worldwide average, but still significant. It would be prudent to design projects in this area to be robust to global warming in the long-term.
Wildfire	In Kildare the wildfire hazard is classified as medium according to the information that is currently available to this tool. This means that there is between a 10% and 50% chance of experiencing weather that could support a hazardous wildfire that may poses some risk of life and property loss in any given year. Based on this information, the impact of wildfire should be considered in the project, in particular during design and construction. Project planning decisions, project design, construction methods and emergency response planning should take into account the level of wildfire hazard. Note that impacts on people and property can not only occur due to direct flame and radiation exposure but also due to ember storm and low-level surface fire. Further detailed information specific to the location and planned project should be obtained to adequately understand the level of hazard.

A Flood Risk Assessment Report has been prepared for the Scheme and is provided under separate cover as part of the planning application.

7.4 Predicted Impacts

7.4.1 Construction Phase

There is the potential for a number of GHG emissions to atmosphere during the construction of the Scheme. As part of the Proposed Scheme, construction stage embodied GHG emissions have been calculated under the following headings within the TII Carbon Tool where applicable:

- Embodied Carbon of Materials;
- Construction Activities; and
- Construction Waste.

As part of the design development of the Proposed Scheme, a whole-life carbon assessment for the Proposed Scheme was undertaken with an emphasis on embodied carbon reduction over the project lifecycle.

The Whole-life cycle carbon management approach for the Proposed Scheme was in line with PAS 2080: 2023 *Carbon Management in building and infrastructure* specification. PAS 2080: 2023 is a specification for whole life carbon (WLC) management when delivering projects and programmes in the built environment (infrastructure and buildings); in the provision, operation, use and end of life of new projects and/or programmes of work, as well as the management or retrofit of existing assets and networks. WLC is the cumulative total carbon emissions that arise from all stages in the life cycle of an asset or infrastructure.

The WLC assessment was undertaken on the emerging preferred option to establish a defined baseline and identify carbon “hotspots” and identify carbon reduction opportunities to minimise/ mitigate the impacts of carbon hotspots in managing carbon during the construction and operational phase.

The WLC assessment was carried out using the TII Carbon Assessment Tool for Road and Light Rail Projects and also OneClick LCA which allows access to the Ecoinvent database; a globally recognised extensive database for relevant construction projects; as well as other tools where necessary. A summary of the baseline WLC assessment is detailed in **Section 7.4.1.1** below.

7.4.1.1 Baseline Emissions Assessment

Based on the PAS 2080: 2023 whole lifecycle modular approach, the overall baseline emissions assessment of this project was calculated to be 6,140 tonnes CO₂(eq) across a 2.12km road distance; equating to 2,896 tonnes CO₂(eq) per km. The baseline emissions generated at each lifecycle stage can be seen below in

Figure 7-1 below. Further details and discussion are provided in **Appendix 7.1C (Whole Life Carbon Assessment)**.

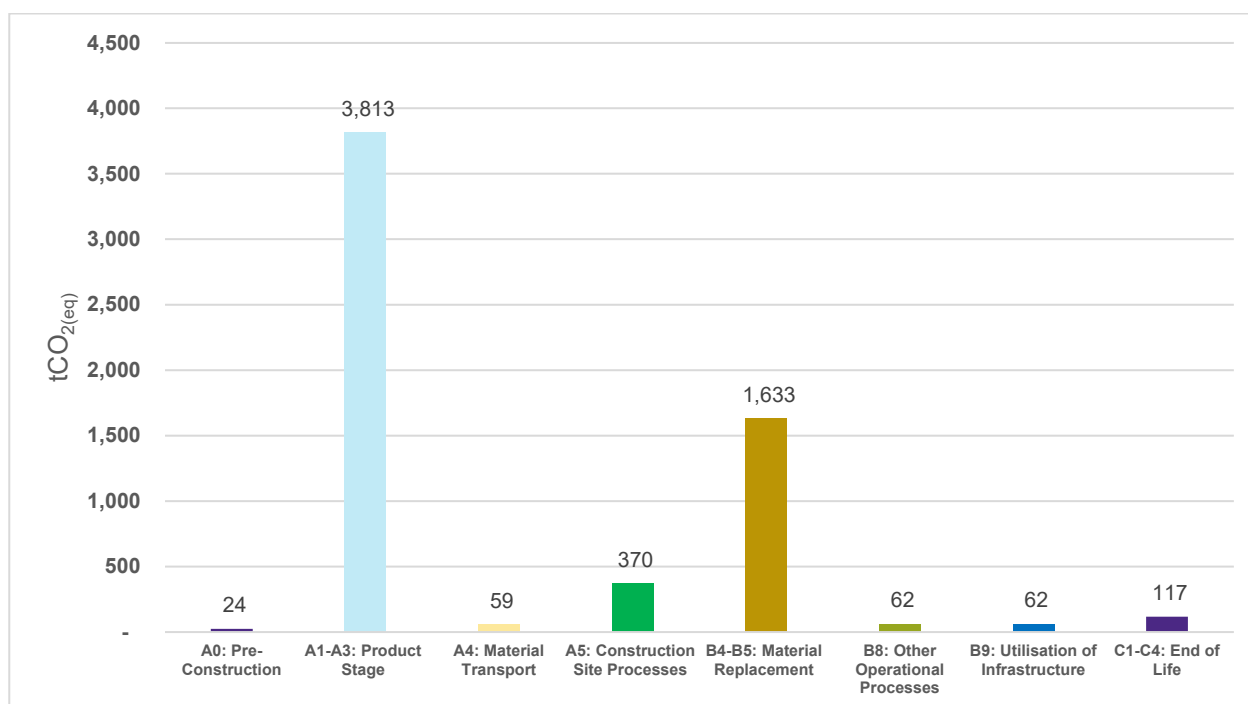


Figure 7-1 CHMC Project Baseline Emissions by Lifecycle Stage

7.4.1.2 Climate Adaption

Sensitivity Analysis

As per the TII Guidance, a sensitivity analysis was carried out on all construction elements (construction compounds, processing areas, etc.) as well as asset categories including pavements; drainage; structures; utilities; landscaping; signs, light posts, and fences. The sensitivity analysis was used to identify which climate hazards are relevant to the construction phase of the Proposed Scheme. **Table 7.13** presents the sensitivity analysis and the rationale for the sensitivity score for the construction of the project.

Table 7.13: Sensitivity Analysis of Climate Hazards to the Construction of the Proposed Scheme

Climate Hazard	Sensitivity	Sensitivity Score
Flooding (Coastal)	Medium sensitivity to Coastal flooding. Damage caused by flooding tends to last longer than any other weather-related hazard.	2
Flooding (Pluvial)	Medium sensitivity to Pluvial flooding. Damage caused by known flooding events tends to last longer than any other weather-related hazard.	2
Flooding (Fluvial)	Medium sensitivity to Fluvial flooding. Damage caused by known flooding events to last longer than any other weather-related hazard.	2
Extreme heat	Medium sensitivity to extreme heat, as concrete may be sensitive to extreme heat.	2
Extreme cold	Medium sensitivity to extreme cold whereby the asset suffers limited impact, but ice or snow may result in road closures or other economic or social impacts.	2
Wildfire	All assets are considered to have a medium sensitivity to wildfires. Can cause some surface damage to the asset band, may lead to road closures impacting with economic or social impacts.	2
Drought	Low sensitivity to extreme wind on all assets.	1
Extreme wind	Extreme wind is not predicted to significantly affect the various elements of the Proposed Scheme due to the nature of the scheme and its design. Construction sites could be affected by extreme winds.	2

Climate Hazard	Sensitivity	Sensitivity Score
Lightning and hail	Low sensitivity to lightning and hail for all assets. Potential for short term interruptions to works.	1
Fog	Fog is not predicted to significantly affect the various elements of the Proposed Scheme due to the nature of the scheme and its design.	1

Exposure Analysis

An exposure analysis was also carried out on the construction phase of the proposed Scheme based on the known climate hazards presented in **Section 7.3.3**. Given that the construction phase is anticipated to take place within the medium term, the analysis focusses on the current climate hazards but the long-term future climate hazards are also considered as appropriate. **Table 7.14** presents the rationale for the exposure scoring for the construction phase.

Table 7.14: Exposure Analysis based on Past and Predicted Climate Events

Climate Event	Detail	Exposure Score
Flooding (Coastal)	Low exposure according to CFRAM mapping, as the proposed Scheme is not located on the coast.	0
Flooding (Pluvial)	According to CFRAM mapping, there is low exposure to Pluvial Flooding.	1
Flooding (Fluvial)	In Kildare the river flood hazard is classified as medium based on the modelled flood information currently available. The ThinkHazard! Tool states that there is a chance of more than 20% that potentially damaging and life-threatening river floods will occur in the coming 10 years.	2
Extreme heat	Extreme heat hazard is classified as low, according to the ThinkHazard! Tool.	1
Extreme cold	Extreme cold hazard is classified as low based on modelled information currently available.	1
Wildfire	In Kildare the wildfire hazard is classified as medium according to the ThinkHazard! tool. This means that there is between a 10% and 50% chance of experiencing weather that could support a hazardous wildfire that may poses some risk of life and property loss in any given year.	2
Drought	Drought is rated as low exposure.	1
Extreme wind	Extreme wind is rated as medium exposure. Between 1991-2020 there were an average of 12.6 days with gales (circa 3% of the year).	2
Lightning and hail	Lightning and hail are rated as low exposure. Between 1991-2020 there were 11.3 days of hail, and the mean number of thunder days was 6.1 days equating to circa 1.7% of the year on average.	1
Fog	Fog is rated as low exposure. Between the years 1991-2020 there were 19.8 days of fog on average per annum equivalent to 5% of the year.	1

Based on the estimated sensitivity and exposure the vulnerability of the construction phase may be assessed and is summarised in **Table 7.15**. The analysis indicates that Wildfire, Extreme wind and Fluvial flooding represent the highest vulnerability for the construction phase.

Table 7.15: Vulnerability Analysis for the Construction Phase

Exposure			
Sensitivity			
	Low	Medium	High
	Low	Drought, Lightning and Hail, Fog	Extreme Wind
	Medium	Pluvial Flooding, Extreme heat, Extreme Cold	Wildfire, Extreme wind, Fluvial flooding
	High		

Climate Risk Assessment

Examples of potential climate impacts are included in Annex D (Climate proofing and environmental impact assessment) of the *Technical Guidance on the Climate Proofing of Infrastructure* (European Commission, 2021). Potential impacts to the proposed Scheme as a result of climate change include:

- Flood risk due to increased precipitation, and intense periods of rainfall. This includes fluvial and pluvial flooding;
- Increased temperatures potentially causing drought, wildfires, and prolonged periods of hot weather;
- Reduced temperatures resulting in ice or snow;
- Geotechnical impacts; and
- Major Storm Damage – including wind damage.

During construction, the Contractor will be required to mitigate against the effects of extreme rainfall / flooding through site risk assessments and method statements. The Contractor will also be required to mitigate against the effects of extreme wind / storms, temperature extremes through site risk assessments and method statements. All materials used during construction will be accompanied by certified datasheets which will set out the limiting operating temperatures. Temperatures can affect the performance of some materials, and this will require consideration during construction. During construction, the Contractor will be required to mitigate against the effects of fog, lightning and hail through site risk assessments and method statements.

In short, the vulnerability of the works to climate change will be suitably mitigated and the potential impact is considered to be minor adverse for the short-term construction phase.

7.4.2 Operational Phase

7.4.2.1 GHG Assessment

Baseline emissions were discussed in **Section 7.4.1.1**. The use or operational phase of the scheme was found to produce 1,757 tonnes of CO₂e. The results of this can be seen in **Table 7.16** below.

Table 7.16: Estimated Carbon associated with the Operational and Maintenance of the Proposed Scheme over the total design life

Phase	Operational tCO ₂ e
Maintenance Phase	1,757 tonnes

7.4.2.2 Climate Vulnerability

The approach to assessing the climate risk associated with the operation phase is analogous similar to that presented for the construction phase in **Section 7.4.1.2**. **Table 7-17** presents the sensitivity analysis and the rationale for the sensitivity score for the operation phase of the Proposed Scheme.

Table 7-17: Sensitivity Analysis of Climate Hazards to the Operation of the Proposed Scheme

Climate Hazard	Sensitivity	Sensitivity Score
Flooding (Coastal)	Medium sensitivity to Coastal flooding. Damage caused by flooding tends to last longer than any other weather-related hazard.	2
Flooding (Pluvial)	Low sensitivity to pluvial flooding given the absence of any existing significant risks and given that the drainage systems for the proposed Scheme are designed to meet best practice standards.	1
Flooding (Fluvial)	Medium sensitivity to fluvial flooding. Damage caused by known flooding events tends to last longer than any other weather-related hazard.	2

Climate Hazard	Sensitivity	Sensitivity Score
Extreme heat	Low sensitivity to extreme heat. Potential to cause some deterioration in road surfaces but only if occurring over long periods.	1
Extreme cold	Medium sensitivity to extreme cold whereby the asset suffers limited impact, but ice or snow may result in road closures or other economic or social impacts.	2
Wildfire	All assets are considered to have a medium sensitivity to wildfires. Can cause some surface damage to the asset band, may lead to road closures impacting with economic or social impacts.	2
Drought	Low sensitivity to drought on all assets with the exceptions of landscaping works which has a high sensitivity to drought.	2
Extreme wind	Extreme wind is not predicted to significantly affect the various elements of the Proposed Scheme due to the nature of the scheme and its design.	1
Lightning and hail	Low sensitivity to extreme wind on most assets with the exceptions of lighting or signposts which have a moderate sensitivity to extreme winds.	1
Fog	Low sensitivity to fog for all assets. Potential to affect road safety.	1

Based on the estimated sensitivity and exposure, the vulnerability of the operation phase is summarised in **Table 7.18**. The analysis indicates that Fluvial flooding and Wildfire and represent the highest vulnerabilities for the operation phase.

Table 7.18: Vulnerability Analysis for the Operation Phase

		Exposure		
		Low	Medium	High
Sensitivity	Low	Pluvial flooding, Extreme heat, Lightning and hail, Fog	Extreme wind	
	Medium	Extreme cold, Drought	Fluvial flooding, Wildfire	
	High			

With committed design measures in place, the risk of adverse climate change impact on the Proposed Scheme is low. In short, the vulnerability of the operational phase to climate change has been suitably mitigated and the potential impact is considered to be beneficial in the long-term for the wider area and community.

7.4.2.3 Operational Traffic Emissions

Active Travel and Modal Shift

There are a number of operational measures included in the Proposed Scheme to promote active travel in the area including the following:

- The proposed Scheme will provide a high-quality pedestrian and cycle route connecting the town with the train station.

The provision of these features presents the opportunity for appealing pedestrian and cycling routes in line with Action TR/25/7 of CAP (Advance roll-out of 1,000 km walking/cycling infrastructure).

The above measures are aligned with the Sustainable Transport Trips metrics for the Transport sector in the CAP. Each of the above has the potential to reduce the operational transport emissions but these elements have not been quantified in the operational traffic model and therefore have not been factored into the climate analysis presented for operational traffic.

Road Traffic

Road traffic predictions with the Proposed Scheme in operation have been modelled and are summarised in the Traffic and Transport Assessment (provided in **Chapter 4**). These predicted changes in traffic have been employed to estimate the future generation of transport related GHG. The predicted emissions for

operational traffic are presented in **Table 7.19**. These results suggest that the Proposed Scheme will decrease traffic on the road network and will redistribute traffic around the network.

Table 7.19: Predicted Annual GHG Emissions from Road Transport from the Proposed Scheme

Scenario	BaU Scenario (tonnes CO ₂ e per year)	Intermediate Scenario (tonnes CO ₂ e per year)	CAP Scenario (tonnes CO ₂ e per year)
Baseline	110,870	110,629	110,313
Do-Minimum 2040 ¹⁰	134,022	126,645	120,703
Do-Something 2040 ¹¹	133,115	125,761	119,839
Change relative to 2040 DM (%)	-0.68%	-0.7%	-0.72%

Employing the significance criteria in **Table 7.3**, the following considerations apply to the operational road traffic emissions for the Do Something CAP scenario relative to the Do-Minimum Scenario:

- The project's GHG impacts have been mitigated through 'good practice' measures – in the case of the modelled emissions under the CAP scenario, this includes national measures such as the electrification of the fleet and the biofuels blend as per the CAP. These national mitigation measures are inherent in the calculations presented through the CAP implementation scenario presented;
- The project complies with existing and emerging policy requirements, again through the implementation of CAP policy measures such as EV and biofuels in the CAP scenario modelled; and
- While the regional predictions using the REM model suggest that all future scenarios (Do-Minimum and Do-Something) will decrease and therefore fully in line to achieve Ireland's trajectory towards net zero, the inherent conservatism in the REM model suggests this is a worst case outcome.

With these factors considered, the net impact on climate of the operational phase traffic emissions is classed as beneficial in the long term.

7.5 Proposed Mitigation Measures

7.5.1 Construction Phase

The projected emissions from the construction phase are presented using traditional methods and materials and result in a moderate adverse impact. The need to mitigate these impacts is clearly signalled in national policy such as CAP25 (National KPI for 2030: *Decrease by at least 30% embodied carbon for materials produced and used in Ireland*). Embodied carbon in the materials employed in the construction phase dominate the impact. As such, to mitigate these impacts the use of the following will be required:

- As a replacement for traditional precast concrete materials made with Portland cement mixes, the Proposed Scheme will use 50% ground granulated blast-furnace slag (GGBS) cement for all structural and non-structural precast structures;
- Similarly, all concrete poured in-situ for the proposed Scheme will consist of 50% GGBS cement;
- All reinforcing steel employed on site will be 85% minimum recycled steel; and

The use of these low embodied carbon materials in construction will reduce the construction phase emissions and comply with the requirements of CAP25.

In addition to the above mitigation regarding material choices, there are a series of additional construction mitigation measures that will also be adopted as follows:

- The use of non-concrete assets shall be optimised in the design e.g., gravel footpaths, grassed drains etc. to minimise the need for concrete.

¹⁰ 2040 Do-Minimum i.e. design year without the Proposed Scheme in 2040

¹¹ 2040 Do-Something i.e. design year with the Proposed Scheme in 2040

- All aggregates shall be secondary aggregates. Virgin aggregates shall only be employed where it is demonstrated that secondary aggregates are unsuitable for structural reasons and/or they are unavailable.
- Wherever available, the contractor shall secure construction materials from local/regional sources or sources within the State to minimise material transport emissions and reduce life cycle carbon emissions associated with the construction materials.
- For electricity generation at the construction compounds, hydrogen generators or electrified plant shall be utilised over traditional diesel generators. This shall also apply to lower powered mobile plant, as appropriate.
- A regular maintenance schedule for all construction plant machinery shall be undertaken to maintain optimum machinery efficiency.
- Sustainable timber post fencing will be specified over steel in boundary treatments where possible.
- Engines will be turned off when machinery is not in use.
- The use of private vehicles by construction staff to access the site will be minimised through the encouragement of use of public transport, encouragement of car sharing, and maximising use of local labour to reduce transport emissions.

The measures outlined within this assessment will reduce the impact to climate during the construction of the Proposed Scheme. These measures will be tracked through the development of a Project Carbon Management Plan (PCMP) which will be prepared in accordance with PAS 2080 (Carbon Management in Infrastructure). This Plan will be devised by Kildare County Council at detailed design stage and then transferred for ownership to the Contractor for construction and handover. The Plan will be used to monitor and report on the above committed carbon management measures and all other measures adopted during the design, procurement and construction phases.

7.5.2 Operational Phase

Maintenance and operational emissions have been somewhat mitigated through design. Employing the significance criteria in **Table 7.3**, the impact on climate of the maintenance phase emissions is classed as minor adverse.

Total transport emissions associated with the operation of the Proposed Scheme are estimated to reduce relative to the Do-Minimum scenario. This is true even under the conservative business as usual scenario as well as the scenario assuming the successful implementation of the Climate Action Plan measures. With these factors considered, the net impact on climate of the operational phase traffic emissions is classed as minor adverse in the long term. While projected emissions are negligible relative to the Do-Minimum scenario, any emissions of GHG represent an adverse impact.

Overall, the risk of climate change impact on the operational phase of the Proposed Scheme will be minor adverse for each of the main climate threats.

7.6 Residual Impacts

The projected emissions from the construction phase are presented using traditional methods and materials and result in a moderate adverse impact. The need to mitigate these impacts is clearly signalled in national policy such as CAP25 (National KPI for 2030: *Decrease by at least 30% embodied carbon for materials produced and used in Ireland*). A series of engagements between the climate team and the design team have been undertaken to assess the potential pathways for mitigation during construction of the Proposed Scheme.

Embodied carbon in the materials employed in the construction phase dominate the impact. Feasible carbon reduction initiatives were identified to be implemented at each lifecycle stage and quantification of the impact of implementation of each reduction initiative against the baseline assessment was carried out.

The impact of implementing the feasible reduction initiatives identified at each stage of the project shows an overall result of a 43% absolute reduction in the scheme's project WLC carbon footprint (total reduction of 2,638 tonnes CO₂e) when compared to the baseline.

7.7 Monitoring

No project specific monitoring is proposed for climate during the construction or operational phases of the Proposed Scheme.

8 LANDSCAPE & VISUAL

8.1 Introduction

This chapter of the Environmental Report identifies, describes and presents an assessment of the potential effects of the Proposed Scheme on Landscape and Visual (LV) resources during both the construction and operational phases of the proposed Scheme.

The purpose of this Landscape and Visual Impact Assessment (LVIA) is to identify and determine the effects on landscape character, landscape features, visual receptors, and visual amenity because of the works associated with the construction and operation of the Proposed Scheme.

8.2 Assessment Methodology

The methodology and approach to the assessment, and the production of visualisation which accompany this report, have been carried out in accordance with the guidance described in the following documents:

- TII Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) for Specified Linear Infrastructure Projects: Overarching Technical Document (TII Publication PE-ENV-01101, December 2020) (TII, 2020a);
- TII Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) of Proposed National Roads: Standards (TII Publication PE-ENV-01102, December 2020) (TII, 2020b); and
- Technical Guidance Note 06/19 Visual Representation of Development Proposals (The Landscape Institute, 2019).

The LVIA involves two related but separate assessments:

- The assessment of effects on landscape (changes to the landscape character and / or landscape resource); and
- The assessment of visual effects (changes in views, visual amenity and effect on viewers).

8.2.1 Relevant Guidelines, Policy and Legislation

There is no specific legislation relating to Landscape and Visual Impact Assessment however the Planning and Development Acts, 2000 – 2022, as amended, addresses the topic with respect to land use planning, notably in the context of County Development Plans (CDP).

The LVIA methodology follows the process outlined in the Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) for Specified Linear Infrastructure Projects: Overarching Technical Document (TII Publication PE-ENV-01101, December 2020), published by Transport Infrastructure Ireland (TII). Further details on the process set out within TII Publication PE-ENV-01101 and the assessment methodology are presented in **Appendix 8.1B (Methodology)**.

Whilst the assessment process is primarily concerned with assessing the visual impacts on Protected Views identified in the Kildare CDP, the assessment also includes an assessment of predicted visual impacts from a range of viewpoints that have been selected to be representative of a range of views that are experienced by a variety of receptors within the study area.

The policy context in relation to the Kildare County Development Plan in which the Proposed Scheme is located is addressed in **Appendix 8.1A (Relevant Guidelines, Policy and Legislation)**. This includes a review of the policies which are considered to be relevant to this LVIA.

8.2.2 Study Area and Zone of Influence

Using terrain-modelling techniques combined with the Proposed Scheme specification a map was created which identified areas from which the Proposed Scheme may theoretically be visible. This Zone of Theoretical Visibility (ZTV) (refer to **Figure 8-1**) is the area within which views of the Proposed Scheme could theoretically be obtained, determined by the topography of the area and is representative of a theoretical worst-case scenario in line with current guidance.

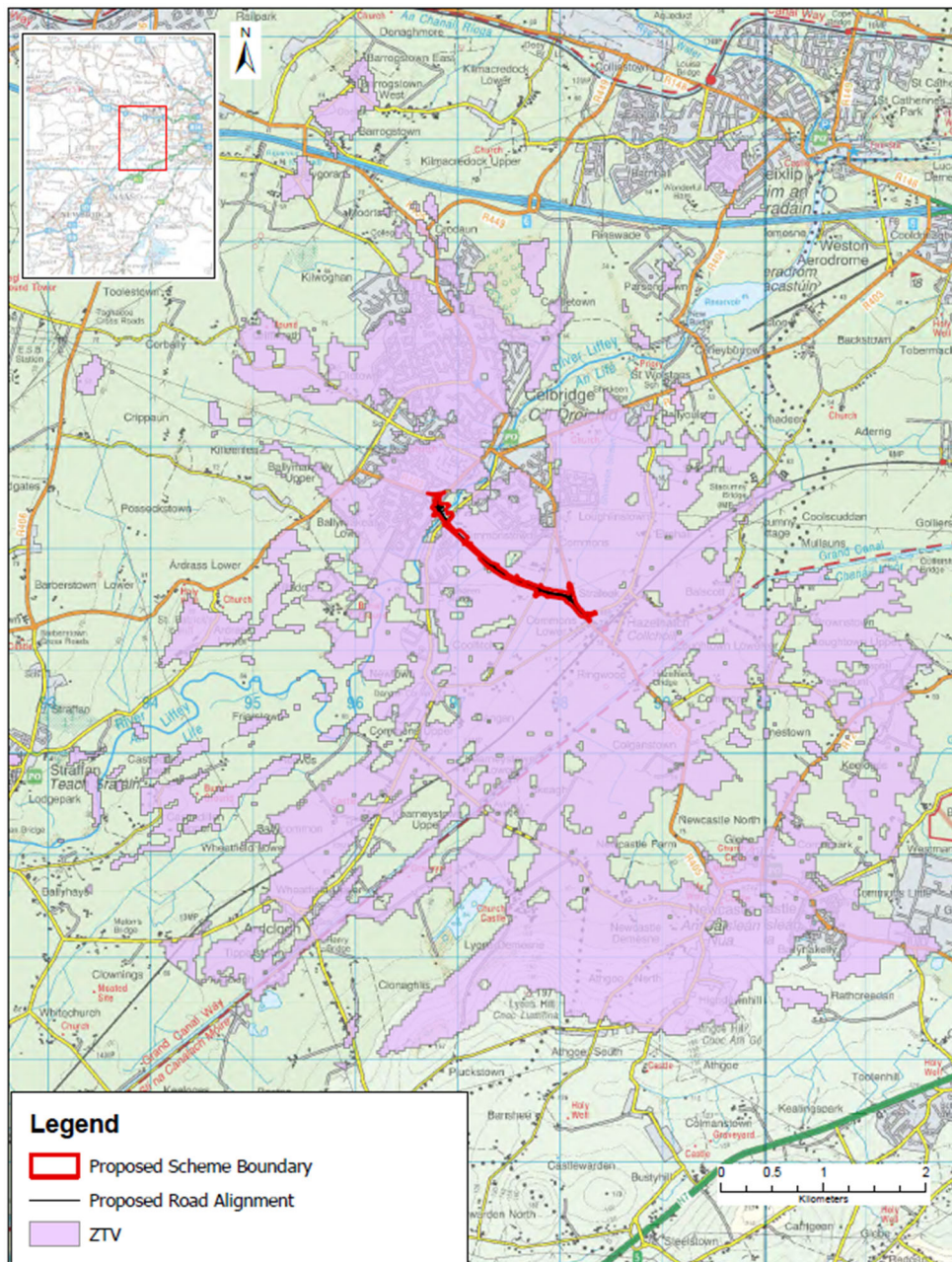


Figure 8-1 Zone of Theoretical Visibility

The ZTV forms the basis for the study area associated with the Proposed Scheme for both landscape and visual impact assessment. It is noted that the ZTV does not reflect potential screening by local features such as roadside hedgerows, field boundary hedgerows, woodland planting, coniferous forestry or built form. In practice the actual visibility of the Proposed Scheme is considerably less in extent than the theoretical one, since individual elements of the proposal are difficult to focus on at long distances and localised changes in topography, hedges, trees, and woodland tend to restrict views.

The ZTV was assessed against the elements of the Proposed Scheme, the footprint of the Proposed Scheme, the receiving landscape and perceptibility of elements of the Proposed Scheme particularly when viewed against surrounding topographical changes and vegetation cover. Survey and assessment established that elements associated with the Proposed Scheme are not easily perceived within the wider landscape due to intervening topographical changes and vegetation cover.

A zone of influence, equating to 300m from the centreline of the Proposed Scheme has been considered for the purposes of undertaking an assessment of predicted visual impact on residential visual amenity. The 300m buffer has been utilised for the assessment of predicted visual impact on residential properties as views from properties that are located beyond 300m are often restricted due to existing vegetation and intervening built form.

8.2.3 Sources of Information to Inform the Assessment

Baseline conditions have been identified and assessed through analysis of the key sources of information outlined in **Table 8.1**.

Table 8.1: Summary of Key Data Sources Used

Title	Source	Year
Discovery Series mapping and detailed vector maps	Ordnance Survey Ireland (OSi)	2022
Aerial / Orthophotography	OSi	2019
Kildare County Development Plan 2023-2027:	Kildare County Council	2024
Zone of theoretical visibility (based on lorry height of 4.65m on road alignment)	RPS	2024
Photography taken from key views as well as Protected Views and Heritage Features	RPS	Summer 2024
Wireframe images generated from photography	RPS	Summer 2024

In addition, a site visit has been undertaken in June 2024 to assess the existing environment, to establish the existing visual resource and to identify sensitive receptors, i.e. residential properties, scenic viewpoints. The site visit was also used to consider the potential effects on landscape character and visual impacts arising because of the Proposed Scheme.

8.2.4 Key Parameters for Assessment

The key parameters for assessment that have potential to result in likely significant effects on Landscape and Visual are outlined below:

- **Do-Nothing:** which assumes that the existing road networks will be maintained under current regime; and
- **Do-Something:** an assessment of the Proposed Scheme.

8.2.5 Assessment Criteria and Significance

The objective of the assessment process is to identify and evaluate the predicted significant effects arising from the Proposed Scheme. As with any new development, it is acknowledged that the introduction of a new development into the existing landscape or visual context could cause either a deterioration, improvement or neutral impact on the existing landscape or visual resource.

The effects on the landscape resources and visual receptors (people) have been assessed by considering the proposed change in the baseline conditions (the impact of the Proposed Scheme) against the type of landscape resource or visual receptor (including the importance and sensitivity of that resource or receptor). These factors are determined through a combination of quantitative (objective) and qualitative (subjective) assessment using professional judgement. The assessment methodology and the assessment criteria and significance which have been applied to this assessment are included in **Appendix 8.1C (Assessment Criteria and Significance)** and a summary is presented below.

8.2.5.1 Landscape Impact Assessment

The LVIA firstly assesses how a new development would impact directly on any landscape features and resources. The significance of effects on landscape features and character is determined by considering both the sensitivity of the feature or landscape character and the magnitude of impact.

Consideration of the sensitivity of the landscape resource against the magnitude of impact caused by a new development is fundamental to landscape and visual assessment.

8.2.5.1.1 Landscape Significance

The determination of the sensitivity of the landscape receptor is based upon an evaluation of the elements or characteristics of the landscape likely to be affected. The evaluation reflects such factors as its quality, value,

contribution to landscape character and the degree to which the element or characteristic can be replaced or substituted. For this assessment, landscape significance is categorised using the criteria in **Table 8.2** below.

Table 8.2: Landscape Significance

Significance	Description
Very High	Areas of landscape and / or townscape protected by an international or national designation, designated ecological landscapes, Landscape Conservation Areas or UNESCO/ICOMOS Landscape Sites. These are landscapes widely acknowledged for their distinctive features and the quality and value of its elements, and are generally remote or tranquil landscapes with an absence of negative elements.
High	Areas of landscape that are widely acknowledged as containing elements of national importance, and where national designation may apply. A landscape acknowledged for its high quality and value, and which contains features that could not be replaced, though may contain some negative elements, but otherwise contains highly rated landscape elements.
Medium	Areas of landscape that exhibit positive character and which is locally important but may contain some regionally important elements. A landscape of some quality and value but which may have evidence of alteration / degradation or erosion of landscape features resulting in a less distinctive landscape. Areas of landscape with some detracting features present, not designated and which contains elements which could be replaced.
Low	Areas of landscape of local importance but with some degraded elements or conditions, within which change is unlikely to be detrimental. Areas of landscape on the urban fringe/ some peri-urban landscape areas of dereliction with low aesthetic value and few elements of interest.
Very Low / Negligible	Areas of degraded landscape or landscapes dominated by infrastructure with no cultural antiquity, including transport corridors where negative elements dominate the overall character.

Landscape sensitivity is influenced by several factors including susceptibility to change, value and condition. **Table 8.3** defines the criteria that have guided the judgement as to the overall sensitivity of the Landscape Resource. Assessments of susceptibility and value of a particular landscape resource may be different and professional judgement will always be used to conclude on the judgement of sensitivity.

Table 8.3: Landscape Sensitivity

Definition		Sensitivity
Landscape Susceptibility	Landscape Value	
Exceptional landscape quality, no or limited potential for substitution. Key elements/features well known to the wider public. The landscape receptor is of very high susceptibility to the Project and has little or no tolerance to change.	Nationally/internationally designated/valued landscape, or key elements or features of national/internationally designated landscapes. Little or no tolerance to change	Very High
Strong/distinctive landscape character; absence of landscape detractors. The landscape receptor is of high susceptibility to the Project and has low tolerance to change.	Regionally/nationally designated/valued countryside and landscape features or landscapes judged to be of equivalent value using clearly stated and recognised criteria. Low tolerance to change.	High
Some distinctive landscape characteristics; few landscape detractors. The landscape receptor is of medium susceptibility to the Project and has medium tolerance to change.	Locally or regionally designated/valued countryside and landscape features or landscapes judged to be of equivalent value using clearly stated and recognised criteria. Medium tolerance to change.	Medium
Absence of distinctive landscape characteristics; presence of landscape detractors. The landscape receptor is of low susceptibility to the Project and has high tolerance to change.	Undesignated landscapes and landscape features which have little value to local communities. High tolerance to change	Low
Absence of positive landscape characteristics. Significant presence of landscape detractors. The landscape receptor is of negligible susceptibility to the Project and has very high tolerance to change.	Undesignated landscapes and landscape features which have no particular scenic qualities or are in poor condition or altered by presence of intrusive manmade structures. High tolerance to change.	Very Low / Negligible

8.2.5.1.2 Magnitude of Landscape Effect

Direct resource changes on the landscape character in the study area are brought about by the introduction of a new development and its impact on the key landscape characteristics. The changes caused to landscape character because of the Proposed Scheme are evaluated in terms of their size or scale, geographical extent and duration and reversibility.

For the purposes of this LVIA assessment, duration considered to be: Temporary (less than 1 year), short term (1 to 7 years), medium (7 to 15 years), long term (15 – 60 years) and permanent (effects lasting over 60 years). The photomontages in support of this chapter (provided in **Appendix B**) have been provided to illustrate a Year 1 and Year 10¹² scenario, with the latter including mitigation planting. Judgements regarding the magnitude of landscape impact are indicated in **Table 8.4**.

Table 8.4: Magnitude of Landscape Effect

Definition	Magnitude of Effect
Major alteration to, or complete loss of, key landscape characteristics or components of the baseline condition, i.e., predevelopment landscape and/ or introduction of dominant, uncharacteristic elements with the attributes of the receiving landscape	Very High
Notable or long-term change to a widespread area or a notable change in continuous or key landscape characteristics or components, i.e., predevelopment landscape and / or introduction of elements that may be prominent, but may not necessarily be substantially uncharacteristic with the attributes of the receiving landscape.	High
Moderate or longer-term change over a restricted area or a moderate change in key landscape characteristics or components, i.e., predevelopment landscape and or introduction of elements that may not be uncharacteristic with the surrounding landscape.	Medium
Minor short or medium-term change over a restricted area or a minor change in key landscape characteristics or components	Low
Imperceptible change in key landscape characteristics or components	Very Low / Negligible

8.2.5.2 Visual Impact Assessment

8.2.5.2.1 Sensitivity of Visual Receptors

For visual receptors, judgements on significance and sensitivity are closely interlinked. Judgements on the overall visual sensitivity/ susceptibility are provided in **Table 8.5** and overall sensitivity of the visual resource is based on combining judgements on the sensitivity of the human receptor (for example resident, commuter, tourist, walker, recreationist or worker, and the numbers of viewers affected) and judgements on the visual resource significance (for example views experienced from residential properties, workplace, leisure venue, local beauty spot, scenic viewpoint, commuter route, tourist route or walkers' route).

Table 8.5: Visual Resource Sensitivity

Definition		Sensitivity
Viewer susceptibility	Value of value	
Visitors drawn to a particular view (usually promoted or in a designated landscape), including those who have travelled to experience the views. The viewer is of very high susceptibility and has little or no tolerance to change.	Views from nationally and internationally known viewpoints which are designated and are or are associated with internationally designated landscapes or key features or elements of nationally designated landscapes or are linked to important and popular visitor attractions. The view would have Little or no tolerance to change.	Very High
Residents.	Views from residential property. Public rights of way, National Trails, long distance walking routes and nationally designated	High

¹² Note – A Year 10 montage was chosen to represent proposed mitigation, as this was considered to be representative of a year when planting is well-established and providing screening effects.

Definition		Sensitivity
Viewer susceptibility	Value of value	
People engaged in quiet outdoor recreation where landscape is an important part of the experience. The viewer is of high susceptibility and has little tolerance to change.	countryside/landscape features with public access. The view would have low tolerance to change.	
Observers enjoying the countryside from vehicles on quiet/promoted routes. People engaged in outdoor sport or recreation which may involve appreciation of views (e.g. cyclists, golfers). The viewer is of medium susceptibility and has medium tolerance to change.	Views from local roads and routes crossing designated countryside/landscape features as well as promoted paths. The view would have medium Tolerance to change.	Medium
People engaged in outdoor sport or recreation which does not involve appreciation of views. The viewer is of low susceptibility and has high tolerance to change.	Views from workplaces, main roads and undesignated countryside/landscape features. The view would have high tolerance to change.	Low
People at work where the setting is not important to the quality of working life. Road users (commuters) where the view is incidental to the journey. The viewer is of negligible susceptibility and has high tolerance to change.	Views from within and of undesignated landscapes with significant presence of landscape detractors. The view would have high tolerance to change.	Very Low/ Negligible

8.2.5.2.2 Magnitude of Visual Effect

The magnitude of impact on the visual resource results from the scale of change in the view, with respect to the loss or addition of features in the view, and changes in the view composition. The criteria for defining the magnitude of visual impact are provided in **Table 8.6**.

Table 8.6: Magnitude of Visual Effect

Definition	Magnitude
Major alteration to, or completed loss of, key visual characteristics or components of the visual baseline condition. Effects are likely to be experienced at a very large scale, considered permanent and irreversible.	Very High
Notable or longer-term change to a widespread area or view or a notable change in key visual characteristics or components.. Composition of the view would alter. View character may be partially changed through the introduction of features which, though uncharacteristic, may not necessarily be visually discordant.	High
Moderate or longer-term change over a restricted area or view or a moderate change in key visual characteristics or components	Medium
Minor short or medium-term change over a restricted area or view or a minor change in the key visual components. Composition and character of view substantially unaltered.	Low
imperceptible change to the key visual characteristics or components of the view.	Negligible / Very Low

8.2.5.3 Significance of Landscape and Visual Effects

The purpose of this LVIA is to determine, in a transparent way, the likely significant landscape and visual effects of a new development. It is accepted that, due to the nature and scale of the development proposed, the development could potentially give rise to some notable landscape and visual effects. The significance of effect on landscape, views and visual amenity have been judged according to a seven-point scale as presented in **Table 8.7**, which contains a description of the significance of effect criteria.

Table 8.7: Significance of Effect

Landscape Resource	Visual Resource	Significance of Effect
Where the project would not alter the landscape character of the area.	Where the project would retain existing views.	Imperceptible
Where proposed changes would have an indiscernible effect on the character of an area.	Where proposed changes would have a barely noticeable effect on views/visual amenity.	Not Significant
Where proposed changes would be at slight variance with the character of an area.	Where proposed changes to views, although discernible, would only be at slight variance with the existing view.	Slight
Where proposed changes would be noticeably out of scale or at odds with the character of an area.	Where proposed changes to views would be noticeably out of scale or at odds with the existing view.	Moderate
Where proposed changes would be uncharacteristic and/or would significantly alter a valued aspect of (or a high quality) landscape.	Where proposed changes would be uncharacteristic and/or would significantly alter a valued view or a view of high scenic quality.	Significant
Where proposed changes would be uncharacteristic and/or would significantly alter a landscape of exceptional landscape quality (e.g., internationally designated landscapes), or key elements known to the wider public of nationally designated landscapes (where there is no or limited potential for substitution nationally).	Where proposed changes would be uncharacteristic and/or would significantly alter a view of remarkable scenic quality, within internationally designated landscapes or key features or elements of nationally designated landscapes that are well known to the wider public.	Profound

For the purposes of this assessment those effects indicated, as being 'Profound', 'Very Significant' or 'Significant' are regarded as being significant. Effects of 'Slight and lesser significance have been identified within the assessment, though are not considered significant. For those effects indicated as being of 'Moderate' professional judgement has been exercised in determining if the effect is considered to be significant, taking account of site specific or location specific variables which are given different weighting in each instance according to location.

A conclusion that an effect is 'significant' should not be taken to imply that a new development is unacceptable. Significance of effect needs to be considered regarding the scale over which it is experienced and whether it is beneficial or adverse.

8.2.6 Data Limitations

The landscape and visual impact assessment, and site photography utilised in the production of the accompanying photomontages has been conducted from publicly accessible locations only.

The fieldwork exercises have helped inform the visual impact assessment, especially from within built up areas, associated with Celbridge, where existing views currently available to residents of dwellings could not be directly accessed. Assessment of such views would require entering private dwellings which is outside the scope of the assessment.

Effects on protected structures and structures of architectural merit are excluded from the landscape and visual impact assessment. These are documented in the Cultural Heritage Impact Assessment (refer to **Chapter 10** of this Environmental Report).

8.3 Description of Receiving Environment

8.3.1 Landscape Character Assessment of County Kildare

A review of the Landscape Character Assessment accompanying the Kildare CDP has identified that the Proposed Scheme traverses a single Principal Landscape Character Area (LCA), Northern Lowlands and traverses a single Sub-ordinate LCA identified as River Liffey (refer to **Figure 8-2**). Further details on these LCA's are presented in **Appendix 8.1D (Landscape Character Assessment of County Kildare)** including critical landscape factors.

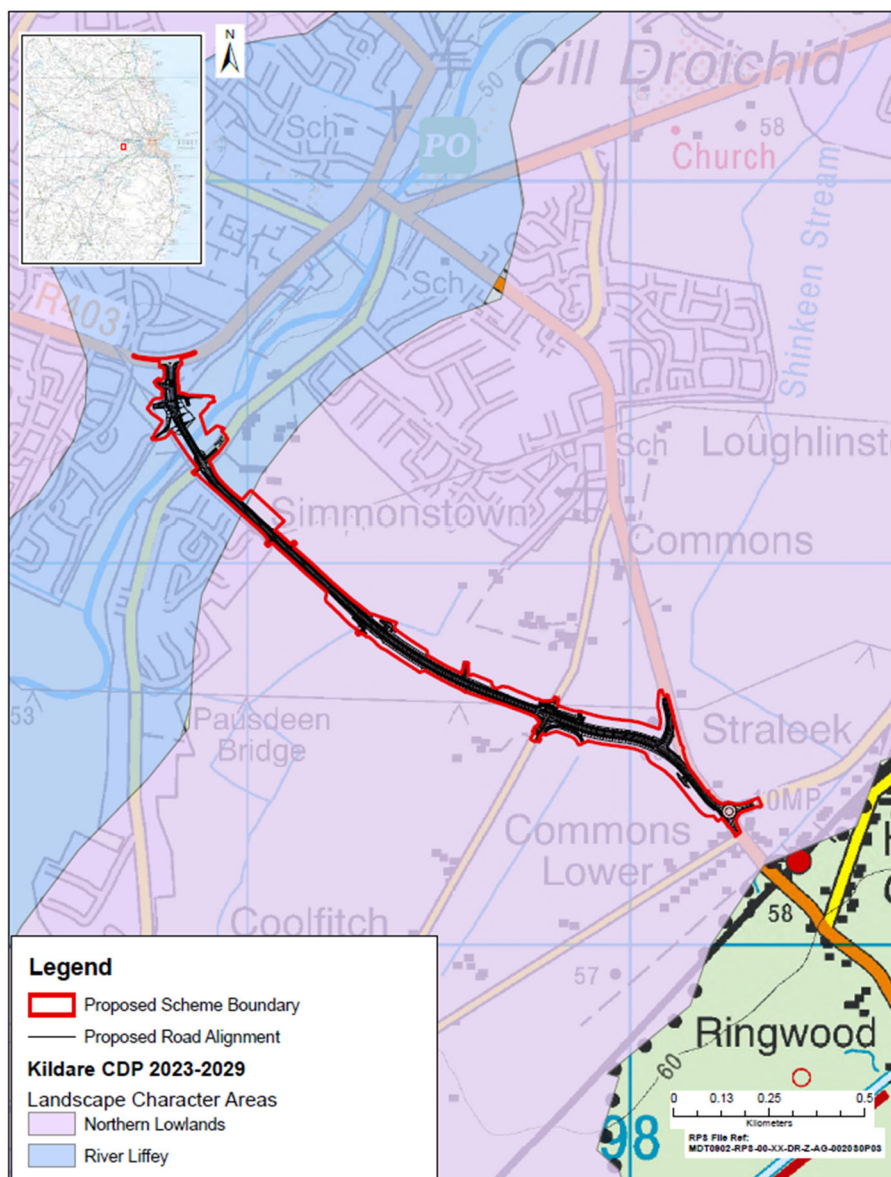


Figure 8-2 Landscape Character Areas

Northern Lowlands LCA

The Kildare CDP Landscape Character Assessment describes the Northern Lowlands LCA as an extensive lowland area within the north-east of the County, which is bisected by the River Liffey Valley.

It is noted that the landscape assessment accompanying the Kildare CDP (Chapter 13, Section 13.3.1) provides categorisation of the Northern Lowlands LCA with regards to Landscape Sensitivity which is identified as:

- Class 1 – Low Sensitivity; *Areas with the capacity to generally accommodate a wide range of uses without significant adverse effects on the appearance or character of the area,*

The Kildare CDP Landscape Character Assessment also determines the impact of development (Chapter 13, Section 13.3.2) on the Northern Lowlands LCA as being highly compatible with a range of development types that include Urbanisation and Infrastructure.

River Liffey LCA

The Kildare CDP Landscape Character Assessment describes the River Liffey LCA as being ‘located on the north-eastern quarter of the County, flowing in a north-east to south-east pattern. Many towns have become well established along the riverbanks, such as Leixlip, Celbridge, Clane, Newbridge, Kilcullen and Ballymore Eustace, where the River Liffey flows into Pollaphuca Reservoir.’

It is noted that the landscape assessment accompanying the Kildare CDP (Chapter 13, Section 13.3.1) provides categorisation of the River Liffey LCA with regards to Landscape Sensitivity which is identified as:

- Class 4 – Special Sensitivity; *Significant adverse effects on the appearance or character of the landscape having regard to prevalent sensitivity factors.*

The Kildare CDP Landscape Character Assessment also determines the impact of development (Chapter 13, Section 13.3.2) on the River Liffey LCA as being of low compatible with a range of development types that include Urbanisation and Infrastructure.

8.3.2 Scenic Routes and Viewpoints

Following a review of Map V1-13.3 (Scenic Routes and Viewpoints) that accompanies the Kildare CDP and available information in relation to Scenic Routes and Viewpoints, it has been established that there is a single Viewpoint in proximity to the Proposed Scheme, identified as RL3 (refer to **Figure 8-3**).

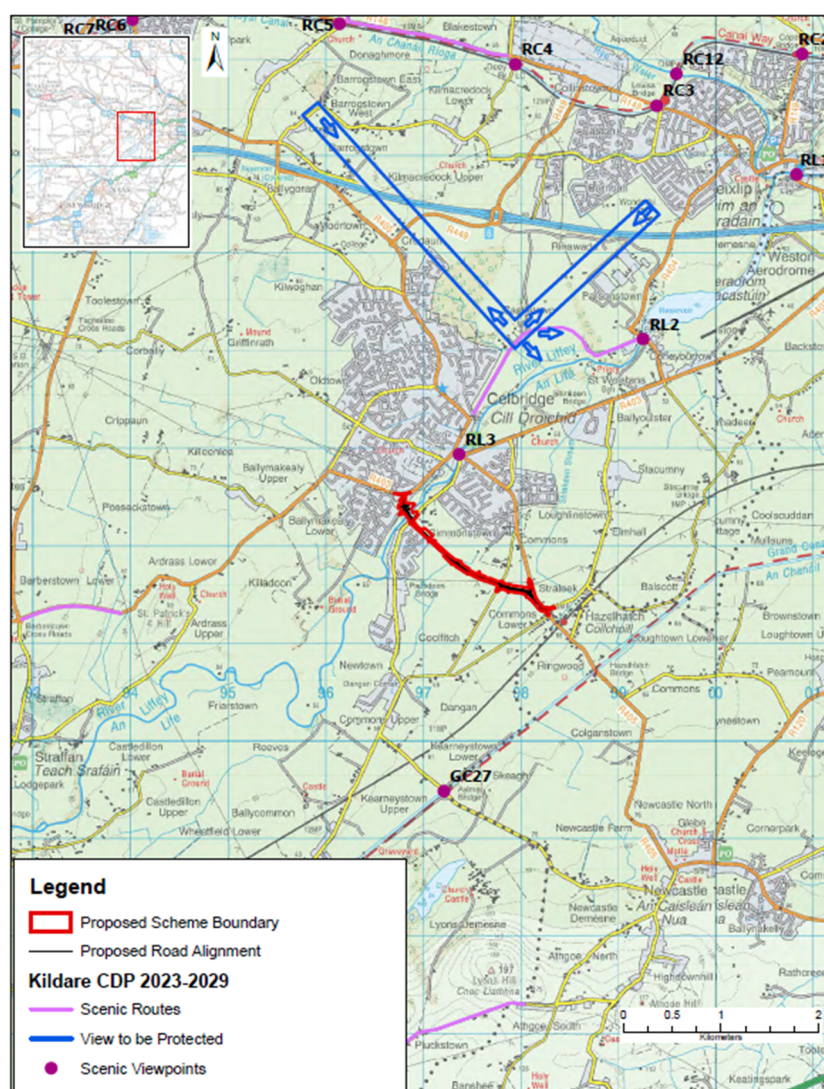


Figure 8-3 Landscape Designations

The viewpoint RL3 is identified as being a view of the River Liffey from Celbridge Bridge, Celbridge. However following site survey works it is considered that due to screening provided by extensive riverside vegetation, including mature trees, that there will be no view of the Proposed Scheme from this identified location and therefore has not been carried forward for further consideration within this assessment.

8.3.3 Baseline Environment

Mobility Corridor

The existing environment, associated with the mobility corridor section of the Proposed Scheme includes lands lying between the junction of Loughlinstown Road and the R405 (Hazelhatch Road) to the south and Newton Road to the north. The landscape associated with the mobility corridor and its wider environs includes the residential development on the southern edge of Celbridge, residential development at Straleek to the south and scattered residential and farmsteads.

Land cover associated with the mobility corridor is comprised of pastoral and arable agricultural land use, with a diverse variety of field sizes and patterns. Field boundaries are well defined by mixed species hedgerows generally of good quality and are well maintained throughout. Tree cover forms a strong element of the landscape, and generally consists of hedgerow trees dividing fields, shelterbelt planting around farmsteads and scattered dwellings and mixed species buffer planting forming a strong edge to existing residential development to the north. Vegetation within the environs associated with the mobility corridor provides a strong sense of enclosure, particularly from the local road networks which traverse the area, including the R405, and provide both a textural contrast and verticality to the otherwise flat landscape.

Whilst large scale man-made elements such as pylons are visible in views from within the agricultural landscape, they form a minor element, often perceived amongst tree cover. The landscape is traversed by a number of local road networks, though such networks are not generally perceived from within the landscape due to the presence of roadside hedges and vegetation.

River Liffey Crossing

The existing environment, associated with the River Liffey Bridge Crossing portion of the Proposed Scheme includes lands lying between Newton Road, to the south of the crossing and the R403 (Clane Road) to the north. The landscape associated with this portion of the Proposed Scheme is strongly enclosed by the existing vegetation cover, including mature trees, associated with the River Liffey. It is noted that this portion of the Proposed Scheme also crosses the south-western portion of the landscape associated with Celbridge Abbey, though the Abbey itself is not perceived from within the River Liffey corridor itself due to the existing vegetation cover. Northern portions of the bridge crossing section includes the existing built form of Celbridge, which includes residential and commercial development, with the river corridor forming accessible open space provision.

8.4 Predicted Impacts

The assessment of the significance of the impact of the Proposed Scheme is presented for Landscape Character and Visual effects for the construction and operational phase.

8.4.1 Construction Phase Landscape Character Impacts

The construction works are anticipated to be approximately 24 months in duration. Construction phase works will be visible to a varied extent depending upon the individual construction activities being undertaken at any given time.

Construction phase impacts relate generally to the following activities that are common across the Proposed Scheme:

- Site clearance activities including removal of existing vegetation along the route of the Proposed Scheme;
- Temporary construction compound for site offices, welfare facilities and storage areas for materials;
- Temporary working areas; and
- Construction machinery and plant movements along the Proposed Scheme corridor and the surrounding road networks.

In addition to the construction phase activities identified above, the aspects of the Proposed Scheme that are most relevant to this LVIA include:

- Upgrade of existing roundabout junction (Ch 1+950) forming the southern extent of the Proposed Scheme at junction of Hazelhatch Road and Loughlinstown Road, including alterations to the existing

pedestrian circulation areas which will involve the remodelling of existing topography to form new embankments, footpath connections and drainage features resulting in the localised loss of established roadside vegetation.

- Realignment of Hazelhatch Road junction at Ch 1+730, which will involve the remodelling of existing topography to form new embankments resulting in the localised loss of hedgerows and established roadside vegetation.
- Formation of new mobility corridor, which will involve the remodelling of existing topography to form new embankments and drainage features resulting in the localised loss of established hedgerows and agricultural land usage.
- Formation of new junction at Simmonstown Manor (Ch 1+420), which will involve the creation of new turning head on the northern side of the new corridor, with new junction formation to the south of the corridor resulting in the localised loss of hedgerow and the formation of new embankments
- Construction of new road corridor (Ch 1+350 to Ch 0+200) which will involve the remodelling of existing topography to form new embankments resulting in the localised loss of hedgerows and established vegetation.
- Construction of new road junction connecting Proposed Scheme to existing local road network, (Ch. 200) which will involve the remodelling of existing topography to form new embankments resulting in the localised loss of established vegetation.
- Construction of new bridge crossing across the River Liffey and associated modifications to local road network, which will involve the remodelling of the existing topography to form new embankments and cuttings resulting in the loss of vegetation and riparian vegetation adjacent to the River Liffey.
- Construction of new SUDS drainage ponds throughout the Proposed Scheme, which will involve the localised remodelling of the existing topography to form new cuttings and slopes resulting in localised removal of existing field vegetation, hedgerows and established sections of roadside vegetation.

An assessment of the significance of the impact of the Proposed Scheme during the construction phase on the landscape character is provided in the following assessment tables (**Table 8.8** and **Table 8.9**).

Table 8.8: Northern Lowlands – Construction Phase Impact Assessment

Northern Lowlands	
Sensitivity	Elements of the Proposed Scheme, located to the north and south of the River Liffey are located within this LCA and are comprised of the re-alignment works associated with the southern roundabout tie in, alignment works associated with Simmonstown Manor Road, and the formation of the main corridor alignment and associated embankments, cuttings and SUDS features. In a wider context this extensive lowland area occurs in the north-east of the County and is bisected by the River Liffey. The Royal Canal runs along its northern boundary and the Grand Canal corridor follows a north-east to south-west alignment. The Northern Lowlands LCA is characterised by generally flat terrain and open lands with regular field patterns. Hedgerows are generally well maintained and low, with scattered trees along the field boundaries. The predominant land use in this LCA is pasture. Several coniferous plantations and deciduous woodlands can also be found, as well as riparian woodland belts along the River Liffey. Settlement patterns in this LCA are linked to the closeness of Dublin City, with large towns such as Naas, Clane, Celbridge, Leixlip and Maynooth, together with other small villages at the outskirts of major towns and a high density of dispersed rural houses and farm dwellings throughout the countryside, indicative of a high population density. This character unit contains the largest population concentrations of the county. The Northern Lowlands LCA, immediately east and west of the River Liffey is locally influenced by the urban form of Celbridge and areas of development along arterial routes such as Newtown Road. The LCA to the east of the River Liffey is a flat agricultural landscape with small to medium scale field pattern, well defined by well-maintained hedgerows with mature trees. Other areas of vegetation include shelterbelt planting around scattered farmsteads and planting forming the boundary between the urban form of Celbridge and the adjacent rural landscape. Tree cover is a strong element locally and provides a sense of enclosure and texture, often restricting views to wider horizons. Locally the LCA is crossed by a series of Regional and Local roads, providing connectivity with Celbridge and wider population centres, with other visual detractors in the local area including the large overhead pylon line which crosses the LCA locally, east to west. Taking account of

Northern Lowlands	
	the above characteristics and influence of existing road corridors within the study areas, the susceptibility of the LCA to the type of development proposed is judged to be medium. Within the Kildare CDP the LCA has been classified as being Class 1 (Low Sensitivity) meaning that it has the capacity to <i>'generally accommodate a wide range of uses without significant adverse effects on the appearance or character of the area'</i>. Based on the susceptibility and value attached to this LCA, the overall sensitivity of this LCA is judged to be Medium.
Magnitude of Change	Direct impacts on the Northern Lowlands LCA will arise from the physical construction of new elements associated with the Proposed Scheme including the construction of the new mobility corridor, associated amendments / alterations to minor road tie-ins, the re-alignment works associated with the southern roundabout tie-in, new embankments, new cuttings and the resulting loss of vegetation required to form these new elements. Overall, the magnitude of change associated with the construction phase of the Proposed Scheme is judged to be localised and High.
Significance of Landscape Effect during Construction Phase	Localised Significant, short term assessed as significant effects are predicted to be experienced during the construction of the Proposed Scheme. Remaining portions of the LCA outside of the Proposed Scheme land take boundary are predicted to experience no significant effects.

Table 8.9: River Liffey - Construction Phase Impact Assessment

River Liffey	
Sensitivity	A relatively small proportion of the Proposed Scheme, comprised of the River Liffey bridge crossing, associated embankments and abutments and the re-alignment to Newtown Road to provide tie-ins along with SUDS pond formations is located within this linear LCA. In a wider context the valley landscape associated with the River Liffey is in the north-eastern quarter of the County, flowing in a north-east to south-east pattern and its waters winding along the central lowlands. Many towns have become well established along the riverbanks, such as Leixlip, Celbridge, Clane, Newbridge, Kilcullen and Ballymore Eustace. This LCA is generally characterised by a smooth terrain with riparian vegetation and woodland extending along localised portions. The LCA has localised extensive open views affording visual linkage with the Chair of Kildare to the west and the Eastern Uplands to the east with distant views including the neighbouring Wicklow Mountains locally available. At a local level the LCA is heavily influenced and enclosed by extensive areas of woodland along the banks of the River Liffey, which form a strong sense of enclosure and restricts views along the alignment of the river valley and further afield to Celbridge and the surrounding urban form. Within the Kildare CDP the LCA has been classified as being Class 4 (Special) meaning <i>'significant adverse effects on the appearance or character of the landscape having regard to prevalent sensitivity factors'</i>. Based on the susceptibility and value attached to this LCA, the overall sensitivity of this LCA is judged to be High.
Magnitude of Change	Direct impacts on this LCA will arise from the physical construction of the new overbridge, crossing the River Liffey, construction of the embankments associated with the overbridge and formation of new elements such as new sections of roadway, footpaths and associated infrastructure. The Proposed Scheme will result in the localised loss of existing vegetation, including mature trees and grassland areas within areas of land required to form these new features. Overall, the magnitude of change associated with the construction phase of the Proposed Scheme is judged to be localised and Medium.
Significance of Landscape Effect during Construction Phase	Localised Significant, short term, effects are predicted to be experienced during the construction of the new river crossing, associated abutments and embankments and the proposed alterations to the Newtown Road to the immediate east. Remaining portions of the LCA outside of the Proposed Scheme land take, are predicted to experience no significant effects.

8.4.2 Operational Phase Landscape Character

The Proposed Scheme will result in new built elements and structures being visible and present within the landscape. The principal sources of impact during the operational phase of the Proposed Scheme include:

- Implementation of new features within the landscape; and
- Traffic movements on the road corridor.

The following features have been considered for the prediction of impacts associated with the operational phase of the Proposed Scheme: operation and movement of traffic on a new road corridor, associated cuttings and embankments; realignment of local road junctions; lighting; signage; creation of a new bridge crossing of the River Liffey; re-alignment works to existing roundabout junction to the south of the Proposed Scheme; and the retention of the existing road network.

An assessment of the significance of the impact of the Proposed Scheme during the operational phase on the landscape character is provided in the following assessment tables (**Table 8.10** to **Table 8.11**).

Table 8.10: Northern Lowlands – Operational Phase Impact Assessment

Northern Lowlands	
Sensitivity	As previously described in Table 8.8 the overall sensitivity of this LCA is judged to be Medium.
Magnitude of Change	As previously discussed in Table 8.8, the Proposed Scheme, including new mobility corridor road, associated amendments / alterations to minor road tie-ins, the re-alignment works associated with the southern roundabout tie-in, new embankments, new cuttings and new SUDs features are contained within this LCA. Potential impacts are considered to be localised and direct in nature. While this LCA contains regional and local road networks it is considered that elements of the Proposed Scheme, including new embankments, cuttings, junction arrangements and associated link roads will alter this landscape permanently, at a local level, as elements of the Proposed Scheme will be perceived as new features in the landscape prior to the successful establishment of the mitigation measures identified within Table 8.15. It is predicted that the Proposed Scheme will not be widely prominent across this LCA as surrounding, enclosing vegetation have the potential to quickly absorb the proposed changes. There are localised sections of the Proposed Scheme which will be more prominent in the landscape, for example, the new southern roundabout junction arrangement with the existing R405, the new turning head facility on the Simmonstown Road, re-alignment works associated with the Newtown Road junction and the junction re-alignment at the northern end of the scheme (R403). The combined affect will be to increase the prominence of road corridors within the LCA, particularly at a local level, however it is considered that the wider landscape has the capacity to accommodate these proposed changes. New earthworks and associated loss of vegetation will have a localised direct effect upon the character of the LCA. The Proposed Scheme would be largely assimilated into the wider landscape due to localised screening provided by intervening vegetation but embankments and cuttings, would be perceived as detracting elements in the short term, prior to establishment of mitigation measures, though would not significantly impact on the overall landscape character. The predicted magnitude of change associated with the elements identified previously, is localised and low.
Significance of Landscape Effect during Operational Phase	Localised Slight, direct medium-term effects, assessed as not significant, are predicted to be experienced during the operational phase of the Proposed Scheme contained within the LCA as at the time of scheme opening proposed areas of planting will not be fully established. Remaining portions of the LCA outside of the Proposed Scheme land take boundary are predicted to experience no significant effects during the operational phase of the Proposed Scheme.

Table 8.11: River Liffey - Operational Phase Impact Assessment

River Liffey	
Sensitivity	As previously described in Table 8.9 the overall sensitivity of this LCA is judged to be High.
Magnitude of Change	As previously discussed in Table 8.9 a small proportion of the Proposed Scheme, comprised of the River Liffey bridge crossing, associated embankments and abutments and the re-alignment

River Liffey

	to Newtown Road to provide tie-ins along with SUDS pond formations is located within this linear LCA. Potential impacts are considered to be localised and direct in nature. While the LCA is bounded by existing local and regional road networks it is considered elements of the Proposed Scheme, comprising new embankments, cuttings, junction arrangements and new bridge crossing with associated embankments and SUDs features will alter this landscape permanently, at a local level, as elements of the Proposed Scheme will be perceived as new features in the landscape prior to successful establishment of the mitigation measures identified within Table 8.15. It is predicted that the Proposed Scheme will not be widely prominent across this LCA as surrounding, enclosing vegetation has the potential to quickly absorb the proposed changes. There are localised sections of the Proposed Scheme which will be more prominent in the landscape, for example, the new bridge crossing and junction arrangement with link road connection with existing Newtown Road and the R403. The combined affect will be to increase the scale and prominence of road corridors within the LCA, particularly at a local level, however it is considered that the wider landscape has the capacity to accommodate these proposed changes. New earthworks and associated loss of vegetation will have a localised direct effect upon the character of the LCA. The Proposed Scheme would be largely assimilated into the wider landscape due to screening provided by intervening vegetation but embankments, cuttings, bridge structure and SUDs features would be perceived as detracting elements in the long term, prior to establishment of mitigation measures. The predicted magnitude of change associated with these elements during the operational phase is localised and Medium.
Significance of Landscape Effect during Operational Phase	Localised Moderate, long-term, effects are predicted to be experienced during the operational phase of the Proposed Scheme associated with the new river crossing and its associated abutments and embankments and the proposed alterations to the Newtown Road to the immediate east. Remaining portions of the LCA outside of the Proposed Scheme land take, are predicted to experience no significant effects.

8.4.3 Summary of Landscape Effects

A summary of the predicted impacts associated with both the construction and operational phases of the Proposed Scheme is provided in **Table 8.12**.

Table 8.12: Summary of Predicted Landscape Effects

Landscape Character / Designation	Predicted Construction Phase Impacts	Predicted Operational Impacts
Northern Lowlands	Localised Significant, short term assessed as significant effects are predicted to be experienced during the construction of the Proposed Scheme. Remaining portions of the LCA outside of the Proposed Scheme land take boundary are predicted to experience no significant effects.	Localised Slight, direct medium-term effects, assessed as not significant, are predicted to be experienced during the operational phase of the Proposed Scheme contained within the LCA as at the time of scheme opening proposed areas of planting will not be fully established. Remaining portions of the LCA outside of the Proposed Scheme land take boundary are predicted to experience no significant effects during the operational phase of the Proposed Scheme
River Liffey	Localised Very Significant, short term, effects are predicted to be experienced during the construction of the new river crossing and its associated abutments and embankments and the proposed alterations to the Newtown Road to the immediate east.	Localised Moderate, long-term, effects are predicted to be experienced during the operational phase of the Proposed Scheme associated with the new river crossing and its associated abutments and embankments and the proposed alterations to the Newtown Road to the immediate east.

Landscape Character / Designation	Predicted Construction Phase Impacts	Predicted Operational Impacts
	Remaining portions of the LCA outside of the Proposed Scheme land take, are predicted to experience no significant effects.	Remaining portions of the LCA outside of the Proposed Scheme land take, are predicted to experience no significant effects.

The predicted significance of landscape effect for the Northern Lowlands LCA during the construction phase is localised, short-term and assessed as significant, though portions of the Northern Lowlands LCA outside of the Proposed Scheme land take boundary are predicted to experience no significant effect during the construction phase. The assessment of the operational phase associated with the Proposed Scheme has identified slight, localised medium-term effects which have been assessed as not significant, as effects are limited in extent by surrounding vegetation cover which limits the extent to which the Proposed Scheme is viewed / experienced.

The predicted significance of landscape effect for the River Liffey LCA during the construction phase has been assessed as localised, short-term and very significant, with portions of the River Liffey LCA outside of the Proposed Scheme land take boundary are predicted to experience no significant effect during the construction phase. The assessment of the operational phase associated with the Proposed Scheme has identified moderate, long-term, localised effects which have been assessed as not significant, as effects are limited in extent by surrounding vegetation cover which limits the extent to which the Proposed Scheme is viewed / experienced.

8.4.4 Visual Impact Construction and Operational Phase

A series of 7 representative viewpoints have been selected to illustrate the existing visual context of the Proposed Scheme and as an aid to the visual impact assessment. All the viewpoints selected have been located on publicly accessible roads, footways, and verges.

The locations of these viewpoints are shown on **Figure 8-4**. Representative baseline views and, where relevant, predicted views prior to mitigation and with mitigation (photomontages) are provided in **Appendix B**. An assessment of the significance of the predicted visual impact of the Proposed Scheme during the construction and operational phases on these views is provided in the **Appendix 8.1E (Visual Impact Assessment)**.

A summary of the predicted visual effects associated with the construction and operational phases for the Proposed Scheme, is presented in **Table 8.13** below and are discussed below.

Table 8.13: Summary of Predicted Visual Effects

No.	Viewpoint Name	Predicted Construction Phase Impacts	Predicted Operational Impacts
1	Hazelhatch Roundabout	Localised Moderate adverse, short-term duration, significant visual effects	Slight, assessed as not significant visual effects
2	Simmonstown Manor Road	Localised Moderate adverse, short-term duration, assessed as significant effects	Slight, assessed as not significant visual effects
3	The Crescent, Temple Manor	Imperceptible as construction phase operations will be screened	Imperceptible
4	Callendars Mill	Imperceptible as construction phase operations will be screened	Imperceptible
5	Newton Road	Moderate, short-term duration, assessed as locally significant	Moderate, assessed as not significant visual effects
6	Riverview – Abbey Farm	Very significant, short-term duration, assessed as locally significant	Very significant, assessed as locally significant, prior to successful establishment of proposed planting, reducing to Moderate, long-term localised assessed as not significant following successful establishment of planting.
7	Clane Road - Celbridge	Localised Significant adverse, short-term duration, assessed as significant	Slight, assessed as not significant visual effects

Following site works and assessment of the potential visual impacts arising because of the Proposed Scheme it is predicted that five of the assessed viewpoints will experience significant effects during the construction phase due to the proximity of the Proposed Scheme to the viewpoint location.

During the operational phase significant visual impacts are predicted to occur at one of the assessed viewpoints, prior to establishment of mitigation planting, with impacts predicted to reduce once planting proposals establish. Remaining viewpoints are predicted to experience no significant impacts because of the Proposed Scheme due to screening provided by intervening vegetation cover such as hedgerows and field boundary hedgerows with mature trees.



Figure 8-4 Viewpoint Location Plan

8.4.5 Residential Visual Amenity

Within this section of the LVIA, for each of the identified residential properties or groups of properties, an assessment of the likely visual effects has been undertaken by evaluating and assessing the predicted changes in the visual resource as a result of the Proposed Scheme.

This assessment of impacts on residential properties follows the methodology described previously in this LVIA. Views from properties which are located beyond 300m are generally restricted in nature due to the well vegetated nature of the surrounding landscape with existing vegetation often constraining and restricting views towards the Proposed Scheme and no significant impacts are predicted to occur on properties beyond 300m due to the low visibility of the Proposed Scheme in available views.

An assessment has been undertaken for residential receptors in proximity to the Proposed Scheme. The assessment is provided in **Appendix 8.1F (Residual Visual Impact Assessment)** and a summary is provided below in **Table 8.14**. At distances beyond 300m, where properties have potential views towards the Proposed Scheme, there are intervening hedgerows and strong belts of trees and retained vegetation that decreases visibility of and / or visually screens the Proposed Scheme in views with no significant visual effects predicted for properties beyond 300m.

As described previously in **Section 8.2.5.2**, residential receptors are high sensitivity receptors.

Table 8.14: Summary of Predicted Operational Residential Effects – Pre Establishment

Receptor Location	Viewer Sensitivity	Magnitude of Change	Predicted Visual Effect (Pre-Establishment)
Property to the immediate south-east of the upgraded roundabout junction (R405 / Loughlinstown Road)	High	Low	Slight, not significant
Cluster of 5 residential properties lying to the west of the upgraded roundabout junction (R405 / Loughlinstown Road)	High	Low	Slight, not significant
Properties to the south of the upgraded roundabout junction (R405 / Loughlinstown Road)	High	Negligible	Not Significant
Single property to the east of the Proposed Scheme at Ch 1+900 approx	High	Low	Slight, not significant
Single property to the east of the realigned section of the R405, east of the link road alignment	High	Negligible	Not Significant
Residential properties associated with the Simmonstown Stud Farm, located approximately 200m north of the proposed Simmonstown Road turning head	High	Negligible	Not Significant
Single residential property to the west of the mobility corridor, west of Ch 1+300 approx	High	Medium	Moderate, localised and medium term
Residential properties associated with Temple Grove, including The Copse, The Court and the Crescent	High	Negligible	Not Significant
Single residential property to the east of the mobility corridor, east of Ch 350 approx.	High	Medium	Moderate, localised and medium term
Cluster of residential properties immediately north of the Proposed Scheme tie in with the R403, associated with Priory Lodge	High	Medium	Moderate, localised and medium term

Following site works and assessment of the potential visual impacts arising because of the Proposed Scheme it is predicted that none of the residential receptors assessed will experience significant effects during the operational phase of the Proposed Scheme.

8.4.6 Cumulative Impact

As identified in **Section 3.3**, a review of proposed developments within 1km of the Proposed Scheme has been undertaken to determine the likelihood for potential significant cumulative landscape and visual effects, taking into consideration the following criteria:

- Type and extent of identified proposal;
- Likely visual influence of the identified proposal;

- Potential inter-visibility between the identified proposal and the Proposed Scheme;
- Potential for cumulative landscape effects on the physical fabric of the landscape; and
- The potential for combined successive and sequential visual effects in the context of the Proposed Scheme.

There is one permitted Project that has been screened in for potential cumulative effects, that is the Iarnród Éireann DART+ South West Project. The other developments have been screened out on the basis that the development is viewed as part of the existing built form of Celbridge. With regards to the DART+ South West Project, it is considered that whilst there is no direct cumulative landscape impact between the Proposed Scheme and the proposed development, localised sequential, cumulative visual impacts may be experienced from the southern extent of the scheme during the construction phase associated with the Proposed Scheme due to the potential for visibility of construction machinery associated with the proposed development immediately south. It is considered that cumulative visual impacts will be localised, short-term and are not significant.

8.5 Proposed Mitigation Measures

8.5.1 General Aims and Objective of Landscape Strategy

As part of the Proposed Scheme, landscape proposals have been developed in combination with the engineering layout to ensure the physical and visual integration of the Proposed Scheme and associated features into surrounding landscape. To achieve this, soft landscape proposals (refer to **Drawings MDT0902-RPS-01-XX-DR-Z-LA0000 to MDT0902-RPS-01-XX-DR-Z-LA0008** inclusive) have been developed that help to avoid, reduce or remedy any significant landscape and visual impacts arising because of the Proposed Scheme.

Landscape proposals shall be in keeping with the existing landscape character, and therefore mixed species broadleaved woodland, mixed species hedgerows, mixed species hedgerows with scattered trees and mixed species shrub / scrub planting formed using plant species present in the local landscape shall be used.

In instances where existing hedgerows are disrupted adjacent boundaries shall be replanted with hedgerows of similar species composition. Plant mixes of native trees and shrubs and wild meadow grass mix will be implemented where appropriate.

The implementation of the landscape mitigation measures will be in accordance with the NRA Guide to Landscape Treatments of National Road Schemes in Ireland.

The aims of the landscape and visual mitigation measures are:

- To provide mitigation measures to help avoid, reduce, or remedy any significant landscape and visual impacts arising from any elements within the Proposed Scheme;
- To ensure that the Proposed Scheme and its associated features (bridges) are physically and visually integrated into the surrounding landscape;
- To provide replacement planting for woodland and hedgerows, whether they are visually significant or not, which are to be removed because of the Proposed Scheme and to ensure green corridor connectivity is maintained;
- As far as possible, avoid, or reduce effects on, landscape features, retain and make best use of existing vegetation and re-use site-won materials wherever possible; and
- To provide appropriate levels of visual screening to avoid, reduce or remedy visual intrusion at residential properties to address any negative aspects regarding the visual impact of the Proposed Scheme.

8.5.2 Construction Phase

- The construction contractor will, during the construction phase of the Proposed Scheme, adhere to the NRA's Guidelines on the Implementation of Landscape Treatments on National Road Schemes in Ireland;

- Topsoil, subsoil and other materials for re-use within the Proposed Scheme will be located in areas to avoid impacting on residential properties;
- Retained trees, retained woodland and retained hedgerows will be amalgamated with new planting to strengthen these existing landscape features;
- Construction compounds and storage areas used during the construction phase will be fully decompacted and re-instated to former usage (prior to the end of the construction phase);
- The removal of important landscape features, such as hedgerows, will be limited as far as practically possible to reduce both direct and indirect impacts on landscape character. Any losses will be replaced with locally native and characteristic plant species and species mixes;
- Existing trees will be retained wherever possible, with protective measures implemented in accordance with current guidance e.g. BS 5837(2012) – Trees in Relation to Design, Demolition and Construction.
- All existing tree losses will be mitigated by replacement planting; and
- Topsoil, stripped as part of the construction operations, will be stored in low mounds and reused in accordance with best practice guidance.

8.5.3 Operational Phase

8.5.3.1 Specific Landscape Measures (SLM)

The location and details of where SLMs will be implemented are set out in **Table 8.15**. Where cuttings and embankments are not present, the SLM will require the implementation of a new mixed species hedgerow to define the boundary together with locally appropriate, native species mixed woodland planting.

Table 8.15: Specific Landscape Measures (SLM)

Location	Description of SLM
Sitewide	During construction phase operations, the site compounds and road diversions will be located where the least environmental impacts will be experienced and located to avoid the excessive removal of existing vegetation. Where vegetation is to be removed, it will be replaced with similar species following completion of the Proposed Scheme.
Sitewide	The land take will be minimised as far as practically possible to reduce both direct and indirect landscape impacts. Gradients of slopes are to be maintained to allow for planting (cuttings and embankments).
Sitewide	Cuttings and embankments will be as natural as possible and graded and shaped to integrate with the adjacent landform. Slopes will be graded to minimise land take in so far as reasonably practical.
Sitewide	Areas requiring re-profiling will be stripped of their existing soils and will be stockpiled for re-use. Existing soils will be re-used on new embankments to retain the seedbank of localised vegetation communities.
Sitewide	Where access road closures occur or where the old road corridors become surplus to requirements, such areas of former road makeup will be fully excavated, removed and re-profiled to allow for planting or seeding with appropriate native species mixtures to continue the existing vegetation adjacent to the former roadside. This will help screen views of the Proposed Scheme and further integrate the new road corridor into the surrounding landscape
Sitewide	The removal of mature trees, mature hedgerows with trees and mixed species woodland will be avoided as far as possible to reduce both direct and indirect impacts. New woodland planting will be provided to compensate for losses of woodland, hedgerows, and trees adjacent to the Proposed Scheme during construction operations and to accommodate the improvements. Different woodland types will be established to reflect the existing woodland composition and promote integration with the existing character.
Sitewide	A species-rich, low maintenance grassland mix will be used within all planting areas on embankments and slopes to enhance the overall biodiversity value associated with the Proposed Scheme.
Sitewide	Drainage elements, such as SuDs ponds, swales, ditches and the like, where they occur, will be naturalistic and sensitively integrated into the wider landscape setting

Location	Description of SLM
Sitewide	Materials for the construction of the accommodation tracks will be selected to integrate with the existing material in the area. In addition, locally sourced materials will aid integration into the landscape and promote sustainability.
Sitewide	The ongoing maintenance and management of the landscape planting and seeding will be an integral part of the Proposed Scheme. The Council will ensure that all mitigation and monitoring committed to in the planning application documentation, will be enforced on the appointed contractor through express terms of the contract, and will be overseen by an official engaged by the Council.

8.5.4 Mitigation Specification

Trees Hedgerows and Shrub Planting

All trees, shrubs, transplants/whips, hedging material and ground cover planting shall conform fully to the specification, prepared by the appointed and suitably qualified landscape architect, in respect of species, size and quality, which shall be designed to deliver on the mitigation as set out in this assessment.

All plants shall be well grown, sturdy and bushy according to species type, use and shall be free from all diseases and defects.

The plants shall be made available for inspection prior to planting works commencing.

Any plant material that does not conform to the specification will be automatically rejected and will be removed from site.

All trees, shrubs and other plant material shall comply with the standards set out in National Plant Specification (NPS) prepared by the Committee on Plant Supply and Establishment and published with the backing of the Joint Council of Landscape Industries (JCLI, 1989).

Defective Plant Material

All trees, shrubs, transplants, hedging material and ground cover planting shall be maintained and guaranteed for a period of five years against death, deformation, die-back, or disease other than that caused by malicious damage, to ensure successful establishment of hedgerows, screen planting and development of habitats.

Plant Mixes

Essentially road verge or bank planting will consist of 'bare root transplants', 'whips' and 'feathered trees' which, due to their smaller stock size at time of planting, will adapt more easily to the disturbed ground and exposed site conditions. All plants are to be positioned in the locations and in the required numbers and centres indicated on the agreed planting plan.

Woodland Mix

Landscape mitigation planting of road verges and slopes and as compensation for loss of existing woodland, individual trees, scrub shrub and hedgerows along the Proposed Scheme will exclusively use Irish native species that reflect the existing vegetation of the area. Core species will include oak, hawthorn, hazel, holly, blackthorn, goat willow, alder, rowan, beech, and birch.

Woodland Mix areas will be planted as whips and feathered transplants at a standard size of 60-90 cm or 90-120 cm augmented by larger, individual tree planting appropriate to final locations.

Species shall be planted randomly in groups to mirror local woodlands. Most species used will be quickly maturing species and will have formed dense woodland within ten years. The canopy will reach at least 7 to 10 m, in places where groups of trees are planted. In addition to whip and feathered transplants individual semi-mature trees shall be used to provide screening at locations where limited roadside space is available or where early effect is required.

Individual Tree Planting

Individual tree planting using standard trees shall be included in the locations identified in Drawings MDT0902-RPS-01-XX-DR-Z-LA0000 to MDT0902-RPS-01-XX-DR-Z-LA0008 inclusive.

Native Shrub Planting

Shrub planting shall consist of native species from the core and additional species listed above to provide a woodland understorey and/or woodland edge. Shrub planting mixes shall complement areas of woodland and be used at locations consistent with the surrounding landscape.

All existing hedgerows shall be reinstated at interrupted field boundaries or where new boundaries with fields and adjacent residential properties are created using native hawthorn, blackthorn and holly that shall be the predominant species used.

Grass and Wildflower Mixes

The road verges will be seeded with a robust, low-maintenance grass seed mix. Areas away from designated sight lines where mowing regimes are not required to be of a regular nature will be seeded with a low maintenance semi-natural species rich seed mix appropriate to final location.

Areas lying adjacent to ponds will be seeded with a low maintenance, species rich, wet meadow seed mixture, using seed from Irish native sources as appropriate to final location. Grass and wildflower mixes using seed from Irish native sources shall be employed to provide quality areas of low maintenance, rapid establishment, and visual appearance.

8.6 Residual Impacts

This section assesses the residual impact on the landscape character and visual receptors previously identified, after the mitigation (described above) has attained ten years of growth.

After ten years of growth the proposed planting will help to integrate the Proposed Scheme into the existing landscape. The proposed planting will limit the extent of influence associated with the Proposed Scheme on adjacent Landscape Character Areas with a resultant reduction in landscape impact.

With regards to visual impact on receptors, in general the visual impacts are reduced by the establishment of replacement or new woodland mix that will offset views towards the Proposed Scheme and its infrastructure and traffic on the road from properties.

8.7 Monitoring

Monitoring of implemented specific landscape mitigation measures shall be carried out in accordance with DMRB Volume 10; Environmental Design and Management; Section 3; Landscape Management and the relevant sections of Volume 1; Specification for Highway Works; Series 3000 Landscape and Ecology to ensure that the proposed planting becomes well-established and aids in the integration of new elements associated with the Proposed Scheme into the surrounding landscape and mitigates visual effects.

9 BIODIVERSITY

9.1 Introduction

This Chapter of the Environmental Report examines the potential impacts and effects of the Proposed Scheme during its construction, operational and maintenance phases.

The chapter provides a description for the methodology of the assessment followed by a description of the relevant baseline conditions of the Proposed Scheme's footprint and the surrounding area. The baseline is used to identify the relevant Important Ecological Features (IEFs). An assessment of the potential impacts and effects of the Proposed Scheme on the IEFs during construction, operation and maintenance is then completed and any required avoidance, minimisation or mitigation measures identified.

9.2 Assessment Methodology

9.2.1 Relevant Guidelines, Policy and Legislation

This Chapter has been prepared to ensure that the Proposed Scheme is consistent with the relevant legislative protections for habitats and species in Ireland. These include the following legislation:

- EU Habitats and Birds Directive; as transposed into Irish law via the European Communities (Birds and Natural Habitats Regulations 2011 (as amended);
- Wildlife Act 1976 (as amended) and Wildlife (Amendment) Act 2000 (as amended);
- Planning and Development Acts 2000 (as amended); and
- Flora (Protection) Order, 2022

Consideration has been given to the National, County and Regional-level planning policy and those considered relevant to the assessment are presented in **Appendix 9.1A (Relevant Guidelines, Policy and Legislation)**.

9.2.2 Study Area and Zone of Influence

The ecological study area is determined by the potential Zone of Influence (Zoi) of the Proposed Scheme. The Zoi for a Proposed Scheme is the area over which ecological features may be subject to significant impacts as a result of the Proposed Scheme and associated activities.

The Zoi is likely to extend beyond the boundary of a development, for example where there are hydrological links extending beyond the site boundaries. Activities associated with the construction and operational and maintenance phases should be separately identified (where relevant) (CIEEM, 2018).

The Zoi will vary for different ecological features depending on their sensitivity to an environmental change. It is therefore appropriate to identify different Zois for different features. The features affected could include habitats, species, and the processes on which they depend. Zois are specified for different features, and types of potential impact.

It is also important to acknowledge that the absence of a designation or documented feature does not mean that no such feature exists within the site. As such, Zoi should be identified for all features potentially occurring within the site of the Proposed Scheme, in addition to any known to occur. As recommended by CIEEM (2018), professionally accredited or published studies, as well as professional judgement, were used to determine Zoi for this Proposed Scheme.

Through the incorporation of relevant Zois for the Proposed Scheme, the ecological study area is determined to extend outside of the footprint of the Proposed Scheme, to include the ecological features as set out in **Table 9.1**.

Table 9.1: Study Area and Zone of Influence for different Ecological Features

Ecological Features	Study Area for Desk Study	Zone of Influence Identified
Sites designated for nature conservation	Catchment Management Unit, groundwater body, and Dublin Bay	All sites with connectivity to the Proposed Scheme
Otter	5 km	Up to 150 m along suitable watercourses
Badger	5 km	Up to 150 m from the redline boundary of the Proposed Scheme
Bats	5 km	Redline boundary of the Proposed Scheme and adjoining habitats
Breeding Birds	5 km	Redline boundary of the Proposed Scheme and adjoining habitats
Other protected mammals	5 km	Redline boundary of the Proposed Scheme and adjoining habitats
Groundwater dependant fauna	Dublin Groundwater Body (GWB)	Redline boundary of the Proposed Scheme and adjoining habitats
Groundwater dependant habitats	Dublin GWB	Redline boundary of the Proposed Scheme and adjoining habitats
Habitats, rare, threatened and protected flora, and invasive alien plant species.	5 km	Redline boundary of the Proposed Scheme and adjoining habitats

9.2.3 Sources of Information to Inform the Assessment

9.2.3.1 Desk Study

Relevant information within the biodiversity study area was collected through a detailed desktop review in July 2024, of existing studies and datasets. Sources of information that were used to inform the desk study assessment included:

- Environmental Protection Agency (EPA) online interactive mapping tool¹³;
- Information on ranges of species populations and habitats in Volume 1, 2 and 3 of NPWS' Status of EU Protected Habitats and Species in Ireland (NPWS, 2019 a, b, c);
- Information on ranges of bird populations from Bird Atlas 2007–11 (Balmer *et al.*, 2013), excluding birds of prey whose ranges were determined with reference to Hardey *et al.* (2013);
- Mapping of designated sites for nature conservation for relevant sites in County Dublin, County Kildare, and beyond, as relevant, available online from the NPWS;
- Distribution records for protected species and habitats (including suitability index for bats) held online by the National Biodiversity Data Centre (NBDC)¹⁴, NPWS¹⁵, Heritage Council¹⁶ and Doogue *et al.* (1998);
- Checklists of protected and threatened species in Ireland (Nelson *et al.*, 2019);
- Red lists for rare and threatened Irish species (Curtis and Gough, 1998; Fitzpatrick *et al.*, 2006; Marnell *et al.*, 2009; Regan *et al.*, 2010; King *et al.*, 2011; Clarke *et al.*, 2016; Wyse Jackson *et al.*, 2016; Marnell *et al.*, 2019; Gilbert *et al.*, 2021);

¹³ Available online at: <https://gis.epa.ie/EPAMaps/default>. Accessed June 2024.

¹⁴ Assessing records up to 10 years old (from date of search), for an area of 5 km from the proposed Project site. Available online at: <https://maps.biodiversityireland.ie/Map>. Accessed 27 June 2024.

¹⁵ Available online at: <https://dahg.maps.arcgis.com/apps/webappviewer/index.html?id=71f8df33693f48edbb70369d7fb26b7e>. Accessed 1 July 2024.

¹⁶ Available online at: <https://www.heritagemaps.ie/WebApps/HeritageMaps/index.html>. Accessed 1 July 2024.

- Surface and ground water quality status data, and river catchment boundaries available from the online database of the EPA;
- National and regional surveys of semi-natural habitats, including grasslands (O'Neill *et al.*, 2013), saltmarsh (McCorry and Ryle, 2009; Devaney and Perrin, 2015), and woodland (Perrin *et al.*, 2008); and
- Boundaries for catchments with confirmed or potential freshwater pearl mussel (FWPM) *Margaritifera* populations in GIS format available online from the NPWS (NPWS, 2020).

9.2.3.2 Field Surveys

To inform the assessment, detailed field surveys were undertaken by qualified professional ecologists between 2020 and 2024, as outlined in **Table 9.2**. Detailed surveys were identified following the completion of preliminary ecological site assessment surveys. All field surveys were undertaken using professional interpretation and application of the guidance, systems, and methods referred to in the text describing each survey. Reference was also made to the NRA's Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Developments (NRA, 2009a) in relation to appropriate survey seasons and methods for relevant protected species.

Complete detailed methods for each field survey are available in **Appendix 9.1B (Detailed Methods for Field Surveys)**.

Table 9.2: Summary of Field Surveys Completed

Field survey focus	Extent of survey	Overview of survey	Surveyors	Survey date(s)
Preliminary ecological site appraisal	Extent of proposed scheme	Preliminary ecological site appraisal	RPS Ecology	July 2021
Habitats	Extent of Proposed Scheme and environs	Habitat classification to Fossitt (2000)	RPS Ecology	June 2023, April/May 2024, April 2025
Protected Flora	Extent of Proposed Scheme and environs	Assessment of potential for species listed in Flora (Protection) Order 2022, and Red Lists (Wyse Jackson <i>et al.</i> , 2016; Lockhart <i>et al.</i> , 2012)	RPS Ecology	June 2023, April/May 2024, April 2025
Invasive alien plants and animals	Extent of Proposed Scheme and environs	Identification of Third Scheduled species of European Communities (Birds and Natural Habitats) Regulations 2011 (as amended)	RPS Ecology	June 2023, April/May 2024, April 2025
Bats – suitability for roosting, commuting and foraging habitats	Extent of Proposed Scheme and environs	2022 suitability assessments completed with cognisance of the Bat Surveys for Professional Ecologists: Good Practice Guidelines (3 rd edition) (Collins, 2016). 2024 suitability assessments completed with cognisance of the 4 th edition of these guidelines (Collins, 2023).	RPS Ecology	May 2022, April/May 2024
Bats – aerial inspection survey	Trees assessed as Moderate during ground-level assessment.	Tree climbing was carried out by ecologists with cognisance of the 4 th edition of these guidelines (Collins, 2023)	RPS Ecology	August 2024
Bats – internal building inspection	Structure assessed as having moderate suitability for roosting bats	Internal building inspection was carried out by ecologists with cognisance of the 4 th edition of these guidelines (Collins, 2023)	RPS Ecology	July 2024

Section 177AE Environmental Report

Field survey focus	Extent of survey	Overview of survey	Surveyors	Survey date(s)
Bats – emergence/re-entry surveys	2022: trees identified as having moderate or higher roosting suitability. 2024: a building identified as having roosting suitability.	2022 surveys completed with cognisance of the Bat Surveys for Professional Ecologists: Good Practice Guidelines (3 rd edition) (Collins, 2016). 2024 surveys completed with cognisance of the 4 th edition of these guidelines (Collins, 2023).	RPS Ecology	August 2022, August/September 2024
Bats – activity	Bat activity transects covered the extent of Proposed Scheme and environs. Static bat detector surveys were at a single location on each bank of the Liffey in 2022. Updated static bat detector surveys were carried out in 2025 at a single location on each bank of the Liffey and 2 additional locations were monitored along the Scheme.	Activity assessments completed with cognisance of the Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2016) and the Bat Mitigation Guidelines for Ireland (Marnell <i>et al.</i> , 2022)	RPS Ecology	May to September 2022 April to August 2025
Badger	Site specific locations as identified during preliminary walkover. Potential sett entrances investigated with trail cameras.	Assessment for evidence of sett entrances and field signs (e.g., scat, hair, trails, prints and snuffle holes). Trail cameras deployed at potential sett entrances; for 10 weeks at one entrance and 5 weeks at another.	RPS Ecology	May 2022, April/May 2024. Trail cameras: July/August 2024
Otter	Site specific locations as identified during preliminary walkover.	Assessment for evidence of holts and field signs (e.g., spraint, slides, trails, prints, and couch).	RPS Ecology	May 2022, April/May 2024
Aquatic (Freshwater Ecology survey)	All watercourses crossed by the proposed project.	Survey included an assessment of the physical and physiochemical condition of the river, while also assessing for any potential mammal signs. Macroinvertebrate sampling was completed as well as an assessment of any potential fish and crayfish habitat.	RPS Ecology	June 2023 and June 2025
Breeding Birds	Predetermined transect following Proposed Scheme layout, commencing at the North of the Proposed Scheme at the R403 and concluding at the culmination of the Proposed Scheme at the R405.	Identification of calls, sightings, and breeding behaviours during timed walked transect.	Veale Ecology Ltd. RPS Ecology	April to June 2022, April/May 2024

Field survey focus	Extent of survey	Overview of survey	Surveyors	Survey date(s)
Kingfisher	The River Liffey.	Identification of calls, sightings, and breeding behaviours during timed vantage points	Veale Ecology Ltd.	April to June 2022,
			RPS Ecology	April/May 2024
Barn owl	Site specific location (buildings located in Simmonstown Stud) as identified during preliminary walkover	Identification of calls, sightings, and breeding behaviours during timed vantage points	RPS Ecology	April, May and July 2023

On the basis of the results of the surveys carried out to inform the baseline environment (desk study and field surveys), and through the assessment of the likely significant effects on ecological receptors, the following surveys were not deemed necessary to inform the baseline:

- Amphibians and reptiles. No significant habitat present within the Zol of the Proposed Scheme for significant populations of protected amphibian and reptile species to occur;
- Terrestrial invertebrates. No significant habitat present within the Zol of the Proposed Scheme for significant populations of protected terrestrial invertebrate species to occur;
- Freshwater pearl mussel (FWPM) (*Margaritifera margaritifera*). There are no records of this species within the subcatchments of the Proposed Scheme or any downstream subcatchments. The only *Margaritifera* sensitive area within the same catchment (i.e. Liffey and Dublin Bay) is in the King's[Liffey]_SC_010 subcatchment within the Wicklow Mountains, upstream of Poulaphouca Dam and approximately 82 km upstream of the Project.
- Mammals (red squirrel (*Sciurus vulgaris*), Irish stoat (*Mustela erminea hibernica*), pine marten (*Martes martes*), and deer species) – no significant habitat present within the Zol of the Proposed Scheme for significant populations of these mammal species to occur; and
- Mammals (pygmy shrew (*Sorex minutus*), Irish hare (*Lepus timidus hibernicus*), hedgehog (*Erinaceus europaeus*)) – habitat is present within the Zol of the Proposed Scheme to support populations of these mammal species. Although it is assumed that these species are likely to occur within the footprint and environs of the Proposed Scheme, they are deemed to occur in low numbers and are unlikely to be significantly negatively impacted by the likely effects.
- Wintering birds – dedicated surveys for wintering birds were not deemed necessary due to habitat suitability and results from the desk study.

9.2.4 Impact Assessment Methodology

The following guidance documents have also been incorporated into the assessment methodology:

- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine, Version 1.2 (CIEEM, 2018); and
- Guidelines for Assessment of Ecological Impacts of National Roads Schemes, Revision 2 (NRA, 2009b).

For the purposes of this impact assessment process on biodiversity, the CIEEM (2018) guidelines have been used for the basis of the assessment. The process takes cognisance of the EPA (2022) guidelines and incorporates NRA (2009b) guidelines for the ecological valuation and geographic context.

9.2.4.1 Important Ecological Features (IEFs)

Having defined the relevant baseline conditions within the Zol of the Proposed Scheme, ecological features therein are valued, in advance of commencing the assessment of potential impacts.

The methodology used to value ecological features takes cognisance of the relevant principles underpinning impact assessment under the EPA (2022) guidelines; however, it also has regard for the geographic frames of reference outlined by the NRA (2009b). The geographic frames of reference outlined by the NRA (2009b) are employed in this assessment.

It is possible that features which are in and of themselves of negligible ecological value (e.g. improved grassland of negligible floristic value) may be of high value in the resource they provide to other features (e.g. a significant resource of invertebrates breeding in the grasslands, which are an important food for local badgers). In some cases, therefore, habitats and species of negligible value may nevertheless be considered of greater importance due to their value to protected species.

'Important Ecological Features', as termed in CIEEM (2018), are defined here as those ecological features which are valued at Local Importance (Higher Value) or above (NRA, 2009b). Ecological features below this value are not carried forward to impact assessment.

9.2.4.2 Ecological Impact Assessment Process

The impact assessment process, as described by CIEEM (2018), involved:

- Identifying and characterising impacts and their effects;
- Incorporating measures to avoid and mitigate negative impacts and effects;
- Assessing the significance of any residual effects after mitigation;
- Identifying appropriate compensation measures to offset significant residual effects; and
- Identifying opportunities for ecological enhancement.

The assessment comprises the review of the baseline data gathered and the identification of IEFs with features valued on available information/guidance and using professional ecological judgement.

9.2.5 Key Parameters for Assessment

The activities that have potential to result in likely significant effects on ecological receptors are outlined below:

Construction phase

The key activities which have potential to result in likely significant effects on ecological receptors during the construction phase are:

- Site clearance and enabling works including the removal of vegetation and trees;
- Demolition of the existing buildings;
- Earthworks and construction activities including the construction of the proposed road infrastructure, bridge, drainage, lighting, compounds, and associated infrastructure;
- Surface water run-off during construction, with potential to carry suspended silt or contaminants into local watercourses and associated habitat deterioration effects upon terrestrial habitats;
- Earthworks with potential for changes to groundwater quality, yield and/or flow paths;

Operational and maintenance phase

The key activities which have potential to result in likely significant effects on ecological receptors during the operational and maintenance phase are:

- Operational activities including the maintenance of the road and lighting;
- Operational and maintenance site drainage carrying suspended silt or contaminants into local watercourses with potential to carry suspended silt or contaminants into local watercourses;
- Increased activity in the form of road users (vehicles, cyclists, and pedestrians).

Impact categories

The impact categories assessed within the assessment are set out as follows:

- Biodiversity loss, fragmentation, and alteration;
- Disturbance from noise, vibration, lighting, and human presence;

- Pollution to water, air, and/or soil; and
- Spread of invasive alien species.

9.2.6 Assessment Criteria and Significance

Impact on IEFs are characterised with the following qualitative terms, as relevant (CIEEM, 2018):

- **Positive or Negative (adverse).** Positive and negative (adverse) impacts and effects were determined according to whether the change is in accordance with nature conservation objectives and policy:
 - positive – a change that improves the quality of the environment e.g., by increasing species diversity, extending habitat or improving water quality. This may also include halting or slowing an existing decline in the quality of the environment.
 - Negative (adverse) – a change which reduces the quality of the environment e.g., destruction of habitat, removal of foraging habitat, habitat fragmentation, pollution.
- **Extent.** The extent is the spatial or geographical area over which the impact/effect may occur under a suitably representative range of conditions (e.g. noise transmission under water).
- **Magnitude.** Magnitude refers to size, amount, intensity and volume. It was quantified if possible and expressed in absolute or relative terms (e.g. the amount of habitat lost, percentage change to habitat area, percentage decline in a species population).
- **Duration.** Duration was defined in relation to ecological characteristics (such as the lifecycle of a species) as well as human timeframes. For example, five years, which might seem short-term in the human context or that of other long-lived species, would span at least five generations of some invertebrate species.
- **Frequency and Timing.** The number of times an activity occurs will influence the resulting effect. For example, a single person walking a dog will have very limited impact on nearby waders using wetland habitat, but numerous walkers will subject the waders to frequent disturbance and could affect feeding success, leading to displacement of the birds and knock-on effects on their ability to survive. The timing of an activity or change may result in an impact if it coincides with critical life-stages or seasons e.g. bird nesting season.
- **Reversibility.** An irreversible effect is one from which recovery is not possible within a reasonable timescale or there is no reasonable chance of action being taken to reverse it. A reversible effect is one from which spontaneous recovery is possible or which may be counteracted by mitigation.

There may be any number of possible impacts on IEFs arising from a project. However, it is only necessary to describe in detail the impacts that are likely to be significant. Impacts that are either unlikely to occur, or if they did occur are unlikely to be significant, are scoped out. If in doubt, the precautionary principle is applied, and the potential impact will be assessed.

When assessing the significance of an effect and for the purposes of this assessment, the significance of an effect is simply any effect that is sufficiently important to require assessment and reporting so that the decision maker is adequately informed of the environmental consequences of permitting a project. For the purposes of ecological impact assessment, a “significant effect” is defined as an effect that either supports or undermines the biodiversity conservation for the IEF. These significant effects are qualified with reference to an appropriate geographical scale.

The approach to determining significance does not utilise a matrix of degrees of impact significance (such as EPA (2022)), but instead follows the industry standard for ecological impact significance (CIEEM, 2018) where impacts/effects are determined to be ‘significant’ or ‘not significant.’

9.2.7 Data Limitations

9.2.8 Desk Study

Sources of desk study information are neither exhaustive nor necessarily easily available, and an extensive effort was made to obtain ecological data in the public domain to inform the description of the baseline environment and its assessment. Additional information, not in the public domain, is likely to exist, but could

not be obtained or assessed here. This limitation is acknowledged and incorporated into the assessment and is deemed to not affect the certainty or predictability of the assessment.

9.2.9 Field Surveys

The receiving environment (i.e. baseline condition) may naturally vary through seasons and between years (NRA, 2009a). All reasonable effort has been made to address this (e.g. combined use of desk and field survey data), and the limitation is acknowledged. Once incorporated into the assessment the limitation is deemed to not affect the certainty or predictability of the assessment.

9.2.9.1 Bats

Assessment of trees within privately owned gardens east of the R405 was not possible due to accessibility. To reduce any deficiency in the baseline, assessments were carried out using binoculars from the R405. These trees are not proposed for removal but may be within the zone of influence of the Proposed Scheme. As a result, a precautionary approach has been applied to the impact assessment when considering bats in these trees. This limitation is acknowledged and incorporated into the assessment and is deemed to not affect the certainty or predictability of the assessment.

For the internal building inspection on St. John of Gods land, access to the building was restricted to a one-hour timeframe. As a result, the entirety of the building could not be thoroughly internally surveyed. The most likely potential entrances and roosting features were prioritised in the inspection. Access to the lands surrounding the building in St John of Gods property could not be granted for the August emergence survey, so vantage points from the neighbouring service station property were used, providing incomplete coverage of the building. Complete coverage of the building was obtained during the September survey. These limitations are accounted for in the preliminary roost assessment. As a result, a precautionary approach has been applied to the impact assessment when considering bats in this structure.

Two bat detectors were deployed and were rotated on a fortnightly basis across 4 survey locations for the static bat detector survey period in 2025 (April to August 2025). During the survey period, one static bat detector was stolen and resulted in a loss of data. Further monitoring of this location was discontinued due to concerns over the security of the equipment. This data loss limitation is acknowledged and incorporated into the assessment and is deemed to not affect the certainty or predictability of the assessment.

9.2.9.2 Badger and Otter

Certain areas within 150 m of the Proposed Scheme, notably lands east of the R405 and a parcel of land on the south bank of the Liffey approximately 100 m upstream of the proposed crossing, were not accessible for assessment. To reduce any deficiency in the baseline, assessments were carried out using binoculars from accessible lands in-combination with assessment of potentially suitable habitats using satellite imagery. As a result, a precautionary approach has been applied to the impact assessment when considering badger and otter in these areas. This limitation is acknowledged and incorporated into the assessment and is deemed to not affect the certainty or predictability of the assessment.

9.3 Description of Receiving Environment

9.3.1 Designated Sites for Nature Conservation

The Proposed Scheme is not located within or adjoining any internationally or nationally designated sites for nature conservation. Designated sites for nature conservation within the Study Area (i.e. sites within the Dublin GWB, the Liffey and Dublin Bay catchment, or within Dublin Bay) are detailed in **Appendix 9.1C (Designated Sites for Nature Conservation)**, refer to **Figure 9-1**.

The closest nationally designated site for nature conservation to the Proposed Scheme is the Grand Canal pNHA (site code 002103), located approximately 680 m south-east. The closest internationally designated site is the Rye Water Valley/Carton SAC (site code 001398), located approximately 4.7 km north of Proposed Scheme.

A report to inform screening for Appropriate Assessment been prepared to assess the potential for likely significant effects on European sites arising from the Proposed Scheme and it has been concluded that there is potential for likely significant effects. As such, a Natura Impact Statement (NIS) has also been prepared to

support the planning application for the Proposed Scheme. The NIS is provided under separate cover. The contents of this chapter should be read in conjunction with the content of the NIS including the proposed mitigation measures contained within the NIS, FRA and CEMP.

9.3.2 Habitats

Habitats which fall outside of the proposed works area (i.e. the area in which temporary and/or permanent works are proposed) have been mapped to a 50 m buffer using a combination of field survey data and assessment of satellite imagery. The Proposed Scheme and adjoining area predominantly consist of habitats associated with agriculture, commercial development and residential development.

The dominant habitat within the footprint of the Proposed Scheme is improved agricultural grassland (GA1). The proposed Scheme between the R405 and Newtown Road passes through agricultural land predominantly consisting of fields of improved agricultural grassland (GA1). The Proposed Scheme also passes through numerous hedgerows (WL1), drainage ditches (FW4), including one with flowing water classifying it as a depositing watercourse (FW2), and treelines (WL2).

To the north-west of the Newtown Road, the Proposed Scheme passes through a stone wall (BL1), a hedgerow (WL1), an area of GS2 dry meadows and grassy verges and riparian woodland (WN5) before passing over the River Liffey (FW2 depositing/lowland river). There is also an area of grassland adjacent to this section of the Proposed Scheme that is a matrix of GS4 wet grassland and GS2 dry meadows and grassy verges.

North of the River Liffey the Proposed Scheme passes through an area of riparian woodland (WN5), amenity grassland (improved) (GA2), GS2 dry meadows and grassy verges, a hedgerow (WL1) and a small area of dry calcareous and neutral grassland (GS1) and scrub (WS1). North of this area, it passes through an area of buildings and artificial surfaces (BL3) and a matrix of recolonising bare ground (ED3), horticultural land (BC2) and flower beds and borders (BC4). North of this area, it passes through hedgerows (WL1), scrub (WS1) and GS2 dry meadows and grassy verges.

Similar habitats were recorded outside of the boundary of the Proposed Scheme, dominated by agriculture and commercial and residential development.

Habitats identified within the Proposed Scheme area are detailed and illustrated in **Appendix 9.1D (Results – Detailed Habitat Descriptions)**, refer to **Figure 9-2**. Habitats have been classified according to the Irish national standard (Fossitt, 2000). These habitats within the permanent and temporary land acquisition boundaries are detailed in **Table 9.3**.

Table 9.3: Areas of Habitats on site

Habitat Type (Fossitt Code)	Area (ha) or length (m) of habitat*	
	Scheme boundary	Acquisition boundary
BC2 Horticultural land / BC4 Ornamental flower beds and borders / ED3 Recolonising bare ground	0.30 ha	0.30 ha
ED3 Recolonising bare ground	0.03 ha	0.03 ha
BC3 Tilled land	none	none
BL1 Stone walls and other stonework	115 m	145 m
BL3 Buildings and artificial surfaces	1.2 ha	1.2 ha
GA1 Improved agricultural grassland	7.7 ha	7.7 ha
GA2 Amenity grassland (improved)	0.62 ha	0.62 ha
GS2 Dry meadows and grassy verges	0.51 ha	0.51 ha
GS4 Wet grassland	none	none
WL1 Hedgerows	845 m	855 m
WL2 Treelines	185 m	415 m
WL1/WL2	100 m	100 m
WS1 Scrub	0.14 ha	0.14 ha
WS1 Scrub / GS1 Dry calcareous grassland	0.09 ha	0.09 ha
WN5 Riparian woodland	0.36 ha	0.58 ha
WD1 (Mixed) broadleaved woodland	0.06 ha	0.10

Habitat Type (Fossitt Code)	Area (ha) or length (m) of habitat*	
	Scheme boundary	Acquisition boundary
WD3 (Mixed) conifer woodland	0.43 ha	0.43 ha
FW2 Depositing/lowland rivers	150 m	200 m
FW4 Drainage ditches	610 m	610 m

*Approximate values.

9.3.3 Flora

NBDC records of protected or red-listed species are detailed in **Appendix 9.1F (NBDC Desk Study Results**, refer to **Table 9.4)** and a summary is provided below.

No protected flora (i.e. Flora (Protection) Order 2022 and Annex II species protected under the Habitats Directive) or flora species of conservation concern (i.e. red lists for vascular plants and bryophytes), were noted from the field study. Four rare and threatened flora species were noted in the desk study as occurring within the potential Zol of the Proposed Scheme. The latest and closest record of Hairy St John's-wort (*Hypericum hirsutum*) was in an area of riparian broadleaf woodland just downstream of the Leixslip Reservoir and approximately 4.5 km downstream of the Proposed Scheme. Other records of near threatened species were typically associated with habitats along the River Liffey or along the Grand Canal. There were numerous NPWS records of green figwort (*Scrophularia umbrosa*) along the north bank of the Liffey approximately 1.2 km to 2.4 km downstream of the Proposed Scheme.

9.3.4 Invasive Alien Plant Species

The NBDC records of IAPS within 5 km of the Proposed Scheme are detailed in **Appendix 9.1F** (refer to **Table 9.3**). Four 'Scheduled' Invasive Alien Plant Species (IAPS) were returned from the NBDC data search: Nuttall's waterweed (*Elodea nuttallii*), Himalayan balsam (*Impatiens glandulifera*), Japanese knotweed (*Reynoutria Japonica*) and three-cornered garlic (*Allium triquetrum*).

The 'Scheduled' species observed during field surveys were Himalayan balsam, Japanese knotweed, Spanish bluebell (*Hyacinthoides hispanica*) and waterweed (*Elodea* sp.). All observations were either within 50 m of the River Liffey or to the north of the Liffey. Further details on the IAPS observed during field surveys are detailed in **Appendix 9.1E (Results – Invasive Alien Plant Species)**.

9.3.5 Hydrology and Hydrogeology

9.3.5.1 Surface Water

The Proposed Scheme falls within the Liffey and Dublin Bay Water Framework Directive (WFD) catchment (WFD ID: 09). It falls within the subcatchments Liffey_SC_050 (ID: 09_7) on the north side of the River Liffey and Liffey_SC_070 (WFD ID: 09_14) on the south side of the Liffey. The majority of the Proposed Scheme falls within the river sub basin LIFFEY_140 (WFD ID: IE_EA_09L011700). A very small proportion of the Proposed Scheme at the south-eastern end falls within the Liffey_SC_090 subcatchment (WFD ID: 09_15) and the Castletown (Dublin-Kildare) 010 river sub basin (WFD ID: IE_EA_09C500830).

The Proposed Scheme crosses the River Liffey and Loughlinstown Stream in the stud farm. Both of these are within the Liffey_140 WFD river waterbody (WFD ID: IE_EA_09L011700). The WFD 2016-2021 status of this waterbody was 'good' and it is classified as 'not at risk' of failing to meet 2027 WFD objectives. The quality was also 'good' during the latest assessment in 2022 at the 'Br in Cellbridge' monitoring station approximately 650 m downstream of the proposed bridge. At the south-eastern end, the Proposed Scheme is approximately 70 m from the Castletown (Dublin-Kildare) 010 stream (WFD ID: IE_EA_09C500830), which had a 2016-2021 WFD status of 'poor' and its risk of failing to meet WFD objectives is under review. The Proposed Scheme crosses an unnamed stream approximately 250 m west of the R405. Historical OS maps were used to determine the path of this stream, which flows for approximately 2.2 km before flowing into the River Liffey to the north. The Proposed Scheme also crosses a drainage ditch which is connected to this stream both upstream and downstream of the Proposed Scheme and runs along the western side of the R405.

Surface water features and their WFD statuses downstream of the Proposed Scheme are mapped in **Appendix 9.1G** (refer to **Figure 9-7**).

9.3.5.2 Groundwater

The Proposed Scheme is within the Dublin WFD groundwater body (WFD ID: IE_EA_G_008). The WFD 2016-2021 status of this waterbody was 'good' and its risk of failing to meet 2027 WFD objectives is under review. The majority of the Proposed Scheme is within an area of moderate groundwater vulnerability. However, in the vicinity of the River Liffey and north of the Liffey, the groundwater vulnerability is high. The Geological Survey Ireland (GSI) Dublin GWB characterisation (GSI, no date) states that, in general, groundwater flow within the GWB is towards the coast, River Liffey or Dublin City. Flow paths from recharge to discharge are typically less than a kilometre.

9.3.5.3 Flooding

A search of the flood maps for the Republic of Ireland developed by the Office of Public Works (OPW) was carried out to obtain information on the flood history of the study area. The eastern half of the Proposed Scheme is in an area in which flood risk is under review. However, the area of the Proposed Scheme east of the L5052 has been subject to widespread and severe historic flooding. Where the Proposed Scheme crosses the River Liffey, the extent of potential flooding is limited in area, but at the eastern edge of the proposed river crossing, the potential flooding does extend significantly beyond the banks of the Liffey.

9.3.6 Aquatic Ecology

The WFD waterbodies, waterbodies observed during field surveys, and aquatic survey locations are mapped in **Appendix 9.1G** (refer to **Figure 9-8**). The NBDC desk study data search identified the presence of freshwater white-clawed crayfish within the Study Area of the Proposed Scheme. There is a 2016 record in the River Liffey at the 'Br in Cellbridge' monitoring station approximately 650 m downstream and other records approximately 8.5 km upstream. There were no records within the streams that the Proposed Scheme crosses.

A 2021 survey of the fish community of the middle reaches of the Liffey (Leixlip to Poulaphouca Dam) found that brown trout (*Salmo trutta*) was typically the dominant species, with salmon (*Salmo salar*; EU Habitats Directive Annexes II & V and 'Vulnerable' in Ireland), lamprey sp. (EU Habitats Directive Annexes II), minnow (*Phoxinus phoxinus*), stone loach (*Barbatula barbatula*), pike (*Esox lucius*), perch (*Perca fluviatilis*), roach (*Rutilus rutilus*; S.I. 477 invasive species), three-spined stickleback (*Gasterosteus aculeatus*), gudgeon (*Gobio gobio*) and European eel (*Anguilla anguilla*; critically endangered in Ireland) also present (Delanty et al., 2022). Brown trout and salmon also spawn in the main channel.

The Proposed Scheme is downstream of a Margaritifera sensitive area. 'Liffey - Kings' is a catchment of extant populations of FWPM not associated with an SAC. It is approximately 82 km upstream of the Proposed Scheme and also upstream of Poulaphouca Dam. Because juvenile salmonids are the host species of FWPM during its larval phase, impacts on migrating salmonids can impact the FWPM catchment. The Proposed Scheme can potentially affect downstream migrating salmonids. However, because Poulaphouca Dam is impassable to migrating salmon (Delanty et al., 2022), there is no impact pathway from the Proposed Scheme to the FWPM catchment.

The aquatic survey results for the three surveyed sites in 2023 and updated surveys in 2025 are presented in **Appendix 9.1G**. The ecological baseline between 2023 and 2025 remained similar between survey years at all three sites surveyed (notwithstanding the slight temporal variability between survey years). A summary of the changes in the baseline is provided below.

At Site 1, the number of aquatic macroinvertebrate taxa recorded was comparable between survey years (24 taxa in 2023, 21 in 2025). Fish observations included three-spined stickleback and lamprey ammocoetes in 2023; however, only three-spined stickleback were recorded in 2025. Salmonid spawning was rated 'none' in both surveys, due to unsuitable substrate and water depth, while adult salmonid habitat remained 'good', supported by sufficient water depth and instream refugia. Lamprey nursery habitat was consistently rated as 'very good' in both survey years. Crayfish habitat was similarly rated as 'very good' in both years, as a result of overhanging and instream vegetation, leaf litter and suitable refugia.

At Site 2, the number of aquatic macroinvertebrate taxa recorded declined slightly between survey years (16 taxa in 2023, 12 in 2025). Three-spined sticklebacks were present in both years. Habitat suitability for all salmonid life stages was assessed as unsuitable. Lamprey spawning habitat suitability was also assessed as unsuitable; however, lamprey nursery habitat was rated as 'poor' in both years. Crayfish habitat was

considered 'good' in 2023; however, was rated as 'none-poor' in 2025 due to the excessive growth of instream vegetation.

Site 3 on the Simmonstown Stud stream was dry in both survey years. As a result, there were no physico-chemical or instream habitat available from either survey year. An aquatic macroinvertebrate sample was again not collected in 2025 and there was no potential for salmonids, lamprey, crayfish or eels at any life stage at the site surveyed. The surrounding land use and riparian vegetation remained consistent between survey years.

9.3.7 Fauna

9.3.7.1 Bats (Commuting and Foraging)

The NBDC records of bat species within 5 km of the Proposed Scheme are detailed in **Appendix 9.1F**, (refer to **Table 9.6**).

Habitats in the surrounding area were classified as being of high value to commuting and foraging bats. The NBDC maps landscape suitability for bats based on Lundy et al. (2011). The map provides a habitat suitability index which ranges from 0 to 100, with 0 being least favourable and 100 most favourable for bats.

The Suitability of the Study Area for Bat Species (based on NBDC data) is detailed in **Appendix 9.1F**, (refer to **Table 9.5**). The Proposed Scheme is within two areas of assessment and the overall assessment of habitat suitability at the west end was 33 and at the east was 29.78. The riparian and broadleaf woodland habitat around the River Liffey is a particularly favoured habitat.

Bat Activity Transect Surveys

Bat activity transects were walked in May 2022, June 2022 and September 2022. Data from the bat activity transects indicate that the site offers a foraging and commuting resource for soprano pipistrelle (34.1% of passes), Leisler's bat (31.2% of passes) and common pipistrelles (25.0% of passes), with relatively few records of *Myotis* (three passes) and brown long-eared bat (two passes).

The full detail and results of the bat activity transect surveys can be found within **Table 9.10** and **Table 9.11** in **Appendix 9.1G (Results – Fauna)**.

Bat Activity Static Detector Surveys 2022

Static bat detector surveys were at a single location on each bank of the Liffey in 2022. A total of four bat species (Leisler's bat, Nathusius' pipistrelle, common pipistrelle and soprano pipistrelle) were identified foraging and/or commuting in the vicinity of the static detector deployment locations in 2022. In addition, unidentified *Myotis* species and *Pipistrellus* species were also recorded.

The full detail and results of the bat activity static detector surveys can be found within **Table 9.12**, **Table 9.13**, and **Figure 9-4** in **Appendix 9.1G**. Detectors were deployed and recording for 81 nights (North Bank River Liffey) and 70 nights (South Bank River Liffey) between May and September 2022.

Bat Activity Static Detector Surveys 2025

Updated static bat detector surveys were carried out in 2025 at a single location on each bank of the Liffey as per the 2022 surveys. Two additional locations were also monitored along the Scheme.

A total of five bat species (Leisler's bat, Nathusius' pipistrelle, common pipistrelle, soprano pipistrelle and Brown long-eared bat) were identified foraging and/or commuting in the vicinity of the static detector deployment locations. In addition, unidentified *Myotis* species and *Pipistrellus* species were also recorded.

The full detail and results of the bat activity static detector surveys can be found within **Table 9.14**, **Table 9.15A** and **Table 9.15B**, and **Figure 9-4** in **Appendix 9.1G**.

9.3.7.2 Bats (Roosting)

Structures – Preliminary Roost Assessment

Of the structures proposed for removal, one was determined to have moderate suitability for roosting bats (ITM 696730, 732467). The Results of the building preliminary roost assessment are detailed in **Table 9.16** in **Appendix 9.1G**.

All other structures proposed for removal were determined to have no suitability for roosting bats.

Internal Building Inspection

An internal building inspection of the single building which was determined to have roosting potential was carried out on 08 July 2024. The observations from this inspection are detailed in **Appendix 9.1G**.

There was no definitive evidence observed to indicate use of this building by roosting bats. The likely entrances and roosting areas did not appear to be in use. As a result of the survey, a **moderate** potential roosting suitability was determined due to the low disturbance, suitable access points, and presence of roosting features. In line with guidance and with cognisance of the limitations of this preliminary roost assessment, emergence surveys were recommended.

Emergence Surveys

Emergence surveys of the single building which was determined to have roosting potential were carried out on 28 August and 23 September 2024. The dates, timing, and weather conditions for the emergence surveys are detailed in **Appendix 9.1G** (refer to **Table 9.17**).

As discussed in **Section 9.2.7**, because of access restrictions an incomplete view of the building was achieved during the August survey but a complete view was achieved during the September survey. No emergence was observed during these surveys and an extremely low level of bat activity was observed in the vicinity of the building.

Trees – Ground Level Tree Assessment

The results of the ground level tree assessment are detailed in **Appendix 9.1G** (refer to **Table 9.18**). Of the trees within or immediately adjacent to the Proposed Scheme, six trees were classified as being potential roost features for multiple bats (PRF-M) and 53 trees or tree groups were classified as being potential roost features for individual bats (PRF-I).

Trees – Emergence and re-entry Surveys

Emergence and re-entry surveys were carried out on BT17, BT27 and BT29 in 2022. The dates, timing, and weather conditions for the emergence and re-entry surveys are detailed in **Appendix 9.1G** (refer to **Table 9.19**).

Two soprano pipistrelles were observed re-entering BT17 on 16 August 2022. One common pipistrelle was observed emerging from BT27 on 18 August 2022. Approximately 20 common pipistrelles were incidentally seen emerging from BT29 during a transect survey on 8 June 2022. These surveys confirmed the presence of roosting bats in BT17, BT27 and BT29.

Tree Climbing Assessment

With the updated bat guidance advising aerial checks of all trees classified as PRF-M, six trees were identified to be climbed. Full details of the results of the Tree Climbing assessment can be found in **Appendix 9.1G** (refer to **Section 1.1**).

Of these trees, one was reassessed as 'NONE', four were reassessed as PRF-I, and one remained PRF-M). However, BT17 and BT29, which were assessed as PRF-I during the aerial survey, were confirmed to have roosting bats in 2022. No evidence of bats was recorded during this survey.

Combined Assessment

Emergence, re-entry and transect surveys confirmed roosts at BT17, BT27 and BT29. BT29 will be retained, while BT17 and BT19 BT27 are proposed for removal as part of the Proposed Scheme. 55 trees or tree groups were assessed as PRF-I in the context of both the ground level and aerial surveys. The building at St. John of Gods was assessed as having moderate roosting suitability in the context of the internal inspection, but in the context of the subsequent emergence surveys, it was not deemed to have roosting bats.

9.3.7.3 Badger

The presence of badger was noted in the NBDC data search (detailed in **Appendix 9.1F**, refer to **Table 9.3**) within the Ecological Study Area with 70 records of badger within 5 km of the Proposed Scheme. There is a 2011 record of a badger sett within the 1 km grid square that the north-western end of the Proposed Scheme is within, but the location within the 1 km grid square is not public. The closest record is approximately 200 m south-west of the southern tip of the Proposed Scheme.

Badger evidence from field surveys in 2022 and in 2024 are discussed in **Appendix 9.1G (refer to Section 1.2)**. An abundance of badger evidence was identified during the 2024 surveys. This included trails, snuffle holes, latrines, footprints and potential setts. Evidence was found throughout the length of the Proposed Scheme on both sides of the River Liffey with evidence concentrated in similar areas to those in the 2022. Several more potential setts were identified in 2024. The potential setts did not appear to be new, so it is probable that they were present in 2022, but not identified due to vegetation cover. There were seven potential setts identified during field surveys.

The locations of potential badger setts are outlined in the **Confidential Badger Appendix**, provided under separate cover. To mitigate potential for persecution risk with potential sett locations entering the public domain, these details have been provided confidentially to the Competent Authority (**Confidential Badger Appendix**) and exact locations are not detailed here.

Trail cameras were deployed at potential sett entrances. All of the seven potential setts identified during field surveys were determined to not be currently used by badger.

9.3.7.4 Otter

The NBDC desk study data search which is detailed in **Appendix 9.1F (refer to Table 9.3)** identified the presence of otter throughout the Study Area of the Proposed Scheme with 11 records of otter within 5 km of the Proposed Scheme.

Otter are a widespread species and are presumed to forage and/or commute within the surface water bodies within the Zol of the Proposed Scheme. A summary of the otter evidence from the field surveys is provided in **Appendix 9.1G (refer to Section 1.3)**. Mapped otter evidence from the 2022, 2024 and 2024 field surveys is also provided.

9.3.7.5 Other Protected Mammals

The NBDC records of protected mammal species within 5 km of the Proposed Scheme are detailed in **Appendix 9.1F (refer to Table 9.7)**.

A dead Eurasian pygmy shrew was identified in the grassland field west of the R405 and Irish hare was identified on the badger trail camera footage. Although it is assumed that the species identified in the desk study are likely to occur within the footprint and environs of the Proposed Scheme, they are deemed to occur in low numbers and are unlikely to be significantly negatively impacted by the likely effects.

9.3.7.6 Breeding Birds

The NBDC records of bird species within 5 km of the Proposed Scheme are detailed in **Appendix 9.1F (refer to Table 9.3)**. 78 bird species were recorded in the NBDC data search of which four were Annex I (Birds Directive) species, 22 were Special Conservation Interests (SCI), 21 were amber listed species and 12 were red listed BoCCI species (Gilbert et al., 2021).

The results of the bird survey are shown in **Appendix 9.1G (refer to Section 1.4)**. All survey visits were undertaken in suitable conditions, with no visits made during inclement weather that would limit the activity of birds during the surveys. The detailed methods for the field survey are provided in **Appendix 9.1B**.

Of the 44 species recorded during the surveys, 11 were regarded as confirmed breeding or probably breeding within the site. Of those 11 species, one is red listed (high conservation concern) within BoCCI (Gilbert *et al.*, 2021). While the breeding bird surveys classified swallows as non-breeding within the site, six swallow nests were incidentally recorded during the 2024 terrestrial surveys in a farm building approximately 50 m from the proposed construction compound.

The species and numbers recorded within the proposed site are typical of habitats found within urban edge/agricultural land. The red listed yellowhammer was recorded as a confirmed breeder within the site, this species has suffered population declines (hence their inclusion as birds of conservation concern) and is found only within the east and south of Ireland.

9.3.7.6.1 Kingfisher

The NBDC records are detailed in **Appendix 9.1F** (refer to **Table 9.3**) and included a record of three kingfisher observed in April 2023 approximately 4.9 km north-east of the northern end of the Proposed Scheme along the Rye River.

Kingfisher surveys were carried out in 2024 as per the methodology in **Appendix 9.1B**. The survey dates and weather conditions of the surveys are presented in **Appendix 9.1G** (refer to **Section 1.4.1**). No signs of suitable kingfisher nesting habitat were observed. However, one kingfisher was observed commuting up the Liffey on 8 July 2024.

A summary of the bird species and designations observed during the kingfisher surveys are presented in **Appendix 9.1G** (refer to **Section 1.4.1**).

9.3.7.6.2 Barn Owl

The NBDC records are detailed in **Appendix 9.1F** (refer to **Table 9.3**) and included a record of a feeding barn owl (*Tyto alba*) in September 2021 approximately 670 m south-west of the southern end of the Proposed Scheme at Hazlebatch. Barn owls are on the BoCCI red list.

The detailed methods for the field survey are provided in **Appendix 9.1B**. No signs of nesting or roosting barn owls were recorded during the site assessment visit on 17 April 2023 or on 7 August 2024. There was relatively poor suitability for nesting in any of the buildings and despite potential roosting opportunities, there was no feathers, pellets or significant liming. No barn owls were seen or heard on any of the three vantage point survey dates during the breeding season in 2023.

9.3.7.7 Amphibians and Reptiles

The presence of amphibians was noted in the data search (NBDC) detailed in **Appendix 9.1F** (refer to **Table 9.3**) within the Ecological Study Area with 33 records of common frog (*Rana temporaria*) and seven records of smooth newt (*Lissotriton vulgaris*) within 5 km of the Proposed Scheme. No significant habitat is present within the Zol of the Proposed Scheme for significant populations of protected amphibian and reptile species to occur.

9.3.7.8 Terrestrial Invertebrates

The NBDC records of protected or threatened terrestrial invertebrate species within 5 km of the Proposed Scheme are detailed in **Appendix 9.1F** (refer to **Table 9.3**).

No significant habitat is present within the Zol of the Proposed Scheme for significant populations of protected terrestrial invertebrates to occur.

9.3.7.9 Invasive Alien Animal Species

The NBDC records of IAAS within 5 km of the Proposed Scheme are detailed in **Appendix 9.1F** (refer to **Table 9.9**).

There are records of American mink (*Mustela vison*) on the River Liffey approximately 480 m downstream and 360 m upstream of the Proposed Scheme. The records of red-eared terrapin (*Trachemys scripta*) are in the Royal and Grand Canals. Although it is assumed that the species identified in the desk study (aside from red-eared terrapin) are likely to occur within the footprint and environs of the Proposed Scheme, it is not considered likely that the Proposed Scheme would contribute significantly to the spread of these species.

9.3.8 Important Ecological Features

All ecological features identified within the study area (described in **Sections 9.3.1 to 9.3.7**) for the Proposed Scheme have been identified and assessed as to whether they are considered Important Ecological Features (IEFs) to be scoped into the impact assessment.

IEFs are defined as ‘habitats, species and ecosystems, including ecosystem function and processes that may be affected, with reference to a geographical context in which they are considered important (CIEEM, 2018).

The evaluation of the ecological features and a summary of ecological features that were deemed to be IEFs and should be assessed for the listed impact categories during construction and/or operational phases of the Proposed Scheme is detailed in **Appendix 9.1H (Important Ecological Features)**. In summary, the following IEFs have been identified:

- **Designated sites for nature conservation**
 - Sites of Dublin Bay
 - Grand Canal pNHA (otter)
 - Liffey Valley pNHA
- **Habitats and flora**
 - Hedgerows
 - Riparian woodland
 - Depositing lowland rivers
- **Fauna**
 - Bats (commuting and foraging)
 - Otter
 - Common kingfisher (commuting and foraging)
 - Birds (breeding)
 - White-clawed crayfish (Pollution to water)
 - Fish (Pollution to water)

9.4 Predicted Impacts

The impact categories as identified in **Section 9.2.5** are assessed within the assessment are set out as follows:

- Biodiversity loss, fragmentation, and alteration;
- Disturbance from noise, vibration, lighting, and human presence;
- Pollution to water, air, and/or soil; and
- Spread of invasive alien species.

9.4.1 Construction Phase

A summary of the IEFs, ecological valuation, relevant impact categories assessed, characterisation of unmitigated impacts, and effects, during the construction of the proposed Project, are detailed in **Table 9.4**.

The detailed assessment of effects is provided in **Appendix 9.1I (Assessment of Effects)** and a summary is presented below.

9.4.1.1 Designated Sites for Nature Conservation

Sites of Dublin Bay

For the IEF Sites of Dublin Bay the impacts of pollution to water, air and/or soil have been assessed. Water pollution during construction may result from surface water run-off carrying suspended silt or contaminants into local watercourses (the River Liffey and its tributaries), which are connected via hydrological pathway (River Liffey) to the IEFs.

The detailed assessment is provided in **Appendix 9.1I** (refer to **Section 1.6.1.1**) and the effect of water pollution during the construction phase of the Proposed Scheme is predicted to potentially result in a **significant, short-term, and reversible adverse effect at an international geographic scale** on this IEF. Measures, as set out in **Section 9.5.3**, will be required to mitigate this effect.

Grand Canal pNHA

For the IEF Grand Canal pNHA, the impact of Biodiversity loss, fragmentation and alteration – otter has been assessed. The impact on otter associated with the pNHA during the construction phase of the Proposed Scheme has been assessed. Grand Canal pNHA is approximately 680 m from the Proposed Scheme and there is no pathway for direct impacts on in situ receptors. However, suitable potential otter habitat will be impacted by the construction phase of the Proposed Scheme. Therefore, there is potential to impact ex situ habitat which could be used by otters associated with the Grand Canal pNHA.

The detailed assessment is provided in **Appendix 9.1I** (refer to **Section 1.6.1.2**) and in the absence of mitigation, construction phase effects on the pNHA is predicted to result in a **not significant, short-term, and reversible effect** on the Grand Canal pNHA.

Liffey Valley pNHA

For the IEF **Liffey Valley pNHA**, the impacts of pollution to water, air and/or soil have been assessed. Liffey Valley pNHA is 5.8 km downstream of the Proposed Scheme. It spans an approximately 12 km long stretch of the River Liffey, adjacent riparian habitats, and other surrounding habitats. The Liffey Valley site synopsis includes the River Liffey itself and salmon. The construction phase of the Proposed Scheme can potentially adversely affect downstream aquatic habitats. Therefore, the conservation status of the aquatic habitats and species for which Liffey Valley pNHA is designated could experience adverse effects caused by upstream impacts on aquatic habitats.

The detailed assessment is provided in **Appendix 9.1I** (refer to **Section 1.6.1.3**) and in the absence of mitigation, the release of pollutants into watercourses may result in a potential **significant, short-term, and reversible adverse effect at the national geographic scale** on Liffey Valley pNHA. Measures, as set out in **Section 9.5.3**, will be required to mitigate this effect.

9.4.1.2 Habitats and Flora

Hedgerows

For the IEF WL1 Hedgerows, the impact of Biodiversity loss, fragmentation and alteration has been assessed. There is approximately 845 m of hedgerows and 100 m of hedgerow/treeline within the Proposed Scheme boundary. The majority of hedgerow is composed of native species and provide important habitat and corridors for wildlife, including terrestrial mammals, bats and birds. Almost all of the hedgerow within the Proposed Scheme boundary will be removed to accommodate the Proposed Scheme. The proposed landscape plan includes planting of standard trees (i.e. trees free of side branches to a specified height), native hedgerow and/or woodland mix along most of the length of the Proposed Scheme.

The detailed assessment is provided in **Appendix 9.1I** (refer to **Section 1.6.2.1**) and the impact of biodiversity loss, fragmentation and alteration is predicted to result in a **not significant**, medium-term, and reversible adverse effect on hedgerows.

Riparian woodland

For the IEF WN5 Hedgerows, the impact of Biodiversity loss, fragmentation and alteration has been assessed. There is approximately 0.36 ha of riparian woodland within the Proposed Scheme boundary, but approximately half of this is to be retained.

The detailed assessment is provided in **Appendix 9.1I** (refer to **Section 1.5.2.2**) and in the absence of mitigation, biodiversity loss, fragmentation and alteration is predicted to result in a significant, long-term, and partially irreversible adverse effect at the county geographic scale on riparian woodland. Measures, as set out in **Section 9.5.3**, will be required to mitigate this effect.

Depositing lowland rivers

For the IEF FW2 Depositing lowland rivers, the impacts of Biodiversity loss, fragmentation and alteration and pollution to water, air and/or soil have been assessed.

The detailed assessment provided in **Appendix 9.1I** (refer to **Section 1.6.2.3**). No instream works are proposed at the River Liffey crossing. Therefore, the only direct modification of this area of aquatic habitat will be through the shading resulting from the proposed bridge which, due to the small area, is not anticipated to significantly impact the habitat. Proposed channel modifications are the installation of a culvert at each stream crossing and the realignment of the ditch along the R405. Channel modifications will result in

the direct removal of the existing stream/drainage ditch habitats within the footprint of the Proposed Scheme. Biodiversity loss, fragmentation and alteration is predicted to result in a **not significant**, partially long-term and partially irreversible adverse effect on depositing/lowland rivers.

The impacts of pollution to water, air and/or soil have been assessed. The Proposed Scheme crosses multiple watercourses. Construction activities in the vicinity of watercourses can potentially impact the watercourses, primarily through the accidental release of pollutants. The detailed assessment provided in **Appendix 9.1I** (refer to **Section 1.6.2.3**) and in the absence of mitigation, pollution to water, air and/or soil is predicted to result in a significant, short-term, and reversible adverse effect at the national geographic scale on depositing/lowland rivers. Measures, as set out in **Section 9.5.3**, will be required to mitigate this effect.

9.4.1.3 Fauna

Bats (commuting and foraging)

For the IEF Bats (commuting and foraging) the impacts of Biodiversity loss, fragmentation and alteration; and disturbance from noise, vibration, lighting and human presence have been assessed. The detailed assessment provided in **Appendix 9.1I** (refer to **Section 1.6.3.1**).

The impacts of Biodiversity loss, fragmentation and alteration have been assessed. Construction of the Proposed Scheme will result in the loss, fragmentation and degradation of habitat currently used by bat populations for foraging and commuting. The River Liffey and its riparian woodland and surrounding habitats is a particularly high quality habitat for bat activity. The agricultural lands also provide suitable habitat for bat activity, as hedgerows and treelines provide corridors for commuting and foraging bats. Biodiversity loss, fragmentation and alteration is predicted to result in a **not significant**, medium-term, and partially irreversible adverse effect on commuting and foraging bats.

The impacts of disturbance from noise, vibration, lighting and human presence has been assessed and is predicted to result in a not significant, short-term, and reversible adverse effect on commuting and foraging bats.

Bats (roosting)

For the IEF Bats (roosting) the impacts of Biodiversity loss, fragmentation and alteration and disturbance from noise, vibration, lighting and human presence have been assessed. The detailed assessment provided in **Appendix 9.1I** (refer to **Section 1.6.3.2**).

Trees will be felled and structures demolished to accommodate construction of the Proposed Scheme, causing biodiversity loss, fragmentation and alteration for roosting bats. Therefore, in the absence of mitigation, biodiversity loss, fragmentation and alteration is predicted to result in a significant, long-term, and partially reversible adverse effect at the local (higher) geographic scale on roosting bats. Measures, as set out in **Section 9.5.3**, will be required to mitigate this effect.

The impacts of disturbance from noise, vibration, lighting and human presence has been assessed and is predicted to result in a **not significant**, short-term, and reversible adverse effect on roosting bats.

Otter

For the IEF Otter the impacts of Biodiversity loss, fragmentation and alteration, disturbance from noise, vibration, lighting and human presence and Pollution to water, air, and/or soil have been assessed. The detailed assessment provided in **Appendix 9.1I** (refer to **Section 1.6.3.3**).

In relation to Biodiversity loss, fragmentation and alteration (mortality and injury), construction activities could potentially result in mortality of otters. No holts were identified within the footprint of the Proposed Scheme. Therefore, accidental destruction of a holt is not anticipated. Otters could also be killed or injured by falling into excavations within the Proposed Scheme. Given the lack of holts in the area of the Proposed Scheme and the sparsity of evidence of current otter activity, the killing or injuring of otter is considered unlikely. Therefore, the impact of killing or injuring otter is predicted to result in a **not significant** effect on otter.

In relation to Biodiversity loss, fragmentation and alteration (habitat fragmentation), due to the potential evidence of commuting and foraging otter from the field surveys the construction of the Proposed Scheme will potentially result in habitat loss, fragmentation, degradation and alteration for commuting and foraging otter. However, because of the short-term and reversible nature of the impact, habitat loss, fragmentation and alteration during the construction phase of the Proposed Scheme is predicted to result in a **not significant**, short-term, and reversible adverse effect on commuting and foraging otter.

Disturbance from noise, vibration, lighting and human presence associated with construction works could occur, resulting in displacement of commuting and foraging otter. However, otter is generally nocturnal in habit and most construction activities will be carried out during regular daylight hours. Therefore, disturbance from noise, vibration, lighting and human presence is predicted to result in a **not significant**, short-term, and reversible adverse effect on commuting and foraging otter.

In relation to disturbance from noise, vibration, lighting and human presence (breeding/resting otter), the construction works have the potential to result in disturbance, leading to displacement from holts. Given the lack of active holts within 150 m of the Proposed Scheme and the sparsity of evidence of current otter activity, disturbance of breeding or resting otter is considered unlikely. Therefore, the impact of disturbance of breeding or resting otter is predicted to result in a not significant effect on otter.

The impacts of pollution to water, air and/or soil have been assessed. The release of pollutants into watercourses could result in degradation of aquatic habitat which otter utilise. In the absence of mitigation, pollution to water, air, and/or soil during the construction phase of the Proposed Scheme may result in a significant, short-term, and reversible adverse effect at the national geographic scale on commuting and foraging otter. Measures, as set out in **Section 9.5.3**, will be required to mitigate this effect.

Common Kingfisher (commuting and foraging)

For the IEF Otter the impacts of Biodiversity loss, fragmentation and alteration, disturbance from noise, vibration, lighting and human presence and Pollution to water, air, and/or soil have been assessed. The detailed assessment provided in **Appendix 9.11** (refer to **Section 1.6.3.4**).

In relation to Biodiversity loss, fragmentation and alteration, the construction at the Liffey crossing will result in direct habitat alteration in the footprint of the proposed works. However, habitat degradation is limited by the lack of proposed instream works and distance from the abutments to the riverbanks. Because of the small area of degraded habitat at the proposed bridge in comparison to the abundance of alternative habitat along the river, the impact of habitat loss, fragmentation and alteration is predicted to result in a **not significant**, long-term, and irreversible adverse effect on commuting and foraging kingfisher.

Disturbance from noise, vibration, lighting and human presence associated with construction works at the Liffey crossing can result in displacement of commuting and foraging kingfisher. Because of existing bridges and levels of disturbance in the local area, and the short-term nature of the impacts, disturbance from noise, vibration, lighting and human presence is predicted to result in a not significant, short-term, and reversible adverse effect on commuting and foraging kingfisher.

The impacts of pollution to water, air and/or soil have been assessed. The release of pollutants into watercourses could result in degradation of aquatic habitat in which kingfisher forage, reducing foraging success. In the absence of mitigation, pollution to water, air, and/or soil may result in a significant, short-term, and reversible adverse effect at the county geographic scale on commuting and foraging kingfisher. Measures, as set out in **Section 9.5.3**, will be required to mitigate this effect.

Birds (Breeding)

For the IEF Birds (Breeding) the impacts of Biodiversity loss, fragmentation and alteration and disturbance from noise, vibration, lighting and human presence have been assessed. The detailed assessment provided in **Appendix 9.11** (refer to **Section 1.6.3.5**).

○ Breeding Bird - nesting

Construction will result in removal of trees and vegetation with suitability for nesting birds within the area of the Proposed Scheme and the impact of nesting habitat loss, fragmentation, and alteration is predicted to result in a **not significant**, medium-term, and reversible adverse effect on breeding birds.

Vegetation removal during construction may result in mortality of eggs and chicks of the breeding birds onsite via the destruction of nests. In the absence of mitigations, the potential for mortality of chicks/eggs is predicted to result in a significant, long-term, and irreversible adverse effect at the local (higher) geographic scale on breeding birds. Measures, as set out in **Section 9.5.3**, will be required to mitigate this effect.

The construction phase will result in disturbance to breeding birds from noise, vibration, lighting and human presence associated with construction works. Because of its small extent, magnitude, and short-term nature, disturbance at nesting habitats is predicted to result in a **not significant**, short-term, and reversible adverse effect on breeding birds.

○ Breeding Bird - (commuting and foraging)

Construction will result in removal of habitats with suitability for foraging birds within the area of the Proposed Scheme. There is an abundance of equivalent suitable foraging habitat in the locality. Therefore, commuting and foraging habitat loss, fragmentation and alteration is predicted to result in a **not significant**, medium-term, and reversible adverse effect on breeding birds.

The construction phase will result in disturbance to foraging birds from noise, vibration, lighting and human presence associated with construction works. There is an abundance of equivalent suitable foraging habitat in the locality. Therefore, disturbance at commuting and foraging habitat is predicted to result in a **not significant**, short-term, and reversible adverse effect on breeding birds.

White-clawed crayfish

For the IEF White-clawed crayfish the impacts of Pollution to water, air, and/or soil has been assessed. The detailed assessment provided in **Appendix 9.11** (refer to **Section 1.6.3.6**). The release of pollutants into watercourses can adversely impact aquatic habitats, indirectly impacting white-clawed crayfish. Pollutants can have direct effects on white-clawed crayfish. In the absence of mitigation, pollution to water, air and/or soil is predicted to result in a **significant, short to long-term, and reversible adverse effect at the county geographic scale** on white-clawed crayfish. Measures, as set out in **Section 9.5.3**, will be required to mitigate this effect.

Fish

For the IEF Fish the impacts of Pollution to water, air, and/or soil has been assessed. The detailed assessment provided in **Appendix 9.11** (refer to **Section 1.6.3.7**). The release of pollutants into watercourses can adversely impact aquatic habitats, indirectly impacting the fish community. In the absence of mitigation, pollution to water, air and/or soil is predicted to result in a significant, short to long-term, and reversible adverse effect at the national geographic scale on fish. Measures, as set out in **Section 9.5.3**, will be required to mitigate this effect.

9.4.2 Operational Phase

A summary of the IEFs, ecological valuation, relevant impact categories assessed, characterisation of unmitigated impacts, and effects, during the operation of the proposed Project, are detailed in **Table 9.5**.

The detailed assessment of effects is provided in **Appendix 9.11 (Assessment of Effects)** and a summary is presented below.

9.4.2.1 Designated Sites for Nature Conservation

Grand Canal pNHA

For the IEF Grand Canal pNHA, the impact of Biodiversity loss, fragmentation and alteration – otter has been assessed. Grand Canal pNHA is approximately 680 m from the Proposed Scheme and there is no pathway for direct impacts on in situ receptors. However, suitable potential otter habitat may be impacted by the operational phase of the Proposed Scheme. Therefore, there is potential to impact ex situ habitat which could be used by otters associated with the Grand Canal pNHA.

The detailed assessment is provided in **Appendix 9.11** (refer to **Section 1.7.1.1**). A not significant adverse effect on otter, caused by disturbance, is anticipated during the operational phase. Therefore, a **not significant** adverse effect on otter associated with Grand Canal pNHA is anticipated.

9.4.2.2 Habitats and Flora

Depositing lowland rivers

For the IEF FW2 Depositing lowland rivers, the impacts of pollution to water, air and/or soil have been assessed.

The detailed assessment provided in **Appendix 9.11** (refer to **Section 1.7.2.1**). The proposed drainage will reduce the quantity of pollutants which settle on the proposed road from entering watercourses. With the measures designed into the Proposed Scheme, the quantity of pollutants that may enter aquatic habitats is considered ecologically insignificant. Because of the ecologically insignificant quantities of pollutants that may be released into watercourses, pollution to water, air and/or soil is predicted to result in a **not significant**, long-term, and reversible adverse effect on depositing/lowland river habitat.

9.4.2.3 Fauna

Bats (commuting and foraging)

For the IEF Bats (commuting and foraging) the impact of disturbance from noise, vibration, lighting and human presence have been assessed. The detailed assessment provided in **Appendix 9.1I** (refer to **Section 1.7.3.1**). Due to the measures incorporated in the design of the Proposed Scheme, disturbance from noise, vibration, lighting and human presence is predicted to result in a **not significant**, long-term, and reversible adverse effect on commuting and foraging bats.

Otter

For the IEF Otter the impact of disturbance from noise, vibration, lighting and human presence has been assessed. The detailed assessment provided in **Appendix 9.1I** (refer to **Section 1.7.3.2**). During the operational phase of the Proposed Scheme, noise and light generated by traffic and street lighting, as well as human presence, can potentially disturb breeding/resting and commuting/foraging otter. No active holts were identified in the vicinity of the Proposed Scheme, and if any will be established before the construction phase, these will be safely destroyed before construction works commence. Because holts are not likely to be subjected to disturbance and the area of commuting and foraging habitat from which otter may be displaced is relatively small, disturbance from noise, vibration, lighting and human presence is predicted to result in a **not significant**, long-term, and reversible adverse effect on otter.

Common Kingfisher (commuting and foraging)

For the IEF Common Kingfisher the impact of disturbance from noise, vibration, lighting and human presence has been assessed. The detailed assessment provided in **Appendix 9.1I** (refer to **Section 1.7.3.3**).

Given the existing land use surrounding the River Liffey in the environs of Celbridge, commuting and foraging kingfisher in the area are considered to already be habituated to human presence and anthropogenic noise, vibration and light within the environment and disturbance from noise, vibration, lighting and human presence is predicted to result in a **not significant**, long-term, and reversible adverse effect on kingfisher.

Birds (Breeding)

For the IEF Birds (Breeding) the impact of disturbance from noise, vibration, lighting and human presence have been assessed. The detailed assessment provided in **Appendix 9.1I** (refer to **Section 1.7.3.4**).

- **Breeding Bird - nesting**

During the operational phase of the Proposed Scheme, noise and light generated by traffic and street lighting, as well as human presence, can potentially disturb nesting birds. However, this impact will be confined to the immediate vicinity of the proposed road, which will be a small proportion of the potential nesting habitat/vegetation within the locality. The disturbance of nesting birds is predicted to result in a **not significant**, long-term, and reversible adverse effect on breeding birds.

- **Breeding Bird - (commuting and foraging)**

During the operational phase of the Proposed Scheme noise and light generated by traffic and street lighting, as well as human presence, can potentially disturb commuting and foraging birds. However, this impact will be confined to the immediate vicinity of the proposed road, which will be a small proportion of the potential commuting and foraging habitat within the locality. The disturbance of commuting and foraging birds is predicted to result in a **not significant**, long-term, and reversible adverse effect on breeding birds.

9.5 Proposed Mitigation Measures

9.5.1 Measures Incorporated into the design

The following measures have been incorporated and integrated into the Proposed Scheme design as described in **Chapter 2** and illustrated on drawings **MDT902-RPS-01-XX-DR-Z-GA0001 – GA0015** (General Arrangement), **MDT902-RPS-01-XX-DR-Z-LA0000-LA0008** (Landscape Design), **MDT902-RPS-01-XX-DR-C-DR0000 to DR0007** (Surface Water Drainage) and **MDT902-RPS-01-XX-DR-Z-FE0000-FE0007** (Fencing and Environmental Barriers) which are provided under separate cover. The key measures are:

- The bridge abutments will be back from River Liffey banks by at least 5 m;
- The bridge abutments will be a minimum of 1 m distance from the foul sewer pipes on either side of the River Liffey crossing. Foul sewers will be protected in place during construction activities;
- The working platforms for the construction of the bridge will be located outside the extent of the fluvial flooding from the River Liffey;
- Where possible, riparian vegetation at the River Liffey crossing will be retained;
- Various SuDS features will be integrated, including attenuation basins, attenuation swales, bio-retention trenches, infiltration trenches and hydrocarbon interceptors will treat and attenuate the surface water run-off before it discharges to the receiving watercourse at greenfield run-off rates. This will reduce operational phase pollutant run-off into watercourses, pollutant infiltration into groundwater and potential hydraulic changes;
- Aside from at the Liffey crossing, the earthworks do not include significant cuttings, and therefore dewatering of excavations will generally not be required. However, suitable sediment and erosion controls will be implemented for the runoff from the earthworks to ensure that the sediment load in water discharging to the receiving watercourses is kept below permissible levels;
- Measures included in the design of the Proposed Scheme to allow otter and badger to commute under the proposed road and prevent their access onto the proposed road are as follows:
 - The proposed bridge abutments will be set back from the riverbanks, allowing for commuting badger and otter;
 - Box culverts at the unnamed Simmonstown Stud stream and the R405 drainage ditch will include ledges suitable for use by otter and badger to commute under the Proposed Scheme along streams and ditches;
 - In addition to the culverts, two mammal underpasses will be constructed to improve permeability for mammals (see drawing **MDT0902-RPS-01-XX-DR-Z-FE0000-FE0007**). One underpass will run adjacent to the Loughlinstown stream piped culvert to allow mammal commuting when the stream water level is high; Another underpass will connect the lands west of the proposed R405 junction to the lands east of the R405; and
 - Mammal-resistant or mammal proof fencing will be required to guide badgers and otter to the culverts and to prevent animals crossing the new roadway. The specification for mammal-resistant fencing (badger and otter respectively) is outlined in the NRA “Guidelines for the Treatment of Badgers prior to the construction of National Road Schemes” and “Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes” respectively. The fencing will be constructed as per TII standard detail CC-SCD-00319 and CC-SCD-00324. The proposed extents of mammal resistant fencing and measures for gates, security fencing and noise barriers are illustrated on drawings **MDT0902-RPS-01-XX-DR-Z-FE0000-FE0007**;
 - In addition to the culverts, two mammal underpasses will be constructed to improve permeability for badger (see drawing **MDT0902-RPS-01-XX-DR-Z-FE0000-FE0007**). One underpass will run adjacent to the Loughlinstown stream piped culvert to allow mammal commuting when the stream water level is high; Another underpass will connect the lands west of the proposed R405 junction to the lands east of the R405;
- Construction activities will be undertaken during daylight hours. It is proposed that the normal permitted working times will be 07.00 to 19.00 hours. Floodlights will be cowed and angled downwards to minimise light spillage outside of works areas. Lighting will be provided with the minimum luminosity sufficient for safety and security purposes and will be shut off at night when not in use or when works cease at the end of the day in order to minimise the effects of light pollution and disturbance to nocturnal species; and
- A preliminary landscape plan has been prepared for the scheme (see **MDT0902-RPS-01-XX-DR-Z-LA0000-LA0008** provided under separate cover). A detailed Landscape Design Plan will be prepared at the detailed design stage. It is proposed that standard trees, native hedgerow, native woodland mixes, native shrub mix and areas be planted along the length of the Proposed Scheme in varying proportions. It is also proposed to provide tree and vegetation planting in other available green spaces, so long as it does not impact on sightlines and safe operation of the scheme, or maintenance requirements. Over time, the landscaping will reduce the impacts of habitat loss, fragmentation, degradation and alteration.

9.5.2 Framework Measures

9.5.2.1 Ecological Roles

A Project Ecologist shall be appointed by Kildare County Council before the commencement of works. This suitable qualified and experienced ecologist (hereafter referred to as 'the Project Ecologist') shall be utilised in the implementation of the mitigation measures and survey requirements outlined here.

The ecologist shall be a full member of a relevant institution, such as the Chartered Institute of Ecology and Environmental Management (CIEEM) or similar, have relevant experience in the management of mitigation measures and ecological constraints on construction sites/restoration projects, and hold or have previously held a protected species derogation licence in the Republic of Ireland. It shall be their responsibility to supervise and provide recommendations on the execution of any works which have the potential to give rise to negative or positive effects on biodiversity. The Project Ecologist shall be suitable qualified and experienced and have a minimum of five years' experience completing similar tasks on linear infrastructure projects.

The Contractor shall appoint an Environmental Manager / Clerk of Works (hereafter referred to as the 'ECoW') before the commencement of works. This person shall be responsible for carrying out environmental monitoring of the works and ensuring that the mitigation measures, proposed in this EclA and identified by the Project Ecologist, are adhered to. The ECoW shall be suitable qualified and experienced and have a minimum of five years' experience completing similar tasks on linear infrastructure projects.

9.5.3 Construction Phase

9.5.3.1 IEF Mitigation

9.5.3.1.1 Designated sites for Nature Conservation

Sites of Dublin Bay

Potential significant adverse effects on designated sites of Dublin Bay are associated with water pollution. Mitigation relating to water pollution is discussed in **Section 9.5.3.1.2 (under Depositing lowland rivers)**.

Liffey Valley pNHA

Potential significant adverse effects on Liffey Valley pNHA are associated with water pollution. Mitigation relating to water pollution is discussed in **Section 9.5.3.1.2 (under Depositing lowland rivers)**.

9.5.3.1.2 Habitats and Flora

Riparian woodland

The following measures are required to lessen or avoid the identified or potential significant effects on riparian woodland caused by biodiversity loss, fragmentation and alteration:

- In addition to the fencing of the Compulsory Purchase Order (CPO) boundary as part of the enabling works, any other vegetation within the CPO boundary which is capable of being retained during the construction works will be fenced-off with suitable protective fencing; to be specified by the ECoW. This includes the retention of trees, hedgerow, woodland, aquatic features etc. The same measures as stipulated below with respect to avoiding unintended incursion will also be applied to these areas;
- To avoid unintended incursion by personnel, equipment and materials, the construction site boundary will be fenced off and site access/egress points constructed. Only site access/egress points will be used by personnel and equipment;
- Signage will be placed at intervals along the fencing stating, "no access or storage of materials beyond this point" (or similar). The signage is to face inwards into the construction site; and
- As part of the on-site ECoW induction for construction personnel, it will be stated that there will be no access to personnel or equipment and no storage of construction materials beyond the fenced construction boundary.

Depositing lowland rivers

The following measures are required to lessen or avoid the identified or potential significant effects on depositing lowland rivers caused by pollution to water, air and/or soil.

Pollution prevention control measures

The following mitigation is for the general protection of watercourses:

- Stockpiling of construction materials shall be strictly prohibited within 15 m of any ditch or water-laden channel;
- Hazardous materials including diesel, fuel oils, solvents, paints and/or lubricants stored on temporary or permanent lands made available shall be stored on hardstand and within suitably designed bunded areas with a bund volume of 110% of the capacity of the largest tank/container;
- Re-fuelling of plant shall only take place on hardstand and not within 1 m of any watercourse or surface water feature. Spill containment (i.e. drip trays) shall be used, and spill kits shall be kept available and used if necessary;
- Oils, fuel, chemicals, hydraulic fluids, etc. will not be stored outside construction compounds. They will be stored in designated bunded areas at construction compounds in accordance with established guidelines. Refuelling of construction equipment and the addition of hydraulic oil or lubricants to vehicles/equipment will take place in these designated bunded areas only;
- Waste oils and hydraulic fluids shall be collected in leak-proof containers and removed from the site for disposal or recycling at licensed facilities;
- Waste materials shall be stored in designated areas that are isolated from surface water drains and watercourses. Waste materials will be carefully managed including covering stockpiles during rainfall. Skips shall be closed or covered to prevent materials being blown or washed away;
- All machinery will be routinely checked to ensure no leakage of oils or lubricants occurs during the construction phase. Any spillages will be immediately contained, and the contaminated soil removed from the site and disposed of properly;
- Wash down water from exposed aggregate surfaces, cast-in-place concrete and from concrete trucks will be trapped on-site to allow sediment to settle out before clarified water is released to a drain system;
- No waste will be buried, burnt, or dumped on-site or in land adjacent to the site;
- Only emergency breakdown maintenance shall be carried out on site. Emergency procedures and spill kits will be readily available at strategic and/or sensitive site locations and all relevant personnel will be familiar with emergency procedures; and
- Any contaminated soil shall be removed from the site and disposed of in a licensed facility.

For the protection of watercourses from pollution via surface water run-off, the following measures shall be employed:

- Before works commence, a detailed method statement shall be prepared by the Contractor for works within or adjacent to the River Liffey, Loughlinstown Stream, the unnamed Simmonstown Stud stream and the drainage ditch along the R405. The method statement shall include a map showing the locations of surface water features, works exclusion zones, site compounds, stockpiles, settlement tanks/ponds, temporary percolation areas and silt fencing. The method statement and maps will be submitted to the Project Ecologist and ECoW for approval and any further requirements deemed necessary shall be agreed with the Project Ecologist and ECoW, no less than 6 weeks in advance of works commencing.
- Together with the ECoW, environmental triggers for safe undertaking of the high-risk work items will be agreed between the Contractor and Project Ecologist as well as any other experts or technical specialists needed for high risk aspects of the project and understood and transferred to a spreadsheet by the ECoW. An experienced freshwater ECoW may assist with determining these values, but the responsibility rests with the developer / employer. Triggers for the commencement and abandonment of works will be set. The triggers shall be very clearly defined for each work item. The work items will include but will not be limited to the following:
 - Site set-up and materials/equipment delivery;

- Earthworks and excavation;
- Instream and bankside works at all watercourses; and
- Concrete pouring.

Commencement and abandonment triggers for the above items will be agreed for the following parameters:

- Rainfall;
 - Water levels;
 - Onsite weather conditions;
 - Soil wetness; and
 - Integrity of mitigation measures
- Where works are required within 15 m of a watercourse, an ecologist shall assess and verify that appropriate demarcation and signage is in place before works commence. Demarcation shall be physically marked out using post and rail/post and rope/bunting, or equivalent, and be signposted to identify the ecological sensitivity;
 - Silt fencing shall be installed for all work within 15 m of the River Liffey, Loughlinstown Stream, the unnamed Simmonstown Stud stream, and the drainage ditch along the R405. Silt fencing shall consist of a maintainable geotextile membrane (equivalent to Terrastop™ Premium; 250 microns; 45 l/m2/sec). Installation, maintenance, and removal shall follow the manufacturers' specifications. The geotextile membrane will be inspected at least once a week and following any period of heavy rainfall (i.e. Met Éireann orange rain warning);
 - The Contractor will monitor weather forecasts for heavy rain and where required, certain works, in particular excavations/earthworks, will cease in order to minimise exposed soil entering surface water run-off; and
 - Soil excavation will not be completed during periods of prolonged or heavy rain (i.e. Met Éireann orange rain warning).

Control and response to environmental incidents and accidents

In the case of environmental incidents or accidents occurring during the construction phase of the Proposed Scheme, the following measures will be applied:

- An appropriate emergency response plan will be in place for any spillage of fuels, lubricants or hydraulic oils to ensure they are immediately contained;
- The Contractor will be required to have available on-site spill kits and hydrocarbon absorbent materials to deal with any accidental spillages;
- An Environmental Incident and Emergency Response Plan will be established by the Contractor to deal with incidents or accidents during construction that may give rise to pollution in watercourses proximal to the works. This will include means of containment in the event of accidental spillage of hydrocarbons or other pollutants (e.g. oil booms and soakage pads);
- Throughout all stages of the construction phase the Contractor will ensure that all site personnel are made aware of the importance of the freshwater environments and the requirement to avoid pollution of all types;
- All hazardous materials on site will be stored within secondary containment designed to retain at least 110% of the total storage contents;
- Temporary bunds for oil/diesel storage tanks will be used off-site during the construction phase of the Proposed Scheme as appropriate;
- Safe handling of all potentially hazardous materials will be emphasised to all construction personnel employed during this phase of the Proposed Scheme; and
- Any spillage of fuels, lubricants or hydraulic oils will be immediately contained, and the contaminated soil removed from the site and properly disposed of at a suitable licensed facility.

Measures to Protect Biodiversity Features during Instream Works

The following mitigation shall be applied during any instance where instream works are being conducted:

- To minimise adverse impacts on watercourses, instream works shall be carried out during the period July to September;
- Prior to any instream works, the appointed contractor(s) will ensure that all construction equipment is mechanically sound to avoid leaks of oil, fuel, hydraulic fluids, and grease;
- Any instream works area will be isolated and de-watered using a gravity/flume system (or similarly effective method). A whole section of the channel is isolated using barriers that span the full width of the watercourse. This keeps a stretch of the watercourse dry, and the water is transferred downstream of the works area through gravity fed flumes/pipes. The flume(s) is normally placed on the bed of the watercourse through the works area and outfalls at the downstream barrier, if present, or far enough downstream to prevent the water backing up into the work area;
- There shall be a licenced, experienced and qualified ecologist on-hand at the time the contained area is dewatered. Eels, lamprey ammocoetes and crayfish that emerge during the water draw down shall be collected in clean buckets of water and returned to the channel, a short distance upstream of works. Crayfish shall not be transferred to another watercourse.
- The duration of the isolation works shall be kept as short as possible;
- The intake shall be screened to prevent fish being drawn into the flume;
- Before the isolated area is de-watered, appropriate measures shall be taken to relocate any stranded wildlife, with transplanting or watering sensitive aquatic vegetation in isolated areas to be considered;
- To minimise debris and sediment accumulation at the upstream end, inspect the flume pipe (including the inlet and outlet) regularly for damage or blockage. Clear blockages and repair any damage immediately;
- The flume pipe shall be protected from crushing or any impact damage. This may include:
 - Aligning it away from plant movement and areas where works will be carried out; and
 - Using temporary barriers or protective covers;
- Before the removal of the upstream barrier, any silt or trash that has accumulated against the barrier shall be removed and disposed of properly. The downstream barrier shall be removed first; and
- Isolated works areas shall never be de-watered directly into adjacent or nearby watercourses or ditches.

Measures at the River Liffey crossing

- The ECoW shall be present for any bankside works.
- The locations of the foul sewer pipes are to be clearly demarcated. The foul sewers are to be protected in place. The detailed method statement for works at the Liffey bridge crossing shall set out appropriate measures to ensure effective protective measures (e.g. tool box talks, signage, barriers and buffer areas) are in place at all times during construction. An appropriate emergency response plan will be in place in case of a leak to ensure it is immediately contained;
- Water pumped from excavations shall be passed through pre-fabricated settlement tanks. The pond/tank shall be appropriately sized and located on a flat vegetated area, downstream of the works area and well away from the watercourse. This pond/tank will be designed and maintained in accordance with CIRIA C532, '*Control of water pollution from construction sites – Guidance for consultants and Contractors*'. The surface water at the top of the tank/pond will flow by gravity to adjacent greenfield lands for infiltration to ground. A silt sock or bag will be positioned at this exit point as an additional control measure. A specialist Contractor will be required to remove the settled materials at the base of this pond. Trenched silt fencing shall be installed around the area designated for infiltration to capture any silt from overland flow.
- Discharge water from the pond will be inspected on a daily basis and if it is found to be silted, the flow will be stopped immediately and appropriate remedial works (e.g. use of a mobile siltbuster) will be carried out.

- Should water pumped from excavations become contaminated (e.g. from a hydrocarbon spill or leak), pumped water shall be tankered off site and treated at an appropriately licensed facility.
- If large amounts of water leak into the contained area, works shall stop until a more secure system is installed.
- Machinery shall operate from the bankside and not instream.

9.5.3.1.3 Fauna

Bats (commuting and foraging)

No significant effects on commuting and foraging bats are anticipated. Nonetheless, the following measures shall be implemented to lessen or avoid the identified or potential insignificant effects on commuting and foraging bats caused by biodiversity loss, fragmentation and alteration and disturbance from noise, vibration, lighting:

- All works shall be restricted to daylight hours to minimise impacts to these nocturnal species. Where this is not possible, a construction phase lighting design should be compliant with the following:
 - The use of directional lighting is required to reduce disturbance to bats, especially at previously unlit features such as buildings or trees and hedgerows, treelines and watercourses (which are frequently used as foraging corridors) as determined by EcoW.
 - For previously unlit areas, the aim would be to maintain a lux level of 0 to the areas where bats would forage and roost. This will be done through the use of baffles, hoods or louvres to reduce light spill and direct it only to where it is needed (see ILP's guidance note GN08/23 (2023) *Bats and Artificial Lighting at Night*).
- The proposed landscape plan includes the retention of existing trees, hedgerows and other woodland habitats as far as is practicable. As suitable commuting and foraging habitat will require removal, the proposed landscape plan includes the planting of native hedgerows, woodland and shrubs that will mature into valuable commuting and foraging habitat (see **MDT0902-RPS-01-XX-DR-Z-LA0000-LA0008** provided under separate cover).

Bats (roosting)

The following measures are required to lessen or avoid the identified or potential significant effects on roosting bats caused by biodiversity loss, fragmentation and alteration (these have been incorporated into a Derogation Licence Application, refer to **Appendix 9.1J**):

- The bat roost potential of any buildings to be demolished and trees to be felled to enable construction will be confirmed through the completion of update surveys by the ECoW (and appropriately qualified personnel, if required). The surveys will be completed with reference to the following guidance (or relevant guidance at time of survey):
 - *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (Collins, 2023)
 - *Bat Mitigation Guidelines for Ireland* (Marnell *et al.*, 2022); and
 - *UK Bat Mitigation Guidelines* (Reason and Wray, 2023);
- The findings of the pre-construction survey will be reviewed with respect to the Proposed Scheme in relation to whether the updated findings trigger a requirement for a species derogation licence from NPWS. Based on the current baseline, derogation licensing is deemed necessary for felling two trees with confirmed roosts (i.e. BT17 and BT27);
- The findings of the pre-construction survey will be reviewed with respect to the Proposed Scheme in relation to whether precautions (e.g. section-felling) are required for trees that have low roost potential, but the absence of bats cannot be confirmed;
- No demolition of buildings or the removal of any trees with bat roost potential (potential to be determined by the ECoW based on findings of pre-construction surveys) will be undertaken unless the ECoW has confirmed that the buildings or trees do not support roosting bats (confirmed via survey) or unless the demolition/removal is completed under the provisions of a derogation licence;
- Following the pre-construction survey, bat roosts located within the CPO boundary will be clearly identified to all personnel working in the vicinity of the roost. Temporary boundary tape fencing (or

similar) will be used at the discretion of the ECoW to identify such roosts, subject to such measures themselves not impacting on the use of the roost;

- In the event that roosts are removed or significantly disturbed (wholly or partially), this will be completed in accordance with the necessary derogation licence to be obtained from NPWS and with reference to the *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes* (NRA, 2006a), *Guidelines for the Treatment of Bats during the Construction of National Road Schemes* (NRA, 2005a) and *Bat Mitigation Guidelines for Ireland* (Marnell *et al.*, 2022). The need for licencing will be determined by the ECoW. The need for additional mitigation for derogation licensing purposes shall be reviewed and determined by the ECoW. Currently, three confirmed roosts are located within the CPO boundary. One of these roosts is not proposed to be disturbed, while the other two will require closure in accordance with a derogation licence;
- In the unlikely event that unknown roosting or stranded bats are encountered on the Proposed Scheme, works shall immediately cease in that area and the local NPWS Conservation Ranger shall be contacted. If present, bats shall only be removed under licence from the NPWS; and
- The confirmed roosts occur on the south bank of the River Liffey and in Simmonstown Stud at approximately chainage 1+060. To mitigate to loss of roost features, 4 no. bat boxes will be erected in the vicinity of the identified roosts at suitable locations within the CPO boundary. Suitable locations will be determined by the ECoW based on proximity to artificial lighting and connectivity to foraging and commuting habitats. In the absence of suitable structures to erect the boxes (e.g. retained trees or bridge structures), they will be pole-mounted in suitable locations. The bat boxes will be Schwegler-type (woodcrete) type boxes (or similar) and a range of different type boxes (e.g. 2FN, 3FN, 1FD, 1FF, 3FF, 1FW, 1FE and 1FTH) will be used. These will be provided in addition to any mitigation required with respect to any derogation requirements which may be identified as a result of pre-commencement surveys.

Otter

The impact assessment identified potential significant adverse effects on otter caused by pollution to water, air, and/or soil. Mitigation relating to water pollution is discussed in **Section 9.5.3.1.2 (under Depositing lowland rivers)**.

No other significant effects on otter are anticipated. Nonetheless, the following measures shall be implemented to lessen or avoid the identified or potential insignificant effects on otter caused by biodiversity loss, fragmentation and alteration and disturbance from noise, vibration, lighting.

Potential evidence of otter was recorded along the River Liffey and the unnamed Simmonstown Stud stream. No currently used breeding or resting sites were recorded within 150 m of the Proposed Scheme. However, because otter is a mobile species, a pre-construction otter survey will be carried out to ensure that otter has not taken up residence or established any new territories within or in close vicinity to the footprint of the Proposed Scheme. The survey will be completed within the footprint of the proposed scheme and 150 m up and downstream of this footprint. The survey will confirm the presence/absence of otter holts, resting sites (couches) and any other signs of otter activity within the survey area. The survey will be completed with reference to *Guidelines for the Treatment of Otter Prior to the Construction of National Road Schemes* (NRA, 2008). The survey will be completed during optimal seasonal/weather conditions and will be completed by a competent, experienced otter surveyor(s).

The findings of the pre-construction survey will be reviewed with respect to the Proposed Scheme in relation to whether the updated findings trigger a requirement for a species derogation licence from NPWS. Based on current baseline, no such derogation licensing is necessary.

If any holts are identified during pre-construction surveys, the following measures will be implemented:

- No construction personnel or machinery will be used within 150 m of otter holts unless subject to the provisions of a derogation licence. Holts will be clearly identified to all personnel working in the vicinity of the holt. Temporary boundary tape fencing (or similar) will be used at the discretion of the ECoW to identify such holts, subject to such measures themselves not impacting on the use of the holt;
- Neither blasting nor pile-driving will be undertaken within 150 m of active holts during the breeding season, unless subject to provisions of a derogation licence;
- In the event that holts are to be closed (wholly or partially), this will be completed in accordance with the necessary derogation licence which will be obtained from the NPWS and with reference to the NRA guidelines (2008). The need for a licence is to be determined by the ECoW. The need for additional

mitigation for derogation licensing purposes will be reviewed and determined by the ECoW and relayed to the appointed Environmental Team. It is assumed that all holt(s) active at the time of construction and within the CPO boundary will need to be closed in accordance with a derogation licence. Currently, no active holt(s) are located within the CPO boundary and no derogation licence is required; and

- Where required, evacuation and destruction of holt(s) will be carried out under the supervision of an appropriately qualified ecologist under licence from the NPWS. In the event that derogation licence(s) are required, these could require the loss of holt(s) to be compensated through the construction of artificial holt(s). The locations of such holt(s) will be determined by the ECoW and the requirement of any derogation licence.

Otters may potentially be affected during the construction phase of the development during foraging activities. The potential for fatalities from accidents on site or becoming trapped within open works could pose a direct impact. Mitigation measures to protect from the accidental killing/injury of otter during the construction phase are detailed as follows and will be implemented:

- Maintain the set-back zone from both banks of the River Liffey to ensure the free movement and safe passage of otter along the watercourse during construction phase;
- With reference to the NRA guidelines (2008), mammal-resistant fencing will be incorporated along the boundary of construction compounds and working areas to ensure no otters can access or become trapped within open works. Mammal-resistant fencing will adhere to the relevant specifications as set out by the NRA (2008);
- Once installed, the mammal-resistant fencing will be inspected by the ECoW to ensure that fencing is fit for purpose; and
- Excavations will be covered overnight and/or temporary access ramps from excavations will be installed if they are too large or not possible to cover overnight.

Common Kingfisher

The impact assessment identified potential significant adverse effects on kingfisher caused by pollution to water, air, and/or soil. Mitigation relating to water pollution is discussed in **Section 9.5.3.1.2 (under Depositing lowland rivers)**.

Birds (breeding)

The following measures are required to lessen or avoid the identified or potential significant effects on breeding birds caused by biodiversity loss, fragmentation and alteration:

- The removal of existing vegetation (scrub, rough grassland, trees, treeline, and hedgerow) will avoid the bird nesting season (March to August, inclusive);
 - If this seasonal restriction cannot be accommodated, a suitably qualified ornithologist will be required to confirm presence/absence of breeding birds at least 3 days prior to removal/trimming and seek a derogation licence from NPWS as necessary.
 - If any active nests are discovered, then work in the immediate vicinity of the nest should cease and an appropriate buffer zone should be established which should be left in place until it has been confirmed that the young have fledged.
- All retained vegetation within the works corridor shall be kept clear of machinery and materials shall not be stored against them as per the recommendations in BS5837 (2012) – *Trees in Relation to Design, Demolition and Construction*.

White-clawed crayfish

The impact assessment identified potential significant adverse effects on white-clawed crayfish caused by pollution to water, air, and/or soil. Mitigation relating to water pollution is discussed in **Section 9.5.3.1.2 (under Depositing lowland rivers)**.

Fish

The impact assessment identified potential significant adverse effects on fish caused by pollution to water, air, and/or soil. Mitigation relating to water pollution is discussed in **Section 9.5.3.1.2 (under Depositing lowland rivers)**.

9.5.3.2 Non-IEF Mitigation

The following mitigation is proposed to avoid/minimise impact on non-IEFs.

9.5.3.2.1 Pre-construction Ecology Surveys

At least one month in advance, but no greater than six months in advance, of commencing any enabling or advance works, a pre-construction survey for protected and invasive alien species shall be undertaken (within a suitable season) within the Proposed Scheme area, including areas which could not be accessed during the establishment of the baseline. The surveys shall be undertaken by a suitable qualified and experienced ecologist. The ecologist shall also advise, in writing, on any additional relevant protective measures and/or licensing requirements resulting from the pre-construction survey findings.

9.5.3.2.2 Terrestrial Habitats

The riparian woodland mitigation measures, described in **Section 9.5.3.1.2 (Riparian woodland)**, to protect retained vegetation will be implemented over the entire area of the Proposed Scheme to protect all retained vegetation.

IAPS were identified in the study area, predominantly in the vicinity of the River Liffey. IAPS along watercourses is particularly significant, as contaminated soil or vegetative material washed from an infected area can result in the spread of this species downstream. Appropriate mitigation measures including management and control measures are required within the proposed works area where each of these species are encountered for the prevention of spread of these species. Works to eradicate invasive species will be completed and signed off by suitably experienced personnel. At the time of writing, the works will be completed with reference to the following guidance:

- Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads (NRA, 2010);
- Guidelines for the Management of Waste from National Road Construction Projects (NRA, 2014); and
- Invasive Species Northern Ireland guidance¹⁷; and

No vegetation removal or works resulting in earth disturbance will be completed in any area known to support invasive alien species until the eradication of the invasive alien species has been completed and signed off by suitably experienced personnel.

9.5.3.2.3 Tree Protection

Prior to construction commencement, Root Protection Areas (RPAs) for retained trees shall be put in place. The purpose of protective barriers is to avoid any harmful construction activity that may damage the retained trees. Tree protection barriers shall be fit for the purposes of excluding construction activities and be durable to withstand an impact. The extent of the RPA shall be an area equivalent to a circle with a radius 12 times the stem diameter (stem diameter measured at 1.5 m above ground level) (NRA, 2006b).

9.5.3.2.4 Badger

Update badger surveys will be completed for all potential setts (active or inactive) and to identify any newly established setts within 150 m of the CPO boundary, including areas which could not be accessed during the establishment of the baseline. The surveys shall be undertaken by a suitable qualified and experienced ecologist. The level of survey will be sufficient to confirm and classify whether setts are active (or not) and to confirm if they are main, annexe, subsidiary or minor setts. The survey will be completed with reference to *Guidelines for the Treatment of Badgers prior to the construction of National Road Schemes* (NRA, 2005b). The findings of the pre-construction survey will be reviewed with respect to the Proposed Scheme in relation to whether the updated findings necessitate the preparation of a detailed method statement for works with potential to disturb a sett.

¹⁷ Available at invasivespeciesni.co.uk

If any setts are identified as active and are to be closed (wholly or partially), the following measures will be implemented:

- The setts will be evacuated in line with NRA guidelines (2005b);
- Active setts within the footprint of the Proposed Scheme will be clearly marked with temporary fencing and signage and construction activities will be prohibited until the setts have been evacuated; and
- Evacuation and destruction of setts will be undertaken under the supervision of a qualified and licensed ecologist and will be undertaken during the period of July to November, inclusive.

If any identified active setts will not be lost but could be subject to disturbance, the following measures will be implemented:

- No construction personnel or machinery will be used within 30 m of badger setts (extended to 50 m for active setts during the breeding season of December to June, inclusive) unless those works are carried out in line with a method statement detailing the treatment of the sett;
- During the pre-construction survey, setts located within 50 m of the Proposed Scheme will be clearly marked with temporary fencing and the extent of bounds prohibited for vehicles clearly marked by fencing and signage; and
- Neither blasting nor pile-driving will be undertaken within 150 m of active setts during the breeding season.

There is potential for badgers to be killed or injured during construction through accessing areas of construction, including excavations. In addition to the measures set out in **Section 9.5.3.1.3 (Badgers)** to exclude mammals from the construction site, temporary badger fencing (doubling up with otter fencing as necessary) in line with NRA guidelines (2005b) will be used to enclose all construction working areas. The fencing shall be maintained throughout the construction period to provide a robust barrier to avoid movement of badger into and through the construction working areas. Badger fencing will be checked by the ECoW to ensure compliance with specifications.

9.5.4 Operational Phase

9.5.4.1 IEF Mitigation

No additional IEF mitigation measures are proposed, as measures incorporated into the design are sufficient to avoid/minimise operational phase impacts on IEFs.

9.5.4.2 Non-IEF Mitigation

No additional non-IEF mitigation measures are proposed, as measures incorporated into the design are sufficient to avoid/minimise operational phase impacts on non-IEFs.

9.6 Residual Impacts

Residual effects are those which will remain after the proposed mitigation measures have been incorporated and implemented. The residual effects after the incorporation of the mitigation measures (see **Section 9.5**) are outlined below for the construction and operational phases of the proposed development.

Table 9.4 outlines the residual effects on IEFs during the construction phase and **Table 9.5** outlines those related to the operational phase. It is predicted that no residual effects will occur provided the mitigation measures are implemented in full.

Section 177AE Environmental Report

Table 9.4: Residual Effects during the Construction Phase

Important Ecological Features	Ecological Valuation	Relevant Impact Category	Characterisation of unmitigated impact on IEF	Effect without Mitigation	Residual Effects (after mitigation)
Designated sites for nature conservation					
Sites of Dublin Bay	International/ National	Pollution to water, air and/or soil	Water pollution during construction may result from surface water run-off carrying suspended silt or contaminants into local watercourses (tributaries of the River Liffey) which are connected via hydrological pathway (Liffey estuary) to the IEF.	Significant	Not significant with mitigation to control water pollution.
Grand Canal pNHA	National	Biodiversity loss, fragmentation and alteration	Biodiversity loss, fragmentation and alteration may result from impacts on the local otter population that are associated with the pNHA.	Not Significant	N/A
Liffey Valley pNHA	National	Pollution to water, air and/or soil	Water pollution during construction may result from surface water run-off carrying suspended silt or contaminants into local watercourses (tributaries of the River Liffey) which are connected via hydrological pathway (River Liffey) to the IEF.	Significant	Not significant with mitigation to control water pollution.
Habitats and flora					
Hedgerows	Local (higher)	Biodiversity loss, fragmentation and alteration	Biodiversity loss, fragmentation, degradation, and alteration during construction will result from vegetation and tree removal associated with site clearance, excavations, cut and fill requirements, material storage and site compounds, which are connected via direct physical pathway to this IEF.	Not significant	N/A
Riparian woodland	Local (higher)	Biodiversity loss, fragmentation and alteration	Biodiversity loss, fragmentation, degradation, and alteration during construction will result from vegetation and tree removal associated with site clearance, excavations, cut and fill requirements, material storage and site compounds, which are connected via direct physical pathway to this IEF.	Significant	Not significant with measures to protect retained vegetation.
Depositing lowland rivers	National	Biodiversity loss, fragmentation and alteration	Biodiversity loss, fragmentation, degradation, and alteration during construction will result from direct physical alteration of the IEF during culvert installation, channel modification and bridge construction.	Not significant	N/A
		Pollution to water, air and/or soil	Water pollution during construction may result from surface water run-off carrying suspended silt or other contaminants into local watercourses.	Significant	Not significant with mitigation to control water pollution.
Fauna					
Bats (commuting and foraging)	Local (higher)	Biodiversity loss, fragmentation and alteration	Biodiversity loss, fragmentation, degradation, and alteration, in the form of the loss of suitable bat commuting and foraging habitat, will result from removal of trees and vegetation during site clearance.	Not significant	N/A
		Disturbance from noise, vibration, lighting and human presence	Disturbance from noise, vibration, lighting, and human presence during construction will result from construction activities causing high levels of light spill, noise and vibration, which are connected via direct physical pathway to the IEF.	Not significant	N/A

Section 177AE Environmental Report

Important Ecological Features	Ecological Valuation	Relevant Impact Category	Characterisation of unmitigated impact on IEF	Effect without Mitigation	Residual Effects (after mitigation)
Bats (roosting)	Local (higher)	Biodiversity loss, fragmentation and alteration	Biodiversity loss, fragmentation, degradation, and alteration, in the form of the loss of suitable bat roosting features, will result from removal of trees during site clearance.	Significant	Not significant measures to reduce mortality risk and addition of bat boxes.
		Disturbance from noise, vibration, lighting and human presence	Disturbance from noise, vibration, lighting, and human presence during construction will result from construction activities causing high levels of light spill, noise and vibration, which are connected via direct physical pathway to the IEF.	Not significant	N/A
Otter	Local (higher)	Biodiversity loss, fragmentation and alteration	Biodiversity loss, fragmentation, degradation, and alteration, in the form of mortality and injury, may result from construction activities in close proximity to the potential holts and from otters falling into excavations.	Not significant	N/A
			Biodiversity loss, fragmentation, degradation, and alteration, in the form of habitat fragmentation may result from construction of watercourse crossing.	Not significant	N/A
		Disturbance from noise, vibration, lighting and human presence	Disturbance from noise, vibration, lighting, and human presence, in the form of displacement from holts, may result from excavations, earthworks, machinery, vehicles, and personnel causing high levels of noise and vibration, which are connected via direct physical pathway to the IEF.	Not significant	N/A
			Disturbance from noise, vibration, lighting, and human presence, in the form of displacement from commuting and foraging habitat, may result from excavations, earthworks, machinery, vehicles, and personnel causing high levels of noise and vibration, which are connected via direct physical pathway to the IEF.	Not significant	N/A
		Pollution to water, air, and/or soil	Pollution to water, air, and/or soil may result from sediments, cement, hydrocarbons, sewage and other pollutants generated by construction works which may reach aquatic habitat by runoff, which could adversely affect foraging by the IEF.	Significant	Not significant with mitigation to control water pollution.
Common kingfisher	Local (higher)	Biodiversity loss, fragmentation and alteration	Biodiversity loss, fragmentation, degradation, and alteration during construction may result from direct physical alteration of kingfisher commuting and foraging habitat during bridge construction.	Not significant	N/A
		Disturbance from noise, vibration, lighting and human presence	Disturbance from noise, vibration, lighting, and human presence, in the form of displacement from commuting and foraging habitat, may result from excavations, earthworks, machinery, vehicles, and personnel causing high levels of noise and vibration, which are connected via direct physical pathway to the IEF.	Not significant	N/A
		Pollution to water, air, and/or soil	Pollution to water, air, and/or soil may result from sediments, cement, hydrocarbons, sewage and other pollutants generated by construction works which may reach aquatic habitat by runoff, which could adversely affect foraging by the IEF.	Significant	Not significant with mitigation to control water pollution.

Section 177AE Environmental Report

Important Ecological Features	Ecological Valuation	Relevant Impact Category	Characterisation of unmitigated impact on IEF	Effect without Mitigation	Residual Effects (after mitigation)
Birds (breeding)	Local (higher)	Biodiversity loss, fragmentation and alteration	Biodiversity loss, in the form of loss of breeding bird habitat, during construction may result from removal of trees and vegetation with suitability for nesting birds during site clearance.	Not significant	N/A
			Mortality of the eggs and chicks of breeding birds through the destruction of nests during vegetation removal.	Significant	Not significant with site clearance outside nesting season.
			Biodiversity loss, in the form of loss of breeding bird habitat, during construction may result from removal of trees and vegetation with suitability for commuting and foraging birds during site clearance.	Not significant	N/A
		Disturbance from noise, vibration, lighting and human presence	Disturbance from noise, vibration, lighting, and human presence, in the form of displacement from nesting habitat, may result from construction activities causing high levels of light spill, noise and vibration.	Not significant	N/A
			Disturbance from noise, vibration, lighting, and human presence, in the form of displacement from commuting and foraging habitat, may result from construction activities causing high levels of noise and vibration.	Not significant	N/A
White-clawed crayfish	National	Pollution to water, air, and/or soil	Pollution to water, air, and/or soil may result from sediments, cement, hydrocarbons, sewage and other pollutants generated by construction works which may reach aquatic habitats by runoff, which could directly and indirectly adversely affect the IEF.	Significant	Not significant with mitigation to control water pollution.
Fish	National	Pollution to water, air, and/or soil	Pollution to water, air, and/or soil may result from sediments, cement, hydrocarbons, sewage and other pollutants generated by construction works which may reach aquatic habitats by runoff, which could directly and indirectly adversely affect the IEF.	Significant	Not significant with mitigation to control water pollution.

Section 177AE Environmental Report

Table 9.5: Residual Effects during the Operational Phase

Important Ecological Features	Ecological Valuation	Relevant Impact Category	Characterisation of unmitigated impact on IEF	Effect without Mitigation	Residual Effects (after mitigation)
Designated sites for nature conservation					
Grand Canal pNHA	National	Biodiversity loss, fragmentation and alteration	Biodiversity loss, fragmentation and alteration may result from impacts on the local otter population that are associated with the pNHA.	Not significant	N/A
Habitats and flora					
Depositing lowland rivers	National	Pollution to water, air, and/or soil	Water pollution during operation may result from surface water run-off carrying suspended silt or other contaminants into local watercourses.	Not significant	N/A
Fauna					
Bats (commuting and foraging)	Local (higher)	Disturbance from noise, vibration, lighting and human presence	Disturbance from noise, vibration, lighting, and human presence during operation may result from the Proposed Scheme causing light spill, noise and vibration, which is connected via direct physical pathway to the IEF.	Not significant	N/A
Otter	Local (higher)	Disturbance from noise, vibration, lighting and human presence	Disturbance from noise, vibration, lighting, and human presence during operation may result from the Proposed Scheme causing light spill, noise and vibration, which is connected via direct physical pathway to the IEF.	Not significant	N/A
Common kingfisher	Local (higher)	Disturbance from noise, vibration, lighting and human presence	Disturbance from noise, vibration, lighting, and human presence during operation may result from the Proposed Scheme causing light spill, noise and vibration, which is connected via direct physical pathway to the IEF.	Not significant	N/A
Birds (breeding)	Local (higher)	Disturbance from noise, vibration, lighting and human presence	Disturbance from noise, vibration, lighting, and human presence during operation may result from the Proposed Scheme causing light spill, noise and vibration, which is connected via direct physical pathway to the IEF.	Not significant	N/A

9.7 Monitoring

9.7.1 Construction Phase

Construction works will be monitored to ensure that environmental best practice and the measures included in this document are fully and effectively adhered to.

The ECoW will be responsible for ensuring the mitigations prescribed in this document are adhered to. The Contractor's ECoW will liaise directly with the Project Ecologist appointed by Kildare County Council to oversee the ecological aspects of the work. A checklist will be filled in on a weekly basis to show how the measures above have been complied with. Any environmental incidents or non-compliance issues will immediately be reported to the project team.

The project manager will be continuously monitoring the works and will be fully briefed and aware of the environmental constraints and protection measures to be employed;

Surface water monitoring procedures will be undertaken to ensure environmental protection and management requirements are being implemented.

In order to ensure the effectiveness of the exclusion of otter and badger from open works during the construction phase, mammal-resistant fencing requires monitoring and maintenance at regular intervals. If personnel identify problems with fencing, the ECoW will be notified. The ECoW will perform monthly inspections to identify any potential problems with the fencing. Any identified problems will be rectified immediately.

9.7.2 Operational Phase

During the operational phase, Kildare County Council will be responsible for the commission of a suitably experienced ecologist to monitor the effectiveness of:

- Water drainage features;
- Mammal-resistant fencing;
- Bat boxes; and
- Habitat remediation and landscaping.

10 CULTURAL HERITAGE (ARCHAEOLOGICAL, CULTURAL AND ARCHITECTURAL HERITAGE)

10.1 Introduction

This Chapter of the Environmental Report identifies, describes and presents an assessment of the potential effects of the Proposed Scheme on Archaeological, Cultural and Architectural Heritage. The assessment examines the potential effects during the construction and operational phases of the development.

10.2 Assessment Methodology

10.2.1 Relevant Guidelines, Policy and Legislation

In Ireland there are a number of policy and guidance documents issued by the government, local authorities, and semi state bodies to assist in the identification, protection and avoidance of heritage assets. These guidelines also assist in standardising the approach taken during the planning and design stages of development. The guidelines and legislation consulted for the purposes of the Proposed Scheme are provided in **Appendix 10.1A (Relevant Guidelines, Policy and Legislation)**.

The assessment has followed the methodology set out in the Transport Infrastructure Ireland (TII) Guidelines for Cultural Heritage Impact Assessment of TII National Road and Greenway Projects (TII Publication Number PE-ARC-02009) (TII, 2024).

10.2.2 Study Area and Zone of Influence

In accordance with the TII Guidelines for Cultural Heritage Impact Assessment of TII National Road and Greenway Projects, a study area of 250m from the Project land take area is used in the assessment as shown in **Figure 10-1**.

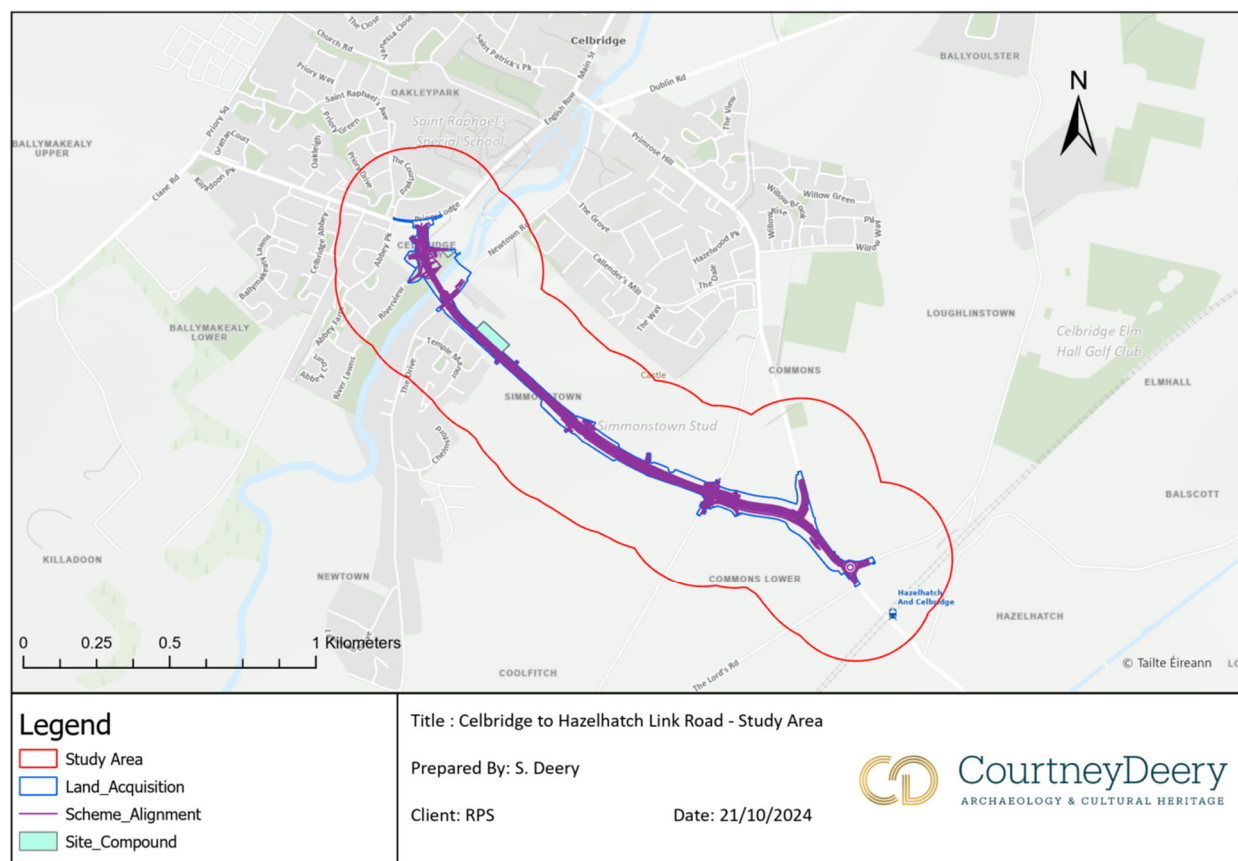


Figure 10-1 Assessment Study Area

10.2.3 Sources of Information to Inform the Assessment

The evaluation of the archaeological and cultural heritage resource of the Proposed Scheme was based on a desk study of published and unpublished documentary and cartographic sources and a site inspection. This was followed by field inspection and a geophysical survey (licence reference 23R0401) of the proposed route corridor.

10.2.3.1 Desktop Study

An archaeological and cultural heritage constraints study and options selection study was carried out for the Proposed Scheme (Garahy 2020 and O'Brien 2021). The options selection involved consideration and assessment of various alternatives/ options to identify an emerging preferred option and ultimately selection of a preferred option to progress to subsequent preliminary design and planning phases. Information on cultural heritage within the cultural heritage study area was collected through a detailed desktop review of existing studies and datasets¹⁸. The evaluation process ensures that all designations relating to cultural heritage assets as well as cultural heritage features that are revealed through research, field assessment and consultation are clearly articulated.

All designated sites of international, national and local importance within the cultural heritage study area were identified using a number of sources. Consideration of the historic environment included UNESCO World Heritage Sites and candidate sites on the Tentative List for inscription onto the World Heritage List, National Monuments, recorded archaeological monuments (RMP), record of protected structures (RPS), architectural conservation areas (ACA's), National Inventory of Architectural Heritage (NIAH) building and garden survey sites, structures of architectural heritage merit (vernacular, urban and rural), cultural heritage features, industrial heritage, placenames, language and inherited traditions. A review of the following information was also undertaken:

- A review of topographical files held in the National Museum of Ireland;
- Cartographical Sources, OSi Historic Mapping Archive, including early editions of the Ordnance Survey including historical mapping (such as Down Survey 1656 Map, Taylor and Skinner 1777 map) (OSI.ie, <https://downsurvey.tchpc.tcd.ie/logainm.ie>);
- The Irish archaeological excavations catalogue i.e., Excavations bulletin and Excavations Database (Excavations.ie);
- Place names (Logainm.ie);
- National Folklore Collection (Duchas.ie);
- A review and interpretation of aerial imagery (OSI Aerial Imagery 1995, 2000, 2005, Aerial Premium 2013-2018, Digital Globe 2011-2013, Google Earth 2001–2022, Bing 2022) used in combination with historic mapping to map potential cultural heritage assets (OSI.ie and Google Earth);
- A review of existing guidelines and best practice approaches;
- Other documentary sources.

10.2.3.2 Field walkover Survey

A field assessment, comprising a field walkover survey of the preferred route corridor option as part of the Options Selection Stage, was undertaken on 12th of July 2021 and subsequently during the geophysical survey in September 2023 to assess the designated cultural heritage features of each component of the Project, and to identify unrecorded features, structures and areas of archaeological potential. This exercise was informed by documentary and cartographic analysis. The field assessment also informed the discussion of potential setting impacts of the Project on protected sites.

¹⁸ Accessed July 2024

10.2.3.3 Archaeological Geophysical Survey

A geophysical survey of the proposed preferred route corridor was carried out by J.M. Leigh Surveys Ltd. from September 13th to 20th, 2023 (DHLGH licence reference 23R0401). The survey area totalled approximately 13 hectares. The results of the geophysical survey are summarised in **Section 10.3.7** of this report.

10.2.4 Key Parameters for Assessment

The key activities that have the potential to result in likely significant effects on archaeological, architectural and cultural heritage (i.e. cultural heritage assets) are outlined below.

Construction Phase

- Demolition, groundworks and site clearance works leading to the removal or part removal of a heritage asset;
- Ground disturbance and excavation, caused by construction activities (including service connections and diversions) which may lead to the damage or destruction / removal of recorded or previously unknown (newly revealed) heritage assets; and
- The degradation of the setting and amenity of a monument or the severance / fragmentation of interrelated features.

Operation and Maintenance Phase

- Operational activities may comprise maintenance activities, though the effect risk to recorded or previously identified archaeological features or cultural heritage assets is considered to be low;
- A change that negatively effects on a sense of place (i.e. detracts from the setting of historic features) and that cannot be mitigated has the potential to be considered a significant or profound impact throughout the operational life of the proposed development; and
- Potential visual effects on archaeological and cultural heritage features during the operational phase may be incurred as a result of the proposed development and result in a change in the character of the receiving historic environment. This change may have a positive or negative affect on the heritage asset.

10.2.5 Assessment Criteria and Significance

Potential impact on the receiving archaeological and cultural heritage environment can be described as direct physical impacts, indirect physical impacts, and impacts on setting.

Archaeological and cultural heritage sites are considered non-renewable resources, and cultural heritage material assets are generally considered to be location sensitive. In this context, any change to their environment, such as construction activity and ground disturbance works, could adversely affect these sites. The likely significance of all effects is determined by considering the magnitude of the impact and the baseline rating upon which the impact has an effect (i.e., the sensitivity or value of the cultural heritage asset). Having assessed the potential magnitude of impact with respect to the sensitivity/value of the asset, the overall significance of the effect is then classified as imperceptible, not significant, slight, moderate, significant, very significant, or profound as per the EPA guidance (2002).

A glossary of effects and assessment terms, including the criteria for the assessment of the significance of the effect, is contained in **Appendix 10.1B (Glossary of Effects and Assessment Methodology)**.

10.2.6 Data Limitations

This assessment has been prepared based on the best available information and in accordance with current best practices and relevant guidelines (detailed desktop review of existing studies and datasets was accessed in July 2024). No technical difficulties or other obstacles were encountered in its preparation.

10.3 Description of Receiving Environment

10.3.1 Historical and Archaeological Background

The proposed route traverses a low-lying landscape in the valley of the River Liffey. The limestone and shale bedrock supports a subsoil of limestone till, with a band of gravels extending parallel to the river's course. Soil cover comprises a combination of grey-brown podzolic, regosols, and complexes.

The Slighe Mór, one of the five ancient roads of Ireland, is generally agreed to have travelled through Celbridge (O'Lochlainn 1940; Geissel 2006). This ancient road is associated with the course of the Eiscir Riada, although a true esker ridge does not occur in Celbridge. Several ecclesiastical sites are associated with the Slighe Mór, including the Early Christian foundation at Celbridge which is associated with the 6th / 7th century St. Mochua.

Land use along the Proposed Scheme route is predominantly agricultural (grazing pasture), occurring on the outskirts of Celbridge town.

The detailed archaeological and historical development of the study area is provided in **Appendix 10.1C**. This includes Prehistoric Activity (c.7000 BC – AD400), Early Medieval Period (c.5th – 11th centuries AD), Medieval Period (late 12th century to early 16th century) and Post Medieval Period.

10.3.2 Townlands and Toponymy

The toponymy of an area can be a valuable indicator of the type of cultural heritage within it. Place-names can sometimes be an invaluable source of information not only on the topography, land ownership, and land use within the landscape, but also on the history, archaeological monuments and folklore associated with a place. Townlands are land divisions that form a unique feature in the Irish landscape; their origins can be of great antiquity, and many are of pre-Norman date. They existed well before the establishment of parishes or counties. Townland boundaries can take the form of natural boundaries or routeways as well as artificially constructed earthen banks and ditch divisions. They are predominantly formed of substantial boundaries which are usually distinguishable from standard field division boundaries.

Townland names within the study area comprises a combination of Gaelic Irish names which have been phonetically anglicised, and English names of Anglo-Norman origin. The place name origins and meanings of the townlands in the cultural heritage study area are provided in **Appendix 10.1C**.

The townland boundaries that the proposed development runs through comprises of public and private roads/lanes and the River Liffey and have no other physical presentation, none are of archaeological interest. The river is a major landscape feature within this area, and it forms the barony boundary between North Salt and South Salt.

10.3.3 Topographical Files of the National Museum of Ireland (NMI)

The Topographical Files of the National Museum of Ireland (NMI) identify recorded stray finds (artefacts) held in the archive of the museum. The finds, which have been donated to the State in accordance with national monuments legislation, are provenanced to townland, and the files sometimes include reports on excavations undertaken by NMI archaeologists earlier in the 20th century.

There are no stray finds recorded from the townlands through which the Proposed Scheme runs.

10.3.4 Previous Excavations within the Study Area

There have been no previous archaeological excavations or assessments in the vicinity of the Proposed Scheme. Excavations were carried out in either the centre of the town of Celbridge or within the Castletown Demesne. Significant remnants of Bronze Age, Early Medieval and post-medieval activity have been uncovered has been discussed in more detail within **Appendix 10.1C**.

10.3.5 Field Work

As previously noted in **Section 10.2.3.3**, an archaeological geophysical survey of the preferred route corridor was carried out and the findings of this survey are presented in this section. The route of the Proposed

Scheme traverses across ten pasture and grazing fields, three overgrown fields to the south of the River Liffey and a landscaped area associated with the Abbey Farm housing estate.

The Proposed Scheme route is 2.1km long and travels through 14 fields, 12 to the south of the River Liffey and two to the north (Figure 10-2).

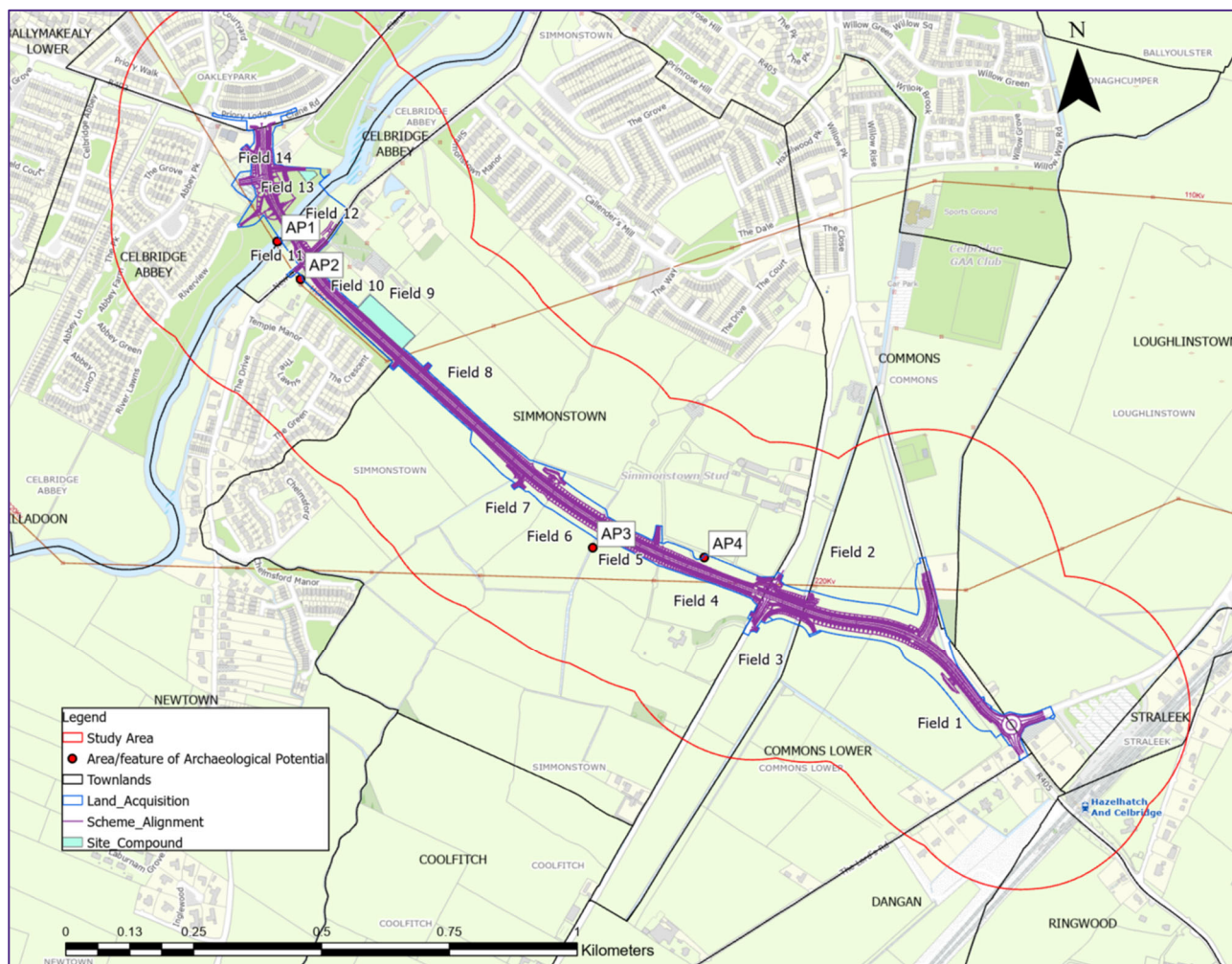


Figure 10-2 Location of Fields 1-14 and areas of archaeological potential AP1-AP4

The fields were subdivided by hedgerow and treelined drainage ditches. Fields 1-6 are low lying irregularly shaped fields of pasture, all within a working stud farm and comprised of short grass. Fields 7-10 comprised grazing pasture fields which were damp underfoot. Fields 11 and 12 were along the southern bank of the River Liffey, comprising of overgrown and rough vegetation, the river is bound by a shelterbelt of mature trees. Field 13 is in a landscaped riverside public park area associated with Abbey Farm housing estate. This park was formerly associated with Celbridge Demesne but there is no longer a physical or visual link between these lands and Celbridge Abbey.

No additional features of archaeological, architectural or cultural heritage interest were identified during the field walkover survey of the Proposed Scheme route. In addition, there were no visible notable topographical features evident in any of fields that would suggest any low-lying features of archaeological potential. The fields either side of the River Liffey, are however of archaeological potential (Table 10.1, Figure 10-2).

Watercourses have attracted settlement and human activity throughout time and the environs of rivers and streams are ideal for the preservation of organic material, such as wood and leather, from archaeological contexts. There is a potential for uncovering sites of archaeological interest along the riverbanks and in their vicinity. The River Liffey is of archaeological potential (unique ID AP1, Figure 10-2); any crossing of the river should consider the potential to reveal archaeological sites or industrial heritage features in its vicinity (for example, sites from early prehistoric fish traps to medieval mill or bridge remnants etc.). The river also represents a townland (Celbridge Abbey), parish (Donaghcumper and Kildrought) and barony boundary (North Salt and South Salt).

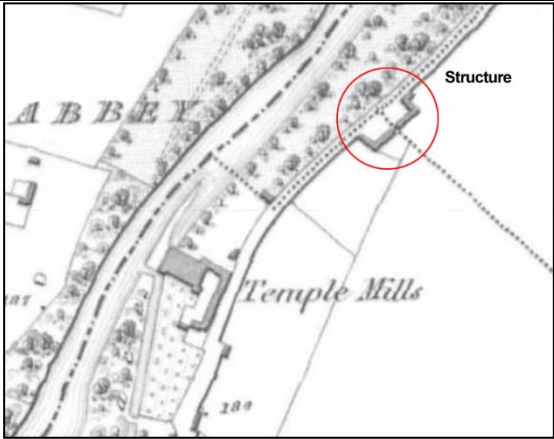
Table 10.1: Field Work Areas of Archaeological Potential

AP Ref.	Potential	Townland	Potential	Distance	Effect
AP1	River Crossing	Celbridge Abbey	Riverbank archaeological potential	0m	Direct

10.3.6 Cartographic Sources

A review of cartographic sources revealed three additional features (AP2- AP4, **Figure 10-2**) of archaeological/cultural heritage potential, these however are no longer upstanding but might be revealed during earthmoving works for the proposed development:

- An elongated U-shaped structure (AP2) was identified on historic mapping within the footprint of the preferred route corridor straddling the townland boundary of Newtown and Simmonstown. It is possible that subsurface remains of this structure survive and may be uncovered during earthmoving work for the proposed development.

AP Ref	AP2 (Figure 10-2)
Reference No.	None
Legal Status	N/A
Townland	Simmonstown/ Newtown
Site Type	Structure
ITM	696803, 732249
Description	A U-shaped structure is depicted at this location on the first edition 6-inch OS map (1836) on the east side of the Newtown Road. The road widens at this location, giving the appearance of a yard or layby surrounded on three sides by this structure. It may have had an industrial function as it is a similar size and shape to a structure at Temple Mills 133m southwest. It was removed some time in the 19 th century and was no longer present by the time of the 25-inch OS survey (1908).
Sources	www.osi.ie
Images	 <i>Structure depicted close to Temple Mills on first edition 6-inch OS map, 1836</i>
Distance	0m
Effect	Direct

- A pump / well site (AP3) and a cluster of structures which may have been a small farmstead (AP4) were also identified on historic mapping approximately 25m and 15m respectively from the footprint of the preferred route (**Figure 10-2**). There will be no impact to these sites.

A summary of areas of archaeological potential are as follows:

Table 10.2: Areas of Archaeological Potential

ID No.	Location	Site Type	Distance	Potential Effect
AP1	Celbridge Abbey	Riverine potential	Within route option	Direct
AP2	Simmonstown / Newtown	Structure	Within route option	Direct

10.3.7 Geophysical Survey

A detailed geophysical survey totalling c.13 hectares of the proposed development was carried out by J.M. Leigh Surveys under licence to the DHLGH (Licence Ref: 23R0401) from the 13th - 20th September 2023. There were areas at both the northern and southern end of the scheme that were not included in the survey area due to the ground conditions (vegetation, developed areas or road surfaces) or later design detail changes (**Figure 10-3**).

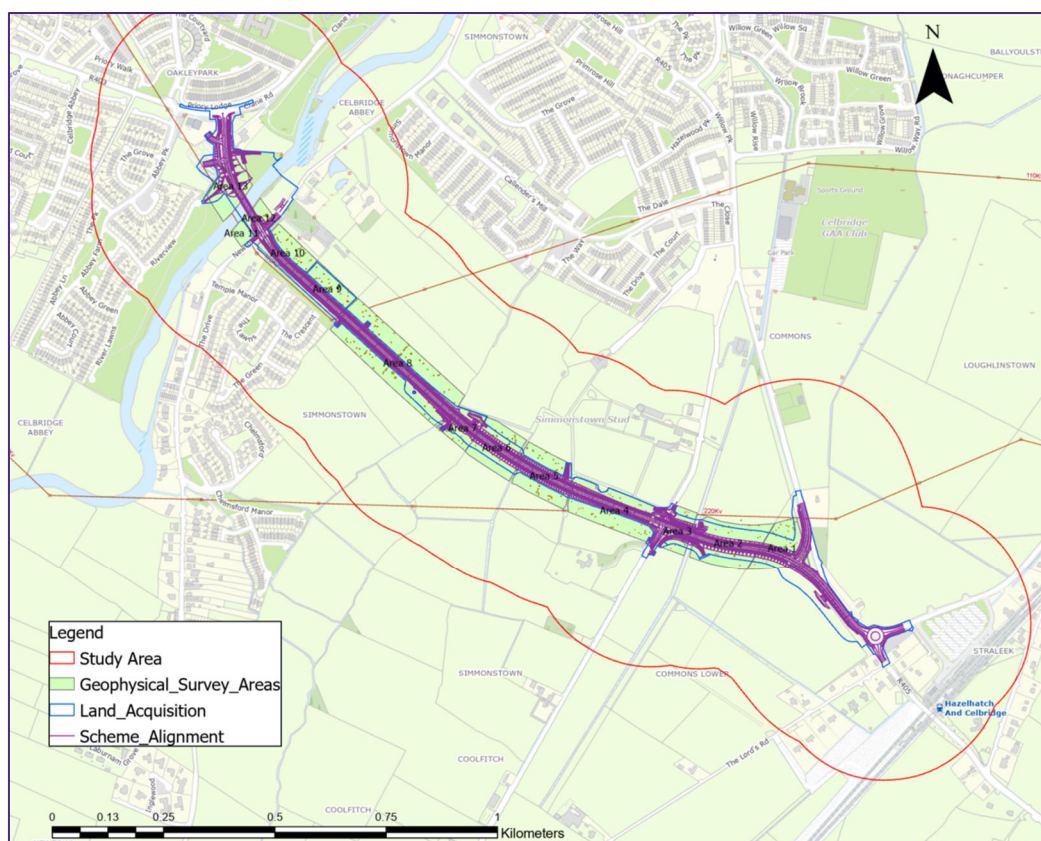


Figure 10-3 Geophysical Survey Areas, Overlaid on the Land Acquisition Areas¹⁹

The main aim of the survey was to identify any geophysical responses that may represent the remains of archaeological features along the Proposed Scheme route. The results are summarised as follows within this section:

The survey data had a low level of background magnetic variation, allowing any responses of interest to be clearly identifiable. There are numerous modern ferrous responses throughout the data sets, which result from modern debris and litter. Although these are prominent, they have not obscured the data, and a clear interpretation of the results can be provided.

Two features of possible archaeological origin were identified in the data, GS1 and GS2 (**Figure 10-4**).

¹⁹ Note: The areas subject to geophysical survey are highlighted in green

- GS1: Comprised a clear circular response (E696983, N732164, Feature F) representing a possible barrow site measuring c.10m in diameter was recorded in Area/Field 9. This is indicative of a ditched feature and may represent the remains of a barrow or small archaeological enclosure. Barrow sites are part of the Bronze/Iron Age burial tradition (c. 2400 BC - AD 400).
- GS2: Comprised a broad response (E697637, N731654, Feature C) in Area/Field 4. It is of unclear origin. Although this may represent the remains of a shallow broad pit-type feature measuring 12m x 8m, it is equally possible that more recent ground disturbance is represented here. Interpretation is however cautious.

At the northwestern end of the scheme in Areas 11 to 13, along the banks of the River Liffey modern magnetic disturbance obscured the data and as such no archaeological interpretation was provided as the disturbance may mask more subtle responses of interest. The riverine context of these areas would increase the archaeological potential at this area.

Numerous ploughing trends were recorded throughout the survey areas. In Area 2 (GS3) these are prominent, and it is possible that ridge and furrow cultivation is represented here.

The geophysical survey did not reveal any large-scale unrecorded subsurface sites within the proposed development area.

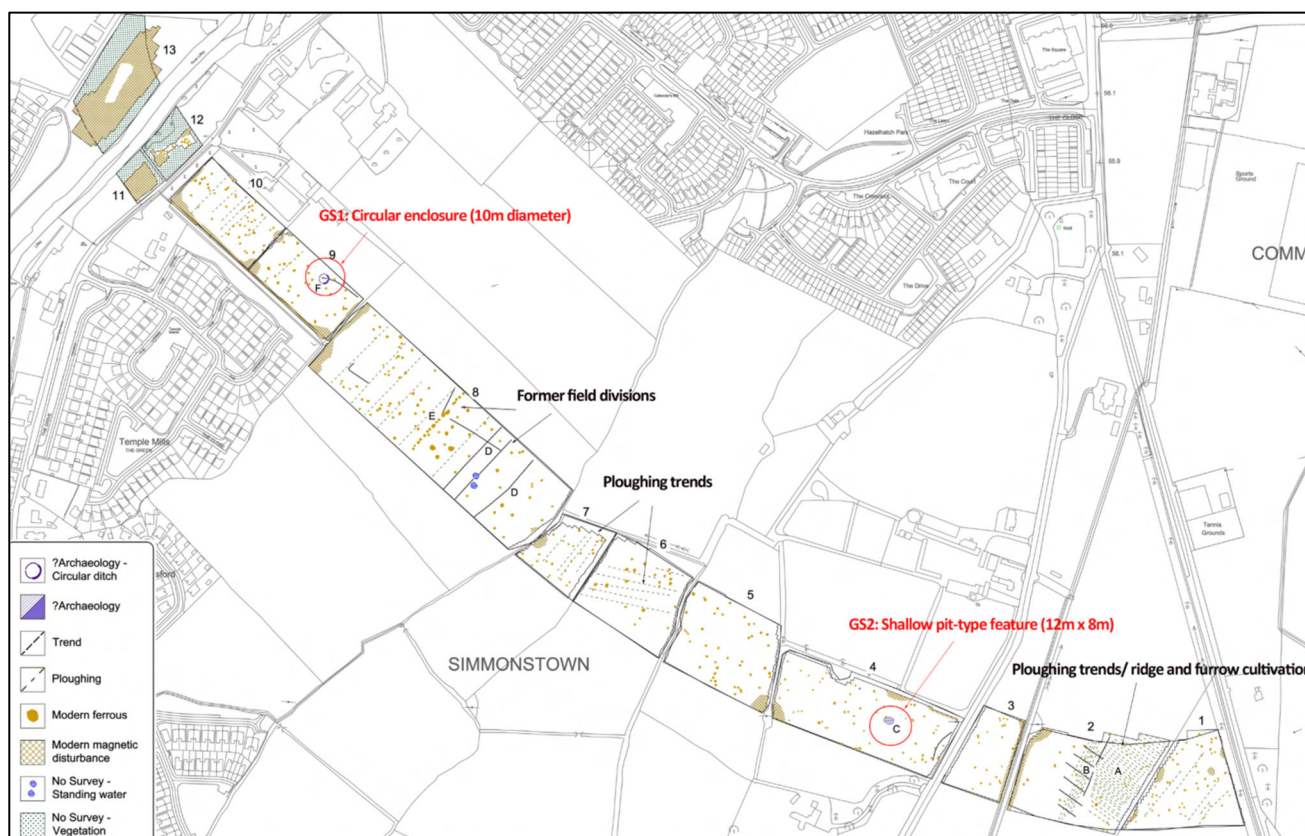


Figure 10-4 Geophysical Survey interpretation with GS1 and GS2 indicated

Geophysical survey feature GS1 is located within the proposed compound and will be directly affected by the earthmoving works required at this location (**Figure 10-5**). GS2 is within the alignment of the scheme where there will be a direct effect on the potential features (**Figure 10-6**).

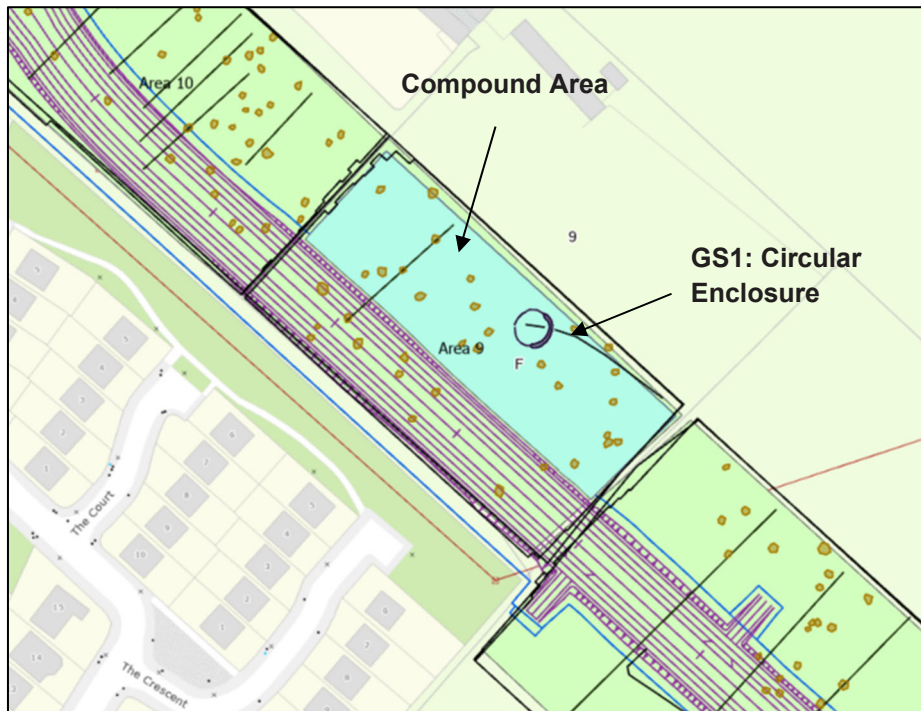


Figure 10-5 Location of the proposed development compound area (in light blue) and land acquisition boundary (blue line) in relation to the Circular Enclosure (GS1)

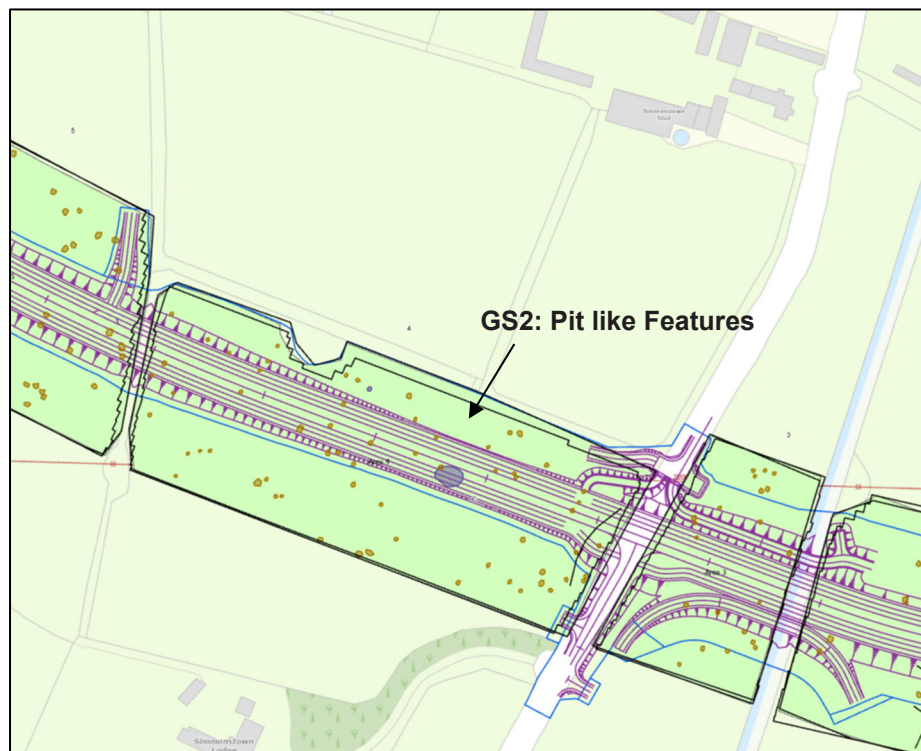


Figure 10-6 Location of the proposed development and land acquisition boundary (blue line) in relation to the Pit-like features (GS2)

Table 10.3: Areas of Archaeological Potential

Survey Ref	Feature	Site Type	Townland	ITM	Distance from the development	Effect
GS1	F, in field 9	Circular enclosure	Simmonstown	E696983 N732164	0m within the eastern compound area	Direct
GS2	C, in field 4	Pit like features	Simmonstown	E697637, N731654	0m, within the land acquisition area	Direct

10.3.8 Designated Heritage Features within the Constraints Study Area

10.3.8.1 World Heritage Sites and National Monuments

There are no World Heritage (WH) Sites or structures of archaeological or architectural heritage within the cultural heritage study area that are on the WH Tentative List. There are no National Monuments in state ownership, guardianship, or vested care of the local authority within 250m of the proposed development.

10.3.8.2 Record of Monuments and Places (RMP) Sites

There are six RMP / SMR sites and their Zones of Notification (ZoN) are located within 250m of the proposed development (**Figure 10-7, Table 10.4**). The RMP sites are listed below in **Table 10.4** and described in detail in **Appendix 10.1D (Recorded Archaeological and Architectural Heritage Sites within 250m Radius of the Proposed Development)**.

Included in these sites is a 17th century house (KD011-026), two mills (KD011-037, KD011-038), two 'sites of' castles (KD011-016, KD011-019) and an enclosure site (KD011-029). The sites are either subsurface sites or are sites that are no longer upstanding.

Table 10.4: RMP sites within the 250m Cultural Heritage Study Area

RMP Ref	Site Type	Townland	ITM	Distance from RMP ZoN – route	Effect
KD011-026	House – 17th century	Celbridge Abbey	696544, 732206	165m southwest	None
KD011-037	Mill - unclassified	Newtown	696667, 732117	135m southwest	None
KD011-038	Mill – unclassified	Newtown	696666, 732120	135m southwest	None
KD011-019	Castle – tower house	Newtown	696775, 732014	134m southwest	None
KD011-063	Enclosure	Simmonstown	697288, 732263	232m northeast	None
KD011-029	Enclosure	Simmonstown	697410, 732037	134m northeast	None
KD011-016	Castle - unclassified	Simmonstown	697561, 732000	196m northeast	None

There will be no direct impacts or indirect setting impacts on any of the RMP sites located within a 250m radius of the proposed development, as they all lie well outside the lands to be acquired to facilitate construction of the Project.

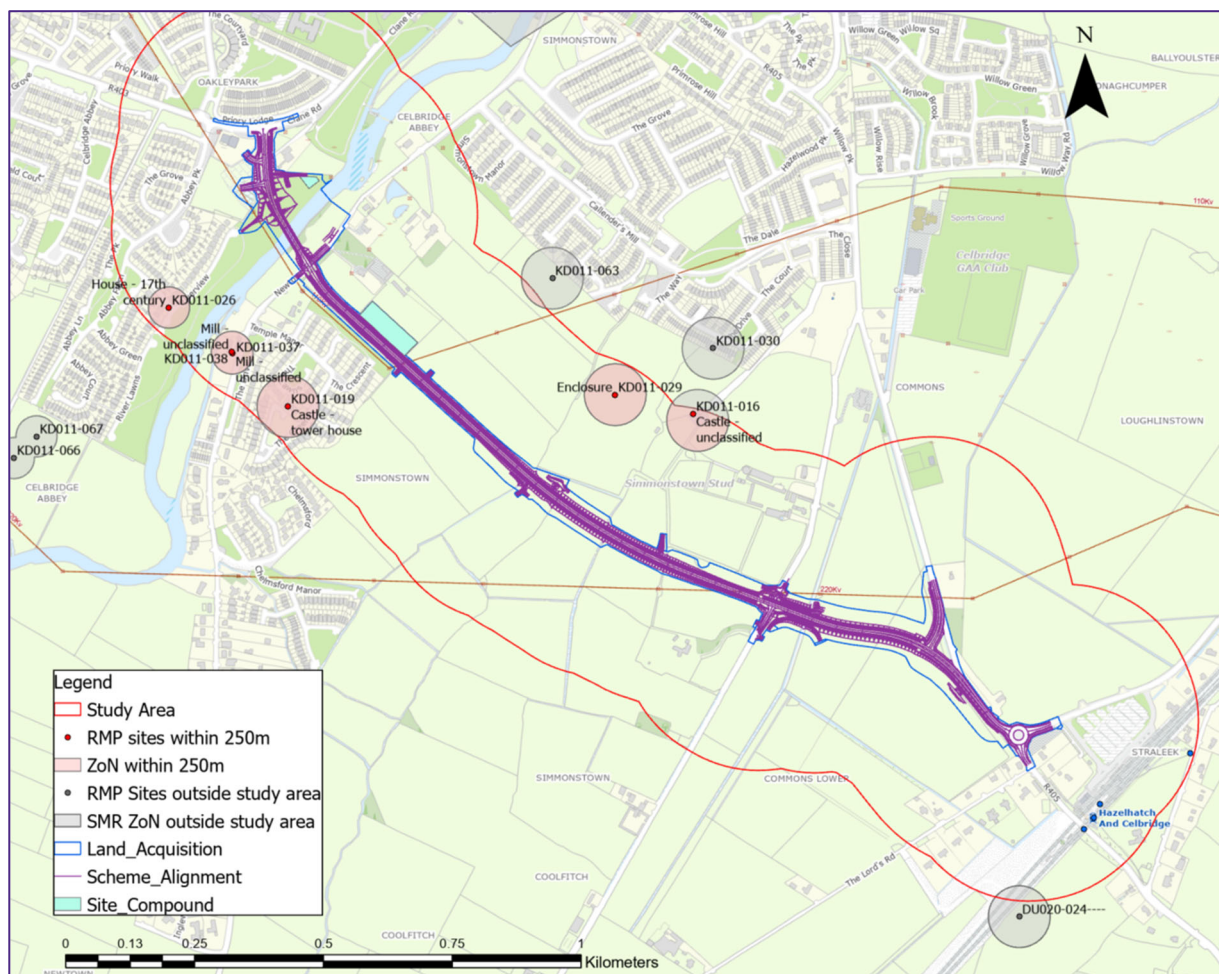


Figure 10-7 RMP sites within the Cultural Heritage Study Area

10.3.8.3 Protected Structures and NIAH Sites

There are seven protected structures within 250m of the land acquisition boundary of the Project (**Figure 10-8, Table 10.5**, these sites are described in detail in **Appendix 10.1D**).

Table 10.5: Protected Structures and NIAH sites within the Cultural Heritage Study Area

RPS, NIAH Ref	Townland	ITM_E/ ITM_N	Name	Distance ²⁰	Effect
BH11-126	Celbridge Abbey (Celbridge Ed)	696859/ 732459	Folly, Vanessa's Bower	40m east	None
B11-110, 11805078	Celbridge Abbey (Celbridge Ed)	696957/ 732574	Foot Bridge, Rock Bridge, Clane Road (off)	130m northeast	None
B11-111, 11805079	Celbridge Abbey (Celbridge Ed)	696935/ 732588	Foot Bridge, Celbridge Abbey, Clane Road	154m northeast	None
B11-112, 11805080	Celbridge Abbey (Celbridge Ed)	696924/ 732566	Mill Race - Sluice/Sluice Gate	160m northeast	None
SD145, 11207013	Hazelhatch	698522/ 731343	Gates/railings/walls	243m southeast	None
SD150,112070 11	Hazelhatch	698349/ 731246	Railway station	142m southeast	None
SD151, 11207010	Hazelhatch	698350/ 731216	Foot bridge	144m southeast	None

²⁰ Distance measured to the land acquisition boundary

The seven protected structures listed in the Record of Protected Structures (Kildare CDP 2023 – 2029 and South Dublin CDP 2022-2028), four at the northern end of the Project associated with the southwestern most extent of the former Celbridge Abbey Demesne (RPS B11-24A -C, B11-126), associated with the river and a further three at the southeastern end relating to the railway line in Hazelhatch. The sites are also listed in the NIAH.

Vanessa's Bower, is a folly located within Celbridge Abbey Demesne. It is described in the RPS record as:

An early 18th century cave-like shelter of limestone construction covered in soil built into an embankment overlooking the River Liffey. The structure was regularly visited by Dean Johnathan Swift and Ester Vanhomrigh who Swift affectionately called 'Vanessa'.

The Kildare RPS places the bower on the northern banks of the river Liffey in the vicinity of a foul pumping station at the northeastern end of a greenspace associated with Abbey Park, c.5 m from the land acquisition area. The site is however located adjacent to rock bridge (130m northeast) having been moved to that location from its original location on the eastern side of the river. (**Figure 10-8**).

None of the RPS sites within 250m of Project will be directly affected by the proposed development as they lie well outside the road construction corridor, similarly these sites will not be subject to setting impacts giving their existing setting, subsurface nature and distance from the development. The bridge and mill related structures are also recorded in the Kildare Industrial Archaeological Heritage Survey (KIDIAH) and bear testament to the growing success of Celbridge in the eighteenth and nineteenth centuries.

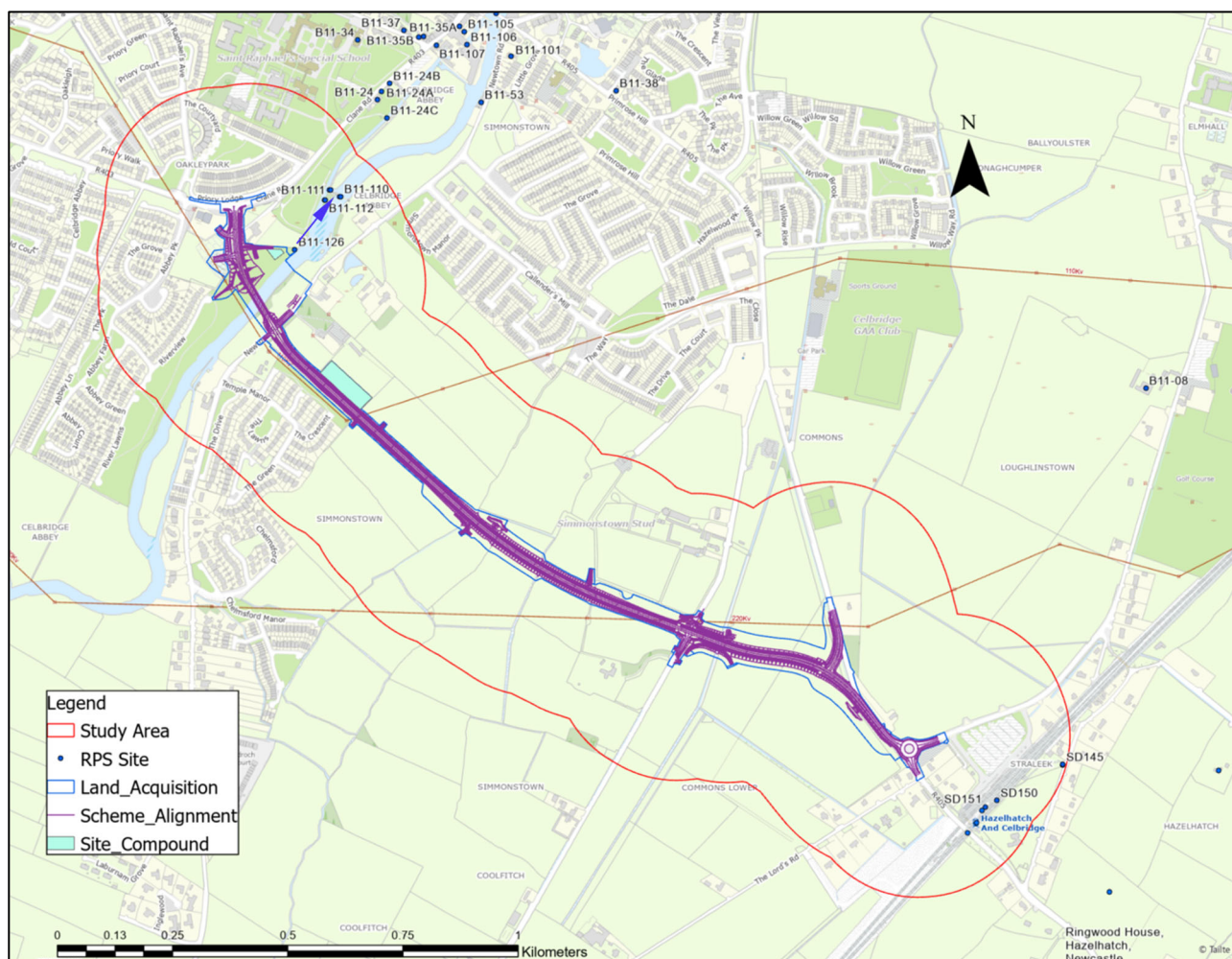
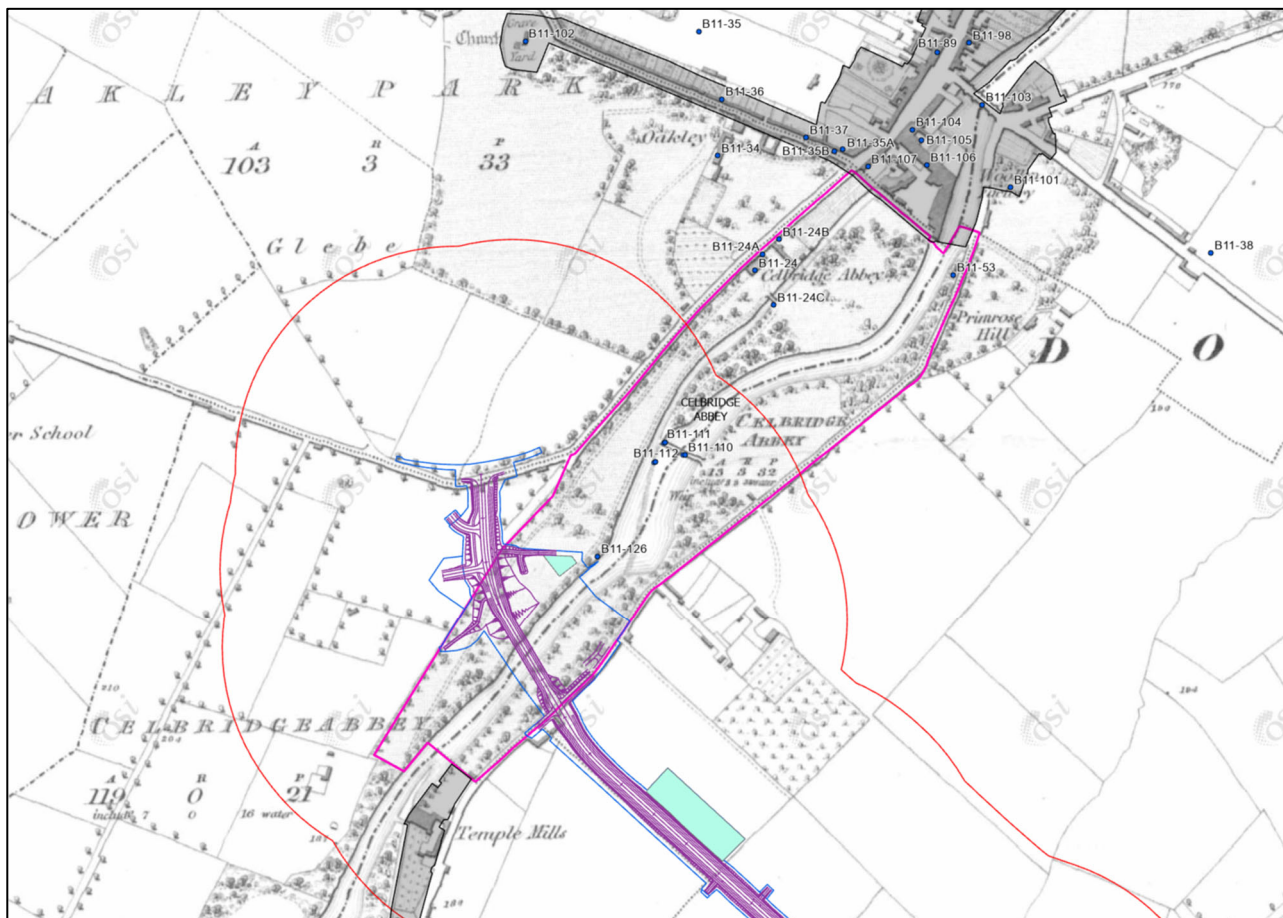


Figure 10-8 RPS sites within the Cultural Heritage Study Area (Note the blue arrow showing the correct location of B11-126)

10.3.8.3.1 Celbridge Abbey

The northern end of the proposed development passes through the former demesne lands associated with Celbridge Abbey (RPS B11-24A -C). The extent of the former demesne is recorded on the first edition OS



Within the former Celbridge Abbey demesne lands, on the northern side of the river, the area through which the proposed development passes is in use as a landscaped public green space associated with a residential development (Abbey Farm). There is a tall metal fence and overgrown hedgerow and mature tree lined boundary dividing this green area from the former demesne lands, preventing access to the Celbridge Abbey lands. On the southern side of the river, the lands are overgrown and unused. These areas on both sides of the river no longer support the heritage value of the demesne as it presents today.

The protected features associated with Celbridge Abbey demesne, relate to the exploitation of the River Liffey. There is a substantial diagonal weir crossing the river, and a canalised section of the river runs through the ground of Celbridge Abbey towards the town and the former Woolen Factory / Celbridge Mills. The canal was built in c. 1775 as part of the Celbridge Abbey estate. The Rock Bridge (B11-110²¹), an 18th century footbridge over the river, and an additional footbridge (B11-111) and a sluice (B11-112) located along the canal / millrace are over 280m upstream from the proposed bridge crossing.

Panoramic photographs of viewpoint locations taken by the Landscape and Visual consultants for the purpose of the Cultural Heritage Impact Assessment capture three open locations within Celbridge Abbey (**Figure 10-10**). The methodology for the accompanying baseline photography is outlined in the Landscape and Visual Impact Assessment (LVIA) provided in **Chapter 8**.

Wireframe images have been generated by the Project Team to illustrate visibility of the project and impact on setting of the heritage features and these are provided under separate cover in **Appendix 10.1E (Wireframes / Heritage Photomontages)**.



Figure 10-10 Location of panoramic photographs taken from within Celbridge Abbey, the proposed route and RPS sites

These locations include views in the direction of the proposed development (southwestern) from the abbey garden (refer to Ref CH01, **Appendix 10.1E**), from an open field between the canal and the river (refer to Ref CH02, **Appendix 10.1E**) and in front of the garden and from Rock Bridge (refer to Ref CH03, **Appendix 10.1E**). The wireframe views reveal that the dense vegetation surrounding Celbridge Abbey and the bend of the river upstream beyond the weir obstruct any long range or informative or open views towards the southwest from these locations and that the development will not be viewed. Due to the topography, the landform, dense tree cover and the bend in the river the proposed development will not cause any visual changes to the setting of Celbridge Abbey.

10.3.8.4 Architectural Conservation Areas and Protected Areas

An Architectural Conservation Area (ACA) is a place, areas, groups of structures or townscape of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest, or which contribute to the appreciation of protected structures, in a planning authority's functional area.

The northernmost end of Temple Mills ACA (CDP 2023-29) (**Figure 10-11**) is within the 250m Cultural Heritage study area of the Scheme. It is c. 91m southwest of the proposed development (measured from the proposed intersection with Newtown Road).

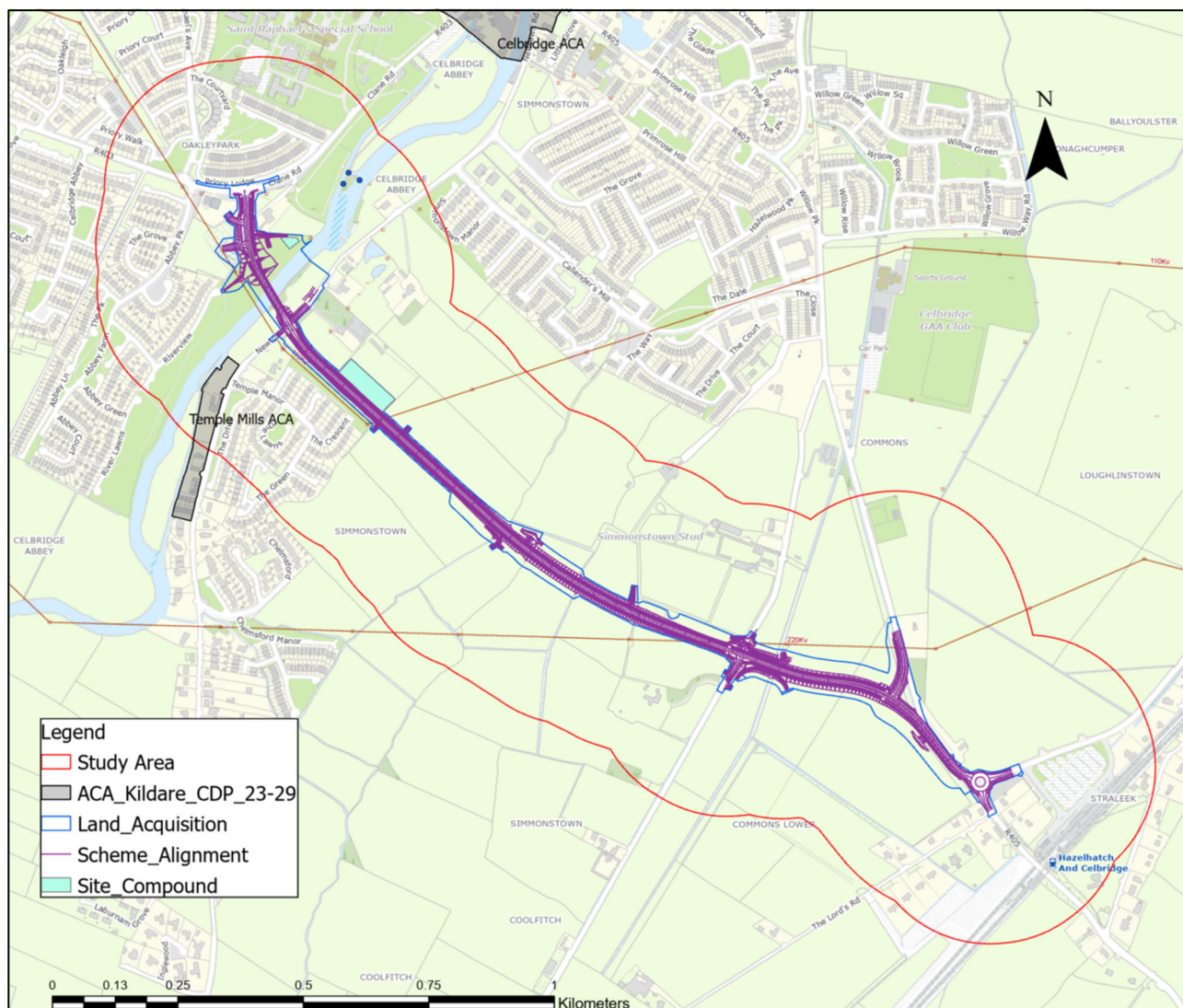


Figure 10-11 Celbridge and Temple Mills ACAs

A wireframe view (refer to Ref CH04, **Appendix 10.1E**) taken from the northern end of the ACA at the entrance to the mill buildings captures the view northwest towards the proposed development. The view includes rubble stone walls on the left-hand side of the road, the bend in the road and the new entrance to a residential development on the right-hand side and dense vegetation cover.

The junction of the proposed road and Newtown Road is located after the bend in the existing road, and as demonstrated in the wireframe view there will be no change to the setting or visual amenity of the northern end of the Temple Mills ACA.

10.4 Predicted Impacts

10.4.1 Pre-Construction Phase and Construction Phase

10.4.1.1 Designated Sites

There are no designated archaeological sites (RMP sites, national monuments) within the proposed development area. The demolition and construction phase of the proposed development will have no direct or indirect negative effects on any designated archaeological sites.

Similarly, there will be no direct or indirect (setting) effects on any architectural heritage sites (protected structures, NIAH structure or garden sites or ACA's) in the receiving landscape due to their topographical location, screening by dense vegetation, and distance.

10.4.1.2 Effect on Newly Identified Sites

There will be a direct, negative, permanent impact on the possible ring barrow site GS1 and the pit-like feature, GS2 discovered during the geophysical survey.

GS2 is a relatively small and isolated site, which may or may not prove to be archaeological in nature, however an archaeological explanation for the feature cannot be ruled out. In accordance with the EPA assessment criteria (**Appendix 10.1B**) the magnitude of impact on this feature is considered to be medium (i.e. where the area of the site to be impacted will be permanently impacted upon leading to a loss of character, integrity and data about the archaeological feature/site). The site is considered to be of low sensitivity and as a result the overall effect on GS2 will therefore be of slight negative significance.

The possible barrow site identified in the geophysical survey (GS1) is located within the construction compound. The magnitude of impact is considered to be medium, as the nature and scale of the site is suggestive of a prehistoric ring barrow the site is considered to be of medium significance and as a result the overall effect on GS1 will be of moderate negative significance.

10.4.1.3 Effect on Areas of Archaeological Potential

Other than the two sites discovered, the geophysical survey did not detect any large-scale archaeological sites or areas of particular sensitivity. However, there remains a potential, although low, that small scale isolated subsurface archaeological sites or features may lie undiscovered in the undisturbed greenfields through which the proposed development travels (Fields 1-10). Furthermore, as mentioned above, the areas on both sides of the River Liffey (Fields 11-13) would be considered to have an archaeological potential (AP1). The presence of modern disturbances in Fields 11-13 identified in the geophysical survey may conceal any underlying archaeological remains. Consequently, there is a possibility that previously unknown archaeological features or finds associated with the river could be subject to impacts by the earthmoving works associated with the construction of the proposed development. Further archaeological investigation will be required to determine whether any archaeological deposits, features or finds are present at these locations.

Should previously unknown archaeological features be identified, the impact on any such remains would be direct, negative, and permanent. As the importance of the receptor is unknown, the significance of effect is recorded as yet undetermined.

A structure (AP2, Field 10) was identified on the 1836 OS historic mapping within the footprint of the route option (refer to **Section 10.3.6**) straddling the townland boundary of Newtown and Simmonstown, it was demolished by the revised 1911 OS map edition. It is possible that subsurface remains of this structure survive and that they will be exposed during the earthmoving works associated with the construction of the proposed development. Nothing was however identified at this location in the geophysical survey, which may suggest that the structure was temporary in nature with little in the way of foundation remains. Possible buried foundations of 18th / 19th century structures would be of local historical and social interest and the impact on any such remains would be direct, negative, and permanent. These sites are considered to have a low sensitivity value, and the magnitude of impact will be medium. Therefore, the overall significance of effect is slight negative.

The proposed development does not require works within the River Liffey or its banks and as such the proposed development will have no impact on any in-situ underwater archaeology that might be present.

10.4.2 Operational Phase

All physical archaeological, architectural and cultural heritage impact issues will be resolved at the pre-construction stage of the development, and therefore, no potential effects are envisioned at the operation stage of the development. The operational effects will be of no significance.

10.4.3 Cumulative Impact

No cumulative impacts were identified in the course of this assessment.

10.5 Proposed Mitigation Measures

10.5.1 Construction Phase

Mitigation of the impact of development on the archaeological resource can take the form of 'preservation by record' (full hand excavation, i.e. sterilisation of archaeological area); and 'preservation in situ' (excluded from development, i.e. avoidance through design in a location where the future protection and interpretation of the site can be assured) or a combination of both.

All archaeological works will take place under Ministerial Direction or Section 26 Consent Licence to the Department of Housing, Local Government and Heritage (DHLGH).

Archaeological Excavation

It is recommended that an area measuring 10m x 10m around pit feature GS2 and a 10 x 10m around the possible barrow site (GS1) (from the outer edges of both sites) be subject to preservation by record or full archaeological excavation. This will be carried out under licence to the National Monuments Service DHLGH well in advance of main construction works. Archaeological excavation ensures that the removal of any archaeological soils, features, finds and deposits is systematically and accurately recorded, drawn and photographed, providing a paper and digital archive and adding to the archaeological knowledge of a specified area (i.e. preservation by record).

As archaeological excavation involves the removal of the archaeological soils, features, finds and deposits, following this mitigation measure there is no further impact on the archaeological heritage.

Archaeological Testing

It is recommended that the land acquisition boundary of the fields either side of the river crossing (Fields 11-13) are subject to archaeological testing well in advance of main construction works. The disturbance noted in these fields in the geophysical survey may mask in-situ archaeological sites or features in these fields.

Archaeological testing within Field 10 where structure AP2 is recorded on historic mapping, is also recommended in order to identify and record any surviving features.

Any archaeological features revealed by the test-trenching, which will be directly impacted by the proposed works, will be preserved by record by means of archaeological excavation, recording and publication of results.

Archaeological Monitoring

Licensed archaeological monitoring of earthmoving works in the remaining greenfield areas is also recommended to be carried out. The purpose of monitoring is to establish the presence or absence, as well as the nature and extent, of any archaeological deposits, features or sites that may be present within the land acquisition boundary of the Project.

In the event of the discovery of archaeological finds or remains, the NMS and the National Museum of Ireland (NMI) will be notified immediately. If features are revealed, the immediate area will be investigated, allowing no further development to take place until the site is fully identified, recorded and excavated to the satisfaction of the statutory authorities.

If archaeological features are identified, provision (time and funding) should be made for the full recording and, if necessary, excavation of the archaeological material in compliance with any measures that the DHLGH and the relevant local authority deem appropriate. This possibility will be accounted for in the Project programme and budget and will be undertaken at the earliest phases of the development to allow the archaeologists sufficient time to record/excavate as required.

Monitoring includes all groundwork associated with the development including the placement of construction compounds, access and maintenance roads, landscaping, drainage and topsoil stripping within the permanent and temporary land-take to ensure that no features are damaged or removed without proper recording.

The licensed archaeologist will have provision to inspect all excavation to the formation level for the proposed works and to temporarily halt the excavation work, if and as necessary. They will be given provision to ensure the temporary protection of any features of archaeological importance identified. The

archaeologist will be afforded sufficient time and resources to record and remove any such features identified.

Kildare County Council will make provision to allow for, and to fund, the necessary archaeological monitoring, inspection and excavation works that will be needed on-site during and prior to construction, either directly or indirectly via the appointed contractor.

10.5.2 Operational Phase

All physical archaeological, architectural and cultural heritage impact issues will be resolved at the pre-construction stage of the development, and therefore, no potential effects are envisioned at the operation stage of the development. The operational effects will be of no significance.

10.6 Residual Impacts

With the mitigation measures implemented in full, identified and previously unknown subsurface archaeological features that are identified will be resolved and recorded in full. The residual effects would be reduced to imperceptible, and this would result in a significance of effect of negligible which is not significant in EIA terms.

There will be a residual positive effect resulting from the excavation of the archaeological sites within the proposed development, as the sites will be recorded and the results published, thus adding to the body of archaeological knowledge in this part of Celbridge.

10.6.1 Construction Phase

During the construction phase all mitigation measures will be undertaken in compliance with national policy guidelines and statutory provisions for the protection of the archaeological heritage. All methodologies will have to be agreed in advance with the National Monuments Section of the Department of Housing, Local Government and Heritage (DHLGH).

10.6.2 Operational Phase

Upon the completion of the proposed development, there will be no negative residual effects on the archaeological or cultural heritage resource. No future monitoring of cultural heritage to test the predictions made within the impact assessment is considered necessary.

11 MATERIAL ASSETS: AGRICULTURAL PROPERTIES

11.1 Introduction

This Chapter of the Environmental Report identifies, describes and presents an assessment of the potential effects of the Proposed Scheme on Material Assets: Agricultural Properties during both the construction and operational phases of the Proposed Scheme. The assessment should be read in parallel Drawing **MDT0902-RPS-01-XX-DR-Z-LH0001-LH0003**.

11.2 Assessment Methodology

11.2.1 Relevant Guidelines, Policy and Legislation

There is no specific guidance on the assessment of impact on agricultural property. In the absence of guidelines that are specific to the assessment of the impact on agricultural property, consistent with best practice, the assessment and appraisal of the impact on agriculture was prepared with regards to the following guidance documents:

- Environmental Protection Agency (EPA), 2022. Guidelines on the information to be contained in Environmental Impact Assessment Reports.
- Transport Infrastructure Ireland (TII), 2024. PE-PAG-02031, Project Appraisal Guidelines Unit 7.0 – Multi Criteria Analysis.

11.2.2 Study Area and Zone of Influence

The study area for this assessment comprises of the agricultural property directly impacted by the Proposed Scheme. The zone of influence extends to the agricultural lands, to include owned or rented lands, being farmed as part of directly affected agricultural properties.

11.2.3 Sources of Information to Inform the Assessment

The assessment has been informed by roadside surveys and agricultural property landowner surveys. The roadside survey has informed the assessment of the wider baseline environment. The landowner surveys have, where required, been completed for each agricultural property that is directly impacted by the Proposed Scheme. Further sources of information to inform the assessment included the following:

- Property Registration Authority of Ireland (PRAI) – Land registry / landownership information. ship i
- Central Statistics Office – National Census of Agriculture statistics derived from the June 2020 Census of Agriculture (2022).
- Teagasc - Irish National Soils Map, 1:250,000k, V1b (2014).
- Environmental Protection Agency (EPA) - Creamer, R. "Irish SIS Final Technical Report 13: Irish Soil Information System Legend".

11.2.4 Key Parameters for Assessment

The key parameters for assessment that have potential to result in potential effects on agricultural properties are outlined below:

- Land take: The Proposed Scheme is almost entirely offline on agricultural and non-agricultural lands. The Proposed Scheme will involve significant areas of land take on two individual farm holdings. Land take details on individual properties are presented in **Table 11.5** (Refer to **Section 11.4.2**).
- Farm Division: The Proposed Scheme will result in farm division occurring on two farm holdings. During the construction period, there may be temporary impacts on access to both severed and remaining lands due to works involved and traffic diversions required for the construction of the

Proposed Scheme and the associated junctions. Where farm division occurs, mitigation measures may be necessary to restore access to lands.

- Farm Enterprise: The effect of land take and / or farm division on farm holdings will differ according to farm enterprise(s). Some farms enterprises are considered more sensitive to the construction and / or operation effects of a proposed development due to the intensity or type of farming activities on the farm holding.
- Effects on farm buildings / farm facilities: The Proposed Scheme will not impact on farm buildings or facilities on agricultural properties.

11.2.5 Assessment Criteria and Significance

The baseline environment for agricultural property has been evaluated on an individual property basis and assigned a baseline rating. This baseline rating combined with a magnitude of impact from construction and operational effects impacts associated with the Proposed Scheme will determine the significance of the agricultural impact.

Baseline Rating Criteria

The criteria used to determine the baseline rating for the farm holdings on the Proposed Scheme are shown in **Table 11.1**. The criteria for each of the baseline ratings have been developed in consideration of the relevant EPA guidelines on describing the existing environment.

Table 11.1: Baseline Rating Criteria

Rating	Criteria
High	• Intensively managed farm enterprises on good quality lands. • Specialist dairy enterprises or farm enterprises involved in the breeding of high-quality livestock. • Specialist equine enterprises involved in the training or breeding of high-quality horses. • Tillage enterprises on good quality lands. • Mixed livestock and/or tillage enterprises on good quality lands. • Agricultural lands used for research and education.
Medium	• Livestock and / or tillage enterprises on medium quality lands. • Agricultural lands of good quality leased for livestock or tillage production. • Agricultural lands of good quality which is zoned or planning permission exists for non-agricultural purposes.
Low	• Extensively managed farm enterprises on medium quality lands. • Land parcels with limited agricultural capacity due to size or shape. • Agricultural lands of medium or poor quality leased for livestock production. • Lands under commercial forestry or woodland. • Agricultural lands of medium quality which is zoned or planning permission exists for non-agricultural purposes.
Very low	• Extensively managed livestock farm enterprises on poor quality lands. • Unused agricultural lands of medium or poor quality. • Agricultural lands of poor quality which is zoned or planning permission exists for non-agricultural purposes.

Impact Magnitude

Impacts on agricultural properties arising from construction and operation of the Proposed Scheme include: Land-take; Farm Division and Effects on farm buildings / facilities. Further details are provided in **Appendix 11.1A (Impact Magnitude)**.

Magnitude of Impact Criteria

The criteria used to determine the magnitude of impact for the farm holdings arising from the Proposed Scheme are shown in **Table 11.2**. The criteria for each of the impact ratings have been developed in consideration of the relevant EPA guidelines on the assessment of impact.

Table 11.2: Magnitude of Impact Rating Criteria

Rating	Criteria
Very High	- The impact on the farm is such that the farm enterprise(s) cannot continue. - Permanent land-take of such an area that the farm enterprise(s) is unworkable. - Permanent land severance of such an area that the farm enterprise is unworkable. - Essential farm buildings / facilities may be significantly impacted.
High	- The impact on the farm is such that the farm enterprise(s) cannot continue without considerable management changes. - Permanent land-take of such an area that the continued management of the farm enterprise will require considerable change. - Permanent land severance of a nature that the continued management of the farm enterprise will require considerable change. - Essential farm buildings / facilities may be directly or indirectly impacted.
Medium	- The impact on the farm is such that the farm enterprise(s) can be continued as before but with increased management difficulties. - Permanent land-take of such an area that the management of the farm enterprise(s) can be continued but with increased difficulties. - Permanent land severance of a nature that the management of the farm enterprise(s) will require management changes. - Farm buildings and/or farm facilities may be directly or indirectly impacted.
Low	- The impact on the farm is such that the farm enterprise(s) can be continued as before with minor management changes. - Permanent or short-term land-take of such an area that the farm enterprise(s) incurs minor difficulties as a result. - Permanent or short-term land severance of a nature that the farm enterprise(s) will require minor management changes. - Farm buildings / facilities would not be directly impacted. There may be indirect impacts. - Temporary construction impacts.
Very Low	- The impact on the farm is such that the farm enterprise can be continued as before or with temporary management changes. - Temporary land-take of such an area without noticeable consequences. - Permanent land-take of very small areas of land or of public roadbed only. - Temporary land severance of a nature that the farm enterprise can be continued but with minor management changes. - Farm buildings / facilities would not be directly impacted. There may be indirect impacts. - Temporary construction impacts.

Significance of Impact

The significance of impact/effect on an agricultural property is determined by the baseline rating of a farm holding combined with the magnitude of impact of the Proposed Scheme. The likely significance rating is determined by reference to the matrix in **Table 11.4** using the baseline rating (**Table 11.1**) and magnitude of impact (**Table 11.2**). The likely significance of effects is prior to the implementation of any mitigation measures.

Table 11.3: Significance of Impact

Baseline	Magnitude of Impact				
	Very High	High	Medium	Low	Very Low
High	Profound	Significant to very significant	Moderate	Slight	Not significant
Medium	Significant to very significant	Significant	Moderate	Slight	Not significant
Low	Moderate to Significant	Moderate	Slight	Not significant	Not significant
Very Low	Moderate	Slight	Slight	Not significant	Imperceptible

11.2.6 Data Limitations

The assessment has been prepared based upon the best available information and in accordance with current best practice and relevant guidelines. There were no technical difficulties or otherwise encountered in the preparation of this assessment.

11.3 Description of Receiving Environment

11.3.1 Agricultural Land

The Proposed Scheme will require the permanent acquisition of agricultural lands and will result in a reduction in the national utilised agricultural land area.

The national agricultural farmed area is 4,509,256 ha including rough grazing. When this category is excluded, there is 4,151,456ha of grassland, 265,592ha of cereals and 92,208 ha of other crops, fruit and horticulture (Central Statistics Office, 2022). There are 135,037 farms in Ireland with an average farm size of 33.4ha nationally. The main agricultural enterprises are beef (54.9%), sheep (12.9%), dairying (11.4%), and mixed field crops (8.5%). Mixed grazing livestock (6.3%), tillage (3.4%), mixed crops and livestock (1.3%) and other (1.3%) are the remaining enterprises (Central Statistics Office, 2022).

County Level

The total agricultural area of County Kildare is 113,449ha and when commonage and rough grazing are excluded there is 79,913 ha grassland, 27,667ha cereals and 5,869 ha of other crops, fruit and horticulture (Central Statistics Office, 2022). There are 2,534 farms in County Kildare with an average farm size of 44.8ha. The main agricultural enterprises are beef (42.7%), tillage (15.3%), mixed field crops (11.9%), sheep (11.7%), mixed grazing livestock (6.6%), dairy (5.9%), mixed crops & livestock (3.7%), and other (2.2%) (Central Statistics Office, 2022).

11.3.2 Soils

Soil series information is organised as Soils Associations – the mapping of local soils series or soil types that commonly occur in the landscape. The main soil association found within the study area is Straffan soil association (Environmental Protection Agency, 2014).

Soil Association Straffan is classified as a Surface-water Gley or water influenced soil. There is a slowly permeable sub surface horizon that impedes downward water movement resulting in waterlogging. In the study area, Straffan soils are found on agricultural lands from the Temple Mills Road (L1016) to the Hazelhatch Road (R405). They are described as fine loamy in texture and the parent material is drift with limestones. Straffan soils are suitable for grassland and are also used for tillage.

11.3.3 Agriculture in the Study Area

The study area is comprised of agricultural properties directly impacted by the Proposed Scheme. There is a relatively low number of agricultural properties within the study area and these properties are located in close proximity to existing urban development in Celbridge Town.

There are four agricultural properties impacted by the Proposed Scheme. There are two agricultural properties within lands that are zoned as 'New Residential' under the Celbridge Local Area Plan 2017-2023. The lands also fall within the Simmonstown Key Development Area (KDA) identified in the Celbridge Local Area Plan 2017 - 2023. The baseline rating for agricultural properties along the Proposed Scheme is presented in **Table 11.4**.

Table 11.4: Baseline Rating For Agricultural Properties along the Proposed Scheme

Rating	No. of properties	% of total
High	3	75
Medium	1	25
Low	0	0
Very low	0	0
Total	4	100.0%

11.4 Predicted Impacts

11.4.1 Construction Phase

The assessment of the impact on agricultural land includes the effects of the construction impacts. Construction activity associated with the Proposed Scheme will give effect to further impacts on agricultural property which are discussed below.

Temporary Land take - The construction works for the Proposed Scheme will involve a total temporary land-take of 0.5ha agricultural lands.

Construction Noise - The activity of earth moving machinery, transport lorries and other ancillary vehicles will generate additional noise emissions in the immediate vicinity of the construction area. Noise can be of significance for farm animals (i.e., when noise becomes excessively loud). In general, animals become accustomed to regular noises and sounds. Intermittent noises can cause fright and distress. Intermittent noises close to farm buildings can distress livestock.

Dust - Dust generated from the exposure of soil to the atmosphere during construction may cause annoyance or nuisance to the farmer and farm animals. Livestock are at risk of eye irritations from high levels of windblown dust particles. This stress may reduce productivity and increase management difficulties.

Restricted Access to Land - Access to land will be maintained, as much as possible, during the Proposed Scheme construction process (i.e., following the commencement of construction but before the accommodation works have been completed).

Disturbance of Field Drainage - Field drainage systems currently in situ will be interrupted by the construction works. These systems will be restored as part of the completed proposed development works. However, there may be temporary impaired drainage in the period of time between initial disturbance and final reinstatement of such drainage works.

Disturbance of Services - Access to either piped water or drinking points on watercourses may be affected during construction through the severance of piping on the farm or the diversion of watercourses used by livestock on the farm. Electric fencing used on farms to stock proof farm boundaries or control the movement of stock may also be affected.

11.4.2 Operational Phase

The Proposed Scheme will involve a total land-take of 9.1ha from four agricultural holdings, involving permanent land take of 8.6ha and temporary land take of 0.5ha.

The permanent land take is comprised of 8.4 ha agricultural lands and 0.2 ha public road. Temporary land take is comprised of 0.5ha agricultural lands.

Impact on Agricultural Land Nationally and in County Kildare

The permanent acquisition of approximately 8.4 ha of agricultural land is not significant at a national level. The area of land take from a local or individual perspective will be high on some of the individual farms but is not significant at a county level.

Impact on Agricultural Land in the Study Area

The impact on agricultural land is confined to farm holdings impacted by the Proposed Scheme. An assessment of the impact (pre-mitigation) of the Proposed Scheme on agricultural property is presented in **Table 11.5**. Measures to mitigate the adverse effects of the Proposed Scheme are described in **Section 11.5**. An assessment of the significance of the residual impact following the implementation of mitigation measures is presented in **Section 11.6**.

Section 177AE Environmental Report

Table 11.5: Assessment of the Impact of Land take on Agricultural Properties

Farm ID	Farm Size (ha)	Farm Type	Baseline Rating	Perm. Agri Land (ha)	Perm. Public Road (ha)	Temp. Agri Land (ha)	Temp. Public Road (ha)	Impact Details	Magnitude of Impact	Impact Significance (Pre-mitigation)	Specific Mitigation Measures	Significance of Residual Impact
105	0.4	Llamas	Medium	0.0000	0.0121	0.0000	0.0000	Permanent reduction in public road only.	Very Low	Not Significant	None required	Not Significant
107 / 108	24.3	Mixed - Dairy & Beef	High	2.6304	0.0000	0.4575	0.0000	Permanent and temporary reduction in agricultural area due to proposed mainline, Newtown Road Junction, site compound and attenuation pond. Division of farm holding into two separate areas. Loss of access from the severed area to the farmyard. Impact on existing field gate. Impact on property boundary.	High	Significant	Provide access to the severed lands via staggered field gates. Provide permanent stockproof boundary.	Moderate
109	81.7	Equine	High	5.7199	0.1722	0.0932	0.0000	Permanent and temporary reduction in agricultural area due to proposed mainline, Simmonstown Manor Road Junction, Hazelhatch Road Junction and flood / drainage elements. Division of farm holding into two separate areas. Loss of access from the severed area to the farmyard. Impact on existing field gates. Impact on existing land drainage. Impact on existing services. Impact on property boundary.	High	Significant	Provide field access to retained lands. Provide permanent stockproof boundary.	Moderate
112	9.8	Tillage	High	0.0000	0.0547	0.0000	0.0000	Permanent reduction in public road only.	Very Low	Not Significant	None required	Not Significant

Based on **Table 11.5**, the magnitude of impact on agricultural land and property ranges from Very Low to High. The significance of effect (pre-mitigation), which is determined by combining the magnitude of impact with the baseline rating for that farm, ranges from *not significant to significant*.

There are two agricultural properties (Farm ID 107/108 and 109) where the magnitude of impact is *High* and the level of impact is considered to be *significant*. This effect is due to the combined impact of permanent land-take and division of retained lands. The impact is such that the continued management of the farm enterprise will require mitigation. Such management changes may involve changes to current farming practices or day to day management (livestock type and numbers, areas of fodder / crop production and the use of existing farmyard facilities).

There are two agricultural properties (Farm ID 105 and 112) where the magnitude of impact is *Very Low* and the level of impact is considered to be *not significant*.

11.4.3 Cumulative Impact

No cumulative impacts were identified in the course of this assessment.

11.5 Proposed Mitigation Measures

This section describes the measures that when implemented will mitigate the adverse impact on agricultural land. At this stage measures such as compensation for land acquisition and disturbance are not considered. These matters will be agreed, if possible, with landowners or their representative(s) once approval for the Proposed Scheme has been granted. If agreement is not possible, such compensation will be decided upon by an arbitrator.

11.5.1 Construction Phase

Details of specific measures that are required for individual properties have been specified in **Table 11.5**.

- **Temporary Land take:** Following the completion of relevant construction works, lands temporarily acquired will be reinstated to existing agricultural condition. Measures will be considered on a site-by-site basis, subject to proposed construction works. Where construction compounds will involve installing a hard-core surface it will be necessary for topsoil to be removed and stored. Where new access is proposed affecting existing property boundaries these will be reinstated on a like for like basis. This may require storage of stone wall material during construction or replanting of hedgerow / trees, as required.
- **Construction Noise:** Measures to mitigate noise impacts on sensitive receptors are detailed in the Noise and Vibration Assessment (provided in **Chapter 5**). Good communication between the contractor and adjacent landowners during the construction phase, especially when excessively loud activities are programmed, will prevent undue disturbance to farm animals. It will also facilitate farm enterprises so that livestock can be moved away from the construction work during critical times.
- **Dust:** Measures to control the production of dust will be put in place by the contractor as detailed in the Air Quality Assessment (provided under separate cover) which presents a series of measures to control dust. Good communication between the contractor and the farmers in the proximity of construction activities will facilitate on-going farm enterprises so that livestock may be kept as far as possible from the construction work during critical times.
- **Restricted Land Access:** Access will be restored, as soon as possible, to lands where it is removed or restricted by the Proposed Scheme. The location of such access will be at a suitable location and, where possible, with the agreement of the landowner. Good communication between individual farmers and the contractor will minimise difficulties caused by the restriction of access to land. Temporary fencing will be erected as required to delineate the site boundary and to minimise disturbance to adjacent lands. Temporary access gates may be required until such time as permanent access arrangements are in place.
- **Disturbance of Field Drainage:** In cases where drainage is impeded during construction and causes obvious difficulty to a particular landowner, temporary measures will be considered on a site-specific basis. This may include allowing waters to drain to less critical areas, so as to minimise the impact.
- **Disturbance of Services:** Where required, an alternative source of water / electricity will be provided to ensure that disruption to farming is minimised during the construction phase.

11.5.2 Operational Phase

The following general mitigation measures will be provided:

- Access will be restored to lands where it is removed or restricted. Access will also be provided to lands via the replacement of field access gates. The location of such field access gates will be at a suitable location and, where possible, with the agreement of the landowner.
- Permanent boundary treatment along agricultural lands will consist of a stockproof boundary that is comprised of one of the following:
 - Concrete post and wire.
 - Timber post and rail fence.
 - Paladin style security fencing.
 - Acoustic barriers.
- The new drainage system will be designed to ensure that there will be no increased risk of flooding as a consequence of the Proposed Scheme.
- Any services that are interfered with as a result of the Proposed Scheme will be repaired / replaced without unreasonable delay.
- Ducting for the restoration of water and power supply services will be provided, as necessary.
- Screening will be provided, where required, to mitigate the noise and visual effects of construction works and operational traffic.

11.6 Residual Impacts

The significance of the residual impact on agricultural land has been assessed following the implementation of general mitigation measures as outlined in **Section 11.5** and a summary of the residual impact on agricultural properties is presented in **Table 11.6**.

Following mitigation, there are no agricultural properties on which the residual impact is likely to be profound, *very significant* or *significant*. There are two agricultural properties (Farm ID 107/108 and 109) where the level of impact is *moderate*, representing a reduction a *significant* impact pre-mitigation. There are two agricultural properties (Farm ID 105 and 112) on which the residual impact is likely to be *not significant*.

Table 11.6: Summary of Residual Impact

Significance of Impact	No. of Properties	% of total
Profound	0	0
Very Significant	0	0
Significant	0	0
Moderate	2	50.0%
Slight	0	0
Not Significant	2	50.0%
Imperceptible	0	0
Total	4	100.0%

11.7 Monitoring

No specific monitoring is required for either the construction or operational phases.

12 MATERIAL ASSETS: NON-AGRICULTURAL PROPERTIES

12.1 Introduction

This Chapter of the Environmental Report identifies, describes and presents an assessment of the potential effects of the Proposed Scheme on Material Assets: Non-Agricultural Properties during both the construction and operational phases of the Proposed Scheme. The assessment should be read in parallel Drawing **MDT0902-RPS-01-XX-DR-Z-LH0001-LH0003**.

12.2 Assessment Methodology

12.2.1 Relevant Guidelines, Policy and Legislation

There is no specific guidance on the assessment of impact on non-agricultural property. In the absence of guidelines that are specific to the assessment of the impact on non-agricultural property, consistent with best practice, the assessment and appraisal of the impact on non-agricultural properties was prepared with regards to the following guidance documents:

- Environmental Protection Agency (EPA), 2022. Guidelines on the information to be contained in Environmental Impact Assessment Reports.
- Transport Infrastructure Ireland (TII), 2024. PE-PAG-02031, Project Appraisal Guidelines Unit 7.0 – Multi Criteria Analysis.

12.2.2 Study Area and Zone of Influence

The study area for this assessment comprises of the non-agricultural property directly impacted by the Proposed Scheme and includes the following:

- Residential property;
- Commercial property;
- Community property – Public park, open space or lands that are used for recreational amenity, and
- Development land – Lands zoned for development (with or without planning permission) and sites with planning permission.

Consultation was deemed necessary for properties where lands were to be acquired under the Proposed Scheme with the exception of land from statutory bodies, public road only or for lands where the effect was deemed to be not significant.

12.2.3 Sources of Information to Inform the Assessment

The assessment has been informed by roadside surveys and meetings involving property walkover survey with property owners or their representatives. The roadside survey has informed the assessment of the wider baseline environment. The property surveys have, where required, been completed for each property that is directly impacted by the Proposed Scheme. Property surveys involved on-site meetings with non-agricultural property owners, walk-over survey of the affected lands and the completion of a detailed property questionnaire. Property surveys of the affected lands enabled an assessment of the impact of the Proposed Scheme and the exploration of possible mitigation measures necessary to alleviate negative effects.

Further sources of information to inform the assessment included the following:

- Property Registration Authority of Ireland (PRAI) – Land registry / landownership information;
- Kildare County Development Plan 2023-2029 – Planning and zoning objectives;
- Celbridge Local Area Plan 2017-2023 – Planning and zoning objectives.

12.2.4 Key Parameters for Assessment

The key parameters for assessment that have potential to result in potential effects on non-agricultural properties are outlined below:

- Land take: The Proposed Scheme is almost entirely offline on agricultural and non-agricultural lands will involve areas of land take that may be considered significant on non-agricultural properties.
Land take details on individual properties are presented in **Table 12.5** (Refer to **Section 12.4.2**).
- Property Type: The property type will inform the potential effect of the Proposed Scheme on non-agricultural property. Residential, commercial, community and land that is zoned for development or land/sites with planning permission are considered to be of greater importance and more sensitive to effects associated with the Proposed Scheme. Such properties are indicative of a 'high' baseline rating. Land that is not zoned for development or land without planning permission is indicative of a 'medium' baseline rating.
- Effects on Properties: Effects on non-agricultural properties arising from the proposed development may include:
 - The acquisition of the entire property.
 - The acquisition of a portion of the site on a permanent basis.
 - The acquisition of a portion of the site on a temporary basis.
 - Properties on which access will be relocated or altered.
 - Properties where only public road/ private road is to be acquired.

12.2.5 Assessment Criteria and Significance

The baseline environment for non-agricultural property was evaluated on an individual property basis and assigned a baseline rating. This baseline rating combined with a magnitude of impact from construction and operational impacts associated with the Proposed Scheme will determine the significance of the non-agricultural impact.

Baseline Rating Criteria

The criteria used to determine the baseline rating for property impacted by the Proposed Scheme are shown in **Table 12.1**. The criteria for each of the baseline ratings have been developed in consideration of the relevant EPA guidelines on describing the existing environment.

Table 12.1: Baseline Rating Criteria

Rating	Criteria
High	Residential property. Commercial property. Community property used for public and private education, recreation and / or amenity. Land / site that is zoned and / or planning permission exists for development.
Medium	Land / site that is not zoned and / or planning permission does not exist for development. Residential property (vacant / derelict / ruin). Commercial property (vacant / derelict / ruin).
Low	Property consisting of public road / private road and small plots of land.

Magnitude of Impact Criteria

The criteria used to determine the magnitude of impact for the non-agricultural property on the Proposed Scheme are shown in **Table 11.2**. The criteria for each of the impact ratings have been developed in consideration of the relevant EPA guidelines on the assessment of impact.

Table 12.2: Magnitude of Impact Rating Criteria

Rating	Criteria
High	An impact on the property where the use of the property cannot continue.
Medium	An impact on the property where the use of the property can continue. An impact of temporary or permanent duration resulting in a change to the character of the property.
Low	An impact on the property where the use of the property can continue. An impact of temporary or permanent duration with a minimal effect on the character of the property.
Very low	An impact on the property that does not affect the long term use of the property (i.e. acquisition of public road / private road only or small plots of public land).

Significance of Impact

The significance of impact on a non-agricultural property is determined by the baseline rating assigned to the property combined with the magnitude of impact of the Proposed Scheme. The likely significance rating is determined by reference to the matrix in **Table 12.3** using the baseline rating (**Table 12.1**) and magnitude of impact (**Table 12.2**). The likely significance of effects is prior to the implementation of any mitigation measures.

Table 12.3: Significance of Impact

Baseline	Magnitude of Impact			
	High	Medium	Low	Very Low
High	Very Significant to Profound	Significant	Slight	Not significant
Medium	Very Significant	Moderate	Slight	Not significant
Low	Moderate	Slight	Not significant	Imperceptible

12.2.6 Data Limitations

The assessment has been prepared based upon the best available information and in accordance with current best practice and relevant guidelines. There were no technical difficulties or otherwise encountered in the preparation of this assessment.

12.3 Description of Receiving Environment

12.3.1 Non-agriculture Property in the Study Area

The study area is comprised of agricultural and non-agricultural properties that will be directly impacted by the Proposed Scheme. Non-agricultural lands are comprised of residential property, commercial property,

community property and public road. There are eleven non-agricultural properties directly impacted by the Proposed Scheme as follows:

- Residential property consists of four residential properties / developments.
- Commercial property consists of one property, the Texaco Service Station on the R403.
- Community property consists of four properties including St. John of Gods property, lands owned by Scouts Ireland and two properties comprised of non-agricultural lands involving public road owned by CIÉ and Kildare County Council.

The Proposed Scheme traverses lands zoned as 'B: Existing Development / Infill', 'E: Community and Educational' and 'F2: Strategic Open Space' in the Celbridge Local Area Plan 2017-2023.

The baseline rating for non-agricultural property along the Proposed Scheme is presented in **Table 12.4**.

Table 12.4: Baseline Rating for Non-agricultural Properties along the Proposed Scheme

Rating	No. of Properties	% of Total
High	8	72.7%
Medium	0	0
Low	3	27.3%
Very low	0	0
Total	11	100.0%

12.4 Predicted Impacts

12.4.1 Construction Phase

The assessment of the impact on non-agricultural property includes the effects of the construction impacts. Construction activity associated with the Proposed Scheme will give effect to further impacts on agricultural property which are discussed below.

Temporary Land take - The construction works for the Proposed Scheme will involve a total temporary land-take of 0.2ha on non-agricultural property involving 0.19ha non-agricultural lands and 0.005ha public road.

Access to Property - Access to some properties will be affected during the construction phase. The construction of local road junctions and crossings in particular may impact on access to properties.

Noise and Vibration - The activity of construction vehicles will generate additional noise emissions in the immediate vicinity of construction. Noise and vibration may be a cause of disturbance to those residing in dwelling houses located in close proximity to the construction of the Proposed Scheme.

Dust - Dust generated during the construction phase may have a nuisance effect on nearby properties especially during dry weather.

Disturbance of Drainage Systems - Existing drainage systems may be disturbed by the construction works. These systems will be restored as part of the completed works. However, there may be temporary impaired drainage in the period of time between initial disturbance and final reinstatement of such drainage works.

Disturbance of Services - The construction of the Proposed Scheme may impact on services including supply of water, electricity and phone service and facilities for, or connections to wastewater treatment facilities.

12.4.2 Operational Phase

The Proposed Scheme will involve a total land-take of 5.2ha from eleven non-agricultural properties involving permanent land take of 5.0ha and temporary land take of 0.2ha. The permanent land take is comprised of 3.1ha non-agricultural lands and 1.9ha public road.

As outlined previously in **Section 12.4.1**, the temporary land take is comprised of 0.19ha non-agricultural lands and 0.005ha public road.

Impact of Non-agricultural Property in the Study Area

The impact on non-agricultural property is confined to those properties directly impacted by the Proposed Scheme. An assessment of the impact (pre-mitigation) of the Proposed Scheme on non-agricultural property is presented in **Table 12.5**. Measures to mitigate the adverse effects of the Proposed Scheme are described in **Section 12.5**. An assessment of the significance of the residual effect following the implementation of mitigation measures is presented in **Section 12.6**.

Section 177AE Environmental Report

Table 12.5: Assessment of the Impact of Land take on Non-agricultural Properties

Property ID	Property Type	Baseline Rating	Perm Land (ha)	Perm. Public Road (ha)	Temp Land (ha)	Temp. Public Road (ha)	Impact Details	Magnitude of Impact	Impact Significance (Pre-mitigation)	Specific Mitigation Measures	Significance of Residual Impact
100	Infrastructure (Road)	Low	0.0000	0.2433	0.0000	0.0000	Permanent acquisition of part of Public road only.	Very Low	Imperceptible	None required	Imperceptible
101	Commercial (Service Station)	High	0.0114	0.0000	0.0158	0.0000	Permanent and temporary reduction in lands due to the proposed Clane Road Junction. Impact on the existing vehicle and pedestrian entrance to service station (existing access to be removed) and resulting impact on traffic movement within the property. Impact on existing car parking spaces (reduction in no. of spaces). Impact on existing property boundary.	High	Very Significant	Replacement entrance and access to service station will be provided from the Proposed Scheme. Existing exit from the service station will be retained. Reinstate property boundary and property entrance on a like for like basis.	Slight to Moderate
102	Community (Community Services)	High	0.4893	0.0000	0.1683	0.0000	Permanent and temporary reduction in lands due to the proposed mobility corridor. Division of retained lands into two separate areas. Impact on existing buildings (demolition of buildings and polytunnels) and existing car parking spaces. Impact on existing property boundary.	High	Very Significant	Existing entrance and access from Clane Road will be maintained. New entrance and access gate to retained lands will be provided from the Proposed Scheme. Reinstate property boundary and property entrance on a like for like basis.	Significant
103	Community (Park)	High	1.2862	0.0000	0.0000	0.0000	Permanent reduction in lands due to the proposed mobility corridor and attenuation basin. Impact on existing amenity area for Abbey Farm residential development.	Low	Slight	A pedestrian link to Abbey Farm Housing estate will be provided from the Proposed Scheme.	Slight
104	Community (Open Space)	High	0.8720	0.0547	0.0000	0.0000	Permanent acquisition of the entire lands due to the proposed mobility corridor and attenuation basin.	High	Profound	Note 1	Profound

Section 177AE Environmental Report

Property ID	Property Type	Baseline Rating	Perm Land (ha)	Perm. Public Road (ha)	Temp Land (ha)	Temp. Public Road (ha)	Impact Details	Magnitude of Impact	Impact Significance (Pre-mitigation)	Specific Mitigation Measures	Significance of Residual Impact
106	Residential	High	0.0000	0.0089	0.0000	0.0000	Permanent acquisition of part of the Public road only.	Very Low	Not Significant	None required	Not Significant
110	Residential	High	0.0000	0.2024	0.0000	0.0000	Permanent acquisition of part of the Public road only.	Very Low	Not Significant	None required	Not Significant
111	Residential	High	0.0000	0.1044	0.0029	0.0000	Permanent reduction in public road. Temporary impact on house curtilage lands. Impact on property boundary.	Low	Slight	Reinstate property boundary on a like for like basis.	Not Significant
113	Community	Low	0.0000	0.1542	0.0000	0.0052	Permanent and temporary acquisition of part of the Public road only.	Very Low	Imperceptible	None required	Imperceptible
114	Land	Low	0.0000	1.0974	0.0000	0.0000	Permanent acquisition of part of the Public road only.	Very Low	Imperceptible	None required	Imperceptible
115	Residential	High	0.0000	0.4370	0.0000	0.0000	Permanent reduction in lands due to the proposed R403 Clane Road signalised junction. Impact on amenity area for Priory Lodge residential development. Impact on existing property boundary.	Low	Slight	Reinstate property boundary on a like for like basis.	Slight

Note 1: Permanent and temporary land take will be dealt with by way of compensation. Compensation is part of the CPO process and is outside the scope of this assessment.

Based on **Table 12.5**, the magnitude of impact on non-agricultural property ranges from Low to High. The significance of the effect (pre-mitigation), which is determined by combining the magnitude of impact with the baseline rating for that property type, ranges from *imperceptible* to *profound*.

There is one non-agricultural property (Property ID 104) where the level of effect is considered *profound*. This effect on this property is due to the acquisition of the entire area.

On two non-agricultural properties the level of impact is considered *very significant*. These effects are due to land take impacts on one community property (Property ID 101) and on one commercial property (Property ID 102).

On three non-agricultural properties, the level of effect will be *slight*. These effects are due to land take impacts on one community property (Property ID 103) and on two residential properties (Property ID 111 and 115).

On the remaining non-agricultural properties, the level of effect will be *not significant* on two properties (Property ID 106 and 110) and *imperceptible* on three properties (Property ID 100, 113 and 114).

12.4.3 Cumulative Impact

No cumulative impacts were identified in the course of this assessment.

12.5 Proposed Mitigation Measures

This section describes the measures that when implemented will mitigate the adverse impact on non-agricultural property. At this stage measures such as compensation for land acquisition and disturbance are not considered. These matters will be agreed, if possible, with landowners or their representative(s) once approval for the Proposed Scheme has been granted. If agreement is not possible, such compensation will be decided upon by an arbitrator.

12.5.1 Construction Phase

- **Temporary Land take:** Following the completion of relevant construction works, lands temporarily acquired will be reinstated where necessary.
- **Access to Property:** Access will be maintained to all affected property as much as possible and if interrupted will be restored without unreasonable delay. Traffic management measures will be put in place during construction where temporary or minor diversions are required.
- **Noise and Vibration:** Timing of works and noise and vibration limit values are amongst the main measures to mitigate noise impacts on sensitive receptors. These measures are detailed in the Noise and Vibration Assessment (refer to **Chapter 5**). Good communication between the contractor and property owners during the construction phase will prevent undue disturbance due to noise.
- **Dust:** Dust suppression measures to mitigate the production of dust are detailed in the Air Quality Assessment (provided under separate cover). Good communication between the contractor and property owners during the construction phase will prevent undue disturbance due to dust.
- **Disturbance of Drainage:** In cases where drainage is impeded during construction and causes obvious difficulty to a particular property owner, temporary measures will be considered on a site-specific basis. This may include allowing waters to drain to less critical areas, so as to minimise the impact.
- **Disturbance of Services:** Where required, an alternative source of water / electricity will be provided to ensure that disruption to properties is minimised during the construction phase.

12.5.2 Operational Phase

The following general mitigation measures will be provided:

- Access will be maintained to all affected property as much as possible and if interrupted will be restored without unreasonable delay.
- Where part of the curtilage of a property is to be permanently acquired, the acquiring authority will hold discussions with the property owner and generally agree to replace boundaries on a like-for-like basis

where possible, subject to safety considerations. Permanent boundary treatment will consist of a boundary that is comprised of one of the following:

- Replacement boundary on a like-for-like basis.
 - Concrete post and wire.
 - Timber post and wire.
 - 2.4m Security Purpose (SP) Palisade fencing.
 - Open mesh steel pane for general purposes.
 - Acoustic barriers.
- Any utility services that are interfered with as a result of the Proposed Scheme will be repaired / replaced without unreasonable delay.
 - The new drainage system will be designed to ensure that there will be no increased risk of flooding as a consequence of the Proposed Scheme.

12.6 Residual Impacts

The significance of the residual impact on non-agricultural property has been assessed following the implementation of general mitigation measures as outlined in **Section 12.5**. A summary of the residual impact on agriculture is presented in **Table 12.6**.

There is one non-agricultural property on which the residual impact is considered to remain as *profound* (Property ID 104). There are two non-agricultural properties which represent reductions with *Very Significant* impacts pre-mitigation to residual impacts considered to be *significant* (Property ID 102) and *slight to moderate* (Property ID 101) respectively.

There are two non-agricultural properties (Property ID 103 and 115) where the level of impact is *slight*. On the remaining non-agricultural properties, the level of effect will be *not significant* on three properties (Property ID 106, 110 and 111) and *imperceptible* on three properties (Property ID 100, 113 and 114).

Table 12.6: Summary of Residual Impact

Significance of Impact	No. of Properties	% of Total
Profound	1	9.1%
Very Significant	0	0
Significant	1	9.1%
Moderate	0	0
Slight	3	27.3%
Not Significant	3	27.3%
Imperceptible	3	27.3%
Total	11	100.0%

12.7 Monitoring

No specific monitoring is required for either the construction or operational phases.

13 ENVIRONMENTAL COMMITMENTS

The Schedule of Environmental Commitments will comprise the following:

- The construction phase mitigation and monitoring measures as outlined in this Environmental Report;
- The construction phase mitigation and monitoring measures as outlined in the Natura Impact Statement, CEMP and FRA;
- Any commitments arising from the planning conditions imposed by the Competent Authority, An Coimisiún Pleanála.

The appointed contractor will be required to comply with all Environmental Commitments, and all applicable legislation, including relevant standards, codes of best practice and guidelines.

13.1 Schedule of Environmental Commitments

The construction phase mitigation (i.e. which the appointed contractor will implement) are outlined in the relevant Environmental assessment contained within this Environmental Report and NIS. A full schedule and summary of the schedule of all the environmental commitments are presented in the Outline Construction Environmental Management Plan, which is provided under separate cover and are not repeated here.

14 CONCLUSION

The Proposed Scheme includes a new river crossing to the south of Celbridge town centre and a new mobility corridor of approximately 2km providing access for cyclists, pedestrians and vehicles to Hazelhatch and Celbridge Station.

The capacity of the existing road infrastructure is inadequate in Celbridge, demonstrated by severe traffic congestion and delays, particularly during peak periods. Celbridge's single river crossing point results in a lack of circulation and permeability within the town centre and throughout the general road network in the study area. The existing network has limited provision for cyclists and pedestrians wishing to travel between the town centre and the rail station. This makes the route unattractive for commuters to access Train services, particularly for residents living north of the River Liffey.

The following conclusions can be drawn from the environmental assessments of the Proposed Scheme on Traffic & Transport, Noise & Vibration, Air Quality, Climate, Landscape and Visual, Biodiversity, Cultural Material Assets: Agricultural and Non-agricultural properties completed in Chapters 4 to 12 of this Environmental Report:

Traffic & Transport: The Proposed Scheme will have a net benefit in terms of traffic changes as it reduces flow on key built up locations in the town particularly at the existing river crossing point, Celbridge Bridge. During construction the total volume of traffic generated per day is expected to be below the 10% of baseline traffic and is considered to be negligible. A CTMP will be developed to prevent any transport issues arising during construction.

Noise & Vibration: Predicted noise impacts for various construction activities have been modelled and assessed against the construction noise thresholds from the NRA Guidelines (2004). A list of activity-specific measures to mitigate the construction noise impacts if the threshold values are exceeded have been included. By applying these mitigation measures, the impacts of construction stage noise will be managed.

In relation to operational road traffic noise, twenty-seven receptor locations were identified as meeting the NRA criteria for mitigation. In order to reduce operational road traffic noise, in addition to the use of a low noise road surface within the scheme boundary, additional noise reducing measures in the form of 3 no. noise barriers are proposed.

Air Quality: The impacts associated with construction phase dust emissions are considered to pose at worst, a medium risk, and therefore represent a short term moderate negative impact without mitigation. To reduce dust nuisance, a series of measures will be implemented including the preparation of a Dust Management Plan (DMP) and monitoring of construction dust deposition at nearby sensitive receptors.

The expected peak traffic construction traffic volumes will be below the 10% of baseline traffic on the existing road network, the impact to air quality from this traffic is considered negligible.

The air quality impacts of operational road traffic has been assessed both locally and regionally. At a regional level, there is a reduction in total NOx and total PM10, suggesting the Proposed Scheme will improve air quality. At a local level, all ambient air pollutants will remain in compliance with the ambient air quality standards.

Climate: Predicted Annual GHG Emissions from Road Transport from the Proposed Scheme have been modelled and are estimated to reduce relative to the Do-Minimum scenario. As part of the design development of the Proposed Scheme, a whole-life carbon assessment for the Proposed Scheme was undertaken with an emphasis on embodied carbon reduction over the project lifecycle. The impact of implementing the feasible reduction initiatives identified at each stage of the project shows an overall result of a 43% absolute reduction in the scheme's project WLC carbon footprint when compared to the baseline.

Landscape & Visual: Landscape mitigation planting for the Proposed Scheme has been developed and will limit the extent of influence associated with the Proposed Scheme on adjacent Landscape Character Areas with a resultant reduction in landscape impact. Overall, the wider landscape and visual resources of the development's surroundings have the capacity to accommodate a development of this type and scale.

Biodiversity: Suitable sediment and erosion controls will be implemented for the runoff from the construction earthworks to ensure that the sediment load in water discharging to the receiving watercourses is kept below permissible levels. Various SuDS features have been incorporated into the design of the Scheme which will treat and attenuate the surface water run-off before it discharges to the receiving watercourse at greenfield run-off rates. In addition, measures have also been included in the design of the Proposed Scheme to allow otter and badger to commute under the proposed road and prevent their access onto the Proposed Scheme.

A series of best practice measures are also proposed and will be included in the CEMP to minimise impact on biodiversity during construction. The Proposed Scheme will not have any significant adverse residual effects on the important ecological features of the study area, provided that the mitigation measures are implemented in full.

Cultural Heritage: The demolition and construction phase of the proposed development will have no direct or indirect negative effects on any designated archaeological sites. Similarly, there will be no direct or indirect (setting) effects on any architectural heritage sites. The proposed development will have no impact on any in-situ underwater archaeology that might be present.

Two features of possible archaeological origin were identified from the archaeological geophysical survey and mitigation has been recommended at the pre-construction stage of the development. As such, all physical archaeological, architectural and cultural heritage impact issues will be resolved at the pre-construction stage of the development.

Material Assets – Agricultural Properties: There are four agricultural properties impacted by the Proposed Scheme. Following mitigation, there are no agricultural properties on which the residual impact is likely to be profound, very significant or significant.

Material Assets – Non-Agricultural Properties: There are eleven non-agricultural properties directly impacted by the Proposed Scheme. After mitigation, there is one non-agricultural property on which the residual impact is considered to be profound and one non-agricultural property on which the residual impact is considered to be significant. Compensation for land acquisition is part of the CPO process and is outside the scope of the assessment.

The majority of impacts identified in the environmental assessments are not significant and of a temporary nature that occur during the construction of the Proposed Development. These impacts will be managed through the implementation of the specific mitigation measures outlined in **Chapters 4 to 12** and the implementation of a CEMP. Land take impacts on individual properties are addressed by way of design, mitigation and will be addressed through the CPO process where appropriate.

Once operational, the Proposed Scheme with active travel provision including a cycling and walking path will improve the transport network capacity for all pedestrians, cyclists and vehicular traffic. The Proposed Scheme will encourage a modal shift to more sustainable modes and will result in traffic reduction and congestion in Celbridge town centre. The Proposed Scheme will improve access to Celbridge Train Station and the improved accessibility provided by the scheme will benefit the local community and supports the provision of enhanced rail services facilitated by Iarnród Éireann through the DART+ South West Project.