Appendix A1:

Introduction

Appendix A1-1

Planning Application Search

Relevant Planning Application Search (2011 – 26/07/2021) (*Distance from approximate centre point of the Proposed Road Development)

An additional search of myplane.ie was carried out on the 04/02/2022 and no additional planning applications were identified within the Proposed Road Development site.

App. Ref. No.	Summary of Development	Decision Date	Expiry Date	*Distance
211062	for the construction of a serviced dwelling with an effluent treatment system and a garage/shed at the above address. Gross floor space of proposed works: 248 sqm (Dwelling) and 60 sqm (Garage)	Live Application Received 15/06/2021	n/a	c.2.7km northwest
21951	to construct a slatted shed and manure pit to include concrete aprons and all associated works. Gross floor space of proposed works: Shed: 210.50 sqm. Manure pit: 37.21 sqm. Aprons: 304.40 sqm	Live Application Received 01/06/2021	n/a	c.4km southeast
21891	for construction of a new dwelling house, domestic garage / fuel store, treatment system / septic tank, percolation area and all ancillary site development works. Gross floor space of proposed works: House: 265 sqm, Garage: 60 sqm	Received 25/05/2021 Further information Requested	n/a	c.2.2km southeast
21623	of existing agricultural sheds, and for permission to construct a new general purpose shed. Gross floor space of proposed works: 359.4 sqm. Gross floor space of work to be retained: 404.2 sqm	19/07/2021	n/a	c.3.6km northeast
21627	To construct a new 2 storey dwelling, domestic garage, septic tank, treatment system, percolation area and all associated works. Gross floor space of proposed works: House 250 sqm, Garage 60 sqm	19/07/2021	n/a	c.2.7km southeast
21747	for the construction of a dwelling house, domestic garage, proprietary treatment system and all ancillary site works. Gross floor space of proposed works: House: 153.7 sqm, Garage: 60 sqm	29/06/2021	n/a	c.2.7km northwest
21215	to construct a straw bedded sheep shed, concrete apron and seepage tank. Gross floor space of proposed works: 300 sqm	15/06/2021	25/07/2026	c.1.6km southeast
21619	to construct a dwelling house, domestic garage/fuel store, septic tank, treatment system and percolation area. Gross floor space of proposed works: 235 sqm (house)	08/06/2021	18/07/2026	c.4km northwest
21145	to construct a new dwelling house (gross floor space 255 sqm) domestic garage/fuel store and all associated site works. Gross floor space of proposed works: 325 sqm	01/06/2021	11/07/2026	c.2.5km southwest
21220	to construct a new dwelling house, domestic garage fuel store with wastewater treatment plant percolation area, and all associated site works. Gross floor space of proposed works: 255 sqm	18/05/2021	04/07/2026	c.500m northwest
21307	for the construction of an extension to the rear of an existing dwelling and demolition of existing single storey extension to sides and rear of existing dwelling and the installation of a new treatment plant and percolation area and all associated works (gross floor space proposed 132 sqm; demolition 60 sqm)	27/04/2021	26/04/2021	c.2.5km southwest
21216	for a three bay agricultural shed for the storage of hay and straw to include a concrete apron to the front and all associated site works. Gross floor space of proposed works: 163 sqm	14/04/2021	30/05/2026	c.1km southeast
20460	To construct a new 2 storey dwelling, domestic garage, septic tank, treatment system, percolation area and all associated works. Gross floor space of proposed works: House 250 sqm, Garage 60 sqm	11/09/2020	18/10/2025	c.2km southwest

App. Ref. No.	Summary of Development	Decision Date	Expiry Date	*Distance
20309	For the construction of a dwelling house, detached garage, treatment plant and percolation area and all associated works. Gross floor space of proposed works: Dwelling = 230 sqm, garage = 60 sqm	17/06/2020	02/08/2025	c.4km southwest
191960	To construct dwelling house, domestic garage and fuel store, wastewater treatment system and percolation area along with associated site works. Gross floor space of proposed works: 202.00 sqm	20/02/2020	29/03/2025	c.3km west
191638	To construct a fully serviced private dwelling house with waste water treatment system and private garage / fuel shed to include all associated works. Gross floor space of proposed works: House = 203.28 sqm, Garage = 53.94 sqm	13/02/2020	22/03/2025	c.4.2km southeast
191475	To construct dwelling house, wastewater treatment system and percolation area along with associated siteworks. Gross floor space of proposed works: 83 sqm	16/12/2019	02/02/2025	c.2.8km west
191639	For development consisting of the construction of an AstroTurf pitch with perimeter fencing and flood lighting, children's playground and all associated car parking, drainage, boundary treatments and site works	13/12/2019	26/01/2025	c.4.8km north
191412	To construct dwelling house, garage and associated services. Gross floor space of proposed works: Dwelling - 127.50 sqm, Garage - 60.0 sqm	12/12/2019	26/01/2025	c.2km southeast
191124	To construct a fully serviced private dwelling house with waste water treatment system and private garage / fuel shed to include all associated works. Gross floor space of proposed works: House = 200.99 sqm, Garage = 53.94 sqm	22/10/2019	01/12/2024	c.4.2km southeast
181825	For the construction of a dwelling house, detached garage, septic tank and percolation area and all associated works. Gross floor space of proposed works: Dwelling - 197 sqm, garage - 56.9 sqm	03/05/2019	09/06/2024	c.4km west
181657	To retain the existing funeral home, septic tank, percolation area and car parking facilities all on revised site boundaries from the previous planning application Ref. No. 55867 and all ancillary site works. Gross floor space of work to be retained: 100 sqm	04/03/2019	03/03/2024	c.1km southwest
181576	For the construction of a new dwelling along with garage, treatment septic tank system and all associated site works. Gross floor space of proposed works: (house) 217 sqm, (garage) 40 sqm	08/01/2019	17/02/2024	c.2.5km southeast
181474	For 1) construction of a sports wall incl. all ancillary site development works. 2) for flood lighting to main pitch incl. all ancillary site development works. 3) retention of Ball Catch Netting to rear of both goals on main pitch.	11/12/2018	20/01/2024	c.4.8km north
181459	To construct a new dwelling house, garage & associated wastewater treatment system. Gross floor space of proposed works: (house) 204 sqm, (garage)	07/12/2018	13/01/2024	c.3.5km west
18717	For the construction of two temporary classrooms and an extension (changing suite)to an existing school together with associated works and an increase in effluent treatment capacity in lieu of Planning Permission 15/371.	24/07/2018	02/09/2023	c.500m southeast
18757	For 1. construction of a sports wall incl. all ancillary site development works. 2. the construction of synthetically surfaced sports pitch, erection of sports fencing with netting incl. all ancillary site development works. Gross floor space 560m2	30/07/2018	09/09/2023	c.4.7km northwest

App. Ref. No.	Summary of Development	Decision Date	Expiry Date	*Distance
18449	For construction of a dwelling house, external store, wastewater treatment system and percolation area, and all associated site development and external works. Gross floor space of proposed works (house) 173 sqm. (store) 23 sqm.	07/06/2018	15/07/2023	c.4km south
171704	For the construction of a dwelling house, domestic garage, proprietary treatment system and for all ancillary site works. Gross floor space of proposed works 214.0 sqm.	08/03/2018	15/04/2023	c.1km southwest
171472	For the construction of new 2 storey dwelling along with garage, treatment septic tank system and all associated site works. Gross floor space of proposed works Dwelling 239 sqm, Garage 60 sqm.	20/02/2018	01/04/2023	c.800m southwest
17728	For the permanent placement of soil and topsoil on part of a land plot with an area of 2.58 hectares. The plot of land is adjacent to the proposed upgrade of the N63 at Ballyglunin. Fill depth will vary between 0.1 mt - 3.60 mt approximately. Access to the plot of land for the placement of soil and topsoil will be via the N63 in the Townland of Polara, Abbeyknockmoy on behalf of Johnston Plant Hire ltd	26/01/2018	04/03/2023	c.2.5km southeast
17658	For the filling of agricultural lands with inert materials comprising of soil and stone and all associated ancillary works	24/01/2018	04/03/2023	c.3.3km southwest
17573	To construct a new dwelling house, with wastewater treatment plant, polishing filter and all associated site works. (Gross floor space of proposed works: 191.50 sqm.)	10/08/2017	17/09/2022	c.4.3km east
171441	To construct serviced dwelling house and domestic garage/store. Gross floor space of proposed works Dwelling House 330 sqm, Garage 62 sqm.	23/11/2017	07/01/2023	c.4km southwest
17917	To demolish fire damaged dwelling house and to construct a new dwelling house and proprietary treatment system (Gross floor space demolition 155.93 sqm; proposed 193.27 sqm)	14/08/2017	24/09/2022	c.4km southeast
17573	To construct a new dwelling house, with wastewater treatment plant, polishing filter and all associated site works. (Gross floor space of proposed works: 191.50 sqm.)	10/08/2017	17/09/2022	c.4.2km east
17405	For the construction of (1) a dwelling house, (2) Sewerage treatment system and percolation area, (3) a garage and all associated site works. (Gross floor space of proposed works: House 156.65 sqm., Garage 57.6 sqm.)	29/06/2017	06/08/2022	c.5km north
17464	For the construction of a new dwelling house, domestic garage, and treatment plant with associated site works. (Gross floor space of proposed works: House 65.7 sqm; Garage 38 sqm.)	01/06/2017	09/07/2022	c.1km south
161440	For the construction of a dwelling house, domestic garage and a proprietary treatment system. The site is adjacent to a protected structure, record number GA058-033 "Icehouse". Gross floor space of proposed works: 218.1 sqm	26/05/2017	02/07/2022	c.4.5km west
16259	For development that will consist of the construction, operation and decommissioning of a solar photo-voltaic panel array to export electricity to the national grid. The solar panel array will consist of up to approximately 40,000 square metres of solar photovoltaic	11/11/2016	18/12/2021	c.3.7km north

App. Ref. No.	Summary of Development	Decision Date	Expiry Date	*Distance
	panels supported by ground mounted frames, one electrical control building, 4 number power inverter cabins, underground cable ducts, temporary laydown area, boundary security fence, CCTV, site entrance, and all associated site works (gross floor space 43.1375 sqm)			
161305	Of bus lock up building and domestic shed/store and new entrance on to side road for bus lock building. (Gross floor space of work to be retained: 161.775 sqm.) SPLIT DECISION (REFUSE PERMISSION FOR RETENTION OF THE BUS LOCK-UP BUILDING AND NEW ENTRANCE	18/11/2016	01/01/2022	c.4km northeast
161051	Of a single storey dwelling house with single storey extensions thereto and associated septic tank and percolation area and an associated out building to the rear of same on a site with revised site boundaries (gross floor space to be retained 264 sqm)	04/11/2016	11/12/2021	c.1.3km southeast
16977	To construct dwelling house, wastewater management system, domestic garage and fuel store (gross floor space 215 sqm)	18/10/2016	27/11/2021	c.2km south
16761	For the demolition of an existing derelict dwelling house and sheds, the construction of a new dwelling house and domestic garage and associated site works (Gross floor space house 200 sqm; garage 40 sqm, demolition 80.42 sqm)	26/10/2016	04/12/2021	c.2km west
16721	For a new 1507 sqm, 2 storey community centre building comprising elderly day care centre, gym, meeting rooms, offices, sports shall, changing facilities, children and youth facilities and signage. An AstroTurf pitch with associated external lighting, children's playground and an external recreation area are also proposed on the site in addition to 67 no. car parking spaces, proprietary effluent treatment system and associated site works (previous planning reference no. 10/1049)	20/07/2016	19/07/2021	c.4.8km north
151051	To construct serviced dwelling house and domestic garage/store (gross floor space dwelling 225 sqm; garage 60 sqm)	13/01/2016	21/02/2021	c.1km south
151035	For the construction of a self-service fuel filling station, car wash, signage and for the provision of an ancillary single storey building for the provision of 2 commercial units, consisting of a deli area with associated seating/retail area and the provision of a unit for use as a pharmacy/hairdressing salon or other similar uses. The development uses the existing access and treatment plant previously approved under planning reference 07/2858 & 15/168 (gross floor space 225.9 sqm)	15/12/2015	24/01/2021	c.4.6km northeast
151035	For the construction of a self-service fuel filling station, car wash, signage and for the provision of an ancillary single storey building for the provision of 2 commercial units, consisting of a deli area with associated seating/retail area and the provision of a unit for use as a pharmacy/hairdressing salon or other similar uses. The development uses the existing access and treatment plant previously approved under planning reference 07/2858 & 15/168 (gross floor space 225.9 sqm)	15/12/2015	24/01/2021	c.4.8km northeast
151098	To construct a new viewing stand on their grounds. Gross floor space of proposed works: 36 sqm	02/11/2015	13/12/2020	c.600m southwest
15805	Of a dwelling house and associated sheds on a site with revised site boundaries. Previous planning references 12387 and 23094. Gross floor area 302.5 sqm	25/08/2015	04/10/2020	c.4km southwest
15655	To construct an agricultural slatted shed, an extension to an existing shed along with a meal silo. Gross floor space 150 sqm (extension) & 746 sqm (new shed).	22/07/2015	30/08/2020	c.2.7km southeast

App. Ref. No.	Summary of Development	Decision Date	Expiry Date	*Distance
15374	To construct a playground and associated site services	29/06/2015	28/06/2020	c.800m west
14949	For construction of domestic garage/fuel store (gross floor space 146.25 sqm)	08/04/2015	17/05/2020	c.4.7km west
141307	To construct a private dwelling house, domestic garage and sewerage treatment system with all other site services (gross floor space house 188sqm; garage 60 sqm)	18/03/2015	26/04/2020	c.2.5km west
141308	Of agricultural buildings, the cattle holding facilities, the existing concrete apron and the storage container (gross floor space 279 sqm)	03/02/2015	15/03/2020	c.3.5km northwest
141103	For a dwelling house, sewerage treatment system, percolation area, domestic garage/fuel store and all associated site works (gross floor space dwelling 223 sqm; garage 59.9 sqm)	22/01/2015	01/03/2020	c.1.5km southeast
14318	Of the existing foul sewer connection from existing public house and two no. private residences to existing foul sewer network at the Granary.	12/01/2015	11/01/2020	c.800m southwest
141106	For the demolition of the existing Cahergal National School building, removal of existing prefabs and the construction of a new six classroom school, including, a new waste water treatment plant, polishing filter & service store, roads, parking, boundary alterations, surface water soakaways and external site works (gross floor space proposed 1037 sqm; demolition 219.4 sqm)	09/12/2014	18/01/2020	c.4.5km northwest
14601	To construct a new dwelling house, domestic garage / fuel store and to install a wastewater treatment plant, percolation area and all associated site works (gross floor area 307 sqm)	26/08/2014	05/10/2019	c.2.8km east
14518	To construct 2 No. 2 megawatt wind turbines on 75m towers plus substation, access road and crane stand (gross floor space 31.7 sqm, previous Planning Ref. No.08/2407)	14/08/2014	13/08/2019	c.4.5km northwest
14172	RETENTION of dwelling house, domestic garage and domestic store, provision of sewage treatment system (upgrade of existing system) (gross floor space 156 sqm)	14/04/2014	25/05/2019	C3.5km west
13117	For upgrade works and alterations to Ballyglunin Railway Station for conversion to visitor centre and community meeting hall. To consist of the following: (a) conversion of existing north courtyard to toilets with new flat roof over, (b) conversion of existing residential area to meeting room, tea room and store, (c) conversion of existing south courtyard to meeting room, relocation of existing toilets and two additional windows to east elevation and new flat roof over, (d) alterations to existing soffit and fascia to original profile and replacement of existing corroded rainwater pipes, (e) to remove existing slate roof, provide roof felt and reinstate existing slates and flashings to all roof areas and chimneys, (f) change of existing window to door to rear elevation of the waiting room, (g) to provide staff and visitor car and bus parking and permission to install treatment plant and percolation area and all associated services, drainage and siteworks	12/08/2013	11/08/2018	c.3.8km west

App. Ref. No.	Summary of Development	Decision Date	Expiry Date	*Distance
121577	Extension of duration for the conservation, restoration, refurbishment and conversion, including alterations, additions and new buildings to an existing, disused farm complex to provide 15 no. tourism-related holiday homes. The Tower House and associated buildings existing on site are Protected Structures. The proposed development will provide 8 no. tourist dwelling units through the refurbishment, extension and alteration of the existing protected structures. 7 no. tourist dwelling units will be new-build in the form of 2 no. single-storey units and 5 no. detached 2-storey units. The proposed development will also include 2 no. single-storey utility buildings for use as central boiler/plant room and maintenance store ancillary to the propose development, all site development/enabling works and the provision of an on-site sewerage treatment plant (previous planning ref. no. 07/3365) (Gross floor area 2392 sqm)	19/02/2013	18/02/2018	c.4.7km southwest
12386	For 14 No semi-detached two storey dwellings, all with connections to previously granted roads and associated services (PDref 05/4097) including all other ancillary site works, previous planning reference no. 06/4250 (Gross floor area 1652 sm).	15/05/2012	14/05/2017	c.4.5km northeast
121003	To construct a residential development consisting of 21 no. detached dwelling houses, 21 no. garages, 1 no. access road, 1 no. access point onto public road and carry out all associated site development works including provision of proprietary sewage treatment system and percolation area - Gross floor space 3929.1 sqm house, 504 sqm garage (previous planning reference number 07/2174)	01/10/2012	30/09/2017	c.4km west
11278	Extension of duration for the construction of a rural cluster residential development comprised as follows: A) 13 residential units consisting of 9 detached dwellings and 4 semi-detached dwellings B) domestic garages on sites number 1,3 & 10 in the development scheme C) the construction of a proprietary treatment system and percolation area/polishing filter D) all ancillary site works, services, traffic calming, hard and soft landscaping and the holding of existing natural hedgerows within the development site. (gross floor space 2100.64 sqm)(previous pl. ref. 06/2371)	13/06/2011	n/a	c.400m southeast

Relevant Part 8 Application Search (2011 – 26/07/2021)

Ref. No.	Summary of Development	Address	Application Received	*Distance
LA0420	Permission for the development of a burial ground including provision for off road vehicular parking at Ballyglooneen Townland, Tuam, Co. Galway.	Brooklodge, Tuam, Co. Galway	09/09/2020	c.5km southwest
LA0318	Permission for the development of a burial ground including provision for off road vehicular parking at Ballyglooneen Townland, Tuam, Co. Galway.	Brooklodge, Tuam, Co. Galway	22/06/2018	c.5km southwest
LA1014	The proposed development includes for improvement and widening of the existing N63 as well as off-road realignment of the existing N63. The development comprises a Type-2 Single carriageway road type – 7.0m carriageway with 2 x 0.5m hard strips. Additionally, a 2.5m verge will be provided on the north side of the road, and a 2m footway will be provided on the south side. Junctions to link the proposed realignment with the existing road infrastructure, drainage works, rail-bridge replacement works, utility diversion works, and landowner accommodation works will also be included as part of this development.	Abbeyknockmoy to Annagh Road	02/10/2014	c.1km southwest

Appendix A3: Consideration of Alternatives

Appendix A3-1

Option Selection Report

N63 Liss to Abbey Realignment Scheme

Phase 2 - Option Selection Report

Galway County Council

AECOM Project Number: 60571547
GCC Project Number: GC/16/13416

Document Reference: N63-ACM-PH02-ZZ-RP-ZZ-0001

24th April 2020

Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
0	24th April 2020	FINAL	EG	Eoin Greene	Project Manager

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1. Executive Summary

1.1 Introduction

The N63 Liss to Abbey Realignment Scheme is a proposed road scheme in Abbeyknockmoy Co. Galway that will facilitate a number of objectives in the Galway County Development Plan (2015-2021), including the provision of higher-quality national roads and the separation of regional and local traffic. The scheme will also meet a number of objectives of the Road Safety Authority's Road Safety Strategy.

The proposed scheme is located in the north east of County Galway along the N63 Route, a national secondary route, and directly to the east of the village of Abbeyknockmoy. The study area extends in a north easterly direction, from the eastern edge of Abbeyknockmoy, across the Abbert River, to the townland of Derreen and on towards the junction of the N63 with the L6234. The study area includes a National Monument to the west, the Cistercian Abbey.

Strategically, while the N63 itself does not form part of the TEN-T Network, the proposed improvements will support the objectives of the TEN-T in broad terms by improving the connectivity to Junction 19 on the M17 TEN-T network.

The scheme generally runs from south west to north east across the Abbert River, which is part of the Lough Corrib Special Area of Conservation (SAC). The scheme location is characterised by the presence of open greenfield area with some wooded areas in the section south of the Abbert River.

The main constraints within the study area are the Cistercian Abbey and the Abbert River, which is a tributary of the Clare River and thus forms part of the Lough Corrib SAC (site code:000297). The existing N63 crosses the Abbert River in the townland of Liss. Liss Bridge is a seven-arched limestone bridge, built circa 1800. The existing N63 is lined by residential properties, and several community facilities at the junction with the local road L3110.

The scheme is located in close proximity to Abbeyknockmoy Abbey, a National Monument, enjoying the highest level of statutory protection under the National Monuments Acts 1930–2004. It is located to the north of Abbeyknockmoy.

1.2 Scheme Background

AECOM-ROD were commissioned to begin work on the scheme in May 2019. The scheme has been progressed by AECOM-ROD through the Phase 1 of the TII Project Management Guidelines 2019 (PE-PMG-02041) (Feasibility Studies), and a Scheme Feasibility Report was published in August 2019.

It was deemed that a Stage F Road Safety Impact Assessment was not required due to the minor land take required. A feasibility working cost and the Phase 1 Gateway Review Statement have been produced.

1.3 Traffic Studies

A traffic survey was undertaken in the summer of 2019 to inform the Phase 1 Feasibility Report. Junction Turning Counts and Automatic Traffic Counts were monitored, and compared with the AADT data for the last three years, as obtained from a TII traffic counter located in the vicinity.

TII maintains a network of traffic counters on the National Road Network. One such traffic counter (Ref. TMU N63 080.0W) is located on the N63 between Roscommon and Galway at Derreen, Co. Galway.

Automatic Traffic Count tubes were installed at three locations within the study area over a two-week period between Tuesday 21st May 2019 and Monday 3rd June 2019. The Junction Turning Counts were completed at five junction locations over a 12hr period (7am to 7pm) on Tuesday 21st May 2019.

The traffic assessment was carried out using the TII Simple Appraisal Tool, which can be used for minor projects where significant re-routing does not take place (costing between €5m and €20m) instead of building a full traffic assignment model.

Based on the traffic survey data a simple model was created which calculated the percentage of local and regional traffic for each Option.

Using the link-based growth rates that have been provided for county Galway (Table 6.2 of TII Project Appraisal Guidelines for National Roads Unit 5.3 - Travel Demand Projections (PE-PAG-02017)), the

future AADT flow have been determined for each Option, for both the Opening Year (2023) and Design Year (2038).

1.4 Constraints Study and Options

The initial step in the Option Selection process was to identify the nature and extent of significant constraints within a defined study area. The definition of a suitable study area was progressed during the Feasibility Study (Phase 1) and presented in the resulting Feasibility Report (August 2019).

The Constraints Study informed the development of numerous potentially feasible Options. In addition to the six Options that were developed, the Do-Nothing and Do-Minimum options were assessed, but it was found that without the provision of a new river crossing, it would not be possible to address the congestion and associated safety issues inherent in the existing road network.

Due to the minor differences between the Do-Nothing and Do-Minimum Options, it was agreed to combine these options into the Do-Nothing/Do-Minimum Option for this report.

1.5 Stage 1 - Preliminary Options Assessment

The potentially feasible Options were assessed by applying the three-stage option selection process set out in the TII Project Management Guidelines 2019 (PE-PMG-02041). At Stage 1, all Options were subject to a Multi Criteria Analysis assessing Engineering, Economy and Environment.

The six Stage 1 Options can be seen in Figure 1-1 below. The results of the Stage 1 Preliminary Options Assessment can be seen in Table 1-1.

	Do-Nothing / Do-Minimum Option	Option A (Cyan)	Option B (Green)	Option C (Yellow)	Option D (Pink)	Option E (Blue)	Option F (Red)
Engineering	Minor or slightly negative	Moderately positive	Major or highly positive	Minor or slightly positive	Not significant or neutral	Minor or slightly negative	Minor or slightly negative
Environment	Not significant or neutral	Major or highly negative	Moderately negative	Moderately negative	Moderately negative	Moderately negative	Moderately negative
Economy	Minor or slightly negative	Minor or slightly positive	Moderately positive	Minor or slightly positive	Not significant or neutral	Minor or slightly negative	Not significant or neutral
Overall Ranking	**Minor or slightly negative**	**Not significant or neutral**	**Minor or slightly positive**	**Not significant or neutral**	**Minor or slightly negative**	**Moderately negative**	**Minor or slightly negative**

Table 1-1 Stage 1 Preliminary Option Assessment Summary

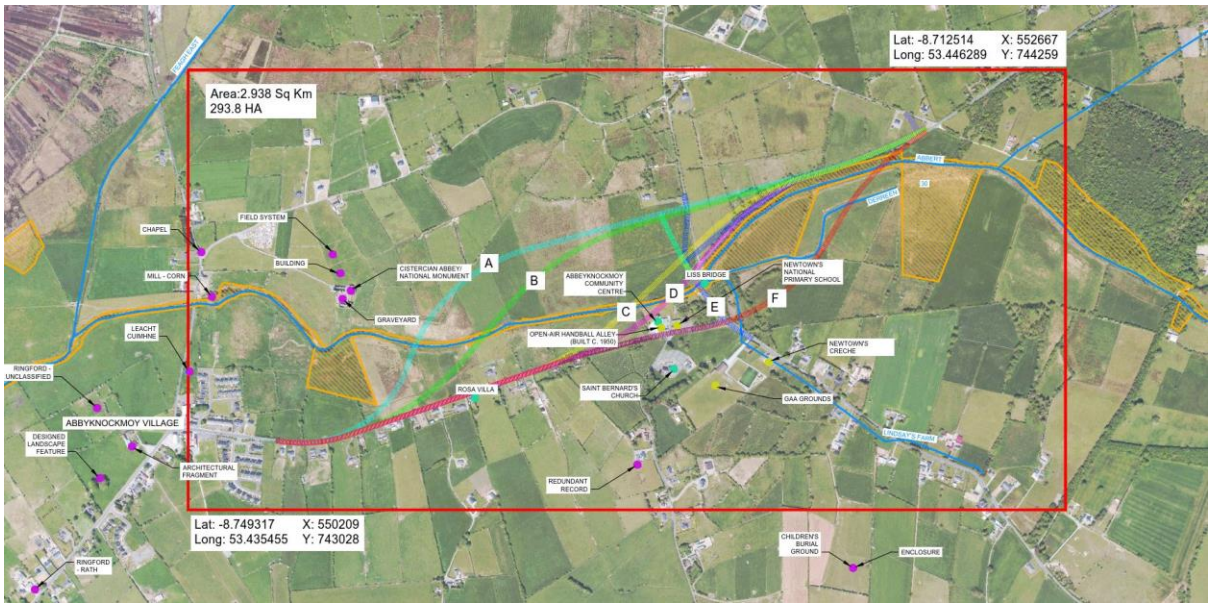


Figure 1-1 Stage 1 Options

A Public Consultation was held in October 2019 to present the study area, and the six Options (A-F) that arose from the Stage 1 Preliminary Options Assessment .

Following the Stage 1 Preliminary Options Assessment , it was decided that three Options (A, B and C) and the Do-Nothing/Do-Minimum should be brought forward to Stage 2 Project Appraisal.

Following review of the submissions at the first Public Consultation, it was observed that the majority of the public in attendance were in support of an improvement scheme, with significant requests for non-motorised user facilities to connect the community facilities to the residential area of Abbeyknockmoy.

1.6 Stage 2 - Project Appraisal Matrix

The three Options that were taken forward to Stage 2 Project Appraisal are shown in Figure 1-2

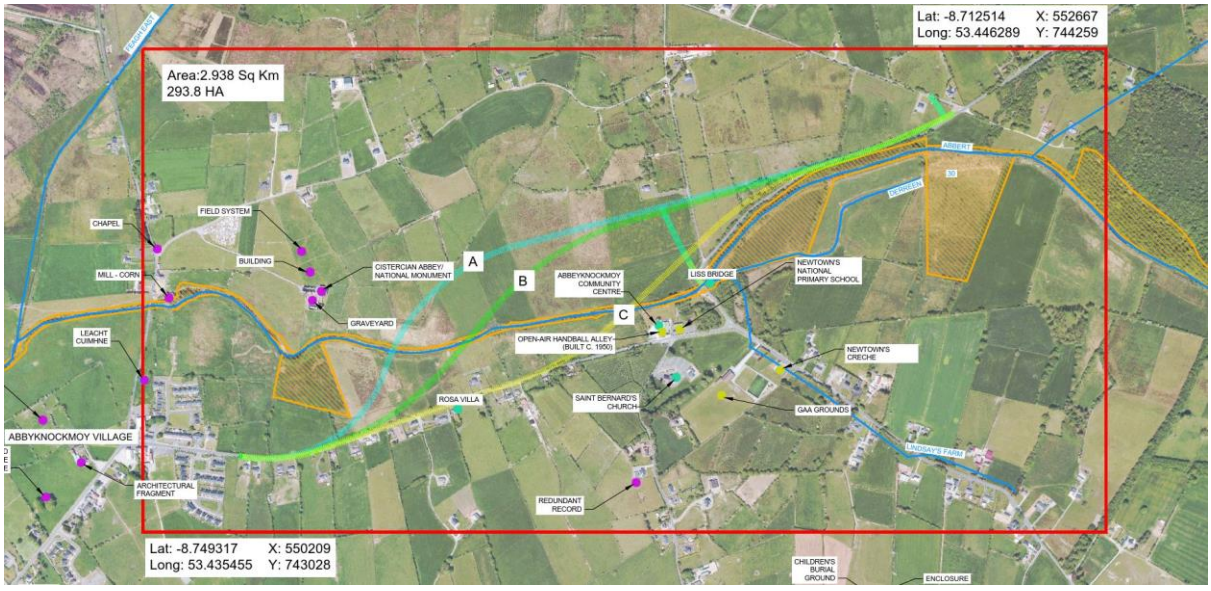


Figure 1-2 Stage 2 Options

A detailed and informed comparative assessment was undertaken in accordance with the TII Project Management Guidelines 2019 (PE-PMG-02041) and the Common Appraisal Framework (published by the Department of Transport, Tourism and Sport). The results of these assessments under the six required criteria are summarised in Table 1-2 below.

	Do-Nothing / Do-Minimum Option	Option A (Cyan)	Option B (Green)	Option C (Yellow)
Economy	Major or highly negative	Moderately positive	Major or highly positive	Minor or slightly positive
Safety	Moderately negative	Moderately positive	Moderately positive	Moderately positive
Environment	Not significant or neutral	Major or highly negative	Moderately negative	Moderately negative
Integration	Not significant or neutral	Moderately positive	Moderately positive	Moderately positive
Accessibility & Social Inclusion	Not significant or neutral	Moderately positive	Moderately positive	Moderately positive
Physical Activity	Not significant or neutral	Moderately positive	Moderately positive	Moderately positive
Overall Ranking	**Minor or slightly negative**	**Not significant or neutral**	**Minor or slightly positive**	**Not significant or neutral**

Table 1-2 Stage 2 Project Appraisal Matrix Summary

Following the Stage 2 Project Appraisal, it was recommended that Option B (Green) should be taken forward as the Emerging Preferred Option for the N63 Liss to Abbey Realignment Scheme.

1.7 Emerging Preferred Option - Public Consultation

A further Public Consultation was held in February 2020 to present the Emerging Preferred Option and seek public input to inform its further development.

Following review of the submissions at the second Public Consultation, it was observed that the majority of the public in attendance were in support of the Emerging Preferred Option, with the request for non-motorised user facilities to connect the community facilities to the residential area of Abbeyknockmoy being reiterated. Some concerns about visual impact and land take were raised and these will be reviewed at the preliminary design stage.

1.8 Conclusion

The Option Selection process concluded that the Emerging Preferred Option is Option B (Green).

The delivery of the realignment scheme will include the provision of a new bridge crossing over the Abbert River, improvement of the alignment of the N63 and segregation of regional traffic from local traffic. The scheme will provide an improved link for regional traffic to the M17 motorway, enhance the N63 route consistency, in line with other sections of the N63 corridor, and increase the overtaking opportunities. It is also expected to reduce traffic congestion at the Liss Bridge and in the vicinity of the community facilities. The existing N63 will be upgraded to provide facilities for both cyclists and pedestrians to improve connectivity between the community facilities and residential properties. By introducing a new road alignment to segregate local and regional traffic as well as introducing facilities for non-motorised users, safety for all road users will be improved.

It is recommended that detailed topographical surveys and geotechnical investigations should be undertaken to inform the further development of the design of this preferred option, sufficient to inform a full Environmental Impact Assessment.

It is recommended that this Option is taken forward to the design stage of the project (Phase 3) and concurrently to the Environmental Impact Assessment Report (EIAR) and Statutory Process stage of the project (Phase 4).

2. Introduction & Description

2.1 Introduction

AECOM-ROD has been commissioned by Galway County Council to provide Engineering Consultancy Services for the development of the N63 Liss to Abbey Realignment Scheme including the Feasibility Stage, Option Selection, Preliminary Design and Preparation of the Environmental Impact Assessment Report (EIAR).

The purpose of this report is to summarise the assessment of Options for the N63 Liss to Abbey Realignment Scheme and identify an Emerging Preferred Option. The proposed scheme will include the upgrade of approximately 2.4km of the existing road alignment.

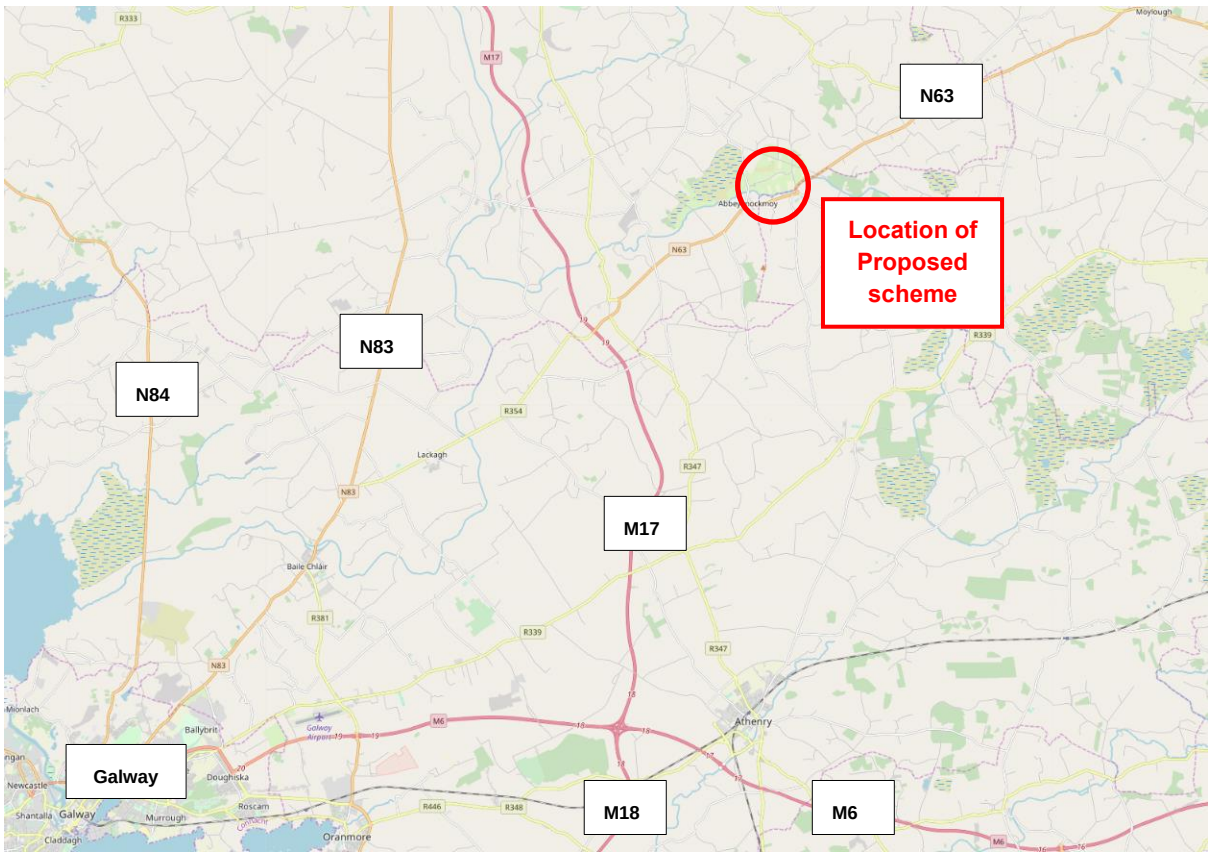


Figure 2-1 Regional Location Plan

The N63 Liss to Abbey Realignment Scheme is a proposed road scheme in Abbeyknockmoy Co. Galway that will facilitate a number of objectives in the Galway County Development Plan (2015-2021), including the provision of higher-quality national roads and the separation of regional and local traffic. The scheme will also meet a number of objectives of the Road Safety Authority's Road Safety Strategy.

The proposed scheme is located in the north east of County Galway along the N63 Route, a national secondary route, and directly to the east of the village of Abbeyknockmoy. The study area extends in a north easterly direction, from the eastern edge of Abbeyknockmoy, across the Abbert River, to the townland of Derreen and on towards the junction of the N63 with the L6234. The study area includes a National Monument to the west, the Cistercian Abbey.

Strategically, while the N63 itself does not form part of the TEN-T Network, the proposed improvements will support the objectives of the TEN-T in broad terms by improving the connectivity to Junction 19 on the M17 TEN-T network.

The scheme generally runs from south west to north east across the Abbert River, which is part of the Lough Corrib Special Area of Conservation (SAC). The scheme location is characterised by the presence of open greenfield area with some wooded areas in the section south of the Abbert River.

The main constraints within the study area are the Cistercian Abbey and the Abbert River, which is a tributary of the Clare River and thus forms part of the Lough Corrib SAC (site code: 000297). The existing N63 is lined by residential properties, and several community facilities at the junction with the

local road L3110. The existing N63 crosses the Abbert River in the townland of Liss. The Liss Bridge is a seven-arched limestone bridge, built circa 1800.

The scheme is located in close proximity to Abbeyknockmoy Abbey, a National Monument, enjoying the highest level of statutory protection under the National Monuments Acts 1930–2004. It is located to the north of Abbeyknockmoy.

The purpose of the scheme is to provide an improved link for regional traffic to the M17 motorway and reduce traffic congestion at the Liss Bridge and the community facilities. The existing N63 will be upgraded to provide facilities for both cyclists and pedestrians and will improve connectivity between the community facilities and residential properties.

Some options for the realignment scheme will include the provision of a new bridge crossing over the Abbert River, improvement of the alignment of the N63 and segregation of regional traffic from local traffic. By introducing a new road alignment to segregate local and regional traffic as well as introducing facilities for non-motorised users, safety for all road users would be improved.

The main roads within the defined study area or in its proximity are as follows;

- N63 – National Secondary Road;
- L3110 (Monivea Road) – Local Road;
- L7138 (Lisch Road) – Local Road;
- L6188 (Old Road) – Local Road;
- L6159 – Local Road;
- L2128 – Local Road;
- L6234 – Local Road; and
- L21281 – Local Road.

The extent of these routes is shown in Figure 2-2 below.

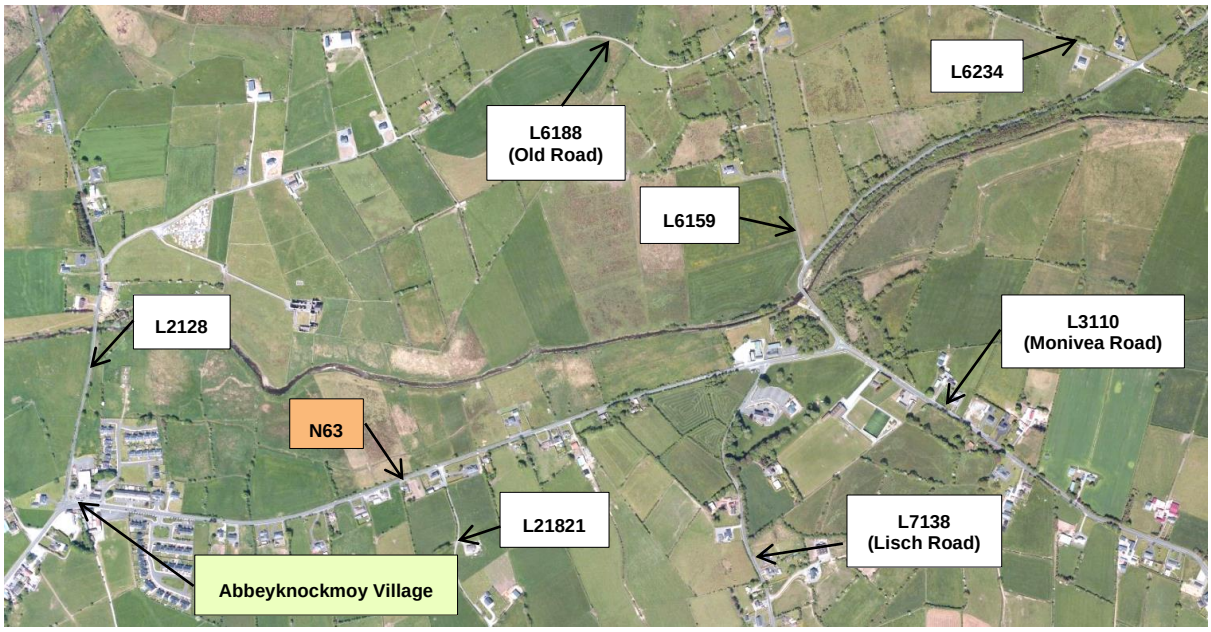


Figure 2-2 Existing Road Network

2.2 Scheme Background

AECOM-ROD were commissioned to begin work on the scheme in May 2019. The scheme has been progressed by AECOM-ROD through Phase 1 (Feasibility Studies) of the TII Project Management Guidelines 2019 (PE-PMG-02041) and a Scheme Feasibility Report was published in August 2019.

It was deemed that a Stage F Road Safety Impact Assessment was not required due to the minor land take required. A feasibility working cost and the Phase 1 Gateway Review Statement have been produced.

2.3 Project Objectives

The objectives of the N63 Liss to Abbey Realignment Scheme, as already detailed at Feasibility Stage, are as follows:

2.3.1 Economy

The key economic objectives are:

- To reduce journey times and improve journey time reliability on the N63 for long distance trips between the West and North-West Regions and medium distance trips between Longford/Roscommon and Galway; and
- To assist in supporting the economic performance of the counties of Galway, Longford and Roscommon through the provision of improved transport infrastructure, which will reduce the cost of travel for business and tourism and assist in reducing the overall cost of production, thereby improving competitiveness.

2.3.2 Safety

The key safety objectives are:

- To reduce the collision rate along the national road network between Abbeyknockmoy village and Derreen to below the national average rate;
- To reduce the severity of collisions along the national road network between Abbeyknockmoy village and Derreen;
- To improve safety for all road users including pedestrians and cyclists along both the national road network and on the surrounding road network between Abbeyknockmoy village and Derreen;
- To support the RSA Road Safety Strategy 2013-2020; and
- To improve the security of vulnerable road users by providing for non-motorised users.

2.3.3 Environment

The key ecological receptor identified within the vicinity of the proposed scheme is the Abbert River which is within the Lough Corrib Special Area of Conservation (SAC). (Site Code 000297). The SAC boundary extends to include adjacent wet grassland to the south of the river. The existing Liss bridge crosses over the Abbert river.

Abbeyknockmoy Cistercian Abbey (National Monument No. 166; GA058-004001) and one National Monument subject to Preservation Order (earthworks and buildings associated with Abbeyknockmoy Cistercian Abbey (NM No. 166 & PO No. 4/1989; GA058-004004) are situated within the study area. The Abbey is a very well-preserved ruin of an important 13th-century Cistercian foundation, with royal patronage and at least one royal burial. It's fabric and setting are protected by the National Monuments Acts. Preserving the character and visual amenity of the ruins will be an important challenge for the present scheme.

The key environmental objectives of the scheme are:

- To avoid adverse impacts on the internationally important European Sites;
- To improve road drainage;
- To be sensitive to the visual amenity of the Abbey; and
- To minimise any noise impacts on properties.

2.3.4 Accessibility & Social Inclusion

The principal accessibility and social inclusion objectives are:

- To improve accessibility to key facilities, such as employment, education, transport, and healthcare for all road users, but in particular for vulnerable groups;

- To improve accessibility and reduce severance particularly within the community of Abbeyknockmoy village and in turn support social and economic development within the village and its hinterland; and
- To support the accessibility and social inclusion objectives of national, regional and local planning policy including the Updated National Action Plan for Social Inclusion 2015-2017;

Of the residents in the area between 10.0%-13.9% are disabled. A dedicated pedestrian/cycle route and improved road network conditions would assist these people with onward travel and their independence.

The 2016 Pobal HP Deprivation Index at Electoral Districts (ED) level is 'Marginally below average' in all the three ED within the study area (Abbey West, Abbey East and Moyne).

The separation of regional and local traffic coupled with the introduction of pedestrian/cycling facilities will improve accessibility to employment, community facilities and heritage resources. As a result the social inclusion of for vulnerable groups will be improved by the scheme.

2.3.5 Integration

The proposed scheme is required to integrate with general policies and plans under the headings of Transport, Land Use, Geographical and Government Policy. The following objectives are outlined for integration:

- To support the integration objectives set out in European, National, Regional and Local planning policy by upgrading the N63 National Secondary between Abbeyknockmoy village and Derreen;
- To support initiatives to bring investment into the West Region; and to support transport integration within the wider region, maximising the benefits of previous investment in the N63 route, integrating with regional public transport facilities, and improving access to the main ports and airports;

2.3.6 Physical Activity

The following objectives are outlined for physical activity:

- To improve facilities and segregation between national and regional traffic, and the movement of local non-motorised users such as pedestrians and cyclists;
- To provide a dedicated route for pedestrians and cyclists along the existing road network, promoting healthy lifestyle choices, particularly with regard to children's movement to and from school / community facilities; and
- To improve connectivity to the community facilities in the local area.

2.4 Purpose of this Report

The purpose of this report is to outline the works undertaken within the Phase 2 Option Selection Process to identify a suitable study area, to identify key constraints within that study area, to develop feasible Options and to carry out systematic assessment of these Options leading to the selection of an Emerging Preferred Option.

The report also describes the public consultations that occurred during the Options Assessment Stage and following the identification of an Emerging Preferred Option. The general requirements which inform the preparation of an Option Selection Report are outlined in the TII Project Management Guidelines 2019 (PE-PMG-02041).

2.5 Option Selection Methodology

A suitable study area was identified, and a constraints study was carried out to identify key constraints within the study area. This is detailed in Chapter 5 of this report.

Option Selection is a process which seeks to identify a preferred option through a structured appraisal process which can be referred to as a narrowing of options. This process falls under the Stage 1 Preliminary Appraisal process in the Common Appraisal Framework (CAF).

Feasible Options for the N63 Realignment Scheme were identified and subjected to a Stage 1 Preliminary Options Assessment. The Options were presented at a public consultation held at the Abbeyknockmoy Community Centre in October 2019.

A Stage 2 Project Appraisal was undertaken to identify an Emerging Preferred Option. The Emerging Preferred Option was presented at a public consultation at Abbeyknockmoy Community Centre in February 2020. The systematic assessment process of feasible Options for this project, is taken from the PMG's described in the following figure.

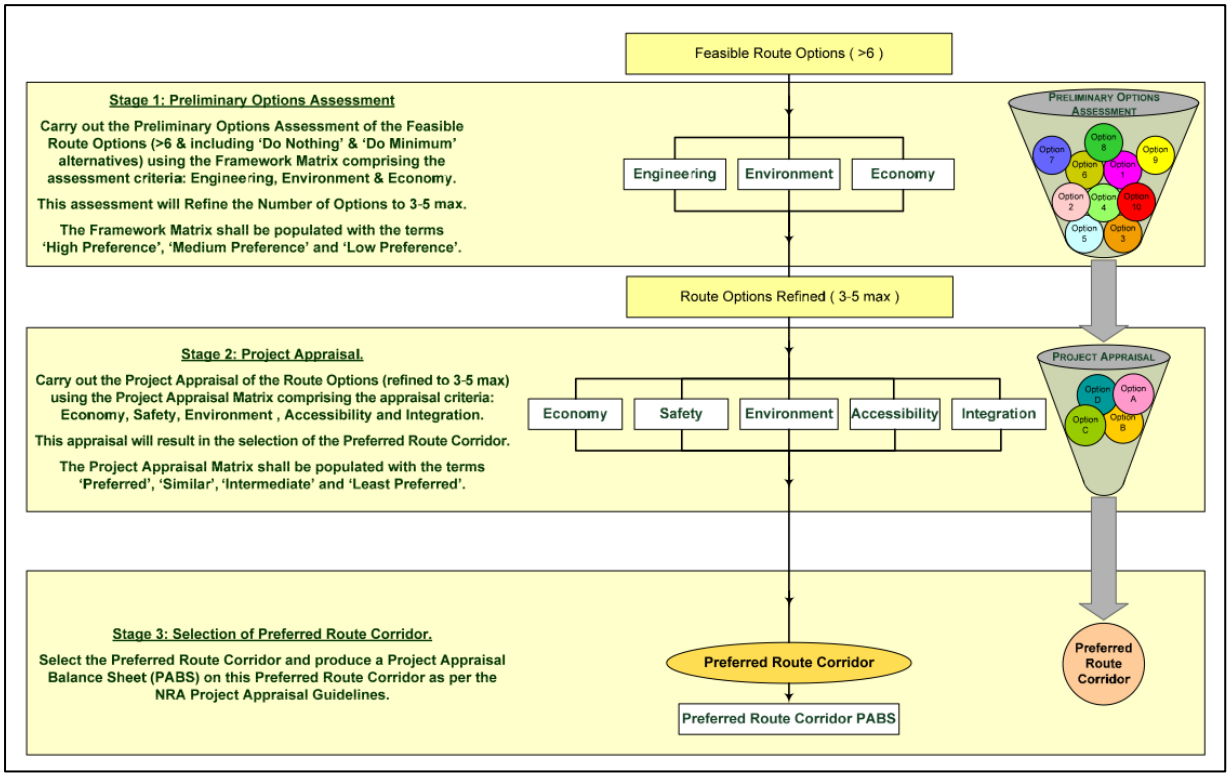


Figure 2-3 Stages of the Options Section Process (NRA/TII PMG 2010)

Stage 1 - Preliminary Options Assessment

An analysis of the Do-Nothing and Do-Minimum scenarios was undertaken to determine a baseline for route comparison, known as the base case. This is detailed in Chapter 6 of this report. The Stage 1 Preliminary Options Assessment for N63 Realignment was carried out using a Multi-Criteria Analysis (MCA) matrix. The matrix considers the Options under the assessment criteria of Engineering, Environment and Economy to refine Options.

The study included a number of offline Options, connecting the proposed realigned road to the existing N63 via several different tie-in options.

The feasible Options that provided the greatest benefit when compared to the assessment criteria were progressed to Stage 2 Project Appraisal to identify the Emerging Preferred Option. Further details of the Stage 1 Preliminary Options Assessment are included in Chapter 7 of this report.

Stage 2 - Project Appraisal of Options

Following the completion of the Stage 1 Preliminary Options Assessment, Stage 2 Project Appraisal was undertaken for the progressed Options.

The Stage 2 Project Appraisal was carried out using a Project Appraisal matrix comprising the headings of Economy, Safety, Integration, Environment, Accessibility & Social Inclusion, and Physical Activity.

These six headings, outlined by the Department of Transport, Tourism and Sport in their report 'Guidelines on a Common Appraisal Framework for Transport Projects and Programmes (March 2016)', are as follows:

- Economy

  "The impacts of a transport investment on economic growth and competitiveness are assessed under the economic impact and economic efficiency criteria."

- Safety

"Safety is concerned with the impact of the investment on the number of transport related accidents."

- Integration

  "Integration considers the extent to which the project being evaluated promotes integration of transport networks and is compatible with a range of Government policies, including national spatial and planning policy."

- Environment

  "Environment embraces a range of impacts, such as emissions to air, noise, and ecological and architectural impacts."

- Accessibility & Social Inclusion

  "Accessibility and social inclusion embraces the notion that some priority should be given to benefits that accrue to those suffering from social deprivation, geographic isolation and mobility and sensory deprivation."

- Physical Activity

  "This relates to the health benefits derived from using different transport modes."

The feasible Option that provided the greatest benefit when considered with respect to the above headings was then identified as the Emerging Preferred Option. The Emerging Preferred Option will progress to Stage 3 – Preferred Option. Further details of the Stage 2 Project Appraisal of Options are included in Chapter 8 of this report.

3. Project Need, Strategic Fit and Priority

3.1 Overview

The compatibility of the proposed scheme in terms of meeting the objectives of national, regional and local planning policy is considered in this section of the Option Selection Report.

3.2 Road Development Policies

The need for N63 Realignment Scheme has been identified within the Project Brief and is consistent with the following international, national, regional and local planning policy documents:

International and National Policy Context

- TEN-T Trans European Transport Network;
- National Planning Framework (NPF);
- Strategic Investment Framework for Land Transport;
- A Programme for a Partnership Government – May 2016; and
- Road Safety Authority Road Safety Strategy 2013 – 2020.

Regional Policy Context

- West Regional Planning Guidelines (2010-2022); and
- Regional Spatial Economic Strategy (RSES).

Local Policy Context

- Galway County Development Plan (2015-2021).

3.3 International and National Policy

3.3.1 TEN-T Trans European Transport Network

The TEN-T Trans European Transport Network, which was the subject of Regulation (EU) No. 1315/2013, provides for the TEN-T Trans European Network and requires the development of a core network by 2030 with a connecting comprehensive network of high-quality routes incrementally by 2050. The requirements for the comprehensive network, is described by the regulations as follows:

> *"The comprehensive network should be a Europe-wide transport network ensuring the accessibility and connectivity of all regions in the Union, including the remote, insular and outermost regions, as also pursued by the Integrated Maritime Policy established by Regulation (EU) No 1255/2011 of the European Parliament and of the Council, and strengthening social and economic cohesion between them. The guidelines laid down by this Regulation ("the guidelines") should set the requirements for the infrastructure of the comprehensive network, in order to promote the development of a high-quality network throughout the Union by 2050.1"*

While the N63 does not form part of the comprehensive TEN-T Network, the proposed improvements will support the objectives of the TEN-T in broad terms by improving the connection to Junction 19 on the M17 TEN-T network which in turn feeds into:

> *"...the core network at regional and national level. The aim is to ensure that progressively, throughout the entire EU, the TEN-T will contribute to enhancing internal market, strengthening territorial, economic and social cohesion and reducing greenhouse gas emissions."*

Figure 3-1 TEN-T Trans European Transport Network Map

3.3.2 National Planning Framework (NPF)

The National Planning Framework (NPF) is the Government's high-level strategic plan for shaping the future growth and development of Ireland out to the year 2040. Its overarching visions are to:

- Develop a new region-focused strategy for managing growth;
- Linking this to a new 10-year investment plan, the Project Ireland 2040 National Development Plan 2018-2027;
- Using state lands for certain strategic purposes;
- Supporting this with strengthened, more environmentally focused planning at local level; and
- Backing the framework up in law with an Independent Office of the Planning Regulator.

The goals and objectives of the NPF are expressed within the Plan as 'National Strategic Outcomes', which include:

- Compact Growth;
- Enhanced Regional Accessibility;
- Strengthened Rural Economies and Communities;
- High Quality International Connectivity;
- Sustainable Mobility;
- A Strong Economy, supported by Enterprise, Innovation and Skills;
- Enhanced Amenities and Heritage;
- Transition to a Low Carbon and Climate Resilient Society;
- Sustainable Management of Water, Waste and other Environmental Resources;
- Access to Quality Childcare, Education and Health Services.

The proposed upgrade of the N63, will directly support 'Enhanced Regional Accessibility', which is defined below:

Enhanced Regional Accessibility

A co-priority is to enhance accessibility between key urban centres of population and their regions. This means ensuring that all regions and urban areas in the country have a high degree of accessibility to Dublin, as well as to each other. Not every route has to look east and so accessibility and connectivity between places like Cork and Limerick, to give one example, and [through the Atlantic Economic Corridor [See definition below] to Galway as well as access to the North-West is essential.]

The achievement of this 'National Strategic Outcome' will in turn support the long-term achievement of other 'National Strategic Outcomes'.

Of most significance in terms of the NPF, is the fact that the N63 connects directly to the core component of the Atlantic Economic Corridor (AEC), which is defined within the Plan as:

> *… a linear network along the Western seaboard, stretching from Kerry to Donegal, which has the potential to act as a key enabler for the regional growth objectives of the National Planning Framework. The corridor straddles parts of both the Northern and Western Region and the Southern Regions, with the potential to further extend its scope by building on the Cross-Border relationship between Letterkenny and Northern Ireland, and into Cork City and County to the south. The overarching objective of the AEC initiative is to maximise the infrastructure, talent and enterprise assets along the western seaboard and to combine the economic hubs, clusters and catchments of the area to attract investment, improve competitiveness, support job creation and contribute to an improve duality of life for the people who live there. [The lack of high-quality connectivity between the regions within the AEC has been a major impediment to its development as a counter-balance to Dublin and the East coast.]*

Improved connectivity between Counties Galway, Longford, Roscommon and also to Clare via the M17/M18 will be delivered through this project; thereby in turn enhancing accessibility for the region.

3.3.3 Strategic Framework for Investment in Land Transport

The Strategic Framework for Investment in Land Transport (SFILT) which was published by the Department of Transport, Tourism and Sport outlines the key principles against which national and regional, comprehensive and single mode-based plans and programmes will be drawn up and assessed. The framework does not set out a list of projects to be prioritised however the following three priorities are noted in terms of investment:

- Priority 1 – Achieve steady state maintenance;
- Priority 2 – Address urban congestion; and
- Priority 3 – Maximise the value of the road network.

In terms of Priority 3, the report states that "*the value of the road network will be maximised through targeted investments that:*

- *Enhance the efficiency of our existing network, particularly through the increased use of ITS applications;*
- *Support identified national and regional spatial planning priorities;*
- *Provide access for large-scale employment proposals; and*
- *Support identified national and regional spatial planning priorities"*

The proposed scheme will support the objectives of the SFILT by improving the efficiency of this section of the national road network.

3.3.4 A Programme for a Partnership Government – May 2016

In May 2016, the Government launched "A Programme for a Partnership Government – May 2016" outlining the policies and objectives over the term of the government. The proposed road development aims to support the objectives and policies contained within the programme for a partnership government, by improving access to the western region, supporting investment and providing infrastructure improvements to enable the development of the Atlantic Economic Corridor. The proposed scheme specifically addresses the policy objective to upgrade key radial routes from the existing motorway network, improving access to the western region and direct access to Ireland West Airport Knock.

3.3.5 Road Safety Authority Road Safety Strategy 2013 - 2020

The Road Safety Authority (RSA) Road Safety Strategy 2013 – 2020, sets outs targets to be achieved in terms of road safety in Ireland as well as policy to achieve these targets. The primary target of this strategy is:

> *"A reduction of road collision fatalities on Irish roads to 25 per million population or less by 2020 is required to close the gap between Ireland and the safest countries. This means reducing deaths from 162 in 2012 to 124 or fewer by 2020.*

A provisional target for the reduction of serious injuries by 30% from 472 (2011) to 330 or fewer by 2020 or 61 per million population has also been set."

The plan sets out strategies for engineering and infrastructure in terms of the benefits that they can have in terms of reducing collisions. The provision of the upgraded sections of national roads proposed as part of this scheme will support this RSA strategy.

The policy which aims to extend measures in the EU Road Infrastructure Safety Management Directive 2008/96/EC relating to road safety inspection and traffic management, which currently apply to the TEN-T routes, to the entire national road network by 2016 has also been adopted for all National Routes since 2013.

3.4 Regional Policy

3.4.1 West Regional Planning Guidelines (2010-2022)

The West Regional Planning Guidelines (2010-2022) (RPG2010) identifies the following works for priority completion in order to promote a balanced regional development:

IO5: Identify the following works for priority completion in order to promote a balanced regional development. The following projects must be assessed as to their environmental impact, through relevant assessment, where necessary, including Habitats Directive Assessment in accordance with the requirements of the Habitats Directive, with preferred Options ensuring minimal impact, on the natural and built environment. 8. Upgrade and improve all National Secondary roads in Particular: (C) N63 Galway to Roscommon connecting the Gateway to the County town of Roscommon; minimising environmental impact.

The West Regional Assembly was consumed into the Northern & Western Regional Assembly in January 2015 and are preparing a Regional Spatial Economic Strategy (RSES) for the region which will support the implementation of the National Planning Framework (NPF – Ireland 2040 – Our Plan). The RSES will put in place policies and recommendations that will better manage regional planning and economic development throughout the region.

3.5 Local Policy

3.5.1 Galway County Development Plan (2015-2021)

The national and regional objectives identified above have been developed further and translated into local objectives through the Galway County Development Plan (2015-2021) (CDP). The CDP stated the N/M6 and M17/M18 as the main access routes in the region and the N59, N63, N83 and N84 as important inter-regional routes within the Galway County Development Plan (2015-2021). The CDP makes specific reference to the wider N63 Leacht Seoirse-Ballygar route of which the N63 Liss to Abbey is a sub-section.

3.6 Policy Summary

Policy and planning documents have further defined the need for the scheme and support the objectives of an improved N63 Route, particularly;

1. Sustaining Economic Growth through the provision of improved transport connectivity in this rural location.
2. Enhanced Regional and Local Accessibility, providing improved accessibility & social inclusion to school and community facilities and to heritage resources.
3. Enhanced Environmental benefits, through a reduction in traffic queuing and journey time reliability.
4. Improved Safety through improved road alignment, pedestrian and cycle user segregation, and ultimately reducing collisions in line with the Road Safety Strategy.

3.7 Project Specific Need

The N63 forms part of the National Secondary Road network. The TII National Roads Network Indicators 2018 report describes that the N63 is operating at a volume / capacity ratio of below 80% in most areas but at a number of pinch points it is operating at a volume/ capacity ratio of 100%-120%.

Along one section, the N63 is operating at above 120% volume capacity. A review of the condition of the existing N63 within the study area was carried out, and is reported below.

The existing N63 within the study area is generally narrow with no hard shoulders. Alignment of the road is poor in both the horizontal and vertical planes. There is no off-carriageway provision for pedestrians or cyclists. The existing Liss Bridge is narrow and significantly restricts traffic flows, with two HGV's travelling in opposite directions unable to safely pass on the Liss Bridge. Given the rural nature of the study area, agricultural vehicles conflict with local road traffic on the Liss Bridge on a regular basis, which in turn generates localised traffic issues. There have been collisions at this location as identified in TII and RSA collision data, described in more detail in Section 5.

The Liss Bridge is significantly below standard both in terms of alignment and containment. During a site inspection a number of bridge strikes were apparent, with the existing sub-standard parapet walls repaired in several locations.

The N63 is a regional connector route connecting Roscommon to the M17 which leads on to Galway. Any proposed upgrade to the current sub-standard N63 alignment will improve the route consistency of the national road network and increase the overtaking opportunities. This will help with connectivity between these areas and improve journey times and reliability.

Outside of the study area the N63 is a relatively straight road with standard verges, no pedestrian/cyclist facilities and a number of overtaking areas when travelling from east to west towards Abbeyknockmoy. To the west of Abbeyknockmoy there is recently upgraded section of the N63 connecting to the M17 consists of a Type 2 single carriageway cross-section; any proposed upgrade for this section of the N63 will aim to use the same cross-section which will help improve route consistency along the national road network offer an improved cross-section for all road users.

Figure 3-2 N63 Westbound

Figure 3-3 N63 eastbound approaching Liss Bridge

The N63 Realignment Scheme is considered to be consistent with both local and regional policy guidelines. The scheme is described as a specific objective within both the current development plan and local transport plan.

The proposed scheme is a multi-modal transport scheme, with a provision for both cyclists and pedestrians. The scheme will improve journeys across the Abbert River, with improved horizontal and vertical alignments. In addition, improved cross-sections, realignment and upgraded junctions will improve safety, particularly for pedestrians and cyclists.

The scheme also forms a key east / west transport link across the Abbert River, thus, providing a link to the national road network via the M17 Junction 19.

In addition, the N63 currently experiences significant traffic congestion issues in the vicinity of the Liss Bridge. This scheme will assist in the alleviation of these issues at the local level, while improving safety for both motorised and non-motorised users.

4. Traffic Assessment & Option Cross-Section

4.1 Overview

This chapter outlines details of the following traffic data related information;

- Summary of Traffic Data Collection;
- Summary of Traffic Data Analysis;
- Initial Selection of Road Type and Design Speed; and
- Consideration of a Preliminary Junction Strategy.

The traffic assessment of Options is contained within Chapters 7 and 8 of this Option Selection Report.

As there are currently no dedicated cyclist facilities in the study area there were no cyclist counts undertaken. There are limited pedestrian facilities within the area of Abbeyknockmoy town as well as between the GAA Club and the Church. These limited facilities are dispersed throughout the study area and as such no pedestrian counts were undertaken.

It is also noted that the lack of cyclist/pedestrian counts at this stage will not affect option comparison as the existing facilities are limited and proposed facilities will be the equally considered for all the options.

4.2 Traffic Data Collection

In order to develop the project, traffic data was collected. A series of detailed traffic surveys were therefore undertaken to inform the development of the scheme. The surveys undertaken included:

- Junction Turning Counts (JTC);
- Automatic Traffic Counts (ATC);

The following sections describe the collation of traffic data collected in May 2019.

4.2.1 Junction Turning Counts (JTC)

Classified JTC data gives an indication of the turning movements observed at key junctions in the network. These were commissioned in the 5 locations shown in Figure 4-1, and recorded in 15-minute intervals between 07:00 and 19:00 on Tuesday 21st May 2019.

A high-level review of the JTC survey results has been provided in Appendix A.1.

4.2.2 Automatic Traffic Counts (ATC)

ATC data provides link count data over a longer time period, which smooths out any day-to-day variations that may not be picked up when undertaking a single day count. ATC data was collected at the 3 sites shown in Figure 4-1. Each site was active for two weeks, with the majority of sites actively collecting data between 21st May and 3rd June 2019.

A high-level review of the ATC survey results has been provided in Appendix A.1.

Figure 4-1 JTC and ATC Locations Map

ATCs were also used to assess the speed distribution of the traffic along the existing N63. A high-level review of the speed distribution results has been provided in Appendix A.1.

TII maintains a network of traffic counters on the National Road Network. One such traffic counter (Ref. TMU N63 080.0W) is located on the N63 between Roscommon and Galway at Derreen, Co. Galway. This location is shown also on Figure 4-1 and an extract of the collected traffic data is provided in Figure 4-2.

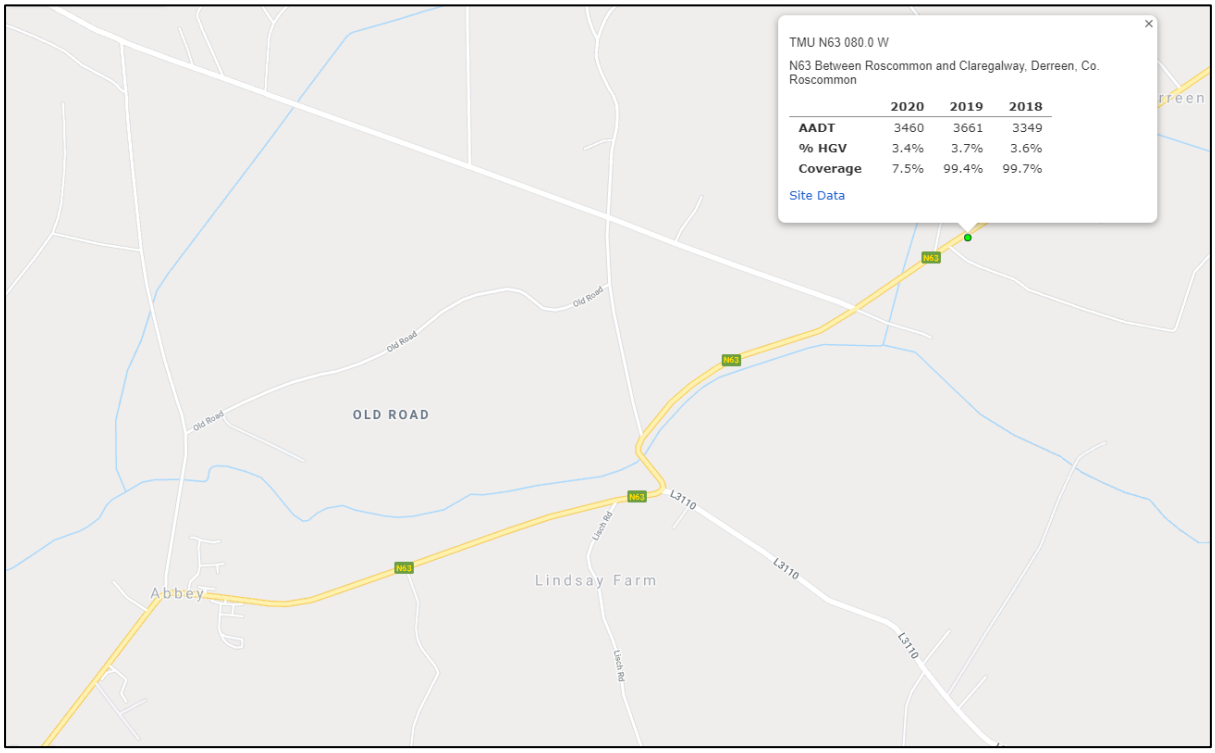


Figure 4-2 TII Traffic Counter data (TMU N63 080.0 W)

4.2.3 Journey Times

Typical journey times along the N63 within the study area are in the order of 3 minutes. As a result of the congesting influence of the narrow bridge journey time reliability is negatively affected with some vehicles achieving a clear movement across the existing narrow bridge, while others need to yield to opposing traffic, this therefore generates an unreliability within vehicular journey times. The effect of the narrow bridge on journey time and journey time reliability was further investigated during Phase 2 – Project Appraisal.

4.2.4 Analysis of the Traffic Survey Data

Traffic flow data is available for the TII traffic counter since 2014. Analysis of this data indicates that the Annual Average Daily Traffic (AADT) flow on the N63 at Derreen townland, North East of Abbeyknockmoy village, in 2019 was 3,598 vehicles per day with 3.3% Heavy Goods Vehicles (HGV). The percentage of HGV had previously increased from 3.1% in 2014 to 3.6% in 2018.

Analysis of the traffic survey data indicates that the AADT flow on the N63 at Derreen townland, North East of Abbeyknockmoy village, in 2019 was 3,500 vehicles per day with 3.6% HGV. This is within an acceptable deviation compared to the TII Traffic Counter as the traffic counts are based on a 12-hour period, rather than a 24-hour period like the TII Traffic Counter.

The AADT for the last three years from the TII Traffic Counter along with existing traffic flows from automatic traffic counts are shown in Figure 4-3.

Figure 4-3 Existing Traffic Flows

4.2.5 Conclusions of Traffic Surveys

A number of key conclusions can be drawn from the review of the existing and completed traffic surveys which support the need to deliver the proposed scheme objectives. These include;

- Traffic volumes along the route have grown at rate of 4% between 2017-2018 and 7% between 2018-2019 (based on the TII Permanent Traffic Count data).
- The traffic flows are reasonably balanced between east and west movements.
- The 85th percentile speed along the existing N63 is high, particularly in consideration of the existing sub-standard road alignment.
- The existing community building and schools in close proximity to the road edge, the single lane bridge with substandard entry radii, and the significant number of road junctions and direct accesses, give rise to a safety concern when considered in conjunction with these high speeds.
- The traffic volumes are relatively high for such a rural link road and this is largely dominated by through flows.
- There are a number of right turn movements along the route. The movement to the L3110 from the N63 has potential to generate shunt collisions, given the limited junction visibility and proximity to the community facilities and the Liss Bridge.

4.3 Traffic Assessment

For minor projects where significant re-routing does not take place (costing between €5m and €20m) the TII Simple Appraisal Tool can be used instead of building a full traffic assignment model. In order to calculate the number of vehicles which would use the new Option (regional traffic), the number of vehicles that would remain on the existing route (local traffic) needed to be determined first. Based on the traffic survey data a simple model was created which calculated the percentage of local and regional traffic for each Option.

For simple models, traffic flows are generally represented as vehicular traffic flows on links, with limited information on origin, destination or trip length. In such cases, future year traffic growth is projected using growth rates which describe likely traffic growth that may occur over the appraisal period of the scheme.

The derivation of link-based growth rates is based on an aggregate projection of growth in vehicle kilometres within a defined geographical area, with appropriate classifications by vehicle type and projected period. This allows the specification of a series of growth rates which can be applied directly to traffic flows on simple networks to generate an appropriate estimate of future traffic flows.

The growth rates for Galway from Table 6.2 of TII Project Appraisal Guidelines for National Roads Unit 5.3 - Travel Demand Projections (PE-PAG-02017 - May 2019) were applied. An extract from PAG Unit 5.3 can be seen in Table 4-1 below.

Area	2016-2030		2030-2040		2040-2050		2050+	
	LV	HV	LV	HV	LV	HV	LV	HV
Galway								
	Central Growth							
	1.0259	1.0446	1.0109	1.0198	1.0105	1.0236	1.0000	1.0000
	High Sensitivity Growth							
	1.0294	1.0480	1.0148	1.0236	1.0181	1.0336	1.0000	1.0000
	Low Sensitivity Growth							
	1.0243	1.0430	1.0087	1.0177	1.0088	1.0218	1.0000	1.0000

Table 4-1 Growth Rates (Galway) – From Table 6.2 of TII PE-PAG-02017

Using the link-based growth rates that have been provided for county Galway, the future AADT flow can be determined for each Option, for both the Opening Year (2023) and Design Year (2038).

The results of the traffic model are discussed in more detail in the Stage 1 Economic Assessment (Section 7.6) and Stage 2 Economic Assessment (Section 8.3). Future traffic flows (AADT) for each Option have been provided in Appendix A.2.

4.4 Initial Selection of Road Type and Speed Limits

4.4.1 Selection of Road Type and Cross-Section

For the purpose of the assessment an appropriate cross-section for the proposed scheme has to be selected. Considering the rural nature of the scheme, the cross-section has been designed in accordance with TII DN-GEO-03031 – Rural Road Link Design.

In consideration of the expected level of traffic on the N63 mainline and to maintain a route consistency with road improvement already completed to the west of Abbeyknockmoy, a Type 2 Single Carriageway have been selected.

Type of Road 1.	Capacity[2] (AADT) for Level of Service D	Edge Treatment	Access Treatment	Junction Treatment at Minor Road	Junction Treatment at Major Road
Type 3 Single (6.0m) Carriageway (National Secondary Roads Only)	5,000	0.5m hard strip. Cycle Facilities Footways	Minimise number of accesses to avoid standing vehicles and concentrate turning movements.	Simple Priority Junctions[5]	Priority junctions, with ghost islands where necessary[5] or roundabouts.
Type 2 Single (7.0m) Carriageway	8,600	0.5m hard strips. Cycle Facilities Footways	Minimise number of accesses to avoid standing vehicles and concentrate turning movements.	Priority junctions, with ghost islands where necessary[5].	Priority junctions, with ghost islands[5] roundabouts [3], compact grade separation where necessary.
Type 1 Single[4] (7.3m) Carriageway	11,600	2.5m hard shoulders	Minimise number of accesses to avoid standing vehicles and concentrate turning movements.	Priority junctions, with ghost islands where necessary[5].	Ghost islands[5] or roundabouts or, compact grade separation where necessary

Figure 4-4 Recommended Rural Road Layouts (extract of Table 6.1 - DN-GEO-03031)

4.4.2 Proposed Cross Section

All Options assume a Type 2 Single Carriageway in compliance with TII Standard Construction Detail CC-SCD-00002. The proposed cross section is indicated in Figure 4-5 below.

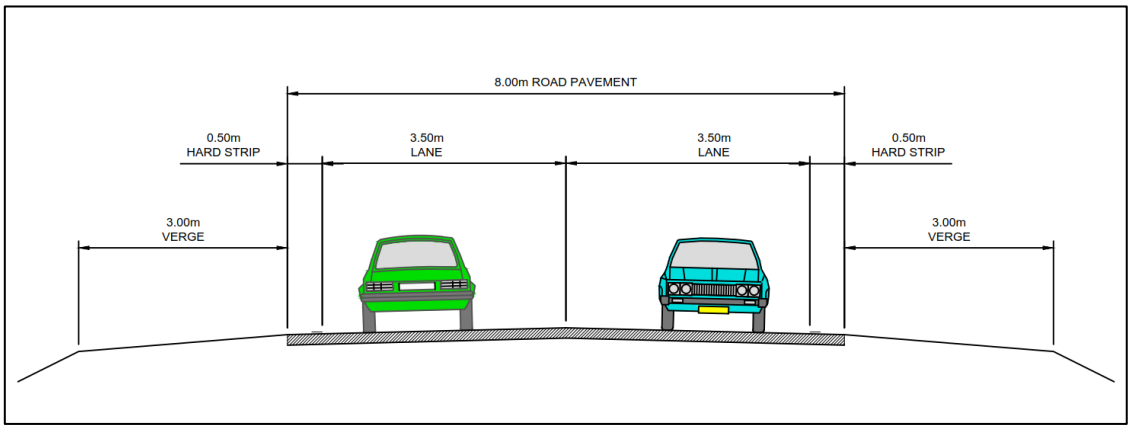


Figure 4-5 Proposed Cross-Section (Indicative Layout Only)

As part of the development of the Options, while considering the feedback received at the scheme public consultation event, it is proposed to include facilities for non-motorised users along the existing N63. These facilities are expected to be implemented by provision of a footway / cycleway along one side of the existing N63, however the detail of this is subject to development at Phase 3 - Preliminary Design. As such, the provision for non-motorised users will not be required along any realigned section of the N63.

Note that the above cross-section is indicative.

The cross section that has been considered is in line with the requirements included in Table 4.2 of TII DN-GEO-03036 - Cross Sections and Headroom, and includes:

- 7.0m single carriageway;
- 0.5m hard strip (both sides);
- 3.0m verges (both sides);

It is currently not proposed to include bus lanes on the proposed N63 scheme as there is no current requirement for a dedicated bus route on the scheme. However, it is noted that the scheme will facilitate public transport modes via connection to existing routes along the existing N63. This will be in the form of a dedicated pedestrian / cycle route which will be confirmed at preliminary design stage.

The provision of an offline/online Type 2 Single Carriageway would:

- Segregate local (journeys stopping in the locality) and regional traffic (longer distance journeys on N63 which do not stop in the locality);

- Improve the alignment to a national road standard;
- Reduce the potential for right-turning vehicles to affect the predominant flows;
- Reduce the risk of rear shunt collisions; and
- Provide an opportunity for the provision of safe walking and cycling facilities along the existing route to serve the existing community centre, the Abbey heritage site, community facilities and a number of local schools.

4.4.3 Speed Limits

The Stage 1 Preliminary Options Assessment assumed that a speed limit of 100km/h would be imposed on the proposed realigned section of the N63 in line with existing conditions. In the interim, Galway County Council have reduced the speed limit in the vicinity of the study area from 100km/h to 80km/h. The extent of the imposed speed limit can be seen in Figure 4-6 below.

Following consultation with GCC, it was agreed that the design speed for the scheme would remain as 100km/h.

During the Stage 2 Project Appraisal, all Options were assessed for a posted speed limit of 80km/h to ensure that the future designs could be developed to be consistent with the TII Guidelines DN-GEO-03031 – Rural Road Link Design.

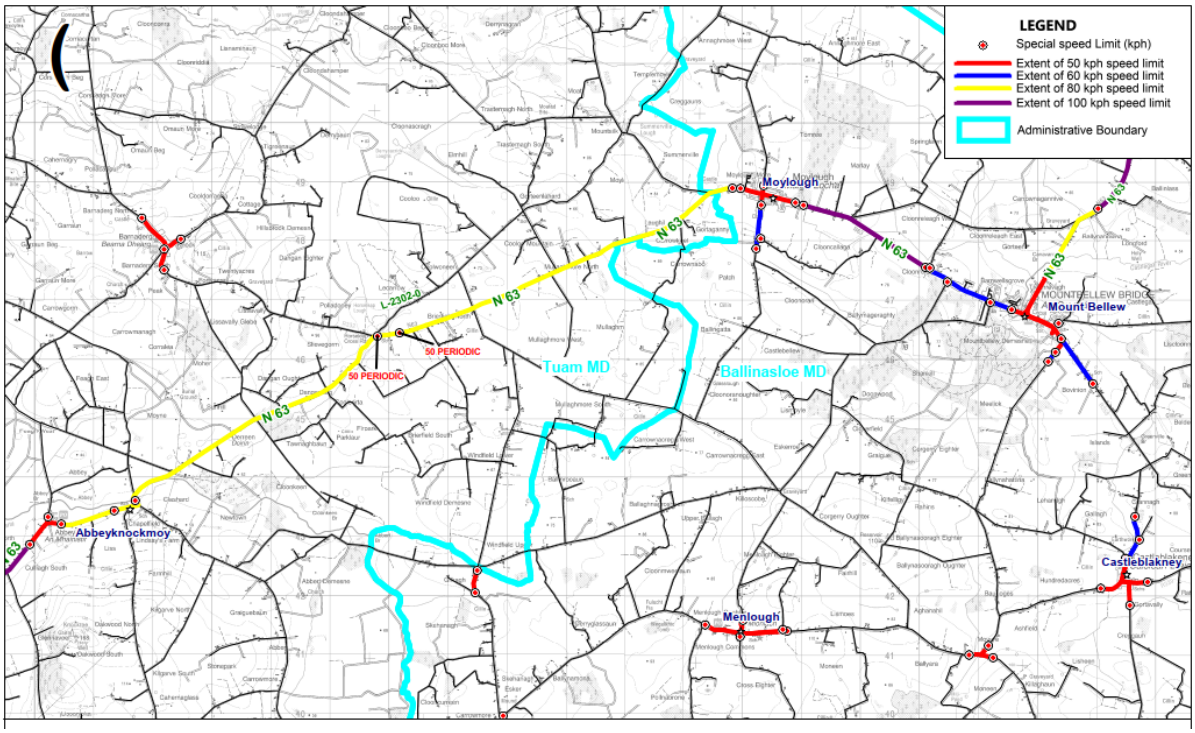


Figure 4-6 Updated Speed Limits

4.5 Junction Strategy

The following outlines the Phase 2 Option Selection junction strategy used to asses with defining options, the exact junction type, size, and location will be confirmed at Phase 3 - Preliminary Design stage.

Any offline Options will include at least two junctions, an eastern and western tie in, with the option for a central junction at the existing Liss Bridge and L6159 / L6188 tie-in.

The eastern tie in would be a continuation of the N63. A connection to the L6234 will be required. This would consist of a potential realignment of the existing junction subject to further design at Phase 3 - Preliminary Design stage. The current cross-roads junction at the eastern tie in (private access and L6234) would be reviewed to identify if the junctions can be realigned to improve sight distances.

Any connections between the existing Liss Bridge and the L6159 / L6188 has bene considered as a simple priority junction and will be reviewed in more detail at Phase 3 - Preliminary Design stage to identify if any right turn pockets would be required on the mainline.

The western tie in would be the major junction within the scheme. There are a number of options for this tie in but it is envisaged that a roundabout would be the most appropriate to tie in the existing N63 to the realigned N63, and maintain local accesses. A roundabout is considered the likely choice for a combination of alignment, speed control, and providing a suitable transition from higher posted speed zone to lower speed zones close to the Abbeyknockmoy village.

The number of junctions for an online Option would reflect the current situation of the road network. Due to the nature of the existing road network there may be an opportunity to upgrade or rearrange the junctions that incorporate part of any online Option.

The design team will be considering junction types and location in more detail as part of the early stages of the Phase 3 – Preliminary Design.

5. Constraints Study

5.1 Constraints Study Introduction

The initial step in the Option Selection process is to identify the nature and extent of significant constraints within a defined study area. This chapter outlines the process by which the study area was defined, and documents significant constraints identified. The impact these constraints have on the option selection process and feasible Options is also detailed in this section. The constraints identified were mapped (refer to Appendix B) to facilitate the design of a number of feasible Options that avoid the constraints, wherever possible.

The constraints gathering exercise mainly comprised a desktop study and the nature of certain constraints were verified by means of site visits. Further constraints which were identified during subsequent public consultations, through submissions received from members of the public and statutory bodies, have been included here for completeness.

The purpose of Chapter 5 of this Option Selection Report is to identify all the constraints located within the relevant study area. Section 5.2 describes the identification of the study area. The TII Project Appraisal Guidelines splits constraints into three categories: natural constraints, artificial constraints and external parameters. Sections 5.3, 5.4 and 5.5 below list in detail the natural constraints, artificial constraints and external parameters, respectively, located within the N63 study area.

5.2 Defining the Study Area

The area selected for investigation should comprise of a viable study area holding potential for feasible Options and exclude those areas which are non-viable because of issues such as topography, urban development, protected sites, and non-fulfilment of purpose.

The definition of a suitable study area was progressed during the Feasibility Study (Phase 1) and presented in the resulting Feasibility Report (August 2019). The study area boundaries, reported as follows, have been re-assessed prior to commencement of the Phase 1 (Preliminary Option Assessment) constraints study and no changes have been identified.

The extents of the study area, in the townland of Liss, are limited by the village of Abbeyknockmoy to the west, by the intersection between the N63 and the L6234 to the east, by the L6188 (Old Road) to the north and by residential properties to the south as shown in Figure 5-1. The Abbert River runs through the central section of the study area in an east to west direction. The study area encompasses approximately 293.8 hectares and is approximately 2.46km long (east to west) and 1.23km tall (north to south).

The study area consists of small areas of woodland around the Liss Bridge. The area is mainly agricultural land. The existing N63 runs east to west through the study area and it is confined by residential properties on each side along with a number of community facilities in the vicinity of Liss Bridge. The central section of the study area includes the Abbert River and its floodplain, an area within the Lough Corrib SAC. Abbeyknockmoy Abbey National Monument is located to the north of the Abbert River, in the western side of the study area. Mature trees and hedgerows are spread across the site typically along field boundaries and close to the Abbert River. Field boundaries are typically a combination of barbed wire fences, hedge rows, tree lines and water filled ditches.

Outside the study area, Abbeyknockmoy village continues to the west, and the Lough Corrib SAC continues along the banks of the Abbert River. To the north west of the study area there is a large cut away peat bog. The remainder of the area is made up of farm land connected by local roads and sparse housing. The area comprises predominantly agricultural fields (pasture land) with minor residential development and occasional farm buildings. A number of public roads cross the study area at various locations.

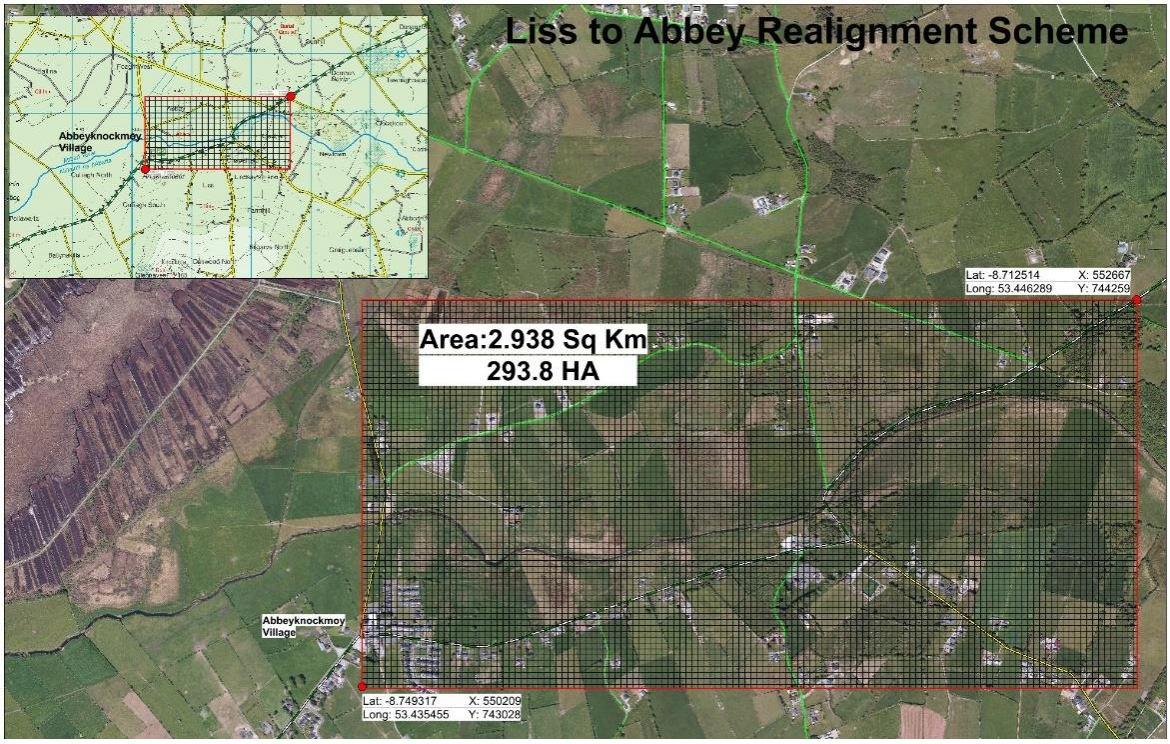


Figure 5-1 N63 Study Area

5.3 Natural Constraints

Natural constraints identified are listed and discussed in detail below:

- Biodiversity (incorporating Flora and Fauna);
- Water (incorporating Flood Risk and Hydrology);
- Land and Soils (incorporating Soils, Geology and Hydrogeology); and
- Landscape and Visual.

5.3.1 Biodiversity (incorporating Flora and Fauna)

The biodiversity appraisal of constraints had regard for relevant guidance including the:

- NRA 2009 '*Guidelines for Assessment of Ecological Impacts of National Roads Schemes'* and
- NRA 2006 '*Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes*'.

The study area for the biodiversity appraisal included the potential zone of influence of significant effects, which varies by receptor, but can extend up to several kilometres in the case of bats (e.g. where distant roosts may be impacted by severance impacts of key foraging or commuting habitats).

The appraisal was informed both by a desk study and a field survey.

5.3.1.1 Desktop Survey Methods and Results

A desktop review was conducted in order to identify possible designated sites and protected areas in the study area.

Designated conservations sites were identified from GIS data downloaded from the National Parks and Wildlife Service (NPWS) map viewer[2]. These conservation sites included: SACs, designated under the EU Habitats Directive; Special Protection Areas (SPAs), designated under the EU Bird's Directive; and Natural Heritage Areas (NHA), which under the Wildlife (Amendment) Act, are designated to conserve species and habitats of national importance.

[2] NPWS Map Viewer Accessed 12th August 2019

Desktop searches for records of rare or protected species including accessing:

- The online database of the NPWS;
- The National Biodiversity Centre's Biodiversity Maps[3].

Designated sites and Protected Areas

One designated site was identified within the study area (detailed in Appendix B drawing):

- Lough Corrib SAC (000297)

A second designated site was identified some 2km south west and downstream of the scheme, as shown in Table 5-1 below, which outlines the designated sites within the Potential Zone of Influence of the Scheme.

Designated Site (and site code)	Location Relative to Scheme	Summarized Reasons for Designation (Examples)
Lough Corrib SAC (000297)	Crossed by scheme	• Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*); • Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea • Hard oligo-mesotrophic waters with benthic vegetation of Chara spp. • Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation; • Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia)* (* important orchid sites) • Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) • Active raised bogs; • Old sessile oak woods with Ilex and Blechnum in the British Isles; • Degraded raised bogs still capable of natural regeneration; • Depressions on peat substrates of the Rhynchosporion; • Calcareous fens with Cladium mariscus and species of the Caricion davallianae; • Petrifying springs with tufa formation (*Cratoneurion*); • Alkaline Fens; • Limestone pavements; • Bog woodland; • Lesser Horseshoe bat (*Rhinolophus hipposideros*); • Atlantic Salmon (*Salmo salar*); • Otter (*Lutra Lutra*); • White-clawed Crayfish (*Austropotamobius pallipes);* • Freshwater Pearl Mussel (*Margaritifera margaritifera*) • Sea Lamprey (*Petromyzon marinus*); • Brook Lamprey (*Lampetra planeri*); • Lesser Horseshoe Bat (*Lesser Horseshoe Bat*); • Slender Green Feather-moss (*Drepanocladus vernicosus);* and • Slender Naiad (*Najas flexilis*)
Killaclogher Bog NHA (001280)	2 km south west of the scheme (downstream)	• Peatlands

Table 5-1 Designated Sites within the Potential Zone of Influence of the Scheme

[3] https://maps.biodiversityireland.ie/Map Accessed 12th August 2019

The Abbert River is the main watercourse running through the study area; which is located in the central section of the study area. The Abbert River has been identified as being 'at risk' of meeting the Water Framework Directive (WFD) objective (i.e. achieving and maintaining 'Good Ecological Status').

A small section of the Feagh East River is located to the north west of the study area boundary. The Derreen and Lindsay's Farm watercourses are located in the north east and south east section of the study area respectively.

A small section of the Lecarrow stream is located to the north east of the study area boundary. The WFD risk of these rivers are currently unassigned by the EPA.

The Abbert River forms part of the designated Lough Corrib SAC as it has examples of habitats and/ or species listed in Annex I/II of the E.U Habitats, as outlined in Table 5-1 above.

Watercourses in the downstream catchment are not designated salmonid watercourses.

There were no Nature Reserves and National Parks identified in the study area after reviewing the NPWS 'National Parks and Nature Reserves' interactive map viewer[4].

Aquatic Ecology

As identified on the EPA's Catchments Map Viewer[8], the Abbert River and Derreen stream have been identified as being 'at risk' of meeting the WFD objective (i.e. achieving and maintaining 'Good Ecological Status').

The Abbert River is not protected under the Salmonid Regulations (S.I 293 1988); which outlines the WFD River Network Routes that are designated protected Salmonid Waters. The river is also not a designated protected shellfish water area.

As discussed in Section 5.3.1, the Abbert River is part of the designated Lough Corrib SAC due to a number of qualifying interests, including White-clawed Crayfish (*Austropotamobius pallipes)*.

Protected Species

The study area is likely to provide breeding and/or resting habitats for a variety of protected species.

A number of protected species were identified on the National Biodiversity Centre's Biodiversity Maps. Datasets from four 2km grid squares surrounding the study area (M44X; M44W; M54B; M54C; M54G and M54H) were downloaded and compile from the National Biodiversity Centre's online database, the results of which are outlined in Table 5-2 overleaf.

[4] NPWS Map Viewer Accessed 18th July 2019

Species Group	Species Name	Date of last record	Grid Refence
Bird	Common Linnet (*Carduelis cannabina*)	31/12/2011	M44X
Bird	Barn Swallow (*Hirundo rustica*)	14/05/2010	M44W
Bird	Common Kingfisher (*Alcedo atthis*)	20/04/2010	M44W
Bird	Common Snipe (*Gallinago gallinago*)	29/03/2010	M44W
Bird	Great Cormorant (*Phalacrocorax carbo*)	29/03/2010	M44W
Bird	Mallard (*Anas platyrhynchos*)	14/05/2010	M44W
Bird	Mute Swan (*Cygnus olor*)	19/05/2010	M44W
Bird	Sand Martin (*Riparia riparia*)	14/05/2010	M44W
Terrestrial mammal	Eurasian Badger (*Meles meles*)	31/12/2006	M44W
Bird	Barn Swallow (*Hirundo rustica*)	31/12/2011	M54B
Bird	Common Kestrel (*Falco tinnunculus*)	31/12/2011	M54B
Bird	Common Kingfisher (*Alcedo atthis*)	14/05/2010	M54B
Bird	Common Linnet (*Carduelis cannabina*)	31/12/2011	M54B
Bird	Common Pheasant (*Phasianus colchicus*)	31/12/2011	M54B
Bird	Common Snipe (*Gallinago gallinago*)	20/04/2010	M54B
Bird	Common Starling (*Sturnus vulgaris*)	31/12/2011	M54B
Bird	Common Swift (*Apus apus*)	31/12/2011	M54B
Bird	Common Wood Pigeon (*Columba palumbus*)	31/12/2011	M54B
Bird	Great Cormorant (*Phalacrocorax carbo*)	29/03/2010	M54B
Bird	House Martin (*Delichon urbicum*)	31/12/2011	M54B
Bird	House Sparrow (*Passer domesticus*)	31/12/2011	M54B
Bird	Mallard (*Anas platyrhynchos*)	31/12/2011	M54B
Bird	Mute Swan (*Cygnus olor*)	19/03/2015	M54B
Bird	Sand Martin (*Riparia riparia*)	31/12/2011	M54B
Bird	Sky Lark (*Alauda arvensis*)	31/12/2011	M54B
Bird	Stock Pigeon (*Columba oenas*)	31/07/1991	M54B
Bird	Yellowhammer (*Emberiza citrinella*)	31/07/1991	M54B
Crustacean	Freshwater White-clawed Crayfish (*Austropotamobius pallipes*)	18/08/2005	M54B
Terrestrial mammal	Soprano Pipistrelle (*Pipistrellus pygmaeus*)	25/04/2005	M54B
Bird	Barn Swallow (*Hirundo rustica*)	31/12/2011	M54C
Bird	Common Linnet (*Carduelis cannabina*)	31/12/2011	M54C
Bird	Common Pheasant (*Phasianus colchicus*)	31/12/2011	M54C
Bird	Common Snipe (*Gallinago gallinago*)	31/12/2011	M54C
Bird	Common Starling (*Sturnus vulgaris*)	31/12/2011	M54C
Bird	Common Wood Pigeon (*Columba palumbus*)	31/12/2011	M54C
Bird	Eurasian Curlew (*Numenius arquata*)	31/07/1991	M54C
Bird	House Martin (*Delichon urbicum*)	31/12/2011	M54C
Bird	House Sparrow (*Passer domesticus*)	31/12/2011	M54C
Bird	Mallard (*Anas platyrhynchos*)	31/07/1991	M54C
Bird	Northern Lapwing (*Vanellus vanellus*)	31/12/2011	M54C
Bird	Sand Martin (*Riparia riparia*)	31/12/2011	M54C
Bird	Sky Lark (*Alauda arvensis*)	31/12/2011	M54C
Bird	Spotted Flycatcher (*Muscicapa striata*)	31/12/2011	M54C

Terrestrial mammal	Eurasian Pygmy Shrew (*Sorex minutus*)	31/10/2010	M54C
Terrestrial mammal	Soprano Pipistrelle (*Pipistrellus pygmaeus*)	22/04/2007	M54C
Bird	Barn Swallow (*Hirundo rustica*)	31/07/1991	M54G
Bird	Black-headed Gull (*Larus ridibundus*)	31/12/2011	M54G
Bird	Common Kestrel (*Falco tinnunculus*)	20/04/2010	M54G
Bird	Common Pheasant (*Phasianus colchicus*)	31/12/2011	M54G
Bird	Common Starling (*Sturnus vulgaris*)	31/12/2011	M54G
Bird	Common Wood Pigeon (*Columba palumbus*)	31/12/2011	M54G
Bird	Eurasian Curlew (*Numenius arquata*)	31/12/2011	M54G
Bird	Eurasian Teal (*Anas crecca*)	31/12/2011	M54G
Bird	Eurasian Woodcock (*Scolopax rusticola*)	31/12/2011	M54G
Bird	Great Black-backed Gull (*Larus marinus*)	14/05/2010	M54G
Bird	House Martin (*Delichon urbicum*)	31/07/1991	M54G
Bird	House Sparrow (*Passer domesticus*)	31/07/1991	M54G
Bird	Mallard (*Anas platyrhynchos*)	20/04/2010	M54G
Bird	Sand Martin (*Riparia riparia*)	14/05/2010	M54G
Terrestrial mammal	Eurasian Badger (*Meles meles*)	31/12/2009	M54G
Bird	Barn Swallow (*Hirundo rustica*)	31/12/2011	M54H
Bird	Common Linnet (*Carduelis cannabina*)	31/12/2011	M54H
Bird	Common Pheasant (*Phasianus colchicus*)	31/12/2011	M54H
Bird	Common Starling (Sturnus vulgaris)	31/12/2011	M54H
Bird	Common Wood Pigeon (*Columba palumbus*)	31/12/2011	M54H
Bird	House Martin (*Delichon urbicum*)	31/12/2011	M54H
Bird	House Sparrow (*Passer domesticus*)	31/12/2011	M54H
Bird	Sand Martin (*Riparia riparia*)	31/12/2011	M54H
Bird	Sky Lark (*Alauda arvensis*)	31/07/1991	M54H
Terrestrial mammal	Eurasian Badger (*Meles meles*)	31/12/2011	M54H
Terrestrial mammal	West European Hedgehog (*Erinaceus europaeus*)	26/09/2014	M54H
Source: National Biodiversity Centre; Biodiversity Maps			

Table 5-2 Protected Species

5.3.1.2 Other Ecological Features

The study area is located in the Corrib catchment area (Code: 30) and the Clare [Galway] sub-catchment (Code: 30_12; area 231.8 km^2).

5.3.1.3 Field Survey Methods and Results

A field survey was completed within the zone of influence in accordance with relevant guidance including the NRA/TII 2009 '*Guidelines for Assessment of Ecological Impacts of National Roads Schemes'.* The field surveys completed are detailed in Table 5-3 below.

Survey	Dates
Habitat survey including rare and invasive flora	July 2019
Walkover survey to catalogue habitat types occurring	January 2020

Table 5-3 Ecological Surveys Informing the Constraints Study

5.3.1.4 Limitations and Data Deficiencies

The surveys carried out in January 2020 were completed at sub-optimal period for several species' groups. These include flowering plants. Therefore, some of the habitat assessments carried out at this time (e.g. grassland types) should be considered provisional until confirmed by survey at an optimal period for relevant species. No breeding birds may be surveyed at this season (winter). While potential or likely bat habitats may be recorded at this season, no bat surveys may be carried out until late spring/summer. However, conditions were optimal for non-volant mammal surveys.

5.3.1.5 Results

The study area was searched for invasive species during the site walkover in January 2020 but no invasives were found that required treatment. Once the Emerging Preferred Option is identified the area will be reviewed in detail for invasive species during floral and habitat surveys.

5.3.1.6 Conclusion

The results from the desktop survey and the two site surveys were that the main biodiversity constraint that will influence the feasibility of Options is the Lough Corrib SAC, of which the Abbert River forms a part. Interaction with the SAC should be kept to a minimum with the large flood plain areas being avoided where possible. If offline options are considered it is noted that a new river crossing will have to interact with the SAC, but this interaction should be minimised through appropriate design measures. Any bridge that is to be considered should be a single span bridge to avoid any conflict with the river bed.

There were no other constraints identified that could not be overcome without mitigation and the limitations of feasible options due to Biodiversity constraints is minimal.

5.3.2 Water (incorporating Flood Risk and Hydrology)

5.3.2.1 Methodology

A desktop study was undertaken in order to gather baseline data in the study area and to identify the environmental sensitivity and setting of the water environment. This involved identifying and retrieving published information on the hydrology, flood risk and water quality of the defined study area, in accordance with the NRA's '*Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes'*.

The following topics are discussed:

- Surface water features;
- Catchment and sub-catchment geomorphology;
- Flooding; and
- Surface Water resources (including surface abstraction sites and identified rivers and lakes for water supply);

The following is a list of sources of information consulted for use in the desk-based study:

- Ordnance Survey of Ireland (OSI) National Townland and Historical Map Viewer for historical maps (Historic Map 6-inch 1837-1842; Historic Map 25-inch 1888-1913; Historic Map 6-inch Cassini 1830-1930)[5];
- Geological Survey of Ireland (GSI) 'Spatial Resources Viewer'[6];
- EPA Map Viewer[7];
- Catchments Map Viewer[8]; and
- Office of Public Works (OPW) Flood Maps[9].

5.3.2.2 Results

Water attributes identified within in the study area are outlined in Appendix B.

Surface Water Features

The Abbert River is the main watercourse running through the study area, providing hydrological connectivity to watercourses in the wider area. All proposed Options cross the Abbert River. The EPA has classified the river water quality (2018) of the Abbert River as Q4 'Good' status, from monitoring results taken at one hydrometric station on the Abbert River (located adjacent to the Liss Bridge). It should be noted however that the Abbert River has been identified as being 'at risk' of meeting the Water Framework Directive (WFD) objective (i.e. achieving and maintaining 'Good Ecological Status').

The Derreen stream is located in the north east section of the study area, with the Lindsay's Farm stream located in the south east section.

A small section of the Lecarrow stream is located just to the north east of the study area boundary.

The WFD risk and water quality for all three streams is currently unassigned by the EPA.

Catchment and sub-catchment geomorphology

The study area is located in the Corrib catchment area (Code: 30) and the Clare [Galway] sub-catchment (Code: 30_12; area 231.8 km^2). The Corrib catchment area includes the area drained by the River Corrib and all streams entering tidal water between Renmore Point and Nimmo's Pier, Galway, draining a total area of 3,112 km^2. The catchment is characterised by a wide, flat, limestone plain occupying the eastern two-thirds of the catchment, which terminates in the large lakes of Corrib and Mask that abut against the igneous granites of Galway and metamorphic uplands of southwest Mayo. The entire area of this catchment east of the large lakes is karstified and groundwater and surface water are highly interconnected in this region.

[5] OSI National Townland and Historical Map Viewer Accessed 12th August 2019
[6] GSI Spatial Resources Viewer accessed 12th August 2019
[7] EPA Map viewer accessed 12th August 2019
[8] Catchments Map accessed 12th August 2019
[9] Flood Maps Accessed 12th August 2019

Flooding

According to the OPW's Flood Maps[9], the study area is not within a designated flood zone. The Flood Maps also show no past flood events were recorded within or close to the study area.

Onsite observations confirmed that the lands immediately adjacent to the Abbert River are likely to be prone to flooding as this area is relatively flat and at a lower elevation than surrounding lands.

In addition, the vegetation present in this area is characteristic of flood plain flora as discussed Section 5.3.1.

Historical mapping (25-inch map series (1888-1913) and 6-inch Cassini (1830-1930)) shows lands south of the Abbert River and to the north east of the river are marked as 'Liable to Floods' (Figure 5-2 and Figure 5-3).

Surface Water Resources

The Abbert River is not a source of drinking water that has extra protection by law (EPA Map Viewer[7]).

5.3.2.3 Conclusion

The Abbert River is one of the main constraints within the study area. Any new offline Options will require a new crossing, and an online Option would require the upgrade of an existing river crossing. The presence of the river and its flood plain will have a direct effect on the levels of any proposed Option as the finished road level should be out of the flood plains. Offline Options may also cross some of the three streams mentioned earlier so diversions or culverts for these streams will have to be considered.

The Abbert River will play a significant part in any Option as the skew of any bridge crossing will be determined by the horizontal curvatures provided.

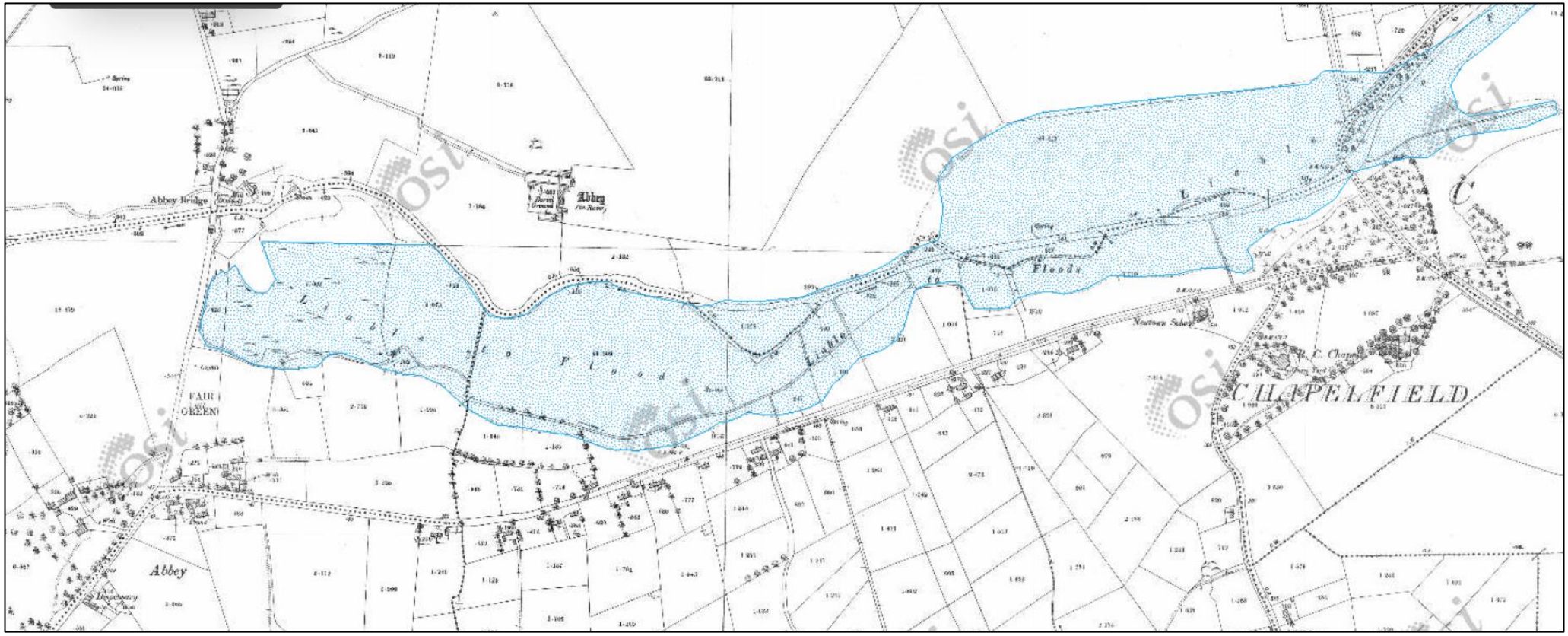


Figure 5-2 Historic 25-inch map showing lands 'Liable to Floods' within the study area

http://map.geohive.ie/mapviewer.html Accessed 10/01/2020

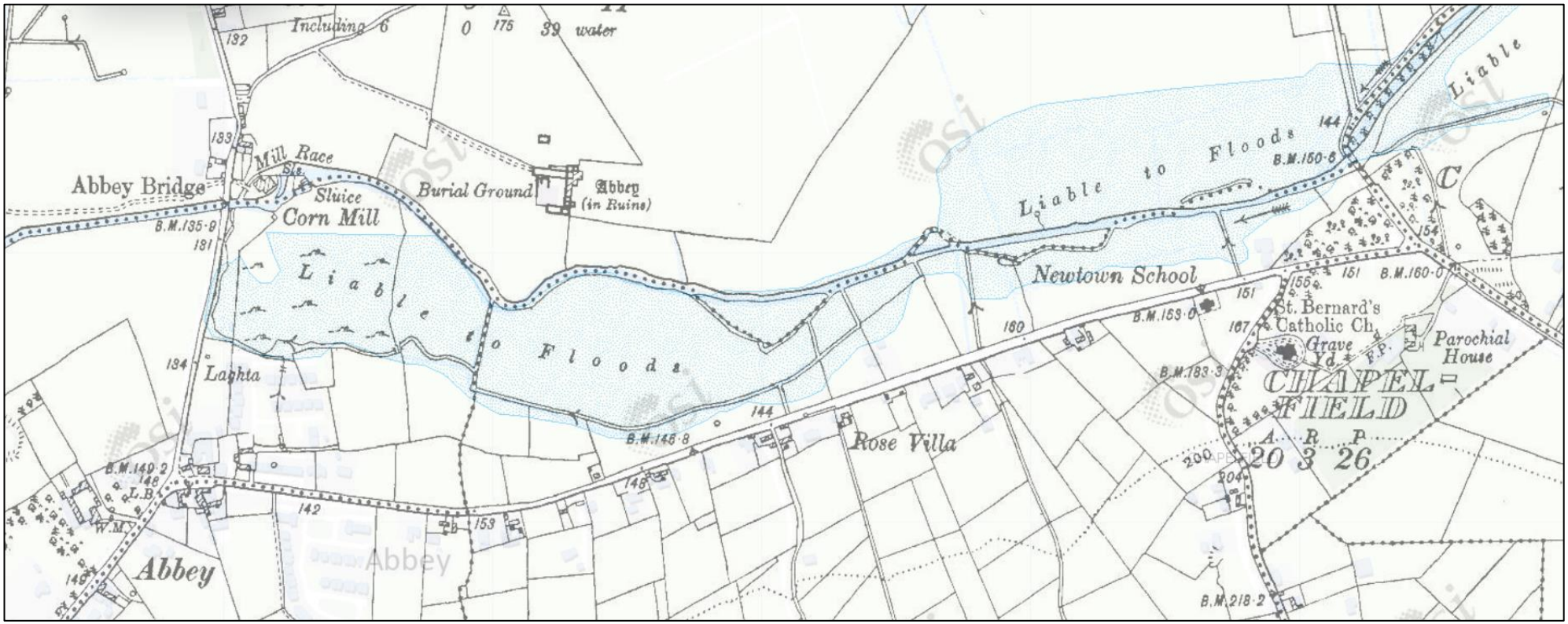


Figure 5-3 Historic Cassini 6-inch map showing lands 'Liable to Floods' within the study area

http://map.geohive.ie/mapviewer.html Accessed 10/01/2020

5.3.3 Land and Soils (incorporating Soils, Geology, and Hydrogeology)

5.3.3.1 Methodology

A desktop study was undertaken in order to gather land/soils baseline information in the study area and to identify the environmental sensitivity and setting. This involved identifying and retrieving published information on the geology and hydrogeology of the defined study area, in accordance with the NRA's '*Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes'*.

The following topics are discussed:

- Geomorphology including, existing landforms in the study area and potential geohazards;
- Bedrock geology, karst features, soil and subsoil deposits;
- Contaminated land (including landfill sites and other sites within the study area which could potentially have contaminated soil);
- Economic Geology (including active quarries, pits, mines and known or likely mineral/aggregate resource areas); and
- Geological Heritage sites.

The following compiles sources of information consulted for use in the desk-based study:

- OSI National Townland and Historical Map Viewer for historical maps (Historic Map 6-inch 1837-1842; Historic Map 25-inch 1888-1913; Historic Map 6-inch Cassini 1830-1930)[10];
- GSI 'Spatial Resources Viewer'[6];
- EPA Map Viewer for ground and groundwater information, as well as EPA Integrated Pollution Control licenced facilities or EPA licenced waste facilities;
- The Co-Ordinated Information on the Environment (CORINE) (2018) land cover dataset (accessed via the EPA Map Viewer).
- Teagasc Soils Map[11]http://gis.teagasc.ie/soils/map.php

5.3.3.2 Results

Land and Soils attributes identified within the study area are outlined in Appendix B.

Geomorphological Study

Geomorphology is the study of the landforms which comprise the Earth's surface, the processes which have modified and shaped them in the past and which continue to modify and shape them at the present time.

The principal geomorphological processes are erosion and deposition, and these are driven by ice, wind and water.

The physiographic maps on the GSI Spatial Resources Viewer show that the study area is located within '*Phyisoclass L1- Flat to undulating sediment'*. These physiographic maps are cartographic representations of the broad-scale physical landscape of a region.

The 'Enclosure by Landform', Landscape Character Map of County Galway produced for the Landscape and Landscape Character Assessment for Galway, shows the study area within an area of 'Flat'.

The constraints associated with the water attributes of the study area are discussed above in Section 5.3.2. The Abbert River is the main watercourse running through the study area, providing hydrological connectivity to watercourses in the wider area. The Derreen stream is located in the north east section of the study area, with the Lindsay's Farm stream located in the south east section. A small section of the Lecarrow stream is located just to the north east of the study area boundary.

The GSI Landslide Susceptibility Map, which can be found on the GSI's 'Spatial Resources Viewer'[6], shows that the study area is not within a landslide susceptibility area.

[10] OSI National Townland and Historical Map Viewer Accessed 12th August 2019
[11] Teagasc Soil Map Accessed 12th August 2019

Therefore, results from the desktop geomorphological study has shown that it is likely that there are no potential geohazards or dynamic landforms in this study area.

Bedrock Geology

According to the GSI 'Spatial Resources Viewer'[6], the underlying bedrock is described as "pale grey clean skeletal limestone" from the Burren Formation. No mapped aquifer faults are located within the study area (Appendix B).

Karst Features

As shown on the GSI's 'Spatial Resources Viewer'[6], the bedrock aquifer consists of a 'Regionally Important Aquifer - Karstified (conduit)'.

A review of the GSI's National Karst Database system shows no additional karst features within the study area. However, the database is not comprehensive as not all areas have been mapped to the same level or have been mapped at all.

Soils and subsoils

The quaternary sediments map (provided on the GSI 'Spatial Resources Viewer') indicates that the local quaternary deposits include (Drawing in Appendix B):

- Till derived from limestones (TLs)
- Alluvium (A)
- Cut over raised peat (Cut)

The Teagasc soil maps[11] indicate that the soils in the study area consists of well drained, "Coarse loamy drift with limestone" from the Mullabane soil association; well drained "Coarse loamy over calcareous gravels" from the Baggotstown soil association; as well as, poorly drained river alluvium and peat (Drawing in Appendix B).

The Corine (2018) land cover dataset indicates the study area predominantly consists of 'Pastures', with a small section of 'Peat bogs' in the north west of the study area.

Hydrogeology

According to the GSI 'Spatial Resources Viewer'[6,] the bedrock aquifer consists of a 'Regionally Important Aquifer - Karstified (conduit)' (Drawing in Appendix B).

A gravel aquifer is not indicated to be underlying the study area and is not located within a Source Protection Area.

Groundwater vulnerability in the study area consists of a mix of 'Extreme', 'High', 'Moderate' and 'Low' vulnerability. The Abbert River is classified as 'Rock at or Near Surface or karst' with the area to the south of the river varying between extreme and high, and the area to the north of the river varying from low to moderate (Drawing in Appendix B).

The GSI define groundwater vulnerability as "…*a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities".*

There are no abstraction wells identified within the study area. There is one groundwater well located just south of the study area (well type: Borehole; GIS name:1425SWW019). It is important to note that the location accuracy of this well is to 50 m. AECOM notes that the GSI groundwater dataset may be incomplete as there is no statutory requirement to register boreholes. Hence, the presence (historical or current) of boreholes cannot be discounted.

Contaminated Land

From a review of the historic 6-inch colour map series (1837-1842), the study area consists of a mix of greenfield sites, roads and dwellings. The Abbey, as well as the chapel are both mapped within the study area.

A review of the historic 25-inch map series (1888-1913) shows that surrounding land use has not changed significantly since earlier historic mapping. The mapping series includes Newtown School and a number of mapped springs along the road running through the study area (similar footprint to the existing N63). As outlined in Section 5.3.2 lands south of the Abbert River and to the north east of the river are marked as 'Liable to Floods'.

The historic Cassini 6-inch map (last edition) dated between 1830-1930 shows the addition of Rose Villa and a Parochial House in lands to the east of the St. Bernard's Catholic church (mapped previously as R.C. Chapel in earlier historic maps).

Historical maps examined as part of this desktop study indicated the risk of on-site historical contamination is low.

There are no EPA licenced waste facilities or landfill sites within the study area (EPA Map Viewer[7]).

Economic Geology

There are no active quarries or mineral locations within the study area.

Geological Heritage Sites

There are no Geological Heritage sites within the study area.

5.3.3.3 Conclusion

As detailed above there are no contaminated lands, active quarries, mineral locations or Geological Heritage Sites within the study area. The main constraints will be the Regionally Important Aquifer and the groundwater vulnerability. The entire study area is within the Regionally Important Aquifier so this will have to be considered with any Option to be provided. The ground water is most vulnerable to the south of the river so any offline Options will have to consider this and mitigation measures to protect the ground water will have to be considered during the Detailed Design Stage.

5.3.4 Landscape and Visual

The landscape appraisal of constraints has regard for relevant guidance including the:

- TII's 2019 Draft *'Landscape character assessment (LCA) and landscape and visual impact assessment (LVIA) of proposed national roads: Standards Document'*

5.3.4.1 Methodology

A desktop review was undertaken to identify any potential landscape and visual constraints within a study area of 1.5 km from the boundary of the study area. Landscape and visual constraints have been illustrated in drawings 60546769-SHT-RS-0000-CH-0103-A to 60546769-SHT-RS-0000-CH-0105-A (Appendix B).

The following topics are discussed:

- Landscape character, including topography and landscape features;
- Sensitive Landscape elements; and
- Sensitive visual receptors.

The following is a list of sources of information consulted for use in the desk-based study:

- Galway County Development Plan 2015-2021 (incorporating Variation No.1 and No. 2(a) and 2 (b), Landscape and Landscape Character Assessment;
- GSI 'Spatial Resources Viewer'[6];
- CORINE (2018) land cover dataset (accessed via the EPA Map Viewer).
- Heritage Maps[12].

5.3.4.2 Results

Landscape Character

There are several cultural heritage aspects to the landscape of the study area, including several Record of Monuments and Places (RMP) sites, one national monument under the guardianship of the State and is managed on behalf of the state by the Office of Public Works (Abbeyknockmoy Cistercian Abbey; GA058-004001) and one national monument subject to Preservation Order (earthworks and buildings associated with Abbeyknockmoy Cistercian Abbey; GA058-004004).

[12] Heritage Maps accessed 13th August 2019

There are five sites listed on the National Inventory of Architectural Heritage located within the study area, four of which are identified in; Galway County Development Plan (2015-2021), Record of Protected Structures as protected structures. More information on cultural heritage features of the site are outlined in Section 5.4.4.

As outlined in section 5.3.3.2, the CORINE (2018) land cover dataset indicates the study area predominantly consists of 'Agricultural Areas', with a small area of 'Wetland' in the north west of the study area.

The Abbert River is the main watercourse running through the study area; which is located in the central section of the study area.

The Abbert River forms part of the designated Lough Corrib SAC. Mature trees and hedgerows are spread across the study area typically along field boundaries and close to the Abbert River.

The Derreen stream is located in the north east section of the study area, with the Lindsay's Farm stream located in the south east section.

A small section of the Lecarrow stream is located to the north east of the study area boundary.

The study area is characterised by presence of open greenfield area with some wooded areas in the section south of the Abbert River. The existing N63 is lined by residential properties, with several community facilities at the junction with the L3110. The road crosses the Abbert River in the townland of Liss. Abbeyknockmoy village is located in the western side of the study area, which is surrounded by agricultural land and sparse housing.

The majority of the study area is located within the Landscape Character Area (LCA) 1 'Northeast Galway (Ballinasloe to Ballymoe). This LCA is described as:

> "*Landscape is flat to undulating open pastoral land bound by field hedgerows, with small scattered coniferous plantations of 1-6 km² in size. There are no areas of particular scenic value. This area is primarily rural and includes the settlements of Ballinasloe, Mountbellew Bridge, Glennamaddy, Ballymoe and Dumore*".

A small section of the southern portion of the study area is located within Area 3 'East Central Galway (Athenry, Ballinasloe to Portumna) LCA. This LCA is described as:

> *"The landscape is flat, coarse grassland, occasional clumps of coniferous forestry between 1- 3 km² in size, fields defined principally by stone walls. There are no areas of particular scenic value although the stone walls are quite distinct"*.

As outlined in Section 5.3.3, the 'Enclosure by Landform', Landscape Character Map of County Galway produced for the Landscape and Landscape Character Assessment, shows the study area within an area of 'Flat' land and is therefore considered visually open. The study area is not in an area enclosed by forestry.

Sensitive Landscape Elements

The landscape sensitivity and landscape value of both LCA's in the study area outlined above have been ranked as follows:

Character Area	Landscape Values: Cultural	Landscape Values: Socio Economic	Landscape Values: Environmental	Landscape Values: Total Rating	Landscape Sensitivity
Northeast Galway	Low	Low	Low	Low	Class 1- Low with pockets of Class 2 - Moderate
East Central Galway	Low	Low	Low	Low	Class 1- Low with pockets of Class 2 - Moderate

Table 5-4 Landscape Values

As outlined in the Landscape and Landscape Character Assessment, which forms part of the Galway Development Plan 2015-2021, landscape values were derived by consideration of environmental and cultural benefits; for example, aesthetics, historical and socio economic.

The sensitivity of a landscape to development and therefore to change will vary according to its character and to the importance which is attached to any combination of landscape values. The

sensitivity value of the character area was derived by consideration of designations including SPAs, NHAs and National Parks.

As outlined above, there are several cultural heritage features in the landscape that are located within the study area. Abbeyknockmoy Cistercian Abbey (GA058-004001) is located to the north west of the study area and is of particular importance due to its location and prominence within the study area. Any proposed offline Option, to the west of the existing Liss Bridge, will share the same visual envelope as the Abbey when viewed from the south west. An assessment of all cultural heritage features located within the study area will be carried out in the Cultural Heritage chapter and cross referenced in the Landscape and Visual chapter at EIAR stage.

No trees designated for preservation are located within or in close proximity to the study area.

There are no historic gardens or designed landscapes located within the study area.

One designed landscape feature is located within 200m of the study area (currently information on this record has not been uploaded to the RMP). A designed landscape feature can be defined as:

"*A man-made feature that is laid out to produce the effect of natural scenery, or other features, usually within demesnes and associated with a country house. These date from the 17th to the 19th century AD*".

Sensitive Visual Receptors

The majority of the north-western section of the study area is located within a designated 'Focal Point/View (No. 26)' as identified in the Galway County Development Plan 2015-2021. The protected Focal Point/View is associated with 'Knockmoy Abbey Southeast of Tuam' (or referred to as Abbeyknockmoy Cistercian Abbey herein)., located in the north west section of the study area. Objective FPV 1 is relating to 'Protected Focal Points / Views' and states the following:

"*Development Management Preserve the focal points and views as listed in Map FPV1 from development that in the view of the Planning Authority would negatively impact on said focal points and views. This shall be balanced against the need to develop key infrastructure to meet the strategic aims of the plan and have regard to the zoning objectives of serviced development land within the Galway Metropolitan Area*".

There are no designated scenic driving routes, national walking routes, including looped walks, on road cycling and waymarked ways, located within the study area. A small cluster of houses sit along the N63, all of which are orientated towards the Abbey. These receptors are highly sensitive as they have a direct and open view of a number of the Options.

5.3.4.3 Conclusion

The main landscape and visual constraints within the study area are the Cistercian Abbey, and the designated Focal Point/View that surrounds it. Any Options considered will have to take views of the Cistercian Abbey into consideration. Mitigation measures regarding final road levels and bridge types will have to be considered at the Detailed Design Stage to ensure they do not impact the views of the Abbey. Any offline Options will have to avoid the Focal Point/View. The visual impact on the Cistercian Abbey will be one of the major constraints when choosing feasible Options.

5.4 Artificial Constraints

5.4.1 Land Use and Planning

As part of the constraints study for the N63 Realignment Scheme, a desktop study of land use, land ownership and planning applications was undertaken.

Land Use

The study area is characterised by presence of agricultural land. The agricultural land to the north of the Abbert River and to the east of the L3110 is organised in large plots, while the agricultural land located between the Abbert River and the existing N63 is subdivided into smaller and more segmented plots. A more detailed assessment of the agricultural features is provided in the Section 5.4.3 below.

Several community facilities are located in proximity of the junction between the N63 and L3110, both on the north and south side of the existing N63. These facilities include: Abbeyknockmoy Community Centre, Handball Court, Newtown's National Primary School, Newtown's Creche, Saint Bernard's Church, GAA Ground, Newtown's Creche.

The existing N63, between Abbeyknockmoy village and the community centre area, is lined by 20 residential properties, which are located almost entirely on the south side.

The study area also contains the Abbert River, a tributary river of the Lough Corrib SAC, and some wooded areas in the section south of the Abbert River.

Land Ownership

A register of land ownership has been compiled using www.landdirect.ie, the website of The Property Registration Authority. A drawing of the land ownership breakdown can be seen in Appendix B (N63-AEC-ZZ-ZZ-SK-HW-000001).

Planning

A desktop review of current planning applications for residential and commercial developments within the study area of the N63 realignment was carried out. Information were collected from the Galway County Council Planning database and it was identified that at the time of writing there were no planning applications submitted.

5.4.1.1 Conclusion

The main constraint within the study area are related to the land use. A mixed of residential and community facilities land use is observed along the existing N63 and this will directly affect any option including online developments. Conversely, the land use to the north of the existing N63 and River Abbert is predominantly agricultural; any offline options will impact on the use and access to these agricultural areas.

Given the nature of the scheme, it is inevitable that some land holdings will be affected by the development, however the scheme will be designed in order to minimise impacts where possible and accommodation works will be included to further reduce the impact on land use and avoid land severance.

5.4.2 Engineering

As part of the constraints study for the N63 Liss to Abbey Realignment Scheme, a desktop study of engineering constraints was undertaken, including;

- the existing road network,
- pedestrians and cyclists;
- public transport, and;
- safety implications;

5.4.2.1 Existing Road Network

The existing road network in the environs of the N63 Realignment Scheme is illustrated in Figure 5-4 and in Appendix B. Key roads of interest are as follows:

- L3110 is a minor road to the south of the proposed scheme which leads to Mullagh Hill. Its profile is a single carriageway with a footway on the western side leading from the GAA Club to the junction with the N63. There is a GAA Club, creche and numerous private accesses on this road.
- L7138 (Lisch Road) is a local road to the south of the scheme that leads to Monivea. Its form is a single carriageway (no centre line) with a footway connecting the church to the N63 mainline. There is a church and a few entrances to private dwellings on this road.
- L6188 (Old Road) is located to the north of the existing N63 and is a local road that leads to Carrogorm. Its form is a single carriageway (no centre line) with no footway or cycleway provisions. There are an insignificant number of private accesses along the road.
- The L6234 is located to the north of the study area and connects to the N63. Its profile is a single carriageway (no centre line) with no footway or cycleway provisions. This road intersects L6188 Old Road to the north of the study area. There are an insignificant number of private accesses along the road.
- The L21821 is situated to the west of the study area and connects to the N63 in Abbeyknockmoy village. Its form is a single carriageway (no centre line) with no footway or cycleway provisions. There are an insignificant number of private accesses along the road.
- There are significant housing developments and private accesses that join the N63 within the vicinity of Abbeyknockmoy village.

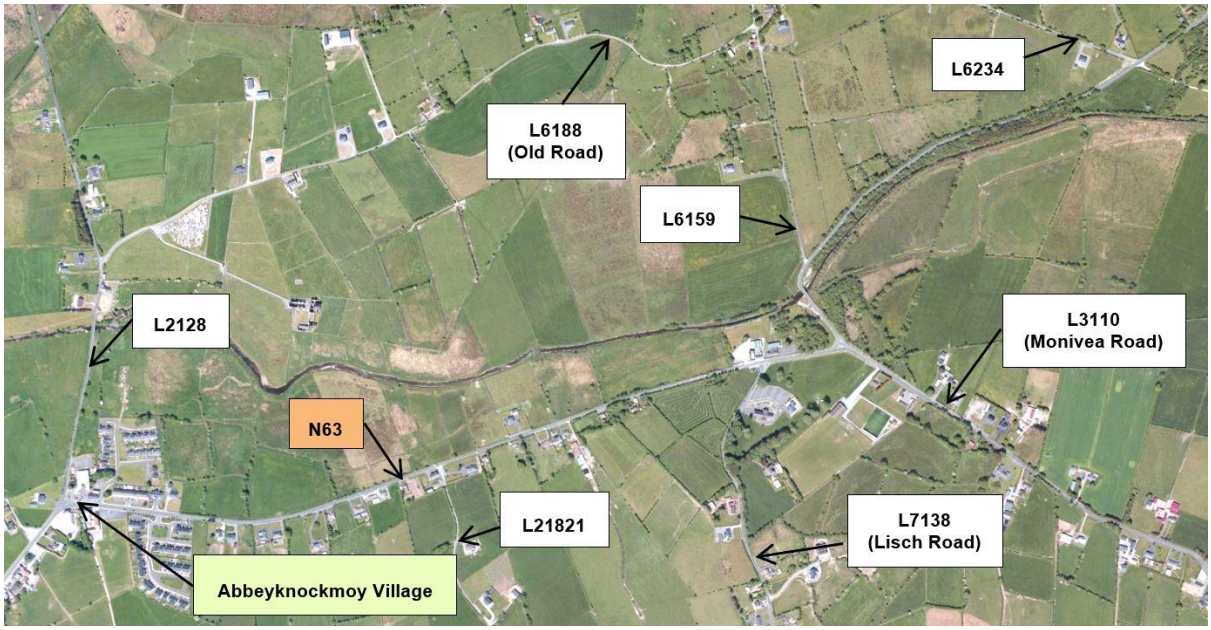


Figure 5-4 Existing Road Network

5.4.2.2 Pedestrians and Cyclists

As part of the constraints study a desktop study was undertaken to identify any current or future pedestrian & cyclist facilities within the study area.

Cycling Facilities

At present there are no dedicated cycle facilities within the area, and there are no planned works in this area. As part of this scheme it is proposed to introduce cycling facilities along the bypassed section of the N63.

Pedestrian Facilities

There is currently a minor network of footpaths and pedestrian facilities in the vicinity of the community facilities. It is recognised that there is an overall poor level of pedestrian provision in this area, and there are no planned works in this area. With the construction of additional pedestrian routes along the existing N63 alignment the pedestrian provision in the area could reach an improved standard and increase the current pedestrian modal share in the village.

Through communication with the local residents it was identified where the pedestrian desire lines are and these are highlighted in Figure 5-5 below. As shown the main desire line is between the community

facilities and the residential area, which is not catered for under the current arrangement. There would be a number of individual properties picked up along this desire line that join the network. There are also minor desire lines around the community facilities, but these are catered for under the current minor network of footpaths.

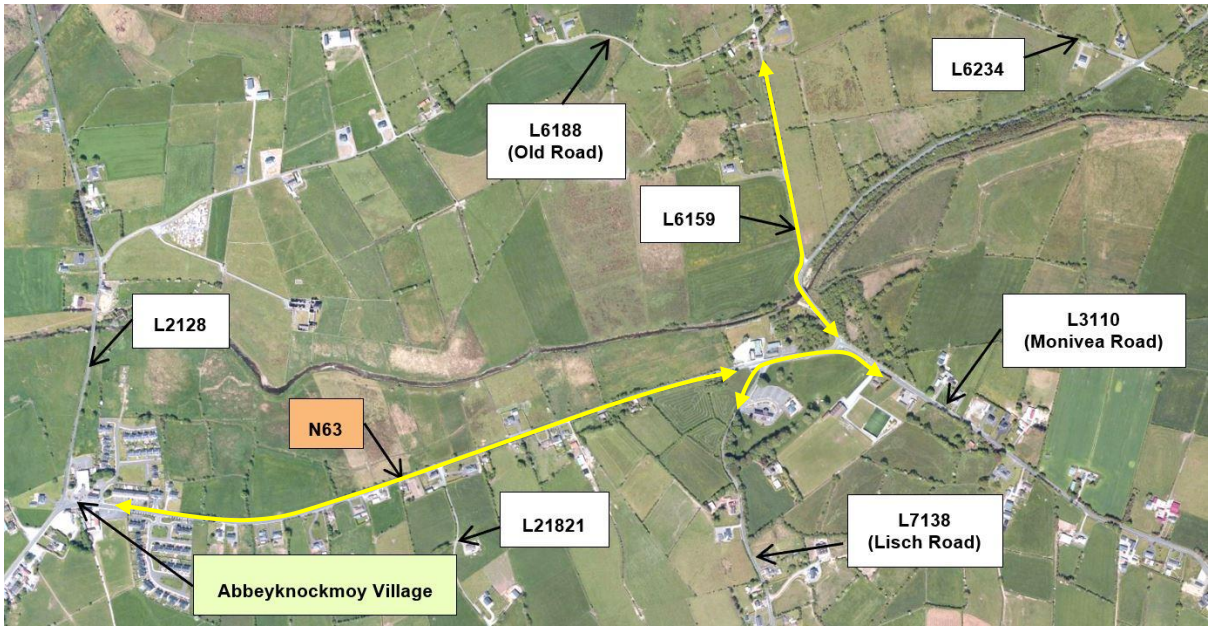


Figure 5-5 Pedestrian Desire Lines

5.4.2.3 Public Transport

A desktop study was undertaken to identify any public transport infrastructure located within the study area.

Bus

Several regional bus routes pass through the study area. These are provided by operator Bus Éireann and Bus 4U. There are four bus stops in the study area, two westbound and two eastbound. There are eastbound and westbound facilities at Abbey, Newtown Cross which are served by Bus Éireann service no. 425 (Galway – Longford), these bus stops can be seen in Figure 5-6 below. At Mannions Bar in Abbeyknockmoy there are eastbound and westbound facilities, these stops service the 425 route and the Bus 4U 433 service (Roscommon-Galway Cathedral). These bus stops can be seen in Figure 5-7.

Railway

There are no railways within the study area. The railway to Galway runs south of the study area through Athenry and to the north the railway runs through Roscommon to Westport and Ballina. These lines form part of the Intercity railway network. There is a decommissioned railway line that runs north-south to the west of the study area that connected Tuam and Athenry, but this was decommissioned in 1993.

Figure 5-6 Newtown Cross Bus Stops

Figure 5-7 Abbeyknockmoy Bus Stops

5.4.2.4 Safety Implications

5.4.2.4.1 Collision Statistics

The Road Safety Authority (RSA) maintains a database of Personal Injury Accidents (PIA) collisions statistics. The database currently covers the eleven-year period between 2005 and 2016. Collisions in this database are classified into three groups based on severity (fatal, serious, and minor).

Table 5-5 summarises the PIA data based on severity over the eleven-year period up to and including 2016 (most recent available records). A total of eleven collisions occurred within the study area, resulting in seventeen casualties.

Collision Severity	Total Number of Collisions	Total Number of Reported Casualties
Fatal	0	0
Serious	3	5
Minor	8	12
Total	**11**	**17**

Table 5-5 RSA PIA Data (2005-2016)

Figure 5-8 illustrates the location and severity of collisions in the study area between 2005 and 2016.

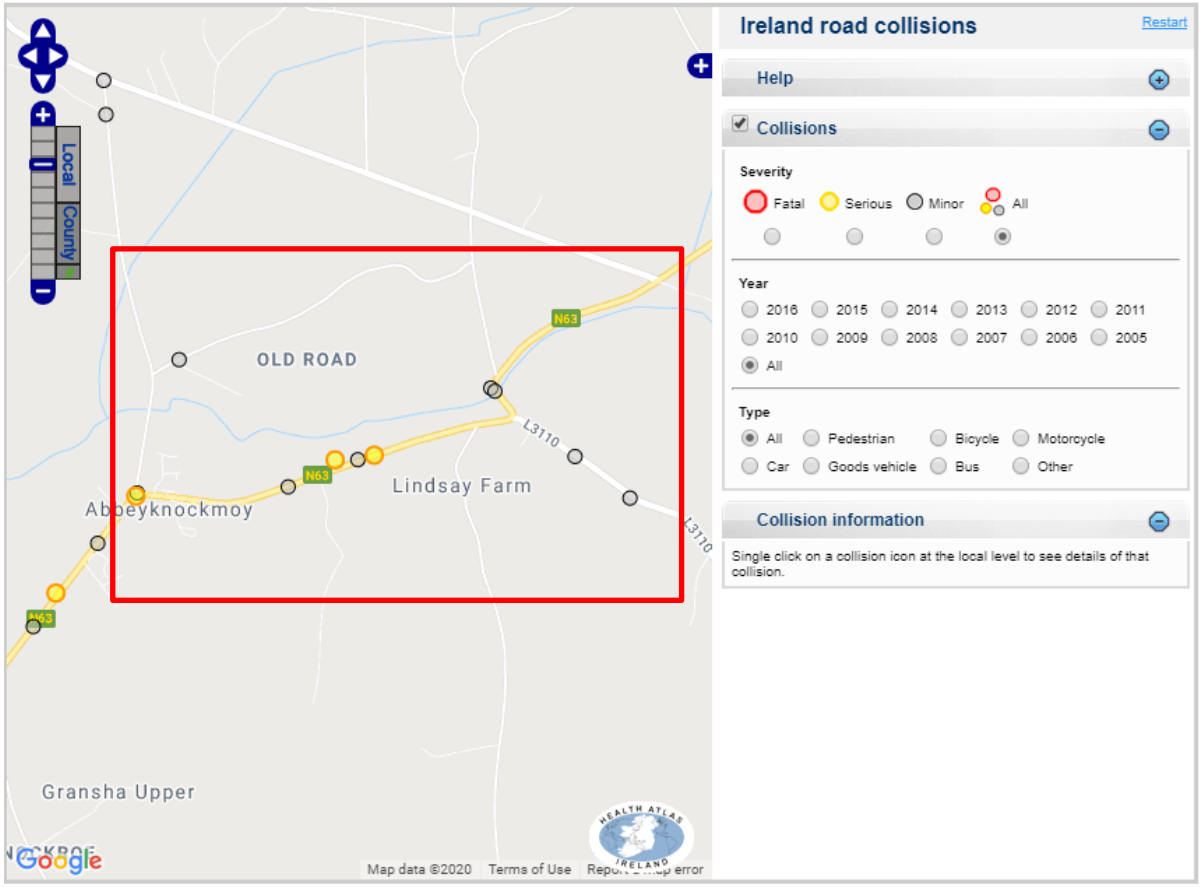


Figure 5-8 RSA PIA Data (2005 – 2016)

Further analysis of the RSA collision dataset shows that all but one collision is car related, with the exception involving a goods vehicle. A breakdown of the collisions shows that four are single vehicle only, three are head-on conflicts, one is a rear end shunt, one is an angled collision and two are classified as other collisions.

5.4.2.4.2 Assessment of the Road Safety Impact

As part of this commission, AECOM-ROD have undertaken an initial assessment of road safety along the existing infrastructure through Abbeyknockmoy and its environs. Using this baseline information, it

is possible to determine the impact on road safety due to the introduction of the N63 Liss to Abbey Realignment Scheme.

This assessment identified that numerous minor severity head-on collisions have taken place on the N63 mainline in the vicinity of the Liss Bridge.

TII have undertaken a programme of road safety inspections of the national road network. The inspections break the national road network into 1km sections and assess the collision rate against the average rate to identify the locations where high concentrations of collisions occur. Collision rate data (by National Route section) has been retrieved from the TII Data Portal for January 2012 to September 2014 and from January 2014 to September 2016 and is presented in Figure 5-9 and Figure 5-10 below.

The collision rate data indicates that the N63, in the vicinity of the study area, exhibits a collision rate twice above the rate for the road type between 2012-2014 and twice below the average between 2014-2016. The collision rate of the route will be, in part, due to the poor road alignment and the narrow cross section of the Liss Bridge. It should be noted that the collision data has been extracted from official sources, and there are likely recent incidents which have not yet been added to the data base.

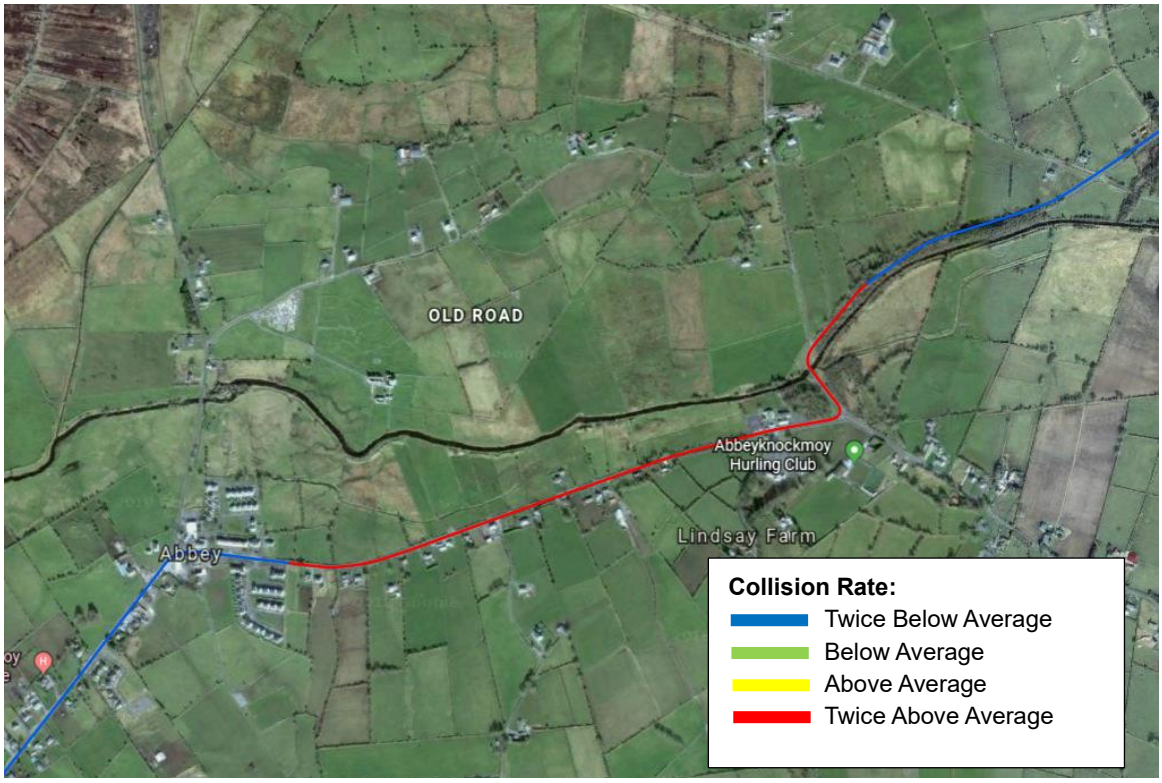


Figure 5-9 Collision Rate Data for National Roads (Jan 2012 - Sep 2014)

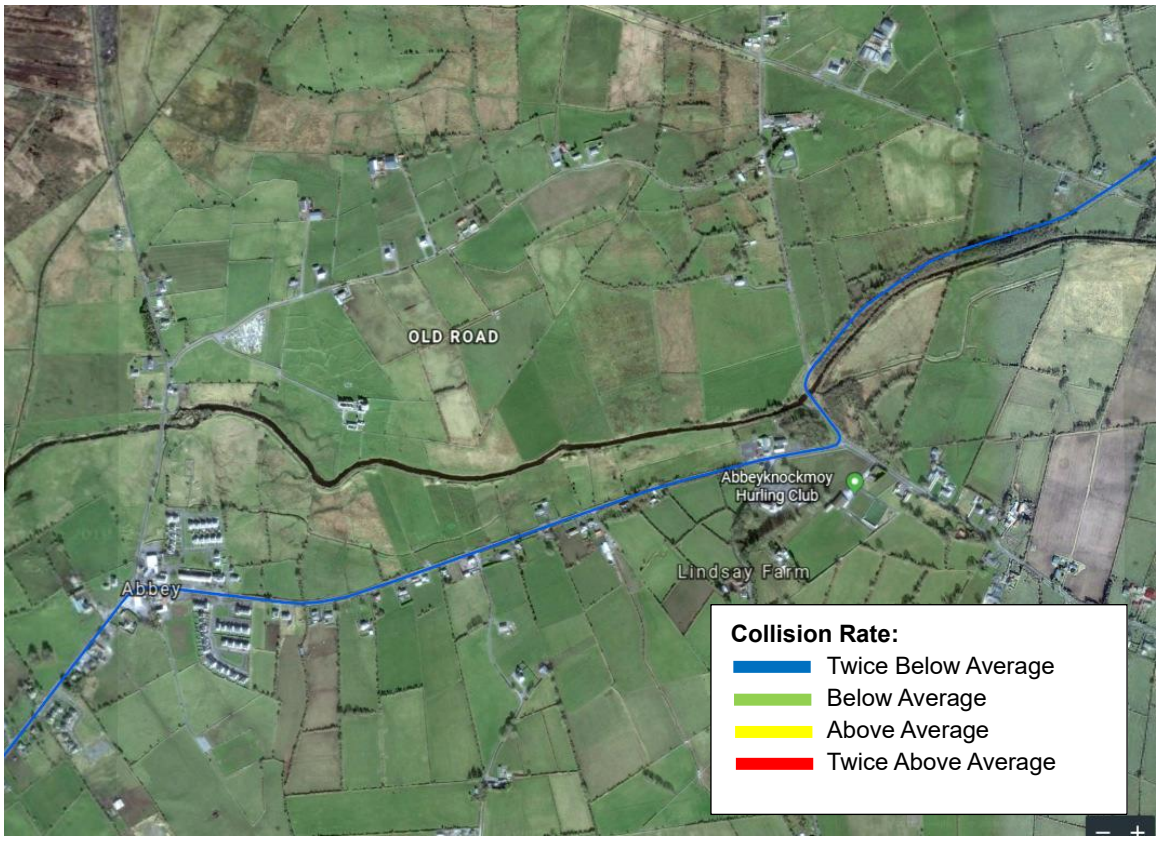


Figure 5-10 Collision Rate Data for National Roads (Jan 2014 - Sep 2016)

The assessment has indicated that any proposed Option should improve safety as a result of the following:

- Providing a link with horizontal and vertical alignments of the required standard is expected to reduce the number of rear end shunt collisions due to consistent link nature and improved stopping sight distances.
- Providing standard cross-sections for Abbert River Bridge will allow vehicles to pass by each other without needing to stop.
- Segregating local and through traffic should remove the large variation in speed and prevent these two types of traffic interacting.
- Reducing the potential for right-turning vehicles to affect the predominant flows should remove a large speed variation and prevent any mainline queueing.
- Providing an opportunity for safe walking and cycling provision along the existing route to serve the existing community centre, community facilities and local schools will remove the potential for pedestrians/cyclists to encounter high-speed regional traffic.

As the N63 Liss to Abbey Realignment Scheme progresses beyond Option Selection Stage, further work will be required to better assess the expected changes to safety across sections of the network. Where there are expected changes to traffic and / or active mode flows (particularly where there are increases), safety for all modal forms of transport will be considered. These results will be taken into consideration at the detailed design stage to ensure the Emerging Preferred Option offers safety benefits for all road users. For example, where local roads expect an increase in traffic, its junctions, bends, overtaking opportunity (central medians and islands), cycling facilities and pedestrian crossing opportunities may require review.

In this particular case, the following elements have been already highlighted as potentially critical and will represent the starting point of further assessments:

- The tie-in options between the proposed realignment and the existing road network;
- The interaction between L6188 Old Road and the potential realignment;
- The western tie-in with any existing section of the N63 to be downgraded and;

- The connection with the existing Liss Bridge.

Similarly, safety-based interventions may be required to improve walking and cycling access within the study area.

5.4.2.5 Conclusion

The major constraints regarding Engineering and their impact on feasible Options are summarised below;

The Existing Road Network

The constraints with the existing road network are the poor horizontal and vertical alignments, and the narrow cross-section across the Liss Bridge. Any online Option will have to address these where possible and any offline Options should improve on the current conditions.

Pedestrians and Cyclists

There is a limited existing network for pedestrians and cyclists at the moment, any Option will have to ensure it does not restrict these movements. The introduction of dedicated pedestrian/ cyclist facilities should be considered for all Options, specifically between the residential area and the community facilities. There may be limitations to providing these facilities for online Options and if an offline Option is proposed then introducing pedestrian/cycling facilities should be considered as part of the cross-section.

Public Transport

There are a number of existing bus routes within the area so any Option will have to consider these routes and ensure no areas are being by-passed by the Emerging Preferred Option. If an offline Option is proposed this may involve introducing dedicated pedestrian facilities to connect any by-passed areas to bus stops for these existing services.

Safety Implications

The main safety constraints are to improve on the existing road network. The key areas of concern have been highlighted above and these will be considered during the Detailed Design Stage to make sure any Options create a benefit for all road users.

5.4.3 Agriculture

The purpose of this constraints study is to identify agricultural features, such as the presence of farms, that have the potential to constrain the location of any proposed routes for the new road scheme.

5.4.3.1 Methodology

A desktop assessment was undertaken in order to identify all potential agricultural constraints.

The following is a list of sources of information consulted for use in the desk-based study:

- Central Statistics Office (CSO) 2016/11 Census of Agriculture[13]; and
- Property Registration Authority (PRAI) of Ireland[14]

Census information is divided into State, Provincial, County, Major Town and District Electoral Division (DED or ED) level but may not be available for all levels. For the purposes of this constraints study ED level data was used wherever possible.

The study area lies within two EDs:

- Abbey West
- Abbey East

5.4.3.2 Results

Agricultural Land Use

The number of farms within each ED is outlined below.

[13] CSO Agri Maps Accessed 18th November 2019
[14] PRAI Accessed 18th November 2019

Electoral Division	Total number of Farms
Abbey West	55
Abbey East	75
Total	130

Table 5-6 Number of Farms

As outlined in Table 5-6 above, 130 farms can be found within the Abbey West and Abbey East E.Ds.

The farm enterprises are predominantly beef and there are no forestry plantations. The study area consists of 57 agricultural land parcels as identified in the PRAI website.

Topography and Soil types

The topography of the study area is generally flat, particularly along the Abbert River which runs parallel to the N63. South of the N63 the land rises gradually from approximately 50m above sea level to approximately 170 m (Knockroe) over a two-kilometre distance.

The soil types in the area are dominated by Brown Earths derived from Limestone parent material. The alluvial soil (Code *5RIV*[11]) along the Abbert River is low lying and wet. The soil series north and south of the river is a sandy loam Brown Earth – Mullabane Series (Code *1100q*). This free draining soil is suited mainly to improved grassland. Further to the south of the N63 as the topography rises the soil type is the free draining sandy clay loam - the Baggotstown Series (Code *1150a*). This is a Calcareous Brown Earth which is suited to both arable and improved grassland uses. Generally, land south of the N63 is better quality and the agricultural potential is higher here. Conversely, land along the Abbert River is low lying and wet and has a lower agricultural potential.

5.4.3.3 Conclusion

The main constraint regarding Agriculture will be the loss of agricultural land due to any proposed offline Options. As with the Land Use and Planning constraint a land liaison will be required to negotiate purchase orders and accommodation works with land owners to ensure whatever Option is the Emerging Preferred Option will have minimal impact on land owners and they can still access their properties safely.

5.4.4 Cultural Heritage (incorporating Architectural Heritage, Archaeology and the Historic Landscape)

The cultural heritage appraisal of constraints had regard for relevant guidance including the:

- NRA (2005) '*Guidelines for Assessment of Archaeological Heritage Impacts of National Road Schemes'*.; and
- NRA (2005) '*Guidelines for Assessment of Architectural Heritage Impacts of National Road Schemes'*.

5.4.4.1 Methodology

A desktop review was undertaken to identify any potential archaeological and cultural heritage resources or constraints within the study area.

Publicly available information reviewed to identify archaeological and cultural resources include:

- Online records of the Archaeological Survey of Ireland (www.archaeology.ie) at the National Monuments Service
- Statutory Record of Monuments and Places (1997) for County Galway
- Records of National Monuments and Preservation Orders available from the National Monuments Service
- Architectural heritage features and designed landscapes recorded in the statutory National Inventory of Architectural Heritage
- Annual gazetteer of licensed archaeological excavations in Ireland at www.excavations.ie
- Record of Protected Structures (architectural heritage) in the Galway County Development Plan 2015-2021

5.4.4.2 Results

Cultural Heritage assets identified within the study area are outlined in Appendix C which contains a detailed inventory of the archaeological and built heritage sites, along with location maps of the same in Appendix B.

Cultural Heritage assets located within the study area

There are no Architectural Heritage Areas (ACAs) located within the study area. The closest ACA is Tuam Town Centre, located approximately 12 km to the north east of the study area.

There are eight identified RMP sites within the study area, comprising of one National Monument under the guardianship of the State and is managed on behalf of the State by the Office of Public Works (Abbeyknockmoy Cistercian Abbey; National Monument No. 166; GA058-004001) and one National Monument subject to Preservation Order (earthworks and buildings associated with Abbeyknockmoy Cistercian Abbey; NM No. 166 & PO No. 4/1989; GA058-004004).

The key cultural heritage receptor is the Abbey which is a National Monument. The Abbey is a very well-preserved ruin of an important 13th-century Cistercian foundation, with royal patronage and at least one royal burial. Its fabric and setting are protected by the National Monuments Acts.

For all National monuments in Ireland in the ownership or guardianship of the Minister or a Local Authority or which are subject to a Preservation Order or Temporary Preservation Order, the requirement for written consent for any works that may impact a National Monument should be sought from the Minister for Culture, Heritage and the Gaeltacht. Preserving the character and visual amenity of the abbey ruins will be an important challenge for the present scheme.

Reference No.	Class	Legal Status	Townland	Source
GA058-067	Redundant record (This record relates to a natural feature, a hollow, and not an archaeological monument)	Recorded Monument	Liss (Tiaquin By)	RMP
GA058-004001	Religious house - Cistercian monks	National Monument[15]	Abbey	RMP/County Inventory/Recorded National Monument List
GA058-004002	Monastic building	National Monument[16]	Abbey	RMP/County Inventory
GA058-004003	Graveyard	Recorded Monument	Abbey	RMP
GA058-004004	Field system: Earthworks & Buildings associated with Abbeyknockmoy Cistercian Abbey	National Monument[17]	Abbey	RMP/County Inventory
GA058-004005	Mill - corn	Recorded Monument	Abbey	RMP
GA058-004006	Chapel	Recorded Monument	Abbey	RMP
GA058-057	Leacht cuimhne	Recorded Monument	Culliagh North	RMP/County Inventory

Table 5-7 RMP Sites within the Study Area

There are five sites listed on the NIAH located within the study area, four of which are identified in Galway County Development Plan (2015-2021)- Record of Protected Structures (Table 5-8).

[15] National Monument Number 166
[16] Also registered as National Monument Number 166. Also subject to a preservation order made under the National Monuments Acts 1930 to 2014 (PO no. 4/1989).
[17] The national monument is subject to a preservation order (PO no. 4/1989).

NIAH No.	Name	Description	Townland	Coordinates	Information Source	Importance /Legal Status	Record of Protected Structures
30405807	-----	Freestanding limestone monument, built c.1720.	Culliagh North	150248, 243390	NIAH / Development Plan	Regional	Yes (RPS No. 3921)
30405810	Handball Alley	Detached open-air handball alley, built c.1950, now disused.	Liss (Tiaquin By)	151564, 243529	NIAH	Regional	No
30405811	Liss Bridge	Seven-arch limestone road bridge, built c.1800.	Clashard / Abbey / Liss (Tiaquin By.)	151696, 243635	NIAH / Development Plan	Regional	Yes (RPS No. 3925)
30405814	Rose Villa	Detached three-bay single-storey teacher's house, built c.1870.	Liss (Tiaquin By)	151051, 243316	NIAH / Development Plan	Regional	Yes (RPS No. 3923)
30405815	Saint Bernard's Church	Freestanding cruciform-plan Roman Catholic Church, built c.1820, having two-bay nave, and with four-bay lower twentieth-century extension to altar end, and glazed entrance porch to north-west transept.	Chapelfield	151609, 243397	NIAH / Development Plan	Regional	Yes (RPS No. 83)
Source: Appendix V – Record of Protected Structures Galway County Development Plan (2015-2021)							

Table 5-8 NIAH and RPS sites within the Study Area

Previous Excavations

The Excavation Bulletin is now published as an online database of licensed excavations in Ireland at www.excavations.ie. This online database or gazetteer indicates that two test excavations have previously been carried out in in the study area.

One of the excavations consisted of pre-development testing undertaken at the development of a single dwelling house and associated services, adjacent to the monastic complex (GA058-004004). Three trenches were mechanically excavated in the course of the testing of the site. No archaeological layers or features were uncovered in the course of the testing.

The results of the second excavation referenced in the Excavation Bulletin have been published in a journal article entitled 'Archaeological Excavations at Abbeyknockmoy, Co. Galway', *Proceedings of the Royal Irish Academy* 87C, pp 1-12 (Sweetman, P.D., 1987). The report describes the results of limited archaeological excavations at Abbeyknockmoy during the summers of 1982 and 1983. The excavations were prompted by OPW conservation and maintenance works to the Abbey. Foundation levels of a fifteenth century cloister were revealed, the north and south transepts were investigated and an isolated building to the north of the abbey was excavated.

Historic Gardens and Designed Landscapes

There are no historic gardens or designed landscapes within the study area.

5.4.4.3 Conclusions

The main cultural heritage constraint when identifying feasible Options will be the Cistercian Abbey, which is a designated National Monument. As outlined earlier, preserving the character and visual amenity of the abbey ruins will be an important challenge for the scheme. Any offline Options will have to avoid the National Monument.

As outlined earlier, mitigation measures regarding final road levels and bridge types will have to be considered at the Detailed Design Stage to ensure they do not impact the views of the abbey.

5.4.5 Utilities

As part of the constraints study, a desktop study was carried out in order to identify all utility constraints located within the study area for the realignment scheme. As part of the desktop study, a number of utility providers were contacted to obtain up-to-date information on the location and type of services that are situated within the defined study area.

The desktop study found that the following companies have identified apparatus within the study area:

- Cuillagh Group Water Scheme;
- EIR;
- ESB; and
- Irish Water.

The location of each of these constraints can be seen in Appendix B.

During the same desktop study, the following companies confirmed that they did not have any recorded apparatus within the study area:

- Brighter Networks;
- BT Ireland;
- Clear Channel;
- Colt.
- Enet;
- EU Networks;
- Gas Networks Ireland;
- Magnet;
- Siro; and
- Virgin Media; and,
- Vodafone.

There are a number of companies that at the time of writing AECOM-ROD are still awaiting information from;

- Industria;
- Viatel, and;
- Verizon.

Cuillagh Group Water Scheme

There is an underground mains pipe that runs along the existing N63 alignment.

Eir

Eir have a number of over ground and underground lines running parallel under the road and next to the road connecting to a number of properties within the study area.

ESB

There are a number of overhead powerlines with the corresponding infrastructure within the study area.

Irish Water

Irish Water have infrastructure running under the existing road network along with other assets for the length of the scheme along the mainline and side roads.

5.4.5.1 Conclusion

The presence of utilities under the existing road network was expected and mitigation measures for all Options are being considered. By communicating with Utilities companies, we can arrange for diversions to be put in place for any online or offline Option. It is not anticipated that there will be any great limitations due to existing utilities on the feasibility of any Option at this stage, but utility diversions will be reviewed in more detail during the Detail Design Stage.

5.4.6 Local Amenities, Community Activities and Facilities

In order to identify all potential constraints, it is appropriate to carry out an appraisal of the main socio-economic/community activities and facilities within the study area and its close proximities. A desktop assessment was undertaken in order to identify all potential constraints. Drawings in Appendix B show the location of all the identified local amenities and community constraints.

There are two schools in close proximity of the study area, these are as follows:

- Newtown National Primary School, and;
- Newtown Creche.

Other Recreational / Community facilities within the study area include:

- Abbeyknockmoy Community Centre;
- Abbeyknockmoy Church (Saint Bernard's);
- Frank Manion Longue Bar, and;
- O'Donohoes Service Station.

In addition, the following club / groups and cultural heritage sites are located within the study area:

- Abbeyknockmoy GAA Club;
- Newtown Kids Club;
- Saint Bernard's Soccer Club;
- Abbeyknockmoy Cistercian Abbey; National Monument No. 166; GA058-004001) and one National Monument subject to Preservation Order (earthworks and buildings associated with Abbeyknockmoy Cistercian Abbey; NM No. 166 & PO No. 4/1989; GA058-004004), and'
- Abbeyknockmoy Cemetery.

These activities and facilities are an integral part of their respective communities and it is important that any potential impact is kept to a minimum.

Immediately outside of the study area the only additional community facility is the Abbeyknockmoy Health Centre which is located within the town.

In terms of amenity facilities, the Abbert River is an angling river fishery.

5.4.6.1 Conclusion

The Local Amenities, Community Activities and Facilities don't provide any constraints themselves, but they will have to be considered when identifying feasible Options. The interaction between slow moving vehicular traffic using these facilities and the regional traffic will have to be considered for all online and offline Options. The proximity of the mainline to these facilities could be considered for an offline Option in an attempt to maximise segregation. The use of these facilities by pedestrians/ cyclists will have to be considered when designing any pedestrian/ cyclist facilities.

5.4.7 Noise & Vibration

5.4.7.1 Methodology

The purpose of this constraints study is to identify noise-sensitive receptors with the potential to constrain the location of any proposed routes for the new road scheme.

The assessment has been prepared in accordance with the NRA's 2014 '*Guidelines for the Treatment of Noise and Vibration in National Road Schemes*'. These guidelines outline the following as example noise and vibration sensitive receptors:

> "…*schools, hospitals, places of worship, heritage buildings, special habitats, amenity areas in common use and designated quiet area. However, residential properties must not be overlooked, and it may be noted that some commercial or industrial uses can also be noise sensitive; for example, recording studios and research or manufacturing facilities using noise or vibration-sensitive equipment*".

5.4.7.2 Results

Existing Environment

The existing noise climate in the study area is influenced by N63 through traffic and traffic accessing local side roads from the N63.

Strategic noise maps were prepared by TII in 2017 for over 3,000 km of national roads in Ireland, based on a road noise computation model run by the TII. These maps are graphical representations of the predicted situation with regards to noise in an area with different colours representing different noise levels in decibels [dB(A)].

The study area is not included in the extent of the noise maps produced for Galway County.

Sensitive Receptors

The majority of noise sensitive receptors in the study area are residential properties located along the existing N63, as well as in Abbeyknockmoy village.

There are also a number of community facilities and heritage buildings in the study area as outlined in Section 5.4.6.

All of the sensitive receptors are exposed to some degree of road traffic noise from the existing N63 in the study area.

The location of sensitive receptors identified within in the study area are outlined in Figures in Appendix B.

5.4.7.3 Conclusion

The noise-sensitive receptors outlined above will impact on the formation of feasible Options. Mitigation measures will need to be considered during the Detailed Design Stage to reduce or offset potential noise and/or vibration impacts on the sensitive receptors.

5.4.8 Air Quality and Climate

The purpose of this constraints study is to identify air quality sensitive receptors that have the potential to constrain the location of any proposed routes for the new road scheme.

5.4.8.1 Methodology

The NRA's '*Guidance for the Treatment of Air Quality during Planning and Construction of National Roads*' was adopted during this assessment.

The EPA's Air Quality Database for Co. Galway was also used in this constraints study.

To date, there have been no air quality assessments or monitoring undertaken by the EPA in the Abbeyknockmoy area.

5.4.8.2 Results

The location of sensitive receptors identified within in the study area are outlined in Figures in Appendix B.

Existing Air Quality

The Environmental Protection Agency (EPA) has designated four Air Quality Zones for Ireland:

- Zone A: Dublin City and environs
- Zone B: Cork City and environs
- Zone C: 16 urban areas with population greater than 15,000
- Zone D: Remainder of the country.

These zones were defined to meet the criteria for air quality monitoring, assessment and management described in the Framework Directive and Daughter Directives. The study area lies within Zone D, which represents rural areas located away from large population centres.

Within Zone D, the monitoring stations located closest to study area are found at Claremorris (located approximately 50 km to the northwest) and Roscommon Station (located 50 km to the north east of the study area). No individual air quality monitoring station reports have been produced for both monitoring sites.

The most recent air quality assessment located close to the study area was conducted in Galway city between 13th March 2001 and 23rd October 2001. The assessment included the measurement of carbon monoxide, sulphur dioxide, nitrogen oxide, benzene, particulate matter, and lead. The results concluded that no limit values were exceeded during the measurement period. It is important to note that this monitoring station is located in Zone C, which comprises urban areas with populations greater than 15,000. The area is a mixed residential/commercial district of Galway City.

The EPA's 'Air Quality in Ireland' (2018) report concluded that ambient air quality in Ireland met all the legal requirements under the Ambient Air Quality and Cleaner Air for Europe Directive (2008/50/EC) , which was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011), by being within statutory limit and target values.

The EPA's Air Quality Bulletin for PM10 shows that the values recorded in 2019 to date at Claremorris and Roscommon stations have not exceeded the EU's limit value of 50 micrograms per cubic metre (µg/m3) more than 35 times in a year. In addition to this, the EPA's Air Quality Bulletin for nitrogen dioxide shows that these monitoring stations have not exceeded the hourly limit for NO2 of 200 ug/m3 to date in 2019.

However, as outlined in the EPA's 'Air Quality in Ireland' (2018) report, values of some key pollutants, including particulate matter (PM10) and NO2 were above the World Health Organisation's (WHOs) guideline values for health.

With regards to PM10, the report states that although there were no exceedances of the EU limit values (annual and daily) at 26 monitoring stations in 2018, the WHO air quality guideline daily limit value was exceeded at nine monitoring stations for a total of 16 days. However, the report does not outline which stations exceeded the recommended daily limit.

NO2 was measured at 17 monitoring stations in Ireland in 2018. There were no exceedances of the EU annual limit values. There was one monitoring station which was above the WHO Air Quality Guidelines for hourly NO2 levels, but this was in Ballyfermot. Co. Dublin.

According to the EPA Map Viewer, the Air Quality Index for Health for Galway City and the Galway County is 2, 'Good' at the time of writing.

Climate

The climate of the region has a significant influence on the spatial and temporal concentrations of air pollutants measured. The existing climate conditions are reflective of a temperate oceanic climate, resulting in mild winters and cool summers. The nearest representative weather station collating detailed weather records is Athenry Automatic Weather Station in Athenry County Galway, located approximately 19km south of Abbeyknockmoy village.

The mean annual wind speed at the station in Athenry, is 3.6 metres per second. The 18-year annual average rainfall for Athenry is 1,152mm/yr. This will be due to Galway's oceanic position on the Atlantic seaboard.

Sensitive Receptors

As per the NTA/TII guidance, air quality sensitive receptors are associated with "locations where members of the public are likely to be regularly present"; these can include residential housing, schools, sports centres, places of worship and shopping areas.

The majority of air quality sensitive receptors in the study area are residential properties located along the existing N63, as well as in Abbeyknockmoy village.

There are also a number of community facilities and heritage buildings within the study area as outlined in Section 5.4.6.

The location of sensitive receptors identified within in the study area are outlined in Figures in Appendix B.

5.4.8.3 Conclusion

The main air quality and climate constraints are the sensitive receptors outlined above. The location of these sensitive receptors will impact on the formation of feasible Options. Mitigation measures will need to be considered during the Detailed Design Stage to reduce or offset air quality impacts on the sensitive receptors.

5.4.9 Population, Economy Business and Tourism

5.4.9.1 Methodology

In order to identify all potential constraints, it is appropriate to carry out an appraisal of the main socio-economic parameters within the study area. A desktop assessment was undertaken in order to identify all potential constraints.

The following is a list of sources of information consulted for use in the desk-based study:

- Central Statistics Office 2016 Small Area Population Statistics[18]: and
- Failte Ireland's, 2017 Performance Facts, West Region[19]

Census information is divided into State, Provincial, County, Major Town and District Electoral Division (DED or ED) level but may not be available for all levels. For the purposes of this constraints study ED level data was used wherever possible.

The study area lies within two EDs:

- Abbey West
- Abbey East

5.4.9.2 Results

Population

The total population growth for Abbey (East and West) was 2.7% between the years of 2011 and 2016 as detailed in Table 5-9. There was a significantly higher growth rate (8.4%) for the Abbey West district. The population growth experienced by Abbey and surrounding is in line with the population growth for County Galway as a whole, which was 2.4% for the same recorded period.

District	2011 Census [Persons]	2016 Census [Persons]	Actual Change in Population 2011-2016	% Change in Population 2011-2016
Abbey East	670	632	(38)	(5.7%)
Abbey West	710	775	65	8.4%
Abbey (TOTAL)	1,380	1,407	27	2.7%

Table 5-9 Population of Abbey

A short summary of additional data from the 2016 Census for Galway County is listed below:

[18] Census 2016 SAP Map Accessed 14th August 2019
[19] 2017 Performance: West Region, Failte Ireland Accessed 14th August 2019.

- Unemployment in the area has fallen by between 0.1% and 7.9% from 2011 to 2016, but it was noted that unemployment in smaller towns is higher than that of larger towns.
- 60%-69.9% (of persons aged over 15) of the population in the area are actively participating in the Labour force.
- The breakdown for the skilled workforce for Galway County is as follows;
  - Professional Workers = 14.7%
  - Managerial and Technical = 52.2%
  - Non-manual =30.3%
  - Skilled Manual = 26.1%
  - Semi-skilled = 26.1%
  - Unskilled = 5.8%
  - All other gainfully occupied and unknown = 28.7%
- Approximately 20% of households have no cars, 50% have one car, 25% have two cars and 5% have three or more cars.

Tourism

Ireland is divided into seven tourism regions. The study area is located within the 'West' Region, which comprises counties Galway, Mayo and Roscommon. The total revenue in 2017 in the West region was € 694m (the most recent period for which regional figures are available) (Fáilte Ireland, 2018). This Region benefited from approximately 13% of the total number of overseas tourists to the country and approximately 14% of the total tourism income generated in Ireland in 2017

As outlined in Section 5.3.4, there are no designated scenic routes, national walking routes, including looped walks, on road cycling and waymarked ways, located within the study area. The majority of the northern section of the study area is located within a designated Focal Point/View (No. 26), which is associated with Abbeyknockmoy Cistercian Abbey, located in the north west section of the study area. This abbey is the main tourist attraction pertaining to the study area.

5.4.9.3 Conclusion

The Abbeyknockmoy Cistercian Abbey is the main tourism constraint in the study area and will need to be considered when identifying feasible Options. Any offline Options will have to avoid the Abbey.

As outlined earlier, mitigation measures regarding final road levels and bridge types will have to be considered at the Detailed Design Stage to ensure they do not impact the views of the Abbey.

It is not anticipated that the current population numbers of the study area will impact on the formation of feasible Options.

5.5 External Parameters

5.5.1 Construction Phasing

The scheme is approximately 2.4km in length, as a result, it is intended to complete the scheme within one construction phase.

5.5.2 Required Levels of Service

A Type 2 carriageway will operate at Level of Service (LoS) D with an AADT of 8,600, as the N63 AADT is below this value it is anticipated that the LoS > D. To help improve the LoS the detailed design will include recommendations from Table 6.1 in *DN-GEO-03031 Rural Road Link Design.* Private accesses joining directly onto any offline Option should be minimised. Any offline Options should concentrate turning movements, where appropriate, at standard junction arrangements. The detailed design stage will identify how the existing junctions in the study area between the N63 and minor roads will be upgraded.

5.5.3 Technical Standards

The design will be developed in compliance with the latest TII Standards (as of October 2019).

5.5.4 Access Control

As this is not a motorway scheme there will be no limited access along the proposed Options. As detailed above, private accesses to the proposed Option will be minimised to help to improve the LoS. It is intended to realign the cross-roads to the east of the scheme as part of any Option to provide a more standard arrangement. If the L6159 and the existing Liss Bridge are to be connected to an offline Option, then it is the intention to provide a staggered crossing to help safety in the area.

5.5.5 Policy Documents

Policy Documents are discussed in detail in Section 3.

5.5.6 Procedural & Legal Requirements

As part of the Phase 4 deliverables Competent Authority Proceedings including an oral hearing (if required) and consultation will be required based on preparation of Briefs of Evidence. From this a Competent Authority Decision will be made. An Environmental Impact Assessment (EIA) Screening will be undertaken to establish if a full EIA Report (EIAR) is required, of if Galway County Council deem the scheme to have “significant effects on the environment” then they can request that a full EIAR be carried out through An Bord Pleanála. Compulsory Purchase Orders (CPO) will be required for the anticipated land take of this scheme.

6. Do-Nothing and Do-Minimum Alternatives

6.1 Introduction

This chapter discusses the existing road characteristics and assesses the feasibility of the 'Do-Nothing' and 'Do-Minimum' alternatives. It addresses the deficiencies of the existing roads with respect to modern road design standards and examines the potential for a 'Do-Minimum' improvement of these roads.

6.2 'Do-Nothing' Alternative

The 'Do-Nothing' consideration investigates the existing road infrastructure and its ability to meet future demands for traffic and safety without any upgrade works, other than routine maintenance. The definition in the TII Project Appraisal Guidelines for National Roads (Unit 4.0 - Consideration of Alternatives and Options - PE-PAG-02013*)* is as follows:

> *"The Do-Nothing assumes that there will be no other investment in the transport network (other than regular maintenance) during the appraisal period beyond that being considered as part of the scheme under appraisal."*

6.2.1 The 'Do-Nothing' Alternative for Liss to Abbey Scheme

The 'Do-Nothing' scenario does not provide for any additional crossing of the Abbert River or improvement of the existing road network other than routine maintenance.

Any local or regional traffic travelling on the N63 wishing to cross the Abbert River will be restricted by the substandard road geometry and Liss Bridge in both directions.

6.3 'Do-Minimum' Alternative

As an alternative to the 'Do-Nothing' scenario, the 'Do-Minimum' alternative investigated the potential to upgrade the existing infrastructure to meet the predicted user demands for the next 30 years. The 'Do-Minimum' alternative is defined in the TII Project Appraisal Guidelines for National Roads (Unit 4.0 - Consideration of Alternatives and Options - PE-PAG-02013*)* as follows:

> *"The Do-Minimum Option should include those transportation facilities and services that are committed within the appraisal period. All elements of the Do-Minimum Option must be part of each proposed Do-Something Option except where an option replaces services or facilities within the corridor. To provide a basis of comparison the Do-Minimum Option must include the following features:*
>
> *• The maintenance of existing facilities and services in the study corridor and region;*
>
> *• The completion and maintenance of committed projects or policies in the study corridor that have successfully completed their environmental review; and*
>
> *• The continuation of existing transportation policies."*

An analysis of improving the traffic situation in Abbeyknockmoy by means of do-minimum is summarised in the following section.

6.3.1 The "'Do-Minimum' Alternative for Liss to Abbey Scheme

The 'Do-Minimum' scenario identified a lack of additional crossings of the Abbert River, the narrow cross-section of the carriageway and poor alignment of the N63. The road safety issues, as detailed in Chapter 5, relating to the existing layout of the N63 require consideration.

The 'Do-Minimum' scenario investigates the potential to undertake minor improvement works that would improve safety concerns in the vicinity of the Liss Bridge through localised widening and the introduction traffic control across the bridge. It is proposed to introduce traffic signals across the bridge to help reduce vehicle conflicts and improve journey time consistency. However, this will increase the overall journey time in both directions.

Consideration has been given to improving the junctions along the N63/ L3110 to improve driver safety. The limited width of the existing bridge over the Abbert River and the constrained environment in the

area surrounding the bridge restrict the options for safety improvements. Improvements to the non-motorised users' facilities (cycle facilities in particular) along the N63 were not considered.

6.4 Conclusion

Owing to with the fact that the only works that are feasible as part the 'Do-Minimum' alternative are of a minor nature the 'Do-nothing' and 'Do-Minimum' alternatives have been combined and will be referred to as the 'Do-Nothing/Do-Minimum' alternative for the remainder of this report.

There are no other committed schemes within the study area which could be considered. Therefore, the 'Do Nothing/Do Minimum' option can be defined as the existing corridor with only normal regular maintenance to be accounted for.

While potentially providing some improvement to safety, the Do-Nothing/Do-Minimum option for Abbey fails to address the two fundamental issues which are predominantly causing the current safety issues. Firstly, the Do-Nothing/Do-Minimum still requires all traffic traversing Abbert River to cross the existing bridge, which has poor horizontal and vertical alignment. The Do-Nothing/Do-Minimum will not add capacity to the bridge crossing restrictions as no further crossing point will be developed or constructed. Secondly, the regional traffic and local traffic are not segregated, which results in little prospect of improving capacity and improving road safety at the same time. The introduction of traffic signals across the bridge would help to prioritise traffic in one direction during peaks but the signals will not reduce congestion.

Due to the nature of the Do-Nothing/Do-Minimum option it is not proposed to introduce pedestrian/cyclist facilities as part of this option. The reason for this is that introducing these facilities along a high-speed section of road that has below standard vertical and horizontal alignment may lead to an increase in safety risks for all road users. In addition to that, it is not possible to introduce these facilities along the entire length of the scheme; the provision of not continuous facilities has been deemed too high a risk to safety to be adopted.

Overall the Do-Nothing/Do-Minimum scenario for Abbey would not alleviate the existing safety concerns along the N63 or minimise journey times.

7. Stage 1 – Preliminary Options Assessments

7.1 Stage 1 Options

As part of the Stage 1 Preliminary Options Assessment six Options (Options A to F) have been developed within the study area in addition to the Do-Nothing/Do-Minimum Option. To allow an accurate comparison of the alternative options, different tie-in options and at grade junctions were considered.

All of the Options presented below include one crossing of the Abbert River and a tie-in with the L3110 (no other interface with existing local roads or direct accesses have been identified at this stage). All proposed Options have the same eastern and western tie-in points to the existing N63, with the current crossroad junction with the L6234 being realigned as part of the scheme. It is under review whether to pedestrianize the existing Liss Bridge or to leave it open to vehicular traffic. For the purpose of this report the Liss Bridge has been modelled as remaining open to vehicles.

The introduction of pedestrian/cyclist facilities has been reviewed for other options, but these facilities would work best with options that provide a by-pass of the existing N63 within the study area. This by-pass will allow for the existing section of N63 to be downgraded and pedestrian/cyclist facilities introduced. The introduction of these facilities may require a reduction in the carriageway cross-section which will coincide with a downgrade of road but reducing the carriageway cross-section to introduce the pedestrian/cyclist facilities and keeping the road as a regional route would not be beneficiary. It would lead to safety implications for all road users.

The Stage 1 Option centrelines can be seen in Figure 7-1.

7.1.1 Option A – Cyan

Option A (Cyan) commences at the fixed tie-in point to the north-east of the study area where it deviates from the existing N63 alignment. From there, the horizontal alignment runs west across a small area of woodland, then the L6159 and into a vast area of agricultural land.

The current L3110 will be extended across the existing Liss Bridge to tie into the proposed alignment through a junction.

The horizontal alignment sweeps south with a tight horizontal curve leading to a new crossing over the Abbert River. Then, it sweeps west again with a tight horizontal curve through more agricultural land to tie back into the existing N63 to the east of Abbeyknockmoy village.

7.1.2 Option B – Green

Option B (Green) commences at the fixed tie-in point to the north-east of the study area where it deviates from the existing N63 alignment. From there, the horizontal alignment runs west across a small area of woodland, then the L6159 and into a vast area of agricultural land.

The current L3110 will be extended across the existing Liss Bridge to tie into the proposed alignment through a junction.

The horizontal alignment sweeps south leading to a new skewed crossing over the Abbert River. Then it sweeps west again through more agricultural land to tie back into the existing N63 to the east of Abbeyknockmoy village.

7.1.3 Option C – Yellow

Option C (Yellow) commences at the fixed tie-in point to the north-east of the study area where it deviates from the existing N63 alignment. From there, the horizontal alignment runs west across a small area of woodland, then sweeps south-west across the L6159 and into a vast area of agricultural land.

The current L3110 will be extended across the existing Liss Bridge to tie into the proposed alignment through a junction.

The horizontal alignment continues south-west leading to a new skewed crossing over the Abbert River. Then, it sweeps west again through more agricultural land to tie back into the existing N63 to the east of the local road L21821. Then, the Option runs along the existing N63 until the western tie-in point.

7.1.4 Option D – Pink

Option D (Pink) commences at the fixed tie-in point to the north-east of the study area. From here, the horizontal alignment runs along the existing N63 across a small area of woodland and it deviates from the existing N63 alignment on the approach to the L6159.

The current L3110 will be extended across the existing Liss Bridge to tie into the proposed alignment through a junction.

The horizontal alignment continues south-west leading to a new skewed crossing over the Abbert River to the west of the existing Liss Bridge. The horizontal alignment passes in close proximity to the north of Newtown National Primary school and then sweeps west again through agricultural land to tie back into the existing N63 to the west of the Newtown National Primary school. Then, the Option runs along the existing N63 until the western tie-in point.

7.1.5 Option E – Blue

Option E (Blue) substantially represent an online improvement option. The Option commences at the fixed tie-in point to the north-east of the study area. From here, the horizontal alignment runs along the existing N63 until it develops into a three-armed roundabout which connects the L6159 to the north and the tie in with the existing Liss Bridge to the south.

The Option continues across the Abbert River along the existing alignment before introducing a new three-armed roundabout, which connects the L3110 to the two arms for the N63 heading north and west. Then, the Option runs along the existing N63 until the western tie-in point.

7.1.6 Option F – Red

Option F (Red) Option C (Yellow) commences at the fixed tie-in point to the north-east of the study area where it deviates from the existing N63 alignment. From here, the horizontal alignment sweeps immediately south-west across a small area of woodland and crosses the Abbert River at a more easterly point than the other options.

The horizontal alignment then continues south west between two areas of the Lough Corrib SAC before sweeping west through agricultural land and across some minor watercourses.

The Option ties back into the existing N63 at the junction with the L3110, which will be upgraded to a four-armed roundabout. Then, the Option runs along the existing N63 until the western tie-in point.

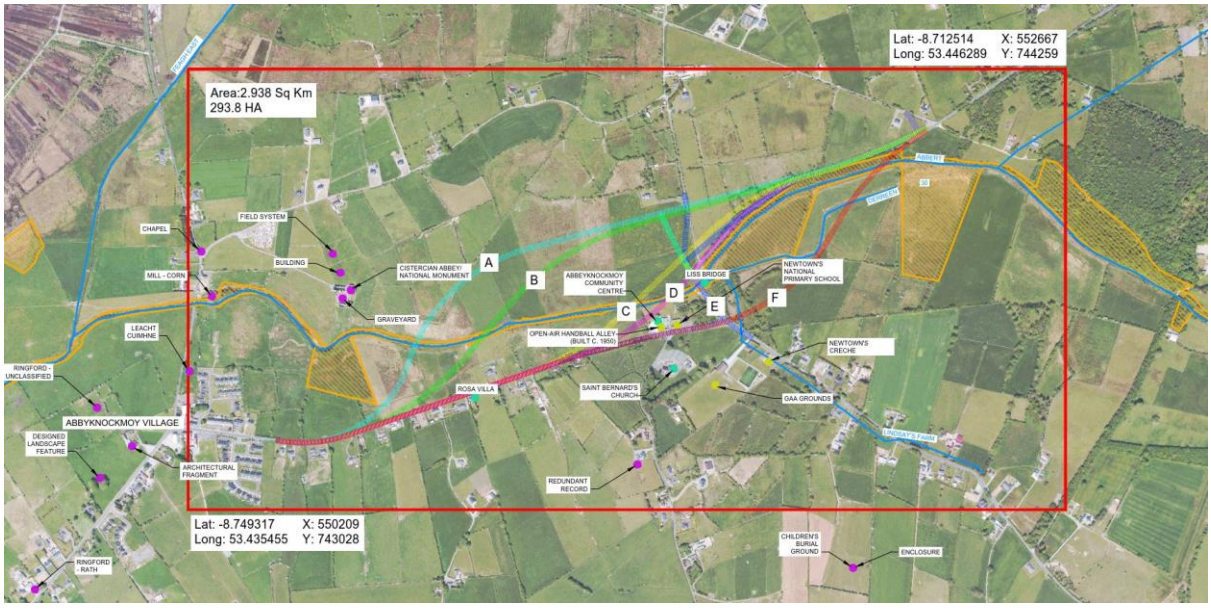


Figure 7-1 Stage 1 Options

7.2 Public Consultation (PC1) - Study Area and Options

In conjunction with the Stage 1 Assessment and prior to commencing the Stage 2 Project Appraisal, a Public Consultation (PC1) was held on the 2nd October between 2:30pm and 7:30pm at the Abbeyknockmoy Community Centre. The objective of the Public Consultation was to:

- Introduce the scheme and engage with local stakeholders;
- Present the study area and all Stage 1 Options to the public;
- Inform the public of the process and programme for the project;
- Invite submissions on the Options; and
- Gather local information, which may not be known to the design team.

7.2.1 Publicity

The Public Consultation was advertised in advance by Galway County Council in the local newspaper. A newsletter update was also undertaken by the project team to businesses in the vicinity of the study area. The Members of Tuam Municipal District were also informed of the scheme by the project team prior to the Public Consultation at the regular meeting.

7.2.2 Attendance

On the day of the consultation event 91 people signed the attendance register. To inform and develop a list of interested parties, attendees were asked for their name and address as they entered the venue. Attendees were offered a copy of a brochure explaining the scheme, providing images of the Options and study area, and a response questionnaire.

7.2.3 Format

A brochure was presented to the public and a number of maps were put on display during the consultation to assist members of the public in understanding the Options being presented. The maps presented were;

- Options Plan showing the study area considered during the Option Selection Process as well as the six Options on Aerial Photography at a scale of 1:5000;

Staff from Galway County Council's National Roads Project Office and the design team from AECOM were present to answer any questions. Members of the design team also sought information from the public to assist in gaining a greater understanding of local issues and constraints which may impact on the selection of the preferred option.

7.2.4 Feedback

The closing date for receipt of submissions from PC1 was the 4th October 2019. Questionnaires were handed in at the exhibition or sent by email and by post to Galway County Council. All submissions received were reviewed and recorded on a submission register.

A total of 134 submissions were received from the public. Of these 134 submissions, 38 were returned using the questionnaires provided and 96 were returned in the form of a signed letter template.

7.2.5 Analysis of Submissions

A number of the PC1 submissions received indicated an Option preference;

- Option A – Cyan – ranked first preference by five people;
- Option B – Green – ranked first preference by twelve people;
- Option C – Yellow – ranked first preference by fourteen people;
- Option D – Pink – ranked first preference by one person;
- Option E – Blue – ranked first preference by zero people; and
- Option F – Red -– ranked first preference by two people

An analysis of the submissions highlighted the following comments and concerns:

- The 96 letters submitted were in support of the scheme but requested that the scheme include cycle and pedestrian facilities, improved road lighting, traffic calming and potential pedestrian crossings.
- The majority of the attendees expressed a strong interest in cycle and pedestrian facilities along the existing N63, linking the two sections of Abbeyknockmoy to be included as part of this scheme. It was noted that a number of children already cycle/walk to school and this was one of the driving reasons behind introducing dedicated facilities.
- Option E was less favourable amongst the public as it does not provide a new river crossing.
- Concern was raised about the western tie into the scheme and the land take this would require from residential properties in this area.
- The proximity to the Abbey was raised and it was highlighted that the views of the Abbey from the road should advertise the Abbey in a positive light.
- Any road alignment and bridge crossing should be sympathetic to the Abbey.

7.2.6 Options

As part of the submission process members of the public were asked for additional comments and concerns with regards each Option. The general concerns received for each Option are summarised below:

Option A (Cyan)

Option A received positive feedback for having the lowest impact on the existing network and for separating regional traffic from local traffic, however concerns were raised about the proximity of the scheme to the Abbey and to some properties.

Option B (Green)

The overall reaction to Option B was largely positive, with local residents acknowledging that the Option has similar benefits to Option A but would require less land take. No concerns were raised regarding the proximity to the Abbey but there were still concerns from property owners especially in the area of the proposed western tie in.

Option C (Yellow)

The overall reaction to Option C was positive, but attendees did note that the benefits of C were not as great as A or B. The main concern was the earlier western tie-in which would result in a shorter length of pedestrian/cyclist route being installed on the existing N63.

Option D (Pink)

The overall reaction to Option D was negative, this was due to the proximity of the Option to the school and the fact the school would lose its playing fields to accommodate this Option. It presented similar disadvantages as Option C.

Option E (Blue)

The overall reaction to Option E was negative, the attendees identified that this Option delivered no advantages as it did not segregate the local and regional traffic. There was also concern about upgrading the existing road alignment that would increase the speed of traffic along the existing road and no pedestrian/ cyclist facilities could be provided.

Option F (Red)

The overall reaction to Option F was negative, With the attendees noting that although this Option removed the bad bends on the approach to the village it would increase vehicle speed on the approach to the village and there was no segregation between regional and local traffic. It was noted that this Option raised similar concerns as Option E.

7.2.7 Public Consultation 1 - Conclusions

A general preference for Option A, B or C was indicated during the consultation and in the subsequent submissions. Options B and C were the clear favourites with 12 and 14 attendees ranking them as first choice respectively. The preference for these three Options aligns with the outcome of the Stage 1 Assessment as detailed in Section 0.

A number of the PC1 submissions received indicated an Option preference as detailed above.

During the consultation the desire for non-motorised user facilities to be introduced to connect the community facilities to the dwellings to the west of the site was heavily emphasised by public response. There were 96 signed letters requesting pedestrian/ cycling facilities, improved road lighting, traffic calming and pedestrian crossings to be considered as part of this scheme so these facilities will have to be reviewed during the detailed design stage.

7.3 Stage 1 Options Appraisal

In order to assess the various options and establish a preference to identify the most promising options for further detailed assessment, a Stage 1 Preliminary Options Assessment was undertaken in accordance with the TII Project Management Guidelines 2019 (PE-PMG-02041). The options were assessed under the headings of Engineering, Environment and Economy.

The purpose of the Stage 1 assessment is to refine the number of feasible Options to between three and five options to progress through a more detailed assessment as part of the Stage 2 Project Appraisal.

Options were assessed in terms of Positive to Negative under the headings of Engineering, Environment and Economy and the sub-headings listed below. The ranking system is in line with the TII Project Appraisal Guidelines and the scoring definitions can be seen in Section 2.4 of Unit 7.0 - Multi Criteria Analysis (PE-PAG-02031).

In addition to the Options A–F described above, the Stage 1 Assessment also includes the Do-Nothing/Do-Minimum Option.

Table 7-1 below gives the overall Stage 1 Preliminary Options Assessment summary matrix, with the full assessment matrix contained within Appendix B, the following headings were used to measure the Options against:

Engineering:

- Traffic Assessment & Option-Cross Section;
- Technical Standards;
- Interaction with Existing Road Network;
- Structures;
- Geology;
- Hydrogeology;
- Earthworks;
- Road Safety;
- Drainage;
- Construction;
- Comparative Service Conflicts; and,
- Comparisons on Land & Property.

Environment:

- Biodiversity (incorporating Flora and Fauna);
- Water (incorporating Hydrology);
- Land and Soils (incorporating Soils, Geology, and Hydrogeology);
- Landscape and Visual;
- Noise and Vibration;
- Air Quality and Climate;
- Population and Human Health;
- Cultural Heritage (incorporating Architectural Heritage and Archaeology);
- Material Assets - Agriculture; and,
- Material Assets - Non-Agriculture.

Economic:

- Efficiency & Effectiveness;
- Wider Economic Impacts;

- Transport Quality & Reliability; and,
- Funding Impacts.

	Do-Nothing /Do-Minimum Option	Option A (Cyan)	Option B (Green)	Option C (Yellow)	Option D (Pink)	Option E (Blue)	Option F (Red)
Engineering	Minor or slightly negative	Moderately positive	Major or highly positive	Minor or slightly positive	Not significant or neutral	Minor or slightly negative	Minor or slightly negative
Environmental	Not significant or neutral	Major or highly negative	Moderately negative	Moderately negative	Moderately negative	Moderately negative	Moderately negative
Economy	minor or slightly negative	Minor or slightly positive	Moderately positive	Minor or slightly positive	Not significant or neutral	Minor or slightly negative	Not significant or neutral
Overall Ranking	**Minor or slightly negative**	**Not significant or neutral**	**Minor or slightly positive**	**Not significant or neutral**	**Minor or slightly negative**	**Moderately negative**	**Minor or slightly negative**

Table 7-1 Stage 1 Preliminary Option Assessment Matrix Summary

7.4 Engineering Assessment

The Stage 1 Preliminary Options Appraisal process looked at the Engineering assessment under the sub-headings as detailed in the section above.

Do-Nothing/Do-Minimum Option

The Engineering assessment for the Do-Nothing/Do-Minimum Option is considered the least Preferred Option, with failure to achieve current design standards along the N63. The Do-Nothing/Do-Minimum scenario utilises the existing road infrastructure with no capacity to meet any increase future demands for traffic and safety, especially at the existing Liss Bridge. This inability to meet the objectives is not considered to outweigh the notional neutral impact under existing services impact, land and property impacts and construction impacts achieved by the avoidance of construction works.

Option A – Cyan

The most westerly Option, Option A scored as 'Moderately positive' mainly due to traffic assessment and the river crossing. The horizontal curvature of this Option will be below TII standards due to the tight radii to the west end of the Option. The main advantage of this Option is the angle of the river crossing, which reduces the skew of the bridge. This Option would also introduce a roundabout to connect to the existing road network on the western extent. Another benefit of this Option is the segregation between local and regional traffic, but the main disadvantage will be the impact on cultural heritage, land and property.

Option B – Green

Option B scored as 'Major or highly positive" mainly due to traffic assessment and the reduced land take required in comparison to Option A. The horizontal curvature of the Option will be to TII standards. The main benefit of this Option is the segregation between local and regional traffic, Option B introduces the benefits of Option A but has less of an impact on cultural heritage, land and property. The disadvantage will be the skew of the river crossing.

Option C – Yellow

Option C scored as "Minor or slightly positive' mainly due to traffic assessment and the reduced length of off-line construction. The horizontal curvature of the Option will be to TII standards. The main benefit of this Option is the reduced land take required. The benefits of this Option are not as great as Options

A or B due to the amount of online alignment and the proximity to the community facilities. Option C segregates the regional and local traffic but for less of an extent than another Options.

Option D – Pink

Option D scored as 'Not significant or neutral' mainly due to traffic assessment and the proximity to community facilities. Due to the reduced length of off-line construction the benefits of the Option are not as great as Options A-C. The horizontal curvature of the Option will be to TII standards. The main benefit of this Option is reduced land take required. The benefits of this Option are not as great as Options A-C due to the amount of online alignment and the proximity to the community facilities. Option D segregates the regional and local traffic but for less of an extent than other options.

Option E – Blue

Option E scored as 'Minor or slightly negative' due to the introduction of two roundabouts and using the existing Liss Bridge. This Option also realigns one of the existing side roads to tie into the northern roundabout. It was identified that this Option would not provide any traffic benefits and the use of the existing bridge will still cause safety concerns. These disadvantages outweigh any advantages from land take or construction.

Option F – Red

The most easterly Option, Option F scored as 'Minor or slightly negative'. Although the bridge span over the Abbert River is comparable with Option C, this Option would involve the construction of more difficult embankments on the southbound approach to the bridge and would involve the construction of another bridge/ culvert for the Derreen River (a feeder into the Abbert River). The proposed curvature will be to TII standards and a roundabout will be introduced at the current L3110 junction.

7.5 Environment Assessment

The Stage 1 Preliminary Options Assessment looked at the Environment assessment under the sub headings as described in Section 0 above.

It is important to note that only very limited engineering design and site-specific information was available when conducting the impact assessment.

Where possible, the assessment took account of environmental mitigation measures that can be implemented during the construction and operation of the scheme. No mitigation measures were developed during this stage of the project.

7.5.1 Do-Nothing/Do-Minimum

Information on the Do-Nothing/Do-Minimum option is outlined in Section 6.3. When compared to the Options, this option scored poorly under a number of headings, including Population and Human Health, Noise and Vibration, Water, as well as Land and Soils, as summarised below:

- *Population and Human Health*: The opportunity to improve congestion issues at Liss Bridge, while improving safety for both motorised and non-motorised users would be lost.
- *Noise and Vibration:* Noise levels are likely to remain similar to those currently experienced at noise sensitive properties located along the Do-minimum Option, with the potential for increases in noise levels from congestion traffic. There is little scope for inclusion of mitigation measures.
- *Water/Land and Soils:* The existing drainage infrastructure does not have any environmental protection measures in terms of surface water attenuation and hydrocarbon interceptors which would be included in any new works.

For a number of the environmental topics, including Material Assets; Agriculture; and Cultural Heritage this option was considered to have a 'Not Significant or Neutral' impact. Due to the minor works required the effective impact on ecology is seen as minor, as a result this Option received a score of 'Major or Highly Positive' under Biodiversity.

7.5.2 Biodiversity

7.5.2.1 Introduction

The option selection involves undertaking a comparative evaluation of the Option corridors, having regard to multiple factors, in order to identify a preferred option corridor.

7.5.2.2 Methodology

The assessment has been carried out in accordance with Stage 1 of the option selection process outlined in the TII's PMG's (2017), as well as TII's '*Project Appraisal Guidelines for National Roads, Unit 7.0- Multi Criteria Analysis*' (2016). The assessment was also carried out in accordance with NRA's environmental guidelines; *"Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes" and "Guidelines for Assessment of Ecological Impact of National Roads Schemes*

The assessment was based on a desk study of freely available ecological information relevant to the study area and a site walkover carried out in January 2020. The biodiversity survey took into consideration the main habitat types in the area and included rare and invasive flora.

The study area for the biodiversity appraisal included the potential zone of influence of significant effects, which varies by receptor.

Consultation with statutory bodies will be required in future stages of the assessment process. Further field studies will be required during the next phases of the assessment.

7.5.2.3 Existing Environment

The Abbert River, which is a tributary of the Clare River and thus forms part of the Lough Corrib SAC (site code:000297and Natura 2000 site is located within the area of the proposed Options. The reasons for designation are summarised in Table 5-3, Section 5.3.1.2 of this document. The closest SPA is Lough Corrib SPA which is located circa. 20km west of the proposed Options.

Killaclogher Bog Natural Heritage Area (site code: 001280) is located circa. 3.5 km south east of the proposed Options. The site contains a raised bog and is a site of conservation significance. However, this site is located upstream of the proposed Options.

As detailed in Section 5.3.1.1 the Abbert River traverses the study area associated with the proposed Options and is part of the Lough Corrib SAC. The Abbert River is considered 'At Risk' of achieving and maintaining good ecological status under the Water Framework Directive (WFD). The latest Q-value (2018) from a sampling station on the Abbert River in proximity to Liss Bridge has a Q-value score of Q4 and is considered of 'Good' status (the WFD River Waterbody Status (2013-2018)[1] within the proposed study area ranges from 'good' to 'moderate'). The Abbert River is not protected under the Salmonid Regulations (S.I 293 1988) and is not a designated protected shellfish water area.

A small section of the Feagh East River is also located to the north west of the study area. The Derreen and Lindsay's watercourses are located in the north east and south east section of the study area respectively, a small section of the Lecarrow stream is located just to the north west of the study area boundary. The WFD risk of these rivers are currently unassigned by the EPA.

The desk study identified a number of protected species surrounding the proposed study area, this included a range of birds including the common kingfisher, mute swan and sand martin, a crustacean, the Freshwater White-clawed Crayfish, and terrestrial mammals such as the Eurasian Pygmy Shrew, Soprano Pipistrelle and the Eurasian Badger. Further details of protected species identified surrounding the proposed study area are included in Table 5-2 of Section 5.3.1.1 of this document.

The site walkover in January 2020 and the desk study identified areas of mature planted woodland in proximity to the junction between the existing N63 and the L3110 (near Newtown National School) and areas of mature hedgerows along the existing N63 to the east of the study area. These areas could be of potential importance for foraging, commuting and roosting bat species, could also provide foraging and breeding habitat for badgers, provide areas for otter holts and could be of importance to breeding birds. Evidence of otter activity was found during the walkover surveys in January 2020.

All of the above would be key ecological receptors to be considered as part of the Options assessment as well as during later stages of the assessment and following further site surveys and investigation.

[1] https://gis.epa.ie/EPAMaps/

Ecological attributes associated with the proposed Options such as the Lough Corrib SAC, the Abbert River and areas of potential otter habitat are outlined in Appendix B.

7.5.2.4 Impact Assessment

From a biodiversity perspective the Do-Nothing/Do-Minimum option is the most favourable as it will require minor works in comparison to other Options and would occur in the vicinity of the existing road carriageway. An additional crossing of the Abbert River is not proposed for the Do-Nothing/Do-Minimum Option.

All other Options will require a bridge crossing of the Abbert River, a tributary river of the Lough Corrib SAC and as such are considered to have lower ratings due to potential likely significant effects on biodiversity.

Options A-D (Cyan, Green, Yellow and Pink) have equal weighting and are all considered 'Moderately Negative' in comparison to the other Options for a variety of reasons such as the significant greenfield land take required for these options which could impact upon habitat connectivity, the crossing of the Abbert River and the loss of mature hedgerow where the eastern section of these options tie in with existing infrastructure. However, these Options would avoid areas of mature woodland located in the eastern extent of the study area. The provision of a bridge over Abbert River, part of Lough Corrib SAC, could also cause potential impacts related to instream works or works in close proximity to the SAC. This could impact protected species such as the Freshwater White-clawed Crayfish should they be present and could also impact upon aquatic fauna and flora both at the construction site and downstream.

Option E (Blue) traverses along the existing road infrastructure and similar to the Do-Nothing/Do-Minimum option works would occur in the vicinity of the existing road carriageway. However, this Option also requires land take of green field at the eastern extent of the study area where arms of the proposed Option deviate from existing infrastructure. In comparison to other Options, Option E is considered 'Not Significant or Neutral.'

Option F (Red) is considered the least favourable from a biodiversity point of view as the Option will require the crossing of the Abbert River and culverts may be required to cross the Derreen watercourse. The Option would also cut through a portion of mature woodland. The removal of greenfield, woodland and mature hedgerow could impact protected species such as bats, badgers and breeding birds. The removal of trees and hedgerows could impact upon bat roosts, and foraging and could also impact badger foraging and setts should they occur in the area. Any removal of trees has the potential to impact upon breeding birds should tree removal occur within the breeding bird season. The provision for a bridge over Abbert River, part of Lough Corrib SAC, could also cause potential impacts related to instream works or works in close proximity to the SAC. This could impact protected species such as the Freshwater White-clawed Crayfish should they be present and could also impact upon aquatic fauna and flora both at the construction site and downstream. Crossing works could also cause potential impacts on the Derreen watercourse.

Site No.	Site Name	Site Description / Habitat (s)	Receptor Importance	Impact Significance
000297	Lough Corrib SAC		International	Significant
N/A	Woodland in eastern extent of study area	Pockets of woodland adjacent to the Abbert River and the N63	Local	Moderate negative
N/A	Mature hedgerows in eastern extent of study area	Mature network of hedgerow adjacent to the Abbert River	Local	Minor negative
N/A	Wet grassland	Occurs predominantly to the north of the Abbert River toward the centre and west of the survey area	Local	Minor negative

Table 7-2 Ecological sites (designated and non-designated) potentially impacted by each Option corridors

Impact Level	Do-Nothing/ Do-Minimum	Option A (Cyan)	Option B (Green)	Option C (Yellow)	Option D (Pink)	Option E (Blue)	Option F (Red)
Significant Impact on feature of National Importance	Unlikely	Possible	Possible	Possible	Possible	Unlikely	Possible
Significant Impact on feature of County Importance	Unlikely	Possible	Possible	Possible	Possible	Unlikely	Likely
Significant Impact on feature of Local Importance	Unlikely	Likely	Likely	Likely	Likely	Likely	Likely
Overall Ranking	1	3	3	3	3	2	4

Table 7-3 Summary comparison of impacts on ecological sites of the Do-Nothing/Do-Minimum and the Option corridors

7.5.2.5 Summary

Option	Do-Nothing/ Do-Minimum	Option A (Cyan)	Option B (Green)	Option C (Yellow)	Option D (Pink)	Option E (Blue)	Option F (Red)
Overall Ranking	7 – Major or Highly Positive	2 - Moderately Negative	2 - Moderately Negative	2 - Moderately Negative	2 - Moderately Negative	4 - Not Significant or Neutral	1 - Major or Highly Negative

Table 7-4 Overall Score (Biodiversity)

The Do-Nothing/Do-Minimum option and Option E are the most favourable option from a biodiversity point of view as they predominately traverse existing infrastructure and works would likely be confined to areas in proximity to existing infrastructure, these Options would also not require an additional bridge crossing over Abbert River.

Options A to D have equal weighting and are all considered 'Moderately Negative,' in comparison to the other options resulting from a variety of potential likely significant effects on biodiversity resulting from the loss of greenfield, potential loss of connectivity between fields, the loss of woodland and potential impacts to the Lough Corrib SAC.

7.5.3 Water (incorporating Hydrology)

7.5.3.1 Introduction

The Preliminary Options Assessment involves undertaking a comparative evaluation of the Option corridors, having regard to multiple factors in order to identify an Emerging Preferred Option.

For the Stage 1 Preliminary Options Assessment, the specific water (hydrological) impacts associated with each Option corridor are identified as part of the comparative evaluation.

7.5.3.2 Methodology

The assessment has been carried out in accordance with Stage 1 of the option selection process outlined in the TII's PMG's (2017), as well as TII's '*Project Appraisal Guidelines for National Roads, Unit 7.0- Multi Criteria Analysis*' (2016). The assessment was also carried out in accordance with NRA's '*Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes'*.

For this assessment, the study area with an overall width of 500m, i.e. 250m from the centre line of each Option was chosen, as specified within the NRA's '*Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes'.*

The likely impact each Option will have on the water attributes along each Option have been assessed using information obtained from desk top studies. In assessing likely impacts, due account was taken of both the importance of the attributes (Table 7-5) and the predicted scale and duration of the likely impacts.

Importance	Criteria	Typical Examples
Extremely High	Attribute has a high quality or value on an international scale	River, wetland or surface water body ecosystem protected by EU legislation e.g. 'European sites' designated under the Habitats Regulations or 'Salmonid waters' designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988.
Very High	Attribute has a high quality or value on a regional or national scale	River, wetland or surface water body ecosystem protected by national legislation – NHA status Regionally important potable water source supplying >2500 homes Quality Class A (Biotic Index Q4, Q5) Flood plain protecting more than 50 residential or commercial properties from flooding Nationally important amenity site for wide range of leisure activities
High	Attribute has a high quality or value on a local scale	Salmon fishery Locally important potable water source supplying >1000 homes Quality Class B (Biotic Index Q3-4) Flood plain protecting between 5 and 50 residential or commercial properties from flooding Locally important amenity site for wide range of leisure activities
Medium	Attribute has a medium quality or value on a local scale	Coarse fishery Local potable water source supplying >50 homes Quality Class C (Biotic Index Q3, Q2-3) Flood plain protecting between 1 and 5 residential or commercial properties from flooding
Low	Attribute has a low quality or value on a local scale	Locally important amenity site for small range of leisure activities Local potable water source supplying <50 homes Quality Class D (Biotic Index Q2, Q1) Flood plain protecting 1 residential or commercial property from flooding Amenity site used by small numbers of local people

Table 7-5 Criteria for rating site attributes - Estimation of Importance of Hydrology Attributes

Source: NRA's Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes

For the water (hydrology) topic, the attributes (and impacts) to be assessed for each Option corridor may include the following:

- watercourses crossed by each Option corridor and potential impact on water quality arising from re-alignment works and discharge of surface water run-off;
- aquatic ecological sites close to and downstream of water crossings;
- surface water abstraction close to and downstream of water crossings;
- established amenity value of surface waters traversed by each Option corridor; and
- potential increase (or reduction) in flood risk to existing properties.

7.5.3.3 Existing Environment

This section outlines and describes the water attributes associated with the various Options. Figure 5 in Appendix B shows the location of the Options in relation to existing water attributes in the area.

Overview of Catchments and Sub-catchments Crossed

All Options are located within the Corrib catchment area (Code: 30) and the Clare [Galway] sub-catchment (Code: 30_12; area 231.8 km^2).

Overview of Watercourses and Surface Water Quality

All Options require one crossing over the Abbert River, a tributary river of the Lough Corrib SAC, which is the main watercourse running through the study area. The EPA has classified the river water quality (2018) of the Abbert River as Q4 'Good' status, from monitoring results taken at one hydrometric station on the Abbert River (located adjacent to the Liss Bridge).

Option F also crosses over Derreen and Lindsay's Farm watercourses in the north east and south east of the study area respectively.

Overview of Flood Risk

All Options consist of off-line road developments as well as upgrading of online sections of the existing N63.

According to the OPW's Flood Maps, none of the Options are within a designated flood zone. The Flood Maps also show no past flood events were recorded within or close to the study area. Onsite observations confirmed that the lands immediately adjacent to the Abbert River are likely to be prone to flooding as this area is relatively flat and at a lower elevation than surrounding lands. In addition, the vegetation present in this area is characteristic of flood plain flora as discussed Section 5.3.1 Biodiversity.

Overview of Amenity Areas

The Abbert River has been identified as making a significant contribution to wild brown trout stocks in the Clare River system and Lough Corrib[20]. In September 2018, new by-laws were introduced, which will afford greater protection to spawning salmonids in this tributary of the Clare River.

The by-law extends the closed season for all angling on the Abbert River by two months to cover the period from the 1st of September until the 31st of March annually.

Overview of Surface Water Abstraction areas

According to the EPA map viewer, the Abbert River is not a source of drinking water that has extra protection by law. The Abbert River has not been identified as a river with significant abstraction pressures.

Overview of Aquatic Ecological Sites

Lough Corrib SAC (site code:000297) and Natura 2000 site and the Abbert River are located within the area of the proposed Options. The Derreen stream is located in the north east section of the study area, with the Lindsay's Farm stream located in the south east section, both of which are partly located within the boundary of the SAC.

Evidence of Otter activity was found during the walkover surveys in January 2020.

7.5.3.4 Impact Assessment

Each of the Options are assessed under the following headings:

- Watercourses (including water quality);
- Aquatic Ecology;
- Flood risk; and
- Surface water abstraction.

Watercourses and Water Quality

All Options require one crossing of the Abbert River which is a designated SAC, therefore this attribute has an 'Extremely High' level of importance (Table 7-5). Option F also crosses over Derreen and Lindsay's Farm watercourses in the north east and south east of the study area respectively.

The risk of potential significant impacts from any of the Options occurring during both the construction and operational phases (in the absence of adequate management and mitigation measures) can arise from several activities; for example, construction of watercourse crossings, accidental spills and runoff from the road surfaces.

[20] http://www.fishinginireland.info/salmon/west/corrib.htm Accessed 19th November 2019

The implementation of appropriate mitigation measures could therefore potentially be required to assist in reducing the potential risk for a significant impact to receiving surface waters. The need for mitigation measures will be assessed and identified during Phase 3 'Design and Environmental Evaluation' of the proposed project.

It is noted that during operation, the Emerging Preferred Option would only discharge surface water runoff to any nearby watercourses following attenuation.

Aquatic Ecology

As outlined above, all Options require one crossing of the Abbert River which is a designated SAC, an of 'Extremely High' level of importance (Table 7-5). The provision for a bridge over the Abbert River, which forms part of Lough Corrib SAC, could cause potential impacts related to instream works or works in close proximity to the SAC, as outlined earlier in Section 7.5.2.4.

Option F is considered the least favourable from a biodiversity point of view as the Option will require the crossing of the Abbert River, the Derreen watercourse, and the Lindsay's Farm watercourse. The Derreen watercourse is also partly located within SAC boundary.

Flood Risk

Based on the information available to date, it is considered unlikely that any of the Options would potentially increase flood risk to existing properties. Therefore, the impacts from flood risk to properties are not likely to be significant.

However, further assessments will be required to determine the hydrological effects caused by any new structures or changes to the drainage system.

Surface Water Abstraction

According to the EPA map viewer, the Abbert River is not a source of drinking water that has extra protection by law and is not identified as a river with significant abstraction pressures; therefore, no impacts from any of the Option corridors during construction and operational phases are anticipated.

Amenity

As outlined previously, the Abbert River has been identified as making a significant contribution to wild brown trout stocks in the Clare River system and Lough Corrib and is noted as being a local angling river fishery.

There is potential for temporary, negative impacts to the amenity value of the Abbert River during the construction phase of any of the Option corridors. Given the scale of the Options and the rivers low importance value (i.e. locally important amenity site) it is likely that this will result in an imperceptible impact to the overall amenity value of the river.

If any culvert installation is required for any of the proposed Options, if not properly installed, they could act as a barrier to the movement of migratory fish, such as salmon, trout and eel.

A detailed consideration of the impacts and the potential requirement mitigation measures will be completed during Phase 3 'Design and Environmental Evaluation' of the Emerging Preferred Option.

7.5.3.5 Summary

Table 7-6 below outlines the overall score for each Option.

Option	Do-Nothing / Do-Minimum	Option A (Cyan)	Option B (Green)	Option C (Yellow)	Option D (Pink)	Option E (Blue)	Option F (Red)
Overall Ranking	3 - Minor or slightly negative	2 - Moderately negative	2 - Moderately negative	2 - Moderately negative	2 - Moderately negative	2 - Moderately negative	2 - Moderately negative

Table 7-6 Overall Score (Water)

As shown in Table 7-6, all Options received a score of 'Moderately negative'. All Options require one crossing over the Abbert River, which is a designated SAC of 'Extremely High' importance. In addition to this, Option F will require one crossing over the Derreen Stream and Lindsay's Farm watercourse. The provision for a bridge over the Abbert River, which forms part of Lough Corrib SAC, could cause potential impacts related to instream works or works in close proximity to the SAC.

With respect to flood risk, it is considered unlikely that any of the Options would potentially increase flood risk to existing properties. However, further assessments will be required to determine the hydrological effects caused by any new structures or changes to the drainage system.

In addition to this, there is potential for temporary, negative impacts to the amenity value of the Abbert River during the construction phase of any of the Options. However, given the scale of the Options and the rivers low importance value (i.e. locally important amenity site) it is likely that this will result in an imperceptible impact to the overall amenity value of the river.

The Do-Nothing/Do-Minimum received a score of 'Minor or slightly negative' as the existing drainage infrastructure does not have any environmental protection measures in terms of surface water attenuation and hydrocarbon interceptors which would be included in any new works.

7.5.4 Land and Soils (incorporating Soils, Geology and Hydrogeology)

7.5.4.1 Introduction

The option selection involves undertaking a comparative evaluation of the Options, having regard to multiple factors, in order to identify an Emerging Preferred Option.

For the Stage 1 Preliminary Options Assessment, the specific geological and hydrogeological impacts associated with each Option corridor are identified as part of the comparative evaluation.

7.5.4.2 Methodology

The assessment has been carried out in accordance with Stage 1 of the option selection process outlined in TII's PMG's 2017, as well as TII's '*Project Appraisal Guidelines for National Roads, Unit 7.0- Multi Criteria Analysis*' (2016). The assessment was also carried out in accordance with NRA's '*Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes'*.

For this assessment, the study area with an overall width of 500m, i.e. 250m from the centre line of each Option was chosen, as specified within the NRA's '*Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes'*.

The likely impact each Option will have on the land and soils attributes along each Option have been assessed using information obtained from desk top studies.

It is important to note that the impact assessment is based on the information available at this stage of the project. Further information will be available during Phase 3 'Design and Environmental Evaluation' of the Emerging Preferred Option.

In assessing likely impacts, due account was taken of both the importance of the attributes (Table 7-7) and the predicted scale and duration of the likely impacts.

Importance	Criteria	Typical Examples
Extremely High	Attribute has a high quality or value on an international scale	Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation e.g. SAC or SPA status
Very High	Attribute has a high quality, significance or value on a regional or national scale Degree or extent of soil contamination is significant on a national or regional scale Volume of peat and/or soft organic soil underlying route is significant on a national or regional scale*	Geological feature rare on a regional or national scale (NHA) Large existing quarry or pit Proven economically extractable mineral resource Regionally Important Aquifer with multiple wellfields
High	Attribute has a high quality, significance or value on a local scale Degree or extent of soil contamination is significant on a local scale Volume of peat and/or soft organic soil underlying route is significant on a local scale*	Contaminated soil on site with previous heavy industrial usage Large recent landfill site for mixed wastes Geological feature of high value on a local scale (County Geological Site) Well drained and/or highly fertility soils Moderately sized existing quarry or pit Marginally economic extractable mineral resource Regionally Important Aquifer
Medium	Attribute has a medium quality, significance or value on a local scale Degree or extent of soil contamination is moderate on a local scale Volume of peat and/or soft organic soil underlying route is moderate on a local scale*	Contaminated soil on site with previous light industrial usage Small recent landfill site for mixed wastes Moderately drained and/or moderate fertility soils Small existing quarry or pit Sub-economic extractable mineral resource Locally Important Aquifer Potable water source supplying >50 homes
Low	Attribute has a low quality, significance or value on a local scale Degree or extent of soil contamination is minor on a local scale Volume of peat and/or soft organic soil underlying route is small on a local scale	Large historical and/or recent site for construction and demolition wastes Small historical and/or recent landfill site for construction and demolition wastes Poorly drained and/or low fertility soils Uneconomically extractable mineral resource Poor Bedrock Aquifer
*** Relative to the total volume of inert soil disposed of and/or recovered**		

Table 7-7 Criteria for rating site attributes - Estimation of Importance of Geological Attributes

Source: NRA's Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes

For the land and soils topic, the attributes (and impacts) to be assessed for each Option corridor included the following:

- geological heritage sites along each Option corridor;
- landfills, backfilled quarries or former industrial sites along each Option corridor and the potential risk of encountering contaminated ground;
- pits, quarries or mines in the vicinity of each Option corridor, the potential implications (if any) for existing activities and future extractable reserves;
- the extent of peat and soft ground along each Option corridor and the potential requirement to excavate it and remove it off-site as waste for disposal or recovery;
- groundwater resources;
- aquifer and groundwater vulnerability; and
- karst features.

7.5.4.3 Existing Environment

Overview of Solid Geology, Subsoils and Soils

As identified in the GSI Spatial Map Viewer[6], the underlying bedrock is described as “pale grey clean skeletal limestone” from the Burren Formation, with soils in the study area consisting of well drained, “Coarse loamy drift with limestone” from the Mullabane soil association; well drained “Coarse loamy over calcareous gravels” from the Baggotstown soil association; as well as, poorly drained river alluvium and peat (Appendix B).

According to the Teagasc soils maps, none of the Options cross over areas of peat. However, all Options cross poorly drained river alluvium associated with the Abbert River.

The majority of the area is underlain by glacial till derived from limestones, with a band of alluvium associated with the Abbert River as previously noted. It important to note that the exact depth and extent of soft ground within each corridor is unknown at this stage until it is determined during detailed design.

As outlined in Section 5.4.5, the soil types in the area are dominated by Brown Earths derived from Limestone parent material. The alluvial soil (Code *5RIV*[21]) along the Abbert River is low lying and wet. The soil series north and south of the river is a sandy loam Brown Earth – Mullabane Series (Code *1100q*). This free draining soil is suited mainly to improved grassland. Further to the south of the N63 as the topography rises the soil type is the free draining sandy clay loam - the Baggotstown Series (Code *1150a*). This is a Calcareous Brown Earth which is suited to both arable and improved grassland uses. Generally, land south of the N63 is better quality and the agricultural potential is higher here. Conversely, land along the Abbert River is low lying and wet and has a lower agricultural potential.

Overview of Historical Land Use

A review of historical maps show that the risk of historical contamination is low within all Options, as outlined in Section 5.3.3.2, given the historical land use predominantly consisting of greenfield/residential lands.

Overview of Economic Geology

There are no pits, quarries or mines in the vicinity of any of the Options.

Overview of Geological Heritage

There are no Geological Heritage sites located close to any of the Options.

Overview of Aquifer type, classification, characteristics and vulnerability

All Options overlie a 'Regionally Important Aquifer - Karstified (conduit)’.

Groundwater vulnerability underneath all of the Options varies from ‘Moderate’ to ‘Extreme’.

Overview of Groundwater Resources

According to the GSI Spatial Resources Viewer, there are no abstraction wells identified within the vicinity of any of the Options. AECOM notes that the GSI groundwater dataset may be incomplete as there is no statutory requirement to register boreholes. Although the presence (historical or current) of boreholes cannot be fully discounted, AECOM reviewed the information supplied by Irish Water and the Culliagh Water Group and confirmed that all homes in the study area appear to be connected to one of these suppliers, and thus no private dwelling is drawing water from a private well as a primary source.

Overview of Hydrogeological and Karst Features

As outlined above, all Options overlie a 'Regionally Important Aquifer - Karstified (conduit)’.

No additional karst features were identified within or in the vicinity of any of the Options.

7.5.4.4 Impact Assessment

In order to assess the relative merits of each of the identified Options from a geological, or hydrogeological perspective, the likely impact each Option will have on the respective geological, hydrological or hydrogeological attributes along each Option was assessed. Results from the assessment are discussed below:

Geological Heritage Sites

[21] Teagasc Irish Soils Information System

There are no Geological Heritage sites within or close to any of the Options.

Economic Geology

As there are no pits, quarries or mines in the vicinity of any of the Options, there will no impacts from any of the Options to economic geology attributes.

Ground conditions

Potential excavation earthwork impacts from each of the Options could mainly relate to removal of topsoil and shallow subsoils, while infill earthwork will mainly relate to the import and compaction of acceptable fill material. In addition to this, as outlined above, all Options overlie a 'Regionally Important Aquifer - Karstified (conduit)', with a mix of moderate, high and extreme groundwater vulnerability; therefore, there is potential for shallow bedrock within all Options.

All Options require the development of sections of offline road, predominately in open green fields. According to the Teagasc soil map, all sections of offline road cross through an area of river alluvium associated with the Abbert River. None of the Options cross through areas of peat.

The requirement for soft ground excavation and removal off-site as waste for disposal or recovery is not anticipated.

As noted earlier, the exact depth and extent of soft ground, as well as the cut and fill requirements within each corridor is unknown at this stage and will be confirmed at a later stage.

Groundwater Resources

It is anticipated that there will be no significant impacts to groundwater supply springs and wells along any of the Options, as there are no abstraction wells identified within 500 m of any of the Options[22]. The Options are also not located within a Groundwater Drinking Protected Area.

Aquifer and Groundwater Vulnerability

The southern sections of Options C-F closely follow the existing N63 line; therefore, it is anticipated that these corridors will have the least impact to groundwater compared to the other Options in this area. Options A and B have the most sections of offline construction, predominately in open green fields, compared to the other Options. However, all Options will involve the development of some sections of offline roads above the regionally important aquifer, which has been identified as an attribute of 'High' hydrogeological importance.

Groundwater vulnerability underneath all of the Options varies from 'Moderate' to 'Extreme'. The majority of Options A and B are located above areas of predominately 'Moderate' groundwater vulnerability. The groundwater vulnerability beneath Option E is predominantly 'High' or 'Extreme'.

The risk of potential significant impacts occurring during both the construction and operational phases of any of the six Options (in the absence of adequate management and mitigation measures) can arise from several activities; for example, accidental spills and runoff from the road surfaces.

A detailed consideration of the impacts and the potential requirement mitigation measures will be completed during Phase 3 'Design and Environmental Evaluation' of the Emerging Preferred Option.

It is noted that during operation, the Emerging Preferred Option would only discharge surface water runoff to any nearby watercourses following attenuation.

Hydrogeological and Karst Features

As outlined above, all Options overlie a 'Regionally Important Aquifer - Karstified (conduit)'. Potential impacts to this aquifer are discussed above.

[22] AECOM notes that the GSI groundwater dataset may be incomplete as there is no statutory requirement to register boreholes. Hence, the presence (historical or current) of boreholes cannot be discounted.

7.5.4.5 Summary

Table 7-8 below outlines the overall ranking for each Option corridor.

Option	Do-Nothing/ Do-Minimum	Option A (Cyan)	Option B (Green)	Option C (Yellow)	Option D (Pink)	Option E (Blue)	Option F (Red)
Overall Ranking	3 - Minor or slightly negative	2 - Moderately negative	2 - Moderately negative	2 - Moderately negative	2 - Moderately negative	2 - Moderately negative	2 - Moderately negative

Table 7-8 Overall Score (Land and Soils)

As shown in Table 7-8 all Options received a score of 'Moderately negative' as all Options will require the development of sections of offline road over a 'Regionally Important aquifer', an attribute identified as being of 'High' importance. The groundwater vulnerability beneath each corridor consists of a mix of 'Moderate', 'High' and 'Extreme' vulnerability.

The Do-Nothing/Do-Minimum Option received a score of 'Minor or slightly negative' as the existing drainage infrastructure does not have any environmental protection measures in terms hydrocarbon interceptors which would be included in any new works.

7.5.5 Landscape and Visual

7.5.5.1 Methodology

The assessment identified the potential effects resulting from the proposed six Options on the existing landscape character and the visual amenity, as well as identifying potential residential visual effects of each Option.

7.5.5.2 Impact Assessment

All Options require one crossing of the Abbert River, therefore altering the landscape character and visual amenity within sections of the study area.

All Options are located in Landscape Character Areas with a general 'Low Sensitivity' as indicated in the Landscape and Landscape Character Assessment, which forms part of the Galway Development Plan 2015-21.

Option A (Cyan)

Ranked as 'Moderately negative' as it contains the largest sections of offline road development, mainly across green fields, when compared to the other Options resulting in high effects on the landscape character due to the introduction of extended offline road infrastructure and associated embankments.

Visually, Option A is located within an area designated as 'Landscape Focal Point/View' No. 26 – Knockmoy Abbey Southeast of Tuam. Its close proximity to the Abbeyknockmoy Cistercian Abbey will result in higher visual changes than Option B, which is located further east of the Abbeyknockmoy Cistercian Abbey. Option A will considerably alter the visual setting of the abbey as well as views south and east from the abbey. However, Option A is located away from the majority of community facilities and residential receptors, but it will become a new feature in views to the north from residential properties located along the existing N63 as well as view to the south from residences located along a local road 'Old Road' north of the Abbeyknockmoy Cistercian Abbey.

Option B (Green)

Ranked as 'Moderately negative.' Similar to Option A it contains a large section of offline road development, mainly across green fields, resulting in high effects on the landscape character due to the introduction of extended offline road infrastructure and associated embankments.

Visually, Option B is located further east than Option A and mainly outside of an area designated as 'Landscape Focal Point/View' No. 26 – Knockmoy Abbey Southeast of Tuam. The visual effects on views to and from the Abbeyknockmoy Cistercian Abbey will be less than for Option A. However, it will alter the visual setting of the abbey as well as views southeast and east from the abbey. Option B is also located closer to residences located along the existing N63 than Option A and will therefore become a more prominent new feature in available views to the north from these residences. View south from residences located along a local road L6188 (Old Road) north of the Abbeyknockmoy Cistercian Abbey

will be less and more obscured due to a larger distance between the development and sensitive residential receptors.

Option C (Yellow)

Ranked as 'Minor or Slightly Negative'. Option C is one of the shortest Options located offline resulting in lower effects on the landscape character as the crossing of open green fields is minimised.

Option C is also located outside of an area designated as 'Landscape Focal Point/View' No. 26 – Knockmoy Abbey Southeast of Tuam and remain well east of the Abbeyknockmoy Cistercian Abbey, which will retain its setting within green fields and the dialogue with the Abbert River. However, the proposed road development will be seen in views to the east from the Abbey but much further away than Options A and B. View north from residences located along the existing N63 will remain largely unchanged. However, Option C will be located closer to community facilities and the school resulting in higher visual effects from these locations.

Option D (Pink)

Ranked as 'Moderately negative'. While the change to the landscape character will be reduced due to a relatively short section of offline road development, visual effects are considered high as sections of the Option will be located adjacent to community facilities and the school, which are considered highly sensitive receptors. However, Option D is located further east than Option C, which will reduce the effects on views east from the Abbeyknockmoy Cistercian Abbey further than Option C.

Option E (Blue)

Ranked as 'Minor or slightly positive'. This Option will use the majority of the existing road corridor and will therefore least affect the landscape character of the study area.

Visual effects will arise mainly due to the slight realignment of the 'Old Road' and the introduction of two new roundabouts, which may impact on existing vegetation in close proximity, particular the roundabout with the existing N63 and L3110. Visual effects on the community facilities, school and residences will also be minimised due to the re-use of sections of the existing road corridor resulting in small or no visual change in views from residential properties located within the study area. Views to and from the Abbeyknockmoy Cistercian Abbey will also remain largely unchanged.

Option F (Red)

Ranked a 'Moderately negative' as it contains a longer offline section cross green fields than Options C-E. It will also have the highest impact on existing stands of trees and hedgerows of all options.

Visual effects will be slightly higher than for Option E due to the introduction of new road development in views north, northeast from residences located along local road L3110.

7.5.5.3 Summary

Based on the potential landscape and visual impacts associated with each Option the following score has been assigned.

Option	Do-Nothing/ Do-Minimum	Cyan Option (A)	Green Option (B)	Yellow Option (C)	Pink Option (D)	Blue Option (E)	Red Option (F)
Overall Ranking	4 - Not significant or neutral	2 - Moderately negative	2 - Moderately negative	3 - Minor or slightly negative	2 - Moderately negative	5 - Minor or Slightly Positive	2 - Moderately negative

Table 7-9 Overall Score (Landscape and Visual)

7.5.6 Noise and Vibration

7.5.6.1 Introduction

The noise element of the Stage 1 Preliminary Options Assessment is intended to evaluate the relative noise impact of each Option, both against other Options and considerations.

7.5.6.2 Methodology

The assessment has been carried out in accordance with Stage 1 of the option selection process outlined in TII's PMG's 2017, as well as TII's '*Project Appraisal Guidelines for National Roads, Unit 7.0-*

Multi Criteria Analysis' (2016). The assessment was also carried out in accordance with NRA's '*Guidelines for the Treatment of Noise and Vibration in National Road Schemes*' (2014).

For Stage 1, any receptors deemed to be particularly sensitive to noise and or/vibration are identified along with the characterises of the prevailing noise climate and opportunities for noise mitigation.

7.5.6.3 Existing Environment

Prevailing Noise Climate

The study area is mainly agricultural land, with a number of Options traversing through predominantly open green fields. The existing N63 runs east to west through the study area.

The existing noise climate in the study area is influenced by N63 through traffic and traffic accessing local side roads from the N63.

Sensitive Receptors

There are a number of residential properties dotted along the existing N63 line.

There are also a number of community facilities and heritage buildings within 50m of each corridor option, including the Newtown National Primary School, Abbeyknockmoy Community Centre and the Liss Bridge NIAH. Other receptors that are potentially sensitive to noise and/or vibration from the proposed scheme include Abbeyknockmoy Cistercian Abbey (GA058-004001), which is a National Monument.

All Options cross over the Abbert River, a tributary river of the Lough Corrib SAC.

7.5.6.4 Impact Assessment

For all of the Options, the construction phase has the potential to increase noise levels at noise sensitive locations surrounding each Option corridor.

Impact from the construction phase will depend on the number and type of equipment employed during the works. There is also potential for ground vibration due to the construction phase works, which could derive, for example, from groundworks associated with upgrade of the existing roads.

Whilst all Options have the potential to increase noise levels at some more remote sensitive receptors, including Abbeyknockmoy Cistercian Abbey (GA058-004001), noise levels may reduce at existing affected receptors due to improvements in congestion levels.

When compared to the other Options, Options A and B traverse predominately through open green fields, with fewer sensitive receptors within 50m of the carriageway as shown in Table 7-10. Abbeyknockmoy Cistercian Abbey (GA058-004001) is located circa 200 m to the north west of Option A.

Option F has the highest number of sensitive receptors within 50m of the carriage way (49), including Abbeyknockmoy Community Centre and Newtown Girls National Primary School.

Option	No. of Sensitive Receptors (0-50m)
Option A (Cyan)	20
Option B (Green)	26
Option C (Yellow)	41
Option D (Pink)	45
Option E (Blue)	46
Option F (Red)	49

Table 7-10 Sensitive Receptors

A detailed consideration of the impacts and the potential requirement mitigation measures will be completed during Phase 3 'Design and Environmental Evaluation' of the Emerging Preferred Option.

7.5.6.5 Summary

Based on the number and type of sensitive receptors deemed to be particularly sensitive to noise and/or vibration along each proposed Option, the following scores have been assigned to the six Options:

Option	Do-Nothing/ Do-Minimum	Option A (Cyan)	Option B (Green)	Option C (Yellow)	Option D (Pink)	Option E (Blue)	Option F (Red)
Overall Ranking	2 - Moderately negative	3 - Minor or slightly negative	3 - Minor or slightly negative	2 - Moderately negative	2 - Moderately negative	2 - Moderately negative	2 - Moderately negative

Table 7-11 Overall Score (Noise and Vibration)

Options A and B both scored 'Minor or slightly negative' as there is a lower number of sensitive receptors within 50m of the carriageway, including a primary school, residential properties and community facilities, which may be impacted by changes in noise conditions. Abbeyknockmoy Cistercian Abbey (GA058-004001) is located circa 200 m to the north west of Option A.

Options C-F all scored 'Moderately negative' as these Options have the highest numbers of sensitive receptors within 50m of the carriageway and are therefore more likely to experience negative noise and/or vibration impacts during construction and operation.

As a result of the identified scores, the implementation of appropriate mitigation measures will likely be required. A detailed consideration of the impacts and the potential requirement mitigation measures will be completed during Phase 3 'Design and Environmental Evaluation' of the Emerging Preferred Option.

The Do-Nothing/Do-Minimum Option received a score of 'Moderately negative' as during the operational phase, noise levels are likely to remain similar to those currently experienced at noise sensitive properties located along the Do-Nothing/Do-minimum Option, with the potential for increases in noise levels from congestion traffic. There is little scope for inclusion of mitigation measures.

7.5.7 Air Quality and Climate

7.5.7.1 Introduction

The air quality input to the Stage 1 Preliminary Options Assessment includes an examination of the area or areas through which feasible Options might potentially pass.

7.5.7.2 Methodology

The assessment has been carried out in accordance with Stage 1 of the option selection process outlined in TII's PMG's 2017, as well as TII's '*Project Appraisal Guidelines for National Roads, Unit 7.0-Multi Criteria Analysis'* (2016). The assessment was also carried out in accordance with NRA's/TII's '*Guidelines on the Treatment of Air Quality during the Planning and Construction of National Road Schemes'* (2011).

For Stage 1 the existing local air quality conditions in relation to nitrogen dioxide and Particulate Matter 10µm (PM10) is described including any non-road sources that may significantly affect air quality. Sensitive receptors within 50m of the carriageway of each Option have also been identified and recorded.

7.5.7.3 Existing Environment

Air Quality

The greatest existing source of air pollution within each of the Options is road traffic, specifically that emanating from the existing N63.

There are no International Plant Protection Convention licenced industrial facilities with emissions to the atmosphere in close proximity to any of the Options.

All Options are located within Air Quality Zone D (which represents rural areas located away from large population centres). The monitoring stations located closest to the Options are found at Claremorris (located approximately 50 km to the northwest) and Roscommon Station (located 50 km to the north east of the study area). No individual air quality monitoring station reports have been produced for both monitoring sites.

As outlined in Section 5.3.7, the EPA's Air Quality Bulletin for PM10 shows that the values recorded in 2019 to date at Claremorris and Roscommon stations have not exceeded the EU's limit value of 50 micrograms per cubic metre (µg/m3) more than 35 times in a year. In addition to this, the EPA's Air

Quality Bulletin for nitrogen dioxide shows that these monitoring stations have not exceeded the hourly limit for NO2 of 200 ug/m3 to date in 2019.

The results from EPA's 'Air Quality in Ireland' (2018) report concluded that in Ireland only one monitoring station which was above the WHO Air Quality Guidelines for hourly NO2 levels, but this was in Ballyfermot. Co. Dublin.

The 'Air Quality in Ireland' (2018) report also concluded that although there were no exceedances for PM10 of the EU limit values (annual and daily) at 26 monitoring stations in 2018, the WHO air quality guideline daily limit value was exceeded at nine monitoring stations for a total of 16 days. However, the report does not outline which stations exceeded the recommended daily limit.

According to the EPA Map Viewer, the Air Quality Index for Health (AQIH) for Galway City and the Galway County is 3, 'Good' at the time of writing.

Climate

The nearest representative weather station collating detailed weather records is Athenry Automatic Weather Station in Athenry County Galway, located approximately 19km south of Abbeyknockmoy village.

The mean annual wind speed at the station in Athenry, is 3.6 metres per second. The 18-year annual average rainfall for Athenry is 1,152mm/yr. This will be due to Galway's oceanic position on the Atlantic seaboard.

Sensitive Receptors

The majority of air quality sensitive receptors in the study area are residential properties located along the existing N63.

There are also a number of community facilities and heritage buildings within 50 m of each Option, including:

- Abbeyknockmoy Cistercian Abbey;
- Newtown National Primary School; and
- Abbeyknockmoy Community Centre.

7.5.7.4 Impact Assessment

Construction Phase

Emissions from the construction phase are transient in nature and would include emissions from vehicles and plant, and dust-raising activities from earthworks and construction processes utilising concrete and aggregates. The main air quality impacts from all of the Options will be associated with dust generation during site preparation and construction works. Dust and air pollution, including odours, can cause disruption to properties and the public adjacent to the construction works, and can also have adverse impacts upon other environmental receptors, including watercourses and ecologically designated sites. Given the size of each of the Option alignments, it is not anticipated that the Options will result in significant impacts to the existing air quality.

Operational Phase

During the operational phase of the Emerging Preferred Option, the main air emissions will be from road traffic; however, road traffic is currently traversing through the area on the existing road network; therefore, it is not anticipated that the any of the Options will significantly affect existing air emissions from road traffic in the area.

Climatic impacts are expected to be minor emissions of greenhouse gases from truck movements and the operation of site construction equipment. Given the scale and size of the Options, significant impacts are not anticipated.

A detailed consideration of the impacts and the potential requirement mitigation measures will be completed during Phase 3 'Design and Environmental Evaluation' of the Emerging Preferred Option.

Sensitive Receptors

The number of sensitive receptors to air quality and climate within 50m of the carriageway of each Option is outlined in Table 7-12 below.

The majority of the sensitive receptors within each Option are associated with residential properties in the area. Additional sensitive receptors include a number of community facilities, including

Abbeyknockmoy Community Centre and Newtown Girls National Primary School, as well as the Abbert River, a tributary river of the Lough Corrib SAC.

Option	No. of Sensitive Receptors (0-50m)	Preference Order
Option A (Cyan)	20	1
Option B (Green)	26	2
Option C (Yellow)	41	3
Option D (Pink)	45	4
Option E (Blue)	46	5
Option F (Red)	49	6

Table 7-12 Sensitive Receptors

As outlined above in Table 7-12, Option F has the highest number of sensitive receptors within 50m of the carriageway, including, Abbeyknockmoy Community Centre and Newton Girls National Primary School. Option A has the lowest number of sensitive receptors within 50m of the carriageway.

7.5.7.5 Summary

Based on the number of sensitive receptors along each proposed Option, the following score has been assigned to the six Options.

Option	Do-Nothing/ Do-Minimum	Option A (Cyan)	Option B (Green)	Option C (Yellow)	Option D (Pink)	Option E (Blue)	Option F (Red)
Overall Ranking	4 - Not significant or neutral	5 - Minor or slightly positive	5 - Minor or slightly positive	3 - Minor or slightly negative	3 - Minor or slightly negative	3 - Minor or slightly negative	2 - Moderately negative

Table 7-13 Overall Score (Air Quality and Climate)

Option F is ranked as 'Moderately negative' as it has the highest numbers of sensitive receptors within 50m of the carriageway (49). Options C-E received a score of 'Minor of Slightly Negative', as they also have a high number of sensitive receptors within 50m of the carriageway.

Options A and B are ranked as 'Minor or Slightly Positive' as there is a lower number of sensitive receptors within 50m of the carriageway of these Options, including residential properties and community facilities, which may be impacted by temporary air quality impacts during construction works. Beyond 200m, the contribution of vehicle emissions from the roadside to local pollution levels is likely to be not significant for both Options.

The Do-Nothing/Do-Minimum Option received a score of 'Not Significant or neutral' as there are two sensitive receptors within 50 m of the works. The Do-Nothing/Do-Minimum consideration would have no air quality benefits for the area.

7.5.8 Population and Human Health

7.5.8.1 Introduction

The population and human health element of the Stage 1 Preliminary Options Assessment includes an examination of the potential impacts on the local population and human health from each of the Options.

The main potential impacts from each of the Options on population and human health are likely to comprise air emissions, noise, visual and traffic impacts.

7.5.8.2 Methodology

The assessment has been carried out in accordance with Stage 1 of the option selection process outlined in TII's PMG's 2017, as well as TII's '*Project Appraisal Guidelines for National Roads, Unit 7.0-Multi Criteria Analysis'* (2016).

A review of the data collected during the constraints study was conducted for Stage 1 Preliminary Options Assessment.

The purpose of the Population and Human Health evaluation is to identify and assess potential health and wellbeing effects of each of the Options on the surrounding population, any potential effects of each Option on the local community and users of the road.

Impact categories considered include:

- Journey Characteristics;
- Journey Amenity;
- Severance;
- Population;
- Employment; and
- Health Demographics.

Impacts can be positive, negative or neutral.

Journey Characteristics

The assessment of journey times and patterns is dependent on journey characteristics such as the journey start and end point, when the journey occurred and if it was a motorised or non-motorised journey. Journey length is considered as the distance of the journey, while duration is the time it takes to complete the journey. New transport routes and facilities can improve connectivity, reduce journey duration and severance, and can have knock on implications on the transport mode used and economic development amongst others.

Positive effects can result from decreases in journey length and duration while negative effects occur where an increase in journey length or duration occurs.

Severance

Community severance relates to the degree to which movement and activities within a community are affected by the presence of a road. The definition of severance is not precise but can be considered as "the separation of residents from facilities and services they use within their community caused by new or improved roads or by changes in traffic flow". It can be measured as the creation of, or, relief from severance.

Roads can act as barriers, altering journey times and patterns and deterring people from using local community facilities or can remove barriers and facilitate access. New roads can provide relief from severance by reducing traffic volumes, moderating traffic speeds and through the provision of crossing facilities within the design phase of the proposed development or could create a barrier in the form of a new fence, road, increased traffic or the requirement to detour. Severance can also be caused by the demolition of community facilities or through the loss of lands used by the local community.

Journey Amenity

Journey amenity value can be considered as "*the relative pleasantness of a journey*" and is concerned with changes in the degree and duration of exposure to traffic and the impact of the road itself. Journey amenity is influenced by factors such as the level of traffic on a road, the proximity of pedestrian and cyclist facilities to the road, visual intrusions along the route and the provision of crossings. Other considerations include the health and general amenity of the local community; this includes community wellbeing.

A perceived improvement in amenity could occur where pedestrians and other road users experience a reduction in road related visual effects or traffic volumes, while a reduction in amenity value could occur following an increase in traffic volumes or road related visual effects. The significance of impacts relates to the nature of the environment affected, the duration of the effect, and the probability of its occurrence. It must be considered however that amenity values and changes in amenity values are subjective, changing from one person to the next.

The main consideration is for pedestrians and cyclists; however, amenity considerations also apply to drivers and consider factors such as fear of safety.

7.5.8.3 Existing Environment

All six Options are located within the following ED's:

- Abbey West
- Abbey East

Information on population statics for each ED is outlined in Section 5.4.11.

7.5.8.4 Impact Assessment

For all of the Options, potential excavations and earthworks, temporary stockpiling of potentially dusty materials, cutting and grinding of materials and cement, and construction traffic are expected to result in some temporary air quality, noise and neighbourhood amenity impacts, which have the potential to affect physical and mental health during the construction phase. Given the scale of each of the Options, and with best practice control measures, it is not anticipated that this will result in any significant impacts to the human health in the area.

As outlined in Section 7.4.2.2.3, there is potential for temporary, negative impacts to amenity value of the Abbert River during the construction phase of any of the Options. Given the scale of the Options, it is likely that this will not result in a significant impact to the amenity value of the river.

As outlined in Section 7.3.2.5, Options D-F were ranked as 'low' preference as they will likely have the most landscape and visual effects, while A-C were ranked as 'medium' preference. However, there will be residential visual impacts from these Options due to the routing in close proximity of residences when bridging the Abbert River. There will also be significant effects on the visual amenity of the Cistercian Abbey.

All proposed Options will assist in alleviating congestion issues around Liss Bridge at the local level, while also improving safety for both motorised and non-motorised users in the area. The introduction of any dedicated pedestrian/cycle facilities will give the option of trips to/from the community facilities (school, GAA Club, creche and Church) and the residential area to the west of the study area. Therefore, all Options could potentially result in a slight positive impact to journey characteristics and amenity value in the local area once operational.

The additional bridge crossing over the Abbert River has the potential to improve connectivity to the community facilities for locals; which could potentially result in a slight- moderate positive impact on the local community and the population.

Given the size, nature and of each of the Options, the construction phase of any of these Options will potentially create small scale temporary employment within the surrounding area. It is likely that the impact on employment will be an imperceptible to slight, positive impact.

A detailed consideration of the impacts and the potential requirement mitigation measures will be completed during Phase 3 'Design and Environmental Evaluation' of the Emerging Preferred Option.

7.5.8.5 Summary

Based on the potential impacts associated with each Option, the following score has been assigned to the six Options.

Option	Do-Nothing/ Do-Minimum	Option A (Cyan)	Option B (Green)	Option C (Yellow)	Option D (Pink)	Option E (Blue)	Option F (Red)
Overall Ranking	2 - Moderately negative	6 - Moderately positive	6 - Moderately positive	6 - Moderately positive	6 - Moderately positive	6 - Moderately positive	6 - Moderately positive

Table 7-14 Overall Score (Population and Human Health)

As outlined in Section 7.3.2.5, there will be residential visual impacts from all Options due to the routing in close proximity of residences when bridging the Abbert River. There will also be significant effects on the visual amenity of the Cistercian Abbey. However, overall, all six Options will likely result in a positive impact as they will all assist in alleviating congestion issues around Liss Bridge at the local level, while improving safety for both motorised and non-motorised users.

The additional bridge crossing over the Abbert River has the potential to improve connectivity to the community facilities for all in the local in the area.

The Do-Nothing/Do-Minimum received a score of 'Moderately negative' as the opportunity to improve congestion issues at Liss Bridge, while improving safety for both motorised and non-motorised users would be lost.

7.5.9 Cultural Heritage (incorporating Architectural Heritage, Archaeology and the Historic Landscape)

7.5.9.1 Introduction

The Cultural Heritage element of the Stage 1 Preliminary Options Assessment includes an examination of the potential of all recorded archaeological and architectural features that are potentially affected by each Option.

7.5.9.2 Methodology

A desktop study has been undertaken to identify Archaeological and Cultural Heritage sites within the study area and follows on from the constraints study. The information was derived from a number of sources, including:

- Online records of the Archaeological Survey of Ireland (www.archaeology.ie) at the National Monuments Service
- Statutory Record of Monuments and Places (1997) for County Galway
- Records of National Monuments and Preservation Orders available from the National Monuments Service
- Architectural heritage features and designed landscapes recorded in the statutory National Inventory of Architectural Heritage (NIAH)
- Annual gazetteer of licensed archaeological excavations in Ireland at www.excavations.ie
- Record of Protected Structures (architectural heritage) in the Galway County Development Plan 2015-2021
- First and second editions of the Ordnance Survey six-inch series at www.archaeology.ie
- Ordnance Survey twenty-five inch series at www.archaeology.ie

The Archaeology & Cultural desk study looked at the potential impact each of the Options would have on adjacent National Monuments, RMP sites and Protected Structures.

The study involved detailed interrogation of the archaeological, historical and architectural background information on the study area containing the Options, with specific assessment paid to a corridor of 250 m either side of the centrelines.

7.5.9.3 Impact Assessment

Option A passes 99m to the south-east of Abbeyknockmoy Cistercian Abbey (GA058-004001), which is a National Monument (NM No. 166). Within the abbey precincts is a graveyard (GA058-004003). Option A also passes 200m to the south-east of a field system, associated with the monastic site (GA058-004004). Within the field system, immediately to the north of the abbey is a rectangular building (which measures 11.35m east-west by 5.8m north-south internally) (GA058-004002). The building was investigated during excavations at the abbey in 1982 and 1983 (Sweetman 1987, 1-12). The aforementioned field system, which is also designated as a National Monument (NM No. 166 & PO No. 4/1989), is recorded in the RMP as a series of fields covering an area c. 550m north-west to south-east by c. 400m north-east to south-west to the north and west of the abbey. However, inspection of aerial photography suggests that traces of this field system may also extend to the east and south of the abbey, directly in the line of Option A. This Option will impact upon the south-easterly extent of the medieval field system associated with the abbey. Option A will also adversely affect the rural setting of the Cistercian Abbey and surrounding precinct, and there is a likelihood that buried, previously unrecorded archaeological remains occur along this Option. Option A passes 209m to the north of a seven-arch limestone road bridge (NIAH No. 30405811). Known as Liss Bridge, the structure carries the current N63. There will be an impact on this built heritage asset with a visual intrusion within its setting. No other known cultural heritage receptors, whether archaeological or built heritage are situated within 250m of Option A.

Option B passes 340m to the south-east of Abbeyknockmoy Cistercian Abbey (GA058-004001), which is a National Monument (NM No. 166). Within the abbey precincts is a graveyard (GA058-004003). Option B also passes 390m to the south-east of a field system, associated with the monastic site (GA058-004004). The field system, which is also designated as a National Monument (NM No. 166 & PO No. 4/1989), is recorded in the RMP as a series of fields covering an area c. 550m north-west to

south-east by c. 400m north-east to south-west to the north and west of the abbey. However, inspection of aerial photography suggests that traces of this field system may also extend to the east and south of the abbey, 230m south-east of Option B. Option B will affect the rural setting of the Cistercian Abbey and the surrounding precinct, and there is a likelihood that buried, previously unrecorded archaeological remains occur along this Option. Option B passes 174m to the north of Rose Villa (NIAH No. 30405814), a detached three-bay, single-storey teacher's house, built c. 1870. It also passes 209m to the north of Liss Bridge (NIAH No. 30405811). No other known cultural heritage receptors, whether archaeological or built heritage are situated within 250m of the Green Option (B).

Option C passes immediately to the north of Rose Villa (NIAH No. 30405814). It also passes 104m west-north-west of a detached open-air handball alley (NIAH No. 30405810), built in c. 1950, and now disused. It runs 197m north-west of St Bernard's Church (NIAH No. 30405815), the local Roman Catholic church, built in c.1820. It also runs 90m to the north of Liss Bridge (NIAH No. 30405811). There will be an impact on these built heritage assets with a visual intrusion within their settings. No other known cultural heritage receptors, whether archaeological or built heritage are situated within 250m of Option C. While Option C will not affect any standing or visible monuments, there is a possibility that buried, previously unrecorded archaeological remains occur along this Option.

Option D passes immediately to the north of Rose Villa (NIAH No. 30405814). It also passes 32m west-north-west of the disused open-air handball alley (NIAH. 30405810). It runs 132m north-west of the local Roman Catholic church of St Bernard's (NIAH No. 30405815). It also runs 25m to the north of Liss Bridge (NIAH No. 30405811). There will be an impact on these built heritage assets with a visual intrusion within their settings. No other known cultural heritage receptors, whether archaeological or built heritage are situated within 250m of Option D. While Option D will not affect any standing or visible monuments, there is a possibility that buried, previously unrecorded archaeological remains occur along this Option.

Option E passes immediately to the north of Rose Villa (NIAH No. 30405814). It also passes immediately to the south of the handball alley (NIAH No. 30405810), and 86m to the north of St. Bernard's Church (NIAH No. 30405815). It passes right over Liss Bridge (NIAH No. 30405811). There will be an impact on these built heritage assets with a visual intrusion within their settings, and a possible constructional impact on Liss Bridge. No other known cultural heritage receptors, whether archaeological or built heritage are situated within 250m of Option E. While Option E will not affect any standing or visible monuments, there is a possibility that buried, previously unrecorded archaeological remains occur along this Option.

Option F passes immediately to the north of Rose Villa (NIAH No. 30405814), 86m to the north of St. Bernard's Church (NIAH No. 30405815), immediately to the south of the handball alley (NIAH No. 30405810), and 120m south of Liss Bridge (NIAH No. 30405811). There will be an impact on these built heritage assets with a visual intrusion within their settings No other known cultural heritage receptors, whether archaeological or built heritage are situated within 250m of Option F. While Option F will not affect any standing or visible monuments, there is a possibility that buried, previously unrecorded archaeological remains occur along this Option.

All Options have the potential to affect previously unrecorded, buried archaeological remains – of all periods, from early prehistory to post-medieval times – but especially Options A and B, which pass close to the Abbey precinct and therefore have a higher potential for the discovery of associated medieval features.

7.5.9.4 Summary

Based on the potential impacts along each Option, the following score has been assigned to the six Options.

Option	Do-Nothing/ Do-Minimum	Option A (Cyan)	Option B (Green)	Option C (Yellow)	Option D (Pink)	Option E (Blue)	Option F (Red)
Overall Ranking	4 - Not significant or neutral	1 - Major or highly negative	2 - Moderately negative	3 - Minor or slightly negative	3 - Minor or slightly negative	1 - Major or highly negative	3 - Minor or slightly negative

Table 7-15 Overall Score (Cultural Heritage)

Option A is ranked as 'Major or highly negative' as it crosses a field system associated with the Cistercian Abbey. The Option also passes in close proximity to the abbey itself. Both abbey (NM No.

166; GA058-004001), and field system (NM No. 166 & PO No. 4/1989; GA058-004004) are protected National Monuments.

Option B received a score of 'Moderately negative' as it passes in close proximity to the Cistercian Abbey (NM No. 166; GA058-004001) and an associated medieval field system (NM No. 166 & PO No. 4/1989; GA058-004004) which are both protected National Monuments.

Options C, D and F each received a score of 'Minor or slightly negative', as they pass within the immediate vicinity of Rose Villa (NIAH No. 30405814) and the handball alley (NIAH No. 30405810) posing a visual intrusion on their settings. These Options had the least impact on cultural heritage receptors.

Option E received a score of 'Major or highly negative' as it passes directly over the pre-existing Liss Bridge (NIAH 30405811) which is a Protected Structure (RPS No. 3925).

The Do-Nothing/Do-Minimum Option received a score of 'Not Significant or neutral' as no works are proposed outside of the current N63 line.

Figures in Appendix B shows the location of identified Archaeology and Cultural Heritage constraints.

7.5.10 Material Assets - Agriculture

As outlined in the TII's '*Project Appraisal Guidelines for National Roads, Unit 7.0- Multi Criteria Analysis'* (2016), the impact on agriculture can potentially be one of the most significant impacts of a road scheme due to the largely rural nature of green field schemes.

The area along the N63 studied for the Option selection extends for approximately 2km in length and 0.35 km in width between the townlands of Moyne and Culliagh North – passing through townlands Clashard, Abbey (Tiaquin By), Chapel Field and Liss (Tiaquin By). There is ribbon development along the existing N63, and the land adjoining is predominantly in agricultural use. The farm enterprises are predominantly beef and there are no forestry plantations.

The Options pass through 57 agricultural land parcels as identified in the PRAI Property website.

This assessment compares the potential agricultural impacts of each of the six Options.

Details of topography and soils is outlined in Section 3.9.4.

7.5.10.1 Methodology

The assessment has been carried out in accordance with the option selection process outlined in TII's PMG's 2017, as well as TII's '*Project Appraisal Guidelines for National Roads, Unit 7.0- Multi Criteria Analysis'* (2016).

As per the TII's 2016 PAG guidance, the degree to which a new road effects on agricultural property depends on a number of issues such as:

- The type of farm enterprises carried out;
- Farm size;
- The degree of severance with mitigation;
- Viability; and
- Removal of buildings and/or facilities.

Each Option is assumed to start and finish at the same point – therefore some corridors will include the existing N63.

For this assessment, the Options were examined in terms of their overall length, their length through agricultural land, length through non-agricultural land (on-line road sections), proximity to farm yards, potential impacts on high sensitivity enterprises and severance of farms. The land quality was also examined at a high level by measuring the length of the Option corridor through low-lying and wet soils.

7.5.10.2 Existing Environment

As outlined in Section 5.4.5, generally, land south of the N63 is better quality and the agricultural potential is higher here. Conversely, land along the Abbert River is low lying and wet and has a lower agricultural potential. The farm enterprises are predominantly beef and there are no forestry plantations.

Further information can be found in Section 5.4.5.

7.5.10.3 Impact Assessment

The primary impact is loss of agricultural land is not mitigatable and this will generally be related to the length of the proposed Options . Where Options have similar lengths through agricultural land other potential impacts are examined to select the Emerging Preferred Option; such as; potential impacts on farm yards, impacts on high sensitivity enterprises and the land quality of each Option corridor.

Six Options were examined and compared in terms of agricultural land use impacts. The Options are listed in Table 7-16.

Option	Option A (Cyan)	Option B (Green)	Option C (Yellow)	Option D (Pink)	Option E (Blue)	Option F (Red)
Length (m)	2120	2080	2060	2060	2040	2100
On-line length (m)	775	925	2173	1430	1415	1922
Agri land-take (length m)	1705	1500	315	846	690	325
Farms Severed (No.)	11	11	0	3	2	2
Farmyards within 50m (No.)	0	0	0	0	0	0
High sensitivity farms affected (No.)	0	0	0	0	0	0
Length through Alluvial/wet soils (m)	260	500	190	315	0	170

Table 7-16 Option corridor agronomy / land-use attributes

Option A (Cyan)

Approximately 2.12km in length of which 355m is a southern link road to the N63. It is on-line with existing road for approximately 0.77km. It crosses agricultural land for 1.7kms and through low lying wet land for 260m. There are no farm yards within 50m of the centre-line and no high sensitivity farm enterprises along the Option. It will sever 11 land parcels.

Option B (Green)

Approximately 2.08km in length of which 345m is a southern link road to the N63. It is on-line with existing road for approximately 0.92km. It crosses agricultural land for 1.5kms and through low lying wet land for 500m. There are no farm yards within 50m of the centre-line and no high sensitivity farm enterprises along the Option. It will sever 11 land parcels.

Option C (Yellow)

Approximately 2.06km in length of which 220m is a southern link to the N63. It is on-line with existing road for approximately 1.4km. It crosses agricultural land for 0.85kms and through low lying wet land for 315m. There are no farm yards within 50m of the centre-line and no high sensitivity farm enterprises along the Option. It will sever 3 land parcels.

Option D (Pink)

Approximately 2.06km in length of which 165m is a southern link to the N63. It is on-line with existing road for approximately 1.9km. It crosses agricultural land for 0.3kms and through low lying wet land for 170m. There are no farm yards within 50m of the centre-line and no high sensitivity farm enterprises along the Option. It will sever 2 land parcels.

Option E (Blue)

Approximately 2.04km in length (including existing N63) of which 180m is a northern link road and 220m is a southern link to the N63. It is on-line with existing road for approximately 2.17km. It crosses agricultural land for 0.3kms and through low lying wet land for 190m. There are no farm yards within 50m of the centre-line and no high sensitivity farm enterprises along the Option. It will not sever land parcels.

Option F (Red)

Approximately 2.1km in length and is on-line with existing road for approximately 1.4km. It crosses agricultural land for 0.69kms. There are no farm yards within 50m of the centre-line and no high sensitivity farm enterprises along the Option. It will sever 2 land parcels. It crosses land south of the N63 which has a slightly higher agricultural potential.

Option	Option A (Cyan)	Option B (Green)	Option C (Yellow)	Option D (Pink)	Option E (Blue)	Option F (Red)
Agri land-take	6	5	3	1	1	3
Farms Severed	5	5	4	2	1	2
Length through Alluvial/wet soils	4	6	5	2	3	1

Table 7-17 Ranking of impacts of each Option corridor

The total length is generally not relevant from an agricultural impact point of view where on-line sections of Option corridor are a significant portion of its length. The length through agricultural land is the most relevant measure of potential land-take. All Options are similar for impact on farm yards and highly sensitive enterprises. Option F is the only Option corridor to cross land south of the N63.

7.5.10.4 Summary

Based on the potential impacts associated with each Option on agricultural land in the area, the following score has been assigned to the six Options.

Option	Do-Nothing/ Do-Minimum	Option A (Cyan)	Option B (Green)	Option C (Yellow)	Option D (Pink)	Option E (Blue)	Option F (Red)
Overall Ranking	4 - Not significant or neutral	2 - Moderately negative	2 - Moderately negative	3 - Minor or slightly negative	3 - Minor or slightly negative	3 - Minor or slightly negative	3 - Minor or slightly negative

Table 7-18 Overall Score (Material Assets – Agriculture)

The Do-Nothing/Do-Minimum Option received a score of 'Not significant or neutral' as no work is proposed the outside footprint of the current N63.

Options A and B both scored 'Moderately negative'. Option B has considerably higher land takes than the other corridors, but less than the Option A. It will sever most agricultural land parcels. Option B crosses wet land for longer than Option A.

Options C-F have all scored 'Minor or slightly negative' from an agricultural impact point of view. All of these Options will result in agricultural land take and severance of land parcels.

7.5.11 Material Assets - Non-Agriculture

7.5.11.1 Introduction

The assessment has been carried out in accordance with the option selection process outlined in TII's PMG's 2017, as well as TII's '*Project Appraisal Guidelines for National Roads, Unit 7.0- Multi Criteria Analysis'* (2016).

This section will evaluate the following economic assets of the site and environs:

- Utilities including:
  - Electricity Network;
  - Telecommunications (including phone and broadband);
  - Gas Distribution Networks;
  - Water supply networks; and
  - Sewerage networks.
- Land Use and Property (non-agricultural): an assessment of impacts on housing, ownership, severance, loss or rights of way or amenities, or other changes likely to alter the character and use of the surroundings.

The assessment of potential impacts associated with the generation of unusable or unwanted waste materials that may arise during the construction phase is also addressed in this section.

Waste is defined as per the Waste Framework Directive, as amended, as "*any substance or object which the holder discards or intends or is required to discard*."

7.5.11.2 Methodology

The assessment has been carried out in accordance with the option selection process outlined in TII's PMG's 2017, as well as TII's '*Project Appraisal Guidelines for National Roads, Unit 7.0- Multi Criteria Analysis'* (2016).

Properties located outside of the footprint of each of the Options (within 100m) are also considered within this assessment as the Option alignments may change at a later stage, which could result in a direct impact to these properties.

As outlined in the TII's '*Project Appraisal Guidelines for National Roads, Unit 7.0- Multi Criteria Analysis'* (2016) road schemes have the potential to produce significant amounts of waste where a cut/fill balance cannot be achieved. Disposal of material can have adverse effects on the environment in terms of transport of material to/from site, as well as issued with regards to disposal to licenced sites.

The TII's '*Project Appraisal Guidelines for National Roads, Unit 7.0- Multi Criteria Analysis'* (2016) outline the following elements that should be considered in the options assessment:

- Quantities of material to be disposed off-site (unsuitable and suitable material); and
- Any contaminated land/hazardous material is being left in site.

However, exact types and quantities of waste are not available at this stage, more details will become available during the detailed design stage.

7.5.11.3 Existing Environment

Utilities

The desktop study found that the following companies have identified apparatus within the study area:

- Eir;
- ESB;
- Cuillagh Group Water Scheme, and;
- Irish Water.

Note; At the time of writing there are a number of Utility Companies that are still to issue information at the time of writing.

Land Use and Property

The location of all of the Options is characterised by presence of open greenfield area with some wooded areas in the section south of the Abbert River. The study area contains the Abbert River, a tributary river of the Lough Corrib SAC, to the south. The existing N63 is lined by residential properties, with several community facilities at the junction with the L3110

Waste

All Options are located within the Connacht Ulster Region (CUR), managed by Mayo County Council, the Waste Enforcement Regional Lead Authority (WERLA). In terms of waste management, the WERLA are responsible for implementing the Connacht Ulster Region Waste Management Plan (CURWP) 2015-2021, as well as setting priorities and common objectives for waste enforcement within the region.

Waste management in Galway is largely governed by the requirements set out in the CURWP.

The baseline target for the recovery of non-hazardous construction and demolition waste (excluding soil and stone) is at least 70% by weight by 2020, as set out in the WFD, as amended. Uncontaminated excavated soil and stones (EPA's List of waste (LoW code 17 05 04) is specifically excluded from this target. In 2014, 3,314 ktonnes of construction, demolition and excavation waste in Ireland were finally treated (recovered or disposed). Soil and stones accounted for 74 % of the total quantity. Mineral waste (concrete, bricks, gypsum) accounted for 12 per cent of the total quantity[23].

[23] EPA, 2014 Construction & Demolition Waste Statistics for Ireland Available at: http://www.epa.ie/nationalwastestatistics/constructiondemolition/

The EPA's 'Progress to EU Targets' report published on 26th October 2018 shows that Ireland achieved 68% recovery in 2014 and are on track to meet the target deadlines.

7.5.11.4 Impact Assessment

Utilities

During the construction phase of any of the proposed Option, some realignment, or replacement of services and utilities may be required in conjunction with or to accommodate the proposed works; these works could potentially result in suspension of services during the construction and diversion works, which could likely result in a slight impact to the existing network.

At this stage of the project, the exact locations of all services and utilities along each Option is unknown; therefore, it is difficult to determine the locations where conflicts with significant trunk and distribution services occur along each Option.

During the preliminary design phase, exact locations where conflicts with significant trunk and distribution services occur along the Emerging Preferred Option will be identified, and preliminary designs and budget costs for the necessary service diversions will be developed following discussions with the utility providers.

A detailed consideration of the impacts and mitigation requirements will be completed during the environmental assessment process for the Emerging Preferred Option.

Land Use and Properties

The majority of the land use surrounding the Options is agricultural in nature, which is discussed and assessed in the above section 7.3.11.3.

As discussed earlier, Options A and B traverse through predominately open green fields, with fewer properties located close to these Options, when compared to the other Options.

The southern section of Options C-F follow closely to the existing N63 line, with a number of residential properties and community facilities dotted along each side of this road (within 50m).

It is therefore not anticipated that there will be any requirement for demolition or partial land take on any of the properties located adjacent to the Options.

No properties are located within the footprint of any of the six Options. It is proposed to undertake the majority of the online upgrade works within the footprint of the existing N63 line. It is therefore not anticipated that there will be any requirement for demolition of properties; however, the southern section of all Options may require minor acquisition of land at the tie ins.

During the construction phase, it is anticipated that there may be potential negative vibration impacts to residential and commercial properties and community facilities surrounding each of the Options; however, these impacts will be temporary and therefore are not likely to cause significant impacts to residential and commercial properties in the area.

A detailed consideration of the impacts and the potential requirement mitigation measures will be completed during Phase 3 'Design and Environmental Evaluation' of the Emerging Preferred Option.

Waste

During the construction phase a range of waste materials will be generated, including excavated material. It is anticipated that the majority of the waste, where reasonably possible, will be reused and recycled, with the remaining waste materials being disposed of by licensed waste contractors in accordance with the relevant national and EU legislation.

As outlined above, exact quantities of waste volumes are no known at this stage; however, given the scale of the Options, no significant effects from the generation and management of solid waste streams arising from the any of the Options, in the context of the existing local and national resource and waste management environment, are anticipated.

A detailed consideration of impacts from waste and the potential requirement mitigation measures will be completed during Phase 3 'Design and Environmental Evaluation' of the Emerging Preferred Option.

7.5.11.5 Summary

Based on the potential impacts associated with each Option on material assets in the area, the following score has been assigned to the six Options.

Option	Do-Nothing/ Do-Minimum	Option A (Cyan)	Option B (Green)	Option C (Yellow)	Option D (Pink)	Option E (Blue)	Option F (Red)
Overall Ranking	4 - Not significant or neutral	3 - Minor or slightly negative	3 - Minor or slightly negative	3 - Minor or slightly negative	3 - Minor or slightly negative	3 - Minor or slightly negative	3 - Minor or slightly negative

Table 7-19 Overall Score (Material Assets – Non-Agriculture)

Options A-F were all scored as 'Minor or slightly negative' as all Options could potentially result in temporary, negative impact of slight significance to existing services in the area during the construction phase. In addition to this, it is anticipated that there may be potential negative vibration impacts during the construction phase to residential and commercial properties, as well as community facilities surrounding each of the Options. The southern section of all Options may require minor acquisition of land at the ties in.

The Do-Nothing/Do-Minimum Option received a score of 'Not significant or neutral' as no work is proposed the outside footprint of the current N63.

7.6 Economic Assessment

The Stage 1 Preliminary Options Assessment process looked at the Economic benefits assessment under the sub headings of;

- Efficiency & Effectiveness;
- Wider Economic Impacts;
- Transport Quality & Reliability; and
- Funding Impacts.

7.6.1 Efficiency & Effectiveness

To maximise efficiency and travel time the Option must be an effective alignment to allow for traffic to flow freely for as great a time as possible. The Options that maximise the offline alignment will result in a beneficial result, Options A and B. Whereas the Options that rely on the existing alignment more will not be as beneficial, Options C and D. Option F will have an insignificant or neutral impact because vehicles will still have to travel through the Abbeyknockmoy community area. Option E will result in a negative impact as it uses the existing river crossing which will not add any travel time benefits.

7.6.2 Wider Economic Impacts

Wider Economic Impacts will follow a similar methodology the Efficiency & Effectiveness rating with the more offline Options offering a better travel time and allowing for cars and goods vehicles to pass through the area more efficiently.

7.6.3 Transport Quality & Reliability

Transport Quality & Reliability will follow a similar methodology the Efficiency & Effectiveness rating with the more offline Options offering better high-speed alignments that will allow vehicles to travel through the area easier without having to navigate any sub-standard road alignments.

7.6.4 Funding Impacts

The software programme COLBALT was used to calculate the present value benefits, present value costs, net present value, and benefit cost ratio for each Option. The forecast average speed along each of the proposed schemes, for the purpose of initial assessment, was 80km/h.

The results are shown in below. The Benefit Cost Ratio includes residual impacts beyond the design life of the scheme.

Scenario	Present Value Benefits (PVB) (€ Million)	Present Value Costs (PVC) (€ Million)	Net Present Value (NPV) (€ Million)	Benefit Cost Ratio (BCR)
Option A (Cyan)	16.11	11.07	5.04	1.45
Option B (Green)	16.38	11.71	4.67	1.40
Option C (Yellow)	17.81	10.71	7.10	1.66
Option D (Pink)	16.56	12.09	4.48	1.37
Option E (Blue)	19.28	10.16	9.13	1.90
Option F (Red)	15.68	14.78	0.91	1.06

Table 7-20 Economic Assessment Summary

Analysis of the above results revealed that Option E provides the highest benefit, this is due to the reduced construction costs, but it does not offer any traffic benefits. Options A-C are shown to provide lower (but comparable) traffic benefits.

At Stage 1, the cost estimates are largely guided by Option length and the number and sizes of structures required. This shows a clear relative preference for Option C, with Options D and F having a low preference. Although the Do-Nothing/Do-Minimum default to a high preference for minimal cost, this is considered to be outweighed by the failure to provide the desired traffic or safety benefits.

When the costs and traffic benefits are combined, the overall economic preference for Option C and medium preference for Options A and B are apparent. Considering the significantly higher costs and the sub-optimal traffic benefits, Option F is considered a low preference.

7.6.5 Summary (Economic Assessment)

Based on the potential economic benefits associated with each Option, the following score has been assigned to the six Options.

Option	Do-Nothing/ Do-Minimum	Option A (Cyan)	Option B (Green)	Option C (Yellow)	Option D (Pink)	Option E (Blue)	Option F (Red)
Overall Ranking	3 - Minor or slightly negative	5 - Minor or slightly positive	6 - Moderately positive	5 - Minor or slightly positive	4 - Not significant or neutral	3 - Minor or slightly negative	4 - Not significant or neutral

Table 7-21 Overall Score – Economic Assessment

7.7 Stage 1 Preliminary Options Assessment Conclusion

The table below summarises the findings of the Stage 1 Preliminary Options Assessment, with the full assessment table contained in Appendix D.

	Engineering	Environmental	Economy	Progress to next stage?
Do-Nothing / Do-Minimum Option	Minor or slightly negative	Not significant or neutral	Minor or slightly negative	**Yes**
Option A (Cyan)	Moderately positive	Major or highly negative	Minor or slightly positive	**Yes**
Option B (Green)	Major or highly positive	Moderately negative	Moderately positive	**Yes**
Option C (Yellow)	Minor or slightly positive	Moderately negative	Minor or slightly positive	**Yes**
Option D (Pink)	Not significant or neutral	Moderately negative	Not significant or neutral	**No**
Option E (Blue)	Minor or slightly negative	Moderately negative	Minor or slightly negative	**No**
Option F (Red)	Minor or slightly negative	Moderately negative	Not significant or neutral	**No**

Table 7-22 Options Assessment

Given the results of the Stage 1 Preliminary Options Assessment it was deemed to bring three Options to Stage 2; Options A, B and C as overall these three Options resulted in positive results.

8. Stage 2 – Project Appraisal of Options

8.1 Introduction

The Stage 2 Project Appraisal of Options (herein referred to as Stage 2) was based on three Options, A, B and C, which progressed from the Stage 1 Preliminary Options Assessment and Do-Minimum/Do-Nothing options.

Figure 8-1 below shows the three Options which progressed to Stage 2.

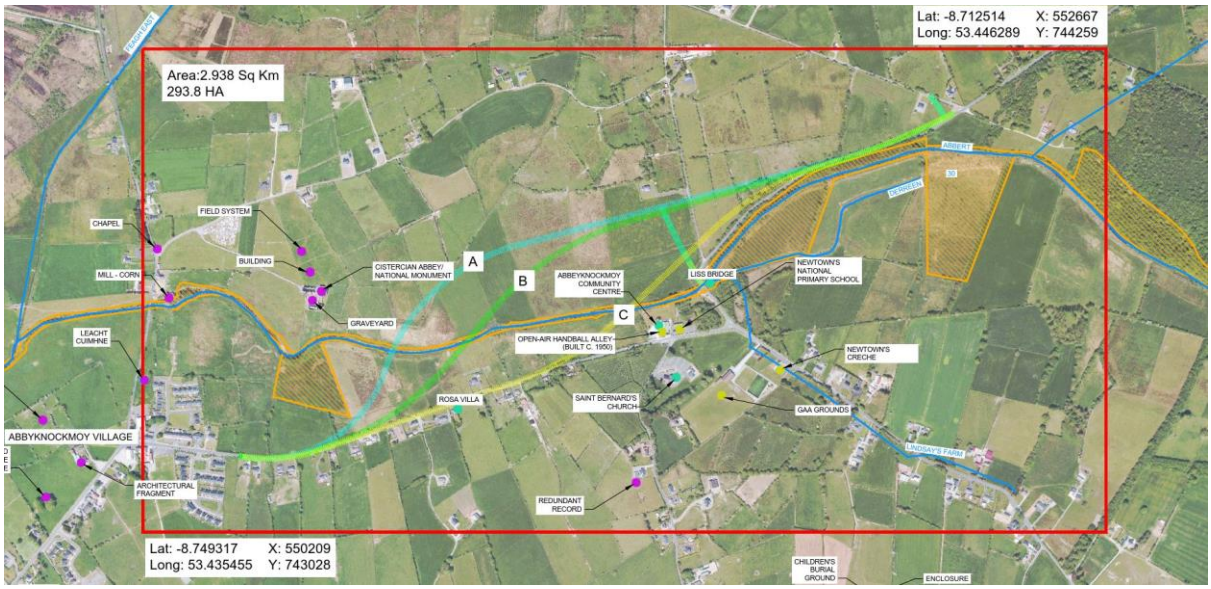


Figure 8-1 Stage 2 Options

Prior to the commencement of Stage 2, further assessments were carried out along each of the three Options. The purpose of these assessments was to identify specific issues and to refine the alignments where possible to reduce any potential impacts. Where possible, Options were amended locally and in consultation with all disciplines to minimise impacts, while respecting the study area constraints.

In accordance with the TII Project Management Guideline 2019 (PE-PMG-02041), a comparison of different Options was carried out using the six Common Appraisal Framework criteria:

- Economy,
- Safety,
- Environment,
- Integration,
- Accessibility & Social Inclusion, and
- Physical Activity[24].

Each of the three Options were ranked based on the same criteria as Stage 1, achieving a score between 'major or highly positive' to 'major or highly negative'. Where all Options are broadly similar in impact/benefit, a rating of a similar level has been used. The overall Stage 2 Options Assessment Matrix is included in Section 8.9 of this Option selection Report.

8.2 Stage 2 Options

All the Options presented in the following paragraphs include one new crossing of the Abbert River and an at grade junction with the L3110. All Options have the same tie-in points to the east and west of the study area. It is noted that all the alignments are only drafted, and no final decision has yet been made regarding any possible impact on existing properties or demolition of existing structures. The option to close the existing Liss Bridge to vehicular traffic is still under consideration, with a final decision intended

[24] Department of Transport, Tourism and Sport - Common Appraisal Framework For Transport Projects And Programmes (March 2016)

for the detailed design stage. For the purpose of Stage 2 all Options have been reviewed with the existing Liss Bridge remaining open to vehicles.

As part of the development of the Options and considering the feedback received at the scheme Public Consultation events, it is proposed to include facilities for non-motorised users along the existing N63. These facilities are expected to be implemented by provision of a footway and/or cycleway along one side of the existing N63, however the detail of this is subject to development at Phase 3 - Preliminary Design. As such, the provision for non-motorised users will not be required along the realigned section of the N63.

8.2.1 Option A (Cyan)

Beginning at the eastern side of the study area and travelling west this Option begins west of an existing crossroads that are to be realigned, the Option then runs westbound across a small area of woodland before crossing agricultural land. A new major/minor junction is proposed to tie in with the L3110, which will be extended across the existing Liss Bridge to tie into the new scheme. This Option extends west the furthest and creates the largest separation between the existing community facilities and the proposed alignment, but it does come in close proximity to the Abbey. The Option continues eastbound towards the Abbey and then sweeps southbound and crosses the Abbert River at a relatively perpendicular angle before sweeping west again and tying back into the existing road network before Abbeyknockmoy village.

8.2.2 Option B (Green)

Beginning at the eastern side of the study area and travelling west the Option begins west of an existing crossroads that are to be realigned, the Option then runs westbound across a small area of woodland before crossing agricultural land. A new major/minor junction is proposed to tie in with the L3110, which will be extended across the existing Liss Bridge to tie into the new scheme. The Option then sweeps southbound at a tighter radius than Option A and crosses the Abbert River at a skew before sweeping west again and tying back into the existing road network before Abbeyknockmoy village.

8.2.3 Option C (Yellow)

Beginning at the eastern side of the study area and travelling west the Option begins west of an existing crossroads that are to be realigned, this Option then runs westbound across a small area of woodland before crossing agricultural land, at a tighter radius than Option B. A new roundabout is proposed to tie in with the L3110, which will be extended across the existing Liss Bridge to tie into the new scheme. The Option then sweeps southbound and crosses the Abbert River at a skew before continuing southwest and tying back into the existing road network before an existing access track. This Option comes in close proximity of the rear of the school and the community centre after it crosses the river and before it ties back into the existing alignment, but there is no interaction between the Abbey and this Option. The existing road network from the tie in point up to Abbeyknockmoy is subject to online improvement as part of this Option.

8.3 Economic Assessment

The Stage 2 Economic Assessment was carried out as outlined below.

8.3.1 Cost Estimates

As part of the Economy Appraisal, the cost estimates prepared for the Stage 1 Preliminary Options Assessment were reviewed and refined to take account of the preliminary earthworks and junction designs and further refinement of the proposed structures, including updated span and widths and likely options for pedestrian/cycleway routing.

The costs for each Option are listed in Table 33 below:

Costs (Excluding VAT)	Do-Nothing / Do-Minimum	Option A (Cyan)	Option B (Green)	Option C (Yellow)
Length of Option	2.2km (Existing Network)	2.12km	2.08km	2.06km
Bridge Length	-	24m	33m	25m
Planning and Design	-	€0.75m	€0.80m	€0.73m
Property	-	€0.19m	€0.19m	€0.18m
Archaeology	-	€0.56m	€0.59m	€0.54m
Advance Works	-	€0.32m	€0.34m	€0.31m
Construction	-	€9.34m	€9.89m	€9.04m
Site Supervision	-	€0.21m	€0.23m	€0.21m
Residual Network	-	-	-	-
Total	**-**	**€11.62m**	**€12.29m**	**€11.24m**

Table 8-1 Option Feasibility Working Cost

Details of the cost estimate prepared for Stage 2 are included in Appendix G of this Option Selection Report.

8.3.2 Traffic Benefits

The three Options described above were assessed using COBALT modelling, with network statistics subsequently being extracted for the scheme opening and design years in order to assess the benefits of each Option. The key network statistics extracted was Journey Time Impacts.

These network statistics were then compared to those from the Do-Nothing/Do-Minimum scenario. The results of this comparison exercise are discussed below.

Table 8-2 outlines the key network statistics. Overall the tables show that all Options provide benefits for the entire network compared to the Do-Nothing/Do-Minimum scenario.

Option	Journey Time Impacts (€ Million)
Do-Nothing / Do- Minimum	-
Option A (Cyan)	8.45
Option B (Green)	8.57
Option C (Yellow)	9.20

Table 8-2 2037 Peak Network Statistics (All Vehicles)

The network statistics outlined above illustrates that Option C provided the greatest reduction in travel time through the network.

8.3.3 Benefit Cost Ratio

The benefit cost ratio is a function of the monetised benefits, Present Value of Benefits (PVB) versus the Present Value of Costs (PVC). In accordance with the Department of Transport, Tourism and Sport guidelines, a discount rate of 4% for the design life of the scheme (30 years), and falling to 3.5% after that, has been applied to the benefits. A shadow pricing for labour factor of 1.0, with a factor of 1.3 for public funds has been applied to the costs.

To ensure robustness within the economic appraisal, all Options have been assessed with an 80kph speed restriction applied, as indicated in section 3.3 of this Option Selection Report.

Table 8-3 below highlights the PVB and PVC and the associated Benefit to Cost Ratio (BCR) of each Option

Option	Present Value Benefits (PVB) (€ Million)	Present Value Costs (PVC) (€ Million)	Net Present Value (NPV) (€ Million)	Benefit Cost Ratio (BCR)
Option A (Cyan)	€ 16.11	€ 11.07	€ 5.04	1.45
Option B (Green)	€ 16.38	€ 11.71	€ 4.67	1.40
Option C (Yellow)	€ 17.81	€ 10.71	€ 7.10	1.66

Table 8-3 Stage 2 Options –Benefit to Cost Ratio

As can be seen in Table 8-3, all Options provide a benefit greater than the cost of construction; however Option C has the highest Benefit to Cost Ratio of 1.66.

8.3.4 Economic Summary

Table 8-4 below provides the overall Economic Ranking preference for each Option.

	Do-Minimum/ Do-Nothing Option	Option A (Cyan)	Option B (Green)	Option C (Yellow)
Efficiently & Effectiveness	Major or highly negative	Moderately positive	Major or highly positive	Minor or slightly positive
Wider Economic Impacts	Major or highly negative	Moderately positive	Major or highly positive	Minor or slightly positive
Transport Quality & Reliability	Major or highly negative	Moderately positive	Major or highly positive	Minor or slightly positive
Funding Impacts	Major or highly positive	Major or highly negative	Moderately negative	Minor or slightly negative
Overall Economic Ranking	Major or highly negative	Moderately positive	Major or highly positive	Minor or slightly positive

Table 8-4 Economic Summary

8.4 Safety Assessment

The safety of each Option has been assessed under the following headings:

- Total Collision Benefits Saved by Scheme
- Total Collisions Saved by Scheme
- Total Casualties Saved by Scheme (Fatal, Serious, Slight)

The assessment outcomes, based on a thirty-year design life, are shown in Table 8-5 below and detailed in the following sections.

	Do-Minimum / Do-Nothing Option	Option A (Cyan)	Option B (Green)	Option C (Yellow)
Total Collision Benefits Saved by Scheme	-	€ 1.274m	€ 1.354m	€ 1.554m
Total Collisions Saved by Scheme	-	16	17	19
Total Casualties Saved by Scheme (Fatal, Serious, Slight)	-	1, 2, 24	1, 2, 33	1, 2, 30

Table 8-5 Safety Assessments (COBALT Results)

8.4.1 Total Collision Benefits Saved by Scheme

A number of road collisions are currently recorded on the road network surrounding the proposed N63 Realignment Scheme.

The three proposed Options will reduce the levels of traffic congestion on the road network in the proximity of the existing Liss Bridge, likely providing a corresponding reduction in collisions along this link. By segregating the high-speed regional traffic and the slower local traffic there will be less of a chance of conflict between these two types of road users. In addition to that, these three Options will be complaint with the current design standards, this will ensure to achieve the maximum level of road safety. Providing a standard alignment for regional traffic it will offer better safety opportunities as it removes the risk of sub-standard horizontal and vertical alignments. Due to proposed junctions, and junction locations Option B is preferred, with Options A and C considered as 'Moderately positive'.

The Do-Nothing/Do-Minimum Option may provide some improvement to road safety as it is proposed to introduce traffic calming, but it does not do anything to address the horizontal or vertical curvature of the existing road network and has been assessed as 'Moderately negative'.

8.4.2 Junctions

For the Option comparison, a preliminary junction assessment was carried out to determine the types of junctions at the intersections between the national, regional and other local roads.

Although all junctions for each Option can be provided to standard, and all Options have a similar number of junctions, different classifications have been provided.

Option A has been assessed as 'Minor or slightly positive' as the connections to the existing road network are through major/minor junctions and a roundabout at the western extent of the scheme. Option B has the same junction layout as Option A but is the 'Moderately positive' option due to the horizontal alignment. Option C has been assessed as 'Major or highly positive' because it requires the construction of a new roundabout that could reduce the speed of traffic on a regional road.

The Do-Nothing/Do-Minimum option will not address current traffic congestion issues, and although it may address some junction upgrade issues, the road alignment will not be up to current standards, so it is deemed as the least preferred Option.

8.4.3 Compliance with Standards

As part of the Stage 2 process a preliminary centre line design of each Option was modelled.

All Options have been designed in compliance of the current design standards, with compliant alignment geometry and have been classed as similar.

8.4.4 Construction

The safety assessment considered the constructability of each option, considering the complexity of the works, with particular reference to the bridge structure, and the extent of works which would require an upgrade of the existing road network.

The upgrading of existing roads will require extensive traffic management to enable the construction works to proceed and generally result in a higher number of conflicts with the existing direct accesses to properties along the main road. Complexity of bridge construction has also been considered, specifically how the skew of the bridge will increase the complexity of construction.

Considering these reasons, Option A has been assessed as most preferred, B has been assessed as 'Moderately positive' and C have been assessed as 'Minor or slightly positive' due to the off-line works but still requiring a significant amount of online upgrade.

The Do-Nothing/Do-Minimum option has been assessed as least preferred, due to exclusive online construction works along congested roads.

8.4.5 Safety Summary

The overall safety ranking for each Option is listed in Table 8-6 below.

	Do-Nothing / Do-Minimum Option	Option A (Cyan)	Option B (Green)	Option C (Yellow)
Collision Benefits	Minor or Slightly Positive	Moderately Positive	Moderately Positive	Major or Highly Positive
Junctions	Not Significant or Neutral	Moderately Positive	Moderately Positive	Major or Highly Positive
Compliance with Standards	Moderately Negative	Moderately Positive	Moderately Positive	Moderately Positive
Construction	Moderately Negative	Major or Highly Positive	Moderately Positive	Minor or Slightly Positive
Overall Safety	Moderately Negative	Moderately Positive	Moderately Positive	Moderately Positive

Table 8-6 Safety Summary

8.5 Environmental Assessment

8.5.1 Biodiversity

Similar to Stage 1, the Stage 2 Project Appraisal involves undertaking a comparative evaluation of the Options, having regard to multiple factors in order to identify an Emerging Preferred Option.

For Stage 2, the specific biodiversity impacts associated with each Option are identified as part of the comparative evaluation.

8.5.1.1 Methodology

The assessment has been carried out in accordance with Stage 1 of the option selection process outlined in the TII's PMG's (2017), as well as TII's '*Project Appraisal Guidelines for National Roads, Unit 7.0- Multi Criteria Analysis*' (2016). The assessment was also carried out in accordance with NRA's environmental guidelines "*Guidelines on the assessment of Ecological impacts of National Road Schemes, and "ecological Surveying Techniques for Protected Flora and fauna during the Planning of National Road Schemes" and "Guidelines for Assessment of Ecological Impact of National Roads Schemes"*

The assessment was based on a desk study of freely available ecological information relevant to the study area and site walkovers carried out in July 2019 and January 2020. The biodiversity survey took into consideration the main habitat types in the area and included rare and invasive flora.

The study area for the biodiversity appraisal included the potential zone of influence of significant effects, which varies by receptor.

Consultation with statutory bodies will be required in future stages of the assessment process. Further field studies will be required during the next phases of the assessment.

8.5.1.2 Existing Environment

Information on the existing environment is outlined in Section 5.3.

8.5.1.3 Impact Assessment

Similar to Stage 1, in order to assess the relative merits of each of the identified Options from a biodiversity perspective, the likely impact each Option will have on biodiversity attributes.

A detailed assessment of likely impacts from the Option has been outlined in Section 7.3.2.2.4.

A brief summary of the likely impacts from the three Options is outlined below:

From a biodiversity perspective the Do-Nothing/Do-Minimum option is the most favourable as it will require minor works in comparison to other Options and would occur in the vicinity of the existing road carriageway. An additional crossing of the Abbert River is not proposed for the Do-Nothing/Do-Minimum option.

Options A-C are all considered 'Moderately negative.' This results from the significant greenfield land take required for these Options which could impact upon habitat connectivity, the crossing of the Abbert River and the loss of mature hedgerow where the eastern section of these options tie in with existing infrastructure. However, these options would avoid areas of mature woodland located in the eastern extent of the study area. The provision for a bridge over Abbert River, part of Lough Corrib SAC, could also cause potential impacts related to instream works or works in close proximity to the SAC. This could impact protected species such as the Freshwater White-clawed Crayfish should they be present and could also impact upon aquatic fauna and flora both at the construction site and downstream. All three Options will require the acquisition of greenfield lands and would likely result in the loss of treelines and hedgerows between agricultural fields. The removal of trees and hedgerows could impact upon bat roosts, and foraging success and could also impact upon breeding birds should trees be removed during the breeding season.

8.5.1.4 Summary

Option	Do-Nothing/Do-Minimum	Option A (Cyan)	Option B (Green)	Option C (Yellow)
Overall Ranking	7 - Major or Highly Positive	2 - Moderately Negative	2 - Moderately Negative	2 - Moderately Negative

Table 8-7 Overall Score (Biodiversity)

As identified by the summary table Options A-C are all considered 'Moderately negative' from a Biodiversity point of view. Each of these Options will require a crossing over the Abbert River which is part of the Lough Corrib SAC. All three Options will also require the acquisition of greenfield lands and would likely result in the loss of treelines and hedgerows between agricultural fields. The removal of trees and hedgerows could impact upon bat roosts, and foraging success and could also impact upon breeding birds should trees be removed during the breeding season. The provision for a bridge over Abbert River, part of Lough Corrib SAC, could also cause potential impacts related to instream works or works in close proximity to the SAC. This could impact protected species such as the Freshwater White-clawed Crayfish should they be present and could also impact upon aquatic fauna and flora both at the construction site and downstream.

From a biodiversity perspective the Do-Nothing/Do-Minimum option would be the most favourable as it will require minor works in comparison to other Options and would occur in the vicinity of the existing road carriageway. An additional crossing of the Abbert River is not proposed for the Do-Nothing/Do-Minimum option.

8.5.2 Water (incorporating hydrology)

Similar to Stage 1, the Stage 2 Project Appraisal involves undertaking a comparative evaluation of the Options, having regard to multiple factors in order to identify an Emerging Preferred Option.

For Stage 2, the specific water (hydrological) impacts associated with each Option are identified as part of the comparative evaluation.

8.5.2.1 Methodology

This appraisal has been carried out in accordance with Stage 2 of the option selection process outlined in TII's PMG's 2017, as well as TII's '*Project Appraisal Guidelines for National Roads, Unit 7.0- Multi Criteria Analysis*' (2016). The assessment was also carried out in accordance with NRA's '*Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes'*.

Further information can be found in Section 7.5.2.2.

8.5.2.2 Existing Environment

Information on the existing environment for each of the Options is outlined in Section 7.5.2.3.

8.5.2.3 Impact Assessment

Similar to Stage 1, in order to assess the relative merits of each of the identified Options from a geological, or hydrogeological perspective, the likely impact each Option will have on the respective geological, hydrological or hydrogeological attributes along each Option was assessed.

A detailed assessment of likely impacts from the Option has been outlined in Section 7.5.2.4.

A brief summary of the likely impacts from the three Options is outlined below:

- All Options require one crossing of the Abbert River, which is a designated SAC, therefore this attribute has an 'Extremely High' level of importance (Table 7-5). The risk of potential significant impacts occurring during both the construction and operational phases (in the absence of adequate management and mitigation measures) can arise from several activities; for example, construction of watercourse crossings, accidental spills and runoff from the road surfaces.
- Based on the information available to date, it is considered unlikely that any of the Options would potentially increase flood risk to existing properties; therefore, no significant flood risk impacts are likely. However, as mentioned previously, a more detailed assessment is required to better inform the assessment.

- There is potential for temporary, negative impacts to the amenity value of the Abbert River during the construction phase of any of the three Options. Given the scale of the Options and its low importance value (i.e. locally important amenity site) it is likely that this will result in an imperceptible impact to the overall amenity value of the river. If any culvert installation is required for any of the proposed Options, if not properly installed, they could act as a barrier to the movement of migratory fish, such as salmon, trout and eel.

A detailed consideration of the impacts and the potential requirement mitigation measures will be completed during Phase 3 'Design and Environmental Evaluation' of the Emerging Preferred Option. All three Options would only discharge surface water to any nearby watercourses following attenuation.

8.5.2.4 Summary

Table 8-8 below outlines the overall score for each Option.

Option	Do-Nothing/Do-Minimum	Option A (Cyan)	Option B (Green)	Option C (Yellow)
Overall Ranking	3 - Minor or slightly negative	2 - Moderately negative	2 - Moderately negative	2 - Moderately negative

Table 8-8 Overall Score (Water)

As shown in Table 8-8 Options A-C received a score of 'Moderately negative'. The three Options require one crossing over the Abbert River, a designated SAC of 'Extremely High' importance. As outlined in Section 8.5.4.1 above, the provision for a bridge over Abbert River, which forms part of Lough Corrib SAC, could cause potential impacts to upon aquatic fauna and flora both at the construction site and downstream related to instream works or works in close proximity to the SAC.

In addition to this, there is potential for temporary, negative impacts to the amenity value of the Abbert River during the construction phase of any of the Options. However, given the scale of the Options and its low importance value (i.e. locally important amenity site) it is likely to result in an imperceptible impact to the overall amenity value of the river.

With respect to flood risk, it is considered unlikely that any of the Options would potentially increase flood risk to existing properties. However, further assessments will be required to determine the hydrological effects caused by any new structures or changes to the drainage system.

The Do-Nothing/Do-Minimum received a score of 'Minor or slightly negative' as the existing drainage infrastructure does not have any environmental protection measures in terms of surface water attenuation and hydrocarbon interceptors which would be included in any new works.

8.5.3 Land and Soils (incorporating Soils and Geology, and Hydrogeology)

8.5.3.1 Introduction

Similar to Stage 1, the Stage 2 Project Appraisal of the options selection process involves undertaking a comparative evaluation of the Options, having regard to multiple factors in order to identify an Emerging Preferred Option.

The specific geological and hydrogeological impacts associated with each of the three Options are identified as part of the comparative evaluation.

8.5.3.2 Methodology

The assessment has been carried out in accordance with Stage 2 of the option selection process outlined in the TII's PMG's 2017, as well as TII's '*Project Appraisal Guidelines for National Roads, Unit 7.0- Multi Criteria Analysis*' (2016). The assessment was also carried out in accordance with NRA's '*Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes'*.

Further information can be found in Section 7.5.4.

8.5.3.3 Existing Environment

Information on the existing environment for each of the Options is outlined in Section 7.5.4.3.

8.5.3.4 Impact Assessment

Similar to Stage 1, in order to assess the relative merits of each of the identified Options from a geological, or hydrogeological perspective, the likely impact each Option will have on the respective geological, hydrological or hydrogeological attributes along each Option was assessed.

A detailed assessment of likely impacts from the Option has been outlined in Section 7.5.4.5.

A brief summary of the likely impacts from the three Options is outlined below:

- Potential negative excavation earthwork impacts from each of the Options will mainly relate to removal of topsoil and shallow subsoils, while infill earthwork will mainly relate to the import and compaction of acceptable fill material. In addition to this, all Options overlie a 'Regionally Important Aquifer - Karstified (conduit)', with a mix of moderate, high and extreme groundwater vulnerability; therefore, there is potential for shallow bedrock within all Options.
- Option B will require the most development of sections of offline road, predominately in open green fields. According to the Teagasc soil map[11], the river alluvium within this Option is thicker than deposits mapped within the other Options. The requirement for soft ground excavation and removal off-site as waste for disposal or recovery is not anticipated.
- All three Options will involve the development of sections of offline roads above the Regionally Important aquifer, therefore this attribute is of 'High' importance (Table 7-7). The risk of potential significant impacts occurring during both the construction and operational phases (in the absence of adequate management and mitigation measures) of any of the Options can arise from several activities; for example, accidental spills and runoff from the road surfaces.
- The southern sections of the Option C closely follow the existing N63 line; therefore, it is anticipated that this Option will have the least impact to groundwater compared to the other Options in this area. However, the northern section of the Option does require the development of offline sections.

A detailed consideration of the impacts and the potential requirement mitigation measures will be completed during Phase 3 'Design and Environmental Evaluation' of the Emerging Preferred Option.

It is important to note that during operation, the Emerging Preferred Option would only discharge surface water to any nearby watercourses following attenuation.

8.5.3.5 Summary

Table 8-9 below outlines the overall score for each Option.

Table 8-9 Overall Score (Land and Soils)

Option	Do-Nothing/Do-Minimum	Option A (Cyan)	Option B (Green)	Option C (Yellow)
Overall Ranking	3 - Minor or Slightly negative	2 - Moderately negative	2 - Moderately negative	2 - Moderately negative

All three Options were ranked as 'Moderately negative' as all Options will require the development of sections of offline road over a 'Regionally Important aquifer'. The groundwater vulnerability beneath each Option consists of a mix of 'Moderate', 'High' and 'Extreme' vulnerability.

The Do-Nothing/Do-Minimum received a score of 'Minor or slightly negative' as the existing drainage infrastructure does not have any environmental protection measures in terms hydrocarbon interceptors which would be included in any new works.

8.5.4 Landscape and Visual

8.5.4.1 Introduction

This chapter examines the landscape types within the study area, the potential effects of each Option on these landscape types, and the potential effect on views that receptors currently experience.

The Transport Infrastructure Ireland (TII), Standards Document PE-ENV-01105 '*Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) of Proposed National Roads*' recognises that landscape is an important resource that contributes to regional identity and sense of place and is of value to future generations.

The principal objective of the Landscape and Visual Impact Assessment at this stage is to undertake sufficient assessment to identify the landscape and visual factors, and the significance of effects upon them, in order to develop and select a preferred option.

8.5.4.2 Methodology

8.5.4.2.1 Assessment Guidelines, Planning Legislation and other information sources

The following guidelines, planning legislation and information sources were used in the assessment:

- TII: Landscape Character Assessment (LCA) and landscape and visual impact assessment (LVIA) of proposed national roads: Standards Document, PE-ENV-01105, January 219, Draft for Consultation
- LI/IEMA: Guidelines for Landscape and Visual Impact Assessment (GLVIA), 2013, 3rd Edition;
- NRA/TII: Environmental Impact Assessment of National Road Schemes - A Practical Guide;
- NRA/TII: A Guide to Landscape Treatments for National Road Schemes in Ireland;
- NRA/TII: Guidelines for Protection and Preservation of Trees, Hedgerows and Scrub Prior to, during and Post Construction of National Road Schemes;
- NRA/TII: Design Manual for Roads and Bridges;
- EPA 'Guidelines on the Information to be contained in Environmental Impact Statements', 2002;
- EPA EIS Manual 'Advice Notes on Current Practice (in the preparation of Environmental Impact Statements)', 2003;
- EPA Draft "Advice Notes for Preparing Environmental Impact Statements", September 2015, where appropriate;
- EPA "Guidelines on the information to be contained in Environmental Impact Assessment Reports", Draft, August 2017;
- Galway County Development Plan 2015 - 2021;
- Irishtrails, http://www.irishtrails.ie/;
- Ordnance Survey Ireland, 1:50,000 Discovery Mapping; and
- Design Manual for Urban Roads and Streets, Dept. of Transport, Tourism and Sport

The TII guidance in particular promotes consistency in the approach to landscape assessment of road projects, including the effects on landscape character and on views from sensitive visual receptors. Defined as a consequential process, the assessment methodology for landscape and visual effects, detailed within the standards documents, has been used to inform this assessment.

The assessment has also been supported by using guidance from the Landscape Institute (LI) and Institute of Environmental Management and Assessment (IEMA) '*Guidelines for Landscape and Visual Impact Assessment*' (2013), 3rd Edition; hereafter referred to as the GLVIA.

8.5.4.3 Approach and Methodology

For the purposes of assessment, a clear distinction is drawn between landscape and visual effects, as defined in the GLVIA:

*"**Landscape Effect** – Change in the elements, characteristics, character and qualities of the landscape as a result of development. These effects can be positive (i.e. beneficial or an improvement) or negative (i.e. adverse or a detraction)."*

*"**Visual Effect** – Change in the appearance of the landscape as a result of development. This can be positive (i.e. beneficial or an improvement) or negative (i.e. adverse or a detraction)."*

It should be noted that this report refers to landscape and visual 'effects' rather than 'impacts. This is in line with current GLVIA guidelines.

Stage 1 provided an appraisal of six preliminary Options located between the Abbeyknockmoy Village within the Abbert River valley and connecting to the existing N63 at Derreen.

Stage 2 considers three main Options.

The baseline landscape and visual conditions of the study area were assessed through desktop studies, previous knowledge of the site and site surveys.

8.5.4.4 Landscape Effects

The assessment of landscape effects firstly requires the identification of the components of the landscape. The landscape components are also described as landscape receptors and comprise the following:

- Individual landscape elements or features;
- Specific aesthetic or perceptual aspects; and
- Landscape character, or the distinct, recognisable and consistent pattern of elements (natural and man-made) in the landscape that makes one landscape different from another.

The assessment will identify the interaction between these components and the proposed development during construction and operation. The condition of the landscape and any evidence of current pressures causing change in the landscape will also be documented and described.

The staged process for undertaking a landscape effects assessment (as outlined within Section 3.5.2.3 of Standards Document PE-ENV-01105) is detailed below:

- Define the study area;
- Collect and collate information on the landscape;
- Assess the character and value of the landscape through consultation and desk study;
- Identify the effects throughout the project's life cycle (Construction, operation at opening year and 15 years when planting has established and matured);
- Identify the nature of the effects: **direct** (because of the development, including lighting), **indirect** or secondary (because of an associated development secondary to the main development), and **cumulative** (because of the addition of many small effects, including cumulative effects of other projects, to create larger, more significant effects);
- Identify the **landscape effects** in relation to the sensitivity of the landscape/ townscape; determine the scale and magnitude of change, as set out in the document;
- Identify the **visual effects** in relation to the sensitivity of the visual receptors; determine the scale and magnitude of change, as set out in the document;
- Identify the **significance** of landscape/ townscape and visual effects (e.g. slight, moderate, significant etc., as per EPA Guidelines);
- Separately assess landscape and visual effects, noting the interaction/closely related aspects of each;
- Establish the duration of the effects, whether they be short, medium or permanent/enduring or temporary; and
- Identify effects as positive (beneficial), negative (adverse or detrimental) or neutral.

The document provides a clear guidance in relation to the assessment approach; *"The landscape and visual assessment should take a step by step approach to making judgements about significance combining judgements about the nature of the receptor (sensitivity), and the nature of the effect (magnitude)".*

Landscape Effects

Landscape effects describe the impact on the fabric or structure of a landscape or landscape character.

The assessment of landscape effects firstly requires the identification of the components of the landscape. The landscape components are also described as landscape receptors and comprise the following:

- Individual landscape elements or features;
- Specific aesthetic or perceptual aspects; and

- Landscape character, or the distinct, recognisable and consistent pattern of elements (natural and man-made) in the landscape that makes one landscape different from another.

The assessment will identify the interaction between these components and the Proposed Development during construction and operational phases. The condition of the landscape and any evidence of current pressures causing change in the landscape will also be documented and described.

Landscape Value

Landscape value is frequently addressed by reference to international, national, regional and local designations, determined by statutory and planning agencies. However, absence of such a designation does not necessarily imply a lack of quality or value. Factors such as accessibility and local scarcity can render areas of nationally unremarkable quality, highly valuable as a local resource. The quality and condition are also considered in the determination of the value of a landscape. The evaluation of landscape value is undertaken with reference to the definitions stated in the table below:

Landscape Value	Classification Criteria
High	Nationally designated or iconic, unspoilt landscape with few, if any, degrading elements.
Medium	Regionally or locally designated landscape, or an undesignated landscape with locally important landmark features and some detracting elements.
Low	Undesignated landscape with few if any distinct features or with several degrading elements.

Table 8-10 Landscape Value

Landscape Susceptibility

Landscape susceptibility relates to the ability of a particular landscape to accommodate the Proposed Development. Landscape susceptibility is appraised through consideration of the baseline characteristics of the landscape, and in particular the scale or complexity of a given landscape.

The evaluation of landscape susceptibility is undertaken with reference to a three-point scale, as outlined in the table below:

Landscape Susceptibility	Classification Criteria
High	Small scale, intimate or complex landscape considered to be intolerant of even minor change.
Medium	Medium scale, more open or less complex landscape considered tolerant to some degree of change.
Low	Large scale, simple landscape considered tolerant of a large degree of change.

Table 8-11 Landscape Susceptibility Criteria

Landscape Sensitivity

Landscape sensitivity to change is determined by employing professional judgment to combine and analyse the identified landscape value, quality and susceptibility and is defined with reference to the scale outlined in the table below:

Landscape Sensitivity	Classification Criteria
High	Landscape characteristics or features with little or no capacity to absorb change without fundamentally altering their present character. Landscape designated for its international or national landscape value or with highly valued features. Outstanding example in the area of well cared for landscape or set of features that combine to give a particularly distinctive sense of place. Few detracting or incongruous elements.
Medium-High	Landscape characteristics or features with a low capacity to absorb change without fundamentally altering their present character. Landscape designated for regional or county-wide landscape value where the characteristics or qualities that provided the basis for their designation are apparent or a landscape with highly valued features locally. Good example in the area of a well-cared for landscape or set of features that combine to give a clearly defined sense of place.
Medium	Landscape characteristics or features with moderate capacity to absorb change without fundamentally altering their present character. Landscape designated for its local landscape value or a regional designated landscape where the characteristics and qualities that led to the designation of the area are less apparent or are partially eroded or an undesignated landscape which may be valued locally – for example an important open space. An example of a landscape or a set of features which is relatively coherent, with a good but not exceptional sense of place - occasional buildings and spaces may lack quality and cohesion.
Medium-Low	Landscape characteristics or features which are reasonably tolerant of change without determent to their present character. No designation present or of little local value. An example of an un-stimulating landscape or set of features; with some areas lacking a sense of place and identity.
Low	Landscape characteristics or features which are tolerant of change without determent to their present character. An area with a weak sense of place and/or poorly defined character /identity. No designation present or of low local value or in poor condition. An example of monotonous unattractive visually conflicting or degraded landscape or set of features.

Table 8-12 Landscape Sensitivity to Change

Magnitude of Landscape Change

Magnitude of change is an expression of the size or scale of change in the landscape, the geographical extent of the area influenced and the duration and reversibility of the resultant effect. The variables involved are described below:

- The extent of existing landscape elements that will be lost, the proportion of the total extent that this represents and the contribution of that element to the character of the landscape;
- The extent to which aesthetic or perceptual aspects of the landscape are altered either by removal of existing components of the landscape or by addition of new ones;
- Whether the effect changes the key characteristics of the landscape, which are integral to its distinctive character;
- The geographic area over which the landscape effects will be felt (within the Project Development site itself; the immediate setting of the Project Development site; at the scale of the landscape type or character area; on a larger scale influencing several landscape types or character areas); and

- The duration of the effects (short term, medium term or long term) and the reversibility of the effect (whether it is permanent, temporary or partially reversible).

Changes to landscape characteristics can be both direct and indirect. **Direct change** occurs where the Proposed Development will result in a physical change to the landscape within or adjacent to the Project Development site. **Indirect changes** are a consequence of the direct changes resulting from the Proposed Development. They can often occur away from the Proposed Development site (for example, off-site construction staff parking) and may be a result of a sequence of interrelationships or a complex pathway (for example, a new road or footpath construction may increase public access and associated problems e.g. littering). They may be separated by distance or in time from the source of the effects. The magnitude of change affecting the baseline landscape resource is based on an interpretation of a combination of the criteria set out in the table below:

Magnitude of Landscape Change	Classification Criteria
None	No change.
Negligible	Little perceptible change.
Low	Minor change, affecting some characteristics and the experience of the landscape to an extent; and Introduction of elements that is not uncharacteristic.
Medium	Noticeable change, affecting some key characteristics and the experience of the landscape; and Introduction of some uncharacteristic elements.
High	Noticeable change, affecting many key characteristics and the experience of the landscape; and Introduction of many incongruous developments
Very High	Highly noticeable change, affecting most key characteristics and dominating the experience of the landscape; and Introduction of highly incongruous development.

Table 8-13 Magnitude of Landscape Change (Landscape Effects)

8.5.4.4.1 Visual Effects

Visual effects are determined by the extent of visibility and the nature of the visibility (i.e. how a development is seen within the landscape); for example, whether it appears integrated and balanced within the visual composition of a view or whether it creates a focal point.

Negative visual effects may occur through the intrusion of new elements into established views, which are out of keeping with the existing structure, scale and composition of the view. Visual effects may also be beneficial, where an attractive focus is created in a previously unremarkable view or the influence of previously detracting features is reduced. The significance of effects will vary, depending on the nature and degree of change experienced and the perceived value and composition of the existing view.

Receptors

For there to be a visual impact, there is the need for a viewer. Views experienced from locations such as settlements, recognised routes and popular vantage points used by the public have been included in the assessment. Receptors are the viewers at these locations. The degree to which receptors, i.e. people, will be affected by changes as a result of the Project Development depends on a number of factors, including:

- Receptor activities, such as taking part in leisure, recreational and sporting activities, travelling or working;
- Whether receptors are likely to be stationary or moving and how long they will be exposed to the change at any one time;
- The importance of the location, as reflected by designations, inclusion in guidebooks or other travel literature, or the facilities provided for visitors;
- The extent of the Option or area over which the changes will be visible;
- Whether receptors will be exposed to the change daily, frequently, occasionally or rarely;

- The orientation of receptors in relation to the Project Development and whether views are open or intermittent;
- Proportion of the developments that will be visible (full, sections or none);
- Viewing direction, distance (i.e. short-, medium- and long-distance views) and elevation;
- Nature of the viewing experience (for example, static views, views from settlements and views from sequential points along routes);
- Accessibility of viewpoint (public or private, ease of access);
- Nature of changes (for example, changes in the existing skyline profile, creation of a new visual focus in the view, introduction of new man-made objects, changes in visual simplicity or complexity, alteration of visual scale, landform and change to the degree of visual enclosure); and
- Nature of visual receptors (type, potential number and sensitivity of viewers who may be affected).

Value of the View

Value of the view is an appraisal of the value attached to views and is often informed by the appearance on Ordnance Survey of tourist maps and in guidebooks, literature or art. Value can also be indicated by the provision of parking or services and signage and interpretation. The nature and composition of the view is also an indicator. The value of the view is determined with reference to the definitions outlined in the table below:

Value	Classification Criteria
High	Nationally recognised view of the landscape, with no detracting elements.
Medium	Regionally or locally recognised view, or unrecognised but pleasing and well composed view, with few detracting elements.
Low	Typical or poorly composed view often with numerous detracting elements.

Table 8-14 Value of the View

Visual Susceptibility

The GLVIA guidelines identify that the susceptibility of visual receptors to changes in views and visual amenity is a function of:

- The occupation or activity of people experiencing the view at a particular location; and
- The extent to which their attention or interest may therefore be focused on the views and visual amenity they experience at particular locations.

For example, residents in their home, walkers whose interest is likely to be focused on the landscape or a particular view, or visitors at an attraction where views are an important part of the experience often indicate a higher level of susceptibility. Whereas receptors occupied in outdoor sport, where views are not important, or at their place of work, are often considered less susceptible to change. Visual susceptibility is determined with reference to the three-point scale and criteria outlined in the table overleaf.

Susceptibility	Classification Criteria
High	Receptors for which the view is of primary importance and are likely to notice even minor change.
Medium	Receptors for which the view is important but not the primary focus and are tolerant of some change.
Low	Receptors for which the view is incidental or unimportant and is tolerant of a high degree of change

Table 8-15 Visual Susceptibility

Visual Sensitivity

Sensitivity to change considers the nature of the receptor; for example, a person occupying a residential dwelling is generally more sensitive to change than someone working in a factory unit. The importance

of the view experienced by the receptor also contributes to an understanding of the susceptibility of the visual receptor to change as well as the value attached to the view.

A judgement is also made on the value attached to the views experienced. This takes account of:

- Recognition of the value attached to particular views, for example in relation to heritage assets, or through planning designations;
- Indicators of the value attached to views by visitors, for example through appearance in guidebooks or on tourist maps, provision of facilities for their enjoyment (sign boards, interpretive material) and references to them in literature or art; and
- Possible local value; it is important to note that the absence of view recognition does not preclude local value, as a view may be important as a resource in the local or immediate environment due to its relative rarity or local importance.

The visual sensitivity to change is based on interpretation of a combination of all or some of the criteria outlined in the table below:

Visual Sensitivity	Classification Criteria
High	Users of outdoor recreational facilities, on recognised national cycling or walking routes or in nationally designated landscapes. Residential buildings.
Medium-high	Users of outdoor recreational facilities, in highly valued landscapes or locally designated landscapes or on local recreational routes that are well publicised in guide books. Road and rail users in nationally designated landscapes or on recognised scenic routes, likely to be travelling to enjoy the view.
Medium	Users of outdoor recreational facilities including public open space in moderately valued landscapes. Users of primary transport road network, orientated towards the Proposed Development, likely to be travelling for other purposes than just the view.
Medium-Low	People engaged in active outdoor sports or recreation and less likely to focus on the view. Primary transport road network and rail users likely to be travelling to work with oblique views of the project or users of minor road network.
Low	People engaged in work activities indoors, with limited opportunity for views of the Proposed Development.

Table 8-16 Sensitivity to Change Criteria

Magnitude of Visual Change

Visual effects are direct effects as the magnitude of change within an existing view will be determined by the extent of visibility of the Proposed Development. The magnitude of the visual effect resulting from the development at any particular viewpoint or receptor is based on the size or scale of change in the view, the geographical extent of the area influenced and its duration and reversibility. The variables involved are described below:

- The scale of the change in the view with respect to the loss or addition of features in the view and changes in its composition, including the proportion of the view occupied by the development;
- The degree of contrast or integration of any new features or changes in the landscape form, scale, mass, line, height, sky lining, back-grounding, visual clues, focal points, colour and texture;
- The nature of the view of the Proposed Development, in relation to the amount of time over which it will be experienced and whether views will be full, partial or glimpses;
- The angle of view in relation to the main activity of the receptor, distance of the viewpoint from the development and the extent of the area over which the changes will be visible; and
- The duration of the effects (short term, medium term or long term) and the reversibility of the effect (whether it is permanent, temporary or partially reversible).

The magnitude of visual effect resulting from the development at any particular viewpoint or receptor is based on the interpretation of the above range of factors and is set out in the table below:

Magnitude of Visual Change	Classification Criteria
None	No change in the existing view.
Negligible	The development will cause a barely discernible change in the existing view.
Low	The development will cause very minor changes to the view over a wide area or minor changes over a limited area.
Medium	The development will cause modest changes to the existing view over a wide area or noticeable change over a limited area.
High	The development will cause a considerable change in the existing view over a wide area or a significant change over a limited area.
Very High	The development will cause significant changes in the existing view over a wide area or a change which will dominate over a limited area.

Table 8-17 Magnitude of Visual Change (Visual Effects)

8.5.4.4.2 Duration and Quality of Effects

The table below provides the definition of the duration of landscape and visual effects:

Duration	Description
Temporary	Effects lasting one year or less.
Short Term	Effects lasting one to seven years.
Medium Term	Effects lasting seven to fifteen years.
Long Term	Effects lasting fifteen to sixty years.
Permanent	Effects lasting over sixty years.

Table 8-18 Definition of Duration of Effects

The quality of both, landscape and visual effects, can be Positive (Beneficial), Negative (Adverse) or Neutral according to the definitions set out in the table below:

Quality of effects	Description
Neutral	This will neither enhance nor detract from the landscape character or view.
Positive (Beneficial)	This will improve or enhance the landscape character or view.
Negative (Adverse)	This will reduce the quality of the existing landscape character or view.

Table 8-19 Definition of Quality of Effects

8.5.4.4.3 Significance Criteria

The objective of the assessment process is to identify and evaluate the potentially significant effects arising from the Proposed Development. The assessment will identify the residual effects likely to arise from the finalised design considering mitigation measures and the change over time.

The significance of effects is assessed by considering the sensitivity of the receptor and the predicted magnitude of effect in relation to the baseline conditions. In order to provide a level of consistency and transparency to the assessment and allow comparisons to be made between the various landscape and visual receptors subject to assessment, the assessment of significance is informed by pre-defined criteria as outlined in the table below. When assessing significance, individual effects may fall across several different categories of significance and professional judgement is therefore used to determine which category of significance best fits the overall effect to a landscape or visual receptor.

The significance of the effects can be adverse (negative) or beneficial (positive) according to the definitions set out in the table overleaf.

Significance Category	Description of Effect
Profound	An effect that obliterates sensitive characteristics within the landscape and/or visual environment.
Very Significant	An effect which, by its character, magnitude, duration, or intensity significantly alters most of a sensitive aspect of the landscape and/or visual environment.
Significant	An effect which, by its character, magnitude, duration, or intensity alters a sensitive aspect of the landscape and/or visual environment.
Moderate	An effect that alters the landscape in a manner that is consistent with existing and emerging baseline trends.
Slight	An effect which causes noticeable changes in the landscape and/or visual environment without affecting its sensitivities.
Not Significant	An effect which causes noticeable changes in the landscape and/or visual environment but without significant landscape and/or visual consequences.
Imperceptible	An effect capable of measurement but without significant landscape and/or visual consequences.

Table 8-20 Categories of Significance of Landscape and Visual Effects

The significance of the effect is determined by considering the magnitude of the effect and the quality of the baseline environment affected by the Proposed Development. The basis for consideration of the significance of effects is included overleaf.

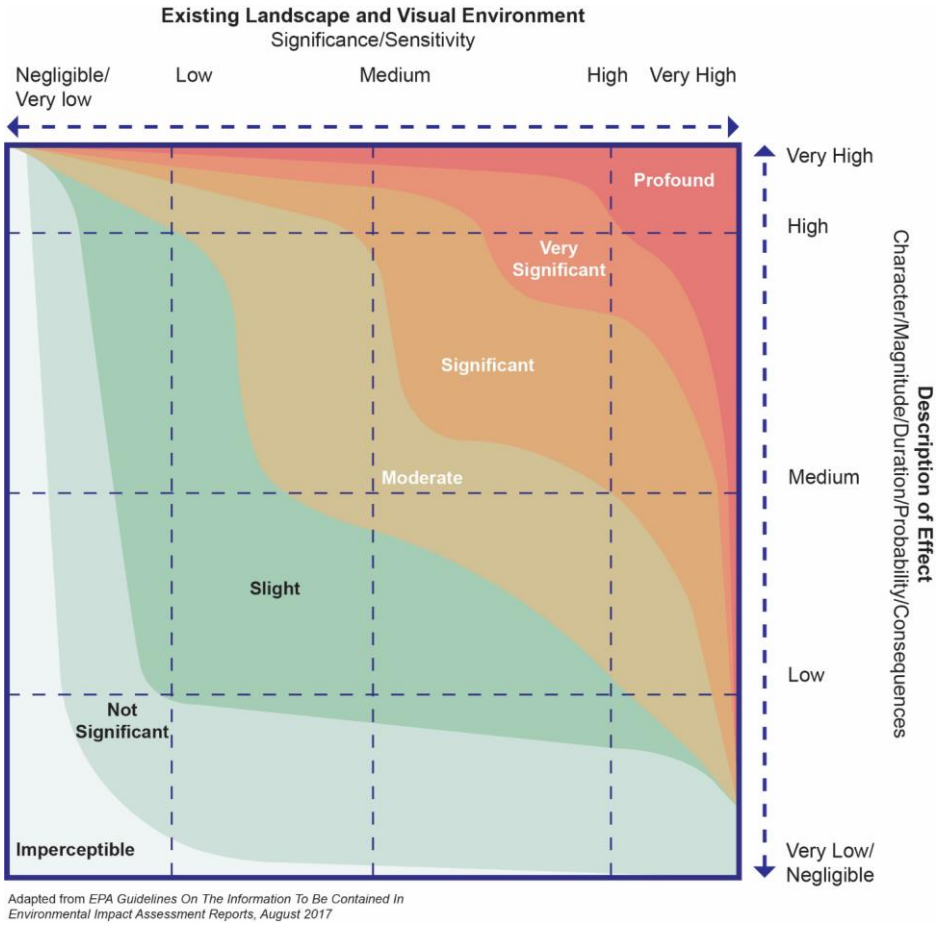


Figure 8-2 Basis for consideration of significance of effects

Effects will be assessed for all phases of the Proposed Development. Construction effects are considered to be temporary, short term effects which occur during the construction/decommission phase only. Operational/residual effects are those long-term effects, which will occur as a result of the presence or operation of the development.

The quality of each effect is based on the ability of the landscape character or visual receptor to accommodate the Proposed Development, and the impact of the development within the receiving context. Once this is done, the quality of the effect is then is assessed as being neutral, beneficial or adverse. A change to the landscape or visual resource is not considered to be adverse simply because it constitutes an alteration to the existing situation.

8.5.4.5 Potential Landscape and Visual Effects (Operation)

The 'Significance of effects' has been evaluated according to the magnitude of change and the sensitivity of the landscape character or visual amenity. The criteria adopted in assessment of the predicted magnitude of change are described above.

A list of potential mitigation measures is included in Section 8.5.4.4. These aim to reduce the significant effects of the proposed road development.

Abbert SAC

All Options encroach to some extent into the Abbert SAC along the river corridor. Resulting Landscape and Visual effects would most likely range from Slight to Significant within the SAC for all Options.

Cistercian Abbey/ National Monument

All Options require a bridge structure to traverse the Abbert River. Any such structure is likely to result in significant landscape and visual effects on the visual amenity of the Cistercian Abbey. Whether these effects are adverse, or beneficiary is a subjective assessment and will depend on the final architectural design of the bridge structure.

LCA 1 – Northeast Galway

All Options encroach to some extent into LCA 1. Resulting Landscape and Visual effects would most likely range from Slight to Very Significant within the LCA for all options. It should be noted that the Landscape Sensitivity and Landscape Value for this Landscape Character Area is low.

LCA 2 – East Central Galway

No Options straddle LCA 2. Resulting Landscape and Visual effects would most likely range from Imperceptible to Not Significant within the LCA for all Options. It should be noted that the Landscape Sensitivity and Landscape Value for this Landscape Character Area is low.

8.5.4.6 Option A (Cyan)

Landscape Effects

The proposed Option will start at grade with the existing N63 east of Abbeyknockmoy village. The Option will run north to bridge across the Abbert River in close proximity to the southeast of the Cistercian Abbey. This proposed Option would be raised on an embankment in order to reach the proposed bridge level. The new bridge with a clearance of approximately 4m above the Abbert River would result in a Very Significant landscape effects. The bridge would introduce an uncharacteristic and prominent elevated feature in the recognised uniform landscape common to East Galway. The significance is considered to be adverse as it would detract from the overall character of the landscape and it is unlikely that the bridge would be able to be integrated into its environs (depending on the architectural quality of the final bridge design).

After crossing Abbert River, the Option would travel east until it reaches the existing N63 at Derreen. This Option would require considerable cuttings and embankments which would likely alter the existing land profile and disrupt the existing landscape character surrounding the Cistercian Abbey.

The routing through a currently flat rural landscape would result in significant landscape effects as the scale of the road would be an uncharacteristic element in the immediate study area, however is should be considered that the Landscape Sensitivity and Landscape Value has been classed as being of Low value within the County Development Plan.

The proposed Option alignment will result in a High-Medium change in landscape character as the proposed section of the offline development would become a well discernible feature in the currently

rural landscape character. The existing prevalence of road infrastructure including the adjacent regional roads will be intensified. The significance is therefore considered Significant-Moderate Negative.

Visual Effects

The majority of visual effects would result from the proposed bridge crossing the Abbert River and the location of sections of the proposed road within an area designated as 'Landscape Focal Point/View' No. 26 – Knockmoy Abbey Southeast of Tuam. Option A is also located closest to the abbey. It will alter considerably the visual setting of the abbey as well as views south and east from the abbey. This is due to significant earthworks (cut and fill) along the south and northeast of the river. The bridge would become a prominent new feature within available views. The bridge would be visible when travelling along local roads to either side of the N63 and from slightly elevated local views such as Saint Bernard's Church and Abbeyknockmoy GAA Club. Cuttings and large embankments would also be visible from many locations within the local area and from receptors (mainly residential) located along the existing N63 and to the northern road opposite the development (along L6188, Old Road). The sensitivity to visual change of receptors would be medium (vehicle travellers) to high (residents, walker and cyclists). The magnitude of visual effects is therefore to be considered High. The significance would be Very Significant Adverse. While landscape mitigation measures would begin to screen the new embankments, residual visual effects of the development would remain high as the overall visual character of the landscape would change along the full length of the Option alignment in this area.

The visual amenity as perceived from residential dwellings along the existing N63 would also change resulting in major visual effects. The magnitude of visual effects is considered High-Medium and their significance Significant-Moderate adverse due to road scheme creating a visual screen between the visual amenity of the abbey, a dominant cultural anchor within the visual amenity and for residents along the N63 where dwellings are orientated towards the abbey.

8.5.4.6.1 Option B (Green)

Landscape Effects

Similar to the Option A, this proposed Option will start at grade with the existing N63 east of Abbeyknockmoy village. The Option will run north to bridge across the Abbert River in close proximity to the southeast of the Abbeyknockmoy Cistercian Abbey. While this Option is located further east from the abbey, it includes a considerable offline section and moves closer to residential dwellings located along the existing N63. This proposed Option would be raised on an embankment in order to reach the proposed bridge level. The new bridge with a clearance of approximately 4m above the Abbert River would result in a High landscape effects. The bridge would introduce an uncharacteristic and prominent feature in the recognised uniform landscape common to East Galway. The significance is considered to be Moderately Adverse as it would detract from the overall character of the landscape and it is unlikely that the bridge would be able to be integrated into its environs (depending on the architectural quality of the final bridge design), this is, however, mitigated by the span of the Option running over a shorter distance offline than Option A.

After the crossing the Abbert River, the Option would continue to travel to the northeast until it reaches the existing N63 at Derreen. This Option would require cuttings and embankments which would likely alter the existing land profile and disrupt the existing landscape character surrounding the Cistercian Abbey.

The routing through a currently flat rural landscape would result in significant landscape effects as the scale of the road would be an uncharacteristic element in the immediate study area, however it should be considered that the Landscape Sensitivity and Landscape Value has been classed as being of Low value within the County Development Plan.

The proposed Option alignment will result in a High-Medium change in landscape character as the proposed section of the offline development would become a well discernible feature in the currently rural landscape character. The existing prevalence of road infrastructure including the adjacent regional roads will be intensified. The significance is therefore considered Significant-Moderate Negative.

Visual Effects

The majority of visual effects would result from the proposed bridge crossing the Abbert River and the significant earthworks (cut and fill) along the southwest and northeast of the river. The bridge would become a prominent new feature within the visual amenity. The bridge would be visible when travelling along the local roads located to either side of the N63 and from slightly elevated local views such as Saint Bernard's Church and Abbeyknockmoy GAA Club. Visual effects on views to and from the Abbeyknockmoy Cistercian Abbey will be less than for Option A as the development will be located further east than Option A and mainly outside of an area designated as 'Landscape Focal Point/View'

No. 26 – Knockmoy Abbey Southeast of Tuam. However, it will alter the visual setting of the abbey as well as views southeast and east from the abbey. Cuttings and large embankments would also be visible from many locations within the local area and from receptors, however, it is envisioned that this Option will be less visible over a wider area than Option A due to landform and intervening vegetation. The sensitivity to visual change of receptors would be medium (vehicle travellers) to high (residents, walker and cyclists). The visual effects are considered High. The significance would be Very Significant. While landscape mitigation measures would begin to screen the new embankments, the visual effects of the development would remain high as the overall visual character of the landscape would change along the full length of the Option alignment in this area. This Option has less of an effect than Option A on local residents as the Option screens fewer residents from the Cistercian Abbey, the Option is also over a shorter offline span.

8.5.4.6.2 Option C (Yellow)

Landscape Effects

Similar to Option A and B, this proposed Option will start at grade with the existing N63 east of Abbeyknockmoy village. However, this option will remain within the existing road corridor of the N63 and begin to re-route only before reaching the handball ally and the Abbeyknockmoy community centre building, where it moves to the northeast. Option C will then run northeast behind the handball ally and bridge across the Abbert River approximately 100m west of the existing Liss Bridge. While this Option is further away from Abbeyknockmoy Cistercian Abbey and residential receptors than Options A and B, it will be located closer to community facilities including a local national school, community centre and a handball alley. This proposed Option would be raised on an embankment in order to reach the proposed bridge level behind the handball ally. The new bridge with a clearance of approximately 4m above the Abbert River would result in a considerable landscape effect. The bridge would introduce an uncharacteristic and prominent feature in the recognised uniform landscape common to East Galway. The magnitude of landscape effects is considered High-Medium as the bridge would be partially screened to the east and south by intervening landform and built structures at this point, however, it would detract from the overall character of the landscape and it is unlikely that the bridge would be able to be integrated into its environs (depending on the architectural quality of the final bridge design).

After the crossing of Abbert River, the Option would continue to travel northeast until it reaches the existing N63 at Derreen. The Option would follow a similar path and span to that of the existing N63. The routing through a similar path to the existing N63 would result in Moderate landscape effects as the scale of the road would be similar in nature to the existing in the immediate study area. However, it should be considered that the Landscape Sensitivity and Landscape Value has been classed as being of Low value within the County Development Plan.

The proposed Option alignment will result in a Medium change in landscape character. The proposed offline section of the development will become a considerably less discernible feature in the currently rural landscape character as it will integrate better into the existing environment than Options A and B. However, the existing prevalence of road infrastructure including the adjacent regional roads will still be intensified. The significance is therefore considered Moderately Negative.

Visual Effects

The majority of visual effects would result from the proposed bridge crossing the Abbert River and the significant earthworks (cut and fill) along the south and northeast of the river. The bridge would become a prominent new feature within the visual amenity. The bridge would be visible when travelling along local roads to either side of the N63 and from slightly elevated local views such as Saint Bernard's Church and Abbeyknockmoy GAA Club. This Option will be located outside of an area designated as 'Landscape Focal Point/View' No. 26 – Knockmoy Abbey Southeast of Tuam, and remain well east of the Abbeyknockmoy Cistercian Abbey, which will retain its setting within green fields and the dialogue with the Abbert River.

This Option would require some cuttings and embankments which would potentially block views of the Cistercian Abbey from some receptors located east and southeast of this Option resulting in Moderate landscape effects. This Option has less of an effect than Options A and B on local residents as the Option screens fewer receptors from the Cistercian Abbey, the Option is also over a shorter span and is similar to the existing N63 in terms of scale and Option. It is envisioned that this Option will be less visible over a wider area than Options A and B due to intervening vegetation, landform and built structure. The sensitivity to visual change of receptors would be medium (vehicle travellers) to high (residents, walker and cyclists).

The magnitude of visual effects is considered Medium. The significance of visual effects will be Moderate. Landscape mitigation measures at this Option will begin to screen the new embankments

and allow the new road to integrate into its environs. Visual effects of the development are therefore considered to be Medium following the successful implementation of landscape mitigation measures, as the overall visual character of the landscape will remain relatively intact along the full length of the Option alignment in this area, particularly when compared to Options A and B.

8.5.4.7 Mitigation Measures

Potential mitigation measures to reduce the landscape and visual effects of the scheme should include:

- Align Options to follow existing contours as close as possible to minimise earthworks, reduce the footprint of the land take, and avoid disruption to topography and vegetation where possible;
- Avoid removing existing mature tree and woodland features, prominent clusters and single stands and hedgerows along the Option to retain natural screening of new road;
- Avoid the area designated as 'Landscape Focal Point/View' No. 26 – Knockmoy Abbey Southeast of Tuam;
- Develop opportunities to enhance areas of poor-quality landscape, giving special consideration to the 'gateway effect' to the East of Galway County and the east/west county link;
- Develop opportunities to enhance the visual amenity of the Cistercian Abbey, which would provide the opportunity for the Abbey to become a landmark for receptors traveling along the newly aligned N63;
- Design new planting as an integral part of all infrastructure development, aiming to reinforce local landscape character, giving special consideration to landscape patterns, traditional stone, hedgerows and tree planting, to create a seamless fit with the surrounding landscape. Avoid linear corridors, provide screening, emphasise areas of broad-leaved woodland, retain and frame key views; and
- Consider the design of the bridge structure across the Abbert River as an integral and important landmark and gateway, signifying the east/west county link, creating a highly attractive feature in the landscape which will allow views of the Cistercian Abbey.

8.5.4.8 Summary

Based on the potential effects associated with each Option, the following score has been assigned to the three Options.

Option	Do-Nothing/Do-Minimum	Cyan Option (A)	Green Option (B)	Yellow Option (C)
Overall Ranking	4 – Not significant or neutral	1 – Major or highly negative	2 – Moderately negative	3 – Minor or slightly negative

Table 8-21 Overall Score (Landscape and Visual)

Option A received a score of 'Major or highly negative.' It is considered that despite the inclusion of appropriate mitigation measures, it has the potential to result in the highest effects on the landscape character as well as the visual amenity of residences and Abbeyknockmoy Cistercian Abbey due to its long offline section and its proximity to the abbey.

Option B received a score of 'Moderately negative,' following the implementation of mitigation measures. As described above, it was determined that effects on the landscape character and the visual amenity are less than for Option A due to its location further east from the Abbeyknockmoy Cistercian Abbey. However, residential receptors to the south along the existing N63, with a view of the abbey, will experience higher visual effects as the proposal is located closer to these receptors.

Option C received a score of 'Minor or slightly negative', as outlined above, the visual effects upon the residential dwellings and the Abbeyknockmoy Cistercian Abbey are further reduced due to the location of the development away from the abbey and residences. While visual effects on community facilities will be higher than for Options A and B, the overall effects on the landscape character and visual amenity are less than for Options A and B.

The Do-Nothing/Do-Minimum option received a score of 'Not Significant or neutral' as the works during this option will be minimal.

8.5.5 Noise and Vibration

8.5.5.1 Introduction

Similar to Stage 1, the objective of the Stage 2 Project Appraisal is to evaluate the relative noise impact of each Option, both against other options and against other considerations.

8.5.5.2 Methodology

The assessment has been carried out in accordance with Stage 2 of the option selection process outlined in NRA PMG's 2010 and TII's PMG's 2017, as well as TII's '*Project Appraisal Guidelines for National Roads, Unit 7.0- Multi Criteria Analysis*' (2016). The assessment was also carried out in accordance with NRA's '*Guidelines for the Treatment of Noise and Vibration in National Road Schemes*' (2014).

For Stage 2, there are three elements that should be considered in the option selection. These are as follows:

a. Assessment of Potential Impact based on receptor counts (Quantitative): the determination of the Potential Impact Rating (PIR) of each Option.

b. Assessment of changes in traffic flow (Quantitative): estimate of the number of receptors in the vicinity of roads where traffic flows are likely to increase by 25% or more

c. Assessment of the likely need for mitigation measures (Qualitative)

The NRA Guidelines advise that the noise impact should be determined by counting the number of noise-sensitive properties within 300m of the centreline of each Option , subdivided into distance bands of 0 to 50m (Band 1), 50 to 100m (Band 2), 100 to 200m (Band 3) and 200 to 300m (Band 4). The count in each band is then multiplied by a rating factor according to distance, as outlined below:

- Band 1: Factor 4
- Band 2: Factor 3
- Band 3: Factor 2
- Band 4: Factor 1

The weighted totals are then summed to give a PIR for each Option. The Option with the lowest PIR has the lowest nominal potential impact.

The second quantitative element is an estimate of the number of receptors in the vicinity of roads where traffic flows are likely to increase or decrease by 25% or more. Finally, a qualitative statement is made for each Option considering what opportunities exist for the provision of noise mitigation measures, should they be deemed necessary.

8.5.5.3 Existing Environment

Information on the existing environment for each of the Options is outlined in Section 7.3.2.6.3.

8.5.5.4 Impact Assessment

a. Assessment of Potential Impact based on receptor counts (Quantitative)

An assessment of potential impact in terms of noise and vibration based upon the number of noise sensitive receptors within specified distance bands from each of the Options is outlined in this section.

Band	Rating Factor (a)	Option A (Cyan)		Option B (Green)		Option C (Yellow)		
		No. of Receptors in band (b)	a x b	No. of Receptors in band (c)	a x c	No. of Receptors in band (d)	a x d	
1 (0-50m)	4	20	80	26	104	41	164	
2 (50-100m)	3	25	75	26	78	24	72	
3 (100-200m)	2	74	148	75	150	70	140	
4 (200-300m)	1	61	61	60	60	58	58	
PIR			364		392		434	
Order of Preference			1		2		3	

Table 8-22 Order of Preference

As shown in Table 8-3, based on the PIR ratings, Option A is the preferred Option.

b. Assessment of changes in traffic flow (Quantitative):

The quantitative assessment, based on the number of receptors in the vicinity of roads where traffic flows are likely to increase by 25% or more, is given in Table 8-23.

Band	Option A (Cyan)	Option B (Green)	Option C (Yellow)
1 (0-50m)	4	1	2
2 (50-100m)	10	10	8
3 (100-200m)	22	18	12
4 (200-300m)	35	24	27
Total	71	53	49
Order of Preference	*3*	*2*	*1*

Table 8-23 Order of Preference

As shown in Table 8-23, based on the PIR ratings, Option C is the preferred Option.

c. Assessment of the likely need for mitigation measures (Qualitative)

Considering the PIR rating for each option and the number of receptors located within 300m of roads which will see an increase in road traffic levels of greater than 25%, a qualitative assessment of the need for mitigation measures has been undertaken.

With regards to the PIR for Option A, this is ranked as the preferred option in terms of noise and vibration impacts. However, this Option results in a greater number of sensitive receptors being located within 300m of the roads which will see an increase in road traffic flows of greater than 25%, resulting in this Option being the least preferred.

For Option B, this is ranked as the 2nd preferred option for both the PIR assessment and the assessment for the numbers of receptors affected by roads which will see an increase in road traffic flows of 25% or greater.

For Option C, this is the least preferred option when assessed using the PIR rankings, but the preferred option with regards to the number of receptors that will affected by roads with an increase in road traffic flows if greater than 25%.

Whilst a greater number of receptors will be affected by increases in road traffic flows of more than 25% for Option A, there is much greater potential for the inclusion of mitigation measures to reduce noise impacts upon noise sensitive receptors when compared to Option C. Such mitigation measures can include the new roads to be located within cuttings, or the construction of earth bunds or installation of noise barriers to provide shielding. These mitigation measures could also be implemented in Option B.

On balance, it is therefore concluded that Options A and B have greater potential to result in the least noise impact upon noise sensitive receptors.

8.5.5.5 Summary

Based on the potential impacts associated with each Option, the following score has been assigned to the three Options.

Option	Do-Nothing/Do-Minimum	Cyan Option (A)	Green Option (B)	Yellow Option (C)
Overall Ranking	2 - Moderately negative	3 - Minor or slightly negative	3 - Minor or slightly negative	2 - Moderately negative

Table 8-24 Overall Score (Noise and Vibration)

Both Option A and B received a score of 'Minor or slightly negative,' As discussed above, it was determined that with the inclusion of appropriate mitigation measures, Options A and B have greater potential to result in the least noise impact upon noise sensitive receptors.

Option C received a score of 'Moderately negative', as outlined above, there is less potential for the inclusion of mitigation measures to reduce noise impacts upon noise sensitive receptors when compared to Options A and B.

The Do-Nothing/Do-Minimum Option received a score of 2' Moderately negative' as during the operational phase, noise levels are likely to remain similar to those currently experienced at noise sensitive properties located along the Do-Nothing/Do-Minimum Option , with the potential for increases in noise levels from congestion traffic. There is little scope for inclusion of mitigation measures.

8.5.6 Air Quality and Climate

8.5.6.1 Introduction

The pollutants of most concern near roads are Nitrogen Dioxide (NO2) and Particulates (PM10) in relation to human health, and Oxides of Nitrogen (NOx) in relation to vegetation and ecosystems. A new road project, such as a bypass, may alter traffic flows in a locality in terms of vehicle numbers and speed, and may have a corresponding impact on air quality.

Road projects are usually perceived as having only negative effects, however in the majority of cases, the overall effect can be beneficial. A bypass not only relieves congestion on the existing road network but can produce lower emissions and subsequently reduce overall pollutant levels by keeping traffic flowing steadily throughout the region.

The principal objective of the Stage 2 of the Options Selection air quality assessment is to indicate whether there are likely to be significant air quality impacts associated with the three Options ('Do-Something') in comparison with the Do-Nothing/Do-Minimum scenario, and existing 'Base Year' (2019) conditions. In order to fully appraise the potential impact of the scheme on existing air quality, both local and regional air quality assessments must be conducted in accordance with the procedures detailed in the National Roads Authority (NRA) 'Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes' (Revision 1, May 2011).

8.5.6.2 Methodology

The assessment has been carried out in accordance with Stage 2 of the option selection process outlined in NRA PMG's 2010 and TII's PMG's 2017, as well as TII's '*Project Appraisal Guidelines for National Roads, Unit 7.0- Multi Criteria Analysis'* (2016). The assessment was also carried out in accordance with TII's '*Guidelines on the Treatment of Air Quality during the Planning and Construction of National Road Schemes'* (2011).

For Stage 2, four elements were considered for the air quality and climate section of the Options assessment:

- Changes to baseline air quality conditions (qualitative)
- Calculation of the Index of Overall Change of Exposure (quantitative)
- Calculation of local scale pollutant (NO_2 and PM_{10}) concentrations (quantitative)
- Consideration of impacts on sensitive ecosystems (quantitative)

The first quantitative element is the Calculation of the Index of Overall Change in Exposure which allows a comparison of the overall impact of each Option to be carried out and is based on the number of properties within 50m of the carriageway of all road links that will experience a significant change in

traffic. The second quantitative element is required if there is limited information about existing air quality near to roads, or there are sensitive receptors within close proximity to one or more Options. Finally, a quantitative assessment is required to calculate nitrogen oxide concentrations and nitrogen deposition rates within designated sites where there would be a 5% change or greater in traffic flows.

The impact on climate is measured through a number of quantitative statements relating to the amount of carbon dioxide (CO_2) likely to be produced for both the Do-Nothing/Do-Minimum and Do Something scenarios.

Under the Clean Air for Europe Directive, EU member states must designate "Zones" for the purpose of managing air quality. For Ireland, four zones were defined in the Air Quality Standards Regulations (2011). According to the EPA, Abbeyknockmoy is located within Zone D (Rural West), which encompasses rural town and villages with populations of 5000 or less.

Ambient Air Quality Standards

The Clean Air for Europe (CAFE) programme revisited the management of Air Quality within the EU with a single legal act, the Ambient Air Quality and Cleaner Air for Europe Directive 2008/50/EC (Council of European Communities, 2008).

Directive 2008/50/EC is the principal instrument for governing outdoor ambient air quality policy in the EU. It sets health and environmental objectives and emission reduction targets for the key air pollutants associated with human health and ecological impacts. It proposes to deliver the objectives in stages and make it possible to protect EU citizens from exposure to particulate matter and ozone, and protect European ecosystems more effectively from acid rain, excess nutrient nitrogen and ozone.

This Directive is currently transposed into Irish Law by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011). The Regulations introduce a limit value to $PM_{2.5}$ in addition to the existing limit values for PM_{10}, NO_2 and oxides of nitrogen, sulphur dioxide, lead, ozone, carbon monoxide and benzene. These limit values are binding on the Republic of Ireland and have been set with the aim of avoiding, preventing or reducing harmful effects on human health and on the environment as a whole. Air quality limit values are an appropriate measure to use in assessing the significance of effects on air quality sensitive receptors.

In relation to the Proposed Scheme, the limit values (as detailed within Schedule 11 of the Regulations) for pollutants specific to protection of human health are contained within Table 8-25.

Pollutant	Averaging Period	Limit Value	Maximum Permitted Exceedances	Target Year
Nitrogen Dioxide (NO_2)	Annual Mean	40µg/m^3	None	2010
	Hourly Mean	200µg/m^3	18 times per year	
Particulate Matter (PM_{10})	Annual Mean	40µg/m^3	None	2005
	Hourly Mean	50µg/m^3	35 times per year	
Fine Particulate Matter ($PM_{2.5}$)	Annual Mean	25µg/m^3	None	2015
	Hourly Mean	20µg/m^3	None	2020

Table 8-25 Relevant Air Quality Standards for the Protection of Human Health

Source: Air Quality Standards Regulations (S.I. 180 of 2011)

The EPA is the competent authority for the purpose of Directive 2008/50/EC and these Regulations. As detailed within the National Roads Authority (NRA) *'Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes'* (Revision 1, May 2011), the national exposure reduction target is focused on reducing average exposures across the most heavily populated areas of Ireland and is therefore not directly relevant to individual road schemes. Air quality assessments of national road schemes should, however, take account of the $PM_{2.5}$ limit values.

The EPA also has a duty to ensure that critical levels for the protection of vegetation as detailed in Schedule 6 to the Regulations are not exceeded. In relation to the Proposed Scheme, the critical levels for pollutants specific to the protection of vegetation are contained within Table 8-26.

Pollutant	Critical Level	
	Concentration	Measured as
Oxides of Nitrogen (NO_x)	30 µg/m^3	Annual mean

Table 8-26 Critical levels for the Protection of Vegetation specific to the assessment of road

Source: Air Quality Standards Regulations (S.I. 180 of 2011)

Index of Overall Change of Exposure

In line with TII guidance, a Calculation of the Index of Overall Change in Exposure has been carried out. This allows a comparison of the overall impact of each Option to be carried out and is based on the number of properties within 50m of the carriageway of all road links that will experience a significant change in traffic. 50m represents the distance within which detectable impacts of a road might be found, while a significant change can be considered to be an increase or decrease in traffic flow (AADT) of 5% or more. The number of properties is then multiplied by the predicted change in the emission rate along that link, and then summed across all links.

Calculation of local scale pollutant concentrations

The methodology adopted for calculating local-scale pollutant concentrations has been prepared in accordance with Appendix 4: Approach to Dispersion Modelling of the NRA '*Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes'* (Revision 1, May 2011). This Appendix provides a description of the various approaches that may be taken for dispersion modelling studies.

DMRB Screening Model

A 'Simple' local air quality assessment utilising the DMRB Screening Model was deemed 'fit for-purpose', based on professional judgement and a review of projected traffic volumes and previous air quality assessments for the affected area. Although the Proposed Scheme would result in a change to the existing road network, traffic flows throughout the locale and proximity to receptors, these changes would not be of such an magnitude to warrant a 'Detailed' assessment as predicted environmental concentrations (i.e. ambient background + predicted concentration) lie sufficiently below the Air Quality Standards (taken to be <90% of the standard), and there are no complex or unusual features (i.e. grade separated Junctions, road links with gradients >2.5%) associated with the Proposed Scheme.

Impacts upon Sensitive Ecosystems

The methodology adopted for assessing impacts upon sensitive ecosystems has been prepared in accordance with Appendix 9: Impacts upon Sensitive Ecosystems of the NRA 'Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes' (Revision 1, May 2011). Reference has also been made to the NRA's '*Guidelines for Assessment of Ecological Impacts of National Road Schemes*' (Rev. 2, National Roads Authority, 2009) and to 'Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities' (Department of the Environment, Heritage and Local Government, 2010) for details regarding the regime governing the legal protection of designated conservation areas. If a designated ecological site has been identified as likely to be affected by the Proposed Scheme, NO_x concentrations and Nitrogen Deposition rates are calculated in a transect up to 200m away from each of the affected roads, within or near the site. The calculations are for the 'Base Year' (2019) and the assumed year of Opening (2020), for both the Do-Nothing/Do-Minimum and 'Do-Something' scenarios. The estimates are also made using the 'Local' application of the DMRB Screening Model. The concentrations are then compared with the vegetation criterion for NOx and the critical load levels for Nitrogen Deposition and the change in concentration due to the Proposed Scheme, determined in the assumed year of Opening.

Background Concentrations

As per the methodology described with Appendix 11: Derivation of Regional Background Concentrations for the NO_x:NO_2 model of the NRA 'Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes' (Revision 1, May 2011), it has been assumed that the regional background concentrations in Ireland are characterised by a local authority in Northern Ireland (Craigavon is recommended as per Appendix 11). This approach has the advantage that concentrations in future years will be automatically calculated within the model. In this respect, it should be noted that the gradient of regional background NO_x, NO_2 and O_3 concentrations is relatively small across the geographic domain of the United Kingdom. Background pollutant concentrations for nitrogen dioxide, PM_{10} and $PM_{2.5}$ used in this assessment were sourced from Defra projected background maps (Defra, 2014b). Concentrations for the selected 1x1km grid square for all assessment years are shown in Table 8-27.

2019			2023			2039		
NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$
4.25	8.06	4.90	3.64	7.74	4.63	3.11	7.51	3.72

Table 8-27 Background annual mean pollutant concentrations (in µg/m³) rural area

Source: Defra projected background maps from Craigavon Local Authority, Northern Ireland

Assessing the Significance of Effects

It is not sufficient to simply assess the size and probability of possible impacts; their significance should also be assessed. The significance of the effect is formulated as a function of the receptor or resource's environmental value (or sensitivity) and the magnitude of project impact (change). In other words, significance criteria are used to report the effect of the impact.

The Institute of Air Quality Management (IAQM) has recommended an approach to defining the magnitude of changes and describing air quality impacts at specific receptors, as set out in Table 8-28.

Magnitude of Change	Annual Mean Change (NO_2, PM_{10})
Large	Increase/Decrease ≥4µg/m³
Medium	Increase/Decrease 2 - <4µg/m³
Small	Increase/Decrease 0.4 - <2µg/m³
Imperceptible	Increase/Decrease <0.4µg/m³

Table 8-28 Magnitude of Impact for changes in Annual Mean NO_2 and PM_{10} concentrations at a

Source: 'Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes' (Revision 1, May 2011).

When describing an air quality impact, the actual concentration at that specific receptor should be considered, in combination with the magnitude of impact as a means of estimating the significance of potential effects, as detailed in Table 8-29. Professional judgement and awareness of the relative balance of importance between sensitivity and magnitude allows the overall significance of impact to be assessed with mitigation (if required) to define residual effects.

Absolute Concentration in relation to Objective/Limit Value	Small	Medium	Large
Increase with Scheme			
Above Objective/Limit Value *with* Scheme (≥40µg/m³ of NO_2 or PM_{10})	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value *with* Scheme (36 - <40µg/m³ of NO_2 or PM_{10})	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value *with* Scheme (30 - <36µg/m³ of NO_2 or PM_{10})	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value *with* Scheme (<30µg/m³ of NO_2 or PM_{10}) (<18.75µg/m³ of $PM_{2.5}$)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value *without* Scheme (≥40µg/m³ of NO_2 or PM_{10})	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value *without* Scheme (36 - <40µg/m³ of NO_2 or PM_{10})	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value *without* Scheme (30 - <36µg/m³ of NO_2 or PM_{10})	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value *without* Scheme (<30µg/m³ of NO_2 or PM_{10})	Negligible	Negligible	Slight Beneficial

Table 8-29 Air Quality Impact Descriptors for Changes to Annual Mean NO_2 and PM_{10} Concentrations at a Receptor

Source: 'Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes' (Revision 1, May 2011).

IAN 174/13 (June 2013), '*Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 Air Quality (HA 207/07)',* outlines amendments to the reporting of significant local air quality effects for public exposure and designated ecosystems. This advice is only applicable to assessments which identify exceedances to air quality thresholds in either the 'without scheme' scenario and/or 'with scheme' scenario.

Any change which is greater than 'Imperceptible' (as outlined in Table 8-28), due to the project, which causes any of the below to occur at receptor:

- worsening of air quality objective above the objective limit;
- creation of a new exceedance above the objective limit;
- improvement of an air quality objective already above objective; or
- removal of an existing exceedance of an objective limit.

would be subject to further evaluation against key criteria as to its overall significance.

8.5.6.3 Existing Environment

Information on the existing environment can be found in Section 7.5.7.

8.5.6.4 Impact Assessment

Changes to Baseline Air Quality Conditions

Currently there are no directly comparable air quality monitoring sites in Galway. However, the monitoring station at Claremorris in Co. Mayo, approximately 43km to the north of the study area, is representative of the Rural West Air Quality Index for Health (AQIH) region. This monitoring station continually records Particulate Matter levels, both PM_{10} and $PM_{2.5}$. Organic/elemental carbon, and a range of anions and cations are also monitored, albeit not continually. The current AQIH for the study area is 3 – Good, and there have been no exceedances noted. Due to the smaller population the air quality within the study area of Abbeyknockmoy is likely to be similar or better to that described for Claremorris. The EPA air quality bulletin for PM10 levels at Claremorris confirmed that no limit values were exceeded during the measurement period.

According to the NRA/TII (2011) Guidance document a sensitive receptor location may include 'residential housing, schools, hospitals, places of worship, sports centres and shopping areas, i.e. locations where members of the public are likely to be regularly present.' The majority of the air quality-sensitive receptors located within the N63 study area are one and two storey private dwellings that are located along existing roads.

Other air-quality sensitive receptors within the study area of Abbeyknockmoy include:

- Lough Corrib SAC
- Abbeyknockmoy Community Centre
- St Bernard's Church
- Abbeyknockmoy GAA Club
- Newtown National Primary School

For the purposes of assessment, it is necessary to identify representative locations in proximity to the existing and proposed Options that are likely to be most affected. Hence the location of sensitive properties was examined, and representative receptor sites carefully chosen, as shown in Appendix B.

Each receptor site was selected to illustrate the impact that Options would have on local air quality, in order to portray the level of change that a receptor would experience, and whether these key properties would be close to, or in breach of, the Air Quality Standard Regulations limit values. Two residential (Anabel House and Rose Villa) and two community facilities (Newtown National Primary School and St. Bernard's Church), were chosen to be representative of the change likely to be experienced. Those receptors located on the existing N63 are likely to have a positive change as a result of lower traffic flows passing within 200m of them, whereas those properties located in an area currently devoid of regional traffic may experience a deterioration in air quality as a result of more proximal traffic.

Baseline conditions for current year, as well as future construction and operational years, have been predicted at each receptor to allow for comparison between the future Do-Nothing/Do-Minimum

scenarios and the Do-Something scenarios. The predicted pollutant concentrations for the 2019 Base Year scenario are shown in Table 8-30.

Receptor	Location	Predicted Annual Mean Concentration (µg/m^3)		Number of exceedances of 24-hour PM_{10} limit (days)
		NO_2	PM_{10}	
R1	Anabel House	4.25	8.06	0
R2	Newtown NPS	6.15	8.37	0
R3	St Bernard's Church	4.49	8.10	0
R4	Rose Villa	6.02	8.30	0

Table 8-30 Baseline (2019) Scenario annual mean pollutant concentrations

Under 'Base Year' (2019) conditions, all airborne contaminants screened at the various receptor locations fall well below the Air Quality Standard Limit Values for the protection of human health. They also fall below the lower assessment thresholds for all pollutants of concern. As expected of the receptor sites selected, the lowest pollutant concentrations experienced would be at those furthest from traffic utilising the N63 and relatively distant from the local road network, namely Receptor 1. This is due to the fact that pollution concentration is related specifically to distance from the emission source, as increasing distance relates to the diminishing contribution that vehicle emissions make to local air pollution. Beyond 200m, the contribution of vehicle emissions from the roadside to local pollution levels is not significant and remains largely at background levels.

Index of Overall Change of Exposure

As noted in Section 7.5.7 earlier, a calculation of the Index of Overall Change in Exposure has been undertaken to provide a quantification of the change in exposure in the assumed 'Opening Year 2023' at sensitive receptor locations arising from changes in road traffic as a result of the Proposed Scheme. The Index has been based on the number of sensitive receptor locations within 50m of the carriageway of all road links that would experience a significant change in traffic associated with the Proposed Scheme. Where a property is within 50m of the carriageway of two or more links, it should be 'double counted', and included in the counts for all links within 50m. The calculation considers the change in concentrations of NO_2 and PM_{10} under both the Do-Nothing/Do-Minimum and Do-Something scenarios (for each Option) as detailed within Table 8-31 and Table 8-32. A negative Index score indicates that there would be an overall reduction in exposure to pollution (i.e. a benefit); a positive Index score indicates an increase in exposure to pollution, (i.e. adverse impact).

A summary of the calculations are given in Table 8-31 and Table 8-32.

Option	NO_x Exposure Index	Better or Worse
Option A (Cyan)	-5075.12	Better
Option B (Green)	-11676.89	Better
Option C (Yellow)	7834.88	Worse

Table 8-31 Summary of Index of NO_x Overall Change in Exposure for each Option vs the Do-Minimum situation in the Assumed Year of Opening (2023)

Option	PM_{10} Exposure Index	Better or Worse
Option A (Cyan)	-63.43	Better
Option B (Green)	-275.32	Better
Option C (Yellow)	256.38	Worse

Table 8-32 Summary of Index of PM_{10} Overall Change in Exposure for each Option vs the Do-Minimum situation in the Assumed Year of Opening (2023)

The calculation indicates that there would be an overall reduction in exposure to pollution as a result of implementing either Option A or Option B.

A larger number of properties would experience a decrease in exposure to PM_{10} and NO_2 throughout the affected road network than experience an increase. Consequently, air quality would be improved with implementation of either Option A or Option B for the majority of receptors. The changes in emissions are obviously influenced by changes in traffic flow, composition, speed and location. The movement of the mainline of the N63 to the north of the existing road alignment is increasing the distance between the majority of receptors, and the source of the emissions, i.e. the main flow of traffic.

Conversely, with implementation of Option C there would be no benefit to properties west of the Lisch Road, over the Do-Minimum situation, as the traffic flows are maintained in close proximity to receptors with this option.

Local Air Quality Impacts

The predicted pollution concentrations at each receptor for operation of the Proposed Scheme in the Opening Year (2023), a future Design Year (2039), and the change in concentrations between the future years Do-Minimum and Do-Something scenarios are also presented within Table 8-33 to Table 8-40.

Receptor & Location	Predicted Annual Mean Concentration		Number of exceedances of 24-hour PM_{10} limit (days)
	NO_2	PM_{10}	
R1 - Anabel House	3.64	7.74	0
R2 - Newtown NPS	5.75	8.10	0
R3 - St Bernard's Church	3.9	7.78	0
R4 - Rose Villa	5.61	8.01	0

Table 8-33 Opening Year (2023) Do-Minimum Scenario annual mean pollutant concentrations

Receptor & Location	Predicted Annual Mean Concentration		No. of exceedances of 24-hr PM_{10} limit (days)	Predicted change from Do-Minimum Scenario	
	NO_2	PM_{10}		NO_2	PM_{10}
R1 - Anabel House	4.1	7.82	0	-0.46	-0.08
R2 - Newtown NPS	4.39	7.86	0	1.36	0.24
R3 - St Bernard's Church	3.73	7.76	0	0.17	0.02
R4 - Rose Villa	5.76	8.12	0	-0.15	-0.11

Table 8-34 Opening Year (2023) Do-Something Scenario annual mean pollutant concentrations (Option A)

Receptor & Location	Predicted Annual Mean Concentration		No. of exceedances of 24-hr PM_{10} limit (days)	Predicted change from Do-Minimum Scenario	
	NO_2	PM_{10}		NO_2	PM_{10}
R1 - Anabel House	4.02	7.81	0	-0.38	-0.07
R2 - Newtown NPS	4.31	7.86	0	1.44	0.24
R3 - St Bernard's Church	3.72	7.75	0	0.18	0.03
R4 - Rose Villa	4.58	7.90	0	1.03	0.11

Table 8-35 Opening Year (2023) Do-Something Scenario annual mean pollutant concentrations (Option B)

Receptor & Location	Predicted Annual Mean Concentration		No. of exceedances of 24-hr PM_{10} limit (days)	Predicted change from Do-Minimum Scenario	
	NO_2	PM_{10}		NO_2	PM_{10}
R1 - Anabel House	3.68	7.75	0	-0.04	-0.01
R2 - Newtown NPS	4.78	7.94	0	0.97	0.16
R3 - St Bernard's Church	3.75	7.76	0	0.15	0.02
R4 - Rose Villa	5.73	8.11	0	-0.12	-0.1

Table 8-36 Opening Year (2023) Do-Something Scenario annual mean pollutant concentrations (Option C)

Receptor & Location	Predicted Annual Mean Concentration		Number of exceedances of 24-hour PM_{10} limit (days)
	NO_2	PM_{10}	
R1 - Anabel House	3.11	7.51	0
R2 - Newtown NPS	6.09	8.01	0
R3 - St Bernard's Church	3.48	7.57	0
R4 - Rose Villa	5.87	7.97	0

Table 8-37 Design Year (2039) Do-Minimum Scenario annual mean pollutant concentrations

Receptor & Location	Predicted Annual Mean Concentration		No. of exceedances of 24-hr PM_{10} limit (days)	Predicted change from Do-Minimum Scenario	
	NO_2	PM_{10}		NO_2	PM_{10}
R1 - Anabel House	3.76	7.62	0	-0.65	-0.11
R2 - Newtown NPS	4.05	7.67	0	2.04	0.34
R3 - St Bernard's Church	3.22	7.53	0	0.26	0.04
R4 - Rose Villa	6.07	8.03	0	-0.2	-0.06

Table 8-38 Design Year (2039) Do-Something Scenario annual mean pollutant concentrations (Option A)

Receptor & Location	Predicted Annual Mean Concentration		No. of exceedances of 24-hr PM_{10} limit (days)	Predicted change from Do-Minimum Scenario	
	NO_2	PM_{10}		NO_2	PM_{10}
R1 - Anabel House	3.65	7.60	0	-0.54	-0.09
R2 - Newtown NPS	4.05	7.67	0	2.04	0.34
R3 - St Bernard's Church	3.22	7.53	0	0.26	0.04
R4 - Rose Villa	4.42	7.74	0	1.45	0.23

Table 8-39 Design Year (2039) Do-Something Scenario annual mean pollutant concentrations (Option B)

Receptor & Location	Predicted Annual Mean Concentration		No. of exceedances of 24-hr PM_{10} limit (days)	Predicted Change from Do-Minimum Scenario	
	NO_2	PM_{10}		NO_2	PM_{10}
R1 - Anabel House	3.16	7.52	0	-0.05	-0.01
R2 - Newtown NPS	4.7	7.78	0	1.39	0.23
R3 - St Bernard's Church	3.27	7.54	0	0.21	0.03
R4 - Rose Villa	6.03	8.02	0	-0.16	-0.05

Table 8-40 Design Year (2039) Do-Something Scenario annual mean pollutant concentrations (Option C)

The predicted pollutant concentrations in the year of opening for the 2023 and 2039 Do-Something scenarios indicate that there would be no exceedances of pollutant limit values of 40µg/m^3 at any receptor. All airborne contaminants screened at the various receptor locations fall well below the Air Quality Standard Limit Values for the protection of human health. They also fall below the lower assessment thresholds for all pollutants of concern. Where the figure in the Predicted Change column is a negative, this indicates a decrease in air quality, whereas a positive figure represents an increase in air quality. The figures above show that in all cases (except R2), the changes are of an 'Imperceptible' nature, and are of 'Negligible' significance. Receptor 2 (Newtown NPS) will experience a 'Small' improvement, but due to the concentrations being well below any objective limits, the significance of this improvement is also considered 'Negligible'.

The reduction in existing sensitive locations in proximity to regional traffic along the existing route is likely to be greatest with Option B. There would be a benefit to multiple properties along the existing N63, should this option be developed. There would be a negative impact to the properties which are currently further than 200m of significant traffic sources, such as Receptor 1 (Anabel House), which would have traffic within 200m with implementation of any Option.

Overall, of the three Options, Option C would give the least improvement over the existing situation, due to its congruent alignment with the existing N63 from its tie-in west of Lisch Road. There would be no benefit to these properties over the Do-Minimum situation.

Regional Air Quality

The regional air quality emission levels for the current Base Year and future Do-Nothing/Do-Minimum years have been predicted and are presented in Table 8-41 below.

Year	C* (tonnes/year)	CO (Kg/year)	THC (Kg/year)	NOx (Kg/year)	PM_{10} (Kg/year)
2019	168	2361	318	1265	35
2023	188	2618	358	1422	39
2039	261	3475	495	2039	55

Table 8-41 Regional Emissions in Current (2019) Base Year, Opening Year (2023) and Design Year (2039) Do-Minimum Scenarios

**carbon bound in the emitted pollutants (carbon dioxide, carbon monoxide, hydrocarbons and particulate matter).*

The results from the Base Year and Do-Minimum scenarios show that there is a predicted increase in all pollutants over the range of assessment periods. The changes in emissions are obviously influenced by changes in traffic flow, composition and speed as a consequence of anticipated growth of the traffic fleet within Ireland.

Regional Air Quality Impacts

The predicted emissions from future years with the Proposed Road Development Options are presented in Table 8-42 and Table 8-43.

	Year	C* (tonnes/year)	CO (Kg/year)	THC (Kg/year)	NOx (Kg/year)	PM_{10} (Kg/year)
Do-Nothing/ Do-Minimum	**2023**	188	2618	358	1422	39
	2039	261	3475	495	2039	55
Option A (Cyan)	**2023**	190	2296	306	1423	41
	2039	263	3051	424	2030	56
Option B (Green)	**2023**	187	2250	299	1400	40
	2039	259	2989	415	1997	55
Option C (Yellow)	**2023**	186	2198	291	1393	40
	2039	258	2920	403	1984	55

Table 8-42 Total yearly emissions for Opening Year (2023) and Design Year (2037) Do-Something scenarios

**carbon bound in the emitted pollutants (carbon dioxide, carbon monoxide, hydrocarbons and particulate matter).*

	Year	C* (tonnes/year)	CO (Kg/year)	THC (Kg/year)	NOx (Kg/year)	PM_{10} (Kg/year)
Option A (Cyan)	**2023**	2	-322	-52	1	2
	2039	2	-424	-71	-9	1
Option B (Green)	**2023**	-1	-368	-59	-22	1
	2039	-2	-486	-80	-42	0
Option C (Yellow)	**2023**	-2	-420	-67	-29	1
	2039	-3	-555	-92	-55	0

Table 8-43 Total difference in yearly emissions per Option in comparison to Do-Minimum scenario

As shown above, Option C is predicted to result in fewer emissions when compared to the Do-Nothing/Do-Minimum scenario, Option A and Option B. Therefore, resulting in a positive impact. However, the total difference in yearly emissions per Option does not vary considerably.

In comparison with the Do-Nothing/Do-Minimum scenario, Option A produces slightly higher levels of C, NO_x and PM_{10}, but lower levels of CO and THC.

Options B and C consistently outperform the Do-Nothing/Do-Minimum scenario in all emissions, except for PM_{10}. The difference between the PM_{10} levels is minimal in the predicted Year of Opening (2023), with 1kg of additional PM_{10} for both Options B and C.

Air Quality Impacts on Sensitive Ecosystems

As well as impacts on human health, some air pollutants also have an effect on vegetation. Concentrations of pollutants in air and deposition of particles can damage vegetation directly or affect plant health and productivity. Deposition of pollutants to the ground and vegetation can alter the characteristics of the soil, affecting the pH and nitrogen availability that can then affect plant health, productivity and species composition. Increased greenhouse gas emissions on a global scale can affect the climate, such that the ability of existing species to tolerate local conditions can change.

The pollutant of most concern for sensitive vegetation near roads is NO_x, with a set EU limit value of 30µg/m^3 (annual mean) forming the critical load level for designated conservation sites. NO_x is composed of Nitric oxide (NO) and its oxidation product NO_2. The latter is taken up by plants principally through their stomata. Concentrations of NO_2 are higher close to roads, so vegetation in these areas is exposed to a larger source of Nitrogen (N).

Critical loads for the deposition of nitrogen, which represent the exposure below which there should be no significant harmful effects on sensitive elements of the ecosystem (according to current knowledge), have been established for certain habitats dependent on low nitrogen levels. Critical loads are expressed in deposition units of kg N ha-1 year-1. The air quality standard for the protection of vegetation is 30µg/m^3, and any increase of more than 2µg/m^3 or to within 10% of this level warrants further assessment of habitat sensitivity to NO_x by the Project Ecologist.

The TII guidelines state that as the potential impact of a scheme is limited to a local level, detailed consideration need only be given to roads where there is a significant change to traffic flows (>5%) and the designated site lies within 200m of the road centre line. One designated site with the potential to be affected at a local scale were identified (Lough Corrib SAC (Site Code: 000297) within 200m of the existing route and Proposed Scheme, and assessed in accordance with the methodology set out in DMRB 11.3.1 Annex F.

Distance from Lough Corrib SAC	NOx Annual Mean (µg/m^3)			
	Baseline (2019)	Do-Minimum 2023 NOx	Do-Something (All Options) 2023 NOx	Difference (Do-Min vs Do-Some)
10m	8.87	8.39	7.75	0.64
20m	8.03	7.47	6.98	0.49
30m	7.42	6.80	6.43	0.37
40m	6.98	6.31	6.03	0.28
50m	6.64	5.95	5.72	0.23
60m	6.38	5.66	5.48	0.18
70m	6.17	5.44	5.30	0.14
80m	6.01	5.26	5.15	0.11
90m	5.88	5.12	5.03	0.09
100m	5.78	5.00	4.93	0.07
110m	5.70	4.91	4.86	0.05
120m	5.63	4.84	4.80	0.04
130m	5.59	4.79	4.76	0.03
140m	5.55	4.76	4.73	0.03
150m	5.53	4.73	4.71	0.02
160m	5.52	4.72	4.70	0.02
170m	5.51	4.71	4.69	0.02
180m	5.50	4.69	4.68	0.01
190m	5.48	4.68	4.66	0.02
200m	5.46	4.66	4.64	0.02

Table 8-44 Annual Mean NOx concentrations within 200m of Lough Corrib SAC

Distance from Lough Corrib SAC	Road Contribution to Nitrogen Deposition (N) (kg N ha^{-1} $year^{-1}$)			
	Baseline (2019)	Do-Min 2023 NOx	Do-Something (All Options) 2023 NOx	Difference (Do-Min vs Do-Some)
10m	0.06	0.06	0.05	0.01
20m	0.06	0.05	0.05	0.00
30m	0.05	0.05	0.05	0.00
40m	0.05	0.05	0.04	0.01
50m	0.05	0.04	0.04	0.00
60m	0.05	0.04	0.04	0.00
70m	0.05	0.04	0.04	0.00
80m	0.05	0.04	0.04	0.00
90m	0.05	0.04	0.04	0.00
100m	0.05	0.04	0.04	0.00
110m	0.04	0.04	0.04	0.00
120m	0.04	0.04	0.04	0.00
130m	0.04	0.04	0.04	0.00
140m	0.04	0.04	0.04	0.00
150m	0.04	0.04	0.04	0.00
160m	0.04	0.04	0.04	0.00
170m	0.04	0.04	0.04	0.00
180m	0.04	0.04	0.04	0.00
190m	0.04	0.04	0.04	0.00
200m	0.04	0.04	0.04	0.00

Table 8-45 Road Contribution to Nitrogen Deposition Rates at Lough Corrib SAC within 200m

The nature of the assessment (in standard 10m distance bands), does not allow for a differentiation between the three Options, and as such only a qualitative opinion can be formed. However, from the table above, it can be seen that there are no expected breaches of NOx from a designated sites point of view, Options A and B would have the least impact on the Lough Corrib SAC, of the three options. These Options run adjacent to the designation for approximately 300m at the eastern end of the scheme. Both Options then crossing undesignated open farmland, before crossing the SAC designation at an angle, and tying back into the existing road network. Despite having a small direct impact on the SAC at the river crossing location, the increased distance between the proposed Options and the SAC would provide a benefit over Option C. Option C would be the least preferred of the offline options in terms of impact on the SAC designation. This Option runs adjacent to the Lough Corrib SAC for approximately 930m (within a 50m proximity). The Do-Nothing/Do-Minimum situation would be the least preferred of the online options under consideration.

Overall, there are to be no increases in concentrations of more than 2µg/m^3 or to within 10% of the standard of 30µg/m^3 for the protection of vegetation. No further assessment of this designated site is deemed necessary at this stage.

8.5.6.5 Summary

The impacts and effects as a result of changes in air pollutant concentrations have been assessed for the three Options (A, B & C) (the Opening Year (2023) and Design Year (2039) DoSomething scenarios), with respect to Current (2019) Base Year conditions and the Do-Nothing/Do-Minimum scenario in the Opening Year (2023) and the Design Year (2039). The assessment has been carried out in accordance with NRA) 'Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes' (Revision 1, May 2011) and other relevant guidance.

The calculation of Index of Overall Change of Exposure indicated that Option B would bring a benefit to the highest number of properties over the other Options (A and C) being considered.

There has been no instance under any scenario considered where a receptor is predicted to be exposed to annual mean concentrations higher than the National Air Quality Standard value for NO_2 and particulate matter (PM_{10}).

There would be an overall reduction in exposure to pollution as a result of implementing the Proposed Scheme. It is evident that a larger number of properties would experience a decrease in exposure to PM_{10} and NO_2 throughout the affected road network than experience an increase, particularly with Option B.

Whilst the Proposed Scheme would result in localised changes in emissions as a result of modification to the existing road layout and associated traffic redistribution effects, the changes in concentrations of nitrogen dioxide or particulate matter (PM_{10}) would generally be of an imperceptible or small magnitude, in terms of both increases and decreases in exposure.

The results of the regional impact assessment indicate that there would be an overall decrease in emissions of carbon monoxide, total hydrocarbons and NOx in the Do-Something Opening Year (2023) scenario for each of the three Options when compared to the Do-Nothing/Do-Minimum scenario. Options B and C would also result in a decrease in emissions for both carbon (C) and PM_{10} in the opening year. PM_{10} levels would remain static with Options B and C in the Design Year (2039), with all other pollutant levels predicted to drop. Overall, any of the Options being considered are preferable in terms of emissions over the Do-Nothing/Do-Minimum situation, the effect on regional air quality would be beneficial but not significant. In terms of designated sites, the assessment indicates NO_x levels would be maintained or slightly improved in proximity to the Options; however as estimated NO_x levels would fall 'Well Below' the EU critical load levels, the significance of effect in all cases would be Negligible. Whilst decreases in NO_x levels would be experienced within designated sites away from the proposed scheme, the significance of effect would also be Negligible.

In addition to this, all Options are preferable over the Do-Nothing/Do-Minimum in terms of climate as a result of the decrease in emissions brought about by the more favourable driving environment created.

Based on the results of the impact assessment, the following score has been assigned to the Options:

Option	Do-Nothing/Do-Minimum	Option A (Cyan)	Option B (Green)	Option C (Yellow)
Overall Ranking	4 - Not Significant or neutral	5 - Minor or slightly positive	5 - Minor or slightly positive	4 - Not Significant or neutral

Table 8-46 Overall Score (Air Quality and Climate)

Based on the Index of Overall Change in Exposure Calculations, there is likely to be an improvement in air quality with Option A and B for a number of properties. There is likely to be a decrease in air quality with Option C; however, the impact from the reduction in air quality is considered not significant.

The sensitive ecosystems assessment has shown a minor improvement/no change in air quality with any of the Options under consideration.

Local air quality will improve for the majority of properties on the existing N63 but deteriorate for those few properties which are now introduced to proximal traffic.

8.5.7 Population and Human Health

8.5.7.1 Introduction

Similar to Stage 1, the population and human health element of the Stage 2 Project Appraisal includes an examination of the potential impacts on the local population and human health from each of the Options.

The main potential impacts from each of the Options on population and human health are likely to comprise air emissions, noise, visual and traffic impacts.

8.5.7.2 Methodology

The assessment has been carried out in accordance with Stage 2 of the option selection process outlined in NRA PMG's 2010 and TII's PMG's 2017, as well as TII's '*Project Appraisal Guidelines for National Roads, Unit 7'* Methodology.

Similar to Stage 1, a review of the data collected during the constraints study was conducted for Stage 2 Project Appraisal. Further information can be found in Section 7.5.8.

8.5.7.3 Existing Environment

Information on the existing environment for each of the Options is outlined in Section 7.5.8.3.

8.5.7.3.1 Impact Assessment

The results from Stage 2 Project Appraisal are similar to that of Stage 1 Preliminary Options Assessment. For example, the additional bridge crossing over the Abbert River has the potential to

improve connectivity to the community facilities for locals; which could potentially result in a slight-moderate positive impact on the local community and the population.

The introduction of dedicated pedestrian/cycle facilities will help those in the local community by giving them an additional option for a mode of transport. As a significant percentage of the community is employed an offline option would improve commuting times due to the separation between regional and local traffic.

All three Options will assist in alleviating congestion issues around Liss Bridge at the local level by segregating the local and the regional traffic. The regional traffic can use the new alignment and the local traffic can use the existing N63 which will separate these two types of traffic that will be travelling at different speeds. This segregation will allow for the local traffic more time and space to manoeuvre if required which will encourage the use of the community facilities. As described in Section 8.4.1 it will also improve safety for both motorised and non-motorised users in the area, resulting in a slight positive impact to journey characteristics and amenity value in the local area once operational. Further information can be found in Section 7.5.8.4.

8.5.7.3.2 Summary

Based on the potential impacts associated with each Option, the following score has been assigned to the three Options.

Option	Do-Nothing/Do-Minimum	Option A (Cyan)	Option B (Green)	Option C (Yellow)
Overall Ranking	2 - Moderately Negative	6 - Moderately positive	6 - Moderately positive	6 - Moderately positive

Table 8-47 Overall Score (Population and Human Health)

As outlined in Section 7.3.2.5, there will be residential visual impacts from all Options due to the routing in close proximity of residences when bridging the Abbert River. There will also be significant effects on the visual amenity of the Cistercian Abbey. However, overall, all three Options will likely result in a positive impact as they will all assist in alleviating congestion issues around Liss Bridge at the local level, while improving safety for both motorised and non-motorised users

The additional bridge crossing over the Abbert River has the potential to improve connectivity to the community facilities for all in the local in the area.

The Do-Nothing/Do-Minimum received a score of 'Moderately negative' as the opportunity to improve congestion issues at Liss Bridge, while improving safety for both motorised and non-motorised users would be lost

8.5.8 Cultural Heritage (incorporating Architectural Heritage, Archaeology and the Historic Landscape)

8.5.8.1 Introduction

Similar to Stage 1, this appraisal compares the potential cultural heritage impacts of each of the three Options.

8.5.8.2 Methodology

As per Stage 1, this appraisal has been carried out in accordance with the following guidelines:

- NRA (2005) '*Guidelines for Assessment of Archaeological Heritage Impacts of National Road Schemes'*.; and
- NRA (2005) '*Guidelines for Assessment of Architectural Heritage Impacts of National Road Schemes'*.

8.5.8.3 Desktop review

A desktop review was undertaken to identify any potential archaeological and cultural heritage resources or constraints within the study area.

Publicly available information reviewed to identify archaeological and cultural resources include:

- Online records of the Archaeological Survey of Ireland (www.archaeology.ie) at the National Monuments Service
- Statutory Record of Monuments and Places (1997) for County Galway
- Records of National Monuments and Preservation Orders available from the National Monuments Service
- Architectural heritage features and designed landscapes recorded in the statutory National Inventory of Architectural Heritage (NIAH)
- Annual gazetteer of licensed archaeological excavations in Ireland at www.excavations.ie
- Record of Protected Structures (architectural heritage) in the Galway County Development Plan 2015-2021
- First and second editions of the Ordnance Survey six-inch series at www.archaeology.ie
- Ordnance Survey twenty-five inch series at www.archaeology.ie

Two locations of small house clusters (no longer visible on the ground surface), but recorded on the first edition of the Ordnance Survey series (published c.1840) were noted during the desktop survey: The first house cluster was located in the townland of Abbey, c. 20m to the north of where Options A and B traverse a local road, the L6188 (see drawing in Appendix B). Options A and B avoid the house cluster though they may encroach on a paddock associated with the more southerly of the houses.

The second house cluster is located in the townland of Moyne at the eastern end of the Scheme where the Options A, B and C coalesce along the existing route of the existing N63. This cluster originally consisted of four property plots on the north side of the road within which three houses were located. This second house cluster is no longer visible to the eye, though orthophotography & digital surface modelling derived from aerial drone photography of the study area has revealed the outline of the properties.

8.5.8.4 Site walkover

The three Options were subject to fieldwalking to inspect the potential for impact on cultural heritage receptors including archaeology, architectural heritage and traditional landscape features (field walls and hedgerows). All of the buildings, archaeological sites and other features of potential interest that were identified by the desk study were inspected, photographed and described in the field by the writer over the course of a visit on 25th and 26th November 2019.

8.5.8.5 Impact Assessment

Three Options were examined and compared in terms of cultural heritage impacts.

Figure 2 in Appendix B shows the location of identified Archaeology and Cultural Heritage constraints.

Option A (Cyan)

Passes 99m to the south-east of Abbeyknockmoy Cistercian Abbey (NM No. 166; GA058-004001), which is a National Monument. Within the abbey precincts is a graveyard (GA058-004-003). Option A also passes 200m to the south-east of a field system, associated with the monastic site (GA058-004004). Within the field system, immediately to the north of the abbey is a rectangular building (which measures 11.35m east-west by 5.8m north-south internally) (GA058-004002). The building was investigated during excavations at the abbey in 1982 and 1983 (Sweetman 1987, 1-12). The field system, which is also designated as a National Monument (NM No. 166 & PO No. 4/1989), is recorded in the RMP as a series of fields (covering an area c. 550m north-west to south-east by c. 400m north-east to south-west) to the north and west of the abbey. However, inspection of aerial photography suggests that traces of this field system extends to the east and south of the abbey, directly in the line of Option A. The site walkover revealed irregular earthworks associated with this field system on the line of Option A. This Option will impact upon the south-easterly extent of the medieval field system associated with the abbey. Option A will also adversely affect the rural setting of the Cistercian Abbey and surrounding precinct, and there is a likelihood that buried, previously unrecorded archaeological remains occur along this Option.

Further east in the townland of Abbey, Option A may encroach upon a paddock associated with the more southerly building within a pre-Famine house cluster identified on the first edition Ordnance Survey six-inch series (c.1840).

Option A passes 209m to the north of a seven-arch limestone road bridge (NIAH No. 30405811). Known as Liss Bridge, the structure carries the current N63 over the Abbert River. There will be an impact on this built heritage asset with a visual intrusion within its setting.

Option A also passes to the immediate south of a second house cluster identified on the first edition of the OS six-inch series (c.1840) in the townland of Moyne at the eastern end of the scheme. The remains of a house are still visible, orientated at right angles to the existing N63 road. The rest of the house cluster is no longer visible to the eye, though orthophotography & digital surface modelling derived from aerial drone photography of the study area has revealed the outline of the properties. Given current knowledge of this archaeological site, works may encroach upon the edge of this house cluster.

No other known cultural heritage receptors, whether archaeological or built heritage are situated within 250m of Option A.

Option B (Green)

Passes 340m to the south-east of Abbeyknockmoy Cistercian Abbey (NM No. 166; GA058-004001), which is a National Monument. Within the abbey precincts is a graveyard (GA058-004003). Option B also passes 390m to the south-east of a field system, associated with the monastic site (GA058-004004). The field system, which is also designated as a National Monument (NM No. 166 & PO No. 4/1989), is recorded in the RMP as a series of fields covering an area c. 550m north-west to south-east by c. 400m north-east to south-west to the north and west of the abbey. However, inspection of aerial photography suggests that traces of this field system may also extend to the east and south of the abbey, 230m south-east of Option B.

Option B will affect the rural setting of the Cistercian Abbey and the surrounding precinct, and there is a likelihood that buried, previously unrecorded archaeological remains occur along this Option.

Option B passes 174m to the north of Rose Villa (NIAH No. 30405814), a detached three-bay, single-storey teacher's house, built c. 1870. It also passes 209m to the north of Liss Bridge (NIAH No. 30405811). There will be an impact on these built heritage assets with a visual intrusion within their settings.

From analysis of earlier editions of Ordnance Survey maps for the area, it is evident that Option B passes c.10m to the south of a pre-Famine house cluster located further east in the townland of Abbey. Given current knowledge of this archaeological site, the possibility remains that works may encroach upon the southern edge of this house cluster.

Again, from analysis of early editions of Ordnance Survey maps in the area, it is apparent that Option B also passes to the immediate south of a second house cluster in the townland of Moyne at the eastern end of the Scheme. The remains of a house are still visible, orientated at right angles to the existing N63 road. The rest of the house cluster is no longer visible to the eye, though orthophotography & digital surface modelling derived from aerial drone photography of the study area has revealed the outline of the properties. Given current knowledge of this archaeological site, works may encroach upon the southern edge of this house cluster.

No other known cultural heritage receptors, whether archaeological or built heritage are situated within 250m of the Option B.

Option C (Yellow)

Passes immediately to the north of Rose Villa (NIAH No. 30405814). It also passes 104m west-north-west of a detached open-air handball alley (NIAH No. 30405810), built in c. 1950, and now disused. It runs 197m north-west of St Bernard's Church (NIAH No. 30405815), the local Roman Catholic church, built in c.1820. It also runs 90m to the north of Liss Bridge (NIAH No. 30405811). There will be an impact on these built heritage assets with a visual intrusion within their settings.

From an analysis of early editions of Ordnance Survey maps, it is apparent that Option C also passes to the immediate south of a second house cluster in the townland of Moyne at the eastern end of the Scheme. The remains of a house are still visible, orientated at right angles to the road. The rest of the house cluster is no longer visible to the eye, though orthophotography & digital surface modelling derived from aerial drone photography of the study area has revealed the outline of the properties. Given current knowledge of this archaeological site, works may encroach upon the southern edge of this house cluster.

No other known cultural heritage receptors, whether archaeological or built heritage are situated within 250m of Option C

There is a likelihood that buried, previously unrecorded archaeological remains occur along Option C.

Options A, B and C cross the Abbert River once each at three different locations. Rivers have facilitated a variety of activities in the past such as farming, fishing, milling and transportation. Such rivers have also formed boundaries defining the political and cultural identities of past peoples who would have lived in the vicinity of these waterways. Votive deposits of valuable prehistoric metalwork have been deposited in rivers and been recovered during the course of dredging. Fish traps and weirs, as well as earlier bridge crossings are a feature of river usage.

All Options have the potential to affect previously unrecorded, buried archaeological remains – of all periods, from early prehistory to post-medieval times – but especially Options A and B, which pass close to the abbey precinct and therefore have a higher potential for the discovery of associated medieval features.

8.5.8.6 Summary

This report assesses the potential significant development impacts of the proposed N63 Liss to Abbey road improvements project on the cultural heritage of the project site and environs, including archaeology and architectural heritage. Based on the potential impacts along each proposed Option, the following score has been assigned to the three Options.

Option	Do-Nothing/Do-Minimum	Option A (Cyan)	Option B (Green)	Option C (Yellow)
Overall Ranking	4 - Not significant or neutral	1 - Major or highly negative	2 - Moderately negative	3 - Minor or slightly negative

Table 8-48 Overall Score (Cultural Heritage)

Option A is ranked as 'Major or highly negative' as it crosses a field system associated with the Cistercian Abbey. The Option also passes in close proximity to the abbey itself. Both abbey (NM No. 166; GA058-004001), and field system (NM No. 166 & PO No. 4/1989; GA058-004004) are protected National Monuments.

Option B received a score of 'Moderately negative' as it passes in close proximity to the Cistercian Abbey (NM No. 166 & GA058-004001) and an associated medieval field system (NM No. 166; PO No. 4/1989; GA058-004004) which are both protected National Monuments.

Option C received a score of 'Minor or slightly negative', as it passes within the immediate vicinity of Rose Villa (NIAH No. 30405814) and the handball alley (NIAH No. 30405810) posing a visual intrusion on their settings. This Option had the least impact on cultural heritage receptors.

Any large development project in a greenfield setting is likely to discover some new archaeological sites, objects or deposits. The same can be said for any development over a river, though as the Abbert River is part of the Corrib SAC, a clear-span bridge will be required for this project, and consequently it will not be envisaged that there be in-stream works, either temporary or permanent.

If the project proceeds the proposed mitigation of the impacts described above would include archaeological surveys and test excavations, followed by full and detailed investigations of whatever archaeological sites might be discovered by test excavations, along with all analyses, reporting and publication of the results.

There will be a need for sensitive landscaping and design for the project as it will involve the construction of embankments and a bridge crossing through a relatively flat river valley with known archaeological and built heritage sites in the vicinity. A full appraisal of the landscape and visual constraints can be seen in section 8.5.4 of this chapter.

The Do-Nothing/Do-Minimum Option received a score of 4' Not significant or neutral' as no works are proposed outside the footprint of the current N63.

8.5.9 Material Assets - Agriculture

8.5.9.1 Introduction

As per Stage 1, this appraisal compares the potential impacts on agriculture from each of the three Options.

8.5.9.2 Methodology

Similar to Stage 1, the appraisal has been carried out in accordance with the option selection process outlined in TII's PMG's 2017, as well as TII's '*Project Appraisal Guidelines for National Roads, Unit 7.0-Multi Criteria Analysis'* (2016).

Further information can be found in Section 7.5.10.1.

8.5.9.3 Existing Environment

Information on the existing environment for each of the Options is outlined in Section 7.5.10.2.

8.5.9.4 Impact Assessment

Three Options were examined and compared in terms of agricultural land use impacts. The measurements of the various Options are summarised in Table 8-49.

Option	Option A (Cyan)	Option B (Green)	Option C (Yellow)
Length (m)	2120	2080	2060
On-line length (m)	775	925	2173
Agri land-take (length m)	1705	1500	315
Farms Severed (No.)	11	11	0
Farmyards within 50m (No.)	0	0	0
High sensitivity farms affected (No.)	0	0	0
Length through Alluvial/wet soils (m)	260	500	190

Table 8-49 Option corridor agronomy / land-use attributes

Option A (Cyan) is approximately 2.12km in length of which 355m is a southern link road to the N63. It is on-line with existing road for approximately 0.77km. It crosses agricultural land for 1.7kms and through low lying wet land for 260m. There are no farm yards within 50m of the centre-line and no high sensitivity farm enterprises along the Option corridor. It will sever 11 land parcels.

Option B (Green) is approximately 2.08km in length of which 345m is a southern link road to the N63. It is on-line with existing road for approximately 0.92km. It crosses agricultural land for 1.5kms and through low lying wet land for 500m. There are no farm yards within 50m of the centre-line and no high sensitivity farm enterprises along the Option corridor. It will sever 11 land parcels.

Option C (Yellow) is approximately 2.06km in length of which 220m is a southern link to the N63. It is on-line with existing road for approximately 1.4km. It crosses agricultural land for 0.85kms and through low lying wet land for 315m. There are no farm yards within 50m of the centre-line and no high sensitivity farm enterprises along the Option corridor. It will sever 3 land parcels.

Option	Option A (Cyan)	Option B (Green)	Option C (Yellow)
Agri land-take	6	5	3
Farms Severed	5	5	4
Length through Alluvial/wet soils	4	6	5

Table 8-50 Ranking of impacts of each Option corridor

The total length is generally not relevant from an agricultural impact point of view where on-line sections of the Option are a significant portion of its length. The length through agricultural land is the most relevant measure of potential land-take. Also, all Options are similar for impact on farm yards and highly sensitive enterprises.

8.5.9.5 Summary

Based on the potential impacts associated with each Option on agricultural land in the area, the following score has been assigned to the three Options.

Option	Do-Nothing/Do-Minimum	Option A (Cyan)	Option B (Green)	Option C (Yellow)
Overall Ranking	4 - Not significant or neutral	2 - Moderately negative	2 - Moderately negative	3 - Minor or slightly negative

Table 8-51 Overall Score (Material Assets – Agriculture)

Option A and B have both received a score of 'Moderately negative' as they have the highest potential land take.

Option C received a score of 'Minor or slightly negative' from an agricultural impact point of view as this Option will result in land take and will sever land parcels.

The Do-Nothing/Do-Minimum Option received a score of 'Not significant or neutral' as no work are proposed outside the footprint of the current N63.

8.5.10 Material Assets - Non-Agriculture

8.5.10.1 Introduction

As per Stage 1, this section will evaluate the following economic assets of the site and environs:

- Utilities including:
  - Electricity Network;
  - Telecommunications (including phone and broadband);
  - Gas Distribution Networks;
  - Water supply networks; and
  - Sewerage networks.
- Land Use and Property (non-agricultural)

The assessment of potential impacts associated with the generation of unusable or unwanted waste materials that may arise during the construction phase is also addressed in this section.

8.5.10.2 Methodology

Similar to Stage 1, this assessment has been carried out in accordance with the option selection process outlined in TII's PMG's 2017, as well as TII's '*Project Appraisal Guidelines for National Roads, Unit 7.0- Multi Criteria Analysis*' (2016).

Additional information on the methodology used can be found in Section 7.5.11.2.

8.5.10.3 Existing Environment

Information on the existing environment for each of the Options is outlined in Section 7.5.11.3.

8.5.10.4 Impact Assessment

The results from Stage 2 Project Appraisal are similar to that of the Stage 1 Preliminary Options Assessment. For example, during the construction phase of any of the three proposed Options, some realignment, or replacement of services and utilities may be required in conjunction with or to accommodate the proposed works; these works could potentially result in suspension of services during the construction and diversion works, which could likely result in a slight impact to the existing network.

As discussed earlier, Option A and B traverse through predominately open green fields, with fewer properties located close to these Options, when compared to the Option C.

The southern section of Option C follows closely to the existing N63 line, with a number of residential properties and community facilities dotted along each side of this road (47 sensitive receptors within 50m of the carriageway).

No properties are located within the footprint of any of the three Options. It is proposed to undertake the majority of the online upgrade works within the footprint of the existing N63 line. It is therefore not anticipated that there will be any requirement for demolition of properties; however, the southern section of all Options may require minor acquisition of land at the ties in.

Further information can be found in Section 7.5.11.4.

8.5.10.5 Summary

Based on the potential impacts associated with each Option on material assets in the area, the following score has been assigned:

Option	Do-Nothing/Do-Minimum	Option A (Cyan)	Option B (Green)	Option C (Yellow)
Overall Ranking	4 'Not significant or neutral'	3 'Minor or slightly negative'	3 'Minor or slightly negative'	3 'Minor or slightly negative'

Table 8-52 Overall Score (Material Assets – Non-Agriculture)

As shows in Table 8-52, all three Options were scored as 'Minor or slightly negative' as all Options could potentially result in temporary, negative impact of slight significance to existing services in the area during the construction phase due to possible service suspensions. In addition to this, it is anticipated that there may be potential negative vibration impacts to residential and commercial properties, as well as community facilities surrounding each of the Options. The southern section of all Options may require minor acquisition of land at the ties in.

The Do-Nothing/Do-Minimum Option received a score of 'Not significant or neutral' as no work is are proposed outside the footprint of the current N63.

8.5.11 Environment Summary

The overall environment ranking for each Option is listed in Table 8-53 below.

	Do-Nothing / Do-Minimum Option	Option A (Cyan)	Option B (Green)	Option C (Yellow)
Biodiversity	Major or highly positive	Moderately negative	Moderately negative	Moderately negative
Water	Minor or slightly negative	Moderately negative	Moderately negative	Moderately negative
Land and Soils	Minor or slightly negative	Moderately negative	Moderately negative	Moderately negative
Landscape and Visual	Not significant or neutral	Major or highly negative	Moderately negative	Minor or slightly negative
Noise and Vibration	Moderately negative	Minor or slightly negative	Minor or slightly negative	Moderately negative
Air Quality and Climate	Not significant or neutral	Minor or slightly positive	Minor or slightly positive	Not significant or neutral
Population and Human Health	Moderately negative	Moderately positive	Moderately positive	Moderately positive
Cultural Heritage	Not significant or neutral	Major or highly negative	Moderately negative	Minor or slightly negative
Material Assets - Agriculture	Not significant or neutral	Moderately negative	Moderately negative	Minor or slightly negative
Material Assets - Non-Agriculture	Not significant or neutral	Minor or slightly negative	Minor or slightly negative	Minor or slightly negative
Overall Environmental	Not significant or neutral	Major or highly negative	Moderately negative	Moderately negative

Table 8-53 Environmental Summary

8.6 Integration

The Abbert River creates a natural barrier to the flow of people and goods and therefore any improvements incorporating a new bridge, such as the N63 Realignment Scheme will have a positive improvement in the overall integration across County Galway. All Options propose a relatively similar river-crossing location and level of function and are therefore expected to provide a generally positive integration improvement.

Option	Do-Nothing / Do-Minimum Option	Option A (Cyan)	Option B (Green)	Option C (Yellow)
Overall Ranking	4 -Not Significant or Neutral	6 - Moderately Positive	6 - Moderately Positive	6 - Moderately Positive

Table 8-54 Integration Summary

8.7 Accessibility and Social Inclusion

Accessibility and social inclusion have been viewed as providing improved access to services, for example, to schools, hospitals, Galway town centre, and onward connectivity. All Options tie into the same location at the northern and southern ends of the proposed scheme.

For properties within the study area and Abbeyknockmoy the three proposed Options will help them on a day to day basis due to a reduction of traffic on the downgraded section of the N63. Regional traffic will use the new alignment, and this will reduce the amount of traffic in the area of the community facilities such as the school and the church. This will allow local residents shorter journey times and reduce the risk of traffic collisions between high speed regional traffic and local traffic pulling in/out of community facilities.

The major benefit for the local community of these three Options is the introduction of dedicated pedestrian/cycle routes. These new routes will allow for direct access from Abbeyknockmoy town to the community facilities for all types of people. These new routes will introduce safe access to the school, creche, GAA club and church. In turn this will allow safe access for children but will also offer safe access for vulnerable road users and give people a new connection to the community facilities. This new connection may in turn lead to job opportunities and social opportunities to those who did not have them before.

The introduction of the realignment (Option A, B or C) will create a by-pass of a section of the existing N63. Along this by-passed section there are no bus stops, but buses may stop along these areas on an ad-hoc bases at the side of the road to collect/ drop off passengers. The scheme may result in some properties being by-passed by buses, but the introduction of a dedicated pedestrian/cycle facility will give people the opportunity to commute safety to dedicated bus stops which are safer set down/ pick up areas as it is a dedicated area for a bus to stop. Any school buses will be affected by the by-pass, their route to/from the school would alter slightly but no homes would be by-passed so no pupils would be adversely affected.

The three Options will allow for all existing connections to be retained, so there will be no adverse effects on local traffic traversing the new alignment.

Therefore, accessibility differences are minor between the three proposed Options, with the only differences being the junction type used to tie in the L3110. In this regard the three Options proposed are assessed as ‘Moderately Positive’. The Do-Nothing/ Do-Minimum option will be negative in comparison to Options A, B and C as the poor horizontal and vertical alignment around community facilities leads to poor social accessibility, but overall rates as ‘Not Significant or Neutral,’ as it will not be any worse off than the current conditions.

Option	Do-Nothing / Do-Minimum Option	Option A (Cyan)	Option B (Green)	Option C (Yellow)
Overall Ranking	4 -Not Significant or Neutral	6 - Moderately Positive	6 - Moderately Positive	6 - Moderately Positive

Table 8-55 Accessibility and Social Inclusion Summary

8.8 Physical Activity

All three Options (A, B and C), would be expected to improve the level of local walking and cycling (providing that the existing road is upgraded to provide footpaths and dedicated cycle facilities). Where

safe and efficient junctions are provided at the tie-in with L3110, it would be expected that school and recreational walking and cycling would increase.

The three Options offer the same major benefit for all road users; separating local and regional traffic. By doing this the regional traffic is able to continue at an appropriate speed along an improved standard of road, which will help improve journey times and the local traffic will be able to navigate from the residential area to the community facilities with minimum interaction with regional traffic.

Each Option will offer dedicated pedestrian/cycle facilities, the introduction of these will help a number of different road users, in particularly school children as there would be a connection between the school and the residential areas. There are also different benefits offered to all road users as detailed in Section 8.7 above.

Differences are minor between the three proposed Options, with the only differences being the junction type used to tie in the L3110. In this regard the three Options proposed are assessed as 'Moderately Positive'. The Do-Nothing/ Do-Minimum option will be negative in comparison to Options A, B and C as the poor horizontal and vertical alignment around community facilities leads to poor social accessibility, but overall rates as 'Not Significant or Neutral,' as it will not be any worse off than the current conditions.

	Do-Nothing / Do-Minimum Option	Option A (Cyan)	Option B (Green)	Option C (Yellow)
Overall Ranking	4 -Not Significant or Neutral	6 - Moderately Positive	6 - Moderately Positive	6 - Moderately Positive

Table 8-56 Physical Activity Summary

8.9 Project Appraisal Matrix

Table 8-57 provides a summary of the project appraisal matrix below, with the full assessment table contained in Appendix E.

	Do-Nothing / Do-Minimum Option	Option A (Cyan)	Option B (Green)	Option C (Yellow)
Economy	Major or highly negative	Moderately positive	Major or highly positive	Minor or slightly positive
Safety	Moderately negative	Moderately positive	Moderately positive	Moderately positive
Environment	Not significant or neutral	Major or highly negative	Moderately Negative	Moderately negative
Integration	Not significant or neutral	Moderately positive	Moderately positive	Moderately positive
Accessibility & Social Inclusion	Not significant or neutral	Moderately positive	Moderately positive	Moderately positive
Physical Activity	Not significant or neutral	Moderately positive	Moderately positive	Moderately positive
Overall Ranking	**Minor or slightly negative**	**Not significant or neutral**	**Minor or slightly positive**	**Not significant or neutral**

Table 8-57 Project Appraisal Matrix Summary

From this assessment, it is recommended that Option B should be taken forward as the Emerging Preferred Option for the N63 Realignment Scheme.

8.10 Public Consultation (PC2) - Emerging Preferred Option

8.10.1 Introduction

In conjunction with the Stage 2 Project Appraisal, a Public Consultation (PC2) was held on the 03rd February between 2:00pm and 7:00pm at the Abbeyknockmoy Community Centre. The purpose of the Public Consultation was to present the three Options that were studied at Stage 2 and present the Emerging Preferred Option. These were;

- Option A – Cyan
- Option B – Green (Emerging Preferred Option)
- Option C – Yellow

The objective of the Public Consultation was to:

- Introduce the Emerging Preferred Option and engage with local stakeholders;
- Invite submissions on the Emerging Preferred Option;
- Inform the public of the process and programme for the project; and
- Gather local information, which may not be known to the design team.

8.10.2 Publicity

The Public Consultation was advertised in advance by Galway County Council in the local newspaper. A newsletter update was also undertaken by the project team to businesses in the vicinity of the study area. The Members of Tuam Municipal District were also informed of the scheme by the project team prior to the Public Consultation at the regular meeting.

8.10.3 Attendance

On the day of the consultation event 62 people signed the attendance register. To inform and develop a list of interested parties, attendees were asked for their name and address as they entered the venue. Attendees were offered a copy of a brochure explaining the scheme, providing images of the Options and study area, and a response questionnaire.

8.10.4 Format

A brochure was presented to the public and a number of maps were put on display during the consultation to assist members of the public in understanding the Options being presented. The maps presented were;

- Options Plan showing the study area considered during the Stage 2 Option Selection Process as well as the three Options on Aerial Photography at a scale of 1:5000; and
- Emerging Preferred Option Plan showing the study area considered during the Stage 2 Option Selection Process as well as the emerging preferred Option on Aerial Photography at a scale of 1:5000.

Staff from Galway County Council's National Roads Project Office and the design team from AECOM were present to answer any questions. Members of the design team also sought information from the public to assist in gaining a greater understanding of local issues and constraints which may impact on the selection of the Emerging Preferred Option.

8.10.5 Feedback

The closing date for receipt of submissions from PC2 was the 7th February 2020. Questionnaires were handed in at the exhibition or sent by email and by post to Galway County Council. All submissions received were reviewed and recorded on a submission register.

A total of 32 submissions were received from the public. Of these 32 submissions, 27 were returned using the questionnaires provided and 5 were returned in the form of a letter.

8.10.6 Analysis of Submissions

A number of the PC2 submissions received indicated they were content with the Emerging Preferred Option.

An analysis of the submissions highlighted the following comments and concerns:

- The majority of the attendees expressed a strong interest in cycle and pedestrian facilities along the existing N63, linking the two sections of Abbeyknockmoy to be included as part of this scheme.
- The existing Liss Bridge should be retained for vehicular access
- Concerns were raised regarding the levels of the road and the proposed bridge and these should be reviewed to minimise visual impacts on the Abbey.
- There were some landowners concerned about land take and the proximity of the scheme in relation to their homes.

8.10.7 Public Consultation 2 - Conclusions

The public were overall in favour of the scheme with the safety benefits of moving traffic away from community facilities clearly seen.

A general preference for the Emerging Preferred Option was indicated during the consultation and in the subsequent submissions. There was concern from landowners due to proximity of the scheme to homes and the visual impacts of the Option, but these will be reviewed in further detail during the detailed design stage. This review may lead to some alignment changes from the original Option corridor.

During the consultation the desire for non-motorised user facilities to be introduced to connect the community facilities to the dwellings to the west of the site was heavily emphasised by public response.

9. Conclusions and Recommendations

The option selection process concluded that the Emerging Preferred Option is Option B. The Emerging Preferred Option can be seen in below.

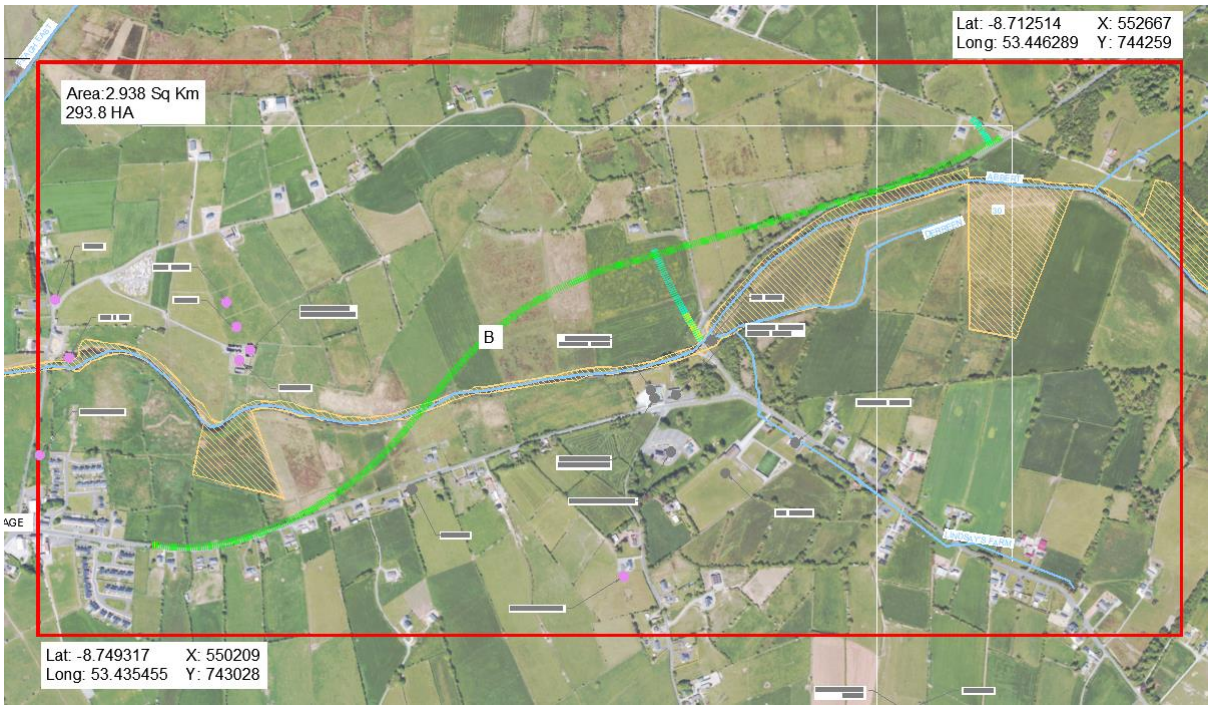


Figure 9-1 Emerging Preferred Option (Option B)

Beginning at the eastern side of the study area and travelling west the Option begins west of an existing crossroads that are to be realigned, the Option then runs westbound across a small area of woodland before crossing agricultural land. A new major/minor junction is proposed to tie in with the L3110, which will be extended across the existing Liss Bridge to tie into the new scheme. The Option then sweeps southbound at a tighter radius than Option A and crosses the Abbert River at a skew before sweeping west again and tying back into the existing road network before Abbeyknockmoy village. It is also proposed to include facilities for non-motorised users along the existing N63. These facilities are expected to be implemented by provision of a footway and/or cycleway along one side of the existing N63, however the detail of this is subject to development at Phase 3 - Preliminary Design. As such, the provision for non-motorised users will no longer be required along the realigned section of the N63.

It is recommended that detailed topographical surveys and other engineering investigations should be undertaken to inform the further development of the design of the Emerging Preferred Option, sufficient to inform a full Environmental Impact Assessment.

It is recommended that Option B be adopted as the Emerging Preferred Option and that this Option is taken forward to the design stage of the project (Phase 3) and concurrently to the EIAR and Statutory Process stage of the project (Phase 4).

Due to the responses from Public Consultation 2 there may be some changes to the Option corridor to help mitigate issues with landowners and this will be reviewed in more detail in Phase 3.

Appendix A – Traffic Data

A.1 Traffic Survey Data Review

A.2 Traffic Assessment – AADT Maps

Project: N63 Liss to Abbey
Title: Traffic Survey (May 2019) Review

Automatic Traffic Count

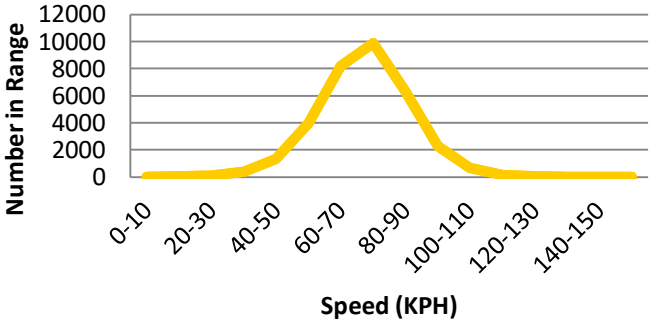
	2019	2018	2017
AADT	3598	3349	3231

	ATC1	ATC2	ATC3
AADT	4981	4859	3500

Values given are calculated AADT based only on the first week of survey period (21/05/19 – 27/05/19). During the second week of survey period (28/05/19 – 03/06/19) a reduction between 10-20% in traffic volumes as been observed (end of school period).

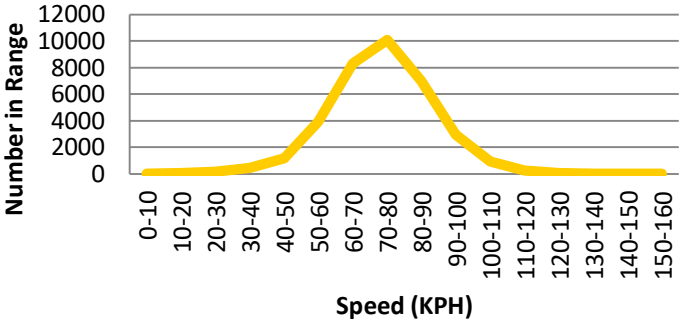
ATC - Speed Distribution

ATC 1 Eastbound Speed Distribution



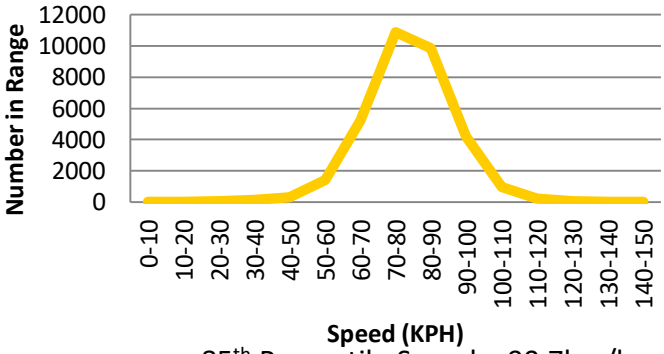
85th Percentile Speed = 86.0km/h

ATC 1 Westbound Speed Distribution



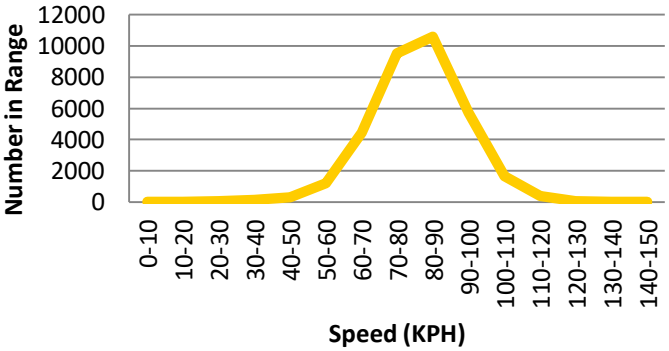
85th Percentile Speed = 87.0km/h

ATC 2 Eastbound Speed Distribution



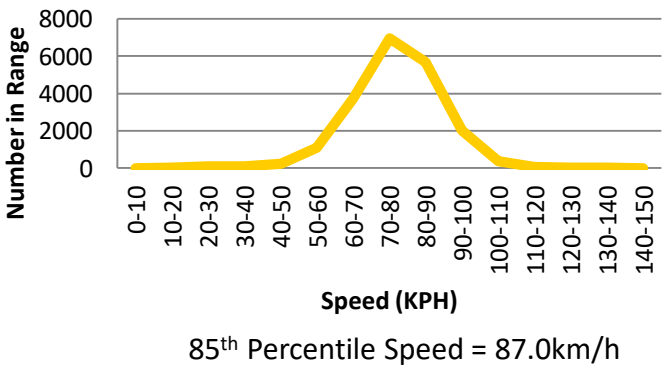
85th Percentile Speed = 90.7km/h

ATC 2 Westbound Speed Distribution



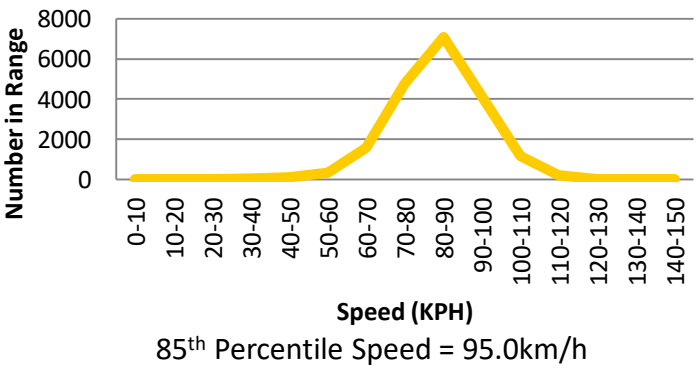
85th Percentile Speed = 93.5km/h

ATC 3 Eastbound Speed Distribution



85th Percentile Speed = 87.0km/h

ATC 3 Westbound Speed Distribution



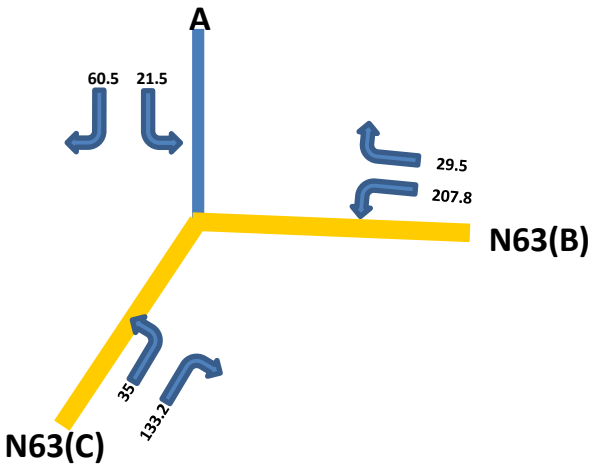
85th Percentile Speed = 95.0km/h

Junction Turning Count

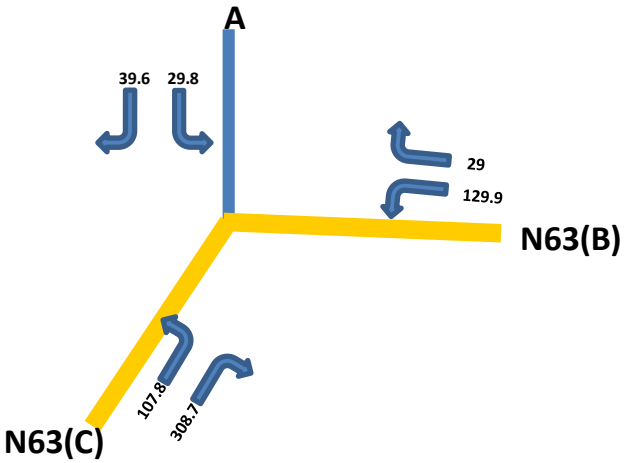
The values in the following slides are reproduced from IDASO traffic survey undertaken on 21st May 2019 (7am to 7pm). Values given below are in PCU.

JTC - Site 1

AM peak (8am to 9am)

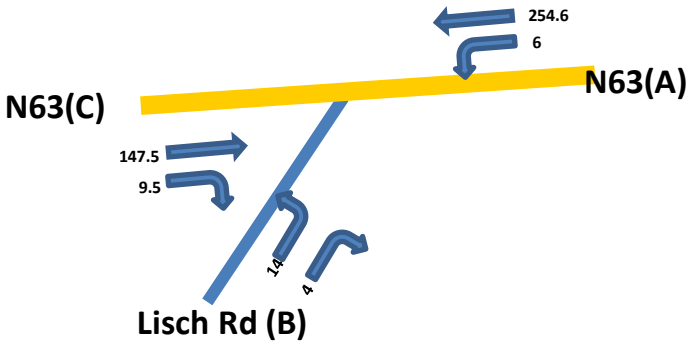


PM peak (5pm to 6pm)

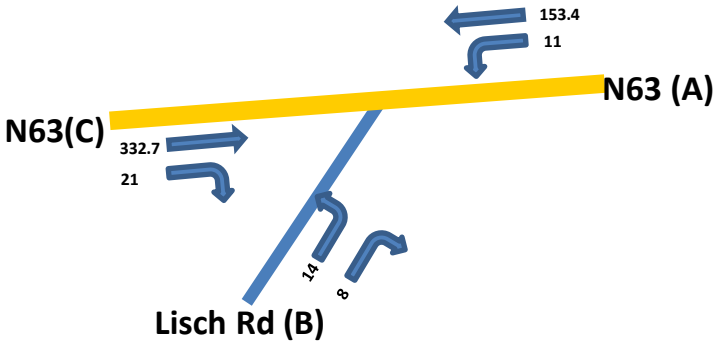


JTC - Site 2

AM peak (9am to 10am)

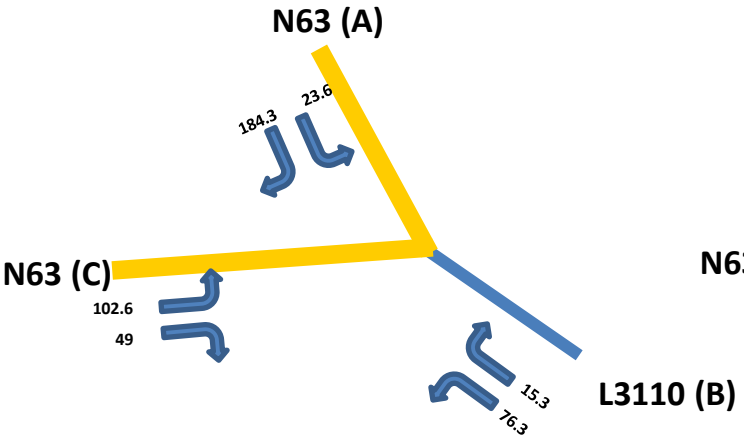


PM peak (5pm to 6pm)

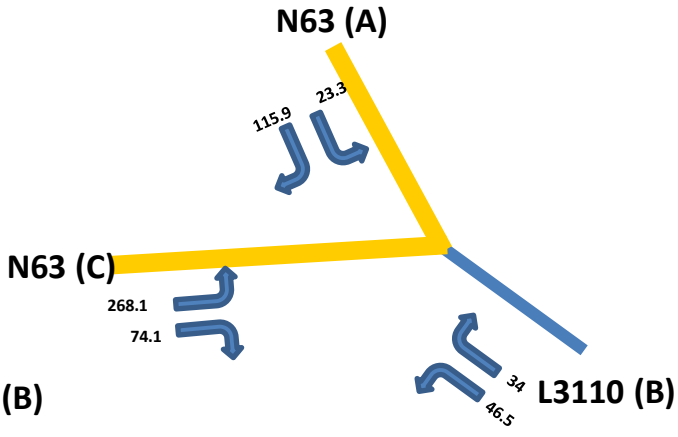


JTC - Site 3

AM peak (9am to 10am)

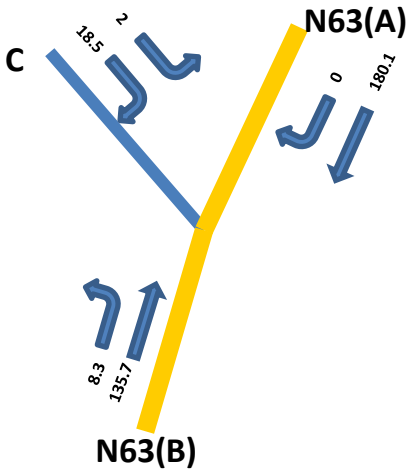


PM peak (5pm to 6pm)

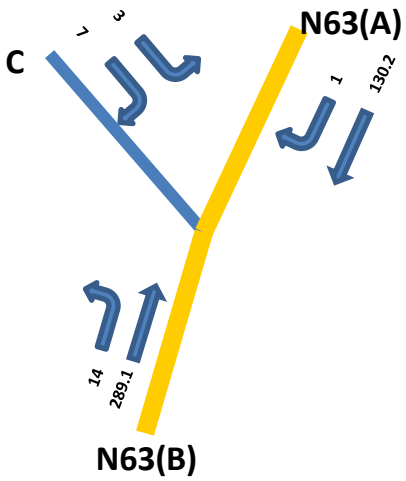


JTC - Site 4

AM peak (8am to 9am)

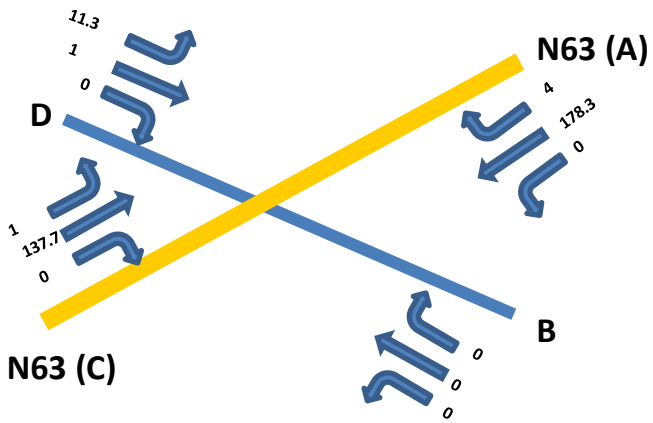


PM peak (5pm to 6pm)

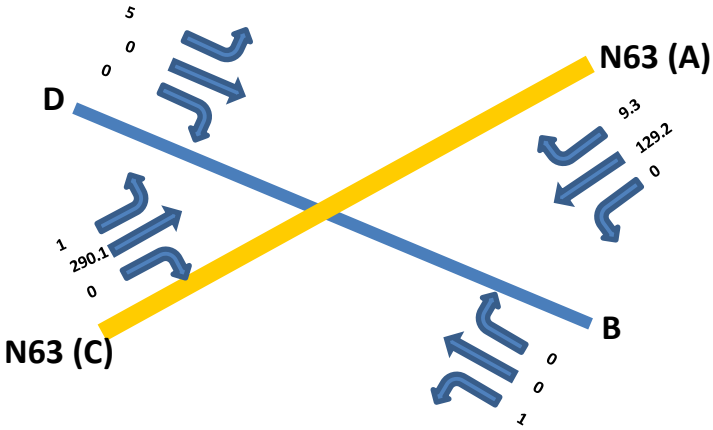


JTC - Site 5

AM peak (8am to 9am)



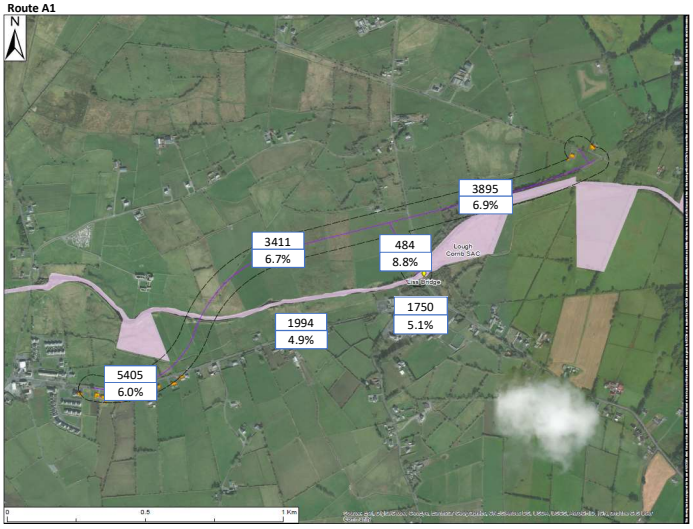
PM peak (5pm to 6pm)



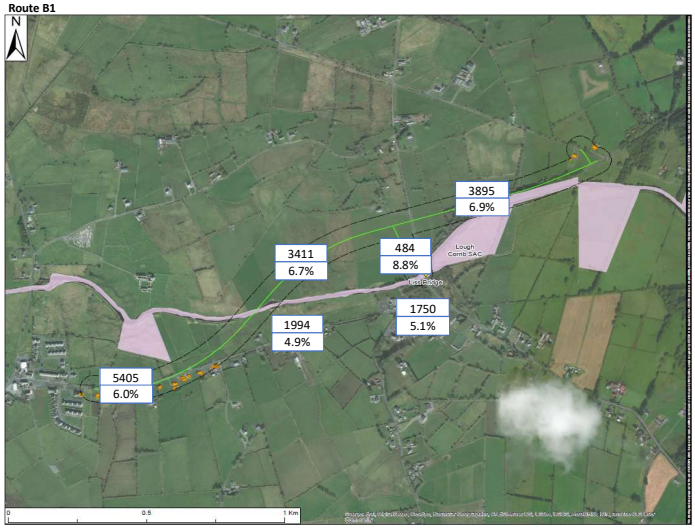
N63 Liss to Abbey Realignment Scheme
Phase 2 - Option Selection

Traffic Analysis
AADT Maps - Opening Year (2023)

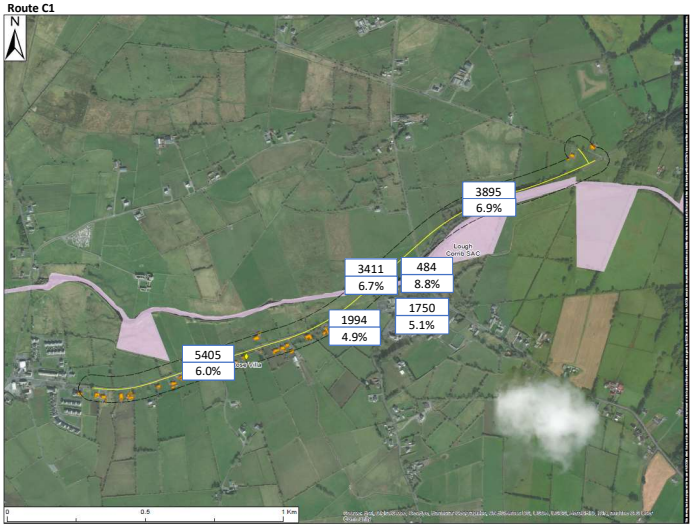
Route A1



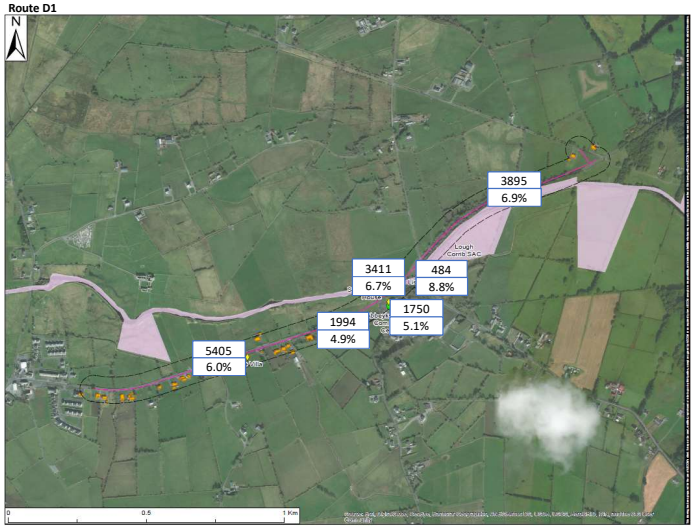
Route B1



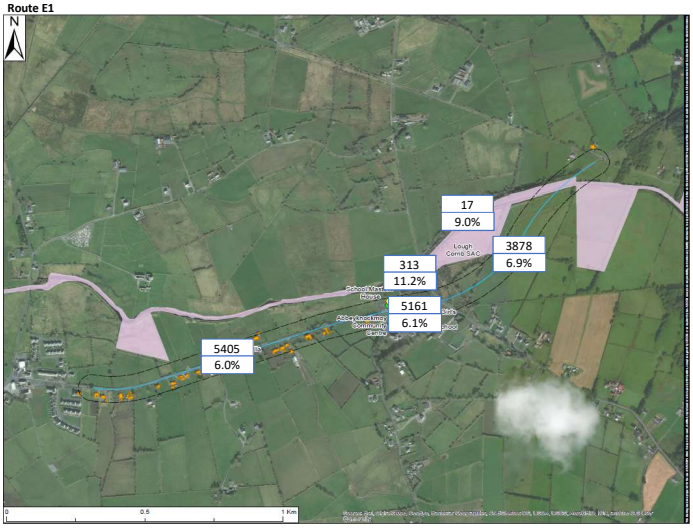
Route C1



Route D1



Route E1

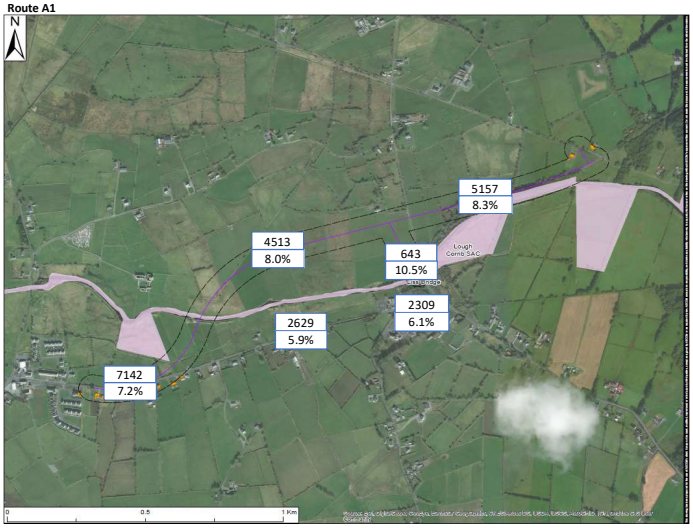


Route F1

N63 Liss to Abbey Realignment Scheme
Phase 2 - Option Selection

Traffic Analysis
AADT Maps - Design Year (2038)

Route A1



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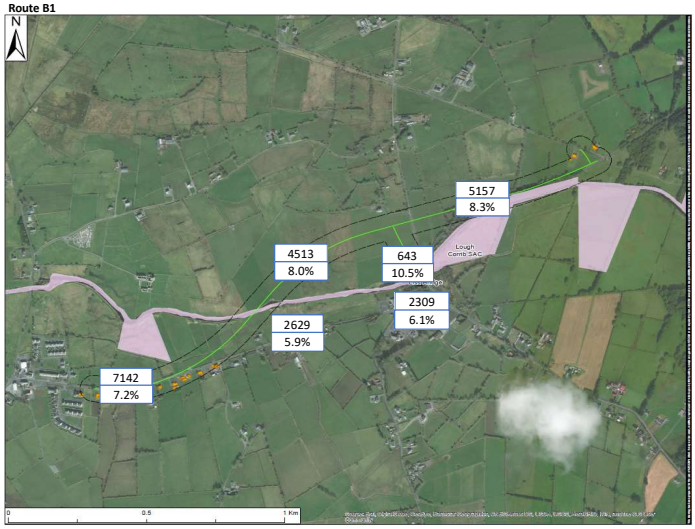
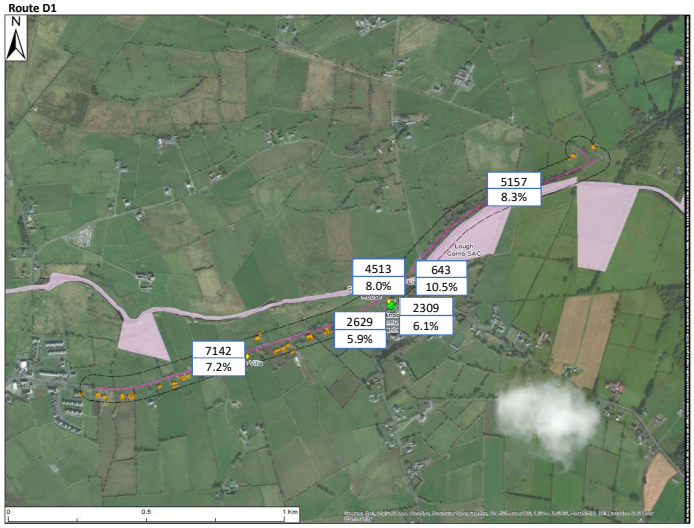


Route C1

Route D1

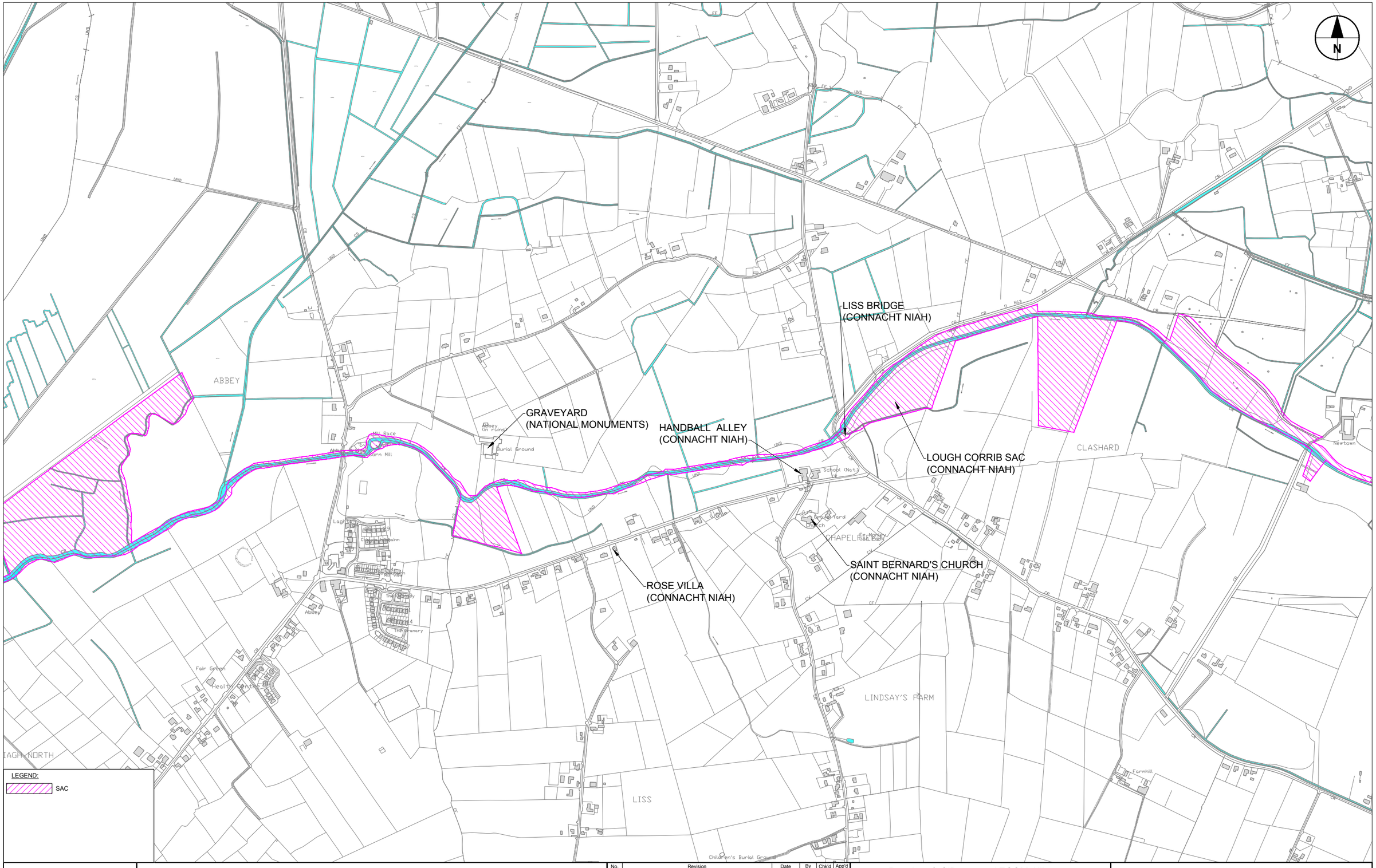


Route E1

Route F1

Appendix B – Drawings

Drawing Number	Drawing Title
N63-AEC-ZZ-ZZ-SK-HW-000003	Study Area and Main Constraints
N63-AEC-ZZ-ZZ-SK-HW-000005	Extents of Study Area
N63-AEC-ZZ-ZZ-SK-HW-000001	Land Ownership Plan
Figure 1	Environmental Constraints – Air Quality
Figure 2A	Environmental Constraints – Cultural Heritage
Figure 2B	Environmental Constraints – Cultural Heritage
Figure 3	Environmental Constraints – Landscape
Figure 4	Environmental Constraints –Noise and Vibration
Figure 5	Environmental Constraints – Ecology
Figure 6	Environmental Constraints – Water
Figure 7	Environmental Constraints – Aquifer Designation
Figure 8	Environmental Constraints – Groundwater Vulnerability
Figure 9	Environmental Constraints – Bedrock Geology
Figure 10	Environmental Constraints – Corine Landcover
Figure 11	Environmental Constraints – Geological Features
Figure 12	Environmental Constraints – Subsoil Deposits
N63-AEC-ZZ-ZZ-SK-HW-000012	Options (Stage 1)
N63-AEC-ZZ-ZZ-SK-HW-000014	Options (Stage 2)
N63-AEC-ZZ-ZZ-SK-HW-000026	Emerging Preferred Option



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Transport Infrastructure Ireland

Comhairle Chontae na Gaillimhe
Galway County Council

No.	Revision	Date	By	Chk'd	App'd

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Drawn	Designed	Checked	Approved	Suitability Code - Description
-	-	-	-	S0 - Work In Progress

Project Title: N63 LISS TO ABBEY REALIGNMENT SCHEME

Drawing Title: STUDY AREA AND MAIN CONSTRAINTS

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
N63 - ACM - ZZ - ZZ - SK - HW - 000003

Scale: 1:5000 @ A1 | Date: 13.06.2019 | Job No: - | Rev: D0

14 June 2019 10:21:24 \\EU.AECOMNET.COM\EMIA\UKI\EDBL2\JOBS\PR-395964_N63_PH1-4\900_CAD_GIS\910_CAD\25-SKETCHES\01-WIP\N63-AEC-ZZ-ZZ-SK-HW-0000033_PLAN_5000.DWG

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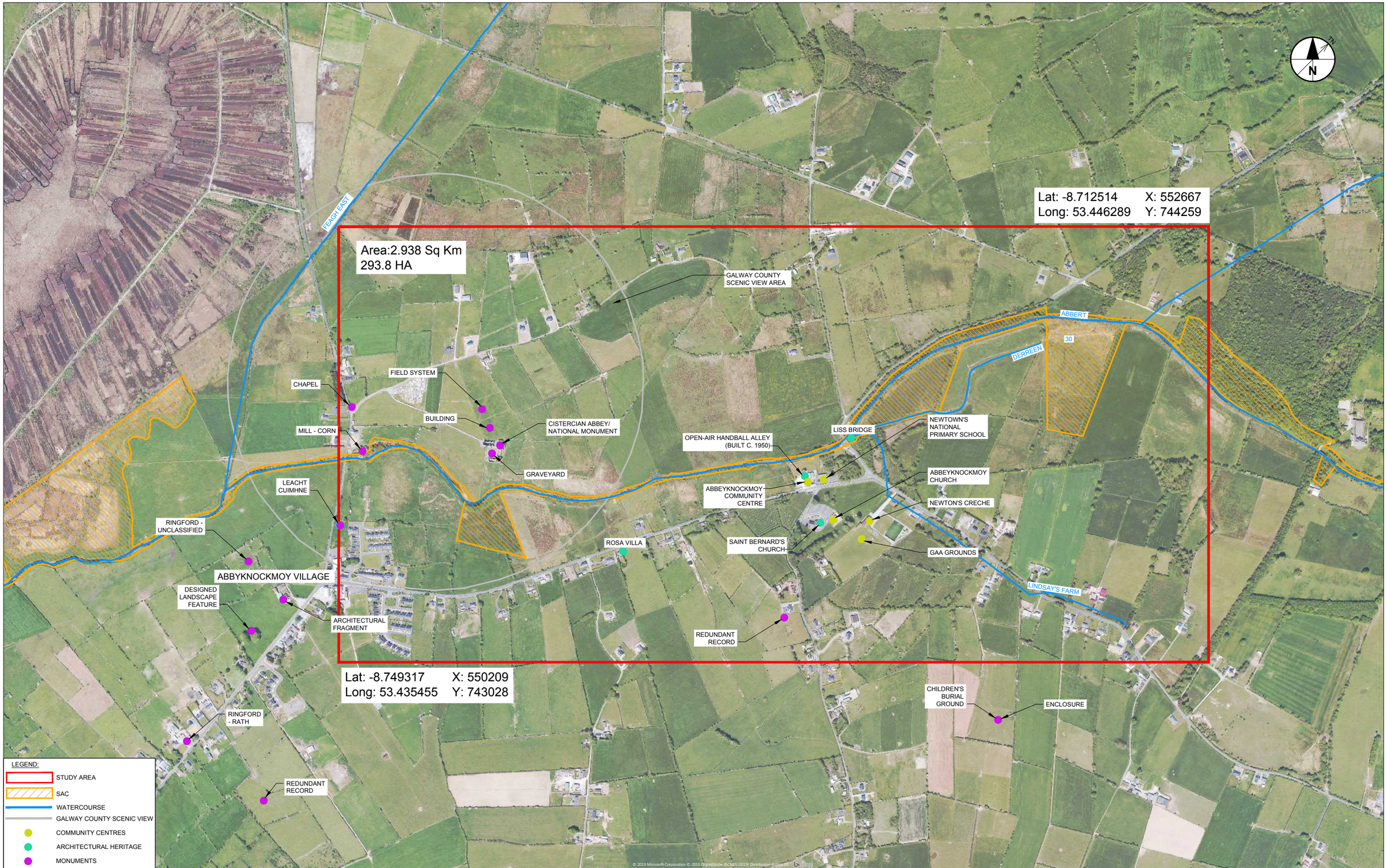

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Drawn	Designed	Checked	Approved	Suitability Code - Description
FOS	-	-	-	S0 - Work In Progress

Project Title	N63 LISS TO ABBEY REALIGNMENT SCHEME
Drawing Title	EXTENT OF STUDY AREA
Drawing Number	N63 - ACM - ZZ - ZZ - SK - HW - 000005
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Date:	22.05.2019
Job No:	-
Rev:	D1

24 July 2019 14:55:20

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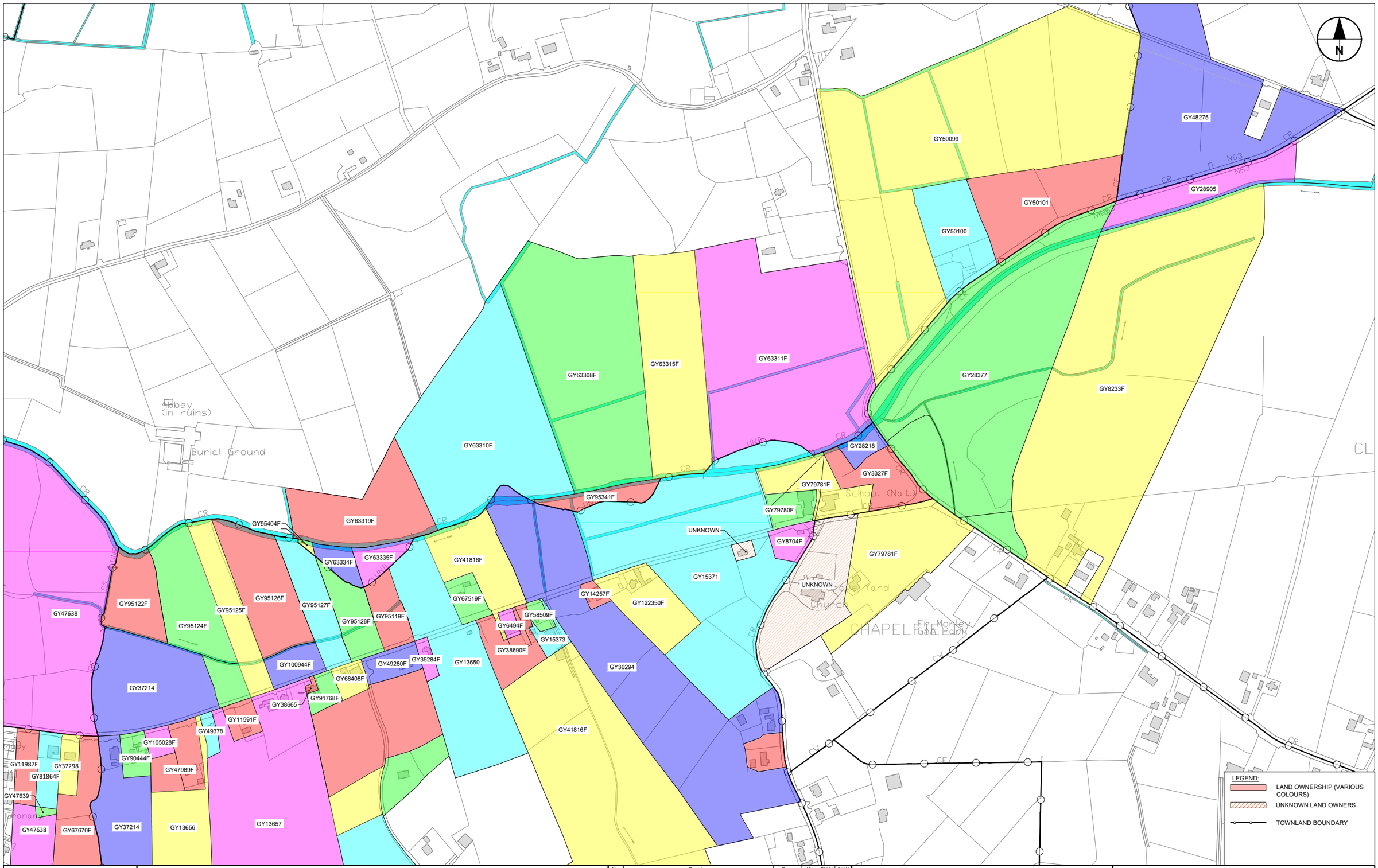
DO NOT SCALE USE FIGURED DIMENSIONS ONLY



LEGEND:

- LAND OWNERSHIP (VARIOUS COLOURS)
- UNKNOWN LAND OWNERS
- TOWNLAND BOUNDARY

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Transport Infrastructure Ireland

Comhairle Chontae na Gaillimhe
Galway County Council

No.	Revision	Date	By	Chk'd	App'd

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Drawn	Designed	Checked	Approved	Suitability Code - Description
SO	SO	LB	EG	S0 - Work In Progress

Project Title: N63 LISS TO ABBEY REALIGNMENT SCHEME

Drawing Title: LAND OWNERSHIP PLAN

Drawing Number	Project	Originator	Volume	Location	Type	Role	Number
	N63	ACM	ZZ	ZZ	SK	HW	000001

Scale:	Date:	Job No:	Rev:
1:2500 @ A1	10.06.2019	-	A

10 June 2019 15:36:43

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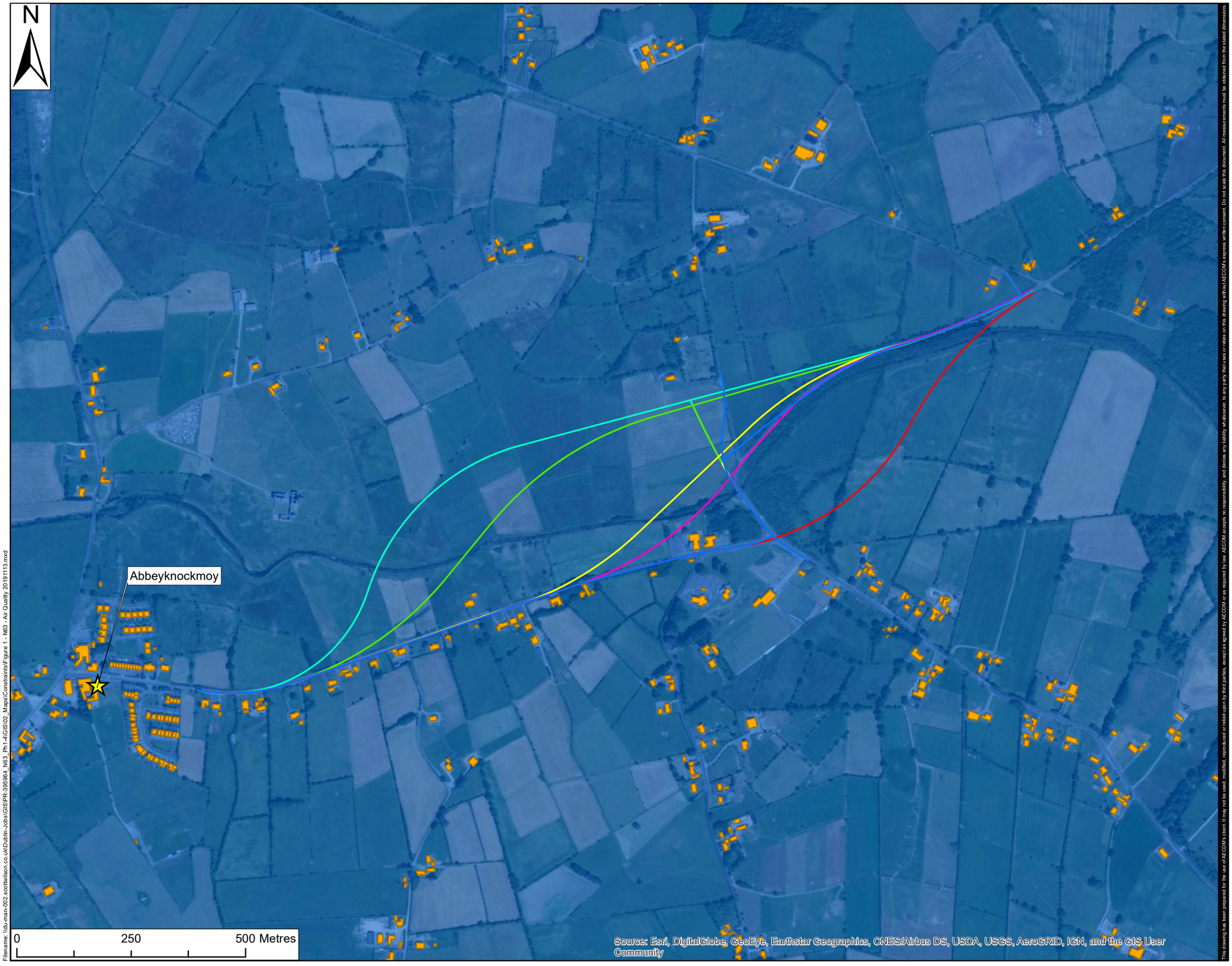
DO NOT SCALE USE FIGURED DIMENSIONS ONLY



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Project Title:

N63 LISS TO ABBEY REALIGNMENT SCHEME

Client:

TII Bonneagar Iompair Éireann Transport Infrastructure Ireland

Project Ireland 2040 Building Ireland's Future

Comhairle Chontae na Gaillimhe Galway County Council

LEGEND

Corridor Options:

- Option A1
- Option B1
- Option C1
- Option D1
- Option E1
- Option F1

Air Zone

- Zone D
- Towns
- Sensitive Receptors

AECOM Internal Project No:

60597858

Drawing Title:

AIR QUALITY

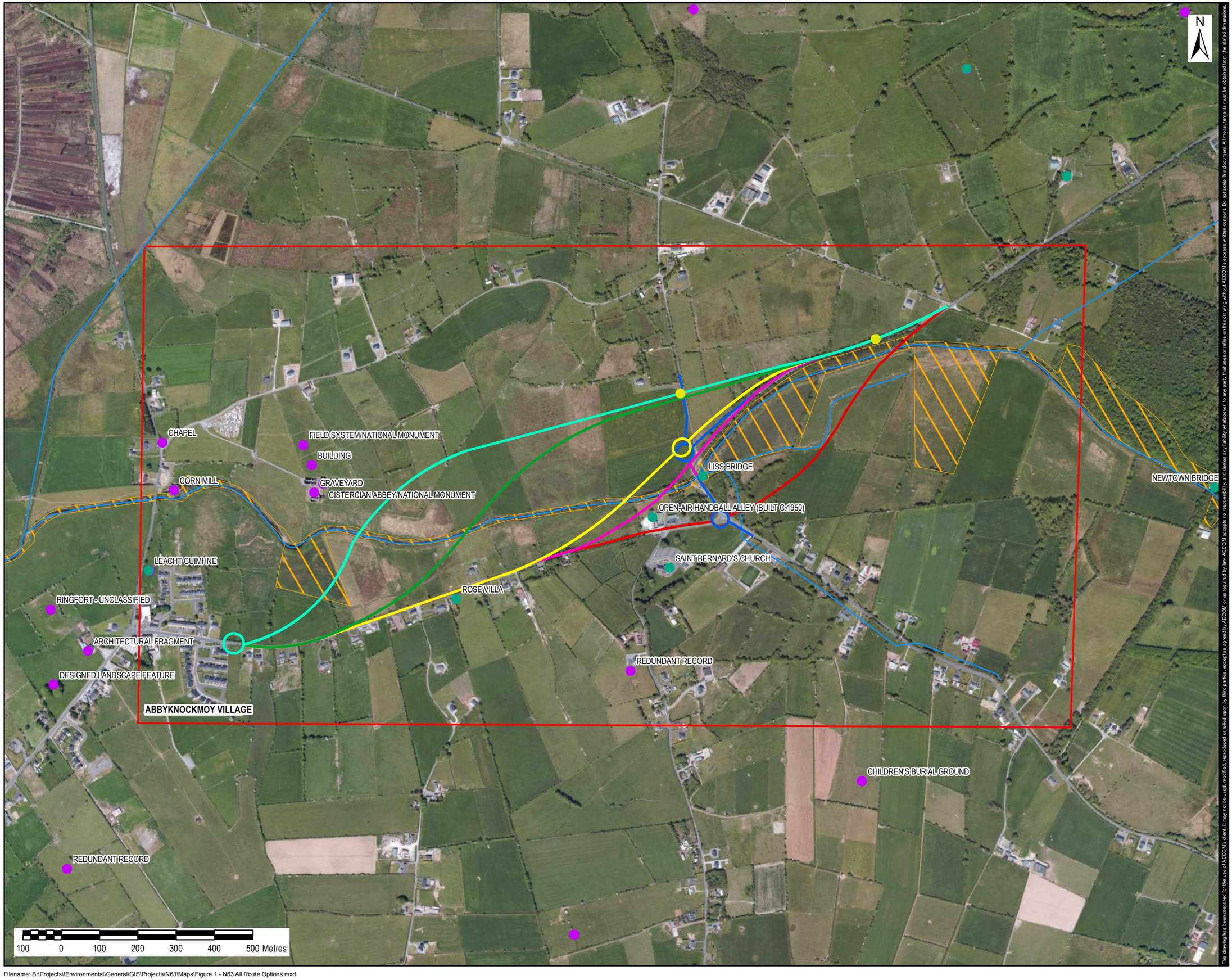
Scale at A3: 1:7,500

Drawing No:

60597858-N63-AIR-1

Drawn:	Chk'd:	App'd:	Date:
DG	SW	NOC	19/08/2019

Filename: \\du-man-002.scottwilson.co.uk\Dublin-Jobs\GIS\PR-395864_N63_Ph1-4\GIS\02_Maps\Constraints\Figure 1 - N63 -Air Quality 20191113.mxd



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www.aecom.com

Project Title:

N63 - ABBEYKNOCKMOY REALIGNMENT

Client:

LEGEND

- House clusters recorded on 1st ed. OS map
- Architectural Heritage
- Monuments
- Route Option A
- Route Option B
- Route Option C
- Route Option D
- Route Option E
- Route Option F
- Watercourse
- Study Area
- Special Area of Conservation (SAC)

AECOM Internal Project No:

60597858 - M001.3-M001.3_ENV

Drawing Title:

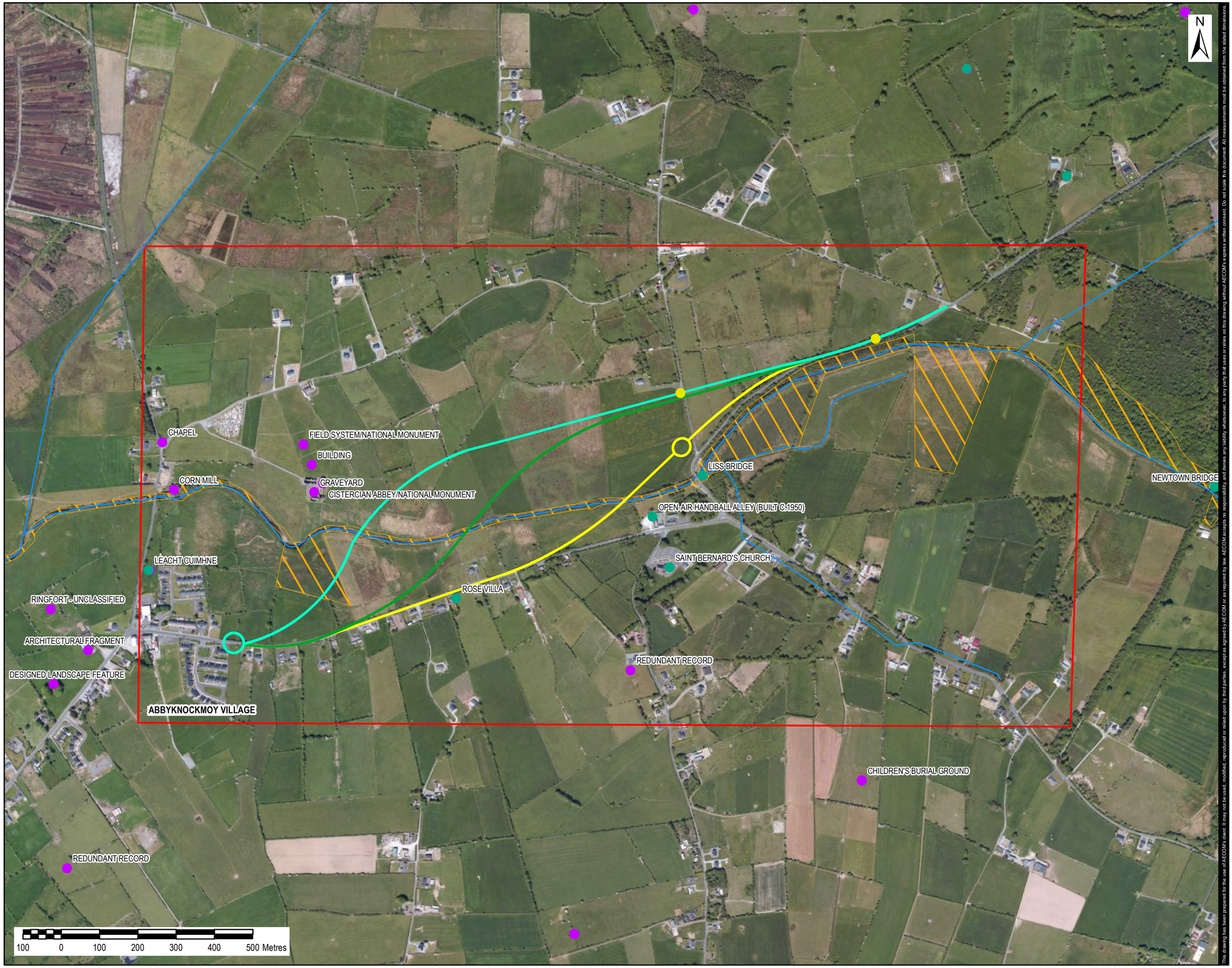
CULTURAL HERITAGE SURVEY PLAN - ALL ROUTE OPTIONS

Scale at A3: 1:9,000

Drawing No:	Rev:
FIGURE 1	001

Drawn:	Chk'd:	App'd:	Date:
AM	BM	JL	02/12/19

Filename: B:\Projects\!Environmental\General\GIS\Projects\N63\Maps\Figure 1 - N63 All Route Options.mxd



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Project Title:

N63 - ABBEYKNOCKMOY REALIGNMENT

Client:

LEGEND

- House clusters recorded on 1st ed. OS map
- Architectural Heritage
- Monuments
- Route Option A
- Route Option B
- Route Option C
- Watercourse
- Study Area
- Special Area of Conservation (SAC)

AECOM Internal Project No:

60597858 - M001.3-M001.3_ENV

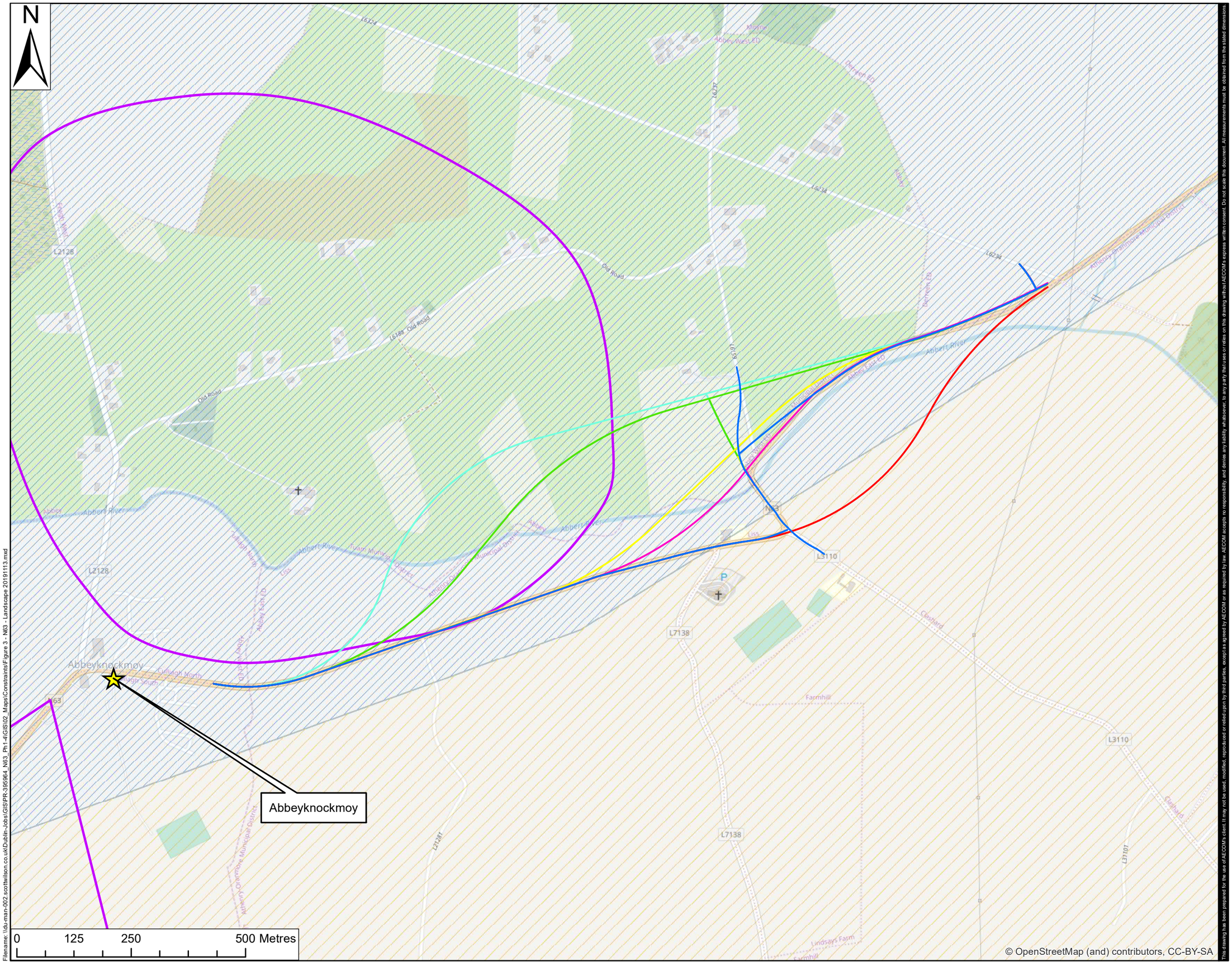
Drawing Title:

CULTURAL HERITAGE SURVEY PLAN - ROUTE OPTIONS A B AND C

Scale at A3: 1:9,000

Drawing No:			Rev:
FIGURE 2			001
Drawn:	**Chk'd:**	**App'd:**	**Date:**
AM	BM	JL	02/12/19

Filename: B:\Projects\!Environmental\General\GIS\Projects\N63\Maps\Figure 2 - N63 Three Route Options.mxd



Filename: \\du-man-002.scottwilson.co.uk\Dublin-Jobs\GIS\PR-395964_N63_Ph1-4\GIS\02_Maps\Constraints\Figure 3 - N63 - Landscape 20191113.mxd

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www.aecom.com

Project Title:

N63 LISS TO ABBEY REALIGNMENT SCHEME

Client:

Transport Infrastructure Ireland (Bonneagar Iompair Éireann)

Project Ireland 2040 – Building Ireland's Future

Comhairle Chontae na Gaillimhe – Galway County Council

LEGEND

Corridor Options:

- Option A1
- Option B1
- Option C1
- Option D1
- Option E1
- Option F1
- Towns

Galway County Council Landscape Focal Viewpoints

- 26: Knockmoy Abbey Southeast of Tuam

Galway County Council Landscape Character Areas

- East Central Galway (Athenry, Ballinsloe to Portuna)
- Northeast Galway (Tuam Environs)

AECOM Internal Project No:

60597858

Drawing Title:

LANDSCAPE

Scale at A3: 1:7,500

Drawing No:

60597858-N63-LAN-3

Drawn:	Chk'd:	App'd:	Date:
DG	SW	NOC	19/08/2019

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www.aecom.com

Project Title:

N63 LISS TO ABBEY REALIGNMENT SCHEME

Client:

TII Bonneagar Iompair Éireann Transport Infrastructure Ireland

Project Ireland 2040 Building Ireland's Future

Comhairle Chontae na Gaillimhe Galway County Council

LEGEND

Corridor Options:

- Option A1
- Option B1
- Option C1
- Option D1
- Option E1
- Option F1
- Towns
- Sensitive Receptors

AECOM Internal Project No:

60597858

Drawing Title:

NOISE AND VIBRATION

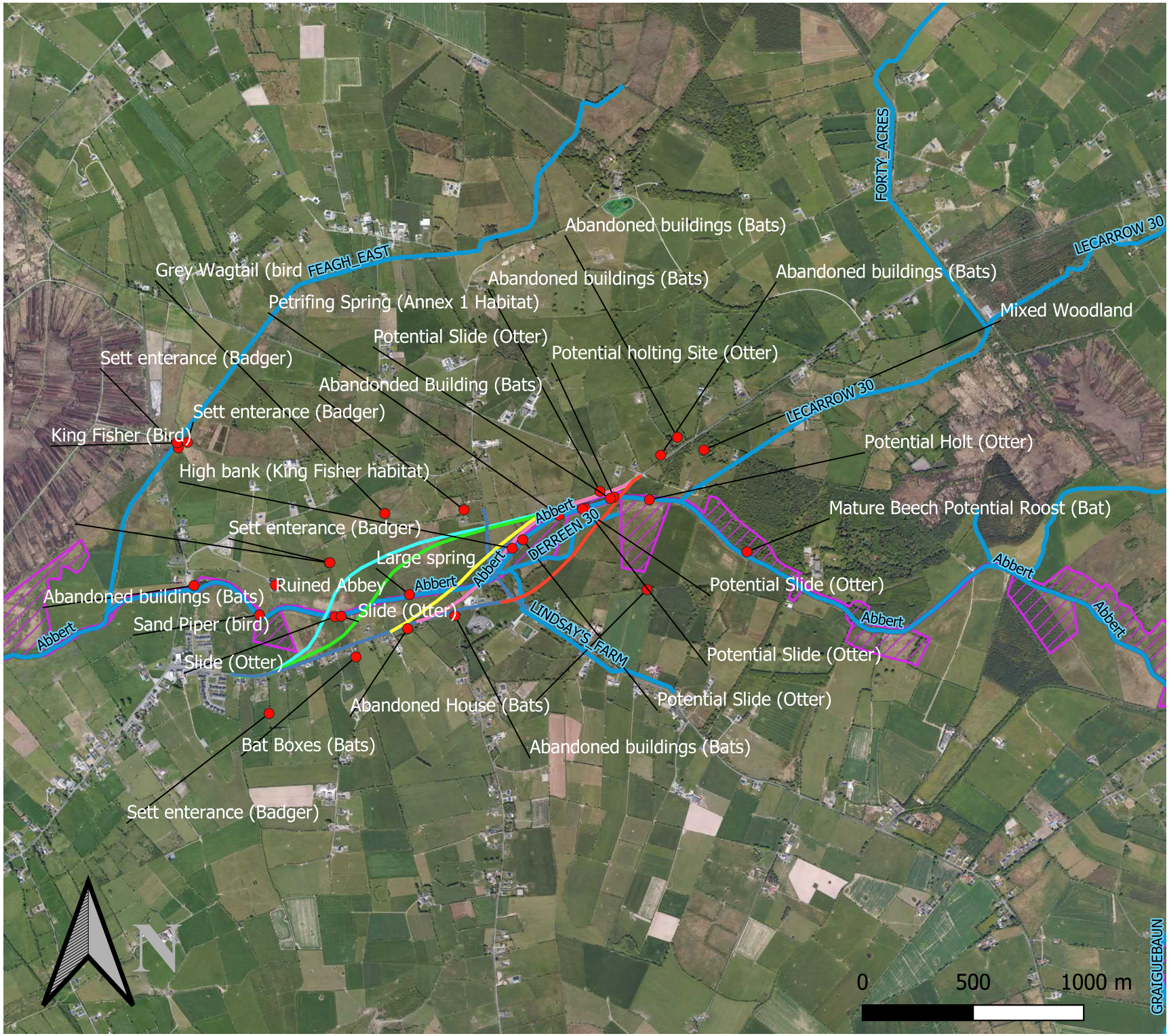
Scale at A3: 1:7,500

Drawing No:

60597858-N63-NOI-4

Drawn:	Chk'd:	App'd:	Date:
DG	SW	NOC	19/08/2019

Filename: \\du-man-002.scottwilson.co.uk\Dublin-Jobs\GIS\PR-395964_N63_Ph1-4\GIS\02_Maps\Constraints\Figure 4 - N63 - Noise and Vibration 20191113.mxd



Ecological Constraints Survey Results

CLIENT NAME: Galway County Council

Legend

- Rivers
- Otter Habitat

Protected Areas

- Lough Corrib SAC

Environmental Constraints

- To be protected

Corridor Options

- Option A1
- Option B1
- Option C1
- Option D1
- Option E1
- Option F1

FLYNN FURNEY
ENVIRONMENTAL CONSULTANTS

Prepared by: Ian Douglas
Date: 17/01/2019
Version number: 1
Job Name: N63 LISS TO ABBEY REALIGNMENT SCHEME

Coordinate system: : IRENET95 / Irish Transverse Mercator Base Map: Bing Aerial 2019

N

SI

Name: Corrib
Catchment ID: 30

Name: Upper Shannon
Catchment ID: 26D

0 0.5 1 2 3 4 5 Km

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Filename: \\du-man-002.scottwilson.co.uk\Dublin-Jobs\GIS\PR-395964_N63_Ph1-4\GIS\02_Maps\Constraints\Figure 6 - N63 - Water 20191113.mxd

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Project Title:

N63 LISS TO ABBEY REALIGNMENT SCHEME

Client:

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Project Ireland 2040 Building Ireland's Future

Comhairle Chontae na Gaillimhe Galway County Council

LEGEND

Corridor Options:

- Option A1
- Option B1
- Option C1
- Option D1
- Option E1
- Option F1
- Source Protection Areas
- River Flood Extents - Present Day - High Probability
- River Flood Extents - Present Day - Medium Probability
- River Flood Extents - Present Day - Low Probability
- Watercourses

WFD Catchments

- Corrib
- Upper Shannon

AECOM Internal Project No:
60597858

Drawing Title:
WATER

Scale at A3: 1:50,000

Drawing No:
60597858-N63-WAT-6

Drawn:	Chk'd:	App'd:	Date:
DG	SW	NOC	15/08/2019

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Project Title:

N63 LISS TO ABBEY REALIGNMENT SCHEME

Client:

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Comhairle Chontae na Gaillimhe Galway County Council

LEGEND

Corridor Options:

- Option A1
- Option B1
- Option C1
- Option D1
- Option E1
- Option F1

Aquifer Designation

- Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- Regionally Important Aquifer - Karstified (conduit)

AECOM Internal Project No:

60597858

Drawing Title:

AQUIFER DESIGNATION

Scale at A3: 1:50,000

Drawing No:

60597858-N63-AQU-7

Drawn:	Chk'd:	App'd:	Date:
DG	SW	NOC	19/08/2019

Filename: \\du-man-002.scottwilson.co.uk\Dublin-Jobs\GIS\PR-395964_N63_Ph1-4\GIS\02_Maps\Constraints\Figure 7 - N63 - Aquifer Designation 20191113.mxd

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N63 LISS TO ABBEY REALIGNMENT SCHEME

Client:

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LEGEND

Corridor Options:

- Option A1
- Option B1
- Option C1
- Option D1
- Option E1
- Option F1

Groundwater Vulnerability

- Extreme
- High
- Low
- Moderate
- Water
- Rock or near Surface or Karst

AECOM Internal Project No:

60597858

Drawing Title:

GROUNDWATER VULNERABILITY

Scale at A3: 1:50,000

Drawing No:

60597858-N63-GRO-8

Drawn:	Chk'd:	App'd:	Date:
DG	SW	NOC	19/08/2019

0 2.5 5 Kilometres

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Filename: \\du-man-002.scottwilson.co.uk\Dublin-Jobs\GIS\PR-395964_N63_Ph1-4\GIS\02_Maps\Constraints\Figure 8 - N63 - Groundwater Vulnerability 20191113.mxd

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Project Title:

N63 LISS TO ABBEY REALIGNMENT SCHEME

Client:

Transport Infrastructure Ireland
Project Ireland 2040 Building Ireland's Future
Comhairle Chontae na Gaillimhe Galway County Council

LEGEND

Corridor Options:

- Option A1
- Option B1
- Option C1
- Option D1
- Option E1
- Option F1

Bedrock Type

- Burren Formation
- Croghan Limestone Formation
- Knockmaa Formation
- Lucan Formation
- Visean Limestones (undifferentiated

AECOM Internal Project No:

60597858

Drawing Title:

BEDROCK GEOLOGY

Scale at A3: 1:50,000

Drawing No:

60597858-N63-BED-9

Drawn:	Chk'd:	App'd:	Date:
DG	SW	NOC	19/08/2019

Filename: \\du-man-002.scottwilson.co.uk\Dublin-Jobs\GIS\PR-395964_N63_Ph1-4\GIS\02_Maps\ConstraintsFigure 9 - N63 - Bedrock Geology 20191113.mxd

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Project Title:

N63 LISS TO ABBEY REALIGNMENT SCHEME

Client:

Bonneagar Iompair Éireann Transport Infrastructure Ireland

Project Ireland 2040 Building Ireland's Future

Comhairle Chontae na Gaillimhe Galway County Council

LEGEND

Corridor Options:

- Option A1
- Option B1
- Option C1
- Option D1
- Option E1
- Option F1

Corine Landcover Type

- 112 Discontinuous urban fabric
- 131 Mineral extraction sites
- 142 Sport and leisure facilities
- 211 Non-irrigated land
- 231 Pastures
- 242 Complex cultivation patterns
- 243 Land principally occupied by agriculture with areas of natural vegetation
- 312 Coniferous forest
- 313 Mixed forest
- 324 Transitional woodland scrub
- 411 Inland marshes
- 412 Peat bogs
- 512 Water bodies

AECOM Internal Project No:

60597858

Drawing Title:

CORINE LANDCOVER

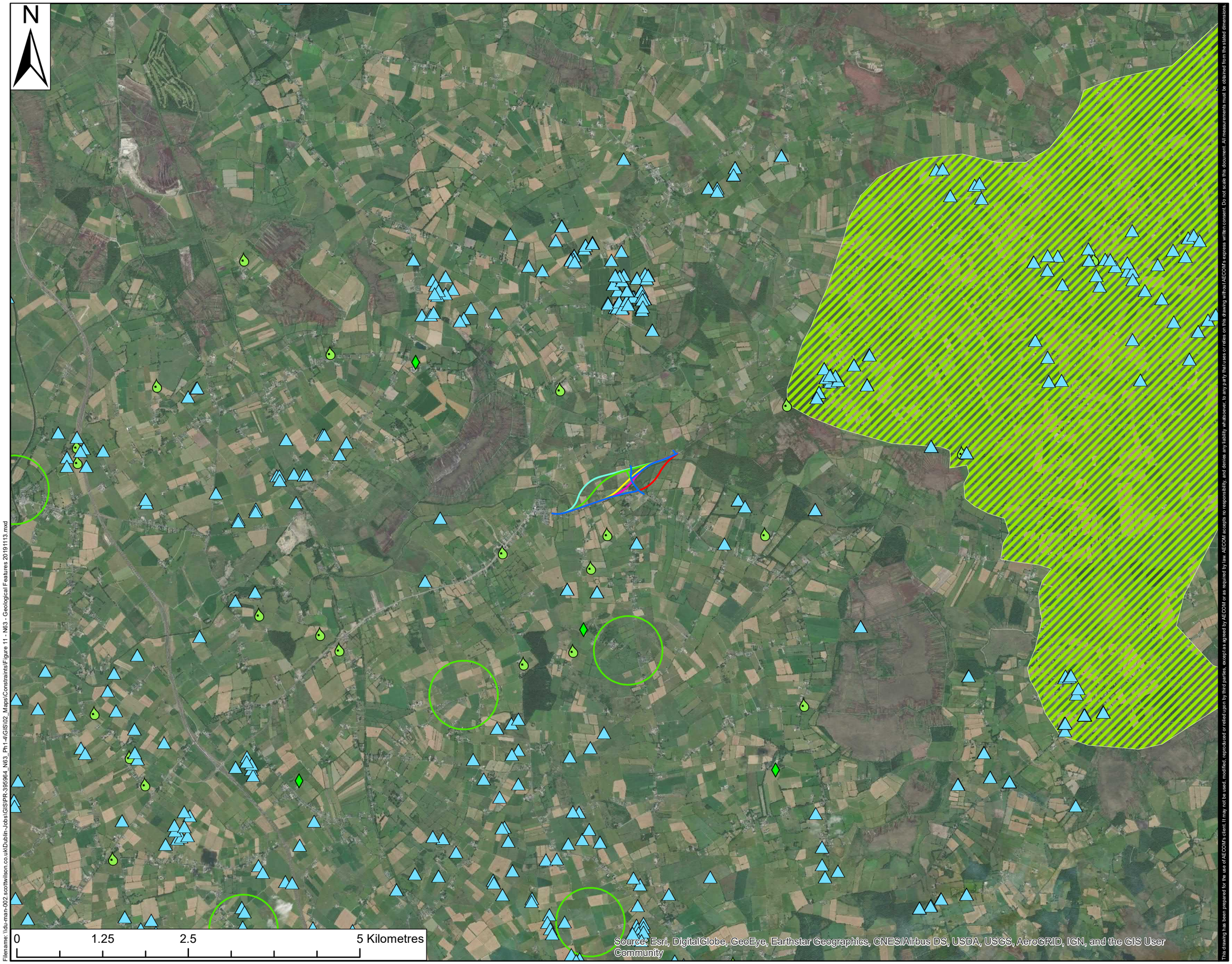
Scale at A3: 1:50,000

Drawing No:

60597858-N63-COR-10

Drawn:	Chk'd:	App'd:	Date:
DG	SW	NOC	19/08/2019

Filename: \\du-man-002.scottwilson.co.uk\Dublin-Jobs\GIS\PR-395964_N63_Ph1-4\GIS\02_Maps\ConstraintsFigure 10 - N63 - Corine Landcover 20191113.mxd



Filename: \\du-man-002.scottwilson.co.uk\Dublin-Jobs\GIS\PR-395964_N63_Ph1-4\GIS\02_Maps\ConstraintsFigure 11 - N63 - Geological Features 20191113.mxd

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Project Title:

N63 LISS TO ABBEY REALIGNMENT SCHEME

Client:

TII Bonneagar Iompair Éireann Transport Infrastructure Ireland

Project Ireland 2040 Building Ireland's Future

Comhairle Chontae na Gaillimhe Galway County Council

LEGEND

Corridor Options:

- Option A1
- Option B1
- Option C1
- Option D1
- Option E1
- Option F1
- Location of Karst Features
- Mineral Location
- Wells 10 to 50B
- Wells 1km to 500B
- Source Protection Areas

AECOM Internal Project No:

60597858

Drawing Title:

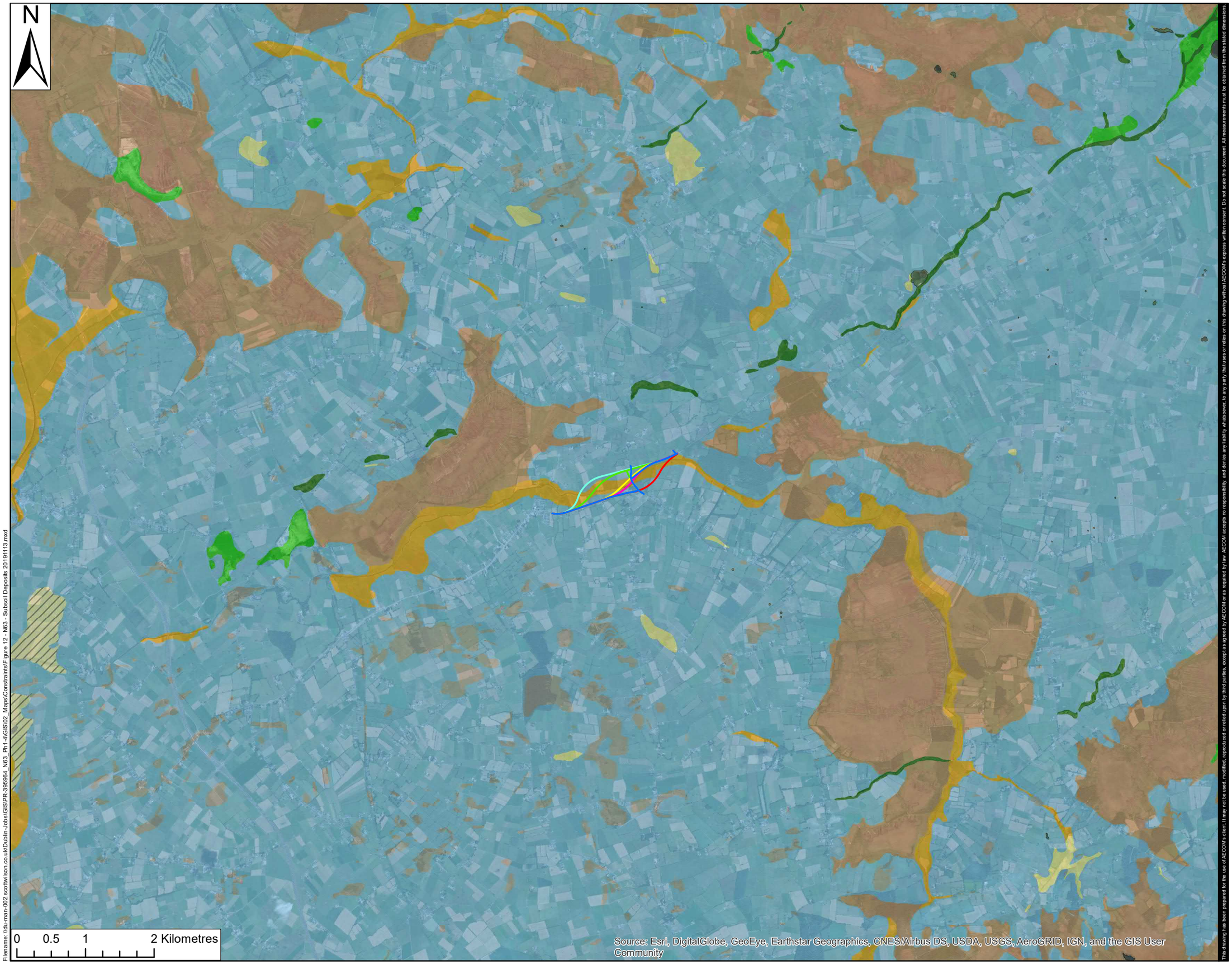
GEOLOGICAL FEATURES

Scale at A3: 1:50,000

Drawing No:

60597858-N63-COR-10

Drawn:	Chk'd:	App'd:	Date:
DG	SW	NOC	19/08/2019



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Project Title:

N63 LISS TO ABBEY REALIGNMENT SCHEME

Client:

Bonneagar Iompair Éireann Transport Infrastructure Ireland

Project Ireland 2040 Building Ireland's Future

Comhairle Chontae na Gaillimhe Galway County Council

LEGEND

Corridor Options:

- Option A1
- Option B1
- Option C1
- Option D1
- Option E1
- Option F1

Subsoil Deposits

- A, Alluvium
- BasEsk, Eskers comprised of gravels of basic reaction
- Cut, Cut over raised peat
- GLs, Gravels derived from Limestones
- KaRck, Kartsified bedrock outcrop or subcrop
- L, Lacustrine sediments
- Mrl, Lake marl
- Rck, Bedrock outcrop or subcrop
- TLs, Till derived from limestones
- Water

AECOM Internal Project No:

60597858

Drawing Title:

SUBSOIL DEPOSITS

Scale at A3: 1:50,000

Drawing No:

60597858-N63-SUB-12

Drawn:	Chk'd:	App'd:	Date:
DG	SW	NOC	19/08/2019

Filename: \\du-man-002.scottwilson.co.uk\Dublin-Jobs\GIS\PR-395954_N63_Ph1-4\GIS\02_Maps\Constraints\Figure 12 - N63 - Subsoil Deposits 20191113.mxd

Lat: -8.712514 X: 552667
Long: 53.446289 Y: 744259

Area:2.938 Sq Km
293.8 HA

FEAGH EAST

ABBERT

DERREEN

30

FIELD SYSTEM

CHAPEL

BUILDING

CISTERCIAN ABBEY/
NATIONAL MONUMENT

MILL - CORN

GRAVEYARD

A

B

C

D

E

F

ABBEYKNOCKMOY
COMMUNITY
CENTRE

LISS BRIDGE

NEWTOWN'S
NATIONAL
PRIMARY SCHOOL

OPEN-AIR HANDBALL ALLEY
(BUILT C. 1950)

NEWTOWN'S
CRECHE

LEACHT
CUIMHNE

RINGFORD -
UNCLASSIFIED

ROSA VILLA

SAINT BERNARD'S
CHURCH

GAA GROUNDS

ABBYKNOCKMOY VILLAGE

LINDSAY'S FARM

DESIGNED
LANDSCAPE
FEATURE

ARCHITECTURAL
FRAGMENT

REDUNDANT
RECORD

Lat: -8.749317 X: 550209
Long: 53.435455 Y: 743028

CHILDREN'S
BURIAL
GROUND

ENCLOSURE

RINGFORD
- RATH

REDUNDANT
RECORD

LEGEND:

- STUDY AREA
- SAC
- WATERCOURSE
- COMMUNITY CENTRES
- ARCHITECTURAL HERITAGE
- MONUMENTS
- ROUTE OPTION A
- ROUTE OPTION B
- ROUTE OPTION C
- ROUTE OPTION D
- ROUTE OPTION E
- ROUTE OPTION F

*FORM AND STYLE OF JUNCTION LAYOUT TO BE DETERMINED IN PHASE 3 DESIGN

DRAFT

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Comhairle Chontae na Gaillimhe
Galway County Council

Project Ireland 2040
Building Ireland's Future

No.	Revision	Date	By	Chk'd	App'd

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Drawn	Designed	Checked	Approved	Suitability Code - Description
RL	PC	CMK	EG	S0 - Work In Progress

Project Title: N63 LISS TO ABBEY REALIGNMENT SCHEME

Drawing Title: ROUTE OPTIONS

Drawing Number	Project	Originator	Volume	Location	Type	Role	Number
	N63	ACM	ZZ	ZZ	SK	HW	000012

Scale: 1:5000 @ A1 | Date: 12.09.2019 | Job No: - | Rev: D1

GALWAY COUNTY COUNCIL 2019/OSI_NMA_090

12 September 2019 17:41:40 Z:\UK\IEDBL2\JOBS\PR-395964_N63_PH1-4\900_CAD_GIS\910_CAD\25-SKETCHES\01-WIP\N63-AEC-ZZ-ZZ-SK-HW-000012_ROUTE_OPTIONS_5000.DWG

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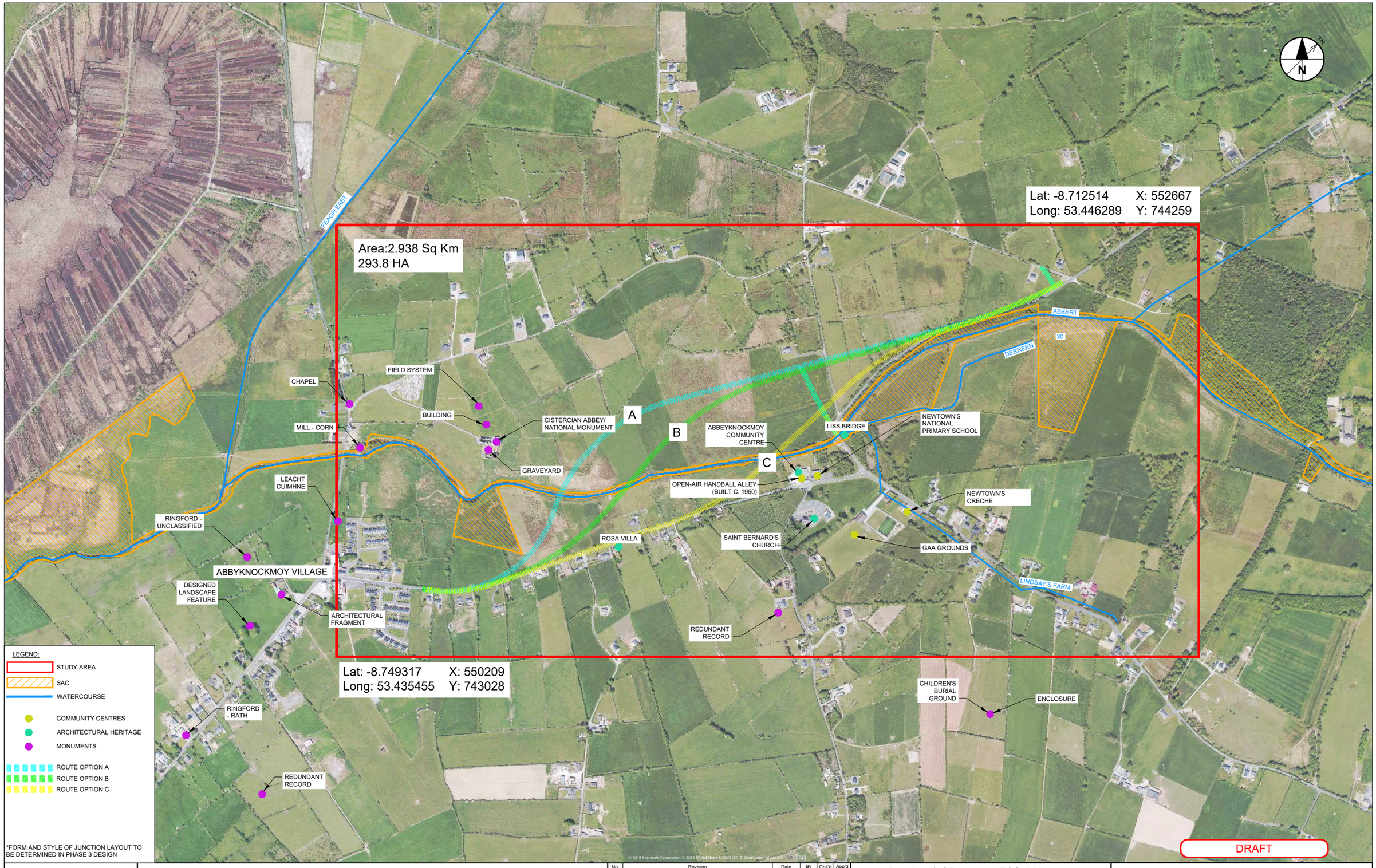

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Drawn	Designed	Checked	Approved	Suitability Code - Description
RL	PC	CMK	EG	S0 - Work In Progress

Project Title: N63 LISS TO ABBEY REALIGNMENT SCHEME

Drawing Title: STAGE 2 ROUTE OPTIONS

Drawing Number	Project	Originator	Volume	Location	Type	Role	Number
	N63	ACM	ZZ	ZZ	SK	HW	000014

Scale: 1:5000 @ A1 | Date: 12.09.2019 | Job No: - | Rev: D1

05 December 2019 09:29:42 \\EU.AECOMNET.COM\EMIA\UK\IEDBL2\JOBS\PR-395964_N63_PH1-4\900_CAD_GIS\910_CAD\25-SKETCHES\01-WIP\N63-AEC-ZZ-ZZ-SK-HW-000012_ROUTE_OPTIONS_5000 - STAGE 2.DWG

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LEGEND:
- SAC
- WATERCOURSE
- COMMUNITY CENTRES
- ARCHITECTURAL HERITAGE
- NATIONAL MONUMENTS
- EMERGING PREFERRED ROUTE CORRIDOR (OPTION B)
- INDICATIVE ROAD ALIGNMENT AND JUNCTION LAYOUT
- EXISTING PEDESTRIAN FACILITIES
- PROPOSED PEDESTRIAN FACILITIES
- PROPOSED PEDESTRIAN CROSSING

N

L6188
L6159
L6234
N63
L2128
L21821
L3110
L7138

INDICATIVE JUNCTION LAYOUT AND LOCATION ONLY
INDICATIVE JUNCTION LAYOUT AND LOCATION ONLY
EMERGING PREFERRED ROUTE CORRIDOR (OPTION B) - 100m WIDE CORRIDOR
INDICATIVE RIVER CROSSING POINT
INDICATIVE JUNCTION LAYOUT AND LOCATION ONLY
PEDESTRIAN FACILITIES CONTINUED ALONG THE EXISTING BRIDGE
PEDESTRIAN CROSSINGS AND JUNCTION LAYOUT TO BE CONFIRMED
PEDESTRIAN CROSSINGS AND JUNCTION LAYOUT TO BE CONFIRMED
PROPOSED PEDESTRIAN FACILITIES ON THE SOUTH SIDE OF THE EXISTING N63 (INDICATIVE LAYOUT ONLY)

CHAPEL
FIELD SYSTEM
BUILDING
CISTERCIAN ABBEY/ NATIONAL MONUMENT
MILL - CORN
GRAVEYARD
LEACHT CUIMHNE
ABBEYKNOCKMOY COMMUNITY CENTRE
LISS BRIDGE
NEWTOWN'S NATIONAL PRIMARY SCHOOL
NEWTOWN'S CRECHE
OPEN-AIR HANDBALL ALLEY (BUILT C. 1950)
SAINT BERNARD'S CHURCH
GAA GROUNDS
ROSA VILLA
REDUNDANT RECORD

ABBERT
DERREEN
LINDSAY'S FARM
CLASHARD
ABBEYKNOCKMOY
CHAPELFIELD FARM

JUNCTION AND ROAD LAYOUT ARE INDICATIVE ONLY
TO BE CONFIRMED DURING PHASE 3 (PRELIMINARY DESIGN)
AND SUBJECT TO ENGINEERING INVESTIGATIONS

No.	Revision	Date	By	Chk'd	App'd

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Drawn	Designed	Checked	Approved	Suitability Code - Description
RL	PC	LB	EG	S0 - Work In Progress

Project Title: N63 LISS TO ABBEY REALIGNMENT SCHEME

Drawing Title: PUBLIC CONSULTATION NO. 2 EMERGING PREFERRED ROUTE CORRIDOR

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
N63 - ACM - ZZ - ZZ - SK - HW - 000026

Scale: 1:3000 @ A1 | Date: 29.01.2020 | Job No: 60597858 | Rev: D2

Bonneagar Iompair Éireann Transport Infrastructure Ireland
GALWAY NATIONAL ROADS PROJECT OFFICE
Comhairle Chontae na Gaillimhe Galway County Council
Project Ireland 2040 Building Ireland's Future

30 January 2020 10:56:23 \\EU.AECOMNET.COM\EMIA\UKI\IEDBL2\JOBS\PR-395964_N63_PH1-4\900_CAD_GIS\910_CAD\25-SKETCHES\01-WIP\N63-AEC-ZZ-ZZ-SK-HW-000026_PC2_EMERGINGPREFERREDROUTECORRIDOR.DWG

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Appendix C – Cultural Heritage Inventory

AECOM Imagine it. Delivered.

AECOM Infrastructure & Environment UK Limited
3rd Floor, Portwall Place
Portwall Lane
Bristol BS1 6NA
United Kingdom

T: +44 117 901 7000
aecom.com

Project name: N63 Liss to Abbey Realignment Scheme

Date:
24 January 2020

Cultural Heritage Inventory

Introduction

The constraints study undertaken for the N63 Liss to Abbey Realignment Scheme uses readily available sources to identify monuments and areas of significant archaeological importance and potential. This includes the creation an inventory of archaeological constraints using a table format.

Inventory of Archaeological Heritage

Legal Status	Recorded Monument
Reference Number	GA058-067
Townland	Liss (Tiaquin barony)
Site Type	Redundant record
NGR	551467, 743161
Description	This record relates to a natural feature, a hollow, and not an archaeological monument).
Sources	RMP / *Archaeological Inventory of County Galway. Volume II: North Galway.* Edited by Olive Alcock, Kathy de hÓra and Paul Gosling (Dublin, The Stationary Office, 1999)
Approx. distance from nearest route	330m south-south-east of Route Option F
Type of Impact	No impact

Legal Status	National Monument (number 166)
Reference Number	GA058-004001
Townland	Abbey
Site Type	Religious house – Cistercian monks
NGR	550662, 743642
Description	On a gentle south-facing slope in pastureland, near Abbeyknockmoy village, it overlooks the Abbert River to south. A Cistercian monastery founded in 1189-90 by Cathal Crobderg O'Conor, King of Connacht. A National Monument, the remains comprise a large conserved Transitional style church (E-W; L 60m) of early 13th-century

	date consisting of an aisled nave, a chancel and two transepts. The chancel has a fine ribbed vault and east altar windows, while the transepts both contain two barrel-vaulted chapels at their eastern ends. Three of the arches of the crossing are walled up, possibly 15th-century work coeval with the insertion of the now largely ruined central tower. The north wall of the chancel bears 15th-century mural paintings depicting the Holy Trinity, the martyrdom of St Sebastian and the Three Dead and Three Live Kings. The claustural buildings and ruined cloister lie to the south, but only the eastern wing, including the sacristy, chapter house and a later garderobe, is well preserved.
Sources	RMP / *Archaeological Inventory of County Galway. Volume II: North Galway.* Edited by Olive Alcock, Kathy de hÓra and Paul Gosling (Dublin, The Stationary Office, 1999)
Approx. distance from nearest route	Route A passes 99m to the south-east and Route B passes 340m to the south-east
Type of Impact	Route A (1-Major or Highly Negative); Route B (2-Moderately Negative)

Legal Status	Part of National Monument Number 166. Also subject to a preservation order made under the National Monuments 1930 to 2014 (PO no.4/1989).
Reference Number	GA058-004002
Townland	Abbey
Site Type	Monastic building
NGR	550637, 743691
Description	In the field immediately to the north of Knockmoy Abbey (GA058-004001). This rectangular building (int. dims. 11.35m east-west; 5.8m north-south; wall thickness 1-1.1.25m) is constructed of double-faced uncut stones laid down in uneven courses. It is featureless apart from a break (Width 2m) in the north wall that may mark a doorway. Three walls (Height 0.6m) abut the east wall of the building; one is on the line of the north wall (Length 3.5m; Width 0.55m), the second (Length 3.6m; Width 0.65m) is 0.75m to the south of the former and the third (Length 4.15m; Width 0.9m) is on the line of the south wall. Foundation lines of the latter wall continue further to the east (Length 8.75m) before turning north (Length 3.9m). The building was investigated by David Sweetman on behalf of the National Monuments Service during the course of excavations at the abbey in 1982 and 1983 in order to determine its age and relationship with the abbey complex. The foundations of the walls of the main building were not at all similar to those of a medieval building and the surviving stonework suggested that it was of post-17th-century date. The middle and south abutting walls formed a second structure (int. dims. c. 12m east-west; 4.7m north-south). Its foundations courses and those of the north abutting wall were stratified above the main building indicating that they were a later addition. The full extent of these walls was not revealed. All the buildings were stratified above an extensive layer of dark soil and charcoal in which one sherd of medieval pottery was found outside the east wall of the main building suggesting that there were medieval domestic buildings in this area.
Sources	RMP / *Archaeological Inventory of County Galway. Volume II: North Galway.* Edited by Olive Alcock, Kathy de hÓra and Paul Gosling (Dublin, The Stationary Office, 1999)
Approx. distance from nearest route	Route A passes 230m to the east-south-east and Route B passes 430m to the east-south-east
Type of Impact	Route A (1-Major or Highly Negative); Route B (2-Moderately Negative)

Legal Status	Part of National Monument Number 166.
Reference Number	GA058-004003
Townland	Abbey
Site Type	Graveyard
NGR	550639, 743619
Description	Post-medieval graveyard which occupies the claustral area of the Cistercian abbey. A number of post-medieval headstones and a ledger slab are present. The first edition of the Ordnance Survey six-inch series ((c.1840) records the presence of the graveyard within the abbey at the time.

Sources	RMP / *Archaeological Inventory of County Galway. Volume II: North Galway.* Edited by Olive Alcock, Kathy de hÓra and Paul Gosling (Dublin, The Stationary Office, 1999)
Approx. distance from nearest route	Route A passes 138m to the south-east and Route B passes 380m to the east-south-east
Type of Impact	Route A (1-Major or Highly Negative); Route B (2-Moderately Negative)

Legal Status	Associated with National Monument Number 166. Also subject to a preservation order made under the National Monuments 1930 to 2014 (PO no.4/1989).
Reference Number	GA058-004004
Townland	Abbey
Site Type	Field system: Earthworks associated with Abbeyknockmoy, Cistercian Abbey
NGR	550614, 743746
Description	There is a relict field system extending to the west and north of Knockmoy Abbey (GA058-004001). It consists of a series of fields covering an area c.550m north-west to south-east by c.400m north-east to south-west. Defined by low grassed-over collapsed stone walls, some of the fields are rectilinear in plan and traces of cultivation are visible.
Sources	RMP / *Archaeological Inventory of County Galway. Volume II: North Galway.* Edited by Olive Alcock, Kathy de hÓra and Paul Gosling (Dublin, The Stationary Office, 1999)
Approx. distance from nearest route	Route A passes through south-easterly extent of the field system (99m to the south-east of the Abbey itself). Route B passes 230m to the south-east of the field system.
Type of Impact	Route A (1-Major or Highly Negative); Route B (2-Moderately Negative)

Legal Status	Recorded Monument
Reference Number	GA058-004005
Townland	Abbey
Site Type	Mill - corn
NGR	550276, 743624
Description	The remains of a post-medieval mill complex. Mill wheel gears still evident against the west gable end of the mill. According to an antiquarian source cited by the County Archaeological Inventory, the mill is said to occupy the original abbey mill. The first edition of the Ordnance Survey six-inch series records a corn mill in ruins.
Sources	RMP / *Archaeological Inventory of County Galway. Volume II: North Galway.* Edited by Olive Alcock, Kathy de hÓra and Paul Gosling (Dublin, The Stationary Office, 1999)
Approx. distance from nearest route	Route A passes 430m to the east-south-east, while Route B passes 750m to the east-south-east.
Type of Impact	Route A (4-Not significant or neutral); Route B (4-not significant or neutral)

Legal Status	Recorded Monument
Reference Number	GA058-004006
Townland	Abbey
Site Type	Chapel

NGR	550247, 743749
Description	The site of a post-medieval chapel, presumably dating from the 18th century during the penal period. Only a single stretch of wall (Length c.6m, Width c.1m), orientated east-west, now survives, built of roughly coursed limestone rubble. Recorded as a rectangular building, fronted by a rectangular courtyard, on the first edition of the Ordnance Survey six-inch series (c.1840).
Sources	RMP
Approx. distance from nearest route	Route A passes 520m to the south-east, while Route B passes 820m to the east-south-east.
Type of Impact	Route A (4-not significant or neutral); Route B (4-not significant or neutral)

Legal Status	Recorded Monument
Reference Number	GA058-057
Townland	Culliagh North
Site Type	*Leacht Cuimhne*
NGR	550211, 743418
Description	The *Leacht Cuimhne* is a stone memorial, situated within what is now a children's playground, to the south-west of the monastic complex (GA058-004001). A roughly built mortared stone pier (Length 1.3m, Width 1.22m, Height 2.7m) stands on a stone plinth. The monument tapers slightly towards the top where it is capped by a rectangular stone, on top of which a small pillar stone rises. A recess in the north wall probably held a commemorative plaque. It is recorded as a '*Laghta*' on the first and second editions of the Ordnance Survey six-inch series.
Sources	RMP / *Archaeological Inventory of County Galway. Volume II: North Galway.* Edited by Olive Alcock, Kathy de hÓra and Paul Gosling (Dublin, The Stationary Office, 1999)
Approx. distance from nearest route	The eastern terminus of both Route A and Route B lie 325m to the south-east.
Type of Impact	Route A (4-not significant or neutral); Route B (4-not significant or neutral)

Legal Status	None
Reference Number	No RMP number
Townland	Abbey
Site Type	House cluster
NGR	551592, 743895
Description	A small house cluster (no longer visible on the ground surface), but recorded on the first edition of the Ordnance Survey series (published c.1840) was noted during the desktop survey. It was situated in the townland of Abbey, 230m north of Liss Bridge. The first edition (c.1840) of the Ordnance Survey (OS) six-inch series records four buildings and associated yards situated on either of a roadway. By the time of the second edition of the OS six-inch series in the late 19th-century, these four buildings and associated yards had disappeared. At that stage only a single building, subsequently built, stood at the roadside.
Sources	First and second editions of the Ordnance Survey six-inch series at www.archaeology.ie Ordnance Survey twenty-five inch series at www.archaeology.ie
Approx. distance from nearest route	Route Options A may encroach on a paddock associated with the more southerly of the houses. Route option B passes c.10m to the south.

Type of Impact	Route A (1-Major or Highly Negative); Route B (3-Minor or Slightly Negative) as this route lies 10m further to the south of the paddock

Legal Status	None
Reference Number	No RMP number
Townland	Abbey
Site Type	House cluster
NGR	552283, 744051
Description	A second house cluster is located in the townland of Moyne at the eastern end of the Scheme. This consisted of four property plots on the north side of the road within which three houses were located. On the later editions of Ordnance Survey mapping, the properties have been consolidated into a single property with only two buildings now standing on a single property. The larger of the two buildings, presumably the farmhouse, still stands. Remains of this house are still visible, orientated at right-angles to the N63 road. The rest of the house cluster is no longer visible to the eye, though orthophotography & digital surface modelling derived from aerial drone photography of the study area has revealed the outline of the properties.
Sources	First and second editions of the Ordnance Survey six-inch series at www.archaeology.ie Ordnance Survey twenty-five inch series at www.archaeology.ie
Approx. distance from nearest route	The house cluster is located to the immediate north side of the existing N63. This is at the eastern end of the Scheme where the Route Options A, B, C, D and E coalesce along the existing route of the N63.
Type of Impact	Route Options A, B, C, D, E and F each received a score of '3-Minor or Slightly Negative', as they pass in the close vicinity of the site of the house cluster.

Inventory of Built Heritage

Legal Status	Protected Structure
Importance	Regional – this monument is similar to that of another monument to Oliver Brown in Sheeaunpark (NIAH 30407112) and contributes to the architectural interest of the roadscape outside Abbeyknockmoy.
Reference Number	NIAH 30405807
Townland	Culliagh North
Site Type	*Leacht Cuimhne*, freestanding limestone monument built c.1720.
NGR	550211, 743418
Description	The *Leacht Cuimhne* is a stone memorial, situated within what is now a children's playground, to the south-west of the monastic complex (GA058-004001). A roughly built mortared stone pier (Length 1.3m, Width 1.22m, Height 2.7m) stands on a stone plinth. The monument tapers slightly towards the top where it is capped by a rectangular stone, on top of which a small pillar stone rises. A recess in the north wall probably held a commemorative plaque. It is recorded as a '*Laghta*' on the first and second editions of the Ordnance Survey six-inch series. This monument is similar to that of Laghta Oliver Brown in Sheeaunpark (30407112) and contributes to the architectural interest of the roadscape outside Abbeyknockmoy.
Approximate Date	Built c.1720
Sources	NIAH; Record of Protected Structures (architectural heritage) in the Galway County Development Plan 2015-2021
Approx. distance from nearest route	The eastern terminus of both Route A and Route B lie 325m to the south-east.
Type of Impact	Route A (4-Not Significant or Neutral); Route B (4-Not Significant or Neutral)

Legal Status	None – not recorded as Protected Structure, but included in NIAH
Importance	Regional - once to be found in most towns and villages, handball alleys are becoming rare. Handball is one of the sports promoted by the Gaelic Athletic Association and was a very popular sport with communities throughout Ireland during the early twentieth century. This alley has social significance for the area.
Reference Number	NIAH 30405810
Townland	Liss (Tiaquin barony)
Site Type	Handball Alley
NGR	551524, 743555
Description	Detached open-air handball alley, built c.1950, now disused. Rectangular plan with two-storey playing wall to rear and sloping side walls. Concrete walls with four concrete buttresses to external face of rear wall and one to side walls, upper section of lower side walls raised. Square-headed entrance opening to west. Remains of iron posts to top of rear and side walls. Set on roadside with gathering space to west and community centre to east.
Approximate Date	Built c.1950
Sources	NIAH
Approx. distance from nearest route	Route Option C passes 104m to the west-north-west. Route Option D passes 32m to the west-north-west. Route Options E and F pass immediately to the south of the handball alley.
Type of Impact	Route Options C, D, E and F each received a score of '3-Minor or Slightly Negative', as they pass in the close vicinity of the handball alley (NIAH No. 30405810) posing a visual intrusion on its setting.

Legal Status	Protected Structure
Importance	Regional – early 19th-century road bridge which exhibits local craftsmanship and materials, exhibits good quality traditional stone masonry.
Reference Number	NIAH 30405811
Townland	Clashard / Abbey / Liss (Tiaquin By.)
Site Type	Liss Bridge
NGR	551637, 743661
Description	Seven-arch limestone road bridge, built c.1800, over Abbert River. Round arches with rubble voussoirs to arch rings, random rubble to spandrels. Single triangular and semi-circular cutwaters to north-east face with cement coping with pipe inlaid. Random rubble parapet with flat rubble coping. Area of repair to north-west face, cut-stone voussoirs to northern two arches, squared limestone infill to spandrel panels and parapet, flat cut-stone coping. Set on N63 with random rubble walls to adjacent fields.
Approximate Date	Built c.1800
Sources	NIAH; Record of Protected Structures (architectural heritage) in the Galway County Development Plan 2015-2021
Approx. distance from nearest route	Route Option C passes 60m to the north-west. Route Option D passes 20m to the north-west. Route Option E passes over the bridge and Route Option F passes 110m to the south of the handball alley.
Type of Impact	Route Option E is ranked as '1-Major or Highly Negative' as it crosses directly over Liss Bridge. Route Options C, D and F each received a score of '3-Minor or Slightly Negative', as they pass in the close vicinity of Liss Bridge (NIAH No. 30405811) posing a visual intrusion on its setting.

Legal Status	Protected Structure

Importance	Regional – attractive, small-scale building in a simple Victorian style, which retains much of its original character. Adds visual interest to the roadscape.
Reference Number	NIAH 30405814
Townland	Liss (Tiaquin By.)
Site Type	Rose Villa
NGR	551558, 743342
Description	Detached three-bay single-storey teacher's house, built c.1870, having dormer floor with gable to front, and having single-storey lean-to extension to rear. Now in use as private house. Pitched slate roof with rendered chimneystacks to gables, cast-iron rainwater goods, exposed rafter ends to eaves and timber bargeboards to front gable. Rendered walls. Square-headed window openings, front elevation having timber sliding sash windows, six-over-six pane to ground floor and four-over-four pane to first floor, with tooled limestone sills. Replacement timber windows to remaining openings. Square-headed painted sheeted timber door with cast-iron door furniture. Set back from road behind rendered wall with square rendered gate piers and farm gate to east and decorative gate piers with stone pier caps to entrance.
Approximate Date	Built c.1870
Sources	NIAH; Record of Protected Structures (architectural heritage) in the Galway County Development Plan 2015-2021
Approx. distance from nearest route	Route Options C, D, E and F pass immediately to the north of Rose Villa.
Type of Impact	Route Options C, D, E and F each received a score of '3-Minor or Slightly Negative', as they pass in the close vicinity of Rose Villa (NIAH No. 30405814) posing a visual intrusion on its setting.

Legal Status	Protected Structure
Importance	Regional - early Gothic Revival-style Roman Catholic church sits on an elevated and prominent location outside Abbeyknockmoy. The simple appearance of the church is typical of churches built before the Catholic Emancipation (1829), with only two windows on the nave and a decorative gable wall to the west facing the village emphasising the importance of the church within the locality. Though extended in the twentieth century, the building retains its original character and many features including stained-glass windows, a slate roof and cast-iron rainwater goods, while the interior is in keeping with the simple appearance of the exterior. The building has considerable social interest as it is the religious centre of the locality.
Reference Number	NIAH 30405815
Townland	Chapelfield
Site Type	Saint Bernard's Church
NGR	551558, 743342
Description	Freestanding cruciform-plan Roman Catholic Church, built c.1820, having two-bay nave, and with four-bay lower twentieth-century extension to altar end, and glazed entrance porch to north-west transept. Pitched slate roof, having stone copings to gables. Rendered and painted walls with rendered plinth. West gable has stone cross finial, flanked with square-plan piers having conical caps and with patera motif to decorative band below, surmounted by fleur-de-lys. Copings of this gable have decorative corbel table below. Pointed-arch niches to lower part of this gable, with moulded surrounds and containing statues. Pointed-arch windows throughout, with stained glass and stone sills, and smaller windows flanking statue niches. Triple-light window in west gable, having moulded string sill course. Transept gables have windows with Y-tracery, and the apse is lit by an oculus. Pointed-arch doorways to north-west and north-east with timber doors, former being main entrance. Interior has choir balcony at west end with glazed screens below. The roofing consists of an exposed king-post timber truss roof supported on stone corbels, and sheeted timber ceiling. There is a cross-groin vault above the altar crossing. Set back from road on elevated site with car park to north incorporating Marian grotto. A bell stand is in the grounds with cast-iron support structure and bell with raised lettering 'PRESENTED BY MICHAEL DONOVAN TO THE PARISH OF ABBEY KNOCKMOY REV. JOHN GREALY, P.P. 1829'.
Approximate Date	Built c.1820
Sources	NIAH; Record of Protected Structures (architectural heritage) in the Galway County Development Plan 2015-2021

Approx. distance from nearest route	Route Options C, D, E and F pass immediately to the north of Saint Bernard's Church.
Type of Impact	Route Options C, D, E and F each received a score of '3-Minor or Slightly Negative', as they pass in the close vicinity of Saint Bernard's Church (NIAH No. 30405815) posing a visual intrusion on its setting.

References

Archaeological Survey of Ireland (National Monuments Service, Record of Monuments and Places)
http://webgis.archaeology.ie/historicenvironment/

National Inventory of Architectural Heritage
http://webgis.archaeology.ie/historicenvironment/

Record of Protected Structures (architectural heritage) in Appendix V of Galway County Development Plan 2015-2021

Appendix D – Stage 1 Assessment Matrix

N63 Liss to Abbey Realignment Scheme
Phase 2 - Option Selection
Stage 1 - Preliminary Options Assessment

Scoring System (based on PE-PAG-02031)

Major or Highly Positive	7
Moderately Positive	6
Minor or Slightly Positive	5
Not Significant or Neutral	4
Minor or Slightly Negative	3
Moderately Negative	2
Major or Highly Negative	1

SUMMARY

Option	Do-Nothing / Do-Minimum	Route Option A (Cyan)	Route Option B (Green)	Route Option C (Yellow)	Route Option D (Pink)	Route Option E (Blue)	Route Option F (Red)
Engineering							
Traffic Assessment & Route Cross-Section	Major or Highly Negative	Moderately Positive	Major or Highly Positive	Minor or Slightly Positive	Not Significant or Neutral	Moderately Negative	Minor or Slightly Negative
Technical Standards	Major or Highly Negative	Moderately Positive	Major or Highly Positive	Minor or Slightly Positive	Not Significant or Neutral	Moderately Negative	Minor or Slightly Negative
Interaction with Existing Road Network	Not Significant or Neutral	Major or Highly Positive	Moderately Positive	Minor or Slightly Positive	Minor or Slightly Negative	Major or Highly Negative	Moderately Negative
Structures	Major or Highly Negative	Major or Highly Positive	Moderately Positive	Minor or Slightly Positive	Not Significant or Neutral	Minor or Slightly Negative	Moderately Negative
Geology	Major or Highly Negative	Moderately Positive	Major or Highly Positive	Minor or Slightly Positive	Not Significant or Neutral	Moderately Negative	Minor or Slightly Negative
Groundwater	Minor or Slightly Negative	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative
Earthworks	Major or Highly Negative	Minor or Slightly Positive	Major or Highly Positive	Moderately Positive	Minor or Slightly Negative	Moderately Negative	Not Significant or Neutral
Road Safety	Major or Highly Negative	Moderately Positive	Major or Highly Positive	Minor or Slightly Positive	Not Significant or Neutral	Moderately Negative	Minor or Slightly Negative
Drainage	Not Significant or Neutral	Moderately Positive	Major or Highly Positive	Minor or Slightly Positive	Minor or Slightly Negative	Major or Highly Negative	Moderately Negative
Construction	Moderately Negative	Major or Highly Positive	Moderately Positive	Minor or Slightly Positive	Not Significant or Neutral	Major or Highly Negative	Minor or Slightly Negative
Comparative Service Conflicts	Moderately Negative	Major or Highly Positive	Moderately Positive	Minor or Slightly Positive	Minor or Slightly Negative	Major or Highly Negative	Not Significant or Neutral
Comparisons on Land & Property	Major or Highly Positive	Moderately Negative	Not Significant or Neutral	Minor or Slightly Positive	Major or Highly Negative	Moderately Positive	Minor or Slightly Negative
Overall Engineering	**Minor or Slightly Negative**	**Moderately Positive**	**Major or Highly Positive**	**Minor or Slightly Positive**	**Not Significant or Neutral**	**Minor or Slightly Negative**	**Minor or Slightly Negative**
Environment							
Biodiversity	Major or Highly Positive	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative	Not Significant or Neutral	Major or Highly Negative
Water	Minor or Slightly Negative	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative
Land and Soils	Minor or Slightly Negative	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative
Landscape & Visual	Not Significant or Neutral	Moderately Negative	Moderately Negative	Minor or Slightly Negative	Moderately Negative	Minor or Slightly Positive	Moderately Negative
Noise and Vibration	Moderately Negative	Minor or Slightly Negative	Minor or Slightly Negative	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative
Air Quality and Climate	Not Significant or Neutral	Minor or Slightly Positive	Minor or Slightly Positive	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Moderately Negative
Population and Human Health	Moderately Negative	Moderately Positive	Moderately Positive	Moderately Positive	Moderately Positive	Moderately Positive	Moderately Positive
Cultural Heritage	Not Significant or Neutral	Major or Highly Negative	Moderately Negative	Minor or Slightly Negative	Minor or Slightly Negative	Major or Highly Negative	Minor or Slightly Negative
Material Assets - Agriculture	Not Significant or Neutral	Moderately Negative	Moderately Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative
Material Assets - Non-Agriculture	Not Significant or Neutral	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative
Overall Environment	**Not Significant or Neutral**	**Major or Highly Negative**	**Moderately Negative**	**Moderately Negative**	**Moderately Negative**	**Moderately Negative**	**Moderately Negative**
Economy							
Efficiency & Effectiveness	Major or Highly Negative	Moderately Positive	Major or Highly Positive	Minor or Slightly Positive	Not Significant or Neutral	Moderately Negative	Not Significant or Neutral
Wider Economic Impacts	Major or Highly Negative	Moderately Positive	Major or Highly Positive	Minor or Slightly Positive	Not Significant or Neutral	Moderately Negative	Not Significant or Neutral
Transport Quality & Reliability	Major or Highly Negative	Moderately Positive	Major or Highly Positive	Minor or Slightly Positive	Not Significant or Neutral	Moderately Negative	Not Significant or Neutral
Funding Impacts	Major or Highly Positive	Major or Highly Negative	Moderately Negative	Minor or Slightly Negative	Moderately Negative	Not Significant or Neutral	Minor or Slightly Positive
Overall Economy	**Minor or Slightly Negative**	**Minor or Slightly Positive**	**Moderately Positive**	**Minor or Slightly Positive**	**Not Significant or Neutral**	**Minor or Slightly Negative**	**Not Significant or Neutral**

Option	Do-Nothing / Do-Minimum	Route Option A (Cyan)	Route Option B (Green)	Route Option C (Yellow)	Route Option D (Pink)	Route Option E (Blue)	Route Option F (Red)
Overall							
Engineering	Minor or Slightly Negative	Moderately Positive	Major or Highly Positive	Minor or Slightly Positive	Not Significant or Neutral	Minor or Slightly Negative	Minor or Slightly Negative
Environment	Not Significant or Neutral	Major or Highly Negative	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative
Economy	Minor or Slightly Negative	Minor or Slightly Positive	Moderately Positive	Minor or Slightly Positive	Not Significant or Neutral	Minor or Slightly Negative	Not Significant or Neutral
TOTAL	**Minor or Slightly Negative**	**Not Significant or Neutral**	**Minor or Slightly Positive**	**Not Significant or Neutral**	**Minor or Slightly Negative**	**Moderately Negative**	**Minor or Slightly Negative**

DETAILED

Option	Do-Nothing / Do-Minimum	Route Option A (Cyan)	Route Option B (Green)	Route Option C (Yellow)	Route Option D (Pink)	Route Option E (Blue)	Route Option F (Red)
Engineering							
Traffic Assessment & Route Cross-Section	Major or Highly Negative	Moderately Positive	Major or Highly Positive	Minor or Slightly Positive	Not Significant or Neutral	Moderately Negative	Minor or Slightly Negative
Qualitative Statement	The existing cross-section along with vertical/ horizontal curves is not able to provide adequate provision for the traffic volumes.	The proposed alignment can provide adequately for the existing and current traffic volumes. The offline construction provides NMU access along the existing route.	This route offers the same advantages as Route A but the increased radii of the curves along this route give it an advantage over Route A.	Route C offers similar advantages as A or B but due to the increased amount of online construction it reduces the NMU facilities available.	Route D offers similar advantages as the previous routes but at a lesser scale but due to the increased amount of online construction it reduces the NMU facilities available.	Route E does not offer significant benefits over the existing layout due to using the existing Liss Bridge. The introduction of two roundabouts will not help traffic flow.	Route D offers similar advantages as the Routes A-D but at a lesser scale but due to the increased amount of online construction it reduces the NMU facilities available.
Technical Standards	Major or Highly Negative	Moderately Positive	Major or Highly Positive	Minor or Slightly Positive	Not Significant or Neutral	Moderately Negative	Minor or Slightly Negative
Qualitative Statement	The existing alignment has not been designed to the latest standards	The option complies with standards but relaxations are required for the horizontal curvature	The option complies with standards and the horizontal curvature does not require any relaxations	Horizontal curvature is to technical standards but the increase in skew of the bridge reduces the score.	Horizontal curvature is to technical standards but the increase in skew of the bridge reduces the score.	Adopting the existing road alignment increases the number of departures required	The offline section is outweighed by the existing road alignment
Interaction with Existing Road Network	Not Significant or Neutral	Major or Highly Positive	Moderately Positive	Minor or Slightly Positive	Minor or Slightly Negative	Major or Highly Negative	Moderately Negative
Qualitative Statement	This option has a neutral impact on the existing road network as it is a traffic calming exercise.	This scheme maximises the offline construction and thus reduces the impact on the existing road network	This scheme has similar advantages to Route A but to a lesser extent due to the earlier western tie-in	The online section is increased thus reducing the score of this route	This route is nearly completely online which reduces the score	This route using the existing Liss Bridge which results in a poor score	The offline section scores well but the online section results in the poor score
Structures	Major or Highly Negative	Major or Highly Positive	Moderately Positive	Minor or Slightly Positive	Not Significant or Neutral	Minor or Slightly Negative	Moderately Negative
Qualitative Statement	The existing Liss Bridge does not have the capacity to deal with the traffic volumes and the poor horizontal/vertical alignment results in a poor score.	The proposed bridge is the least skewed option	The proposed bridge will have a standard cross section but a skew is introduced with this proposal.	The proposed bridge will have a standard cross section but a larger skew is introduced with this proposal.	The benefits of this structure are outweighed by the skew and result in a neutral score	The proposed structure is the existing Liss Bridge alignment which results in a poor score	The scheme will have at least two river crossings at a skew which results in a poor score
Geology	Major or Highly Negative	Moderately Positive	Major or Highly Positive	Minor or Slightly Positive	Not Significant or Neutral	Moderately Negative	Minor or Slightly Negative
Qualitative Statement	Due to the amount of online construction	Due to the amount of offline construction	Due to the amount of offline construction	Due to the amount of offline construction	Due to the amount of online construction	Due to the amount of online construction	Due to the amount of online construction
Groundwater	Minor or Slightly Negative	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative
Qualitative Statement	The installation of traffic calming facilities would have little affect on Groundwater.	All routes will require the development of sections of offline road over a 'Regionally Important aquifer', an attribute identified as being of 'High' importance. The groundwater vulnerability beneath each corridor consists of a mix of 'Moderate', 'High' and 'Extreme' vulnerability.	All routes will require the development of sections of offline road over a 'Regionally Important aquifer', an attribute identified as being of 'High' importance. The groundwater vulnerability beneath each corridor consists of a mix of 'Moderate', 'High' and 'Extreme' vulnerability.	All routes will require the development of sections of offline road over a 'Regionally Important aquifer', an attribute identified as being of 'High' importance. The groundwater vulnerability beneath each corridor consists of a mix of 'Moderate', 'High' and 'Extreme' vulnerability.	All routes will require the development of sections of offline road over a 'Regionally Important aquifer', an attribute identified as being of 'High' importance. The groundwater vulnerability beneath each corridor consists of a mix of 'Moderate', 'High' and 'Extreme' vulnerability.	All routes will require the development of sections of offline road over a 'Regionally Important aquifer', an attribute identified as being of 'High' importance. The groundwater vulnerability beneath each corridor consists of a mix of 'Moderate', 'High' and 'Extreme' vulnerability.	All routes will require the development of sections of offline road over a 'Regionally Important aquifer', an attribute identified as being of 'High' importance. The groundwater vulnerability beneath each corridor consists of a mix of 'Moderate', 'High' and 'Extreme' vulnerability.
Earthworks	Major or Highly Negative	Minor or Slightly Positive	Major or Highly Positive	Moderately Positive	Minor or Slightly Negative	Moderately Negative	Not Significant or Neutral
Qualitative Statement	The existing cross-section does not offer standard horizontal/vertical curvature and results in poor earthworks by current standards	The standard of construction will lead to standard designed earthworks	The standard of construction will lead to standard designed earthworks. The horizontal curvature will help improve the earthworks.	The standard of construction will lead to standard designed earthworks	The proximity to the school will result in restricted earthworks design	As the existing bridge is required the earthwork design is restricted.	The balance between offline and online construction results in good earthworks in the offline areas and restricted earthworks online
Road Safety	Major or Highly Negative	Moderately Positive	Major or Highly Positive	Minor or Slightly Positive	Not Significant or Neutral	Moderately Negative	Minor or Slightly Negative
Qualitative Statement	The introduction of traffic calming will not improve the horizontal or vertical curvature, which is were safety issues arise.	The new alignment and cross-section will improve road safety but it is not as high as B due to the relaxations required.	The improved horizontal curvature leads to improved safety aspects	The increased online construction reduces the safety aspects of this route	The offline section is outweighed by the online safety concerns, particularly in the vicinity of the school	There are still the same safety concerns as there are in the existing scheme	The offline section scores well but traffic still has to flow past the community facilities
Drainage	Not Significant or Neutral	Moderately Positive	Major or Highly Positive	Minor or Slightly Positive	Minor or Slightly Negative	Major or Highly Negative	Moderately Negative
Qualitative Statement	The installation of traffic signals would have an insignificant affect on the existing carriageway drainage.	The offline construction will result in a new drainage system designed to the latest standard	The offline construction will result in a new drainage system designed to the latest standard	The offline construction will result in a new drainage system designed to the latest standard	The online section will require updates to the existing drainage	The online section will require updates to the existing drainage	The online section will require updates to the existing drainage
Construction	Moderately Negative	Major or Highly Positive	Moderately Positive	Minor or Slightly Positive	Not Significant or Neutral	Major or Highly Negative	Minor or Slightly Negative
Qualitative Statement	Online construction of traffic signals in an area of poor visibility will result in safety concerns for the public and the road workers.	The scheme is mostly offline which will lead to safer and easier construction	The scheme is mostly offline which will lead to safer and easier construction	The scheme is mostly offline which will lead to safer and easier construction	The offline section and online section cancel each other out when it comes to construction	The amount of online construction results in safety concerns for construction	The amount of online construction results in safety concerns for construction
Comparative Service Conflicts	Moderately Negative	Major or Highly Positive	Moderately Positive	Minor or Slightly Positive	Minor or Slightly Negative	Major or Highly Negative	Not Significant or Neutral
Qualitative Statement	As traffic calming would be all online this will result with a number of conflicts	The scheme is mostly offline which will lead to minimal service conflicts	The scheme is mostly offline which will lead to minimal service conflicts	The scheme is mostly offline which will lead to minimal service conflicts	The scheme is mostly offline which will lead to minimal service conflicts	As the scheme is mostly online the chance of service conflicts are high	The offline section and online section cancel each other out when it comes to services impacts
Comparisons on Land & Property	Major or Highly Positive	Moderately Negative	Not Significant or Neutral	Minor or Slightly Positive	Major or Highly Negative	Moderately Positive	Minor or Slightly Negative
Qualitative Statement	There should be no third party land take under this option.	The offline construction of the scheme results in a large amount of land take and the land take is in close proximity to the Abbey	The land take for this scheme is mostly farm land which helps bring the score up	This landtake with this scheme is minimised which gives it a good score	This scheme cuts through the school yard which resulted in negative comments during public consultation	This scheme is mostly online which gives it a positive score	The amount of landtake specifically through an SAC results in a poor score

Option	Do-Nothing / Do-Minimum	Route Option A (Cyan)	Route Option B (Green)	Route Option C (Yellow)	Route Option D (Pink)	Route Option E (Blue)	Route Option F (Red)
Environment							
Biodiversity	Major or Highly Positive	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative	Not Significant or Neutral	Major or Highly Negative
Qualitative Statement	Due to the minor works required that are already in the vicinity of the road carriageway the effective impact on ecology is seen as minor.	The significant greenfield land take of greenfield sites and the construction of a new bridge over an SAC result in the poor score. The eastern tie-in will result in the loss of mature hedgerow which contributes to the poor score.	The significant greenfield land take of greenfield sites and the construction of a new bridge over an SAC result in the poor score. The eastern tie-in will result in the loss of mature hedgerow which contributes to the poor score.	The significant greenfield land take of greenfield sites and the construction of a new bridge over an SAC result in the poor score. The eastern tie-in will result in the loss of mature hedgerow which contributes to the poor score.	The introduction of a skewed bridge across an area of mature trees results in the negative score. The eastern tie-in will result in the loss of mature hedgerow which contributes to the poor score.	The use of the existing infrastructure and road network gives this route option a slightly positive score but the introduction of two roundabouts in the area and the requirement for greenfield land take prevent the route from scoring better.	The route travels through a large woodland and has a significant impact on the SAC which results in such a poor overall score. The route has to transverse two water courses which contributes to the poor score.
Water	Minor or Slightly Negative	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative
Qualitative Statement	The existing drainage infrastructure does not have any environmental protection measures in terms of surface water attenuation and hydrocarbon interceptors which would be included in any new works.	This Route option requires one crossing over the Abbert River, a designated SAC. Potential for negative impacts on receiving waters during both the construction and operational phases There is potential for temporary, negative impacts to the amenity value of the River Abbert during the construction phase.	This Route option requires one crossing over the Abbert River, a designated SAC. Potential for negative impacts on receiving waters during both the construction and operational phases There is potential for temporary, negative impacts to the amenity value of the River Abbert during the construction phase.	This Route option requires one crossing over the Abbert River, a designated SAC. Potential for negative impacts on receiving waters during both the construction and operational phases There is potential for temporary, negative impacts to the amenity value of the River Abbert during the construction phase.	This Route option requires one crossing over the Abbert River, a designated SAC. Potential for negative impacts on receiving waters during both the construction and operational phases There is potential for temporary, negative impacts to the amenity value of the River Abbert during the construction phase.	This route option requires one crossing over the Abbert River, a designated SAC. Potential for negative impacts on receiving waters during both the construction and operational phases There is potential for temporary, negative impacts to the amenity value of the River Abbert during the construction phase.	This Route option requires one crossing over the Abbert River, a designated SAC, in addition to the Derreen stream. Potential for negative impacts on receiving waters during both the construction and operational phases There is potential for temporary, negative impacts to the amenity value of the River Abbert during the construction phase.
Land and Soils	Minor or Slightly Negative	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative
Qualitative Statement	The existing drainage infrastructure does not have any environmental protection measures in hydrocarbon interceptors which would be included in any new works.	The route involves the development of sections of offline road through open greenfield over a 'Regionally Important Aquifer'. The groundwater vulnerability beneath this corridor is predominantly 'Moderate', with some southern sections of the corridor comprising of 'High' and 'Extreme' vulnerability.	The Route involves the development of sections of offline road through open greenfield over a 'Regionally Important Aquifer'. The groundwater vulnerability beneath this corridor is predominantly 'Moderate', with some southern sections of the corridor comprising of 'High' and 'Extreme' vulnerability.	The southern section of this Route closely follows the existing N63 line and will likely have less impact to land and soil attributes in the area. The northern section of this Route will involve the development of sections of offline roads above the Regionally Important aquifer. The groundwater vulnerability beneath this Route consists of a mix of 'Extreme', 'High' and 'Moderate' vulnerability.	The southern section of this Route closely follows the existing N63 line and will likely have less impact to land and soil attributes in the area. The northern section of this Route will involve the development of sections of offline roads above the Regionally Important aquifer. The groundwater vulnerability beneath this Route consists of a mix of 'Extreme', 'High' and 'Moderate' vulnerability.	The southern section of this Route closely follows the existing N63 line and will likely have less impact to land and soil attributes in the area. The northern section of this Route will involve the development of sections of offline roads above the Regionally Important aquifer. The groundwater vulnerability beneath this Route is predominantly 'Moderate', with some southern sections of the corridor comprising of 'High' and 'Extreme' vulnerability	The southern section of this Route closely follows the existing N63 line and will likely have less impact to land and soil attributes in the area. The northern section of this Route will involve the development of sections of offline roads above the Regionally Important aquifer. The groundwater vulnerability beneath this corridor consists of a mix of 'Extreme', 'High' and 'Moderate' vulnerability.

Landscape & Visual	Not Significant or Neutral	Moderately Negative	Moderately Negative	Minor or Slightly Negative	Moderately Negative	Minor or Slightly Positive	Moderately Negative
Qualitative Statement	Impacts are considered neutral as the works are minimal.	This route contains the largest sections of offline road development, mainly across green fields, when compared to the other route options resulting in high effects on the landscape character due to the introduction of extended offline road infrastructure and associated embankments. Visually, Option A is located within an area designated as 'Landscape Focal Point/View' No. 26 – Knockmoy Abbey Southeast of Tuam. Its close proximity to the Abbeyknockmoy Cistercian Abbey will result in higher visual changes than Option B, which is located further east of the Abbeyknockmoy Cistercian Abbey. Option A will alter considerably the visual setting of the abbey as well as views south and east from the abbey.	Similar to Option A this route contains a large section of offline road development, mainly across green fields, when compared to the other route options resulting in high effects on the landscape character due to the introduction of extended offline road infrastructure and associated embankments. Option B is also located closer to residences located along the existing N63 than Option A and will therefore become a more prominent new feature in available views to the north from these residences.	There are a lower number of sensitive receptors within 50m of the carriageway, including a primary school, residential properties and community facilities. The landscape sensitivity is also deemed low at this point. There is a concern on the impact on the visual amenity of the Abbey.	While the change to the landscape character will be reduced due to a relatively short section of offline road development, visual effects are considered high as sections of the route will be located adjacent to community facilities and the school, which are considered highly sensitive receptors. However, Option D is located further east than Option C, which will reduce the effects on views east from the Abbeyknockmoy Cistercian Abbey further than Option C.	This option will use the majority of the existing road corridor and will therefore least affect the landscape character of the study area. Views to and from the Abbeyknockmoy Cistercian Abbey will also remain largely unchanged.	This route contains a longer offline section cross green fields than Options C, D and E. It will also have the highest impact on existing stands of trees and hedgerows of all options.
Noise and Vibration	Moderately Negative	Minor or Slightly Negative	Minor or Slightly Negative	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative
Qualitative Statement	Construction: Noise and vibration impacts are unlikely to result in significant, long-term adverse noise impacts upon the closest sensitive receptors to proposed works. Operation: Noise levels are likely to remain similar to those currently experienced at noise sensitive properties located along the Do-minimum route, with the potential for increases in noise levels from congestion traffic. There is little scope for inclusion of mitigation measures.	Construction: The construction phase has the potential to increase noise levels at noise sensitive locations surrounding the route option. There is also potential for ground vibration due to the construction phase works. The implementation of appropriate mitigation measures will therefore be required. Operation: Whilst the route has potential to increase noise levels at some more remote sensitive receptors, noise levels may reduce at existing affected receptors due to improvements in congestion levels. There is scope for the inclusion of mitigation measures in the route design to potentially reduce noise impacts at sensitive receptors.	Construction: The construction phase has the potential to increase noise levels at noise sensitive locations surrounding the Route option. There is also potential for ground vibration due to the construction phase works. The implementation of appropriate mitigation measures will therefore be required. Operation: Whilst the Route has potential to increase noise levels at some more remote sensitive receptors, noise levels may reduce at existing affected receptors due to improvements in congestion levels. There is scope for the inclusion of mitigation measures in the route design to potentially reduce noise impacts at sensitive receptors.	Construction: The construction phase has the potential to increase noise levels at noise sensitive locations surrounding the Route option. There is also potential for ground vibration due to the construction phase works. The implementation of appropriate mitigation measures will therefore be required. Operation: Whilst the Route has potential to increase noise levels at some more remote sensitive receptors, noise levels may reduce at existing affected receptors due to improvements in congestion levels. There is scope for the inclusion of mitigation measures in the route design to potentially reduce noise impacts at sensitive receptors.	Construction: The construction phase has the potential to increase noise levels at noise sensitive locations surrounding the route option. There is also potential for ground vibration due to the construction phase works. The implementation of appropriate mitigation measures will therefore be required. Operation: The Route has potential to result in noise impacts on sensitive receptors. There is less scope for the inclusion of mitigation measures in the route design to reduce noise impacts at sensitive receptors due to site constraints.	Construction: The construction phase has the potential to increase noise levels at noise sensitive locations surrounding the Route option. There is also potential for ground vibration due to the construction phase works. The implementation of appropriate mitigation measures will therefore be required. Operation: The Route has potential to result in noise impacts on sensitive receptors. There is less scope for the inclusion of mitigation measures in the route design to reduce noise impacts at sensitive receptors due to site constraints.	Construction: The construction phase has the potential to increase noise levels at noise sensitive locations surrounding the Route option. There is also potential for ground vibration due to the construction phase works. The implementation of appropriate mitigation measures will therefore be required. Operation: The Route has potential to result in noise impacts on sensitive receptors. There is less scope for the inclusion of mitigation measures in the route design to reduce noise impacts at sensitive receptors due to site constraints.
Quantitative Statement	2 sensitive receptor within 50 m of the Do Minimum option (Lough Corrib SAC and Liss bridge NIAH)	There are 20 sensitive receptors within 50 m of this route option	There are 26 sensitive receptors within 50 m of this Route option.	There are 41 sensitive receptors within 50 m of this Route option.	There are 46 sensitive receptors within 50 m of this Route option	There are 45 sensitive receptors within 50 m of this Route option.	There are 49 sensitive receptors within 50 m of this Route option, including, Abbeyknockmoy Community Centre and Newton Girls National Primary School.
Air Quality and Climate	Not Significant or Neutral	Minor or Slightly Positive	Minor or Slightly Positive	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Moderately Negative
Qualitative Statement	The Air Quality Index for Health (AQIH) for Galway City and County is 2, 'Good' at the time of writing. There are no significant non-road sources contributing to air quality in this rural area.	The Air Quality Index for Health (AQIH) for Galway City and County is 2, 'Good' at the time of writing. There are no significant non-road sources contributing to air quality in this rural area.	The Air Quality Index for Health (AQIH) for Galway City and County is 2, 'Good' at the time of writing. There are no significant non-road sources contributing to air quality in this rural area.	The Air Quality Index for Health (AQIH) for Galway City and County is 2, 'Good' at the time of writing. There are no significant non-road sources contributing to air quality in this rural area.	The Air Quality Index for Health (AQIH) for Galway City and County is 2, 'Good' at the time of writing. There are no significant non-road sources contributing to air quality in this rural area.	The Air Quality Index for Health (AQIH) for Galway City and County is 2, 'Good' at the time of writing. There are no significant non-road sources contributing to air quality in this rural area.	The Air Quality Index for Health (AQIH) for Galway City and County is 2, 'Good' at the time of writing. There are no significant non-road sources contributing to air quality in this rural area.
Quantitative Statement	2 sensitive receptor within 50 m of the Do Minimum option (Lough Corrib SAC and Liss bridge NIAH)	There are 20 sensitive receptors within 50 m of this Route option. A primary school and community centre are within 50m of the residual road network, outwith the route corridor.	There are 26 sensitive receptors within 50 m of this Route option. A primary school and community centre are within 50m of the residual road network, outwith the route corridor.	There are 41 sensitive receptors within 50 m of this Route option. A primary school and community centre are within 50m of the residual road network, outwith the route corridor.	There are 46 sensitive receptors within 50 m of this Route option, including a primary school and community centre.	There are 45 sensitive receptors within 50 m of this Route option, including a primary school and community centre.	There are 49 sensitive receptors within 50 m of this Route option, including a primary school and community centre.
Population and Human Health	Moderately Negative	Moderately Positive	Moderately Positive	Moderately Positive	Moderately Positive	Moderately Positive	Moderately Positive
Qualitative Statement	The opportunity to improve congestion issues at Liss Bridge, while improving safety for both motorised and non-motorised users would be lost.	Potential localised and short term negative impacts from construction works to human health and the amenity value of the River Abbert, an identified river angling fishery. Overall, this route will likely result in a positive impact as it will assist in alleviating congestion issues around Liss Bridge at the local level, while improving safety for both motorised and non-motorised users The additional bridge crossing over the River Abbert has the potential to improve connectivity to the community facilities for all in the local in the area.	Potential localised and short term negative impacts from construction works to human health and the amenity value of the River Abbert, an identified river angling fishery. Overall, this route will likely result in a positive impact as it will assist in alleviating congestion issues around Liss Bridge at the local level, while improving safety for both motorised and non-motorised users The additional bridge crossing over the River Abbert has the potential to improve connectivity to the community facilities for all in the local in the area.	Potential localised and short term negative impacts from construction works to human health and the amenity value of the River Abbert, an identified river angling fishery. Overall, this route will likely result in a positive impact as it will assist in alleviating congestion issues around Liss Bridge at the local level, while improving safety for both motorised and non-motorised users The additional bridge crossing over the River Abbert has the potential to improve connectivity to the community facilities for all in the local in the area.	Potential localised and short term negative impacts from construction works to human health and the amenity value of the River Abbert, an identified river angling fishery. Overall, this route will likely result in a positive impact as it will assist in alleviating congestion issues around Liss Bridge at the local level, while improving safety for both motorised and non-motorised users The additional bridge crossing over the River Abbert has the potential to improve connectivity to the community facilities for all in the local in the area.	Potential localised and short term negative impacts from construction works to human health and the amenity value of the River Abbert, an identified river angling fishery. Overall, this route will likely result in a positive impact as it will assist in alleviating congestion issues around Liss Bridge at the local level, while improving safety for both motorised and non-motorised users The additional bridge crossing over the River Abbert has the potential to improve connectivity to the community facilities for all in the local in the area.	Potential localised and short term negative impacts from construction works to human health and the amenity value of the River Abbert, an identified river angling fishery. Overall, this route will likely result in a positive impact as it will assist in alleviating congestion issues around Liss Bridge at the local level, while improving safety for both motorised and non-motorised users The additional bridge crossing over the River Abbert has the potential to improve connectivity to the community facilities for all in the local in the area.
Cultural Heritage	Not Significant or Neutral	Major or Highly Negative	Moderately Negative	Minor or Slightly Negative	Minor or Slightly Negative	Major or Highly Negative	Minor or Slightly Negative
Qualitative Statement	No work outside footprint of the current N63.	Abbeyknockmoy Cistercian Abbey (NM No. 166; GA058-004001), a National Monument, is located 100m NW of route corridor. Field system associated with monastic site is also a National Monument. Inspection of aerial photos suggests that this field system may extend across the route corridor.	Abbeyknockmoy Cistercian Abbey (NM No. 166; GA058-004001) and an associated medieval field system (NM No. 166 & PO No. 4/1989; GA058-004004), which are both protected National Monuments are located in close proximity to the route corridor. Rose Villa (NIAH No. 30405814) is situated 174m S of route corridor. Liss Bridge (NIAH No. 30405811) is located 209m S of route corridor.	Rose Villa (NIAH No. 30405814) is situated immediately S of route corridor. Handball alley (NIAH No. 30405810) is situated 104m ESE of route corridor. St. Bernard's Church (NIAH No. 30405815) is located 197m SE of route corridor. Liss Bridge (NIAH No. 30405810) is situated 90m S of route corridor. No other known cultural heritage receptors located within 250m of route corridor.	Rose Villa (NIAH No. 30405814) and handball alley (NIAH No. 30405810) are situated immediately adjacent to route corridor. St. Bernard's Church (NIAH No. 30405815) is located 137m SSE of route corridor. Liss Bridge (NIAH No. 30405811) is located 30m S of route corridor. No other known cultural heritage receptors situated within 250m of route corridor.	The route corridor passes direclty over Liss Bridge (NIAH No. 30405811) which is a Protected Structure (RPS No. 3925). Rose Villa (NIAH No. 30405814) and handball alley (NIAH No. 30405810) are situated immediately adjacent to route corridor. St Bernard's Church (NIAH No. 30405815) is 86m S of the route corridor. No other known cultural heritage receptors situated within 250m of route corridor.	Rose Villa (NIAH No. 30405814) and handball alley (NIAH No. 30405810) are situated immediately adjacent to route corridor. St Bernard's Church (NIAH No. 30405815) is 86m S of the route corridor. Liss Bridge (NIAH No. 30405811) is 120m N of the route corridor. No other known cultural heritage receptors situated within 250m of route corridor.
Material Assets - Agriculture	Not Significant or Neutral	Moderately Negative	Moderately Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative
Qualitative Statement	Impacts are considered neutral as the works are minimal.	This Route options will result in agricultural land take and severance of land parcels. The Cyan Route Option the highest potential land take. It will sever most agricultural land parcels.	This Route options will result in agricultural land take and severance of land parcels. The Green Route has considerably higher land takes than the other corridors, but less than the Cyan Route. It will sever most agricultural land parcels. The Green Route crosses wet land for longer than the Cyan Route.	This Route options will result in agricultural land take and severance of land parcels.	This Route options will result in agricultural land take and severance of land parcels.	This Route options will result in agricultural land take and severance of land parcels.	This Route options will result in agricultural land take and severance of land parcels.
Material Assets - Non-Agriculture	Not Significant or Neutral	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative
Qualitative Statement	Impacts are considered neutral as the works are minimal.	Potentially service suspension during construction and possible diversion works. Potential negative vibration impacts to properties surrounding the routes; however, these impacts will be temporary and therefore are not likely to cause significant impacts.	Potentially service suspension during construction and possible diversion works. Potential negative vibration impacts to properties surrounding the routes; however, these impacts will be temporary and therefore are not likely to cause significant impacts.	Potentially service suspension during construction and possible diversion works. Potential negative vibration impacts to properties surrounding the routes; however, these impacts will be temporary and therefore are not likely to cause significant impacts.	Potentially service suspension during construction and possible diversion works. Potential negative vibration impacts to properties surrounding the routes; however, these impacts will be temporary and therefore are not likely to cause significant impacts.	Potentially service suspension during construction and possible diversion works. Potential negative vibration impacts to properties surrounding the routes; however, these impacts will be temporary and therefore are not likely to cause significant impacts.	Potentially service suspension during construction and possible diversion works. Potential negative vibration impacts to properties surrounding the routes; however, these impacts will be temporary and therefore are not likely to cause significant impacts.

Option	Do-Nothing / Do-Minimum	Route Option A (Cyan)	Route Option B (Green)	Route Option C (Yellow)	Route Option D (Pink)	Route Option E (Blue)	Route Option F (Red)
Economy							
Efficiency & Effectiveness	Major or Highly Negative	Moderately Positive	Major or Highly Positive	Minor or Slightly Positive	Not Significant or Neutral	Moderately Negative	Not Significant or Neutral
Qualitative Statement	The efficiency of the network will decrease with the introduction of traffic calming.	This option will offer a free flow option for traffic along improved alignment.	This scheme offers the advantages of Route A but the reduced length and wider horizontal curves improve the overall outcome	The advantages of this scheme are not as great as A or B due to the amount of online construction.	The advantages of offline construction will be lost due to the amount of online construction	The introduction of 2 roundabouts and using the existing Liss Bridge will not improve the traffic through flow	The offline alignment will help improve the traffic flow but then it will slow down at the community facilities.
Wider Economic Impacts	Major or Highly Negative	Moderately Positive	Major or Highly Positive	Minor or Slightly Positive	Not Significant or Neutral	Moderately Negative	Not Significant or Neutral
Qualitative Statement	The do-minimum scheme will not provide any wider economic improvements	This option will offer a free flow option for traffic along improved alignment.	This scheme offers the advantages of Route A but the reduced length and wider horizontal curves improve the overall outcome	This scheme will help elevate congestion at the bridge but will not offer the same free flow scenarios as A or B due to the restrictions through the online sections	This scheme will help elevate congestion at the bridge but will not offer the same free flow scenarios as A or B due to the restrictions through the online sections	The introduction of 2 roundabouts will not improve the situation and will result in a negative outcome	The scheme still travels through the community area where traffic would be heavy so this results in a slightly negative outcome
Transport Quality & Reliability	Major or Highly Negative	Moderately Positive	Major or Highly Positive	Minor or Slightly Positive	Not Significant or Neutral	Moderately Negative	Not Significant or Neutral
Qualitative Statement	Reliability along this corridor will reduce with the introduction of this scheme.	This option will offer a free flow option for traffic along improved alignment.	This scheme offers the advantages of Route A but the reduced length and wider horizontal curves improve the overall outcome	This scheme will help elevate congestion at the bridge but will not offer the same free flow scenarios as A or B due to the restrictions through the online sections	This scheme will help elevate congestion at the bridge but will not offer the same free flow scenarios as A or B due to the restrictions through the online sections	The introduction of 2 roundabouts will not improve the situation and will result in a negative outcome	The scheme still travels through the community area where traffic would be heavy so this results in a slightly negative outcome
Funding Impacts	Major or Highly Positive	Major or Highly Negative	Moderately Negative	Minor or Slightly Negative	Moderately Negative	Not Significant or Neutral	Minor or Slightly Positive
Qualitative Statement	The costs of this scheme will be minimal	This scheme is one of the most costly due to offline construction and land take	This scheme is one of the most costly due to offline construction and land take. The installation of a skewed bridge increases the overall cost of this scheme.	Although there is less offline construction compared to A or B the skew of the bridge increases the cost of this scheme.	Although there is less offline construction compared to A or B the skew of the bridge increases the cost of this scheme. The cost of this scheme is higher than the costs of C.	This scheme has no significant funding impacts when compared to other proposals.	Due to the split between online and offline construction this scheme offers slight positives in the sense of costs compared to the others

Option	Do-Nothing / Do-Minimum	Route Option A (Cyan)	Route Option B (Green)	Route Option C (Yellow)	Route Option D (Pink)	Route Option E (Blue)	Route Option F (Red)
Overall							
Engineering	Minor or Slightly Negative	Moderately Positive	Major or Highly Positive	Minor or Slightly Positive	Not Significant or Neutral	Minor or Slightly Negative	Minor or Slightly Negative
Environment	Not Significant or Neutral	Major or Highly Negative	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative	Moderately Negative
Economy	Minor or Slightly Negative	Minor or Slightly Positive	Moderately Positive	Minor or Slightly Positive	Not Significant or Neutral	Minor or Slightly Negative	Not Significant or Neutral
TOTAL	**Minor or Slightly Negative**	**Not Significant or Neutral**	**Minor or Slightly Positive**	**Not Significant or Neutral**	**Minor or Slightly Negative**	**Moderately Negative**	**Minor or Slightly Negative**

Appendix E – Stage 2 Project Appraisal Matrix

N63 Liss to Abbey Realignment Scheme
Phase 2 - Option Selection
Stage 2 - Project Appraisal Matrix

Scoring System (based on PE-PAG-02031)

Major or Highly Positive	7
Moderately Positive	6
Minor or Slightly Positive	5
Not Significant or Neutral	4
Minor or Slightly Negative	3
Moderately Negative	2
Major or Highly Negative	1

SUMMARY

Option	Do-Nothing / Do-Minimum	Route Option A (Cyan)	Route Option B (Green)	Route Option C (Yellow)
ECONOMY				
Efficiency & Effectiveness	Major or Highly Negative	Moderately Positive	Major or Highly Positive	Minor or Slightly Positive
Wider Economic Impacts	Major or Highly Negative	Moderately Positive	Major or Highly Positive	Minor or Slightly Positive
Transport Quality & Reliability	Major or Highly Negative	Moderately Positive	Major or Highly Positive	Minor or Slightly Positive
Funding Impacts	Major or Highly Positive	Major or Highly Negative	Moderately Negative	Minor or Slightly Negative
Overall Economic Ranking	**Major or Highly Negative**	**Moderately Positive**	**Major or Highly Positive**	**Minor or Slightly Positive**
SAFETY				
Accident Benefits	Minor or Slightly Positive	Moderately Positive	Moderately Positive	Major or Highly Positive
Junctions	Not Significant or Neutral	Moderately Positive	Moderately Positive	Major or Highly Positive
Compliance with Standards	Moderately Negative	Moderately Positive	Moderately Positive	Moderately Positive
Construction	Moderately Negative	Major or Highly Positive	Moderately Positive	Minor or Slightly Positive
Overall Safety	**Moderately Negative**	**Moderately Positive**	**Moderately Positive**	**Moderately Positive**
ENVIRONMENT				
Biodiversity	Major or Highly Positive	Moderately Negative	Moderately Negative	Moderately Negative
Water	Minor or Slightly Negative	Moderately Negative	Moderately Negative	Moderately Negative
Land and Soils	Minor or Slightly Negative	Moderately Negative	Moderately Negative	Moderately Negative
Landscape & Visual	Not Significant or Neutral	Major or Highly Negative	Moderately Negative	Minor or Slightly Negative
Noise and Vibration	Moderately Negative	Minor or Slightly Negative	Minor or Slightly Negative	Moderately Negative
Air Quality and Climate	Not Significant or Neutral	Minor or Slightly Positive	Minor or Slightly Positive	Not Significant or Neutral
Population and Human Health	Moderately Negative	Moderately Positive	Moderately Positive	Moderately Positive
Cultural Heritage	Not Significant or Neutral	Major or Highly Negative	Moderately Negative	Minor or Slightly Negative
Material Assets - Agriculture	Not Significant or Neutral	Moderately Negative	Moderately Negative	Minor or Slightly Negative
Material Assets - Non-Agriculture	Not Significant or Neutral	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative
Overall Environment	**Not Significant or Neutral**	**Major or Highly Negative**	**Moderately Negative**	**Moderately Negative**
INTEGRATION				
Integration	Not Significant or Neutral	Moderately Positive	Moderately Positive	Minor or Slightly Positive
Overall Integration	**Not Significant or Neutral**	**Moderately Positive**	**Moderately Positive**	**Moderately Positive**
ACCESSIBILITY AND SOCIAL INCLUSION				
Accessibility and Social Inclusion	Not Significant or Neutral	Moderately Positive	Moderately Positive	Moderately Positive
Overall Accessibility and Social Inclusion	**Not Significant or Neutral**	**Moderately Positive**	**Moderately Positive**	**Moderately Positive**
PHYSICAL ACTIVITY				
Physical Activity	Not Significant or Neutral	Moderately Positive	Moderately Positive	Moderately Positive
Overall Physical Activity	**Not Significant or Neutral**	**Moderately Positive**	**Moderately Positive**	**Moderately Positive**

Option	Do-Nothing / Do-Minimum	Route Option A (Cyan)	Route Option B (Green)	Route Option C (Yellow)
Overall				
Economy	Major or Highly Negative	Moderately Positive	Major or Highly Positive	Minor or Slightly Positive
Safety	Moderately Negative	Moderately Positive	Moderately Positive	Moderately Positive
Environment	Not Significant or Neutral	Major or Highly Negative	Moderately Negative	Moderately Negative
Integration	Not Significant or Neutral	Moderately Positive	Moderately Positive	Moderately Positive
Accessibility & Social Inclusion	Not Significant or Neutral	Moderately Positive	Moderately Positive	Moderately Positive
Physical Activity	Not Significant or Neutral	Moderately Positive	Moderately Positive	Moderately Positive
TOTAL	**Minor or Slightly Negative**	**Not Significant or Neutral**	**Minor or Slightly Positive**	**Not Significant or Neutral**

DETAILED

Option	Do-Nothing / Do-Minimum	Route Option A (Cyan)	Route Option B (Green)	Route Option C (Yellow)
Economy				
Efficiency & Effectiveness	Major or Highly Negative	Moderately Positive	Major or Highly Positive	Minor or Slightly Positive
Qualitative Statement	The efficiency of the network will decrease with the introduction of traffic calming.	This option will offer a free flow option for traffic along improved alignment of carriageway.	This scheme offers the advantages of Route A but the reduced length and wider horizontal curves improve the overall outcome	The advantages of this scheme are not as great as A or B due to the amount of online construction.
Wider Economic Impacts	Major or Highly Negative	Moderately Positive	Major or Highly Positive	Minor or Slightly Positive
Qualitative Statement	The do-minimum scheme will not provide any wider economic improvements	This option will move traffic through the area faster	This scheme offers the advantages of Route A but the reduced length and wider horizontal curves improve the overall outcome	This scheme will help elevate congestion at the bridge but will not offer the same free flow scenarios as A or B due to the restrictions through the online sections
Transport Quality & Reliability	Major or Highly Negative	Moderately Positive	Major or Highly Positive	Minor or Slightly Positive
Qualitative Statement	Reliability along this corridor will reduce with the introduction of this scheme.	This scheme will be advantageous for traffic reliability as it has the maximum extents of free flow through the area	This scheme offers the advantages of Route A but the reduced length and wider horizontal curves improve the overall outcome	This scheme will help elevate congestion at the bridge but will not offer the same free flow scenarios as A or B due to the restrictions through the online sections
Funding Impacts	Major or Highly Positive	Major or Highly Negative	Moderately Negative	Minor or Slightly Negative
Qualitative Statement	The costs of this scheme will be minimal	This scheme is one of the most costly due to offline construction and land take	This scheme is one of the most costly due to offline construction and land take. The installation of a skewed bridge increases the overall cost of this scheme.	Although there is less offline construction compared to A or B the skew of the bridge increases the cost of this scheme.

Option	Do-Nothing / Do-Minimum	Route Option A (Cyan)	Route Option B (Green)	Route Option C (Yellow)
Safety				
Accident Benefits	Minor or Slightly Positive	Moderately Positive	Moderately Positive	Major or Highly Positive
Qualitative Statement	The accidents in the area have been mostly minor within the area and the do-nothing/ do-minimum approach should help reduce these accidents in the main area of conflict, the Liss Bridge.	The segregation of regional and local traffic along with a new alignment will help keep all road users safe. The new alignment will have a higher design speed than the existing road which should increase safety in the area.	The segregation of regional and local traffic along with a new alignment will help keep all road users safe. The new alignment will have a higher design speed than the existing road which should increase safety in the area.	The segregation of regional and local traffic along with a new alignment will help keep all road users safe. The new alignment will have a higher design speed than the existing road which should increase safety in the area.
Junctions	Not Significant or Neutral	Moderately Positive	Moderately Positive	Major or Highly Positive
Qualitative Statement	The existing junctions within the area have a reasonable design for the amount of traffic on the road and the turning movements	All new junctions should be designed to an acceptable current standard and provide an acceptable LoS for the road network	All new junctions should be designed to an acceptable current standard and provide an acceptable LoS for the road network	All new junctions should be designed to an acceptable current standard and provide an acceptable LoS for the road network. The redcced number of junctions for this Route Option is why it scores higher than A or B.
Compliance with Standards	Moderately Negative	Moderately Positive	Moderately Positive	Moderately Positive
Qualitative Statement	The existing road alignment does not comply with a number of current standards so will not add any safety applications	The new alignment has been designed to the proposed design speed for horizontal curves and removes the need for departures although relaxations may be required	The new alignment has been designed to the proposed design speed for horizontal curves and removes the need for departures	The new alignment has been designed to the proposed design speed for horizontal curves and removes the need for departures
Construction	Moderately Negative	Major or Highly Positive	Moderately Positive	Minor or Slightly Positive
Qualitative Statement	The works will be for the majority online construction that will introduce risks for workers and road users.	Due to the majority of the works being offline this reduces the chance of conflict between road workers and the public during construction	This offers the same benefits of Route Option A but to a lesser extent as there is more online work required	Only a small section of this route is offline but it still offers a small benefit

Option	Do-Nothing / Do-Minimum	Route Option A (Cyan)	Route Option B (Green)	Route Option C (Yellow)
Environment				
Biodiversity	Major or Highly Positive	Moderately Negative	Moderately Negative	Moderately Negative
Qualitative Statement	Due to the minor works required that are already in the vicinity of the road carriageway the effective impact on ecology is seen as minor.	The significant greenfield land take of greenfield sites and the construction of a new bridge over an SAC result in the poor score. The eastern tie-in will result in the loss of mature hedgerow which contributes to the poor score.	The significant greenfield land take of greenfield sites and the construction of a new bridge over an SAC result in the poor score. The eastern tie-in will result in the loss of mature hedgerow which contributes to the poor score.	The significant greenfield land take of greenfield sites and the construction of a new bridge over an SAC result in the poor score. The eastern tie-in will result in the loss of mature hedgerow which contributes to the poor score.
Water	Minor or Slightly Negative	Moderately Negative	Moderately Negative	Moderately Negative
Qualitative Statement	The existing drainage infrastructure does not have any environmental protection measures in terms of surface water attenuation and hydrocarbon interceptors which would be included in any new works.	This Route option requires one crossing over the Abbert River, a designated SAC. Potential for negative impacts on receiving waters during both the construction and operational phases There is potential for temporary, negative impacts to the amenity value of the River Abbert during the construction phase.	This Route option requires one crossing over the Abbert River, a designated SAC. Potential for negative impacts on receiving waters during both the construction and operational phases There is potential for temporary, negative impacts to the amenity value of the River Abbert during the construction phase.	This Route option requires one crossing over the Abbert River, a designated SAC. Potential for negative impacts on receiving waters during both the construction and operational phases There is potential for temporary, negative impacts to the amenity value of the River Abbert during the construction phase.
Land and Soils	Minor or Slightly Negative	Moderately Negative	Moderately Negative	Moderately Negative
Qualitative Statement	The existing drainage infrastructure does not have any environmental protection measures in hydrocarbon interceptors which would be included in any new works.	The route involves the development of sections of offline road through open greenfield over a 'Regionally Important Aquifer'. The groundwater vulnerability beneath this corridor is predominantly 'Moderate', with some southern sections of the corridor comprising of 'High' and 'Extreme' vulnerability.	The Route involves the development of sections of offline road through open greenfield over a 'Regionally Important Aquifer'. The groundwater vulnerability beneath this corridor is predominantly 'Moderate', with some southern sections of the corridor comprising of 'High' and 'Extreme' vulnerability.	The southern section of this Route closely follows the existing N63 line and will likely have less impact to land and soil attributes in the area. The northern section of this Route will involve the development of sections of offline roads above the Regionally Important aquifer. The groundwater vulnerability beneath this Route consists of a mix of 'Extreme', 'High' and 'Moderate' vulnerability.
Landscape & Visual	Not Significant or Neutral	Major or Highly Negative	Moderately Negative	Minor or Slightly Negative
Qualitative Statement	Impacts are considered neutral as the works are minimal.	It is considered that despite the inclusion of appropriate mitigation measures, this Route has the potential to result in the highest effects on the landscape character as well as the visual amenity of residences and Abbeyknockmoy Cistercian Abbey due to its long offline section and its proximity to the abbey.	It was determined that effects on the landscape character and the visual amenity are less than for Option A due to its location further east from the Abbeyknockmoy Cistercian Abbey. However, residential receptors to the south along the existing N63, with a view of the abbey, will experience higher visual effects as the proposal is located closer to these receptors.	The visual effects upon the residential dwellings and the Abbeyknockmoy Cistercian Abbey are further reduced due to the location of the development away from the abbey and residences. While visual effects on community facilities will be higher than for Options A and B, the overall effects on the landscape character and visual amenity are less than for Options A and B.

Noise and Vibration	Moderately Negative	Minor or Slightly Negative	Minor or Slightly Negative	Moderately Negative
Qualitative Statement	Construction: Noise and vibration impacts are unlikey to result in significant, long-term adverse noise impacts upon the closest senstive recetpors to proposed works. Operation: Noise levels are likely to remain similar to those currently experienced at noise sensitive properties located along the Do-minimum route, with the potential for increases in noise levels from congestion traffic. There is little scope for inclusion of mitigation measures.	With regards to the PIR this options is ranked as the preferred route in terms of noise and vibration impacts. However, this option results in a greater number of sensitive receptors being located within 300m of the roads which will see an increase in road traffic flows of greater than 25%, resulting in this option being the least preferred. However. with the inclusion of appropriate mitigation measures, Options A has a greater potential to result in the least noise impact upon noise sensitive receptors (when compared to Route Option C).	For Option B, this is ranked as the 2nd preferred route for both the PIR assessment and the assessment for the numbers of receptors affected by roads which will see an increase in road traffic flows of 25% or greater. However. with the inclusion of appropriate mitigation measures, Options B has greater potential to result in the least noise impact upon noise sensitive receptors (when compared to Route Option C).	For Option C, this is the least preferred route when assessed using the PIR rankings, but the preferred route with regards to the number of receptors that will affected by roads with an increase in road traffic flows if greater than 25%.
Quantitative Statement	NA	PIR= 364 The number of receptors in the vicinity of roads where traffic flows are likely to increase by 25% or more= 71	PIR = 392 The number of receptors in the vicinity of roads where traffic flows are likely to increase by 25% or more= 53	PIR= 434 The number of receptors in the vicinity of roads where traffic flows are likely to increase by 25% or more= 49
Air Quality and Climate	Not Significant or Neutral	Minor or Slightly Positive	Minor or Slightly Positive	Not Significant or Neutral
Qualitative Statement	Baseline background air quality conditions in this rural area are expected to improve over time, as a result of improvements to the vehicle fleet, such as increased fuel efficiency and replacement of older vehicles. The do-minimum consideration would have no air quality benefits for the area.	The AQIH (Air Quality index health) rate for the area is Good-3. The properties located along the existing N63 between the L3110 and the proposed tie-in of the scheme are likely to experience a beneficial increase in air quality. In addition to this, this Route Options is preferable over the Do-Minimum in terms of climate as a result of the decrease in emissions brought about by the more favourable driving environment created.	The AQIH (Air Quality index health) rate for the area is Good-3. The properties located along the existing N63 between the L3110 and the proposed tie-in of the scheme are likely to experience a beneficial increase in air quality. In addition to this, this Route Options is preferable over the Do-Minimum in terms of climate as a result of the decrease in emissions brought about by the more favourable driving environment created.	The AQIH (Air Quality index health) rate for the area is Good-3. The properties located along the existing N63 between the L3110 and the proposed tie-in of the scheme are likely to experience a beneficial increase in air quality. In addition to this, this Route Options is preferable over the Do-Minimum in terms of climate as a result of the decrease in emissions brought about by the more favourable driving environment created.
Quantitative Statement	The designated sites assessment has shown that NOx levels are well within acceptable limits with the existing route/Do-Minimum scenario. CO2 calculated to be produced with the Do-Minimum option is 188tonnes/yr in 2023 and 261 in 2039.	Based on the Index of Overall Change in Exposure Calculations, there is likely to be an improvement in air quality with Route A for a number of properties. The sensitive ecosystems assessment has shown a minor improvement/no change in air quality with any of the Routes under consideration. Local air quality will improve for the majority of properties on the existing N63 but deteriorate for those few properties which are now introduced to proximal traffic. CO2 calculated to be produced with Route Option A is 190 tonnes/yr in 2023 and 263 tonnes/yr in 2039. The overall PVB should be expressed as a ration of the the PVC. Value for Route Option A is 276.50 for 2023 and 382.74 for 2039.	Based on the Index of Overall Change in Exposure Calculations, there is likely to be an improvement in air quality with Route B for a number of properties. This option scored best in this assessment. The sensitive ecosystems assessment has shown a minor improvement/no change in air quality with any of the Routes under consideration. Local air quality will improve for the majority of properties on the existing N63 but deteriorate for those few properties which are now introduced to proximal traffic. Route B would have the most positive impact in this regard. The overall regional emissions calculated for Route B were the least of the Options including Do-Minimum. CO2 calculated to be produced with Route Option B is 187 tonnes/yr in 2023 and 259 in 2039. The overall PVB should be expressed as a ration of the the PVC. Value for Route Option B is 261.58 for 2023 and 362.29 for 2039 .	Based on the Index of Overall Change in Exposure Calculations, there is likely to be an decrease in air quality with Route C. The designated sites assessment has shown a minor improvement/no change in air quality with any of the Routes under consideration. Local air quality will improve for the majority of properties on the existing N63 but deteriorate for those few properties which are now introduced to proximal traffic. Route C would have least positive impact in this regard. CO2 calculated to be produced with Route Option C is 186 tonnes/yr in 2023 and 258 in 2039. The overall PVB should be expressed as a ration of the the PVC. Value for Route Option C is 309.31 for 2023 and 429.04 for 2039.
Population and Human Health	Moderately Negative	Moderately Positive	Moderately Positive	Moderately Positive
Qualitative Statement	The opportunity to improve congestion issues at Liss Bridge, while improving safety for both motorised and non-motorised users would be lost.	Potential localised and short term negative impacts from construction works to human health and the amenity value of the River Abbert, an identified river angling fishery. Overall, this route will likely result in a positive impact as it will assist in alleviating congestion issues around Liss Bridge at the local level, while improving safety for both motorised and non-motorised users The additional bridge crossing over the River Abbert has the potential to improve connectivity to the community facilities for all in the local in the area.	Potential localised and short term negative impacts from construction works to human health and the amenity value of the River Abbert, an identified river angling fishery. Overall, this route will likely result in a positive impact as it will assist in alleviating congestion issues around Liss Bridge at the local level, while improving safety for both motorised and non-motorised users The additional bridge crossing over the River Abbert has the potential to improve connectivity to the community facilities for all in the local in the area.	Potential localised and short term negative impacts from construction works to human health and the amenity value of the River Abbert, an identified river angling fishery. Overall, this route will likely result in a positive impact as it will assist in alleviating congestion issues around Liss Bridge at the local level, while improving safety for both motorised and non-motorised users The additional bridge crossing over the River Abbert has the potential to improve connectivity to the community facilities for all in the local in the area.
Cultural Heritage	Not Significant or Neutral	Major or Highly Negative	Moderately Negative	Minor or Slightly Negative
Qualitative Statement	No work outside footprint of the current N63.	Abbeyknockmoy Cistercian Abbey (NM No. 166 & GA058-004001) and an associated medieval field system (NM No. 166; PO No. 4/1989; GA058-004004), both National Monument, are located 100m NW of route corridor. Field system associated with monastic site is also a National Monument. Inspection of aerial photos suggests that this field system may extend across the route corridor.	The route corridor passes in close proximity to the Cistercian Abbey (NM No. 166 & GA058-004001) and an associated medieval field system (NM No. 166; PO No. 4/1989; GA058-004004), which are both protected National Monuments. Rose Villa (NIAH No. 30405814) is situated 174m S of route corridor. Liss Bridge (NIAH No. 30405811) is located 209m S of route corridor. No other known cultural heritage receptors situated within 250m of route corridor.	Rose Villa (NIAH No. 30405814) is situated immediately S of route corridor. Handball alley (NIAH No. 30405810) is situated 104m ESE of route corridor. St. Bernard's Church (NIAH No. 30405815) is located 197m SE of route corridor. Liss Bridge (NIAH No. 30405810) is situated 90m S of route corridor. No other known cultural heritage receptors located within 250m of route corridor.
Material Assets - Agriculture	Not Significant or Neutral	Moderately Negative	Moderately Negative	Minor or Slightly Negative
Qualitative Statement	Impacts are considered neutral as the works are minimal.	This Route options will result in agricultural land take and severance of land parcels. The Cyan Route Option the highest potential land take. It will sever most agricultural land parcels.	This Route options will result in agricultural land take and severance of land parcels. The Green Route has considerably higher land takes than the other corridors, but less than the Cyan Route. It will sever most agricultural land parcels. The Green Route crosses wet land for longer than the Cyan Route.	This Route options will result in agricultural land take and severance of land parcels.
Material Assets - Non-Agriculture	Not Significant or Neutral	Minor or Slightly Negative	Minor or Slightly Negative	Minor or Slightly Negative
Qualitative Statement	Impacts are considered neutral as the works are minimal.	Potentially service suspension during construction and possible diversion works. Potential negative vibration impacts to properties surrounding the routes; however, these impacts will be temporary and therefore are not likely to cause significant impacts.	Potentially service suspension during construction and possible diversion works. Potential negative vibration impacts to properties surrounding the routes; however, these impacts will be temporary and therefore are not likely to cause significant impacts.	Potentially service suspension during construction and possible diversion works. Potential negative vibration impacts to properties surrounding the routes; however, these impacts will be temporary and therefore are not likely to cause significant impacts.

Option	Do-Nothing / Do-Minimum	Route Option A (Cyan)	Route Option B (Green)	Route Option C (Yellow)
Integration	Not Significant or Neutral	Moderately Positive	Moderately Positive	Minor or Slightly Positive
Qualitative Statement	The traffic calming works will have a minimal impact on integration and will not affect Integration in the long term.	The improvement to the regional road network along with the proposed NMU route gives a positive result for integration. The route helps integration in terms of government policies in promoting a better transport network	The improvement to the regional road network along with the proposed NMU route gives a positive result for integration. The route helps integration in terms of government policies in promoting a better transport network	Due to the more online nature of this route compared to Routes A & B the benefits are not as high.

Option	Do-Nothing / Do-Minimum	Route Option A (Cyan)	Route Option B (Green)	Route Option C (Yellow)
Accessibility and Social Inclusion	Not Significant or Neutral	Moderately Positive	Moderately Positive	Moderately Positive
Qualitative Statement	The traffic calming works will have a minimal impact on integration and will not affect Accessibility & social inclusion in the long term.	The route will offer a dedicated NMU route to connect the two hubs of Abbeyknockmoy and will also offer segregated routes for regional and local traffic. The addition of the new allignment will help connect areas along the route and promote travel	The route will offer a dedicated NMU route to connect the two hubs of Abbeyknockmoy and will also offer segregated routes for regional and local traffic. The addition of the new allignment will help connect areas along the route and promote travel	The route will offer a dedicated NMU route to connect the two hubs of Abbeyknockmoy and will also offer segregated routes for regional and local traffic. The addition of the new allignment will help connect areas along the route and promote travel

Option	Do-Nothing / Do-Minimum	Route Option A (Cyan)	Route Option B (Green)	Route Option C (Yellow)
Physical Activity	Not Significant or Neutral	Moderately Positive	Moderately Positive	Moderately Positive
Qualitative Statement	The traffic calming works will have a minimal impact on integration and will not affect physical activityl inclusion in the long term.	The route will offer a dedicated NMU route to connect the two hubs of Abbeyknockmoy and will also offer segregated routes for regional and local traffic	The route will offer a dedicated NMU route to connect the two hubs of Abbeyknockmoy and will also offer segregated routes for regional and local traffic	The route will offer a dedicated NMU route to connect the two hubs of Abbeyknockmoy and will also offer segregated routes for regional and local traffic

Option	Do-Nothing / Do-Minimum	Route Option A (Cyan)	Route Option B (Green)	Route Option C (Yellow)
Overall				
Economy	Major or Highly Negative	Moderately Positive	Major or Highly Positive	Minor or Slightly Positive
Safety	Moderately Negative	Moderately Positive	Moderately Positive	Moderately Positive
Environment	Not Significant or Neutral	Major or Highly Negative	Moderately Negative	Moderately Negative
Integration	Not Significant or Neutral	Moderately Positive	Moderately Positive	Moderately Positive
Accessibility & Social Inclusion	Not Significant or Neutral	Moderately Positive	Moderately Positive	Moderately Positive
Physical Activity	Not Significant or Neutral	Moderately Positive	Moderately Positive	Moderately Positive
Totals	**Minor or Slightly Negative**	**Not Significant or Neutral**	**Minor or Slightly Positive**	**Not Significant or Neutral**

Appendix F – TII Simple Appraisal Tool Results

Simple Appraisal Tool - PAG Unit 12

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part A - Overview

Date	
Version No.	

Project Title	
Project Description	
PRS Reference Number	
Project Phase	
National Roads Design Office	
TII Project Manager	
Appraisal Team Author	
Design Team Reviewer	
TII Engineering Inspector	
External Auditor	

Part B: Scheme

Version 2 (October 2019)

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Part B - Scheme Information

County or Metropolitan Area	Galway
Existing Route Length (km)	2.28
New Route Length (km)	2.095
Scheme Opening Year	2023
Existing Route Standard	2 Lane Single Carriageway
New Route Standard	2 Lane Single Carriageway
Appraisal Period (years)	30
Residual Period (years)	30

Base Year Observed Data

Observed AADT (vehicles)	3065
HGV%	6.2%
Year of Observed AADT	2019

Part C: Scheme Costs

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Part C - Scheme Costs

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FILL IN ALL CELLS SHADED IN THIS COLOUR IN SCHEME COSTS SHEET.

Base Costs €m (Incl. VAT and Project-specific contingency)		
Main Contract Construction	€	10.60
Main Contract Supervision	€	0.26
Archaeology	€	0.66
Advance Works and other contracts	€	0.37
Residual Network	€	0.24
Land & Property	€	0.21
Planning and Design	€	0.93
Subtotal	€	13.28
Total Inflation Allowance	€	-
TII Programme Risk	€	-
Option Comparison Cost Estimate	€	13.28

Base Cost Expenditure Heading	**Assumed**	**Applicable**	**Government**
Main Contract Construction	30.0%	13.5%	100%
Main Contract Supervision	50.0%	23.0%	100%
Archaeology	50.0%	18.3%	100%
Advance Works and other contracts	30.0%	13.5%	100%
Residual Network	30.0%	13.5%	100%
Land & Property	10.0%	0.0%	100%
Planning and Design	60.0%	23.0%	100%

CPI / RPF / Shadow price Data

CPI Index at month of cost estimate	103.8
CPI Index for base year	99.4
Shadow Price of Government Funds	1.3
Shadow Price of Labour	1.0
RPF Factor	1

Consumer Price Index (CPI) available from http://www.cso.ie

ALLOCATION OF COSTS TO EACH YEAR

Allocate the percentage of each expenditure heading according to year of occurrance. Note: the percentages in each expenditure heading must sum to 100%.

Year	**Expenditure Headings (%)**						
	Main Contract Construction	Main Contract Supervision	Archaeology (all phases)	Advance works	Residual Network	Land & Property	Planning and Design
2011 (and before)							
2012							
2013							
2014							
2015							
2016							
2017							
2018							
2019							25%
2020			60%	40%			30%
2021		5%	40%	60%			45%
2022	63%	45%				50%	
2023	37%	45%			20%	40%	
2024		5%			80%	10%	
2025							
2026							
2027							
2028							
2029							
2030							
2031							
2032							
2033							
2034							
2035							
2036							
2037							
	100%	100%	100%	100%	100%	100%	100%

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Part D - Target Performance

Existing Average Speed, no decimal points (integer only)	*62*
Forecast Average Speed, no decimal points (integer only)	*80*

Part E: Projected Benefits

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Part E - Projected Benefits (TII Central Traffic Growth)

Appraisal Period (Years)	30
Journey Time Impacts (€ Million)	€ 8.45
Vehicle Operating Costs Impacts (€ Million)	€ 0.81
Residual Impacts (€ Million)	€ 6.85
Present Value Benefits, PVB (€ Million)	€ 16.11
Present Value Costs, PVC (€ Million)	€ 11.07
Net Present Value (NPV)	€ 5.04
Benefit to Cost Ratio (BCR)	1.45
BCR (excluding Residual Impacts - if applicable)	0.84
Design Year AADT	4,503
HGV%	8.0%

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Part E - Low Sensitivity Growth

Appraisal Period (Years)	30
Journey Time Impacts (€ Million)	€ 8.19
Vehicle Operating Costs Impacts (€ Million)	€ 0.78
Residual Impacts (€ Million)	€ 6.48
Present Value Benefits, PVB (€ Million)	€ 15.45
Present Value Costs, PVC (€ Million)	€ 11.07
Net Present Value (NPV)	€ 4.38
Benefit to Cost Ratio (BCR)	1.40
BCR (excluding Residual Impacts - if applicable)	0.81
Design Year AADT	4,351
HGV%	8.0%

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Part E - High Sensitivity Growth

Appraisal Period (Years)	30
Journey Time Impacts (€ Million)	€ 9.11
Vehicle Operating Costs Impacts (€ Million)	€ 0.86
Residual Impacts (€ Million)	€ 7.97
Present Value Benefits, PVB (€ Million)	€ 17.95
Present Value Costs, PVC (€ Million)	€ 11.07
Net Present Value (NPV)	€ 6.88
Benefit to Cost Ratio (BCR)	1.62
BCR (excluding Residual Impacts - if applicable)	0.90
Design Year AADT	4,821
HGV%	8.0%

Version 2 (October 2019)

Simple Appraisal Tool - PAG Unit 12

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part A - Overview

Date	
Version No.	

Project Title	
Project Description	
PRS Reference Number	
Project Phase	
National Roads Design Office	
TII Project Manager	
Appraisal Team Author	
Design Team Reviewer	
TII Engineering Inspector	
External Auditor	

Part B: Scheme

Version 2 (October 2019)

Simple Appraisal Tool - PAG Unit 12

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part B - Scheme Information

County or Metropolitan Area	Galway
Existing Route Length (km)	2.28
New Route Length (km)	2.083
Scheme Opening Year	2023
Existing Route Standard	2 Lane Single Carriageway
New Route Standard	2 Lane Single Carriageway
Appraisal Period (years)	30
Residual Period (years)	30

Base Year Observed Data

Observed AADT (vehicles)	3065
HGV%	6.2%
Year of Observed AADT	2019

Part C: Scheme Costs

Version 2 (October 2019)

Simple Appraisal Tool - PAG Unit 12

Part C - Scheme Costs

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

FILL IN ALL CELLS SHADED IN THIS COLOUR IN SCHEME COSTS SHEET.

Base Costs €m (Incl. VAT and Project-specific contingency)		
Main Contract Construction	€	11.23
Main Contract Supervision	€	0.28
Archaeology	€	0.70
Advance Works and other contracts	€	0.39
Residual Network	€	0.26
Land & Property	€	0.21
Planning and Design	€	0.98
Subtotal	€	14.05
Total Inflation Allowance	€	-
TII Programme Risk	€	-
Option Comparison Cost Estimate	€	14.05

Base Cost Expenditure Heading	**Assumed**	**Applicable VAT**	**Government**
Main Contract Construction	30.0%	13.5%	100%
Main Contract Supervision	50.0%	23.0%	100%
Archaeology	50.0%	18.3%	100%
Advance Works and other contracts	30.0%	13.5%	100%
Residual Network	30.0%	13.5%	100%
Land & Property	10.0%	0.0%	100%
Planning and Design	60.0%	23.0%	100%

CPI / RPF / Shadow price Data

CPI Index at month of cost estimate	103.8
CPI Index for base year	99.4
Shadow Price of Government Funds	1.3
Shadow Price of Labour	1.0
RPF Factor	1

Consumer Price Index (CPI) available from http://www.cso.ie

ALLOCATION OF COSTS TO EACH YEAR

Allocate the percentage of each expenditure heading according to year of occurrance. Note: the percentages in each expenditure heading must sum to 100%.

Year	**Expenditure Headings (%)**						
	Main Contract Construction	Main Contract Supervision	Archaeology (all phases)	Advance works	Residual Network	Land & Property	Planning and Design
2011 (and before)							
2012							
2013							
2014							
2015							
2016							
2017							
2018							
2019							25%
2020			60%	40%			30%
2021		5%	40%	60%			45%
2022	63%	45%				50%	
2023	37%	45%			20%	40%	
2024		5%			80%	10%	
2025							
2026							
2027							
2028							
2029							
2030							
2031							
2032							
2033							
2034							
2035							
2036							
2037							
	100%	100%	100%	100%	100%	100%	100%

Simple Appraisal Tool - PAG Unit 12

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part D - Target Performance

Existing Average Speed, no decimal points (integer only)	*62*
Forecast Average Speed, no decimal points (integer only)	*80*

Part E: Projected Benefits

Version 2 (October 2019)

Simple Appraisal Tool - PAG Unit 12

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part E - Projected Benefits (TII Central Traffic Growth)

Appraisal Period (Years)	30
Journey Time Impacts (€ Million)	€ 8.57
Vehicle Operating Costs Impacts (€ Million)	€ 0.85
Residual Impacts (€ Million)	€ 6.96
Present Value Benefits, PVB (€ Million)	€ 16.38
Present Value Costs, PVC (€ Million)	€ 11.71
Net Present Value (NPV)	€ 4.67
Benefit to Cost Ratio (BCR)	1.40
BCR (excluding Residual Impacts - if applicable)	0.80
Design Year AADT	4,503
HGV%	8.0%

Version 2 (October 2019)

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Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part E - Low Sensitivity Growth

Appraisal Period (Years)	30
Journey Time Impacts (€ Million)	€ 8.30
Vehicle Operating Costs Impacts (€ Million)	€ 0.83
Residual Impacts (€ Million)	€ 6.58
Present Value Benefits, PVB (€ Million)	€ 15.71
Present Value Costs, PVC (€ Million)	€ 11.71
Net Present Value (NPV)	€ 4.00
Benefit to Cost Ratio (BCR)	1.34
BCR (excluding Residual Impacts - if applicable)	0.78
Design Year AADT	4,351
HGV%	8.0%

Version 2 (October 2019)

Simple Appraisal Tool - PAG Unit 12

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part E - High Sensitivity Growth

Appraisal Period (Years)	30
Journey Time Impacts (€ Million)	€ 9.24
Vehicle Operating Costs Impacts (€ Million)	€ 0.91
Residual Impacts (€ Million)	€ 8.10
Present Value Benefits, PVB (€ Million)	€ 18.25
Present Value Costs, PVC (€ Million)	€ 11.71
Net Present Value (NPV)	€ 6.54
Benefit to Cost Ratio (BCR)	1.56
BCR (excluding Residual Impacts - if applicable)	0.87
Design Year AADT	4,821
HGV%	8.0%

Version 2 (October 2019)

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Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part A - Overview

Date	
Version No.	

Project Title	
Project Description	
PRS Reference Number	
Project Phase	
National Roads Design Office	
TII Project Manager	
Appraisal Team Author	
Design Team Reviewer	
TII Engineering Inspector	
External Auditor	

Part B: Scheme

Version 2 (October 2019)

Simple Appraisal Tool - PAG Unit 12

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part B - Scheme Information

County or Metropolitan Area	Galway
Existing Route Length (km)	2.28
New Route Length (km)	2.02
Scheme Opening Year	2023
Existing Route Standard	2 Lane Single Carriageway
New Route Standard	2 Lane Single Carriageway
Appraisal Period (years)	30
Residual Period (years)	30

Base Year Observed Data

Observed AADT (vehicles)	3065
HGV%	6.2%
Year of Observed AADT	2019

Part C: Scheme Costs

Version 2 (October 2019)

Simple Appraisal Tool - PAG Unit 12

Part C - Scheme Costs

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

FILL IN ALL CELLS SHADED IN THIS COLOUR IN SCHEME COSTS SHEET.

Base Costs €m (Incl. VAT and Project-specific contingency)		
Main Contract Construction	€	10.26
Main Contract Supervision	€	0.26
Archaeology	€	0.64
Advance Works and other contracts	€	0.35
Residual Network	€	0.24
Land & Property	€	0.20
Planning and Design	€	0.90
Subtotal	€	12.84
Total Inflation Allowance	€	-
TII Programme Risk	€	-
Option Comparison Cost Estimate	€	12.84

Base Cost Expenditure Heading	**Assumed**	**Applicable**	**Government**
Main Contract Construction	30.0%	13.5%	100%
Main Contract Supervision	50.0%	23.0%	100%
Archaeology	50.0%	18.3%	100%
Advance Works and other contracts	30.0%	13.5%	100%
Residual Network	30.0%	13.5%	100%
Land & Property	10.0%	0.0%	100%
Planning and Design	60.0%	23.0%	100%

CPI / RPF / Shadow price Data

CPI Index at month of cost estimate	103.8
CPI Index for base year	99.4
Shadow Price of Government Funds	1.3
Shadow Price of Labour	1.0
RPF Factor	1

Consumer Price Index (CPI) available from http://www.cso.ie

ALLOCATION OF COSTS TO EACH YEAR

Allocate the percentage of each expenditure heading according to year of occurrance. Note: the percentages in each expenditure heading must sum to 100%.

Year	**Expenditure Headings (%)**						
	Main Contract Construction	Main Contract Supervision	Archaeology (all phases)	Advance works	Residual Network	Land & Property	Planning and Design
2011 (and before)							
2012							
2013							
2014							
2015							
2016							
2017							
2018							
2019							25%
2020			60%	40%			30%
2021		5%	40%	60%			45%
2022	63%	45%				50%	
2023	37%	45%			20%	40%	
2024		5%			80%	10%	
2025							
2026							
2027							
2028							
2029							
2030							
2031							
2032							
2033							
2034							
2035							
2036							
2037							
	100%	100%	100%	100%	100%	100%	100%

Simple Appraisal Tool - PAG Unit 12

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part D - Target Performance

Existing Average Speed, no decimal points (integer only)	*62*
Forecast Average Speed, no decimal points (integer only)	*80*

Part E: Projected Benefits

Version 2 (October 2019)

Simple Appraisal Tool - PAG Unit 12

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part E - Projected Benefits (TII Central Traffic Growth)

Appraisal Period (Years)	30
Journey Time Impacts (€ Million)	€ 9.20
Vehicle Operating Costs Impacts (€ Million)	€ 1.08
Residual Impacts (€ Million)	€ 7.53
Present Value Benefits, PVB (€ Million)	€ 17.81
Present Value Costs, PVC (€ Million)	€ 10.71
Net Present Value (NPV)	€ 7.10
Benefit to Cost Ratio (BCR)	1.66
BCR (excluding Residual Impacts - if applicable)	0.96
Design Year AADT	4,503
HGV%	8.0%

Version 2 (October 2019)

Simple Appraisal Tool - PAG Unit 12

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part E - Low Sensitivity Growth

Appraisal Period (Years)	30
Journey Time Impacts (€ Million)	€ 8.91
Vehicle Operating Costs Impacts (€ Million)	€ 1.05
Residual Impacts (€ Million)	€ 7.12
Present Value Benefits, PVB (€ Million)	€ 17.08
Present Value Costs, PVC (€ Million)	€ 10.71
Net Present Value (NPV)	€ 6.37
Benefit to Cost Ratio (BCR)	1.60
BCR (excluding Residual Impacts - if applicable)	0.93
Design Year AADT	4,351
HGV%	8.0%

Version 2 (October 2019)

Simple Appraisal Tool - PAG Unit 12

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part E - High Sensitivity Growth

Appraisal Period (Years)	30
Journey Time Impacts (€ Million)	€ 9.92
Vehicle Operating Costs Impacts (€ Million)	€ 1.15
Residual Impacts (€ Million)	€ 8.77
Present Value Benefits, PVB (€ Million)	€ 19.84
Present Value Costs, PVC (€ Million)	€ 10.71
Net Present Value (NPV)	€ 9.14
Benefit to Cost Ratio (BCR)	1.85
BCR (excluding Residual Impacts - if applicable)	1.03
Design Year AADT	4,821
HGV%	8.0%

Version 2 (October 2019)

Simple Appraisal Tool - PAG Unit 12

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part A - Overview

Date	
Version No.	

Project Title	
Project Description	
PRS Reference Number	
Project Phase	
National Roads Design Office	
TII Project Manager	
Appraisal Team Author	
Design Team Reviewer	
TII Engineering Inspector	
External Auditor	

Part B: Scheme

Version 2 (October 2019)

Simple Appraisal Tool - PAG Unit 12

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part B - Scheme Information

County or Metropolitan Area	Galway
Existing Route Length (km)	2.28
New Route Length (km)	2.075
Scheme Opening Year	2023
Existing Route Standard	2 Lane Single Carriageway
New Route Standard	2 Lane Single Carriageway
Appraisal Period (years)	30
Residual Period (years)	30

Base Year Observed Data

Observed AADT (vehicles)	3065
HGV%	6.2%
Year of Observed AADT	2019

Part C: Scheme Costs

Version 2 (October 2019)

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Part C - Scheme Costs

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

FILL IN ALL CELLS SHADED IN THIS COLOUR IN SCHEME COSTS SHEET.

Base Costs €m (Incl. VAT and Project-specific contingency)		
Main Contract Construction	€	11.60
Main Contract Supervision	€	0.29
Archaeology	€	0.73
Advance Works and other contracts	€	0.40
Residual Network	€	0.27
Land & Property	€	0.20
Planning and Design	€	1.01
Subtotal	€	14.50
Total Inflation Allowance	€	-
TII Programme Risk	€	-
Option Comparison Cost Estimate	€	14.50

Base Cost Expenditure Heading	**Assumed**	**Applicable**	**Government**
Main Contract Construction	30.0%	13.5%	100%
Main Contract Supervision	50.0%	23.0%	100%
Archaeology	50.0%	18.3%	100%
Advance Works and other contracts	30.0%	13.5%	100%
Residual Network	30.0%	13.5%	100%
Land & Property	10.0%	0.0%	100%
Planning and Design	60.0%	23.0%	100%

CPI / RPF / Shadow price Data

CPI Index at month of cost estimate	103.8
CPI Index for base year	99.4
Shadow Price of Government Funds	1.3
Shadow Price of Labour	1.0
RPF Factor	1

Consumer Price Index (CPI) available from http://www.cso.ie

ALLOCATION OF COSTS TO EACH YEAR

Allocate the percentage of each expenditure heading according to year of occurrance. Note: the percentages in each expenditure heading must sum to 100%.

Year	**Expenditure Headings (%)**						
	Main Contract Construction	Main Contract Supervision	Archaeology (all phases)	Advance works	Residual Network	Land & Property	Planning and Design
2011 (and before)							
2012							
2013							
2014							
2015							
2016							
2017							
2018							
2019							25%
2020			60%	40%			30%
2021		5%	40%	60%			45%
2022	63%	45%				50%	
2023	37%	45%			20%	40%	
2024		5%			80%	10%	
2025							
2026							
2027							
2028							
2029							
2030							
2031							
2032							
2033							
2034							
2035							
2036							
2037							
	100%	100%	100%	100%	100%	100%	100%

Simple Appraisal Tool - PAG Unit 12

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part D - Target Performance

Existing Average Speed, no decimal points (integer only)	*62*
Forecast Average Speed, no decimal points (integer only)	*80*

Part E: Projected Benefits

Version 2 (October 2019)

Simple Appraisal Tool - PAG Unit 12

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part E - Projected Benefits (TII Central Traffic Growth)

Appraisal Period (Years)	30
Journey Time Impacts (€ Million)	€ 8.65
Vehicle Operating Costs Impacts (€ Million)	€ 0.88
Residual Impacts (€ Million)	€ 7.03
Present Value Benefits, PVB (€ Million)	€ 16.56
Present Value Costs, PVC (€ Million)	€ 12.09
Net Present Value (NPV)	€ 4.48
Benefit to Cost Ratio (BCR)	1.37
BCR (excluding Residual Impacts - if applicable)	0.79
Design Year AADT	4,503
HGV%	8.0%

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Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part E - Low Sensitivity Growth

Appraisal Period (Years)	30
Journey Time Impacts (€ Million)	€ 8.38
Vehicle Operating Costs Impacts (€ Million)	€ 0.85
Residual Impacts (€ Million)	€ 6.65
Present Value Benefits, PVB (€ Million)	€ 15.88
Present Value Costs, PVC (€ Million)	€ 12.09
Net Present Value (NPV)	€ 3.80
Benefit to Cost Ratio (BCR)	1.31
BCR (excluding Residual Impacts - if applicable)	0.76
Design Year AADT	4,351
HGV%	8.0%

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Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part E - High Sensitivity Growth

Appraisal Period (Years)	30
Journey Time Impacts (€ Million)	€ 9.33
Vehicle Operating Costs Impacts (€ Million)	€ 0.94
Residual Impacts (€ Million)	€ 8.19
Present Value Benefits, PVB (€ Million)	€ 18.46
Present Value Costs, PVC (€ Million)	€ 12.09
Net Present Value (NPV)	€ 6.37
Benefit to Cost Ratio (BCR)	1.53
BCR (excluding Residual Impacts - if applicable)	0.85
Design Year AADT	4,821
HGV%	8.0%

Version 2 (October 2019)

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Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part A - Overview

Date	
Version No.	

Project Title	
Project Description	
PRS Reference Number	
Project Phase	
National Roads Design Office	
TII Project Manager	
Appraisal Team Author	
Design Team Reviewer	
TII Engineering Inspector	
External Auditor	

Part B: Scheme

Version 2 (October 2019)

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Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part B - Scheme Information

County or Metropolitan Area	Galway
Existing Route Length (km)	2.28
New Route Length (km)	2.058
Scheme Opening Year	2023
Existing Route Standard	2 Lane Single Carriageway
New Route Standard	2 Lane Single Carriageway
Appraisal Period (years)	30
Residual Period (years)	30

Base Year Observed Data

Observed AADT (vehicles)	3484
HGV%	6.5%
Year of Observed AADT	2019

Part C: Scheme Costs

Version 2 (October 2019)

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Part C - Scheme Costs

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

FILL IN ALL CELLS SHADED IN THIS COLOUR IN SCHEME COSTS SHEET.

Base Costs €m (Incl. VAT and Project-specific contingency)		
Main Contract Construction	€	9.73
Main Contract Supervision	€	0.24
Archaeology	€	0.61
Advance Works and other contracts	€	0.34
Residual Network	€	0.22
Land & Property	€	0.19
Planning and Design	€	0.85
Subtotal	€	12.18
Total Inflation Allowance	€	-
TII Programme Risk	€	-
Option Comparison Cost Estimate	€	12.18

Base Cost Expenditure Heading	**Assumed**	**Applicable**	**Government**
Main Contract Construction	30.0%	13.5%	100%
Main Contract Supervision	50.0%	23.0%	100%
Archaeology	50.0%	18.3%	100%
Advance Works and other contracts	30.0%	13.5%	100%
Residual Network	30.0%	13.5%	100%
Land & Property	10.0%	0.0%	100%
Planning and Design	60.0%	23.0%	100%

CPI / RPF / Shadow price Data

CPI Index at month of cost estimate	103.8
CPI Index for base year	99.4
Shadow Price of Government Funds	1.3
Shadow Price of Labour	1.0
RPF Factor	1

Consumer Price Index (CPI) available from http://www.cso.ie

ALLOCATION OF COSTS TO EACH YEAR

Allocate the percentage of each expenditure heading according to year of occurrance. Note: the percentages in each expenditure heading must sum to 100%.

Year	**Expenditure Headings (%)**						
	Main Contract Construction	Main Contract Supervision	Archaeology (all phases)	Advance works	Residual Network	Land & Property	Planning and Design
2011 (and before)							
2012							
2013							
2014							
2015							
2016							
2017							
2018							
2019							25%
2020			60%	40%			30%
2021		5%	40%	60%			45%
2022	63%	45%				50%	
2023	37%	45%			20%	40%	
2024		5%			80%	10%	
2025							
2026							
2027							
2028							
2029							
2030							
2031							
2032							
2033							
2034							
2035							
2036							
2037							
	100%	100%	100%	100%	100%	100%	100%

Simple Appraisal Tool - PAG Unit 12

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part D - Target Performance

Existing Average Speed, no decimal points (integer only)	*62*
Forecast Average Speed, no decimal points (integer only)	*80*

Part E: Projected Benefits

Version 2 (October 2019)

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Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part E - Projected Benefits (TII Central Traffic Growth)

Appraisal Period (Years)	30
Journey Time Impacts (€ Million)	€ 10.04
Vehicle Operating Costs Impacts (€ Million)	€ 1.07
Residual Impacts (€ Million)	€ 8.18
Present Value Benefits, PVB (€ Million)	€ 19.28
Present Value Costs, PVC (€ Million)	€ 10.16
Net Present Value (NPV)	€ 9.13
Benefit to Cost Ratio (BCR)	1.90
BCR (excluding Residual Impacts - if applicable)	1.09
Design Year AADT	5,123
HGV%	8.4%

Version 2 (October 2019)

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Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part E - Low Sensitivity Growth

Appraisal Period (Years)	30
Journey Time Impacts (€ Million)	€ 9.72
Vehicle Operating Costs Impacts (€ Million)	€ 1.04
Residual Impacts (€ Million)	€ 7.73
Present Value Benefits, PVB (€ Million)	€ 18.49
Present Value Costs, PVC (€ Million)	€ 10.16
Net Present Value (NPV)	€ 8.34
Benefit to Cost Ratio (BCR)	1.82
BCR (excluding Residual Impacts - if applicable)	1.06
Design Year AADT	4,949
HGV%	8.4%

Version 2 (October 2019)

Simple Appraisal Tool - PAG Unit 12

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part E - High Sensitivity Growth

Appraisal Period (Years)	30
Journey Time Impacts (€ Million)	€ 10.82
Vehicle Operating Costs Impacts (€ Million)	€ 1.14
Residual Impacts (€ Million)	€ 9.52
Present Value Benefits, PVB (€ Million)	€ 21.49
Present Value Costs, PVC (€ Million)	€ 10.16
Net Present Value (NPV)	€ 11.33
Benefit to Cost Ratio (BCR)	2.12
BCR (excluding Residual Impacts - if applicable)	1.18
Design Year AADT	5,484
HGV%	8.3%

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Simple Appraisal Tool - PAG Unit 12

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part A - Overview

Date	
Version No.	

Project Title	
Project Description	
PRS Reference Number	
Project Phase	
National Roads Design Office	
TII Project Manager	
Appraisal Team Author	
Design Team Reviewer	
TII Engineering Inspector	
External Auditor	

Part B: Scheme

Version 2 (October 2019)

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Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part B - Scheme Information

County or Metropolitan Area	Galway
Existing Route Length (km)	2.28
New Route Length (km)	2.2
Scheme Opening Year	2023
Existing Route Standard	2 Lane Single Carriageway
New Route Standard	2 Lane Single Carriageway
Appraisal Period (years)	30
Residual Period (years)	30

Base Year Observed Data

Observed AADT (vehicles)	3499
HGV%	6.5%
Year of Observed AADT	2019

Part C: Scheme Costs

Version 2 (October 2019)

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Part C - Scheme Costs

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

FILL IN ALL CELLS SHADED IN THIS COLOUR IN SCHEME COSTS SHEET.

Base Costs €m (Incl. VAT and Project-specific contingency)		
Main Contract Construction	€	14.20
Main Contract Supervision	€	0.35
Archaeology	€	0.89
Advance Works and other contracts	€	0.49
Residual Network	€	0.33
Land & Property	€	0.23
Planning and Design	€	1.24
Subtotal	€	17.73
Total Inflation Allowance	€	-
TII Programme Risk	€	-
Option Comparison Cost Estimate	€	17.73

Base Cost Expenditure Heading	**Assumed**	**Applicable**	**Government**
Main Contract Construction	30.0%	13.5%	100%
Main Contract Supervision	50.0%	23.0%	100%
Archaeology	50.0%	18.3%	100%
Advance Works and other contracts	30.0%	13.5%	100%
Residual Network	30.0%	13.5%	100%
Land & Property	10.0%	0.0%	100%
Planning and Design	60.0%	23.0%	100%

CPI / RPF / Shadow price Data

CPI Index at month of cost estimate	103.8
CPI Index for base year	99.4
Shadow Price of Government Funds	1.3
Shadow Price of Labour	1.0
RPF Factor	1

Consumer Price Index (CPI) available from http://www.cso.ie

ALLOCATION OF COSTS TO EACH YEAR

Allocate the percentage of each expenditure heading according to year of occurrance. Note: the percentages in each expenditure heading must sum to 100%.

Year	**Expenditure Headings (%)**						
	Main Contract Construction	Main Contract Supervision	Archaeology (all phases)	Advance works	Residual Network	Land & Property	Planning and Design
2011 (and before)							
2012							
2013							
2014							
2015							
2016							
2017							
2018							
2019							25%
2020			60%	40%			30%
2021		5%	40%	60%			45%
2022	63%	45%				50%	
2023	37%	45%			20%	40%	
2024		5%			80%	10%	
2025							
2026							
2027							
2028							
2029							
2030							
2031							
2032							
2033							
2034							
2035							
2036							
2037							
	100%	100%	100%	100%	100%	100%	100%

Simple Appraisal Tool - PAG Unit 12

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part D - Target Performance

Existing Average Speed, no decimal points (integer only)	*62*
Forecast Average Speed, no decimal points (integer only)	*80*

Part E: Projected Benefits

Version 2 (October 2019)

Simple Appraisal Tool - PAG Unit 12

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part E - Projected Benefits (TII Central Traffic Growth)

Appraisal Period (Years)	30
Journey Time Impacts (€ Million)	€ 8.46
Vehicle Operating Costs Impacts (€ Million)	€ 0.49
Residual Impacts (€ Million)	€ 6.73
Present Value Benefits, PVB (€ Million)	€ 15.68
Present Value Costs, PVC (€ Million)	€ 14.78
Net Present Value (NPV)	€ 0.91
Benefit to Cost Ratio (BCR)	1.06
BCR (excluding Residual Impacts - if applicable)	0.61
Design Year AADT	5,145
HGV%	8.4%

Version 2 (October 2019)

Simple Appraisal Tool - PAG Unit 12

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Part E - Low Sensitivity Growth

Appraisal Period (Years)	30
Journey Time Impacts (€ Million)	€ 8.19
Vehicle Operating Costs Impacts (€ Million)	€ 0.48
Residual Impacts (€ Million)	€ 6.37
Present Value Benefits, PVB (€ Million)	€ 15.04
Present Value Costs, PVC (€ Million)	€ 14.78
Net Present Value (NPV)	€ 0.26
Benefit to Cost Ratio (BCR)	1.02
BCR (excluding Residual Impacts - if applicable)	0.59
Design Year AADT	4,971
HGV%	8.4%

Version 2 (October 2019)

Simple Appraisal Tool - PAG Unit 12

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Part E - High Sensitivity Growth

Appraisal Period (Years)	30
Journey Time Impacts (€ Million)	€ 9.12
Vehicle Operating Costs Impacts (€ Million)	€ 0.53
Residual Impacts (€ Million)	€ 7.84
Present Value Benefits, PVB (€ Million)	€ 17.49
Present Value Costs, PVC (€ Million)	€ 14.78
Net Present Value (NPV)	€ 2.71
Benefit to Cost Ratio (BCR)	1.18
BCR (excluding Residual Impacts - if applicable)	0.65
Design Year AADT	5,508
HGV%	8.3%

Version 2 (October 2019)

Appendix G – Cost Estimate

Scheme: N63 Liss to Abbey Realignment Scheme
Phase: Ph2 - Option Comparison
Order of Magnitude Cost (OMC) Estimate

Consultant: AECOM-ROD Alliance | **Produced By:** RB
Rev: A | **Checked By:** PK
Date: 03/12/2019 | **Approved By:** EG

			Option A1	Option B1	Option C1	Option D1	Option E1	Option F1
1	**Main Construction Contract**							
	Total Base Cost for MCC		€ 7,784,080	€ 8,244,667	€ 7,535,586	€ 8,519,360	€ 7,142,657	€ 10,429,503
	Add Project Specific Risk Contingency	20.0%	€ 1,556,816	€ 1,648,933	€ 1,507,117	€ 1,703,872	€ 1,428,531	€ 2,085,901
	VAT @ 13.5%		€ 1,261,021	€ 1,335,636	€ 1,220,765	€ 1,380,136	€ 1,157,110	€ 1,689,579
	Total MCC Base Cost plus Project Specific Risk Contingency		**€ 10,601,917.00**	**€ 11,229,236.00**	**€ 10,263,468.00**	**€ 11,603,368.00**	**€ 9,728,299.00**	**€ 14,204,983.00**
2	**Land & Property (All-in Costs)**							
	Total Base Cost for L&P		€ 194,564	€ 192,284	€ 179,702	€ 182,811	€ 175,573	€ 205,241
	Add Project Specific Risk Contingency	10.0%	€ 19,456	€ 19,228	€ 17,970	€ 18,281	€ 17,557	€ 20,524
	VAT @ 0%		-	-	-	-	-	-
	Total L&P Base Cost plus Project Specific Risk Contingency		**€ 214,020**	**€ 211,513**	**€ 197,672**	**€ 201,092**	**€ 193,130**	**€ 225,766**
3	**Planning & Design**							
	Provision based on percentage of MCC Base Cost	7.0%	€ 653,862.70	€ 692,551.99	€ 632,989.19	€ 715,626.25	€ 599,983.19	€ 876,078.23
	Add Project Specific Risk Contingency	15.0%	€ 98,079	€ 103,883	€ 94,948	€ 107,344	€ 89,997	€ 131,412
	VAT @ 23%		€ 172,947	€ 183,180	€ 167,426	€ 189,283	€ 158,696	€ 231,723
	Total P&D Base Cost plus Project Specific Risk Contingency		**€ 924,889**	**€ 979,615**	**€ 895,363**	**€ 1,012,253**	**€ 848,676**	**€ 1,239,213**
4	**Archaeology**							
	Provision based on percentage of MCC Base Cost	5.0%	€ 467,044.79	€ 494,679.99	€ 452,135.13	€ 511,161.60	€ 428,559.42	€ 625,770.16
	Add Project Specific Risk Contingency	20.0%	€ 93,409	€ 98,936	€ 90,427	€ 102,232	€ 85,712	€ 125,154
	VAT @ 20%		€ 112,091	€ 118,723	€ 108,512	€ 122,679	€ 102,854	€ 150,185
	Total Archaeology Base Cost plus Project Specific Risk Contingency		**€ 672,544**	**€ 712,339**	**€ 651,075**	**€ 736,073**	**€ 617,126**	**€ 901,109**
5	**Advance Works and Other Contracts**							
	Provision based on percentage of MCC Base Cost	3.0%	€ 280,226.87	€ 296,808.00	€ 271,281.08	€ 306,696.96	€ 257,135.65	€ 375,462.10
	Add Project Specific Risk Contingency	15.0%	€ 42,034	€ 44,521	€ 40,692	€ 46,005	€ 38,570	€ 56,319
	VAT @ 13.5%		€ 43,505	€ 46,079	€ 42,116	€ 47,615	€ 39,920	€ 58,290
	Total Advance Works and Other Contracts Base Cost plus Project Specific Risk Contingency		**€ 365,766**	**€ 387,409**	**€ 354,090**	**€ 400,316**	**€ 335,626**	**€ 490,072**
6	**Main Contract Supervision (Employer's Costs)**							
	Provision based on percentage of MCC Base Cost	2.0%	€ 186,817.92	€ 197,872.00	€ 180,854.05	€ 204,464.64	€ 171,423.77	€ 250,308.07
	Add Project Specific Risk Contingency	15.0%	€ 28,023	€ 29,681	€ 27,128	€ 30,670	€ 25,714	€ 37,546
	VAT @ 23%		€ 49,413	€ 52,337	€ 47,836	€ 54,081	€ 45,342	€ 66,206
	Total MC Supervision Base Cost plus Project Specific Risk Contingency		**€ 264,254**	**€ 279,890**	**€ 255,818**	**€ 289,215**	**€ 242,479**	**€ 354,061**
7	**Residual Network**							
	Provision based on percentage of MCC Base Cost	2.0%	€ 186,817.92	€ 197,872.00	€ 180,854.05	€ 204,464.64	€ 171,423.77	€ 250,308.07
	Add Project Specific Risk Contingency	15.0%	€ 28,023	€ 29,681	€ 27,128	€ 30,670	€ 25,714	€ 37,546
	VAT @ 13.5%		€ 29,003	€ 30,720	€ 28,078	€ 31,743	€ 26,614	€ 38,860
	Total Residual Network Base Cost plus Project Specific Risk Contingency		**€ 243,844**	**€ 258,272**	**€ 236,060**	**€ 266,877**	**€ 223,751**	**€ 326,715**
TOTAL LEVEL 1 ESTIMATE (EXCLUSIVE OF VAT)			**€ 11,619,254**	**€ 12,291,598**	**€ 11,238,812**	**€ 12,683,659**	**€ 10,658,551**	**€ 15,507,073**
TOTAL LEVEL 1 ESTIMATE (INCLUSIVE OF VAT)			**€ 13,287,234**	**€ 14,058,274**	**€ 12,853,546**	**€ 14,509,194**	**€ 12,189,087**	**€ 17,741,919**

Notes:

1. Land & Property Rates are assumed based on previous schemes. To be confirmed with GCC Values.
2. Figures above are EXCLUSIVE of provision for Inflation
3. Archaeological VAT costs have been assumed at 20% to cover both site work (13.5%) and Desk/Design work (23%)

Appendix A3-2

River Abbert Bridge Structures

Options Report

N63 Liss to Abbey Realignment Scheme

Phase 3 - River Abbert Bridge Structures Options Report

Galway County Council

AECOM Project Number: 60571547
GCC Project Number: GC\16\13416

Document Reference: N63-ACM-ZZ-ZZ-RP-SE-000001

14th June 2021

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Comhairle Chontae na Gaillimhe
Galway County Council

Project Ireland 2040
Building Ireland's Future

Quality information

Prepared by	Checked by	Verified by	Approved by
Rionach Murphy Graduate Engineer	Arthur Costello Principal Engineer	Niamh Rodgers Associate Director	Eoin Greene Technical Director

Revision History

Revision	Revision date	Details	Authorized	Name	Position
0	22/03/2021	1st Issue	EG	Eoin Greene	Technical Director
1	14/06/2021	Issue for Approval	EG	Eoin Greene	Technical Director

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Structures Options Report - Consultation STA-1a

Categories 1, 2 & 3

Scheme

Name and Location: N63 Liss to Abbey Realignment Scheme

Structure(s)

Name and nature of the Structure(s): River Abbert Bridge

Structures Options Report

Reference N63-ACM-ZZ-ZZ-RP-ZZ-000001

Revision 01

Date 14/06/2021

Submitted by

Signature: Niamh Rodgers

Name Niamh Rodgers

Position Associate Director (Team Leader)

Organisation AECOM

Date 14/06/2021

Structures Section confirmation of consultation:

Name

Position

Organisation

Date

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1. Introduction

The N63 Liss to Abbey Realignment Scheme is a proposed road scheme near Abbeyknockmoy Co. Galway. The aim of the scheme is to facilitate a number of key objectives in the Galway County Development Plan (2015-2021), including the provision of higher-quality national roads and the separation of regional and local traffic. The scheme will also meet a number of objectives of the Road Safety Authority's Road Safety Strategy.

The purpose of the scheme is to provide an improved link for regional traffic to the M17 motorway and reduce traffic congestion at the existing Liss Bridge. The scheme will also allow for the existing section of N63 to be downgraded and pedestrian/cyclist facilities introduced to improve connectivity between the community facilities and residential properties.

In May 2019 Galway County Council commissioned AECOM-ROD to deliver the scheme under the TII Project Management Guidelines 2019 as outlined in PE-PMG-02041. The scheme has since progressed through Phase 1 Feasibility Studies (August 2019) and Phase 2 Options selection (April 2020). The project is currently proceeding through the Phase 3 Design and Environmental Evaluation.

As part of the scope AECOM-ROD have agreed to take all structures through the Technical Acceptance of Road Structures on Motorways and Other National Roads procedure as outlined in DN-STR-03001. At Phase 3 the key deliverable of the Technical Acceptance process is the Structures Options Report (SOR).

The SOR will focus on a new bridge crossing the River Abbert and its associated Special Area of Conservation (SAC). The bridge will carry the main alignment of the proposed N63 and be located in close proximity to Abbeyknockmoy Abbey, a National Monument.

2. Site and Location

2.1 Introduction

The proposed scheme is located in the north east of County Galway, directly to the east of Abbeyknockmoy Village. The proposed road alignment extends in a north easterly direction from Abbeyknockmoy, spanning the River Abbert towards the townland of Derreen and the junction of the N63 and L6234. The location is characterised by the presence of open greenfield agricultural land.

The coordinates of the proposed bridge are 551010.001(E), 743507.846 (N) (ITM).

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Figure 2-1: Location Plan

2.2 Existing Infrastructure

The proposed N63 route is located mainly in existing agricultural farmland. The route is bounded by a number of existing features such as the existing N63, residential properties and several community facilities. In addition, the Knockmoy Cistercian Abbey and the River Abbert provide constraints to the route development.

2.2.1 Existing N63

The existing N63 commences at Junction 19 with the M17 motorway to the south of Tuam and travels for a distance of 112km to Longford Town. Large sections of the route are substandard single carriageway with limited verges and pedestrian & cycle facilities. As the route passes through Abbeyknockmoy it passes a number of sharp and dangerous bends particularly near the existing Liss Bridge. The cross section in this area is typically composed of 2.7m wide carriageways in each direction with no verges. Numerous residential property entrances are also present and community facilities along the route.

2.2.2 Liss Bridge

The Liss Bridge spans the River Abbert and is located along the existing N63 in the townland of Liss, east of Abbeyknockmoy. The bridge is a seven-span masonry arch structure, built in circa 1800. Three of the seven arches carry the River Abbert while the remaining four arches act as flood relief arches in times of river flood. The bridge is approximately 27m long and 6.6m wide from edge of parapet to edge of parapet. The bridge is composed of two 2.5m wide carriageway lanes, with minimal rubbing strips and 0.5m thick masonry parapet walls. The bridge is recorded as a protected structure (reg no. 30405811) by the National Inventory of Architectural Heritage (NIAH). The NIAH records the description and appraisal of the structure as follows:

"Seven-arch limestone road bridge, built c.1800, over Abbert River. Round arches with rubble voussoirs to arch rings, random rubble to spandrels. Single triangular and semi-circular cutwaters to north-east face with cement coping with pipe inlaid. Random rubble parapet with flat rubble coping. Area of repair to north-west face, cut-stone voussoirs to northern two arches, squared and snecked limestone infill to spandrel panels and parapet, flat cut-stone coping. Set on N63 with random rubble walls to adjacent fields. This early nineteenth-century road bridge forms an imposing feature of the N63 road spanning the River Abbert near Abbeyknockmoy. There is evidence of early repairs and extensions as the road network throughout the county was improved. It's simple detailing exhibits evidence of local craftsmanship and materials and exhibits good quality traditional stone masonry."

Figure 2-2: Liss Bridge

2.2.3 Knockmoy Abbey Ruins

Knockmoy Abbey is located directly to the north of the proposed bridge location. The abbey is recorded on Record of National Monuments (RMP) and is protected under the National Monuments Acts 1930–2004. Numerous locations within the grounds of the abbey have been designated with National Monument status including the abbey structure, outbuilding, mill, graveyard, field systems and holy wells. The RMP describes the monuments as follows:

"On a gentle south facing slope in pastureland, near Abbeyknockmoy village, it overlooks the Abbert River to the south. A Cistercian monastery founded in 1189-90 by Cathal Crobderg O'Conor, King of Connnacht. A National Monument, the remain comprise a large conserved Transitional style church (east to west; length 60m) of early 13th century date consisting of an aisled nave, a chancel and two transepts. The chancel has a find ribbed vault and eastern windows, which the transepts both contain two barrel-vaulted chapels at their east ends. Three of the arches of the crossing are walled up, possibly 15th century work coeval with the insertion of the now largely ruined central tower. The north wall of the chancel bears 15th century mural painting depicting the Holy Trinity, the martyrdom of St. Sebastian and the Three Dead and Three Live Kings. The claustral buildings and ruined cloister lie to the south but only the east wing, including the sacristy, chapter house and a later graderobe, is well preserved. The ruins of a rectangular building (east-west, length 11.35m, width 5m) (GA058-004002), probably of post-medieval date, lie immediately to north. A modern mill, 325m to west is said to occupy the site of the original abbey mill (GA058-004005). A field system (GA058-004004) and three holy wells (GA058-004007) are also associated.

The monument was taken into Ownership under the National Monuments Acts 1930 to 2014 – National Monument 166."

Figure 2-3: Knockmoy Abbey

2.2.4 River Abbert

The River Abbert is a tributary of the Clare River and forms part of the Lough Corrib SAC (site code:000297). The SAC boundary extends to include adjacent wet grassland to the south of the river. Full evaluation of the Lough Corrib SAC (site code:000297) will be discussed in the subsequent chapters of this report. The river flows in an east west direction and is approximately 15m wide at the proposed bridge location.

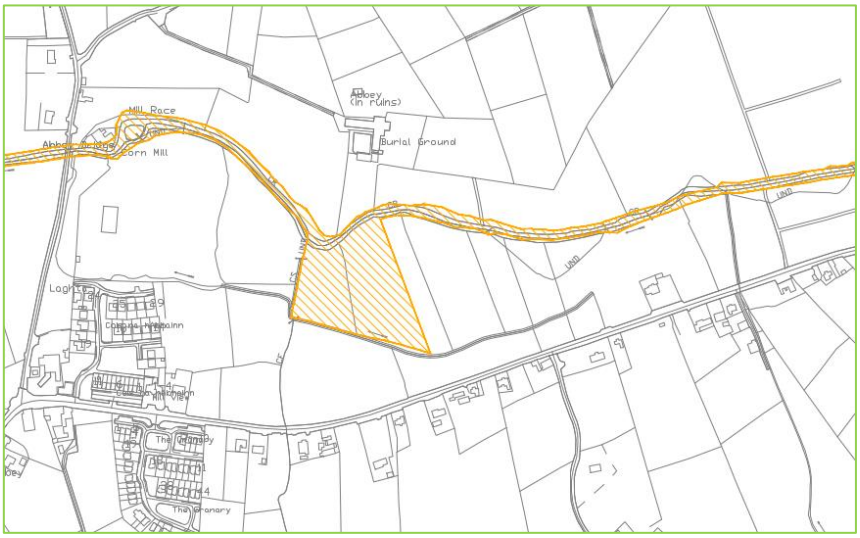

Figure 2-4: Abbert River and SAC (orange)

2.3 Proposed Infrastructure

2.3.1 N63 Proposed Alignment

The proposed N63 alignment will commence to the east of Abbeyknockmoy and proceed in a north eastly direction crossing over the River Abbert towards its tie in point east of the L3110. The proposed cross section is a Type 2 Single Carriageway including 3.5m carriageways, 0.5m hard strips and 2.5m wide verges. This proposed cross section has been determined to match the previous road improvement scheme completed to the west of Abbeyknockmoy. The proposed speed limit for the alignment will be 100 km/h. The horizontal curvature of the proposed alignment will require considerable sightlines particularly at the proposed bridge location. The proposed alignment will allow for the existing section of N63 to be downgraded and pedestrian/cyclist facilities introduced. The introduction of these facilities will require a reduction in the existing carriageway widths coinciding with the downgrade of the road.

Figure 2-5: Map of proposed N63 Alignment

3. Description of Structure and Options Considered

3.1 Introduction

The bridge will be designed in line with the standards set out in the Design Manual for Roads and Bridges (DMRB) as published by Transport Infrastructure Ireland (TII). The DRMB provides guidance for the requirements of the design of new bridge structures on the TII road network.

3.2 Geometry

3.2.1 Cross-section

The three bridge options detailed below assume a Type 2 Single Carriageway as the minimum desirable cross section at the bridge crossing location. The minimum bridge cross section will be 14m wide, composed as follows:

0.5m Parapet Edge Beam
2.5m Raised Verge
0.5m Hard Strip
3.5m Traffic Lane
3.5m Traffic Lane
0.5m Hard Strip
2.5m Raised Verge
0.5m Parapet Edge Beam

Where required the minimum cross-sectional width of the bridge shall be increased to accommodate sightlines and any requirements of the structural form.

At the bridge location the highway alignment assumes a standard cross fall of 2.5% falling from the centre of the carriageway.

3.2.2 Vertical Alignment

The vertical alignment of the bridge has been determined based on a minimum required clearance envelope of 3m above the riverbank of the River Abbert. For all options the alignment spans the River Abbert on a vertical curve with a K value of 100 over a length of 392m.

3.2.3 Horizontal Alignment

The proposed bridge is located in the transition zone between two horizontal curves. The alignment crosses the River Abbert at a skew of 57 degrees. This skew creates a difficult bridge arrangement and may not be technically feasible. All options presented below have been developed with a reduced skew of 45 degrees max. In addition, a minimum 5m offset has been provided to the bridge abutments from the top of riverbank reducing the risk of impacting on the river during construction. In addition the 5m offset provides a maintains a pathway along the edge of the river for wildlife and river users.

3.3 Options Considered

Three options have been considered as part of this report which focuses on different structural forms based on material capabilities.

The following assumptions have been made:

- The bridge will be a single span structure over the River Abbert and the SAC;
- The minimum cross-sectional width of the bridge shall be 14m;
- Where required the bridge width will be widened for sightlines and any structural form requirements;
- Minimum headroom of 3m shall be provided beneath the bridge span;
- The maximum allowable skew angle shall be 45 degrees or less;
- The minimum offset for abutments from the top of riverbank shall be 5m.

3.3.1 Option 1 – Precast Portal Frame

Option 1 is a buried precast portal frame solution. The frame will span perpendicular to the River Abbert with an internal span of 20.5m. The bridge will consist of 33 precast units each 2m wide with a total structure width of 66m. The structural depth of each unit will be a minimum of 500mm, increasing to 750mm at the chamfers provided at the supports. The bridge will be designed as buried structure with a minimum of 600mm 6N fill to the top of the portal frame, this fill material will act to disperse the vertical loading helping to reduce the load concentration and reinforcement requirements.

Spanning perpendicular to the river results in large dead zone areas on either side of the carriageway, it is assumed that no vehicular access will be provided to these dead zones with a vehicle restraint system provided parallel to the carriageway to retain accidental vehicles. A timber post and rail fence will also be provided at the edge of the structure to prevent falls from height in the event of pedestrian access.

Precast gravity retaining wingwalls will be provided to retain the earthworks on approach and departure to the structure. These earthworks will be significant and protrude outwards from the highway alignment due to the large width of the bridge Large areas of exposed concrete at the wingwalls will be finished with a pattern profile finish to improve aesthetics and avoid large areas of plain concrete.

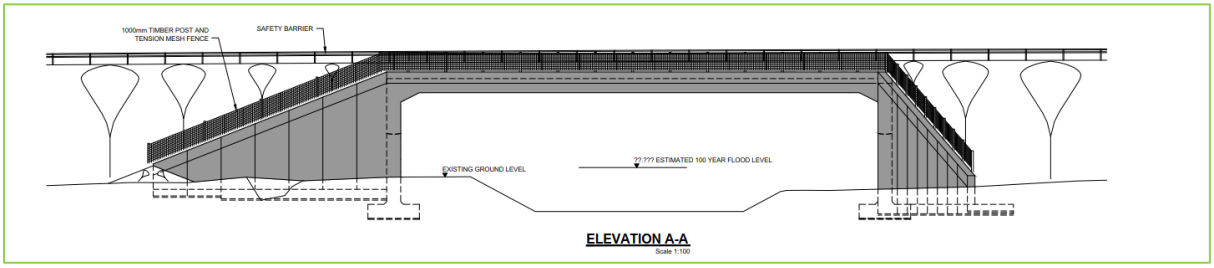

Figure 3-1: Precast Portal Frame Elevation

3.3.2 Option 2 – Steel Girder

Option 2 shall be a composite steel bridge spanning the River Abbert. The superstructure shall be formed of 6 no. braced weathering steel I Girders at 2.53m centres. The option has been developed with a skew angle of 35 degrees and a maximum span length of 60.5m from centre of bearing to centre of bearing. The total bridge width shall be 15.65m which includes the minimum required cross sectional width plus additional verge widening to account for carriageway sightlines at the south west and north east corners. To improve aesthetics the girders shall be fabricated with a varying arched profile soffit with a maximum structural depth at the abutments of 2.5m and a minimum structural depth of 1.8m at the centre of the span. An insitu concrete deck 250mm thick shall be provided to span between the steel girders with parapet edge beams also be provided to the edge of the deck. The use of a single span structure will minimise the need for temporary falsework and formwork over the river during construction. Instead permanent nonparticipating formwork will be utilised between the beams to form the insitu concrete deck. This will help minimise the construction time on site and reduce the risks of working over water.

Weathering steel while uncommon in Ireland provides significant advantages and reduced maintenance costs over the design life of the bridge when compared to the painted steel equivalent. DN-STR-03002 Weathering Steel for Highway Structures highlights the limitations on the use of weathering steel based on the bridge location and geometry. Option 2 has been developed to ensure that these limitations do not apply, and that weathering steel can be utilised.

A span length of 60.5m will result in significant thermal expansions and contractions of the bridge. To this end bridge bearings will be provided at both abutments to accommodate movement. The articulation of the structure will need to consider the most appropriate locations for the expansion bearings to allow longitudinal and transverse movement to occur, in addition the locations of fixed bearings will also need to be considered. The expansion bearings will permit both translational and rotational movements while fixed bearings only allow rotational movements. The types of bearings and the articulation will be determined at detailed design.

The substructure shall be formed using full height concrete abutments supported on insitu concrete foundations. The type of foundations will be determined at preliminary design based on the Ground Investigation data. The approaches to the bridge abutments will be formed of compacted acceptable 6N/6P backfill material. The backfill layer will be designed, detailed, specified and constructed with plant and compaction methods appropriate to the requirements in accordance with TII CC-SPW-00600 for fill to structures. An inspection gallery shall be provided to the rear of the abutment to facilitate access to the bearing shelves for inspection and maintenance in accordance with DN-STR-03012 – Design for Durability.

Insitu cantilever wingwalls and gravity retaining walls will also be provided to retain the earthworks on approach and departure to the structure. Large areas of exposed concrete at the abutments and wingwalls will be finished with a pattern profile finish to improve aesthetics and avoid large areas of plain concrete.

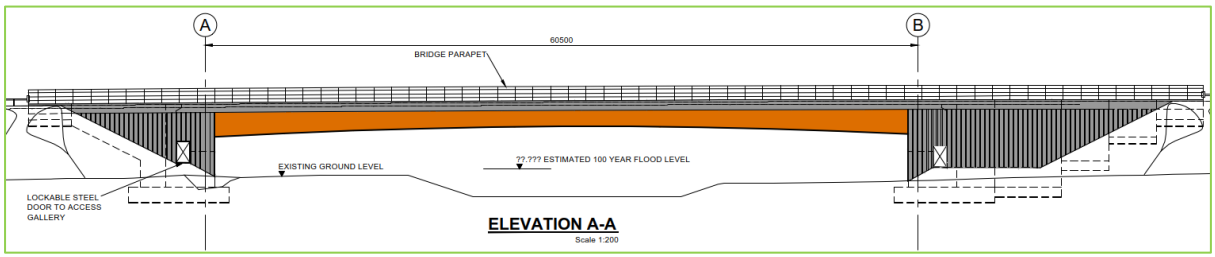

Figure 3-2: Steel Girder Elevation

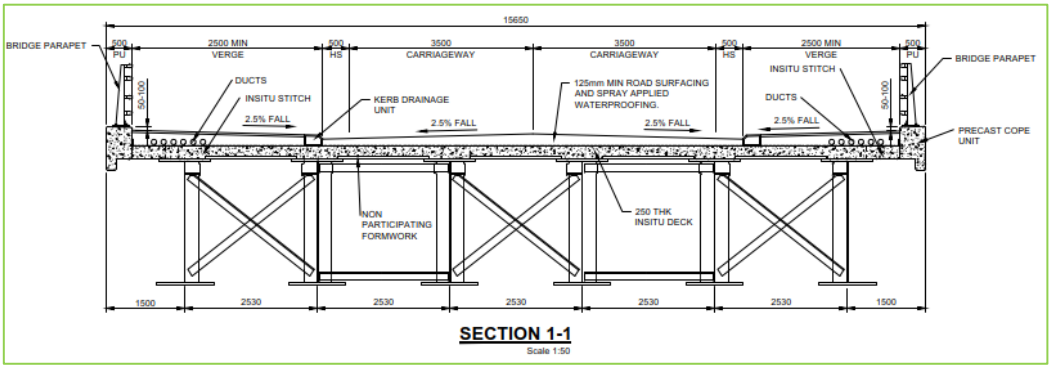

Figure 3-3: Steel Girder Cross Section

3.3.3 Option 3 – Precast Beam

Option 3 proposes a fully integral single span precast prestressed beam bridge spanning the River Abbert. The bridge shall be formed using 8 No. W19 precast concrete beams at a spacing of approximately 3m. The option assumes a skew angle of 40 degrees between the abutment and highway alignment. This results in a beam span of 45m from centreline of abutment to centreline of abutment. This is the maximum typical span length for this type of beam; however, longer spans are possible (up to 49m) through increased concrete strengths and reinforcement. The skew results in large areas of dead zone on either side of the carriageway alignment, it is assumed that these dead zones will be combined with the minimum required 2.5m raised verge. A 250mm thick insitu concrete deck shall span transversely between the precast beams with parapet edge beams also provided to the edge of the deck. This results in a total bridge width of 25.6m from parapet edge beam to parapet edge beam. The overall structural depth of this option shall be 2.55m composed of 2.3m deep W19 precast beams and 0.25m insitu concrete deck. The use of a single span precast structure will minimise the need for temporary falsework and formwork over the river during construction. Instead permanent formwork will be utilised between the beams to form the insitu concrete deck. This will help minimise the construction time on site and reduce the risks of working over water.

Integral connection between the superstructure and substructure shall be created using insitu concrete diaphragms at each abutment which create a fully fixed structure transferring loading between the elements.

The substructure shall be formed using full height concrete abutments supported on insitu concrete foundations. The type of foundations will be determined at preliminary design based on the Ground Investigation data. The approaches to the bridge abutments will be formed of compacted acceptable 6N/6P backfill material. The backfill layer will be designed, detailed, specified and constructed with plant and compaction methods appropriate to the requirements in accordance with TII CC-SPW-00600 for fill to structures. Insitu cantilever wingwalls and gravity retaining walls will also be provided to retain the earthworks on approach and departure to the structure. Large areas of exposed concrete at the abutments and wingwalls will be finished with a pattern profile finish to improve aesthetics and avoid large areas of plain concrete.

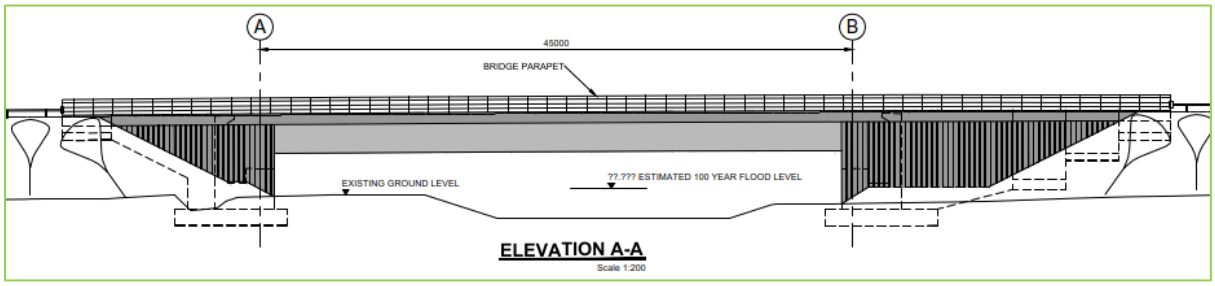

Figure 3-4: Precast Beam Elevation

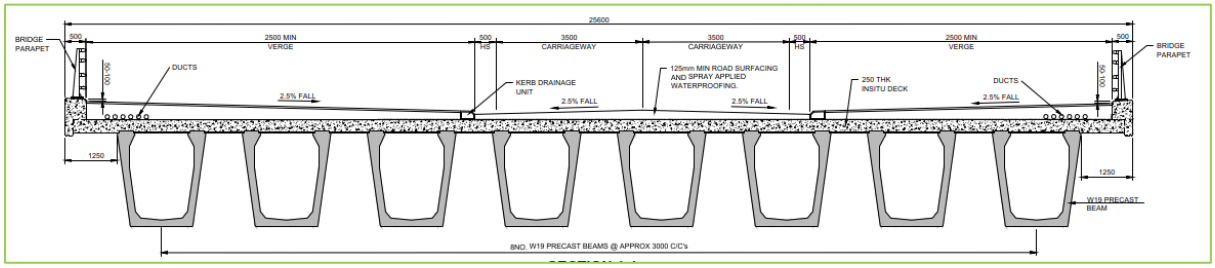

Figure 3-5: Precast Beam Cross Section

4. Technical Evaluation

4.1 Introduction

The options presented above will undergo a technical evaluation and comparison under a range of headings. The evaluation will help to identify structurally the advantages and potential pitfalls of each option when viewed against the others.

4.2 Design Life

The design working life for all options will be a minimum of 120 years as defined in the TII publication, DN-STR-03012 - Design for Durability. Maintainable elements and components listed below are subject to greater wear and will require replacement within the design life. Careful design and detailing combined with thorough routine inspections, quality control and supervision on site will help achieve the minimum expected design life listed in Table 4.1 below:

Component	Years
Bridge Bearings	50
Expansion Joints	50
Parapets	50
Drainage Systems	50
Deck Waterproofing	50
Steelwork Paint Systems	20

Table 4.1 - Minimum Design Life for Structural Elements

4.3 Structural Analysis and Design

The preferred bridge option will be designed in line with the requirements of the Design Manual for Roads and Bridges (DMRB) and any other relevant standards from TII. The bridge will also be designed in line with the Eurocode Standards, as transposed in the Irish National Standards and Annexes.

Option 1 the portal fame will be designed as fully integral buried structure based on metre strip design for the worst-case loading location. The worst-case location will need to be identified based on the skewed road alignment and predicted loading and the depth of fill above the structure. The minimum allowable depth of fill shall be 600mm and it shall be assumed that all load disperses through the fill at an angle of 45°.

The design of Option 2 shall be based on a skewed grillage analysis with longitudinal line elements representing the superstructure beams. The insitu concrete deck shall be modelled using transverse line elements. The articulation of the grillage model will be based on the required bridge bearing articulation. A number of sub models will be used to analyse the substructure abutments with loading applied based on the results of the grillage model. The founding stratum will be idealised as springs with a lateral and vertical stiffness relative to the material properties.

Option 3 shall also be designed based on a skewed grillage analysis similar to Option 2; however, the abutments and foundations shall be modelled as fully integral with the superstructure grillage model and idealised as vertical line elements. The founding stratum and fill to the rear of the abutment will be idealised as springs with a lateral and vertical stiffness relative to the material properties. The soil structure interaction to the rear of the abutment will need to be considered in detail to ensure the effects of thermal expansion and contraction of the precast beams are accounted for.

The loading applied to the structure will be based on the requirements of IS EN 1991-1-1 to IS EN 1991-1-8 and IS EN 1991-2. For all options the load combinations used in the design will be in accordance with those outlined within IS EN 1990. The section capacities and element designs will be carried out using hand calculations and design software, such as Autodesk Structural Bridge Design. Concrete

sections will be checked for Ultimate Limit State (ULS) and Serviceability Limit State (SLS) conditions in accordance with Eurocode 2: Design of Concrete Structures, IS EN 1992-1-1 and IS EN 1992-2 and the Irish National Annexes. All steel elements will be designed for the ULS conditions outlined in Eurocode 3: Design of Steel Structures, IS EN 1993-1-1 and IS EN1993-2 and the Irish National Annexes.

4.4 Classification

All structures are classified based on a range of categories from 0 to 3 depending on a number of factors related to the structural and geotechnical complexity of the design. The checking requirements and form of certificates required for a structure are dependent on this structure category.

Options 1 and 3 presented above shall be Category 2 Structures as they lie outside the requirements for category 0, 1 and 3 structures in accordance with DN-STR-03001. Category 2 structures require a check from an independent checking team that may be from the same organisation as the design team.

Option 2 will be a Category 3 structure due to a single span in excess of 50m in accordance with DN-STR-03001 and will require a check from an independent checking team that must be from a separate organisation to the design team. The checking team must have their own Professional indemnity insurance in addition to sufficient knowledge and previous experience in similar designs.

4.5 Bearings and Joints

Bridge bearings and expansion joints will be used in varying degrees across the bridge options. Bridge bearings will be in accordance with the clauses set out in DN-STR-03004 – “Bridge Bearings. Use of BS 5400: Part 9:1983”. Expansion joints will be designed in accordance with DN-STR-03006.

Option 1 and 3 shall be fully integral structures which will omit the need for bridge bearings and expansion joints at the support locations.

Option 3 will be fully articulated requiring bridge bearings at the support locations to accommodate the predicted thermal expansions and contractions. The type of bearings will be determined at preliminary design based on the required movements. Bridge expansion joints will also be required at the back of the abutment to ensure a continuous surface across the bridge deck.

4.6 Parapets & Safety Barriers

For Options 2 and 3 the bridge parapets will be provided to the edge of each structure on dedicated parapet edge beams. The parapets will be designed with a minimum containment level of H2 based on the requirements of DN-STR-03011 - The Design of Vehicle and Pedestrian Parapets. This is the minimum requirement for all structures on the national road network. The parapet shall also have an impact severity level of B and a working width not exceeding W4. The minimum height of the pedestrian parapet shall be 1.25m above the top of the surfacing, this height includes the minimum plinth height of 50mm above surfacing level.

A bridge parapet shall not be provided on Option 1, instead a road safety barrier supported on a ground beam shall be provided within the verge parallel to the carriageways. This safety barrier shall also be designed with a minimum containment level of H2 based on the requirements of DN-REQ-03034 The Design of Road Restraints Systems (Vehicle and Pedestrian) for Roads and Bridges. A timber post and tension mesh fence shall be provided to the edge of the structure to prevent falls from height for users. This fence shall be 1.0m high designed in accordance with DN-STR-03005.

5. Economic Evaluation

5.1 Introduction

The cost of all options will vary considerably and will be dependent on the developments of the conceptual design. The length of the span, structural form and material will have a major impact on the total construction cost of the bridge. At conceptual design stage, the choice of materials and quality of finish may have a large effect on the cost of the structure. All rates given below are published in Spon's Civil Engineering and Highway Works Price Book 2020 in pounds sterling and converted to euro using a conversion rate of 1:1.16 correct at the time of writing this report. As the design is not sufficiently developed at this stage, AECOM recommend using an "all-in" construction rate per m^2 as detailed below in the tables. A professional consultancy fee, ex. VAT, has also been provided for, this fee is based on full detailed design, checking and full site supervision during construction.

5.2 Option 1 Economic Evaluation

Description	Quantity	Unit	Rate	Amount (€)
Precast Portal Frame	1725	m^2	3000	€ 5,175,000.00
Total Construction Cost				€ 5,175,000.00

Table 5.1 – Option 1 Economic Evaluation

5.3 Option 2 Economic Evaluation

Description	Quantity	Unit	Rate	Amount (€)
Steel Girder	1050	m^2	4500	€ 4,725,000.00
Total Construction Cost				€ 4,725,000.00

Table 5.2 – Option 2 Economic Evaluation

5.4 Option 3 Economic Evaluation

Description	Quantity	Unit	Rate	Amount (€)
Precast W19 Beams	1329	m^2	4000	€ 5,316,000.00
Total Construction Cost				€ 5,316,000.00

Table 5.3 – Option 3 Economic Evaluation

6. Aesthetic Evaluation

6.1 Introduction

As the three options are progressed and evaluated, the basic principles of bridge aesthetics should be incorporated and considered. These principals are described as follows:

- Expression of Function – it is generally accepted that a bridge should clearly express its overriding function. This is considered the basis of good design and any adjustments or additions to the form should add to the expression of functionality and not detract from it;
- Form – the form should derive from the function of the bridge. The form will be justified based on the loading, the clearance requirements, construction issues and the environmental needs. In certain cases, the form will be derived based on the nature of a site;
- Character – a bridge should always be a natural addition and have a permanent association with its setting and surroundings;
- Detail – the quantity and quality of the most minor details are critical to the scale, proportion and perceived attention to the aesthetics of the bridge;
- Scale – the scale of the bridge relates to its overall feeling when viewed against the overall landscape. The scale of the bridge may be large and oppressive or small and intimate all based on detail and form;
- Proportion – this is the sizing or proportion of the structural elements to each other. It is generally preferred to maintain a simple mathematical relationship or ratio throughout the major elements of the bridge; and
- Environmental Intrusion – it is always preferred to minimise the intrusion of a bridge or structure on its surrounding landscape.

6.2 National Monuments

The character of the bridge will be directly linked to the surrounding landscape and particularly the historical protected structures in the area. As discussed above, the Knockmoy Abbey, a National Monument is located within 350m of the proposed bridge location. Sensitivity to the conservation and management of this asset will be central to the approach in determining a viable and sustainable river crossing. The historic buildings have a long-standing direct relationship with the river and any proposed structure needs to ensure that it does not sever existing visual and physical connections. The appropriate design and materials will be seen as a vital. This involves an adjustment of mind-set to embrace the heritage along the river corridor rather than regarding it as a constraint.

Significant embankments on approach and departure to the structure will be of concern due to effects on the sight lines essentially acting as a visual barrier on views from the National Monuments to the surrounding undulating agricultural landscape. The preferred option will need to carefully consider these sight lines including views of the bridge from the monuments and vice versa. These sight lines will need to be considered during both hours of daylight and darkness. The structural depth of the options will be key to reducing the approach embankment height and minimising the effects on the abbey. Option 3 will have the largest structural depth and as a result will require higher embankments having the largest effect on view from the monuments. Option 2 will have a slightly smaller structural depth; however, the addition of an arched soffit improves the proportion and scale of the bridge when viewed from the abbey. Option 1 will likely have the thinnest structural depth; however, the significant dead space and additional retained embankment fill parallel to the river is likely to increase disruption to the visual landscape when compared to the other two options.

6.3 Materials and Finishes

The proposed bridge should not detract from the surrounding environment and if the design and choice of materials is carried out carefully the structure itself can potentially add life to the area. The choice of concrete finish and shape of the bridge elements will have a negligible impact on costs but can offer significant improvements to the visual aesthetics. Making the bridge as simple and elegant as possible

will complement the landscape, which is a practical, cost effective approach to a visually attractive bridge solution.

The advantage of concrete for Option 1 and 3 is that it can be cast using bespoke exterior formwork to have a wide range of patterned finishes, in addition vertical concrete faces such as wingwalls can be clad in masonry blockwork to create a physical connection to masonry abbey structure creating a consistency of form. Consistency of form is an important aesthetic consideration and depends on materials, proportion, colour and details specified. Additionally, the form liners can produce concrete surfaces which avoid streaking. Surfaces with closely spaced vertical ribs or grooves can encourage channelling of rainwater or seepage. The quality of formed concrete finish can range from U1 to U5 and F1 to F5 as is detailed in CC-SPW-01700 with F5 being the highest quality finish. Fabricating the concrete elements off site can provide a higher quality of concrete finish in accordance with CC-SPW-01700.

Steel is more defined in its structural shape and as with the proposals for Option 2 can be formed to create an arched soffit profile which is aesthetically more desirable. The option also assumes the use of weathering steel rather than painted steel due to the reduced maintenance requirements which will be discussed further in the following chapter. The colour of the weathering steel with its brown and orange tones can create a more attractive appearance when compared to the concrete options. These colours can blend with the surrounding landscape particularly in autumn. The weathering steel changes colour over its lifetime, when the patina layer of rust first forms it takes on a yellow shade. When left uncoated, this colour will gradually shift to a vibrant orange before settling to a dark red after several years of exposure. The speed of the colour transition is dependent on the frequency of wet and dry cycles the steel undergoes.

Finally, the addition of bespoke parapets can add character to a bridge while maintaining the safety of the user. There is scope to increase the aesthetic of the parapets within the infill areas between the main parapet posts. The parapets can be designed in a number of finishes such as painted steel which can add contrast to the bridge superstructure material.

7. Evaluation of Durability and Maintenance Requirements

7.1 Introduction

Maintenance of the bridge will be required throughout the 120-year design life. The type and cost of maintenance will have a large effect on the Total Lifecycle cost of the bridge. Further to this, the proposed bridge options contain various articulation arrangements which may pose large maintenance costs throughout the design life.

7.2 Maintenance and Inspection Regime

Inspections of the N63 Bridge will be required regularly throughout its service life. The inspections will be carried out in line with the TII EIRSPAN Bridge Management System. The EIRSPAN system was introduced in 2001 to provide an integrated management system for the bridges in Ireland. The system coordinates activities such as inspection, repairs and maintenance work to ensure optimal management of the bridge stock.

The EIRSPAN system recommends the following intervals for inspections:

- General Inspection to be undertaken every 2 years; and
- Principal inspection to be undertaken at least every 6 years.

The above recommendations are the maximum recommended intervals and are dependent on the condition of the bridge and levels of deterioration since the previous inspection. If high levels of deterioration are identified the inspection interval should be decreased.

For all three options inspection and maintenance to the top deck, parapet systems, road safety barriers and expansion joints will be carried out from road level. Inspection of the superstructures, deck soffits and parapet edge beams will be carried out from an underbridge unit positioned on the top of deck. The positioning of an underbridge unit should consider safe working limits and any requirements for working from height and working over water. Traffic Management and lane closures maybe required during inspection using an underbridge unit. Inspection and maintenance of the bridge abutments and substructure elements can be carried out from the riverbanks. Option 2 will require increased inspection and maintenance requirements due to the larger number of connections and members associated with the steel superstructure.

An inspection gallery will also be provided to the rear of each abutment for Option 2. The gallery will provide access for inspection, maintenance and replacement of the bridge bearings and underside of the movement joint. A lockable steel door will be provided to prevent unauthorised access to the inspection gallery in accordance with DN-STR-03012.

7.3 Bearings

As previously discussed, the use of bearings will be avoided with Option 1 and Option 3 by using a fully integral design. The soil structure interaction for the fill to the rear of the bridge abutments will need to be considered at detailed design to ensure the expansion and contraction of the integral structure can be accommodated.

Option 2 by comparison will have bearings at both abutments that will be designed to ensure a minimum design life of 50 years according to DN-STR-03012. Bearings are required due to the length of the bridge and the predicted movements of the structural members under loading particularly thermal effects. Bearings which maximise the use of stainless-steel components should be specified to maximise resistance to environmental factors and exposure classes.

Proper inspection and maintenance of the bridge should allow bearings to meet and exceed the 50-year design life. Maintenance works such as painting, and lubricating should be carried out as required to maximise the design life. As the replacement of bearings will likely be a large cost item, with bearings scheduled to be replaced twice over the 120-year design life the preferred option should be designed to allow for easy access to bearings and bearing shelves with good detailing maximising the efficiency of replacement. To this end an inspection gallery will be provided to the rear of each abutment for Option 2 to provide access to the bearing shelves.

7.4 Expansion Joints

The fully integral structure proposed for Option 1 and Option 3 will not require the use of any bridge deck expansion joints.

Option 2; however, will require expansion joints at the back of the deck above the inspection galleries. Expansion joints are required due to the length of the bridge, to accommodate bridge bearings and to allow for the movements of structural members under loading or thermal effects. The type of joint will be determined at detailed design based on the likely movements within the bridge.

Expansion joints that are correctly designed allow the movement of the bridge at the expansion gaps while providing a continuous surface for users. Expansion joints are weak points in the structural continuity of the bridge. They must be correctly installed and maintained to prevent leakage and ingress from the upper deck surfaces to lower or internal surfaces and protected bearings. Expansion joints in the structure, will be required to remain watertight for a minimum of 10 years of opening. The joint should be appropriately sealed to prevent the ingress of water.

7.5 Materials

The preferred construction material will have a significant effect on the maintenance and inspection requirements for the bridge.

Options 1 and 3 are both reinforced concrete structures. Reinforced concrete as a structural material can be relatively robust if designed correctly and maintained properly. Minimum cover requirements will need to be satisfied correctly in accordance with the environmental conditions and the correct steel quantities will need to be used to avoid cracking during curing or under live or thermal loading effects. If cracks develop in the concrete to a sufficient depth the reinforcing steel can be attacked and corroded by water and de-icing salts penetrating the concrete. This can lead to the corrosion of the reinforcing steel, reducing the reinforcement area and causing further cracking and spalling of the concrete. Inclement weather conditions must be considered when pouring concrete on site outside of a controlled factory environment; rainwater can get trapped in the formwork and alter the water to cement ratio and temperature changes can affect the rate of curing leading to cracking or a reduction in strength.

All buried concrete surfaces will be treated with two coats of epoxy resin and all exposed concrete faces will receive a hydrophobic pore lining impregnation in accordance with TII publication, DN-STR-03012 - Design for Durability. Concrete bridge decks will require spray applied waterproofing and be robust to withstand direct foot traffic in accordance with DN-STR-03009 – Waterproofing and Surfacing of Concrete Bridge Decks. Concrete structures will be designed taking account of the minimum concrete and steel grades specified in DN-STR-03012.

Option 2 proposes the use of a weathering steel superstructure. Weathering steel requires less maintenance than stainless or painted steel so therefore would be more cost efficient over its design life. DN-STR-03002 Weathering Steel for Highway Structures highlights the constraints on the use of weathering steel based on the bridge location and geometry. Option 2 has been developed to ensure that these constraints do not apply, and that weathering steel can be utilised. Weathering steel is a form of a specialised steel alloy that is chemically developed to ensure the development of a stable rust-like appearance that can resist corrosion and abrasion. A stable rust like protective layer develops on the surface of the steel which is also known as the patina layer. The design of weathering steel requires the inclusion of a sacrificial steel thickness that is broken down during the development of this patina layer. If damage is caused to the patina layer during the design life the patina continuously redevelops and regenerates repairing the damage under normal weather cycles. Studies have shown that bridges fabricated from unpainted weathering steel can achieve a design life of 120 years with only nominal maintenance. It should be noted that special welding techniques and materials are needed during bridge fabrication to ensure that weld-points weather at the same rate as the other main steel elements and ensure they do not become weak points in the structure during the 120-year design life.

8. Hydraulic Considerations

8.1 Introduction

Construction of a new structure in any landscape has the potential to impact the surrounding area's likelihood to flood. As the bridge spans the River Abbert it is likely that works may affect the predicted flood levels by reducing the available flood plain storage. The potential flooding impacts caused due to the construction of a new structure should not be ignored and the potential for flooding should be investigated.

8.2 Flood Risk Assessment

A standalone Flood Risk Assessment (FRA) for the Proposed Development has been undertaken in line with 'The Planning System and Flood Risk Management – Guidelines for Planning Authorities'. This FRA consists of three primary parts as further detailed below.

8.2.1 Stage 1 – Flood Risk Identification

The Stage 1 element of the FRA examined existing available sources of data to determine if there was any likelihood of flooding. This included the following sources:

- Hydrometric Data
- OPW Flood Hazard Maps
- OSi Historical Mapping
- OPW Land Benefitting Maps
- OPW CFRAM Mapping &
- Galway County Development Plan

Of particular interest was the OSi Historical Mapping which highlighted lands both north and south of the river as "Liable to Floods", see Figure 8-1. Also, OPW Land Benefitting Maps which indicated that a significant area of "Benefitting Land" was present along with main and secondary arterial drainage channels.

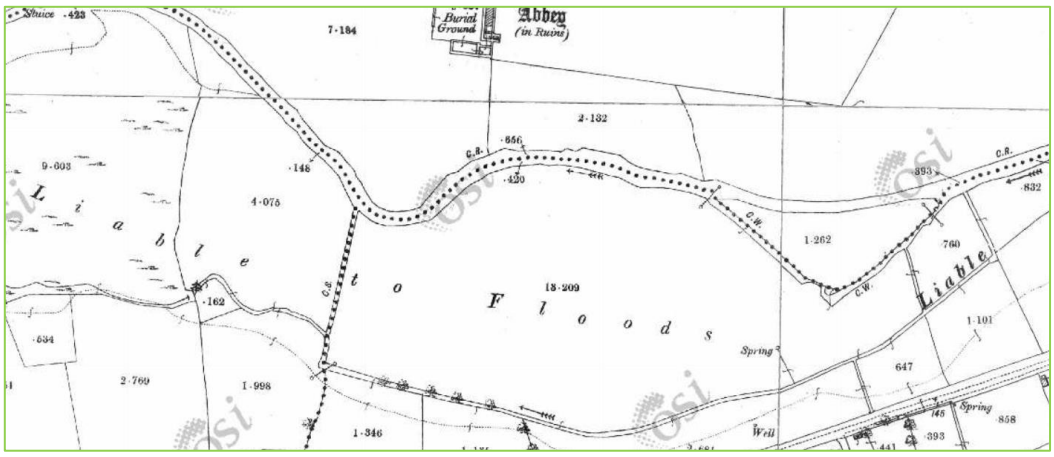

Figure 8-1: Historic 25 Inch Mapping for the River Abbert

The Stage 1 element concluded that "Fluvial flooding is likely in the vicinity of the River Abbert however no definite floodplain extents are available from historic and current information."

8.2.2 Stage 2 – Initial Flood Risk Assessment

The Stage 2 element of the FRA determined that the Proposed Road Development, as Primary Transport Infrastructure, should be considered to be a highly vulnerable development.

The lack of information available prohibited the designation of a flood zone at the development site. Based on the information collated in Stage 1, it is likely that fluvial flooding will occur in the vicinity of the River Abbert and therefore both Flood Zone A and Flood Zone B will be present.

The Stage 2 element of the FRA concluded that “In order to determine the flood extents and level for the Proposed Road Development, a Stage 3 Detailed FRA is required.”

8.2.3 Stage 3 – Detailed Flood Risk Assessment

The Stage 3 element of the FRA comprised the following tasks:

- Assessment of flow using industry standard best practice; A 1% AEP flow estimate of 48.6m3/s was calculated using the FSR-6 method. A corresponding flow hydrograph was produced using the unit hydrograph method to allow unsteady hydraulic analysis to be undertaken. The resultant 0.1% AEP flow of 63.1m3/s was obtained through scaling.
- Baseline model development; A linked 1D-2D hydraulic model representative of the current/baseline conditions was developed in Infoworks ICM modelling software. This was developed from hydrographic survey data obtained by Murphy Surveys in May 2020. This included the existing N63 Liss Bridge and the L2128 bridge along with the substantial weir structure at the former corn mill.
- Determination of Flood Zones; Baseline model runs were undertaken for the 1% and 0.1% AEP flow events using the developed baseline model. This allowed determination of the extents of Flood Zones A, B and C.
- “Proposed without Mitigation” model development; The proposals were added to the baseline model which included the approach embankments, River Abbert bridge and other culverts based on a hydraulic and structural basis only. This model scenario was then ran using the 1% and 0.1% AEP flows which demonstrated an increase in flood level and extents upstream of the crossing and a subsequent reduction downstream.
- “Proposed with Mitigation” model development; Alterations were made to the “Proposed without Mitigation” to reduce the impact of the proposals. This included the provision of additional flood connectivity culverts (2No. south of the bridge, 1No. north of the bridge) through the approach embankments and upsizing of 2No. watercourse culverts. This model scenario was then ran using the 1% and 0.1% AEP flows which still demonstrated an increase in flood level and extents upstream of the crossing and a subsequent reduction downstream however this was much reduced in comparison with the “Proposed without Mitigation” scenario and within acceptable limits.

8.2.4 Climate Change Considerations

The Flood Policy Review Report (2004) produced by OPW states that climate change considerations should be taken into consideration when undertaking flood risk assessments. Sensitivity testing was undertaken for the MRFS only by increasing the flood flow estimates by 20% respectively. It should be noted that the 0.1% AEP event is equivalent to the HEFS and therefore this was already being considered.

8.2.5 Flood Levels and Freeboard Provision

The 1%+CC (MRFS) AEP flood level at the River Abbert bridge has been determined from the modelling exercise to be 39.62mOD upstream and 39.45mOD downstream. Freeboard provided at the lowest soffit point of the crossing is circa 2.88m. The freeboard provision is greatest at the centre due to the arched shape of the bridge beams.

9. Environmental Considerations

9.1 Introduction

The potential environmental effect of the bridge construction must be considered as part of project planning. The impacts on human health, biodiversity, the landscape and climate are just a few of the factors to be considered. The magnitude of the environmental impacts will be related to a number of factors such as the location, quantity and choice of materials, span and structural form etc. It is likely that an Environmental Impact Assessment (EIA), Environmental Impact Assessment Report (EIAR) and/or an Appropriate Assessment (AA) will be required for this project.

9.2 Environmental Impact Assessment

The work related to the EIA will be carried out and completed as part of the planning application to An Bord Pleanála. The design team will maintain a constant stream of communication with the EIA team throughout the progression of the River Abbert Bridge design. The submission of the EIA works will be in accordance with Section 51 of the Roads Act 1993

A number of other aspects will be investigated and assessed as part of the EIA; a full list of the EIAR proposed chapters to be produced by the EIA team is given below:

- Chapter 1: Introduction;
- Chapter 2: Need for the Proposed Road Development and Planning Policy;
- Chapter 3: Examination of Alternatives;
- Chapter 4: Project Description; and
- Chapter 5: Traffic Analysis.
- Chapter 6: Population and Human health;
- Chapter 7: Biodiversity;
- Chapter 8: Land & Soils (incorporating Soils, Geology and Hydrogeology);
- Chapter 9: Water (incorporating Water Quality and Hydrology);
- Chapter 10: Air Quality;
- Chapter 11: Climate;
- Chapter 12: Noise and Vibration;
- Chapter 13: Landscape;
- Chapter 14: Cultural Heritage;
- Chapter 15: Major Accidents and Disasters;
- Chapter 16: Material Assets (Non-Agriculture);
- Chapter 17: Material Assets (Agriculture)
- Chapter 18: Interactions of the foregoing; and
- Chapter 19: Mitigation and Monitoring Measures

9.3 Appropriate Assessment

The obligation to undertake an AA derives from Article 6(3) and 6(4) of the Habitats Directive. The first stage of an AA is to establish whether, in relation to a particular plan or project, an AA is required; this is termed AA screening. Its purpose is to determine whether the bridge could have significant effects on a Natura 2000 site in view of the site's conservation objectives. AA screening requires that potential sources of impact on Special Areas of Conservation (SAC) and Special Protected Areas (SPA) are taken into consideration.

The stages in the AA process are:

- Stage 1 – Screening for AA;
- Stage 2 – AA;
- Stage 3 – Alternative Solutions; and
- Stage 4 – Imperative Reasons of Overriding Public Interest (IROPI)

9.4 Surrounding Environment

9.4.1 Designated sites and protected areas

A number of designated sites are located near the proposed bridge location. Designated sites can be Special Protection Areas (SAC), Special Areas of Conservation (SAC) and National Heritage Areas (NHA). Each designated site type is protected under Irish and European Law due to the recognised qualifying interests of the site be they natural, ecological or cultural values.

The River Abbert forms part of the Lough Corrib SAC (000297) and as such will be crossed by the proposed alignment. In addition, a second designated site Killaclogher Bog NHA (001280) is located some 2km south west of the bridge location. The table below provides a list of the qualifying interests for each site.

Designated Site (and site code)	Qualifying Interests
Lough Corrib SAC (000297)	• Oligotrophic waters containing very few minerals of sandy plains(Littorelletalia uniflorae); • Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea • Hard oligo-mesotrophic waters with benthic vegetation of Chara spp. • Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation; • Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) • Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) • Active raised bogs; • Old sessile oak woods with Ilex and Blechnum in the British Isles; • Degraded raised bogs still capable of natural regeneration; • Depressions on peat substrates of the Rhynchosporion; • Calcareous fens with Cladium mariscus and species of the Caricion davallianae; • Petrifying springs with tufa formation (Cratoneurion); • Alkaline Fens; • Limestone pavements; • Bog woodland; • Lesser Horseshoe bat (Rhinolophus hipposideros); • Atlantic Salmon (Salmo salar); • Otter (Lutra Lutra); • White-clawed Crayfish (Austropotamobius pallipes); • Freshwater Pearl Mussel (Margaritifera margaritifera) Sea Lamprey (Petromyzon marinus); • Brook Lamprey (Lampetra planeri); • Lesser Horseshoe Bat (Lesser Horseshoe Bat); • Slender Green Feather-moss (Drepanocladus vernicosus); • and Slender Naiad (Najas flexilis)
Killaclogher Bog NHA (001280)	• Peatlands

Table 9.1- Designated Sites Qualifying Interests

9.5 Materials

When comparing materials and their impact on the surrounding environment it is imperative to take into account the embodied energy and operational energy requirements. The affects due to steel and concrete production and construction can be comparable in terms of total energy requirement, natural resource consumption and quantity of harmful air emissions.

Concrete production and construction have a greater level of energy consumption compared to other materials. This is associated with the increased quantity of on-site formwork and falsework required, greater transportation costs due to larger and heavier mass of materials and the lengthier installation process with less opportunities for off-site fabrication and additional time allocated for casting and curing of the concrete. Structural concrete use and its energy consumption is linked with the production of a number of harmful emissions including CO_2, CO, NO_2 and hydrocarbon emissions.

Pre-cast concrete solutions should be maximised where possible. Pre-cast solutions reduce the installation time on site, reduce the transportation requirements involved with delivery of the wet concrete and steel rebar and lower the amount of personnel required on site. Pre-cast concrete members are designed in highly optimised and efficient factories so the waste material associated with cast-in-place solutions can be combatted.

In contrast, steel production and construction associate more with the release of volatile organic compounds and hard metal emissions (Cr, Ni, Mn) due to the painting, welding and fabrication involved. Steel solutions can be nearly completely fabricated and assembled in the factory with very high precision. This minimises the material waste and waste disposal requirements, lowers the time on site and reduces the quantity of on-site labour in comparison to concrete. These factors all contribute to steel having a lower embodied carbon impact on the environment.

10. Health and Safety Considerations

10.1 Introduction

It is vital that adequate safety is considered within the design of any construction project. Health and safety will be achieved through communication, competent advice and questioning, effective training and education, management systems and monitoring programmes. Health and safety should be regarded as a core value and the elimination or mitigation of health and safety risks will be considered throughout the design process and from construction to end of service life.

Construction is a dangerous industry with an abundance of risks to the health and well-being of workers, members of the public or the intended user. The hazards include, but are not limited to, harmful substances such as dust and chemicals, injuries from tools, falling from height, manual handling injuries and moving construction vehicles.

The Safety, Health and Welfare at Work (Construction) Regulations 2013 are a statutory instrument in Ireland and are applied across the construction industry. The regulations are enforced by the Health and Safety Authority which was established in 1989 under the Safety Health and Welfare at Work Act, 1999. The Authorities role is to ensure the health and safety at work of all workers in any position. The regulations cover specific requirements for the following work items.

- General safety provisions;
- Evacuation shafts, earthworks, underground works and tunnels;
- Cofferdams and caissons;
- Compressed air;
- Explosives;
- General health hazards;
- Construction work on or adjacent to water;
- Transport, earthmoving and materials-handling, machinery and locomotives;
- Demolition;
- Roads; and
- Construction site welfare facilities.

The regulations also contain duties specific to a number of roles such as Client, Contractor, Project Supervisor Construction Stage (PCSC) and Project Supervisor Design Process (PSDP).

The roles of the Client and the Designer while potentially having the greatest influence in reducing the health and safety risks on the construction site, are the least at risk to the hazards on site. The opposite is the case for the Contractor and Operatives who have the lowest ability to account for safety in the design.

During the design, a Designer's Risk Assessment (DRA) will be prepared in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2013. The DRA will include all risks identified and the resulting mitigation measures or alterations incorporated within the design, where no mitigation is possible the DRA will be used to communicate the risks to the Contractor and site personal. For example, mitigation measures will be put in place to ensure the safety of the construction personnel when working in the vicinity of the river.

Where possible, the hierarchy of risk control will be implemented within the design and construction, with the Designer and Contractor aiming to control all risks through elimination. Where this is not possible, reduction, isolation or mitigation controls will be incorporated to ensure safety during construction.

10.2 Construction Risks

Ensuring the health and safety of the workers, public and end user should always be the priority of everyone involved in a construction project. A risk register listing all potential health and safety issues along with mitigating actions should be developed as early as possible during the design. The risks should be assessed on their severity and probability to all workers and end users. Wherever possible, any risk that can be fully eliminated should be removed from the project by the hierarchy of control. Where elimination is not possible, mitigation measures should be introduced to reduce the probability and severity of the risk as much as possible. In some cases, where it is impossible to eliminate or

mitigate the risk in design the risk should be properly communicated to the respective parties involved in the construction of the project and control measures should be properly implemented.

Schedule 1 of the construction regulations provides the non-exhaustive list of particular risks which should be considered during the development of the risk register:

- Work which puts persons at risk of; Falling from height, burial under earth falls and engulfment in swampland.
- Work which puts persons at risk from chemical or biological substances;
- Work with ionising radiation;
- Work near high voltage power lines;
- Work on wells, underground earthworks and tunnels;
- Work involving the use of explosives; and
- Work involving the assembly or dismantling of heavy prefabricated components.

The above risks are generic and applicable to a large number of construction projects. The following list of particular risks has been identified for the N63 bridge over the River Abbert:

- Construction of the bridge over a river is a specific risk. Lifting heavy beams over water onto the abutments is a high-risk procedure. Actions must be taken to mitigate against the risk of falling materials or debris into the river. The use of permanent formwork will also limit the requirement for temporary formwork over the river during pouring of the insitu concrete deck.
- Transportation of precast frames, beams or prefabricated beams to the building site. The number of traffic movements to and from site should be minimised to avoid increase in the traffic congestion in the area. Beams could be transported late at night or early in the morning to reduce this risk.
- Consideration during design should be given to the safety of the end user when crossing the structure. This will ensure that suitable parapet containment levels and heights are specified, and manageable gradients are applied.

11. Construction and Buildability

11.1 Introduction

Considering the construction and buildability of all structures as early as possibly in the design process is key to ensuring the structure can be successfully delivered through the construction stage. It is also important to consider the local residents of the area and surrounding environment when planning construction to ensure minimal disturbance while construction is taking place.

11.2 Temporary Works

All options use either precast concrete or prefabricated steel components in the design, to maximise the construction time off site and reduce the requirement for fabrication activity on site adding efficiency and enhancing quality for the construction process. Sufficient space should be provided within the lands made available boundary in close proximity to the bridge location. This space will need to ensure that delivery and assembly of structural elements is facilitated. In addition, space should also be provided for piling platforms (should they be required) and crane lifting platforms within the lands made available. At this stage of design development, it should be assumed that lifting platforms will be required on both sides of the river to allow construction of the bridge allowing the Contractor flexibility in their temporary works design for lifting arrangements.

Where possible the need for temporary works will be limited through good design and detailing. For example, the steel girders of Option 2 will be designed to be lifted in braced pairs. This will ensure that the beams are stable at all times during construction and avoid the need for temporary propping following lifting. Similarly, the use of permanent formwork will be maximised within Option 2 and 3 limiting the need for propping of temporary formwork during pouring of the insitu concrete deck.

11.3 Construction Traffic

Consideration will need to be given to the safe traffic movements for both members of the public and construction workers particularly at site entrances and within Abbeyknockmoy. This will be especially important during the transporting of large precast or prefabricated elements. Precast concrete or prefabricated steel components will be utilised in the design, to maximise the construction time off site and reduce the requirement for fabrication activity on site adding efficiency and enhancing quality for the construction process. The transportation of all beams and materials to the site will likely utilise the M17 motorway and the existing N63 road network.

Permission to transport prefabricated and assembled superstructures to the site or site compound will need to be granted by An Garda Siochana by applying for permit for movement of abnormal loads. An Garda Siochana will set out the allowable route, time and speed limits for the loaded vehicle and may need to provide an escort to the transporting vehicle to ensure maximum safety to other road users. It is suspected the bridge will be classed as an abnormal load as set down by Road traffic (Construction and Use of Vehicles) Regulations 2013, S.I. 5 of 2003. Abnormal loads covered under the remit of the aforementioned permit must not exceed size restrictions as set out by the Road Traffic (Permits for Specialised Vehicles) Regulations 2009. The load must not exceed 4.65m in height, 4.3m in width and 27.4m in length.

Option 2 will likely have the lowest requirement for construction traffic as the option requires the least number of large elements to be delivered to site when compared to the other two options. In addition, Option 2 will require significantly less concrete deliveries to site when compared to Option 3 due to the reduced abutment and concrete deck areas.

12. Ground Conditions

12.1 Introduction

The following provides a summary of the desk study and commentary on the findings of ground investigations that have been undertaken for the proposed route.

12.2 Historical boreholes

No historical boreholes or geotechnical investigations are recorded within the study area.

12.3 Geophysical Studies

A geophysical study was carried out and reported in:

- N63 Liss to Abbey Realignment Scheme Co. Galway Geophysical Survey: Draft dated April 7th 2020 by Minerex Geophysics Limited.

The executive summary is as follows

Corridor

The geophysical survey found the general geology along the scheme consisted of deep glacial till overburden over fresh limestone bedrock. There is a thin layer of alluvium identified close to the river and relatively shallow rock near the western end of the scheme.

The EM31 Ground Conductivity and 2D-Resistivity surveys identify the shallowest rock along the scheme as between Ch0 – 110 in the west of the survey area. The extent of alluvium was also identified using these methods and is displayed on Map 3 and Plans 2a – 2c of the above report.

The survey does not indicate karst features along the extent of the corridor. Thick layers of glacial till would provide good protection if the deeper rock should be karstified.

River Banks

Seismic refraction profiles carried out along the river indicate a thin layer of very soft to soft or loose alluvium (Layer A) underlain by firm to very stiff or medium dense to very dense overburden (Layers B –C). Fair to good quality rock (Layer D) was identified between 6 and 12.5 m deep.

Low resistivities (Layer 2) within the high seismic velocity layer (Layer D) along profiles S1/R1 (90 – 150 m) and S2/R2 (100 – 160 m) may indicate a zone of weathered or karstified limestone crossing below the river in a south to north direction. Targeted rotary core holes were recommended here if the bridge will be located here.

The depth to highly consolidated overburden and rock is slightly shallower to the east than at the west along the river banks.

12.4 2020 Geotechnical Investigation

One specific ground investigation has been undertaken to date, reported as follows:

- Report No 22751 N63 Liss to Abbey Realignment Factual Ground Investigation Report (Interim), dated February 2021

In general, the ground investigation utilised the following exploratory techniques:

- Cable percussion (CP) boring in ten locations (BH01 to BH10) sunk using shell and auger techniques. This technique was used to investigate the superficial ground conditions, undertaking in-situ testing and taking undisturbed and disturbed samples for geotechnical/geochemical laboratory testing. Typically, CP boreholes were terminated on encountering refusal on very dense/stiff soils, boulders or weathered bedrock, or at a predefined depth based on the design and construction requirements for the proposed structure/earthwork or upon encountering suspected services.

- Rotary drilling both with and without core recovery (RC02 to RC07 and RC10). Generally, when using rotary drilling within soils standard penetration tests (SPTs) were taken at regular intervals below the depth attained by the CP boring.
    - Rotary drilling without core recovery (RO) was typically used to identify rockhead level and extend CP boreholes to rockhead when the CP could not advance due to obstructions (i.e. very dense/stiff soils or boulders). At RC02, 03, 04 and 10, Symmetrix “full hole cased drilling” techniques were used to advance through the upper deposits.
    - Rotary drilling with core recovery (RC) was typically used in soils to extend CP boreholes beyond obstructions (i.e. very dense/stiff soils or boulders), where more soil information was required than would be recovered by RO methods. The use of a geotechnical wireline triple tube core barrel S-size (“Geobor”) in RC03, 06 and 07 allowed recovery of good quality (Class 1) samples.
    - RC was typically used in rock to provide information on the rock (i.e. lithology, discontinuities, strength, etc.) and recover core samples suitable for laboratory testing.
- Groundwater monitoring standpipes, installed to identify groundwater levels, provide water samples for geochemical testing and monitor groundwater flow were installed in RC03,05,06, and 10.
- Machine excavated trial pits (TP01 to TP10) sunk to identify the near surface ground conditions and, at specific locations, to identify whether there was any archaeological significance. Disturbed samples and, where contamination was suspected, environmental samples were recovered from the trial pits to allow for geotechnical and geochemical testing. In-situ hand vane testing was also carried out in suitable cohesive soils.

12.5 2021 Geotechnical Investigation

An additional rotary core (RC04A) was carried out in April 2021 to target the area described by the geophysics report as possibly indicating a zone of weathered or karstified limestone.

At the time of writing, geotechnical laboratory testing had not yet been completed; however, the draft logs described the following:

- 0 to 1.4 peaty deposits
- 1.4 to 2.80 medium dense gravelly SAND
- 2.8 to 11.8 firm sandy gravelly CLAY with cobbles
- 11.8 to 17.15 Strong to very strong, thickly to thinly bedded, dark blueish grey, fine-grained, LIMESTONE fresh to locally slightly weathered.

The depth to competent limestone was similar to the other coreholes in the vicinity.

Figure 2. 2020 Rotary Core Locations at the Bridge Crossing

Although not shown in the above RC04A is shown at a similar latitude to BH06/RC06 but located immediately south of the river

12.6 Geology

12.6.1 Bedrock

The Geological Survey Ireland (GSI), bedrock geology 1:100,000 Sheet 11 indicates that the study area is entirely underlain by rocks from the Lower Carboniferous (Visean) period; online mapping identifies the rocks to be of the Burren Formation. This stratum comprises pale grey packstones and wackestones but also contains intervals of dark cherty limestones, often associated with oolitic grainstones.

Outcropping limestone is recorded along the western extent of the study area, on the northern banks of the Abbert River.

Bedrock was encountered at depth ranging from 9.4 to 13.2 m below ground level (bgl) in testholes RC02-07. The bedrock was typically described as strong to very strong fresh to locally slightly weathered Limestone: full descriptions are available in the logs.

In RC02, located about 50 m southwest of the south abutment, the driller noted a CLAY band from 14.45 to 15.45 m underlying 1.25 m of slightly weathered Limestone.

Data from rotary boreholes at the bridge site provides the following:

- The Fracture Index (fractures per metre) ranged from 2.3 in RC07 to 4.6 in RC02
- Point load $I_{s(50)}$ tests on 11 samples ranged from 2.5 to 5.26 MPa. This corresponds to a UCS of 69 to 128 MPa using a conversion factor of 20
- UCS tests on 9 samples ranged from 35.73 to 83.08 MPa.
- Seven pH tests measured values between 8.7 and 9. Seven Sulphate (2:1 Water Soluble) as SO4 recorded values between 0.11 and <0.010 g/l.

12.6.2 Superficial Deposits

12.6.2.1 Topsoil

Topsoil was encountered in all testholes and ranged in thickness from 100 mm to 300 mm.

12.6.2.2 Alluvium

These typically comprise soft, soft to firm sandy SILTs with variable gravel contents and were found underlying topsoil and peat/organic soils.

Alluvium was encountered in BH02, 03, 07, 10, RC04, 05 and TP09. The thickness encountered ranged from 0.2 to 1.1 m with an average of approximately 0.6 m.

There may be overlap between the organic soils described as sandy peaty SILT/CLAY and the soil described as alluvium. A lack of organics and a lower moisture content was used to separate the units. There may also be overlap between softened near surface Glacial Till deposits as the descriptions and moisture contents can be similar.

An SPT result of 9 blows per 300 mm was recorded in BH03 at 1 m depth.

Geotechnical laboratory testing indicated the following:

- Four Moisture contents ranged from 9.1 to 53.9 % in this layer with an average of 32 %
- An Atterberg limits test indicated a Non-plastic Silt. The Liquid limit was 23%

12.6.2.3 Peat

Peat and organic soils were generally encountered below the topsoil in the majority of testholes (BH01 to BH06, BH10, and RC02 to RC07. The soil was typically described a soft grey/brown sandy peat SILT to a soft dark brown/black Peat. The thickness of peat ranged from 0.3 to 1.4 m for an approximate average of 0.7 m. The maximum thickness of peat was encountered in BH 01.

These soils are characterised by their high organic contents and moisture contents. An SPT result of 1 blow per 300 mm was recorded in BH 01 at 1 m depth.

Geotechnical laboratory testing indicated the following:

- Five Moisture contents ranged from 49.3 to 308 % in this layer with an average of 175 %
- A one dimensional consolidation test was carried out on a sample of the peat at 1 m depth in BH 01 which indicated the peat is highly compressible upon addition of load.
- A laboratory vane carried out on a sample of the peat in BH01 at 1 m depth indicated an average undisturbed shear strength of 9.4 kPa at a moisture content of 348%.

12.6.2.4 Fluvio-glacial Gravels

Gravels were encountered in the following testholes

- Boreholes:BH01,02,03,04A: typically described as medium dense fine to coarse sandy silty to slightly silty GRAVEL with occasional to some cobbles.
- Rotary Follow on: RC02, 03,04,07: drilled using Symmetrix drilling methods which doesn't facilitate core recovery. Driller described returns of grey silty GRAVEL with cobbles
- Trial pits: TP02,03,05,06,08,10: described as slightly clayey gravelly SAND to sandy Gravels

The gravels were typically found underlying Peat and Alluvium. The thickness of the gravels ranged from about 1.1 m in TP03 to about 11.8 m in RC03. The gravels are likely coarse grained glacial Till and likely interlayered with fine-grained glacial till as shown in RC02

There was a noticeable trend of gravels being most abundant south of the River Abbey. A fines content of less than about 15 to 20% was used to distinguish between fine and coarse grained Glacial Till.

Twenty SPTs ranged from 17 to 60 with an average of 43 blows per 300 mm.

Two pH tests measured values of 8.4 and 9. Two Sulphate (2:1 Water Soluble) as SO4 recorded values of 0.017 and <0.010 g/l. Total sulphate was between 110 and < 100 mg/kg. Two Sulphate (Acid Soluble) tests measured 0.10 and 0.025%.

12.6.2.5 Glacial Till

Fine grained Glacial Till was encountered in the majority of the test holes with the exceptions being RC03, RC04 and TP08.

The fine-grained glacial till generally comprised a stiff to very stiff sandy gravelly SILT with cobbles. The majority of boreholes refused within this layer. The maximum thickness of fine-grained Glacial Till was encountered in RC10 at about 11.6 m

Fines content in excess of about 15 to 20% was chosen to differentiate between the engineering behaviour of coarse grained and fine grained Glacial Till.

Sixty two SPTs ranged from 10 to 70 with an average of 43 blows per 300 mm.

Geotechnical laboratory testing indicated the following:

- 26 Moisture contents ranged from 6.4 to 22.3 % in this layer with an average of 11 %
- 16 Atterberg limits indicted the fines content behaved as a Non-Plastic SILT. The liquid limit varied between 16 and 36 % for an average of 22%
- Two undrained shear strength in triaxial compression without pore pressure measurement tests indicated an undrained shear strength of 23 and 25 kPa at a strain at failure of 19.8% in BH06 and BH09A at 2.5 m depth respectively.
- Laboratory vanes also carried out in samples taken at 2.5 m depth in BH06 and BH09A had undrained shear strengths of 4.6 and 13 kPa respectively. The samples were both described as grey brown slightly sandy slightly gravelly SILT.
- Four Moisture Condition Value tests had results of <1,7.6,8.4, and 9 at depths ranging between 0.5 to 0.7 below ground level.
- Six pH tests measured values between 7.2 and 10. Six Sulphate (2:1 Water Soluble) as SO4 recorded values all <0.010 g/l. Six total sulphate was between 200 and < 100 mg/kg. Six Sulphate (Acid Soluble) tests measured 0.041 and 0.025%.

12.6.3 Hydrology and hydrogeology

12.6.3.1 Hydrology

The main surface water feature within the study area is the River Abbert, which bisects the study area flowing from east to west. Historical mapping has shown the course of the river has changed over time either through natural erosion and deposition by the river channel or artificially through human intervention and land drainage schemes.

12.6.3.2 Aquifers

The site is entirely underlain by a regionally important karstified (conduit) aquifer (aquifer category Rkc).

There are no karst features recorded within the study area. However, there is a spring and two enclosed depressions (dolines) recorded 250m and 900m south of the study area, respectively. As a result of these features coupled with the presence of an underlying karstified limestone aquifer, the potential for karst within the study areas should be considered.

The northern portion of the study area is within a zone of moderate groundwater vulnerability. The area south of the Abbert River is predominantly within a zone of high to extreme groundwater vulnerability.

12.7 Foundations

The investigation has shown that underlying the soft organic and alluvial soils there is predominantly granular deposits to the south west of the River Abbert with more fine-grained glacial tills to the north east. Consolidation of underlying granular deposits will typically occur during the period of the construction programme whereas the fine Glacial Till will undergo a longer settlement duration.

To eliminate the potential for differential settlements associated with shallow footings with the relatively large bridge loads, it is proposed that the Bridge is piled with the piles deriving a significant portion of their capacity via a rock socket likely in excess of 2 m. This will also help de-risk the project with respect to the drop in rock head noted in the geophysics report but not observed in the ground investigation. Bedrock was encountered at depth ranging from 9.4 to 13.2 m bgl in testholes RC02-07. The bedrock was typically described as strong to very strong fresh to locally slightly weathered.

At the detailed design stage, the pile design should be carried out in accordance with Eurocode 7 – Part 1. and the Irish annex. There may be benefit in having a specialist piling contractor carry out the detailed design as part of the works requirements

13. Consultation with Relevant Authorities

13.1 Key Stakeholders

A number of stakeholders have been contacted as part of an ongoing consultation process for the proposed bridge. Further consultation will be required with all bodies as part of the development of a conceptual design and any further works. Consultation will be ongoing throughout the design to achieve a successful planning outcome.

Stakeholder	Contact Name	Title
Galway County Council	Aengus Breathnach	Senior Executive Engineer
	Shaun McLaughlin	Assistant Engineer
Transport Infrastructure Ireland	John Iliff	Head of Structures
	Fergal Cahill	Structures Project Manager
	Jerry O'Sullivan	Archaeologist
Office of Public Works	Liam Ward	-

Table 13.1- List of Relevant Authorities

13.2 Utility Providers

A review of the service records provided by Utility Providers has shown that no utilities are present at the bridge location or in close proximity that will be affected by the construction of the bridge.

14. Conclusions and Recommendations

The results of the multi-criteria analysis (MCA) carries out on the three options is presented in the table below. A detailed breakdown of the MCA process has been detailed Appendix B.

Assessment Criteria	Option 1 Precast Portal Frame	Option 2 Steel Girder	Option 3 Precast W19 Beams
Technical			
Economic			
Aesthetic			
Durability & Maintenance			
Environmental			
Health & Safety			
Construction & Buildability			
Ground Conditions			

Table 14.1- Summary of MCA Ratings

In summary, the following key assessment and considerations are noted:

- Technical – Option 2 while being a slightly more complicated design when compared to the other options will ensure that the bridge design is lean with all structural elements aiming to achieve 100% utilisation. The large dead zones of the other two options are significant disadvantages.
- Economic – Option 2 is the cheapest option to construct based on an all-in construction rate per m^2. The significant dead zones of the other two options substantially increase their construction cost.
- Aesthetics – Option 2, the steel option, is the most aesthetically pleasing option due to the arched soffit profile. The other options also both have substantial dead zones on either side of the carriageways are a disadvantage coupled with the significant structural depth of Option 3.
- Durability and Maintenance – The use of weathering steel for Option 2 significantly improves its durability and maintenance requirements. The use of bridge bearings and expansion joints are a disadvantage.
- Environmental – Option 2 has the lowest embodied energy of the three options considered making it the most advantageous options.
- Health and Safety – All three options require the transportation of large precast/prefabricated structures and will all be assembled on site. Option 2 requires far less crane lifts when compared to the other options, in addition, the option has a far lower requirement for working over water when compared to Option 3.
- Construction and Buildability – Option 2 will require the least number of large structural elements to be delivered to site. In addition, this option will also have the lowest number of crane lifts when compared to the other options presented. The use of permanent formwork and lifting the beams in braced pairs significantly reduces the temporary works required.
- Ground Conditions – The use of bearings in this option will result in all loads being transferred to the foundations axially without any additional horizontal loads or bending moments reducing the size of foundations compared to Option 3.

Its visible from the results of the MCA that Option 2 Steel Girder is the most favourable option when compared to the alternatives and it is this option which is proposed for selection as the emerging preferred bridge option and will be carried forward to the Preliminary Bridge Design.

Appendix A – Drawings

NOTES:

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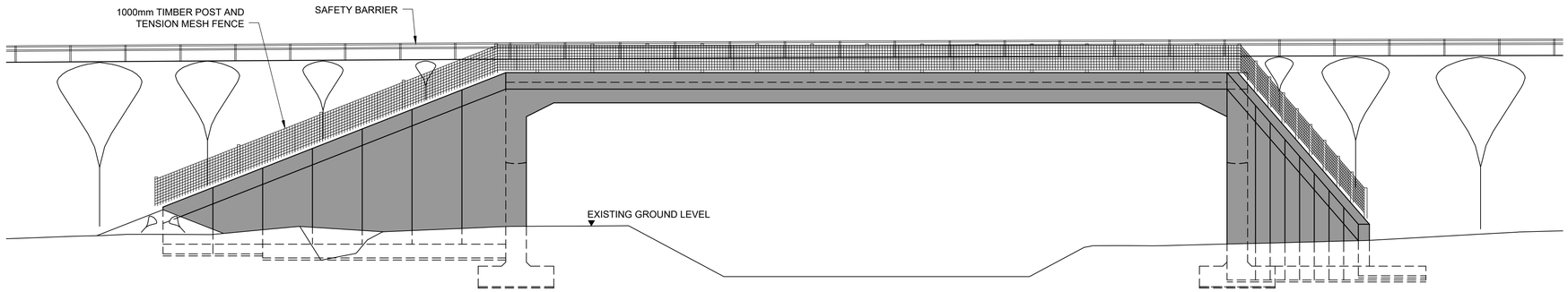

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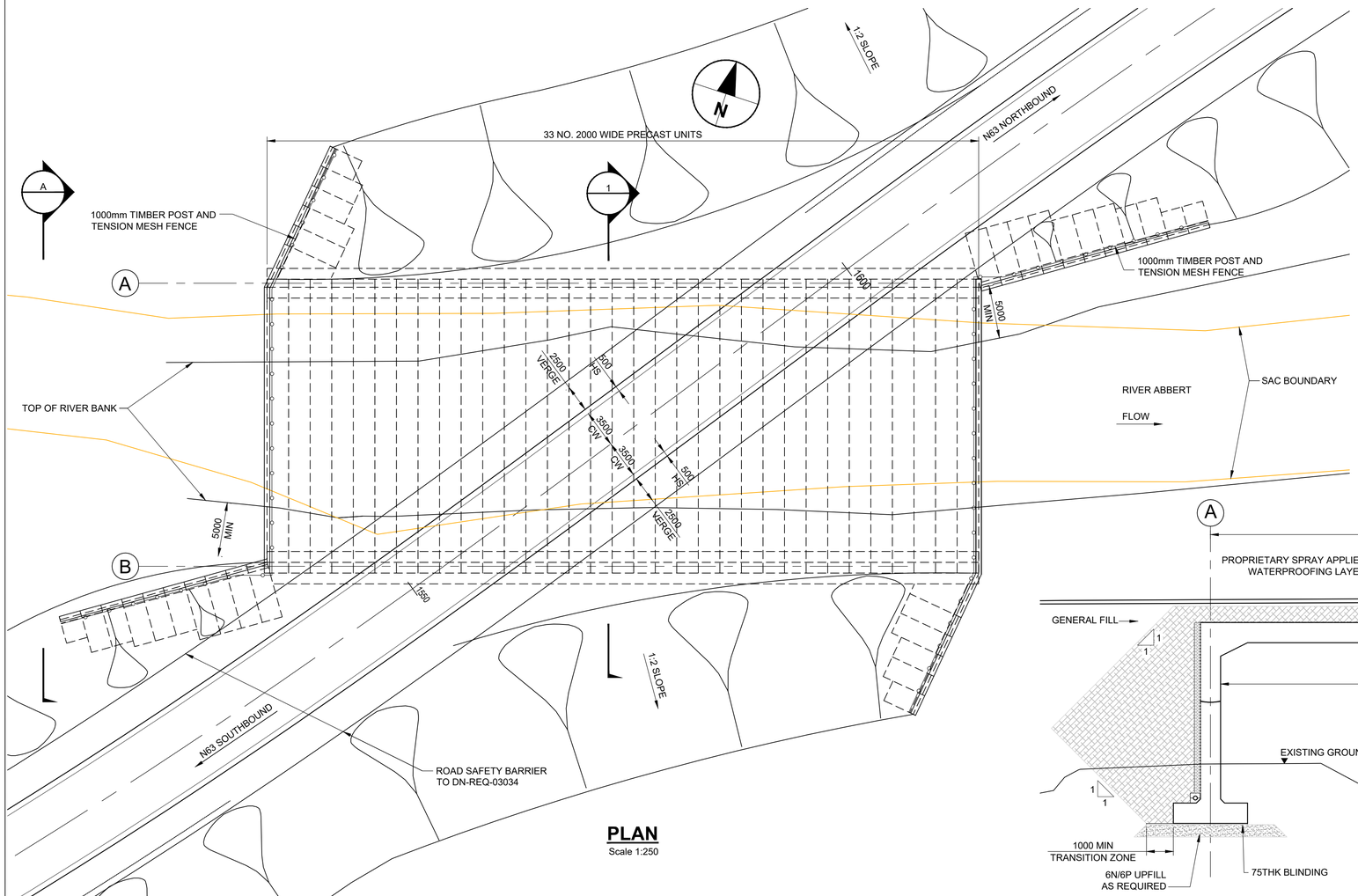

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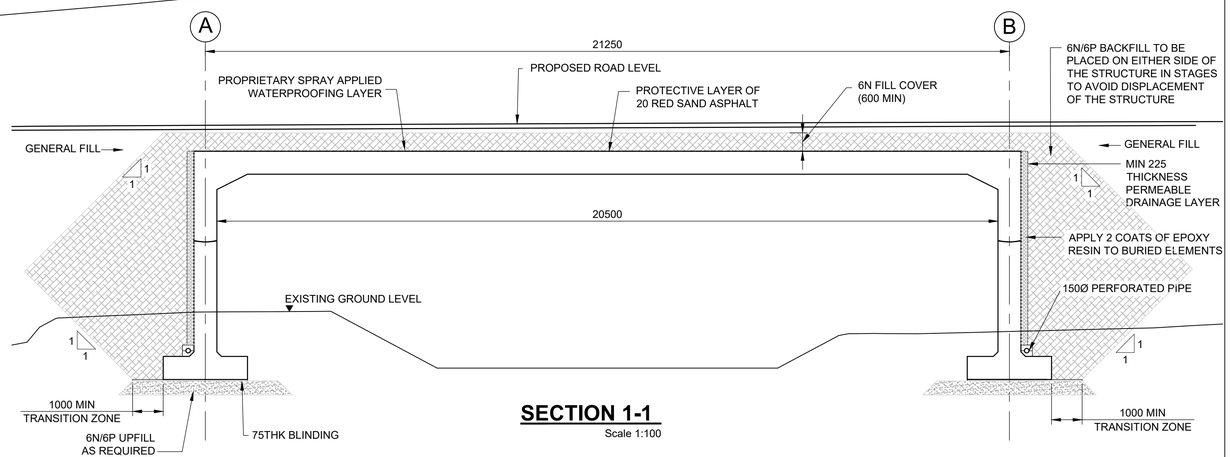

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Bonneagar Iompair Éireann
Transport Infrastructure Ireland

GALWAY NATIONAL ROADS PROJECT OFFICE

Comhairle Chontae na Gaillimhe
Galway County Council

Project Ireland 2040
Building Ireland's Future

No.	Revision	Date	By	Chk'd	App'd

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Drawn	Designed	Checked	Approved	Suitability Code - Description
DSH	AC	AC	NR	S0 - Work In Progress

Project Title	N63 LISS TO ABBEY REALIGNMENT SCHEME
Drawing Title	BRIDGE OPTION 1 GENERAL ARRANGEMENT
Drawing Number	Project | Originator | Phase | Series | Type | Dept. | Number: N63 - ACM - PH03 - 0000 - DR - SE - 0100
Scale:	AS SHOWN
Date:	09.10.2020
Job No:	60597858
Rev:	D1

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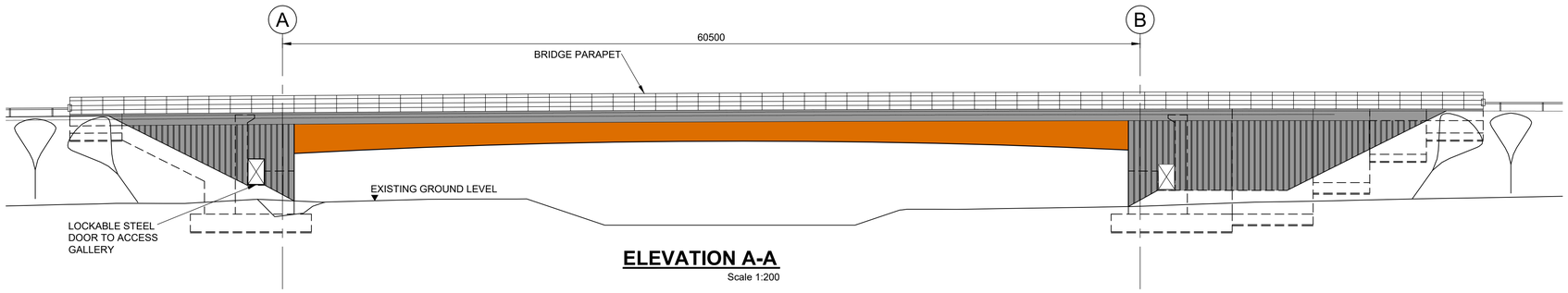

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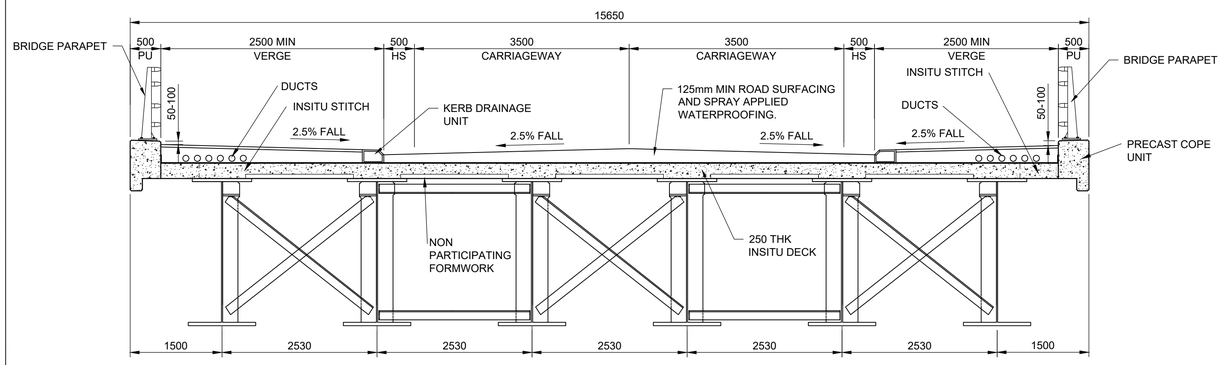

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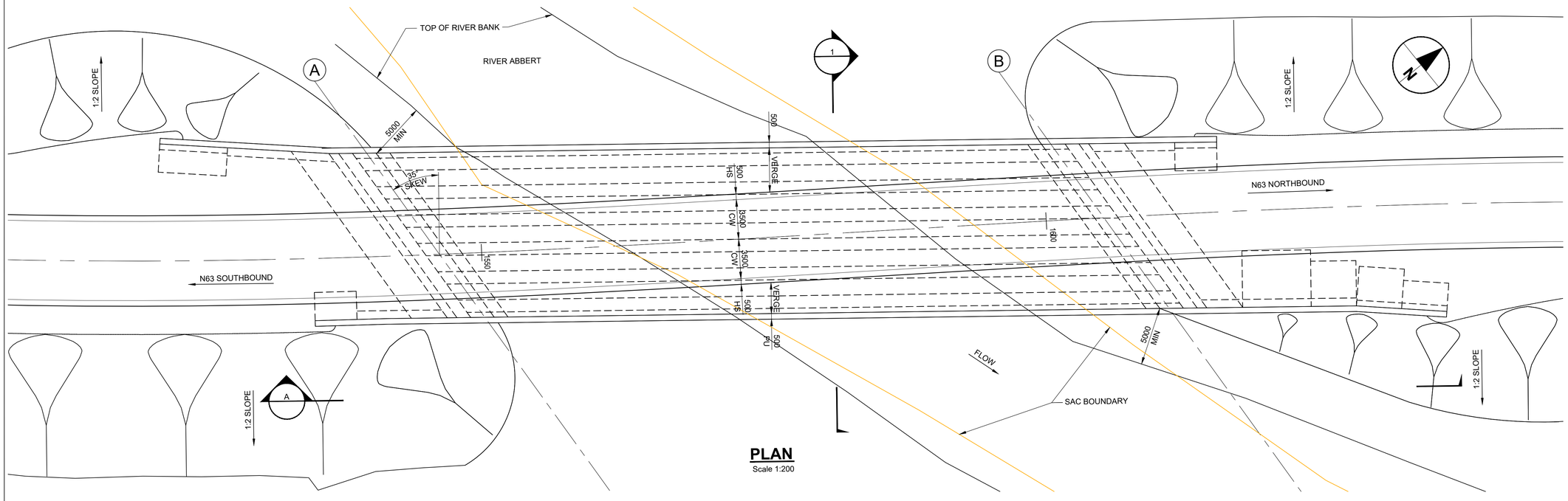

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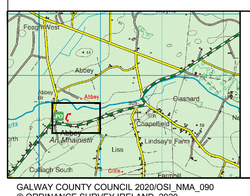

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Drawn	Designed	Checked	Approved	Suitability Code - Description
DSH	AC	AC	NR	S0 - Work In Progress

Project Title: N63 LISS TO ABBEY REALIGNMENT SCHEME

Drawing Title: BRIDGE OPTION 2 GENERAL ARRANGEMENT

Drawing Number	Project	Originator	Phase	Series	Type	Dept.	Number
	N63	ACM	PH03	0000	DR	SE	0200

Scale:	Date:	Job No:	Rev:
AS SHOWN	06.10.2020	60597858	D1

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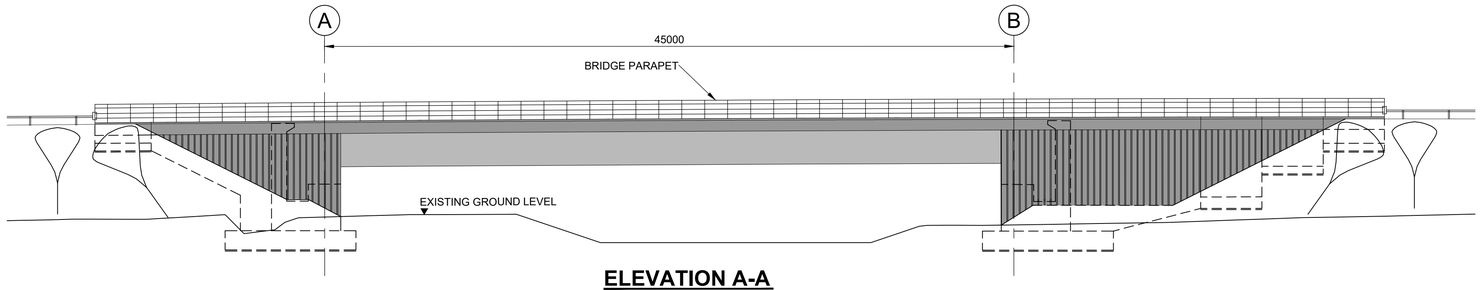

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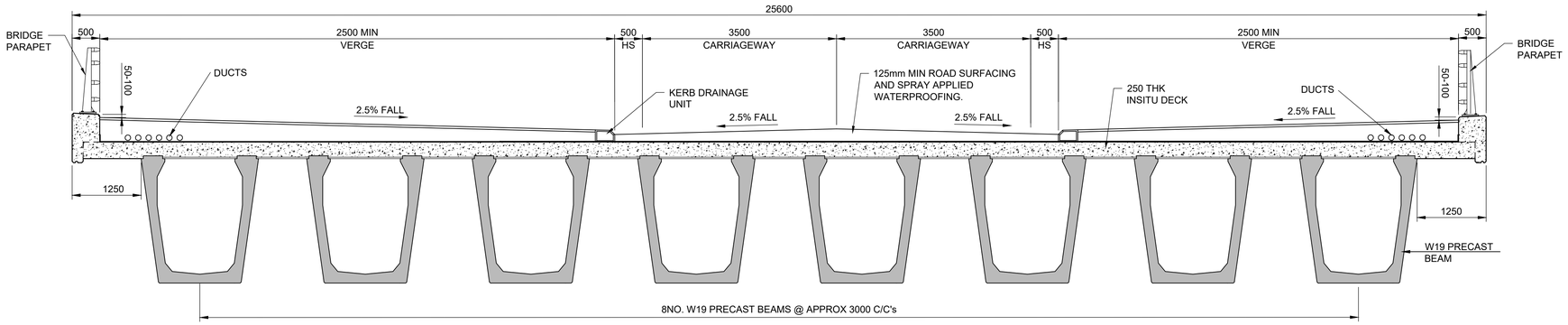

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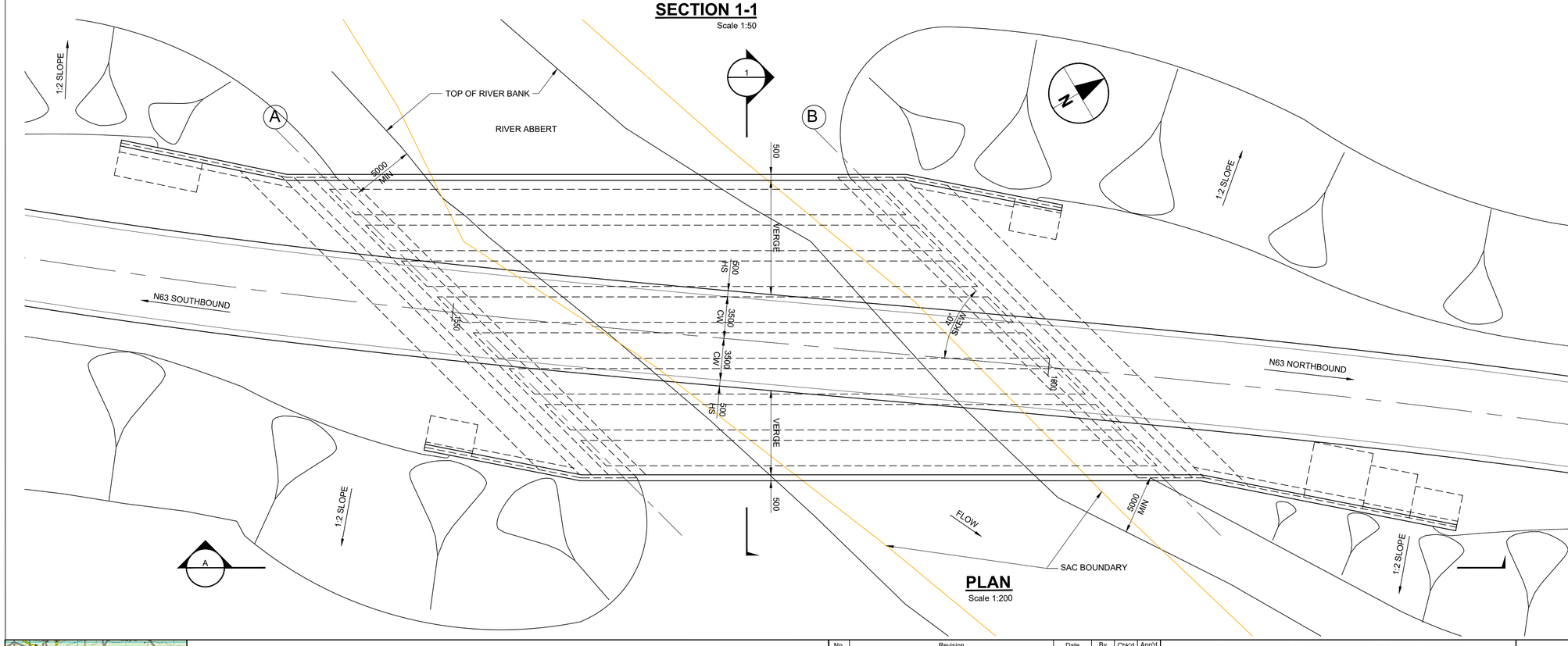

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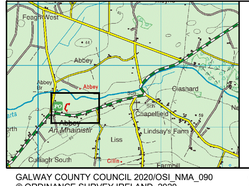

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

GALWAY NATIONAL ROADS PROJECT OFFICE

Comhairle Chontae na Gaillimhe
Galway County Council

Project Ireland 2040
Building Ireland's Future

No.	Revision	Date	By	Chk'd	App'd

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Project Title	N63 LISS TO ABBEY REALIGNMENT SCHEME
Drawing Title	BRIDGE OPTION 3 GENERAL ARRANGEMENT

Drawing Number	Project	Originator	Phase	Series	Type	Dept.	Number
	N63	ACM	PH03	0000	DR	SE	0300

Scale:	Date:	Job No:	Rev:
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Appendix B – Option Rating Evaluation

The options have been evaluated and rated under the following list of criteria:

- Technical;
- Economic;
- Aesthetic;
- Durability & Maintenance;
- Environmental;
- Health & Safety;
- Construction & Buildability; and
- Ground Conditions.

Each option has been ranked using the rating table below against each of the options under each criterion, a justification for each ranking has also been provided. The option appearing the most advantageous when compared with the other options will be deemed the preferred solution.

Colour	Description
	Significant advantages over the other options
	Some advantages over other options
	Neutral compared to other options
	Some disadvantages compared to other options
	Significant disadvantages compared to other options

Assessment Criteria	Option 1 Precast Portal Frame	Option 2 Steel Girder	Option 3 Precast W19 Beams
Technical	Option 1 is the simplest option to design. The buried portal frame will be designed based on a metre strip analysis based on the worst-case location. However, the significant area of dead zones are undesirable and will be overdesigned. The option will be an integral structure which will be beneficial due to the lack of bearings and joints. The presence of multiple restraint systems such as the road restraint system and timber post and rail fence is a disadvantage due to the additional material and clutter created on the top of bridge deck.	Option 2 will be a slightly more complicated design than the other two options.The lack of dead areas offer significant advantages to the other two options, resulting in a lean bridge design that will aim for 100% utilisation of the structural elements. The use of bearings in this option will result in all loads being transferred to the foundations axially without any additional horizontal loads or bending moments reducing the size of foundations compared to Option 3. The option will be a category 3 structure requiring an independent checking company which is a disadvantage compared to the other options.	The integral design of Option 3 is likely to be complicated to achieve due to the expected thermal expansions and contractions. The soil structure interaction will require detailed analysis to ensure that this movement can be accommodated. In addition, horizontal loads and bending moments are likely to be transferred to the foundations requiring increased foundation sizes when compared to the other options.
Economic	Option 1 is the second most expensive option with an economic estimate of €5,175,000.000	Option 2 is the cheapest option with an economic estimate of €4,725,000.00	Option 3 is the most expensive option with an economic estimate of €5,316,000.00
Aesthetic	The large dead zones of Option 1 and the large structure width will create a large environmental intrusion on the landscape particularly when viewed from the National Monuments. In addition, the dead zones detract from the expression of function of the structure.	The weathering steel option is aesthetically the most advantageous of the three options presented. The option will have an arched soffit which is aesthetically please in additional the thinner section properties of the arch make the option seem lighter and airier than the other two options. The lack of dead zone also lends itself to a better form of structure with the function of all elements being clear and concise.	Option 3 will have the largest structural depth of the options presented. This structural depth will require the largest approach embankments creating the largest visual barrier from the National Monuments restricting views of the surrounding undulating landscape. The large structural depth coupled with a low vertical clearance over the river is likely to make the concrete option seem oppressive with squat proportions.
Durability & Maintenance	Reinforced concrete as a structural material can be relatively robust to the elements if designed correctly and maintained properly. Provided that minimum cover requirements are satisfied, and correct steel quantities used a durable structure should be created. Being a fully integral bridge, the lack of bearings and expansion joints provides major savings in maintenance costs over the lifetime of the structure.	Option 2 proposes the use of weathering steel which is a highly durable and robust material requiring limited inspection and maintenance over its lifetime. However, the introduction of bearings and expansion joints are a disadvantage of this option when compared to the other two presented as it leads to having more elements and connections to maintain and inspect.	Reinforced concrete as a structural material can be relatively robust to the elements if designed correctly and maintained properly. Provided that minimum cover requirements are satisfied, and correct steel quantities used a durable structure should be created. Being a fully integral bridge, the lack of bearings and expansion joints provides major savings in maintenance costs over the lifetime of the structure.

Assessment Criteria	Option 1 Precast Portal Frame	Option 2 Steel Girder	Option 3 Precast W19 Beams
Environmental	Option 1 and Option 3 create similar environmental concerns due to the concrete production and construction have a greater level of energy consumption when compared to steel equivalents. This is associated with the increased quantity of on-site formwork and falsework required, greater transportation costs due to larger and heavier mass of materials and the lengthier installation process with less opportunities for off-site fabrication and time allocated for casting and curing of the concrete.	Option 2 is the best option environmentally. Steel production and construction associate more with the release of volatile organic compounds and hard metal emissions (Cr, Ni, Mn) due to the painting, welding and fabrication involved. Steel solutions can be nearly completely fabricated and assembled in the factory with very high precision. This minimises the material waste and waste disposal requirements, lowers the time on site and reduces the quantity of on-site labour in comparison to concrete. These factors all contribute to a lower embodied carbon impact on the environment compared to concrete.	Option 1 and Option 3 create similar environmental concerns due to the concrete production and construction have a greater level of energy consumption when compared to steel equivalents. This is associated with the increased quantity of on-site formwork and falsework required, greater transportation costs due to larger and heavier mass of materials and the lengthier installation process with less opportunities for off-site fabrication and time allocated for casting and curing of the concrete.
Health & Safety	All 3 options require the transportation of heavy prefabricated or precast structures to site and the lifting of them over the water. Option 1 however has a distinct advantage in that extremely limited concrete works will be required over the river limiting the risks for construction workers. The large number of elements that require craning into position pose a higher risk to H&S when compared to the other options.	This option will require significant works over the river for the construction of the insitu bridge deck. Suitable edge restraints will be required to prevent construction workers from falling off the edge. Lifting the steel beams in braced pairs reduces the beam lifts to three which is a significant reduction in H&S risks.	This option will require significant works over the river for the construction of the insitu bridge deck. Suitable edge restraints will be required to prevent construction workers from falling off the edge. The large number of elements that require craning into position pose a higher risk to H&S when compared to the Option 2.
Construction & Buildability	The precast portal frame will be designed and built off-site with reinforced concrete. The fully integral structure will be erected onsite on pre-poured concrete foundation slabs. As the majority of elements are precast construction time will be significantly reduced compared to the other two options.	Option 2 will require the least number of large structural elements to be delivered to site. In addition, this option will also have the lowest number of crane lifts when compared to the other options presented. The use of permanent formwork and lifting the beams in braced pairs significantly reduces the temporary works required.	Option 3 will likely have the longest construction time with significant number of beam lifts required. In addition, a significant number of large 45m bridge beams will need to be transported to site causing disruption to the residents and members of the public.
Ground Conditions	Option 1 is likely to impart the lowest loading on its foundations resulting in lower foundation requirements, however, the significant width of option 1 will result in extremely wide foundations when compared to the other options.	The use of bearings in this option will result in all loads being transferred to the foundations axially without any additional horizontal loads or bending moments reducing the size of foundations compared to Option 3.	The soil structure interaction will require detailed analysis to ensure that this movement can be accommodated. In addition, horizontal loads and bending moments are likely to be transferred to the foundations requiring increased foundation sizes when compared to the other options This option will also be significantly heavier than the other options, which will lead to increased foundation sizes.

Appendix A4:

Description of the Proposed Road Development

Appendix A4-1

Outline Construction Environmental Management Plan

Outline Construction Environmental Management Plan

N63 Liss to Abbey Realignment Scheme

Galway County Council

February 2022

Quality information

Prepared by	Checked by	Verified by	Approved by
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Revision History

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1. Introduction

1.1 Background

AECOM have been appointed to undertake the Outline Construction Environmental Management Plan (Outline CEMP) for Galway County Council (GCC) as part of the documentation to accompany the planning application for the N63 Liss to Abbey Realignment Scheme.

This Outline CEMP sets out the procedures, standards, work practices and management responsibilities to address potential environmental effects that may arise from construction of a 2.3 km national secondary road (hereafter referred to as the Proposed Road Development) in Abbeyknockmoy, Co. Galway (hereafter referred to as the 'Site').

The Outline CEMP outlines the approach that will be adopted to environmental management throughout the Project works at the Site, with the primary aim of reducing any adverse effects from construction on the environment. It could therefore form part of the Contract Documents for the construction stage. The Outline CEMP remains at all times a live document, subject to amendment including the revision and addition of content throughout the works. In this context, the values and information presented herein is subject to change and refinement through the selection of the contractor and the delivery of the Proposed Road Development.

This Outline CEMP shall be further refined and expanded upon by the appointed Contractor (hereafter referred to as the Contractor) into a full Contractor CEMP should the Proposed Road Development receive planning permission. As more certainty and more information becomes available in terms of the proposed layout, construction methods, programme and potential environmental impacts to be mitigated against this information should incorporated into the Contractor CEMP. The elements contained within this Outline CEMP will be included in the Contractor's CEMP, which will be prepared prior to construction by the appointed Contractor and approved by GCC.

At the end of the construction phase, the Contractor shall prepare a Handover Environmental Management Plan (HEMP) that shall contain essential environmental information needed by the bodies responsible for the future maintenance and operation of the asset.

With this purpose in mind, it therefore follows that this Outline CEMP should be treated as a live document throughout the Proposed Road Development lifecycle, requiring regular review and update as necessary.

1.2 Objectives

The objectives of this Outline CEMP and any subsequent Contractor CEMP are therefore to:

- Act as a continuous link and reference document for environmental issues between the design, construction, testing and commissioning stages of the Proposed Road Development;
- Demonstrate how construction activities and supporting design shall properly integrate the requirements of environmental legislation, planning consent conditions, policy, good practice, and those of the environmental regulatory authorities and third parties;
- Record environmental risks and identify how they will be managed during the construction period;
- Record the objectives, commitments and mitigation measures to be implemented together with programme and date of achievement;
- Identify key staff structures and responsibilities associated with the delivery of the Proposed Road Development and environmental control and communication and training requirements as necessary;
- Describe the Contractor's proposals for ensuring that the requirements of the environmental design are achieved, or are in the process of being achieved, during the Contract Period;

- Act as a vehicle for transferring key environmental information at handover to the body responsible for operational management. This shall include details of the asset, short and long-term management requirements, and any monitoring or other environmental commitments; and
- Provide a review, monitoring and audit mechanism to determine effectiveness of, and compliance with, environmental control measures and how any necessary corrective action shall take place.

1.3 Scope

The scope of this Outline CEMP covers the design and construction of the N63 Liss to Abbey Realignment Scheme.

As described in Section 2 (Project Description) the spatial scope of the Proposed Road Development will cover the:

- Site boundary;
- Any additional working areas;
- Access to and egress from Site (s).

This Outline CEMP considers the following subject areas:

- Environmental Management;
- General Site Management;
- Air Quality and Climate;
- Cultural Heritage;
- Biodiversity;
- Land and Soils;
- Water
- Noise and Vibration;
- Traffic Management; and
- Waste Management.

It is noted that the Outline CEMP provides guidance, both descriptive and prescriptive, for the information to be included in the CEMP by the Contractor and the CEMP is the Contractor produced document that describes how the information and conditions provided in the Outline CEMP and outlined in any planning consent conditions or planning documentation is incorporated and adhered to respectively.

2. Project Description

2.1 Location

The Proposed Road Development is situated to the northeast of Galway City, located along the existing N63 corridor. The N63 is a national secondary route, and this section of the N63 is located directly to the east of Abbeyknockmoy village. The Proposed Road Development is a 2.3 km road realignment on 13.8 ha which extends from the eastern edge of Abbeyknockmoy, to the townland of Derreen and on towards the junction of the N63 with the L6234. The Proposed Road Development crosses the Abbert River, which is part of the Lough Corrib Special Area of Conservation (SAC), and is adjacent to Abbeyknockmoy Cistercian Abbey, a National Monument. The location is characterized by presence of open greenfield area with some wooded areas along the River Abbert. The south side of the existing N63 is lined by residential properties, and several community facilities are located in proximity of the junction with the local road L3110. Figure 2-1 highlights the approximate location of the Proposed Road Development.

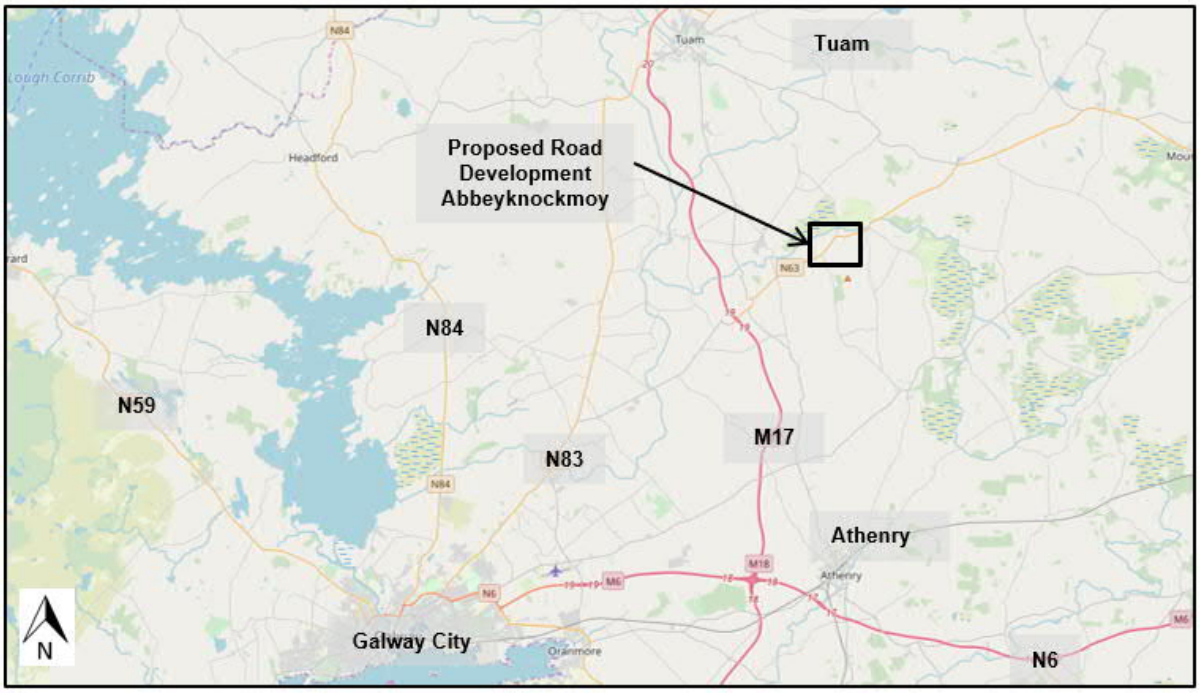

Figure 2-1 Approximate Location of the Proposed Road Development

2.2 Overview

The Proposed Road Development runs in a south-west to north-east direction across the Abbert River. Starting on the eastern edge of Abbeyknockmoy and running north-east to the proposed tie-in with the existing N63 at the L6234 junction.

Beginning at Abbeyknockmoy village, the Proposed Road Development will deviate offline to the north of the existing N63 and be connected to the existing road network through a three-armed roundabout. From there, it will continue in a north-easterly direction through agricultural land before crossing the Abbert River at a skewed angle of approximately thirty-five degrees. The proposed alignment will then sweep east and continue through more agricultural land, running parallel to the existing N63. The alignment then crosses the L6159 and continues east through an area of existing woodland until it ties in with the existing N63 at its junction with the L6234. The existing L6159 will be realigned to create a north/south staggered junction with the proposed alignment, and the L6234 will be realigned to tie in with the proposed alignment.

The Proposed Road Development comprises the following major elements:

- Approximately 2.3 km of new Type 2 Single Carriageway road (predominantly offline);
- One new roundabout at the western end of the Proposed Road Development to provide connection with the existing N63;
- Two new priority junctions to provide connection to the existing L6159 and L6234, including some minor local road realignments;
- One new clear span steel girder bridge crossing of the Abbert River;
- Seven new piped culverts and two new box culverts over existing field ditches;
- Three new flood alleviation culverts (box culverts);
- New pedestrian and cycle facilities, predominantly located along the existing N63;
- Associated earthworks including excavation of unacceptable material (2000 m3), excavation and processing of rock and other material, and recovery of unacceptable material for re-use in the works;
- Accommodation works, including the provision of access roads and accesses;
- Drainage works, including the construction of attenuation ponds in accordance with sustainable drainage design principles and guidance;
- Treatment of surface water run-off prior to outfall discharge, spill containment measures and attenuation treatment facilities;
- Utilities and services diversion works including medium voltage (10 kV/20 kV) overhead lines and EIR overheard lines;
- Safety Barriers, Public Lighting, Fencing;
- Viewing area for Liss Abbey with parking;
- Landscaping planting works, signage, lighting and other works ancillary to the construction and operation of the Proposed Road Development;
- Construction of farm access tracks with accommodation works ancillary to the Proposed Road Development; and
- Environmental measures and other ancillary works.

3. Environmental Management

3.1 Overview

As noted earlier, the CEMP shall fully address the particular requirements of the objectives listed in Section 1.2 of this Outline CEMP, and any updated or new supplementary environmental reports made available to the Contractor as necessary. The CEMP shall also comply with the requirements of the relevant authorities/environmental bodies.

The CEMP shall be prepared by the Contractor and submitted to GCC for approval prior to works commencing on Site. It shall be prepared in sufficient detail to describe the framework of the Contractor's proposed management, control and mitigation strategy for each environmental aspect. Consideration will also be given to relevant adjacent developments in the management of future construction activities on Site. The CEMP should include, where required, specific Method Statements for specific works (e.g. working in or near watercourses) and these should be included in Appendix B.

The CEMP shall be developed/updated as necessary during the course of the design and construction phases and will be reviewed on a regular basis with GCC as necessary.

3.2 Environmental Aspects and Impacts

The Contractor will prepare a project specific Project Environmental Risk Assessment (ERA), which will be included in Appendix C. The Contractor should also include the following:

- Environmental guidelines on how to prepare an ERA;
- Monitoring and checklists that shall be implemented to manage the environment;
- Environmentally sensitive area(s) and control measures to be implemented on site which will be included as an appendix to the CEMP; and
- The procedure for undertaking an ERA to assist in the identification of environmental aspects of the Proposed Road Developments activities, products and services.

3.3 Roles & Responsibilities

The Contractor shall employ a suitably experienced and SEM to undertake co-ordination of monitoring of the works' impacts and implementation of the Contractor's proposals, in respect of all environmental requirements. Further information is provided in Table 3-1.

A Site Environmental Manager (SEM) shall be present on-site for the duration of the Proposed Road Development.

The SEM shall be the point of contact for dealing with environmental issues for the Contractor's employees, Subcontractors, relevant authorities/environmental bodies, and members of the public. The SEM will also be responsible for controlling the construction impacts arising from the activities of the Contractor and his Subcontractors in accordance with the CEMP.

The SEM shall prepare, implement, manage, review and revise the CEMP with the sole purpose of ensuring that the environment is safeguarded at all times from anticipated or unexpected adverse impacts during construction.

Within the Contractor's team, the SEM shall have the authority to ensure that the CEMP is effectively implemented. The SEM must notify the GCC of any transgressions in respect of the CEMP so that necessary sanctions can be imposed.

In general, the duties of the SEM shall include the following:

- Implementation of the CEMP procedures;
- Routine environmental monitoring, recording and reporting;
- Maintaining and auditing the CEMP and documents that underpin it;

- Environmental training including daily toolbox talks to site staff and design staff;
- Liaison with statutory authorities as required;
- Assist in liaison with the relevant authorities/environmental bodies and local community;
- Any other activities that may be necessary in order to protect wildlife and the environment during the works.

In addition, other environmental specialists as listed in Table 3-1 must be available to provide advice on the CEMP during construction. The CEMP shall typically place environmental responsibilities on the key roles within the Proposed Road Development/Project as set out below.

Table 3-1 Key Contractor Team Roles and Responsibilities (indicative)

Role	Responsibilities
Contractor's Project Director	▪ Assign specific environmental duties to competent members of the Contractor's Team. ▪ Identify the environmental training needs of personnel under their control and arrange appropriate training programmes and ensure records are being maintained. ▪ Ensure that significant environmental aspects identified for the Project are managed. ▪ Promote the continual improvement of environmental performance
Site Environmental Manager	▪ Develop, maintain and audit the CEMP (and supporting documents/plans) to ensure all aspects, impacts and statutory requirements etc. are reflected in the CEMP. ▪ Develop and implement a programme of regular Project environmental inspections, monitoring, recording and reporting by the Environmental Site Representative(s) in accordance with procedures set out in the CEMP. ▪ Ensure that the works are constructed in line with the CEMP. ▪ Liaise with statutory authorities. ▪ Attend regular construction meetings to ensure environmental issues are discussed and addressed by the Contractor's Team. ▪ Liaise with relevant authorities/environmental bodies and the local community as required. ▪ Comply with duties under relevant legislation and company procedures in relation to environmental incident investigation and reporting. ▪ Provide support and training to the workforce with regard to understanding environmental aspects, impacts, regulatory requirements, best practice, constraints and methods of working. ▪ Nominate the Environmental Site Representative(s). ▪ Appoint environmental specialists as required. ▪ Ensure identified environmental specialists are in attendance on-site as required by the CEMP. ▪ Review non-conformance reports provided by the Environmental Site Representative(s) and/or the Inland Fisheries Ireland Environmental Advisors to identify any underlying issues or patterns to identify suitable ameliorative measures
Contractor's Project Manager	▪ Ensure that the CEMP is produced, maintained, implemented and distributed to all relevant parties. ▪ Provide an on-call 24hr resource as a first point of contact for environmental issues/incidents. ▪ Monitor the completion of corrective actions by the Site Manager and act as required to expedite completion. ▪ Provide regular reports to the GCC on environmental performance, including details of any identified incidents or non-conformances and corrective actions. ▪ Ensure that all personnel for whom they are responsible are aware of the CEMP and implement the relevant requirements. ▪ Evaluate the competence of all subcontractors and suppliers and ensure that they are made aware of and comply with the CEMP and associated procedures. ▪ Establish a consultation and communication system with all relevant stakeholders and interested parties associated with the Project, including employees, partners, sub-contractors, designers and third parties, etc., where relevant.

Role	Responsibilities
Site Manager	▪ Ensure that all personnel undergo suitable and sufficient environmental induction before starting work on the Project, and periodic refresher environmental awareness training throughout the construction. ▪ Ensure staffs attend the appropriate environmental courses that are organised by the Environmental Manager or CEMPC. Ensure the Environmental Manager is maintaining records of training delivered to site staff. ▪ Monitor the performance of personnel and activities under their control and ensure arrangements are in place so that all personnel can work in a manner which minimises risks to them and to the environment. ▪ Undertake a programme of regular environmental inspections in liaison with the Environmental Site Representative(s). ▪ Complete any corrective actions identified by the Environmental Site Representative(s) and provide status reports as required to GCC. ▪ Assist and support the Environmental Manager (CEMPC) and statutory bodies in the investigation of any incidents. ▪ Notify the Environmental Site Representative(s) of all environmental issues or incidents arising over the course of operations.
Environmental Specialists (i.e. Ecological Clerk of Works (ECoW)	▪ Attend site as required to monitor the protection of asset in accordance with the requirements of relevant legislation, the Environmental Impact Assessment Report (EIAR) mitigation measures, the construction contract and the CEMP. ▪ Identify potential risks to wildlife and develop suitable control measures. ▪ Provide status reports and updates to the Environmental Site Representative(s) in the completion of their activities.

3.3.1 Ecology Specific Roles and Responsibilities

3.3.1.1 Role of the Contractor

Ecological monitoring will be undertaken by the Contractor's Ecological Clerk of Works (ECoW), through site inspections. Additional monitoring will be undertaken by the client's Ecological Specialist. Monitoring will be undertaken through construction and works monitoring. Visual surveys will be undertaken of works to ensure that all required environmental protection measures are in place. Visual surveying of watercourses will also be undertaken, and water quality will be tested by the ECoW through the use of calibrated handheld equipment. Turbidity, pH and conductivity measurements will be taken at drain and riverine locations to assess the effectiveness of mitigation measures. The monitoring programme will require monitoring during construction works, at drain outfalls, and the main channel (both upstream and downstream of works). Ecological monitoring by the ECoW will focus on assessing and highlighting pollution risk and ensuring adequate mitigation and works practices are ongoing in line with this EIAR and CEMP, to ensure no adverse effects of works on the environment. The chronicling of mitigation, monitoring, and reporting of aspects of the Ecological Monitoring Strategy (EcMS) is the responsibility of the ECoW.

The Contractor will carry out a continuous programme of water quality monitoring during the construction phase, whose parameters and requirements will be agreed with the NPWS, IFI and the Client's Ecological Specialist. This monitoring programme will require, at a minimum, the deployment of an upstream and downstream continuous recording meter in the Abbert River between 50 m -500m upstream and 250m-1 km downstream of the works area). These meters will monitor water quality and upload results, so that water parameters can be read in real time by the contractor and client to monitor water quality within the Abbert River (within Lough Corrib SAC).

3.3.1.2 Ecological Specialist and Ecological Clerk of Works

Prior to commencement of construction, a suitably experienced Ecologist will be engaged as part of the Employer's Representative (ER) Team. The Ecologist (referred to throughout this document as 'Ecological Specialist') will be a full member of a relevant professional institute such as the Chartered Institute of Ecology and Environmental Management (CIEEM), have relevant experience in the management of ecological constraints during construction, and hold or have held a protected species licence(s) in the Republic of Ireland. The Ecological Specialist shall be appointed sufficiently in advance of the Proposed Road Development to arrange for any mitigation requirements to be incorporated into the Contractor's site-specific programme. The Ecological Specialist will:

- Oversee carrying out of pre-construction surveys to the appropriate TII specifications (TII, 2005-2011);
- Supervise and direct construction of the Proposed Road Development as part of the Employer's Site Representative (ESR) Team;
- Communicating and reporting pre-construction survey findings, and associated actions and plans arising to GCC, the Contractor, the NPWS and/or the IFI as appropriate;
- Agree on a water monitoring programme with NPWS and IFI, which will include turbidity, conductivity and pH;
- Ensure mitigation addresses any changes in site conditions since completion of surveys that informed the EIAR in 2020 and 2021;
- Review Contractor's method statements to ensure compliance with mitigation measures outlined within the EIAR and NIS carried out for the Proposed Road Development; and
- Liaise with the Contractor in regard to ecological requirements and mitigation for works and aspects of non-compliance with ecological requirements, if applicable.

The Client/Client Representative team will ensure the Ecological Specialist has the necessary support in their role to carry out the duties required;

Prior to commencement of construction, a suitably experienced ECoW will be engaged as part of the Contractor's Team. The ECoW will be a full member of a relevant professional institute such as the Chartered Institute of Ecology and Environmental Management (CIEEM), have relevant experience in the management of ecological constraints during construction. During construction and handover phases, the ECoW will oversee, advise, and facilitate the proper implementation of all ecological mitigation measures by the Contractor, and fulfil the requirements of the Ecological Monitoring Strategy (EcMS), to include consultation input from the NPWS and IFI. The Contractor will accommodate the ECoW, whose role will be to:

- Oversee and advise the appointed Contractor(s) on implementation of mitigation during construction and handover phases;
- Communicate relevant matters to the Contractor, the Client, and other stakeholders as required;
- Review and aid in the development of Contractor Method Statements for compliance with the mitigation requirements in the EIAR and NIS carried out for the Proposed Road Development;
- Conduct site monitoring including surface water monitoring, and monitoring of Annex I habitats as noted in the EIAR;
- Attend site meetings and give input to Contractor toolbox talks prior to commencement and during construction of the Proposed Road Development;
- The ECoW will ensure that the contractor is aware of and adheres to the required mitigation and will liaise with the clients' Ecological Specialist in terms of ecological considerations and mitigation;
- The ECoW will determine the potential requirement for licences outside the scope of this EIAR Chapter (e.g. Frogspawn translocation); and Pre-Construction Surveys

3.3.1.3 Ecological Monitoring Strategy

The Ecological Specialist will review the EIAR, the NIS, planning consent conditions, post-consent consultations with statutory bodies, and the results of pre-construction surveys, to inform production of an 'Ecological Monitoring Strategy" (EcMS). The EcMS will be followed by the contractor, through their ECoW.

The function of the EcMS will be to:

- Monitor and chronicle installation of mitigation, effectiveness of mitigation, results of mitigation and plan mitigation.
- Inform adaptive management measures to be agreed with GCC and advised to the Contractor; and,
- Provide an evidence-base to be communicated to the NPWS and IFI, on the effectiveness of mitigation measures proposed, to inform improvements to industry practice.
- Track contractor performance in relation to implementation of the ISSAMP; CEMP, WMP, CESCP.

The specific aims of the EcMS will be to monitor and oversee the correct implementation of mitigation from the EIAR, CEMP, any planning consent conditions and any additional mitigation identified during pre-construction surveys and instruct the Contractor on how to adapt mitigation as required, with particular regard to (but not limited to):

- Results of pre-construction surveys which may identify new ecological constraints within the ZoI of the Proposed Road Development;
- Implementation of the ISSAMP; CEMP, WMP, CESCP and water quality monitoring.
- Phasing of works including piling, earthworks, and vegetation clearance in response to potentially unforeseen weather conditions or programme changes;
- Phasing of works in accordance with habitat and species-specific ecological recommendations i.e. bird nesting season, Common Lizard mitigation, amphibian mitigation, bat mitigation and the season for instream/drain works and piling and any other relevant considerations highlighted in this EIAR.
- Assessing condition and performance of silt fencing, silt de-watering sacs and other aspects of the CESCP, as informed by site observations by the ECoW, and the results of the Contractor's water quality monitoring;
- Assessing and advising on working methodologies for activities onsite;
- Ensuring directional lighting is used to minimise light spillage on the QI of the Lough Corrib SAC and the Abbert River;
- Ensuring construction and installation of mammal fencing (including lead-in planting, and access ramps);
- Ensuring appropriate installation of culverts and pipe crossings (to ensure and enable mammal, amphibian, and fish passage (TII (2005), IFI (2006));
- Ensuring the drafting and implementation of a habitat translocation, monitoring and maintenance plan, to translocate, maintain and enhance the Annex 1 *Molinia* Meadows;
- Implementation of Annex I *Molinia* Meadows and Petrifying Spring monitoring and conservation plan; and
- The appointed ECoW will report the actions taken under the EcMS to GCC, and the NPWS and IFI in agreement with GCC. The Ecological Specialist may also report on actions to NPWS and IFI.

3.4 Complaints

A Complaints Register for internal communication and for receiving, documenting and responding to environmental complaints from external parties will be established and will be maintained. When a complaint is received, the following information must be taken:

- Date and time of the complaint are recorded;
- Name of complainant (if provided);
- Nature of complaint;
- All complaints received from external sources must be reported to the SEM and Senior Management; and
- All complaints received from external sources and incidents must be reported to the SEM.
- Complaints must be dealt with in a timely manner and reported to GCC monthly.

3.5 Monitoring and Inspections

Monitoring and inspection activities will be carried out on activities that can have a significant environmental impact as outlined in the sections below.

3.6 Environmental Auditing

Planned and documented audits aimed at evaluating the conformance of the Proposed Road Development shall be carried out. The frequency of the audits will be agreed in advance with GCC. As a minimum, the CEMP will be reviewed and audited every 6 months or as per any planning condition requirements or GCC requirements and updated in line with current guidance and legislation.

4. Environmental Management Procedures and Plans

4.1 General Site Management

A list of relevant legislation and guidance should be included by the Appointed Contractor in Appendix D.

4.1.1 Working Hours/Periods

- Onsite construction works shall be permitted to take place between 08:00hrs and 18:00hrs Monday to Friday and between 08:00hrs and 13:00hrs on Saturdays or as directed by GCC and any planning consent conditions;
- Working outside these hours will only take place in exceptional circumstances unless agreed in advance with GCC;
- No works shall take place on Sundays or Bank Holidays. In exceptional cases, GCC may permit works to proceed outside the above times/days. This will be subject to the written agreement of the GCC prior to such works proceeding. Locations of works that are anticipated to be outside normal working hours will be defined and confirmed.

4.1.2 Site Housekeeping

- Good housekeeping is an important part of good environmental practice and helps to maintain a more efficient and safer site. The site should be tidy, secure, and have clear access routes that are well signposted. The appearance of a tidy, well-managed site can reduce the likelihood of theft, vandalism, complaints and/or specific hazards that could affect the safe operation of the other businesses in the area, such as bird hazards and wind-blown litter.
- As outlined in the fourth edition of CIRIA's 'Environmental good practice on site guide' (C741), when considering good housekeeping, the Contractor will implement the following steps:
  - Adequately plan the site with designated areas of materials and waste storage;
  - Segregate and label different types of waste as it is produced and arrange frequent removal;
  - Keep the site tidy and clean;
  - Ensure that no wind-blown litter or debris leaves the site, use covered skips to prevent wind-blown litter;
  - Keep hoarding tidy – repair and repaint when necessary, removing any fly posting or graffiti;
  - Frequently brush-clean wheel washing facilities and keep haul routes clean from site derived materials;
  - Keep roads free from mud by using a road sweeper;
  - Ensure site is secure.

4.2 Air Quality and Climate

4.2.1 Potential Impacts

Negative air quality impacts can come from many sources during construction. Emissions from the construction phase are transient in nature and will include emissions from vehicles and plant, and dust-raising activities from earthworks and construction processes utilising concrete and aggregates. Dust and air pollution, including odours, can cause disruption to properties and the public adjacent to the construction works, and can also have adverse impacts upon other environmental receptors, including watercourses and ecologically designated sites.

Climatic impacts are expected to be minor emissions of greenhouse gases to the atmosphere from truck movements and the operation of site construction equipment.

Mitigation and general control measures (as described below and within the EIAR) shall be required so that construction works are carried out in such a manner that emissions of dust and other pollutants are limited, and that best practicable means are employed to minimise disruption, risks to human health, and to avoid unnecessary impacts on sensitive ecological habitats.

4.2.2 Environmental Mitigation, Control Measures and Proposals

For each of the potential sources of an environmental impact on the existing environment, the Contractor will identify the control and protection measures to be implemented. The following mitigation and general control measures should be followed as a minimum to ensure no significant adverse direct and indirect effects on the environment arise from the Proposed Road Development.

It is recommended that standard industry good practice mitigation measures should be applied to the Proposed Road Development site, such as that described in ‘Control of dust from construction and demolition activities’ (Kukadia et al., 2003), ‘Best Practice Guidance: The control of dust and emissions from demolition and construction’ (GLA, 2006), and ‘Guidance on the assessment of dust from demolition and construction’ (IAQM, 2014).

4.2.2.1 General Measures

The Contractor will be required to implement measures to minimise the amount of dust and emissions (including odour) produced during the Proposed Road Development. There will be a Duty of Care on the Contractor to ensure that dust-raising activities are located away from sensitive receptors, such as nesting birds and residential dwellings as much as feasibly possible and duration kept to a minimum when in proximity to a receptor/activity.

The Contractor shall follow the relevant mitigation measures that are outlined below and any additional mitigation measures from the planning consent document.

The important aspects of air quality mitigation include:

- The assignment of responsibility for dust and emissions (including odour) management to an individual member of the Contractor’s staff (i.e. SEM);
- Training staff to understand the importance of the issue;
- Communicating with the local community (as necessary).

Regular site inspections shall be undertaken by the Contractor’s SEM to monitor compliance with the CEMP and record inspection results. It is anticipated that a daily visual check will be carried out and these records will be available to GCC.

- The Contractor shall comply with the mitigation measures that may be provided in planning consent documents (including the EIAR and NIS), , statutory authority requirements, and any updated or new supplementary environmental reports made available to the Contractor as necessary.
- Works shall be planned to consider the location of sensitive receptors, sensitive core activities associated with operation of other businesses, local topography, wind direction and any potential sources of pollution.

- Discussion with the GCC shall be undertaken at an early stage by the Contractor to determine any specific monitoring requirements and to agree to any proposed trigger/action levels.

4.2.2.2 Vehicle and Plant Emissions

Emissions to the atmosphere, in terms of gaseous and particle pollutants from vehicles and plant used on-site, should be controlled and limited, as far as reasonably practicable, using measures and appropriate control techniques as listed below:

- The engines of all vehicles and plant on-site should not be left running unnecessarily (i.e. idling) to minimise exhaust emissions (and noise);Vehicles and plant shall adhere to applicable emissions standards;
- Plant, equipment and emission control apparatus shall be selected to minimise the engine exhaust emissions, taking into consideration economic constraints and practicability;
- Vehicles and plant shall be in good working order and certified where applicable, with servicing completed in line with manufacturer's recommendations. Records of servicing shall be maintained, and visual checks carried out to ensure that black smoke is not emitted at times other than at ignition;
- Haul routes and plant shall be situated and operated away from sensitive receptors and sensitive core activities associated with operation of other businesses (where possible);
- The use of diesel or petrol-powered generators shall be minimised, with mains electricity of battery powered equipment used as an alternative (where feasible);
- Movement of vehicles and plant shall be minimised around the site;
- Vehicle/plant exhausts shall be directed away from the ground to minimise risk of re-suspension of ground dust; and
- Maximise energy efficiency, which may include using alternative modes of transport, maximising vehicle utilisation by ensuring full loading and efficient routing.

4.2.2.3 Climate Mitigation Measures

The following Greenhouse Gas (GHG) mitigation measures will be implemented during the construction stage of the Proposed Road Development:

- Proposed planting of trees, hedgerows and other vegetation onsite, as described in Chapter 07 Biodiversity and Chapter 13 Landscape and Visual of the EIAR;
- A Traffic Management Plan (TMP) will be produced prior to construction and implemented in full, minimising congestion and encouraging car sharing and the use of public transport; and
- It is a requirement that a CEMP will be prepared by the appointed Contractor prior to construction and will include various measures to reduce GHG emissions, including:
  - Specification of locally-sourced construction materials where possible, including re-use of site-won materials in line with circular economy principles;
  - Handling materials efficiently onsite to minimise the waiting time for loading and unloading, thereby reducing potential emissions;
  - Turning off machinery engines when not in use;
  - Ensuring regular maintenance of plant and machinery;
  - Specification of materials with lower embodied carbon where possible, such as recycled steel and concrete with cement replacements (e.g. Ground Granulated Blast Furnace Slag (GGBS) and Pulverised Fly Ash (PFA)); and
  - A requirement for the contractor to implement an Energy Management System for the duration of the works.
- Climate change projections will be considered when determining appropriate materials (e.g. consideration of materials with increased tolerance to high temperatures).
- The construction stage CEMP will include a requirement to plan for additional mitigation measures to avoid wind-blown dust issues during potential extended periods of dry weather during construction.

4.2.2.4 Control of Dust

The Contractor shall implement mitigations measures from the TII (2011) 'Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes'. Examples are as follows:

- Wind breaks and barriers;
- Frequent cleaning and watering of the construction site and associated access roads;
- Control of vehicle access;
- Control of vehicle speed restrictions;
- Covering of piles;
- Use of gravel at Site exit points to remove caked on dirt from tyres and tracks;
- Washing of equipment at the end of each work day and prevention of onsite burning.
- Where appropriate and practicable, hard surface roads should be wet swept to remove any deposited materials;
- Un-surfaced roads should be restricted to essential Site traffic only; and
- Wheel-washing facilities should be located at all exits from the Site.

A Dust Management Plan that will form part of the contractor's CEMP.

4.2.2.4.1 Generation of Dust

- The Contractor should take all necessary measures to minimise disturbance caused by dust, during construction works.
- As per industry standard for the construction phase, the TA Luft Regulations limit value of 350 mg/m^2/day (as accepted by the Irish EPA) will be adhered to by the Contractor.
- Visual inspections shall be undertaken regularly by the Contractor when dust-raising activities are occurring. Inspections should consider prevailing meteorological conditions, and results shall be recorded, maintained and available for inspection upon request.
- Measures to minimise the amount of dust produced might include, dampening haul roads and stockpiles, keeping roads clean and using covers to minimise dust blow from haulage vehicles. Appropriate measures should reflect the nature of the construction activity (type, dust source points, construction operation periods and time of year) as well as ameliorating conditions (such as prevailing wind directions and speeds, typical precipitation and the dampening effect of retained soil moisture. Possible methods of reducing and controlling dust emissions during construction are listed in Table 4-1 and detailed further in sub-sections below.

Table 4-1 Possible Dust Control Measures

Operation	Dust Control Measure
Drilling	▪ Use dust-extraction equipment such as filters, on exhaust air emissions from drill rigs
Loading/Unloading	▪ Reduce drop heights wherever practicable ▪ Protect activities from wind
Material storage	▪ Dampen material. ▪ Protect from wind and store under cover. ▪ Screen material to remove dusty fractions prior to external storage.
Overburden handling	▪ Protect exposed material from wind (by keeping material within voids or protecting them by topographical features) ▪ Spray exposed surfaces of mounds regularly to maintain surface moisture unless mound surface has formed a crust after rainfall or is grassed ▪ Minimise handling.

Operation	Dust Control Measure
Soil handling and storage	▪ Restrict the duration of the activity. Seal and seed storage mound surfaces as soon as is practical. ▪ Protect surfaces from winds until disturbed areas are sealed and stable.
Transport by vehicle within and off-site	▪ Restrict vehicle speed. ▪ Water unsurfaced roads and paved roads. ▪ Wheel or body wash at an appropriate distance from site entrance. This should always be within the site, and the roadway from the washing facility to the road shall be hard-surfaced. ▪ Load and unload in areas protected from wind. ▪ Minimise drop heights. ▪ Sheet or cover loaded vehicles. ▪ Use water sprays/spray curtains to moisten material. ▪ Sweep/wash paved roads. ▪ Use paved roads where practicable.

4.2.2.4.2 Vehicle and Plant Dust

- Care shall be taken to ensure that machinery or dust-causing activities shall be sited away from sensitive receptors and sensitive core activities associated with operation of other businesses where practicable.
- The production of dust shall be considered when selecting plant equipment, with apparatus with emission controls being chosen, as far as economically practical.
- Vehicles shall not be overloaded, and all loads entering and leaving the construction site and carrying waste and other dusty materials shall be adequately sheeted to prevent the spillage of material during transport.
- Any cutting and grinding operations to be carried out should use equipment and techniques which incorporate dust suppression measures and reduce emissions.
- Facilities for vehicle washing/wheel washing shall be provided on site at the site compounds, as well as procedures for effective cleaning and inspection of vehicles, to keep dust and mud off the public road network.

4.2.2.4.3 Earthwork Dust.

- Exposed earthworks shall be kept damp at all times to prevent airborne dust emissions. Should this not be possible, windbreaks shall be used to minimise the potential for dust generated by wind erosion.
- Dust generation shall be minimised from earthworks by sealing or seeding of surfaces to stabilise them as soon as possible.

4.2.2.4.4 Site Fires

- No site fires are permitted.

4.2.2.4.5 Dust arising from Haul Roads, Compounds and Works Areas

- Haul roads will be damped down using water, spraying will be repeated regularly and frequently during warm and sunny weather (including treatment for any run-off containing suspended solids) where required.
- Hard standing surfaces used within the construction site shall be regularly maintained and kept clean.
- An approved mechanical road cleaner shall be employed to clean the site's hard standing area and the public roads in the vicinity of the site.
- Wheel washing facilities shall be provided at site compounds. They shall be used by all vehicles leaving the site and should be checked and maintained regularly. A record of all checks and maintenance should be kept by the Contractor and should be available for inspection at any time.

4.2.2.4.6 Dust arising from Materials Handling and Storage

- Materials stockpiles on site shall be designed so as to minimise dust generation by wind erosion (i.e. no steep-sided stockpiles or mounds or those that have sharp changes in shape), covered securely, or damped down or suitably treated to prevent the emission of dust.
- Stockpiles and mounds shall be located away from the Site boundary, sensitive receptors, watercourses and surface drains and sited to consider the predominant wind direction.
- Stockpiles shall be maintained at suitable heights.
- Double handling of material shall be avoided wherever reasonably practicable.
- Drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment shall be minimised, with fine water sprays used on such equipment wherever appropriate.
- Where drop heights are greater than 2 m, suitable dust suppression measures shall be utilised to control dust emissions.
- Stockpiled materials that are likely to remain undisturbed for a significant duration shall be vegetated or covered. In the case of long-term stockpiles, they can be seeded, re-vegetated or turfed to stabilise surfaces.
- Any construction materials stored within the site shall be located away from the site boundary and downwind of sensitive receptors unless used for the purposes of screening.
- The site shall be regularly inspected by the Contractor for spillages of dusty or potentially dusty materials and shall have procedures in place for prompt clearance of any such spillage.
- The frequency of site inspections shall be increased when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

4.3 Cultural Heritage

4.3.1 Potential Impacts

The Cultural Heritage Assessment identified one heritage asset partially located within the Proposed Road Development site. This is the planned landscape of Newtown (Ref: 5365) which is located at the east extent of the Proposed Road Development. There are no other recorded heritage assets within the footprint of the Proposed Road Development, though 17 are noted within the surrounding 500 m study area. There is potential for unrecorded archaeological deposits within the Proposed Road Development site.

Potential impacts during the construction phase include for example:

- Partial or total removal of heritage assets during site clearance and contractor compound areas;
- Impact of landscaping, spoil disposal and planting on the setting of heritage assets, and damage caused to archaeological deposits caused by planting or earthwork embankments;
- Compaction of archaeological deposits due to construction traffic movement or materials storage; damage through rutting of superficial deposits from construction traffic;
- Vibration and changes in air quality (dust), causing damage to historic monuments during construction;
- Effects on the setting of heritage assets, including visual and noise intrusion, and changes in traffic levels; and

Given the potential impact to known heritage assets and previously unrecorded archaeological assets, it is recommended appropriate mitigation strategy be applied during the construction phase, as outlined in the below section.

4.3.2 Environmental Mitigation, Control Measures and Proposals

For each of the potential sources of an environmental impact on the existing environment, the Contractor will identify the control and protection measures to be implemented. The following mitigation and general control measures should be followed as a minimum to ensure no significant adverse direct and indirect effects on the environment arise from the Proposed Road Development.

4.3.2.1 General Measures

During the construction phase, procedures will be adopted, to ensure that archaeological areas and sites are protected during construction. This will involve temporary fencing where appropriate and clear notices onsite fences. Toolbox talks will be undertaken when necessary to inform construction supervision staff and site operatives of archaeologically-sensitive areas.

A procedure to agree a minimum period of time to undertake mitigation actions for unforeseen finds during the construction process will be agreed with the Employer and will be recorded in the Contractors CEMP.

In addition:

- The Contractor shall ensure that mitigating measures outlined in the Outline CEMP, planning consent, and any updated or new supplementary environmental reports are included in the CEMP.
- The Contractor will agree with the planning authority details regarding any further cultural heritage requirements (including, if necessary further testing) prior to commencement of construction works and demolition on the Site.
- Archaeological monitoring of all earthmoving works for site preparation will be undertaken to ensure that any features of an archaeological nature that may be revealed are identified, recorded and fully resolved. Hoardings, additional support and temporary weathering will be provided, if required for protected structures onsite.
- If any features of archaeological potential are discovered during the course of the construction phase, further archaeological mitigation may be required such as preservation in-situ or by record.

4.3.2.2 Archaeological Works

Archaeological testing will be carried out at the pre-construction phase in areas identified in the construction impacts section above where the Proposed Road Development has the potential to impact upon archaeological remains (see Volume 03; Figure 14.7 in the EIAR). All archaeological works (which will be agreed by the Archaeological Consultant and the National Monuments Service (NMS)) will be carried out in compliance with the National Monuments Acts 1930 – 2004 and Policy and Guidelines on Archaeological Excavation (Department of Arts, Heritage Gaeltacht and the Islands, 1999).

A suitably qualified and licensed Archaeological contractor will be appointed to carry out the archaeological fieldwork. Relevant licenses will be acquired from the Department for Housing, Local Government and Heritage (DoHLGH)/NMS and the National Museum of Ireland (NMI) for all archaeological works, which will be carried out in accordance with an Overarching Method Statement for Archaeological Works prepared by the Archaeological Consultant and agreed with the NMS. It is anticipated that all archaeological works will be completed pre-construction. This is in accordance with the Code of Practice between the TII and the Minister for Arts, Heritage, Regional, Rural and Gaeltacht Affairs (formerly Arts, Heritage, Gaeltacht and Islands), 2017.

4.3.2.2.1 Archaeological Mitigation Programme

It is anticipated that the archaeological mitigation programme will commence prior to the start of the main construction works.

During Phase 1 (during the enabling works or as soon as access is available) – a programme of extensive test trenching, and if appropriate, test pit evaluation will be undertaken along the entire Proposed Road Development, including within the Compulsory Purchase boundary. Sample-based mechanical or hand excavated trenches will be used to assess and record the character of archaeological remains. Targeted trenching will be used where remains have been identified through non-intrusive survey (geophysical survey/assessment of historic cartographic sources such as CH1 former islands and CH3 former mill pond) or where there is potential for archaeological remains to be discovered. The results of these intrusive trenching or test pit investigation works will inform decision-

making on further mitigation recording that may be appropriate. Geo-archaeological assessment will also be carried out and the upstanding building at CH2 will be subject to a simple building survey involving photography and a written description.

Phase 2 (during enabling works) – areas or sites that require preservation by record and that were identified at Phase 1 for detailed excavation, will be investigated. This will also determine the scope of further mitigation works. If additional detailed geo-archaeological investigations are required, these will also be carried out. A General Watching Brief (GWB) will be carried out for ground works, such as utility diversions, road diversions, ecology works, and woodland clearance at certain locations. Investigation of important small-scale historic landscape features, such as land boundaries and townland boundaries, will be carried out, including topographic survey of earthwork features and historic building recording. Detailed design work for preservation *in-situ* will be developed if required.

Phase 3 (during later enabling works and in advance of and concurrent with construction) – at the start of the construction period, a Targeted Watching Brief (TWB) will be undertaken before or concurrent with the main topsoil strip at selected locations. The GWB will be undertaken in all other areas where it is required.

Phase 4 – a post-excavation assessment will be undertaken in accordance with DoHLGH/NMS advice, followed by an appropriate programme of detailed analysis and reporting. Phase 4 will commence as soon as practicable following completion of the main investigative works. Galway County Council will also require that the results of any archaeological discoveries will be disseminated in the form of printed publications, web-based information and public presentations by the archaeological contractor.

4.3.2.3 Awareness and Training

During the Proposed Road Development induction meeting, all contractors will be made aware of the presence of an Archaeologist who will monitor earthmoving and excavation activities.

4.4 Biodiversity

4.4.1 Potential Impacts

In the absence of mitigation, the Proposed Road Development could have a range of potential impacts on the Qualifying Interests (QIs) within the Zone of Influence (ZoI)[1] during the construction phase. Potential impacts during construction include habitat loss, habitat deterioration, disturbance (i.e. visual, vibration and noise, temporary barriers to connectivity, etc.) and the potential for the release of pollutants and contaminants (i.e. suspended solids, oils, fuels, paints, concrete, lime, etc.) to receiving watercourses.

A range of factors influence the potential significance of effects including vulnerability of individual receptors (e.g. condition of vegetation, or fitness of faunal populations), time of year and lifecycle stage of a species impacted, and the potential for unforeseen events such as extreme weather (including flooding of working areas), or introduction of invasive species to exacerbate predicted impacts.

Losses to an area of *Molinia* Meadow will occur as a result of the Proposed Road Development. These will occur outside the boundary of the SAC. The total area of *Molinia* meadow recorded was 1.7 ha of which 0.36 ha will be lost as a result of the Proposed Road Development. To ensure no additional impacts occur mitigation measures have been prescribed as part of the EIAR and will be implemented through the Contractors CEMP. Works will occur adjacent to an area of Petrifying Spring close to where the Proposed Road Development re-joins the existing N63. No works are due to take place within this habitat area. The hedgerow, ditch and bank separating the current N63, and the Petrifying Spring is due to be retained. This will maintain a hydrological barrier between the roadway and the Petrifying Spring habitat. In addition, there is potential for hydrological impacts due to changes in surface water runoff adjacent to this habitat area as a result of the Proposed Road Development. Changes in surface water hydrology will be considered in the drainage and overall construction design for the Proposed Road Development.

[1] The zone of influence (ZoI) for a project (or "spatial extent of the impact" as described in Annex III (3) of the EIA Directive 2014/52/EU) is the area over which ecological features may be subject to significant impacts as a result of the Proposed Road Development and associated activities. In the case of the project area for example, the Proposed Road Development crosses the Abbert River, which is part of the Lough Corrib SAC (Site Code: 000297).

4.4.2 Environmental Mitigation and Control Measures and Proposals

For each of the potential sources of an environmental impact on the existing environment, the Contractor will identify the control and protection measures to be implemented. The following general control and mitigation measures should be followed as a minimum to ensure no significant adverse direct and indirect effects on the environment arise from the Proposed Road Development.

The Outline CEMP should be read in conjunction with the mitigation measures outlined in the Natura Impact Assessment (NIS). All mitigation measures from the NIS and EIAR as well as any planning consent conditions (should the Prosed Road Development be granted planning permission) or mitigation measure identified during pre-construction surveys will be included within the Contractors CEMP by the contractor. The Contractor will review all planning documents and all pre-construction surveys when preparing the Contractors CEMP.

4.4.2.1 Pre-Construction Surveys

At least six months (and no later than 12 months) in advance of commencing any construction works (including enabling or advance works), the Ecological Specialist will oversee the design and implementation of pre-construction surveys having regard for best available scientific knowledge including the specifications in the TII Environmental and Construction Guidelines (2005-2011).

The objective of these surveys will be to determine if any new breeding or resting sites of protected species, or new invasive species populations have become established since surveys were completed in 2019, 2020 and 2021.

The Client/Client Representative, with guidance from a suitably qualified Ecological Specialist will ensure suitably experienced ecologists complete the pre-construction surveys (as determined by the appointed Ecological Specialist).

The Ecological Specialist will coordinate and manage the following surveys:

- Otter breeding or resting sites (within 150 m of proposed piling works and 50 m of all other works);
- Inspection of marked site boundaries (marked by the project engineers), to ensure no unnecessary clearance of habitat occurs
- Kingfisher nesting sites (within 150 m of proposed piling works and 50 m of all other works);
- Badger breeding or resting sites (within 150 m of proposed piling works and 50 m of all other works):
- Red squirrel dreys (within 50 m of all works);
- Suitable amphibian spawning habitat (within 50m of works)
- Other protected mammal species (within 50 m of all works);
- Evidence of Barn Owl nesting/suitable nest sites (within 50 m of all works);
- Invasive species (within 50 m of all other works);
- Marsh Fritillary and food plant survey will be carried out within the ZoI in suitable habitat including wet grassland areas on both the eastern and western extents of the Proposed Road Development; and
- Trees with bat roost potential within the works footprint.

The Ecological Specialist will take necessary steps to mitigate survey limitations including for instance:

- Overseeing localised clearance of dense vegetation to search for Badger and Otter where the pre-construction survey window does not overlap winter/early spring (i.e. vegetation die-back);
- Survey Kingfisher nest sites where the pre-construction survey window does not overlap with the Kingfisher nesting season, or where areas with potential to contain Otter breeding or resting areas may exist following surveys; and
- Maintain observation records of protected species and highlight mitigation/licencing requirements if necessary.

4.4.2.2 Mitigation

4.4.2.2.1 General Measures

This section prescribes the mitigation measures and appropriate control measures to block pathways with the potential to result in adverse effects thereby protecting the integrity of European sites during the construction and operational phases of the Proposed Road Development.

The Proposed Road Development adopts a number of pre-construction, and construction phase measures that will avoid the potential for adverse impacts to habitats and species. These measures include the following key themes:

- Ecological surveying will be undertaken during the pre-construction and construction phases, to assess impacts on ecological receptors including selected habitats and species and assess site works to ensure adequate mitigation outlined in the CEMP and mitigation as outlined within the Environmental Impact Assessment (EIAR) has been installed;
- Appropriate timing of works by location within the Proposed Road Development footprint to minimise disturbance of nesting birds (being cognisant of bird nesting season) and other fauna (e.g. period for frogspawn, piling works);
- Use of monitoring by a suitably experienced ECoW to determine the effectiveness of mitigation and liaison between contractor, client and client's Ecological Specialist, NPWS and IFI on mitigation implementation. The ECoW will provide guidance to steer continual environmental protection;
- The contractor will produce weekly ecological monitoring reports to the client to update the client on the ecological checks that have been undertaken, and chronicle surveys undertaken in advance of key works; and
- Precedence of mitigation protecting European sites over mitigation protecting other features if any unforeseen conflict arises.

Control measures implemented though a Contractor CEMP including silt fencing, silt traps and cut off drains will be used throughout the construction phase to reduce the risk of losses of soil, sediments, and other potentially polluting material to the Abbert River.

- Regular monitoring and recording of the effectiveness of the control measures will be implemented. This will include daily monitoring of turbidity, pH, and conductivity, as well as weekly monitoring of the above parameters as well as suspended solids, total petroleum hydrocarbons and volatile organic compounds;
- The Proposed Road Development will incorporate an embedded drainage system design that will allow storm-water management. This will include petrol interceptors when out-falling to the Abbert River and attenuation ponds that will ensure adequate sufficient protection to water for all these QI species.
- Sheet piling will be required for abutment construction within 10 m of the riverbank. Piling of the proposed bridge abutments adjacent to the Abbert River should be programmed so as to avoid sensitive lifecycle periods for QI Atlantic Salmon and Brook Lamprey. Piling is advised to be scheduled from July to September inclusive, unless otherwise agreed with IFI;
- Light spill onto the river channel during hours of darkness has the potential to affect QI Atlantic Salmon. Turning off lights during periods of darkness whilst the construction phase is in close proximity to the river will be carried out. Light spill from construction onto the Abbert River will not exceed 1 lux (equivalent to moonlight);
- Dewatering of open trenches requires silt mitigation. This could include the use of silt bags, settlement tanks and/or attenuation ponds. Excavation of drains will require waters to be over-pumped/piped/diverted. Drain works should be undertaken in a manner, and in a timeframe to be agreed with IFI. It is noteworthy that some drain works are classified as 'instream works' and therefore time restrictions for these works may apply. Drain works could require the use of silt bags, settlement tanks and/or attenuation ponds to ensure no pollution to watercourses;
- To minimise the effects of habitat loss on fish species, all sections of river/stream channel within the Proposed Road Development boundary, but not within the footprint of the Proposed Road Development and associated infrastructure, will be protected from site clearance and construction works. Rivers/streams will be fenced off at a minimum distance of 10 m from the river bank and

within 5 m for the specific circumstance of bridge development. Within this zone the natural riparian vegetation will be retained.

The Contractor will be required to:

- Implement the Contractors CEMP, in accordance with the TII Guidelines for the 'Creation and Maintenance of an Environmental Operating Plan'. The Contractors CEMP will set out the environmental commitments set out in the EIAR and NIS and measures stipulated in the planning consent conditions.
- Oversee the implementation of the CEMP, the Contractor will be required to appoint a responsible manager to ensure that the mitigation measures included in the NIS, EIAR and the CEMP are executed in the construction of the works and to monitor that those mitigation measures employed are functioning properly.

4.4.2.2.2 Emergency Response and Environmental Training

The Contractor will produce an Emergency Response Plan (ERP) based on the Contractor's own Risk Assessment, which will be reviewed by the ECoW and Employer's Representative Team. The ERP will include:

- The Contractor's proposed training of relevant staff, including cover staff, in the implementation of the ERP and the use of spill kits;
- Details of procedures to be carried out by the Contractor in the event of the release of any sediment into a watercourse, or any spillage of chemicals, fuel or other hazardous wastes, non-compliance incidents with any permit or licence, or other such risks that could lead to a pollution incident, including flood risks;
- Confirmation of the number and specification of spill kits which will be carried by the Contractor; and
- Information on spill control procedures as specified in Chapter 07 Section 7.5.2 and Chapter 09 Water of the EIAR.

4.4.2.2.3 Phasing of Earthworks

Construction works will avoid vegetation removal/destruction where possible. There will be no requirement for vegetation removal of riparian habitats within 5 m of the Abbert River, given the setback distances associated with the bridge abutments. In the event where the Contractor identifies a potential future flood event, the Contractor will communicate the details to GCC, the ER Team, and the ECoW who will agree the appropriate response to protect the working area and environment. Works area will be strictly adhered to for the duration of works.

4.4.2.2.4 Phasing of Piling (Disturbance to Fisheries)

A range of best practice control measures in relation to noise and vibration have been compiled in Chapter 12 Noise and Vibration of this EIAR. The proposed measures will have due regard to the QI of the Lough Corrib SAC and other protected species during the construction phase. The proposed measures will be carried out with a view to maintaining noise and vibration emissions at reduced levels.

One of the most effective measures to avoid noise and vibration impacts associated with drilling/piling on the QIs (Atlantic Salmon, Brook Lamprey and Otter) of the Lough Corrib SAC is to schedule construction works at periods deemed to have the least sensitivity on the species. The timing of works takes into account seasonal factors and migration preferences (i.e. life cycle, etc.) of the species. Having regard to the preferred migration periods for Atlantic Salmon, it is necessary that works associated with the piling in proximity to the Abbert River will be undertaken within the timeframe of 1 July to 30 September (inclusive) unless otherwise agreed with IFI. The IFI guidance document (Guidelines on Protection of Fisheries During Construction Works and Adjacent to Waters (2016)) advocates undertaking works in proximity to watercourses during the period July-September inclusive to minimise adverse impacts on the fisheries resource. It is envisaged that such works will be scheduled to coincide with periods of dry weather primarily during summer months and outside the core migration period for Atlantic Salmon.

To mitigate impacts to QI Brook Lamprey, a 'soft-start' to drilling/piing will also be employed to allow lamprey and other fish to move away before the full intensity of drilling/piling begins. The soft start will involve a gradual ramping up of drill head rotation speed, incrementally over a set time period to be agreed with the ER Team, until full operational power is achieved. Works giving rise to noise emissions

are restricted to and permitted by GCC to 07.00 – 19.00 Hrs Monday – Friday; and 07.00 - 13.00 Hrs on Saturdays. Work outside of normal hours shall only take place where written permissions have been sought and received from GCC.

4.4.2.2.5 Artificial Lighting

Light spill onto the river channel during hours of darkness has the potential to form a barrier to the migration movement of nocturnal protected species (e.g. bats, some fish species and Otter). Turning off lights during periods of darkness throughout the construction phase will eliminate any risk of impacts to sensitive ecological receptors outside of work hours. The risk of impacts associated with artificial lighting on the Abbert River will be minimised by restricting lighting to the footprint of the Proposed Road Development works and avoiding any unnecessary light spill (i.e. turning lights off outside working hours) onto the surrounding area. Light spill from construction onto the Abbert River should not exceed 1 lux (equivalent to moonlight). In all cases, the Contractor will make retrospective amendments to restrict light spillage. The appointed ECoW will ensure that these measures are adhered to during the construction phase.

4.4.2.2.6 Air Quality and Dust

Best practice construction methodologies (e.g. watering of the construction site/access roads and road cleaning) and mitigation measures (including regulating vehicle speed, through implementation of speed limits) will minimise construction activity-related dust and aid in containing it within the boundary of the Proposed Road Development. The implementation of standard industry good practice mitigation measures as outlined in the EIAR (Section 10.8 of Chapter 10 Air Quality) and mitigation requirements outlined herein and within Chapter 07 Biodiversity of the EIAR are required to be incorporated into the CEMP.

Standard industry good practice mitigation measures will be applied to the Proposed Road Development site, including road sweeping, wheel-wash facilities and the implementation of a dust management plan.

Dust emissions control and mitigation measures during construction works require:

- The wetting of exposed earthworks areas and site haul roads during dry and/or windy conditions (this mitigation would be required when necessary, to prevent dust deposition on sensitive habitats);
- The provision and maintenance of wheel washes at site exit points;
- Restriction of site plant and other vehicle speeds (e.g. 10-20 km/h on un-surfaced site road),
- The adequate covering of haulage vehicles when carrying loads that have the potential to emit dust, and
- The sweeping of hard surface roads within/accessing the site.

Dust screens are to be used in areas of highest sensitivity which is to include the works areas within 20 m of the Abbert River and Lough Corrib SAC, where a 2 m dust screen will be employed. These measures will minimise construction activity-related dust and aid in containing it within the boundary of the Proposed Road Development.

4.4.2.2.7 Mitigation of Potential Hydrological Impacts

Pre Construction mitigation of possible Hydrological impacts from the Proposed Road Development includes:

- A quarterly sampling programme will be undertaken for one year before construction throughout the duration of construction works. This will include scheduling samples for an inorganic suite of analysis, to include pH, electrical conductivity, ammonium, nitrate, fluoride, chloride and sulphate.
- The footprint of construction activities in the area will be minimised to that required for construction of the road and drainage only and the existing bank and hedgerow which acts as a barrier between the road and this habitat area shall be retained. The area shall be clearly marked and areas to be retained/protected shall be cordoned off in advance of works;
- Temporary signage will be installed to highlight the location of the Petrifying Spring to construction personnel accessing the site;

- There will be no interference with areas of the Petrifying Spring during site works, all works will be confined to those within the existing footprint.
- Silt fencing and silt traps will be installed along the boundaries of the route and flowing from any pre earthworks drainage to ensure any runoff from the works area is captured.
- The petrifying spring is located 9.7 m from the boundary of the SAC. A boundary fence will be erected on the roadside of the current hedgerow along the boundary line of the SAC. No works shall be undertaken outside of this area which gives a minimum buffer of 10 m for all works away from the spring.

Construction mitigation of possible Hydrological impacts from the Proposed Road Development includes:

- Clearance of topsoil/substrate is to be kept to an absolute minimum within 50 meters of this habitat area

To prevent any possible impacts to the petrifying spring

- Imported material for base fill used within 100 meters of the spring habitat would be made of limestone and would be of a size that permits flow of waters through it. Limestone should be washed prior to laying as fill.
- Weekly visual checks will be undertaken of the spring during construction works, with photographs taken and written descriptions of flow recorded.

4.4.2.2.8 Pollution Control Mitigation

4.4.2.2.8.1 Water Quality and Earthworks

The measures described in this section will be further refined and expanded by the appointed Contractor into a Contractors CEMP as more information becomes available in the course of detailed road design (e.g. including but not limited to construction methods and work schedule). The detailed CEMP will be prepared prior to commencement of construction and will be subject to the approval of GCC, and the appointed Ecological Specialist. The CEMP will remain at all times a live document, subject to amendment of adaptive management throughout construction as required (e.g. in response to extreme weather including flooding and/or alterations to design elements due to the availability of more cost efficient or effective techniques or materials). The following measures will be implemented as a minimum by the appointed Contractor:

- Drainage design, incorporating SuDS principals, inherent in the overall design, will prevent emissions to the river during the construction and operational phase of the Proposed Road Development, and facilitate water treatment;
- Woodland, scrub, treelines, and hedgerows which lie within, or along the boundary of the Proposed Road Development, that are not directly impacted by the Proposed Road Development or drainage will be retained, thus reducing the area for dust generation and risk of silt entry to watercourses. These areas will be protected for the duration of construction works and fenced off at an appropriate distance. Consideration will be made to ensure minimal disturbance of roots, and sensitive areas (including Root Protection Areas) will be cordoned off with post fencing to ensure no unnecessary damage to these habitats. Works will be done in accordance with ‘Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub Prior to, During and Post Construction of National Road Schemes’.
- Control measures such as check dams, and silt fencing will be used throughout the construction phase to reduce the risk to Lough Corrib SAC. Regular monitoring and recording of the effectiveness of the control measures will be used and implemented with additional control measures employed if and when required.
- Supported silt fencing (supported by wooden posts or suitable alternative) along the route will be installed where watercourses, including drains, are at risk from silt entry. The base of these curtains will be buried into the ground to ensure the fences work effectively. Diversions of surface flows into swales is also envisaged, if necessary, to manage surface waters and prevent pollution incidents;
- Minimal hedge removal through ‘stepping-in’ of proposed fence lines near these habitats;

- Installation of cut-off drains, inherent in construction design, will aid in maintaining a drier works area, and limit surface waters within the construction area. This inherent mitigation will prevent risks to surface waters;
- Phasing and other silt control measures to be refined by the Contractor into an Erosion and Sediment Control Plan (CESCP), which will be agreed between GCC and the appointed Ecological Specialist;
- Phasing of works and other silt control measures to be refined by the CESCP, which will be agreed between the Contractor, ECoW and Client (and Client's Ecological Specialist). The CESCP will conform to requirements within the EIAR;
- Construction compounds will be required along in the vicinity of the Proposed Road Development. The current area for proposed compound areas are flat areas, deemed to be of low risk to the Lough Corrib SAC. Mitigation measures noted in this document, in relation to preventing surface water pollution, will be applied to the proposed compound area and conform to the EIAR and requirements outlined in the CESCP;
- Use of a single layer (and three layers if required) of high-performance silt fence around all works or stockpiles that have potential to affect waterbodies (surface or groundwater) or Annex I habitats; and specifically, and exclusively following installation methods outlined in published literature (Caraco, 2000) to maximize the effectiveness of particle filtration by geotextiles. Use of silt fencing to specification of Hy-Tex Terrastop Premium or similar, whose efficacy has been proven by credible evidence (Liddon, 2013) is required. Fencing will be inspected and assessed for its effectiveness and suitability by the ECoW and Client;
- Use of additional layers of high-performance silt fence, locally, if necessary, to avoid pollution to watercourses or Lough Corrib SAC/SPA;
- Supervision of installation and performance throughout construction of silt fencing and other pollution control measures by the ECoW and Employer Representative Team who will advise the Contractor on repairs required to maximize performance;
- Procedures for dewatering the working area to include adequate treatment of any resulting silt-laden surface water prior to discharge. Use of silt dewatering bags or tubes in conjunction with filter drains/check dams, silt fencing and other means necessary (including swales) to capture, attenuate, and treat surface water generated during construction prior to any discharge to watercourses. If silt is removed from surface/groundwater from mitigation measures, and no contamination is apparent, no adverse impact of the entry of such waters to the environment is envisaged and this practice is deemed satisfactory. No polluted waters/contaminated water is to be released/discharged to a watercourse without a required discharge licence.
- All bowsers onsite should be clean on arrival (internally and externally (to ensure that no pollutants were present within, that may otherwise enter the environment during use);
- Fuel handling and bunding procedures are to be in place during the works, with particular care near rivers, streams, and watercourse. Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in designated areas which will be located away from surface water gullies or drains, with no refuelling within 30 m of a watercourse;
- Stockpiles should have a minimum setback of 20 m and >20 m where possible, from watercourses. Adequate SuDS (e.g. surrounding cut-off drain, silt fencing, settlement ponds) will be installed if required to ensure environmental risks associated with silt are minimised. Seeding of stockpiles (to prevent erosion and dust creation) will be undertaken if deemed necessary by the ECoW or Ecological Specialist.
- Contractor to adopt, and provide evidence to GCC and the Ecological Specialist of staff training in Spill Response & Control Plan to minimize the risk of adverse impacts upon surface waters and groundwater in the potential event of accidental spillages, flooding, or other emergencies;
- Establishment of contingency measures to cater for impacts to unknown services underlying the construction site (for example, old sewers, culverts);
- Control of mud at entry and exit points to the works area using wheel washes;
- Material and machinery/fuel storage to be outside flood-prone areas and removed from such areas in advance of floods to ensure environmental protection; and

- Mitigation measures relating to safeguarding water quality during the construction phase are outlined in Section 4.6 of the Outline CEMP and Chapter 09 Water of the EIAR.

The following guidelines should be followed to ensure protection of the environment:

- IFI (2016) Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters. Inland Fisheries Ireland, Dublin;
- CIRIA Guidelines Control of water pollution from construction sites –Guide to Good Practice (C532); and
- Control of water pollution from linear construction projects. Technical Guidance (C648).

4.4.2.2.9 Mitigation for Habitat (including Lough Corrib SAC)

Habitat Mitigation - Annex I Molinia Meadows

- The footprint of construction activities in the area will be minimised to only include the area required for land-take for the Proposed Road Development. All unnecessary tracking will be restricted. The area will be clearly marked and the area to be retained/protected will be cordoned off in advance of works to ensure damage prevention and habitat protection;
- No areas where *Molinia* Meadows is known to occur shall be used for storage, stock piling soil or any other auxiliary site activities.
- To complement partial translocation, efforts should be made to protect remaining areas of this habitat either side of the development and the hydrology of the surrounding area.
- The ECoW will supervise setting out of the works area to avoid the potential for disturbing Annex I Molinia Meadows during works;
- Where disturbance to *Molinia* outside the SAC is unavoidable, measures to offset the loss of this habitat area including habitat translocation will be carried out. In these areas care will be taken to translocate the area of this habitat that exists within the works footprint. A suitable area for translocation has been identified, with similar hydrological conditions. The field adjacent to the southwest of this area is identified as the preferred location however it is subject to further review at detailed design stage.
- Temporary signage will be installed to highlight the location of Annex I *Molinia* Meadows to construction personnel accessing the site;
- Any requirement for stockpiling, re-fuelling of machinery, etc. during the construction phase will be sited >50 m away from Annex I *Molinia* Meadows;
- There will be no interference with areas of Annex I *Molinia* Meadows during site works, outside of the proposed works footprint. The quantity of material to be translocated will be minimized through careful marking of the route footprint and supervision of works by the ECoW. A compensation area has been included in the Proposed Road Development design (see Volume 03;Fgure A13.4 of the EIAR for location of the compensation area);
- Some Annex I *Molinia* Meadows will be disturbed by the Proposed Road development as they are within the footprint of works. Care will be taken to translocate the area of this habitat that exists within the works footprint. The field adjacent to the southwest of the Annex I Molinia Meadow is an area with similar hydrological and soil conditions that is ideal for sod translocation, provided it was appropriately prepared (Volume 3 Figure A7-2 & Volume 4, Appendix 7-8 of the EIAR).
- A detailed method statement will be developed (*Molinia* translocation management plan) by the contractor and a suitably qualified botanist and will be reviewed by GCC and the Ecological Specialist to translocate the area of this habitat from within the works footprint. The method statement will detail the translocation plan;
- The field for translocation will require advance consultation with and inspection by a suitably qualified botanist, to ensure it has been prepared appropriately in advance of translocation of sods;
- Sods will be carefully positioned, and not stacked, to avoid damage;
- Sod removal and sod translocation should coincide to maximise likelihood of sod development, and prevent disturbance of adjacent ground associated with tracking or for temporary storage;

- Translocation will only be undertaken under supervision of the ECoW and suitably qualified ecologist/botanist to ensure translocation success;
- Translocation should occur at a time (i.e. season) that will optimise the successful establishment of Annex I *Molinia* Meadow at the translocation area;
- Sods will be carefully cut, and handled with care, prior to being translocated to the compensation area;
- The translocation of intact sods would be supervised by the ECoW and must be undertaken within 12 hours of cutting the sods.
- To complement partial translocation and habitat protection, works will be undertaken to protect remaining areas of this habitat (including translocated sods) and the hydrology of the area either side of the development through installation of suitably free-draining, clean, large, rounded, locally derived limestone under the road embankment;
- Hydrological impacts of the Proposed Road Development have been considered, and retention of hydrological characteristics of retained areas will also be accounted for during construction. The *Molinia* area on both sides of the Proposed Road Development area will be monitored monthly during the construction phase and areas within ownership of the Council will be managed as appropriate to ensure it retains good ecological status; and
- The compensation area shall be monitored for a period of 3 years.
- The hydrological regime of overland and subsurface water flow shall be retained (to ensure no hydrological barrier) in the vicinity of the *Molinia* meadow;
- A layer of free draining stone as part of the starter layer for the road surface shall be installed, allowing natural overland flow to percolate in the vicinity of the proposed road development
- The ECoW and Client's Ecological Specialist will verify that the Contractor has left the site of the Proposed Road Development in a satisfactory condition, and where relevant direct the Contractor to remove any materials offsite.

An appropriate management plan will be implemented including an extensive grazing and /or mowing regime with annual monitoring to assess the success of the translocation and management regime and to make recommendations for any changes or alterations to the management that are needed.

Habitat Mitigation (Petrifying Springs)

Mitigation

- Ecological monitoring and protection of Petrifying Springs will be carried out to ensure protection of this habitat (also see Section 3.3.1.3). The location of the Petrifying Spring is included in Appendix 03; Figure A7.2 of the EIAR produced for the Proposed Road Development.
- Road alignment is to be kept as close to existing at grade alignment as possible to reduce works in this area.
- Strictly de-lineating the works area;
- Minimising any additional hard-surfaced areas to avoid increase of runoff;
- Changes in surface water hydrology would be considered in the drainage and overall construction design for the Proposed Road Development. It should be noted that groundwater investigations have concluded that it is unlikely that the construction works here will impact on groundwater conditions here. Therefore, it is highly unlikely that any hydrological impacts will occur on the petrifying spring habitat here.
- A quarterly sampling programme will be undertaken for one year before construction throughout the duration of construction works. This will include scheduling samples for an inorganic suite of analysis, to include pH, electrical conductivity, ammonium, nitrate, fluoride, chloride and sulphate.
- The footprint of construction activities in the area should be minimised. The area should be clearly marked and areas to be retained/protected should be cordoned off in advance of works;
- The existing bank and hedgerows which acts as a barrier between the road and this habitat area shall be retained. As per the current scheme design.

- Temporary signage will be installed to highlight the location of the Petrifying Spring to construction personnel accessing the site;
- Any requirement for stockpiling, re-fuelling of machinery, etc. during the construction phase will be sited >50 m away from the Petrifying Spring;
- There will be no interference with areas of the Petrifying Spring during site works, outside of the proposed works footprint.
- The quantity of material to be translocated will be minimized through careful marking of the route footprint;
- Silt fencing and silt traps will be installed along the route to ensure any runoff from the works are in the vicinity of this habitat area is captured.
- A buffer zone of a minimum allowable distance of 10m between works activities from this Annex I habitat is to be maintained throughout works
- Clearance of existing vegetation is to be kept to an absolute minimum within 50 meters of this habitat area
- Clearance of topsoil/substrate is to be kept to an absolute minimum within 50 meters of this habitat area
- To prevent any impacts to the petrifying spring, imported material for base fill used within 100 meters of the spring habitat would be made of limestone, if required, and would be of a size that permits flow of waters through it.
- In order to avoid any alteration to groundwater pH, only locally derived limestone shall be used in the construction within the ZoI of this habitat. This limestone for base fill will be of a size that permits flow of waters through it, if required. This mitigation measure may ensure no changes to the alkalinity of the Petrifying Spring and will support hydrological connectivity between the north and south side of the Proposed Road Development.
- The ZoI of construction works will be confirmed by the hydrogeologist following risk assessment to inform appropriate mitigation during the construction phase. Minimising the compaction of soils and other substrates associated with construction within the ZoI of this habitat type would be required.
- Weekly visual checks will be undertaken of the spring while construction works are occurring within the ZoI, with photographs taken and written descriptions of flow recorded.
- Ecological monitoring is to be undertaken as per guidelines given by the NPWS (2016). This monitoring is to employ suitable indicator criteria as per Lyons & Kelly (2016) such as tufa type, surface water characteristics and field/ground flora.

If ecological monitoring determines that flow rates are being influenced within the spring, additional mitigation measures may be required to ensure the protection of the spring (i.e. alterations of works area, and ground works to ensure that the spring is receiving suitable water).

Pollution Prevention

- Best practice protocols in construction will be followed for the duration of the works. These include the measures to protect water and prevent water pollution, avoid, and prevent the spread of invasive species, dust and air emissions, and prevention of unnecessary clearance (see Chapter 09 Water and Chapter 08 Land and Soils of the EIAR and Sections 4.5 and 4.6 of the Outline CEMP for further details).

Non-Annex I Habitats

- An exclusion zone will be established to safeguard areas outside the Proposed Road Development to avoid any unnecessary disturbance or intrusion during site works. The ECoW will supervise setting out of all works and instruct the contractor on areas of other sensitive habitats to avoid;
- Where possible, woodland, scrub, treelines, and hedgerows which lie within, or along the boundary of the Proposed Road Development, that are not directly impacted by the Proposed Road Development or drainage will be retained. These areas will be protected for the duration of construction works and fenced off at an appropriate distance.

- Tree roots near works should be considered along the development and damage to roots should be prevented within the Root Protection Area of trees to be retained as per BS 5837-2012.
- Any vegetation (including trees, hedgerows or scrub adjacent to, or within, the Proposed Road Development boundary) which is to be retained shall be afforded adequate protection during the construction phase in accordance with the Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub Prior to, During and Post Construction of National Road Schemes as follows:
  - All trees along the Proposed Road Development boundary that are to be retained, both within and adjacent to the Proposed Road Development boundary (where the root protection area of the tree extends into the Proposed Road Development boundary), will be fenced off at the outset of works and for the duration of construction to avoid structural damage to the trunk, branches or root systems of the trees. Temporary fencing will be erected at a sufficient distance from the tree so as to enclose the Root Protection Area (RPA) of the tree. The RPA will be defined based upon the recommendation of a qualified arborist.
  - Where fencing is not feasible due to insufficient space, protection for the tree/hedgerow will be afforded by wrapping hessian sacking (or suitable equivalent) around the trunk of the tree and strapping stout buffer timbers around it
  - The area within the RPA will not be used for vehicle parking or the storage of materials (including soils, oils, and chemicals).
  - A buffer zone of at least 5 m will be maintained where possible between construction works and retained hedgerows to ensure that the root protection areas are not damaged.
  - A qualified arborist shall assess the condition of, and advise on any repair works necessary to, any trees which are to be retained or that lie outside of the Proposed Road Development boundary but whose RPA is impacted by the works. Any remedial works required will be carried out by a qualified arborist.
  - Machinery access will be restricted to the confines of the Proposed Road Development footprint and the Contractor will agree locations of all access routes, temporary storage areas etc. with the appointed ECoW.

4.4.2.2.10 Mitigation for Invasive Species

The pre-construction survey will be carried out during the growing season (i.e. from April to September) prior to construction starting onsite to assess if new populations of invasive species have become established since the original surveys were completed in 2020/2021 to inform the EIAR.

An Invasive Species Site Assessment and Management Plan (ISSAMP) will be produced by the appointed Contractor as per the recommendations given by TII guidance and encompassing mitigation measures listed in the EIAR and Outline CEMP for invasive species management. This plan will determine the appropriate methods for treatment, control, and/or removal of the Invasive Species recorded as occurring onsite. The ISSAMP will be informed by a pre-construction survey and will incorporate measures to deal with and ensure no spread of land and river based invasive species from construction activities. The ECoW and Ecological Specialist will review the draft ISSAMP to ensure it has due regard for emerging best scientific knowledge.

The ISSAMP will include a biosecurity plan prepared by the appointed Contractor, which will be agreed with GCC. The ISSAMP and the biosecurity plan will consider both terrestrial and aquatic invasive species.

Developing codes of practice aims to reduce the risk from and impacts of invasive species and safeguards the Qualifying interests of the SAC. The Proposed Road Development will adopt best practice control measures to prevent the spread of invasive species. The project and ISSAMP will follow the following guidance and standards documents: ‘The Management of Invasive Alien Plant Species on National Roads – Technical Guidance’ and ‘Management of Invasive Alien Plant Species on National Roads – Standard’. The project and ISSAMP will also have due regard to the relevant biosecurity measures throughout all phases of the project:

- Clearly identify and mark out the infested areas of invasive species to inform construction personnel and operating machinery. Infested areas of invasive species will be fenced off (where applicable, if within the works footprint)) and signage will be installed to highlight the location of invasive species;
- Should any new species become established in the interim, stands will be clearly demarcated by temporary fencing and machinery tracking or otherwise within infested areas will be strictly avoided until a management plan is developed. The suitable buffer zone will be determined by the Ecological Specialist.
- All contractors and staff will be briefed about the presence, identification, and significance of invasive species before commencement of works;
- For any material entering the Proposed Road Development site, the supplier must provide an assurance that it is free of invasive species;
- A designated cleaning area for boots will be established within the site compound, to ensure all boots are cleaned prior to entry to works areas;
- Boats, waders and all associated aquatic equipment will be washed prior to and after being in the water. A disinfectant such as Virkon Aquatic or similar will be used to wash this equipment to ensure no spread of Crayfish plague. All equipment to be used in aquatic areas will be thoroughly cleaned prior to use, with no aquatic invasive species present on them;
- All Contractors will be made aware of biosecurity issues related to working in proximity to invasive species, watercourses, and watercourse vulnerability to aquatic invasive species (fauna and fauna). All Contractors will also be made aware of the crayfish plague. Invasive species and biosecurity measures to be implemented and adhered to on site are to be addressed within the site induction and site toolbox talks;
- Good construction site hygiene will be employed to prevent the spread of such species. All plant and equipment employed on the construction site (e.g. excavator etc.) will be thoroughly power-washed prior to arrival onsite to prevent the spread of invasive plant species present such as Japanese knotweed; and
- 'The Management of Invasive Alien Plant Species on National Roads – Standard' is a standard and must be applied and followed on this project. The treatment and control of invasive alien species will also follow TII guidelines on 'The Management of Invasive Alien Plant Species on National Roads – Technical Guidance'.

4.4.2.2.11 Mitigation for Bats

Lighting

During the construction phase, an experienced bat ecologist will visit the Proposed Road Development site at regular intervals (nocturnal visits) throughout the construction phase to review, using a suitably calibrated light meter, potential light spill of construction lighting onto vegetated areas. The bat ecologist will make recommendations to minimise impacts of construction lighting to bats. As a minimum:

- Light spill from construction onto bat habitats known to be used by highly light sensitive species will not exceed 1 lux; and
- Light spill from construction onto bat habitats known to be used by other bats will not exceed 3 lux.

In all cases, the Contractor will make retrospective amendments to light cowls, until the target lux level is reached.

Tree Felling

No trees with bat roosts were identified. However, this may be subject to change. Trees, hedge, and scrub should be felled at an appropriate time of year, ideally outside of bird nesting season (March 1st to August 31st) (to prevent impacts to nesting birds). Felling of any potential tree roosts will be undertaken during the period September – October as during this period bats are capable of flight and may avoid the risks from tree felling if proper measures are undertaken, but also are neither breeding nor in hibernation.

Trees should be resurveyed for bat roost potential prior to felling. Any tree identified with bat roost potential will be surveyed visually. An emergence survey using visual observation and bat detectors will be carried out on the night immediately preceding the felling operation to determine if bats are present. NPWS will be consulted of any planned works on trees with a confirmed bat roost. If a bat roost is subsequently identified, tree removal will be undertaken in accordance with NPWS recommendations and relevant licencing requirements relevant to bat roost protection.

Immediately prior to felling, trees should be shaken by a machine a number of times, with 30 second intervals, to alert any bats or other wildlife that may be in the tree. The tree should then be pushed to the ground slowly and should remain in place until it is inspected by a bat specialist. Felled trees should be left intact where they fall on the ground for 24 hours before sectioning and/or mulching unless pre-surveyed by an ecologist and deemed bat-free.

4.4.2.2.12 Mitigation for Badgers

As Badger setts may become established following the surveys carried out for the EIAR and the commencement of construction, a dedicated pre-construction mammal survey will be required within 12 months of the commencement of works.

Badgers, and their breeding and resting places, are protected under the Wildlife Acts and it is an offence under that legislation to intentionally kill or injure a Badger or to wilfully interfere with or destroy their breeding or resting places (setts).

A comprehensive suite of mitigation measures have been incorporated into the Proposed Road Development to ensure that Badgers are not intentionally killed or injured and that any impacts to their breeding or resting places will not affect their conservation status, at any geographic scale, and will not give rise to any likely significant effects on the species.

The mitigation measures described below follow the recommendations set out in the 'Guidelines for the Treatment of Badgers during the Construction of National Road Schemes'. These guidelines set out the best practice approach in considering and mitigating impacts on Badgers during construction works.

If setts are found to have become established and require exclusion and removal, or temporary exclusion for the duration of the construction period, these measures will be undertaken in accordance with the methodology detailed in the 'Guidelines for the Treatment of Badgers during the Construction of National Road Schemes' as follows:

- In order to prevent any disturbance to Badger setts not directly affected by the Proposed Road Development no heavy machinery shall be used within 30 m of Badger setts at any time. No works shall be undertaken within 50 m of active setts during the breeding season. Lighter machinery (generally wheeled vehicles) shall not be used within 20 m of a sett entrance. Neither blasting nor pile driving shall be undertaken within 150 m of active setts during the breeding season (December to June inclusive).
- Prior to works commencing, a non-interference zone of 30 m will be established around each of the new Badger setts (if they are developed) within the ZoI of the Proposed Road Development. If the sett is active, a non-interference zone will be extended to 50 m during the breeding season (December to June inclusive). The fencing shall be of a sufficient durability to maintain the exclusion zone throughout the construction period or, if required, until such time as the sett in question is excluded/removed. NPWS will be informed of any new setts in the area and works in the vicinity of setts will only be undertaken under a licence from NPWS.
- In the unlikely event of the establishment of a Main Sett, an artificial sett will be required to mitigate for the loss of this sett. Any Badger setts requiring exclusion and removal will require a monitoring period of at least five days to confirm activity status in advance of any construction works commencing:
- If the sett is active, then it shall not be removed within the Badger breeding season (December to June inclusive). To exclude or remove an active Badger sett outside of this period, inactive entrances shall be soft and hard-blocked with one-way gates installed on active entrances. One-way gates will be tied open for three days before being set to exclude, and then monitored for a period of at least 21 days before the sett is deemed inactive and destroyed. If at any time during the monitoring period the sett becomes active, the exclusion process/programme must commence again from day 1 of the 21-day monitoring period; and

- For inactive setts, entrances will be soft-blocked (lightly blocked with vegetation and soil) and if all entrances remain undisturbed for a period of five days the sett should be destroyed immediately. This can be undertaken at any time of the year for inactive setts.

4.4.2.2.13 Mitigation for Otters

Otters are listed on Annex II and Annex IV of the EU Habitats Directive. Otter are strictly protected under the Birds and Habitats Regulations. Otter, and their breeding and resting places, are also protected under the Wildlife Acts and it is an offence under that legislation to intentionally kill or injure an Otter or to wilfully interfere with or destroy their breeding or resting places (holts/couches).

Habitat Degradation - Water Quality

The mitigation measures relating to the protection of water quality in receiving watercourses during construction are outlined in sections such as Section 4.4.2.2.8, Section 4.4.2.2.9, and Section 4.6 of the Outline CEMP (also see Chapter 07 Biodiversity, Section 7.7 and detailed in Chapter 09 Water of the EIAR).

Loss of Breeding/Resting Sites

As in the future Otter could potentially establish new holt or couch sites within the ZoI of the Proposed Road Development, a pre-construction check of all suitable Otter habitat will be required within 12 months of any constructions works commencing.

4.4.2.2.14 Mitigation for Other Mammal Species

Mortality Risk (During Clearance)

There is no known or established methodology for the excluding of mammal species such as Hedgehog, Pygmy Shrew, Stoat, Red Squirrel, Pine Marten, Irish Hare from nest/hibernation sites and therefore the seasonal clearance of vegetation for breeding birds will be implemented. This means that vegetation clearance will avoid March-August inclusive as far as practicable; which comprises a significant portion of the main breeding season for most of the above mammal species. This mitigation will simultaneously avoid the majority of the main breeding season for most small mammal species.

4.4.2.2.15 Mitigation for Birds

Pre-clearance Mitigation

The ECoW and Client will advise the Contractor on timing of vegetation clearance to protect nesting birds while having regard for other protected features present, such as breeding frogs and their spawn, removal of areas suitable for lizard hibernacula, and time constraints relating to the instream works season.

Vegetation clearance for most areas will be restricted to the period from March to August (inclusive) during the ‘nesting season’. The exception of this is to facilitate earthworks required from the period July to September inclusive, at the proposed bridge abutments, in line with Inland Fisheries Ireland Guidelines. For the avoidance of doubt, it should be noted that birds may nest in grass and low scrub, in addition to hedgerows and trees.

Where unforeseen essential works require removal of vegetation during the breeding season, such works could be approved by the ECoW, who will (with reference to standard guidance on nest findings including Ferguson-Lees *et al*., (2011)) make a detailed check of any suitable vegetation for nests prior to removal and advise the Contractor of any species-specific exclusion zones around potential or confirmed nests. Minor local area clearance, with appropriate equipment (handheld cutting tools) outside of the bird breeding season, should be conducted within 24 hours of bird surveys during the breeding season if no active nests were identified. The ECoW will advise the Contractor on any licensing implications for removing vegetation during the nesting season, in consultation with the NPWS. An exemption exists to permit clearance of vegetation for road construction within the bird nesting season, however, it is more ecologically favourable for clearance of vegetation to occur outside of the bird nesting season and therefore, clearance should be planned accordingly (as noted above) so as not to overlap with the bird nesting season.

The need to remove vegetation during the breeding season could arise if for instance, clearance works are delayed unexpectedly. To protect against this risk, an advance clearance contract, completed from September to February inclusive, could be carried out to greatly reduce the risk of birds nesting within the Proposed Road Development for much of that breeding season. The footprint for clearance is to be

clearly marked in advance of clearance operations. Best efforts to retain habitat, and trees, where possible, and minimise disturbance, should be made.

Clearance of the bankside area, outside of the bird nesting season, where bridge development is planned, is advised, to avoid impacts or delays relating to Grey Wagtail and Kingfisher nesting within the bank. Bank surveys should be undertaken prior to sheet-piling to ensure that no active nests will be disturbed from works.

Pollution

Implementation of pollution prevention protocols as outlined in Section 4.4.2.2.9 are necessary to prevent pollution impacts to birds (e.g. exposure to oil).

Habitat Disturbance

The works will need to be executed in such a manner as to minimise the noise and vibration nuisance arising from the works activities. Activities should be programmed to prevent unnecessary clearance, tracking, movements, and habitat disturbance.

4.4.2.2.16 Mitigation for Fish

In the absence of mitigation, negative effects are likely to arise from the Proposed Road Development on the attributes associated with the QI of the Lough Corrib SAC. This section prescribes the mitigation measures and appropriate control measures to block pathways with the potential to result in adverse effects thereby protecting the integrity of European sites and QI species during the construction and operational phases of the Proposed Road Development.

The project will adopt a number of construction measures that avoid the potential for any adverse impacts on the fisheries QI of the Lough Corrib SAC. The following measures will be incorporated into the works schedule:

- Control measures such as silt fencing will be used throughout the construction phase to reduce the risk to the Abbert River. Regular monitoring and recording of the effectiveness of the control measures will be implemented with additional control measures employed if and when required;
- Sheet piling will be required for abutment construction within 10 m of the riverbank. Piling of the proposed bridge abutments adjacent to the Abbert River should be programmed so as to avoid sensitive lifecycle periods for QI Atlantic Salmon and Brook Lamprey. Piling is advised to be scheduled from July to September inclusive, unless otherwise agreed with IFI;
- Light spill onto the river channel during hours of darkness has the potential to affect QI Atlantic Salmon. Turning off lights during periods of darkness whilst the construction phase is in close proximity to the river is recommended. Light spill from construction onto the Abbert River will not exceed 1 lux (equivalent to moonlight);
- Dewatering of open trenches requires silt mitigation. This could include the use of silt bags, settlement tanks and/or attenuation ponds. Excavation of drains will require waters to be over-pumped/piped/diverted and silt mitigation installed where necessary. Drain works should be undertaken in a manner, and in a timeframe to be agreed with Inland Fisheries Ireland. It is noteworthy that some drain works are classified as ‘instream works’ and therefore time restrictions for these works may apply. Drain works could require the use of silt bags, settlement tanks and/or attenuation ponds to ensure no pollution to watercourses;
- To minimise the effects of habitat loss on fish species, all sections of river/stream channel within the Proposed Road Development boundary, but not within the footprint of the Proposed Road Development and associated infrastructure, will be protected from site clearance and construction works. Rivers/streams will be fenced off at a minimum distance of 10 m from the river bank and within 5 m for the specific circumstance of bridge development. Within this zone the natural riparian vegetation will be retained.
- All temporary crossing structures used to cross watercourses during construction will be designed in accordance with the Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters and Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes to maintain fish and macroinvertebrate passage, and to prevent sedimentation and erosion.

- No abstraction of water for dust suppression from the Abbert River will occur unless agreed with IFI and GCC and if it is agreed, the suction head shall be screened with a fish proof mesh to make sure fish are not removed or damaged during the abstraction process.
- The drain identified as having fishery potential will need to have fish captured and removed, under licence, in a manner to be agreed with Inland Fisheries Ireland (e.g. by 1. electrofishing and netting/2. dewatering with a pump (with a mesh suitable to stop fish suction into the pump) and netting. Live fish will need to be captured and released to the Abbert River. De-fishing will need to be undertaken under licence from IFI. No fishing will be required if the drain has dried out of natural causes and there is no fish potential in the drain; and
- No discharge of pollutants to the adjacent river, should occur.

4.4.2.2.17 Amphibians

Habitat loss can be limited during clearance phase. Avoidance of most sensitive times (February to July, inclusive) will reduce likelihood of impacts on amphibians. A preconstruction survey of areas identified by this survey and other wetland sites suitable for supporting breeding amphibians should be carried out in order to determine whether breeding amphibians are present. In the case of Common frog, any frog spawn, tadpoles, juvenile or adult frogs present will be captured under licence from NPWS and removed from affected habitat by hand net and translocated to the nearest area of available suitable habitat, beyond the ZoI of the Proposed Road Development.

In the case of Smooth newt, individuals will be captured and removed from affected habitat either by hand net or by trapping and translocated to the nearest area of available suitable habitat, beyond the ZoI of the Proposed Road Development. If used, the type and design of traps shall be approved by the NPWS. This is a standard and proven method of catching and translocating Smooth Newt.

If the size or depth of the habitat feature is such that it cannot be determined whether all amphibians have been captured, it will be drained under the supervision of a suitably experienced ecologist to confirm that no amphibian species remain before it is destroyed or infilled. Any mechanical pumps used to drain the habitat feature will have a screen fitted, and be sited, such that no amphibian species can be sucked into the pump mechanism, or damaged by pumping. Any capture and translocation works will be undertaken immediately in advance of site clearance/construction works commencing, under licence from NPWS.

Suitable passage for aquatic species will be enabled through appropriate positioning of any culvert installation in any watercourse through an embedded placement with no barriers to migration.

4.4.2.2.18 Lepidoptera

Clear delineation of clearance areas and works areas will prevent unnecessary removal of habitat for these species.

4.4.2.2.19 White-clawed crayfish

A schedule of mitigation measures set out to ensure protection of surface water quality has been developed in Section 4.4. The proper implementation of these, which will be incorporated into the Contractors CEMP will ensure adequate protection for Crayfish.

4.4.2.2.20 Other Protected and Notable Species

In order to minimise the risk of site clearance and construction works disturbing, or causing the mortality of, Common Lizard the following schedule of site clearance works will be followed:

- Grassland or scrub vegetation will be removed during the winter period, where possible, avoiding potential common lizard hibernacula sites (dry sites which provide frost-free conditions e.g. stone walls, underground small mammal burrows, piles of dead wood or rubble);
- Where winter clearance is not possible and clearance will be undertaken during the active season (March through to September, inclusive), vegetation will be cut first to approximately 15 cm, and then to the ground, under supervision of an ecologist. This will allow the opportunity for lizards to be displaced by the disturbance and leave the affected area; and

- Stone walls that have suitability for Common Lizard (or other potential hibernacula sites) (as determined by the Ecological Specialist) will be removed during the active season (March through to September, inclusive) under the supervision of an ecologist, when they are less likely to be in use by torpid lizards. These walls should also be surveyed in advance for bird nesting potential and follow the appropriate aforementioned procedures relating to nesting birds.

4.5 Land and Soils

4.5.1 Potential Impacts

The risk of potential negative impacts on the land and soils environment occurring during the construction phases of the Proposed Road Development (in the absence of adequate management and mitigation measures) can arise from several activities such as;

- Soil excavation and filling;
- Accidental spills and leaks;
- Use of concrete and lime;
- Monitoring and protection of Molinia Meadows and Petrifying Springs; and
- Use of natural resources.

A CEMP will be prepared for the Proposed Road Development which will incorporate relevant environmental avoidance or mitigation measures to reduce potential environmental impact. The CEMP will include a Construction, Erosion and Sediment Control Plan (CESCP), a Soil Management Plan (SMP) and a Construction and Demolition Waste Management Plan (WMP). It will be drafted by the Contractor as necessary in accordance with Department of Environment, Community & Local Government guidelines and any construction-related requirements imposed as conditions of any planning permission granted. It will also include details of proposed environmental monitoring for the duration of the construction works, be this good practice or as a planning condition requirement. The CEMP will be produced based on the Outline CEMP and will include all mitigation and monitoring measures as outlined within the EIAR. The WMP should be in accordance with the new EPA guidance 'Best Practice Guidance for the Preparation of Resource and Waste Management Plans for Construction and Demolition Projects'.

4.5.2 Environmental Mitigation and Control Measures and Proposals

For each of the potential sources of an environmental impact on the existing environment, the Contractor will identify the control and protection measures to be implemented. The following control and mitigation measures should be followed as a minimum to ensure no significant adverse direct and indirect effects on the environment arise from the Proposed Road Development.

4.5.2.1 Soil Excavation and Filling

Temporary storage of soil will be carefully managed in such a way as to prevent potential negative impact on the receiving environment. Spoil and temporary stockpiles including stone stockpile areas will be positioned in locations which are distant from drainage systems and retained drainage channels and away from areas subject to flooding so as not to cause potential run off to soil and groundwater. The Contractors CEMP will outline proposals for the excavation and management of excavated material. Movement of material will be minimised in order to reduce degradation of soil structure and generation of dust. In order to minimise the potential environmental impact of stockpiles, the Contractors CEMP will contain the following mitigation measures that will be implemented during the construction phase:

- Position spoil and temporary stockpiles in locations which are distant from drainage systems;
- Defined maximum stockpile heights; and
- To help shed rainwater and prevent ponding and infiltration, the sides and top of the stockpiles will be regraded to form a smooth gradient with compacted sides reducing infiltration and silt runoff.

It is estimated that approximately 20,500 m^3 of spoil will be generated from the removal of topsoil and cutting to lower sections of the Proposed Road Development to the appropriate level. This spoil will primarily consist of topsoil, alluvium and till.

Soil requiring offsite disposal will be managed in accordance with relevant waste legislation (Classification, Labelling and Packaging Regulation (CLP) European Waste Catalogue and Hazardous Waste List (EPA, 2002), EU Council Decision (2003/33/EC) of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of Annex II to Directive 19999/31/EC, Council Directive 1999/31/EC on the landfill of waste, Waste Management Act 1996, the Environment (Miscellaneous Provisions) Act 2011 (No. 20 of 2011).

In general, materials will be hauled along the route of the Proposed Road Development between the various sections without the need to use the public road network. The imported fill materials will be brought to the Proposed Road Development site on the public road network, prior to being distributed along the path of the Proposed Road Development site via the haul routes. Any hard core required to form this haul route during the construction stage will be re-used, where possible (most likely in the capping layer).

Some localised construction stage access routes will be needed close to the bridge abutment to cater for beam lifting; these will represent minor elements in terms of earthworks volumes.

Temporary drainage during construction stage will be addressed in the Contractors CEMP and will be managed so as to reduce the direct runoff to ground and water.

4.5.2.1.1 Soil Management Plan

The Contractor shall develop a Soil Management Plan (SMP) outlining its proposal for the management and reuse of excavated materials from the Site, where permitted in accordance with the relevant legislation, and provided that the reuse meets the engineering requirements for material used within the works. The SMP will be required to include details such as:

- Depth and method of topsoil stripping and stockpiling, including separation of topsoil resources of different potential;
- Detail relevant stockpile procedures to track dates of creation, sources of materials, classification and disposal/recovery information;
- Methods of stripping and stockpiling of higher quality re-useable subsoil (if appropriate);
- Identification of landscaping topsoil requirements and assessment of suitability and availability of onsite resources (if appropriate);
- Detail relevant procedures for the unexpected finds of contaminated materials onsite including measures for the handling, treatment and management of contaminated materials;
- Means of protection of subsoil from compaction damage and remedial measures (ripping/subsoiling) for reinstatement; and
- Means of erosion control and measures to prevent sediment laden run-off entering watercourses/standing water bodies.

In addition, where the Contractor proposes to maximise the reuse of excavated soil in order to minimise the generation of waste, it shall set out how it proposes to manage and document this reuse to the satisfaction of GCC or its representatives and must comply with legal and legislative requirements.

The SMP should detail:

- Identification and recording of the location from where the material was excavated;
- Delineation of areas where excavated soil is intended for disposal as waste, and where it is intended for reuse (where permitted);
- Delineation of areas of contaminated and uncontaminated soil (if present);
- Sampling of excavated soil (the number and location of soil samples);
- The proposal for the laboratory to carry out the testing;
- The suite of parameters for which the soil is to be tested;

- The criteria for assessing whether the soil is contaminated or uncontaminated;
- Geotechnical criteria for reuse; and
- The Contractor shall establish the controls necessary to manage the generation, handling and storage of waste at the Site.

4.5.2.2 Construction, Erosion and Sediment Control Plan

A Construction Erosion and Sediment Control Plan (CESCP) will be prepared at detail design stage for the Proposed Road Development. All of the measures, mitigations, controls, requirements, procedures, etc. will be developed from industry environmental best practice to ensure that there are no significant adverse effects on the receiving environment during the construction of the Proposed Road Development. These mitigation measures will be implemented in full and will aim to ensure that sediment laden runoff from the construction site does not pollute watercourses or water bodies with an emphasis on the Lough Corrib SAC.

The purpose of a Construction, Erosion and Sediment Control Plan (CESCP) is to:

- Minimise erosion potential by effective planning, procedures and water management;
- Apply erosion control measures to prevent the movement of sediment; and
- Apply sediment control measures to prevent offsite sediment release in the event of sediment movement.

A CESCP report provides an effective tool for reducing potential environmental effects by:

- Identifying erosion and sediment control objectives before construction;
- Encouraging planning to manage water, control erosion and control sediment by identifying potential impacts and mitigation measures;
- Providing a mechanism for clear communication to workers;
- Defining a performance expectation; and
- Assuring owners and regulators that due diligence has been exercised.

4.5.2.3 See Appendix A for further details on the Construction, Erosion and Sediment Control Plan. Accidental Spills and Leaks

In order to prevent spillages to ground of fuels, and to prevent consequent soil or groundwater quality impacts, it will be necessary to adopt mitigation measures during the construction phase, which include:

- Designating a bunded storage area at the contractor's compound(s) for all oils, solvents and chemicals used during construction. Oil and fuel storage tanks will be bunded to the greater volume of either 110% of the capacity of the largest tank/container within the bunded area or to a volume of 25% of the total capacity of all the containers. Drainage from the bunded area will be diverted for collection and safe disposal. All containers within the storage area will be clearly labelled so that appropriate remedial action can be taken in the event of a spillage. When moving drums from the bunded storage area to locations along the Proposed Road Development a suitably sized spill pallet will be used for containing any spillages during transit;
- Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in designated areas which will be away from surface water gullies or drains. Spill kit facilities will be provided at the fuelling areas in order to provide for accidental releases or spillages in and around the area. Any used spill kit materials will be disposed of using a licenced hazardous waste contractor in accordance with relevant legalisation; and
- Where mobile fuel bowsers are used on the Proposed Road Development, in the event of a machine requiring refuelling outside of the designated area, fuel will be transported in a mobile double skinned tank. Any flexible pipe, tap or valve will be fitted with a lock where it leaves the container and locked shut when not in use. Each bowser will carry a spill kit and each bowser operator will have spill response training.
- The Contractor will develop procedures and contingency plans to deal with emergency accidental spills and leaks.

4.5.2.4 Use of Natural Resources

It is estimated that a small volume (approximately 5,500 m^3) of soils from the Proposed Road Development site will be suitable for re-use within the Proposed Road Development. The remaining fill material requirement will be sourced where possible from local quarries, providers of recycled aggregates or suitable donor sites under Article 27 of the European Communities (Waste Directive) Regulations 2011. A number of local quarries have been identified, and prior to construction, these shall be reviewed and only those quarries that conform to all necessary statutory consents will be used in the construction phase. Soils/fill material to be brought to the Proposed Road Development site will be vetted with chemical soil testing if necessary, in order to check that it is of a reputable origin and that it is 'clean' (i.e. will not introduce contamination to the environment; soil and groundwater). All potential suppliers will be vetted for the following criteria:

- Environmental management status; and
- Regulatory and legal compliance status of the company.

'Clean' fill material will be sourced from suppliers which comply with the above requirements. If recycled aggregate is used as imported fill, chemical testing will be undertaken to confirm that it is 'clean' (i.e. would not introduce contamination to the environment).

According to the GSI Spatial Resources website, the following active quarries are located within a 20 km radius of the Proposed Road Development:

Table 4-2 Active Quarries Identified Within 20km of the Proposed Road Development

Quarry Name	Resource	Distance from Proposed Road Development Site (approximately)
Cortoon Pit	Sand and gravel	13 km north
Mortimers Quarry	Limestone	14 km west
Coshla Quarries	Limestone	15 km southwest
Cathill Pit	Sand and gravel	18 km north
Esker Readymix Quarry	Limestone	19 km south

Source: Geological Survey of Ireland Spatial Resources Website (January 2021)

Backfill material will be sourced from suppliers which comply with vetting requirements.

4.5.2.5 Control of Concrete and Lime

Mitigation measures will include the following:

- Ready-mixed concrete will be brought to the Proposed Road Development site by truck.
- A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated water to the underlying subsoil and groundwater; and
- The pouring of concrete will take place within a designated area protected to prevent concrete runoff into the soil/groundwater media.
- Washout of concrete transporting vehicles will take place at an appropriate facility, offsite where possible, alternatively, where wash out takes place onsite, it will be carried out in carefully managed onsite wash out areas.

4.5.2.6 Dewatering

Where dewatering is required in order to facilitate excavations, a risk assessment should be undertaken to determine the risk to sensitive receptors. Where an unacceptable risk is identified, suitable mitigation will be put in place. Also see Section 4.4 Biodiversity.

4.5.3 Monitoring and Protection of Molinia Meadows and Petrifying Springs

Molinia Meadows

Works will be undertaken to protect areas of Annex I *Molinia* Meadow habitat (including translocated sods) and the hydrology of the area either side of the development through installation of suitably free-draining, clean, large, rounded, locally derived stone under the road embankment and minimising the works footprint in this area.

Petrifying Springs

The following monitoring will be implemented;

- A quarterly sampling programme of the petrifying spring will be undertaken for 6-12 months before, during and two years after construction works. This will include monitoring/recording descriptions of flows', and scheduling samples for an inorganic suite of analysis, to include pH, electrical conductivity, ammonium, nitrate, fluoride, chloride and sulphate. Monitoring data from the pre-construction phase and construction phase will be reviewed to determine whether any additional mitigation requirements are required.
- Weekly visual checks will be undertaken of the spring during construction works, with photographs taken and written descriptions of flow recorded.
- Clearance of topsoil/substrate is to be kept to an absolute minimum within 50 m of this habitat area.
- In order to avoid any alteration to groundwater pH, only locally derived limestone shall be used in the construction within 100 m of this habitat. This limestone for base fill will be of a size that permits flow of waters through it, if required. This mitigation measure would ensure no changes to the alkalinity of the Petrifying Spring and will support hydrological connectivity between the north and south side of the Proposed Road Development.
- Also see Section 4.4 Biodiversity.

4.6 Water

4.6.1 Potential Impacts

Development works by their nature have the potential for impact of watercourses and groundwater by way of pollution. The implementation of appropriate control measures in accordance with the Contractor's CEMP and best management practices will reduce the risk of accidents from polluting substances entering surface water and groundwater. Examples include:

- Polluted discharges from Site;
  - Discharge of vehicle wash-down water;
  - Discharge of construction materials, e.g. uncured concrete;
  - Uncontained spillage of wastewater effluent;
  - Uncontrolled sediment erosion and contaminated silty runoff; and
  - Refuelling facilities, chemical and waste storage or handling areas.
- Changes to the existing drainage network including interception and redirection of natural and artificial watercourses (e.g. drainage channels);
- Increased runoff from cleared and capped areas (relative to greenfield values);
- Construction of watercourse crossings;
- Construction of bridge over the Abbert River;
- Works within water; and
- Outfall points.

During construction, pollution from mobilised suspended solids will generally be the prime concern, but spillage of fuels, lubricants, hydraulic fluids and cement from construction plant may lead to incidents, especially where there are inadequate pollution mitigation measures.

4.6.2 Environmental Mitigation, Control Measures and Proposals

For each of the potential sources of an environmental impact on the existing environment, the Contractor will identify the control and protection measures to be implemented.

4.6.2.1 Sedimentation (Suspended Solids)/Managing Runoff and Silty Water

A CESCP will be prepared as part of the Contractors CEMP, which will be based on the sedimentation control measures in the Outline CEMP (see Appendix A). During the construction phase, the following mitigation measures will ensure that no sediment contamination, contaminated runoff or untreated wastewater will enter watercourses on or near the Proposed Road Development site.

- The Contractor will construct elements of the permanent drainage system as early as practicable, such as the interceptor drains, to facilitate earthworks haul routes and control drainage from the works, to avoid flows onto adjacent land and/or untreated discharges to watercourses.
- Excavations will only remain open for limited time periods to reduce groundwater and surface water ingress and water containing silt will be passed through a settlement tank or adequate filtration system prior to discharge. A discharge consent will be obtained as necessary for disposal of water arising from pumping (if any) or such water may be disposed of as construction site run off where appropriate. Spoil and temporary stockpiles including stone stockpile areas will be positioned in locations which are distant from drainage systems and retained drainage channels, away from areas subject to flooding. They will be appropriately graded and kept to maximum heights to reduce the potential for sediment run-off. Runoff from spoil heaps will be prevented from entering watercourses by diverting it through onsite settlement ponds and removing material as soon as possible to designated storage areas.
- Drainage channels and streams will be clearly identified onsite and shown on method statements and site plans. Construction compounds will be located at least 25 m from watercourses and 10 m from field drains.
- Drains carrying high sediment load will be diverted through settlement ponds, located between the construction area and the nearest surface water drain. Surface water runoff from working areas will not be allowed to discharge directly to the local watercourses. To achieve this, the drainage systems will be constructed prior to the commencement of major site works or the Contractor will provide an alternative means of silt management. Discharge from settlement/treatment ponds will be controlled and maintained at greenfield runoff rates to avoid impacting existing surface water flow rates. The attenuation systems have been designed to accommodate a 1 in 100-year event plus 20% for climate change without increasing the discharge rate to the receiving watercourse
- Silt traps will be placed across the works boundary in any areas adjacent to watercourses to avoid siltation of watercourses. These will be maintained and cleaned regularly throughout the construction phase. Attention will also be paid to preventing the build-up of dirt on road surfaces, caused by trucks and other plant entering and exiting the Proposed Road Development site.
- During the construction activities, there will be a requirement for diverting rainwater away from the construction areas, into nearby drainage channels and streams. Water will be filtered to prevent sediment from entering drainage channels and water streams.
- A monthly water sampling regime for the Abbert River will be put in place by the Contractor during construction activity onsite, to include sampling for pH and total suspended solids. Parameters will be agreed with GCC and Inland Fisheries Ireland (IFI) ahead of works. The frequency of monitoring will be increased to weekly during works over the river, including bridge construction. In addition daily visual checks of the Abbert River will be in place for the duration of the Proposed Road Development
- A temporary cut-off wall will be installed, in order to reduce the risk of sediments generated during bridge construction works mobilising to the Abbert River.
- Works will, where possible, be phased taking into account sensitive periods for aquatic ecology, such as spawning seasons.

The drainage system has also been designed to offset risks to the *Molinia* meadows, by allowing drainage beneath the carriageway at Chainage 1+950 to 2+050. In order to mitigate the impact of the Proposed Road Development it is proposed to provide a layer of free-draining granular material at the base of the embankment to maintain the hydraulic connectivity across the embankment. It is also proposed to omit any pre-earthworks drainage/interceptor ditches within the area of the *Molinia* Meadow to prevent over drainage of the area. Weekly visual checks of the *Molinia* Meadow will be undertaken during construction works, with photographic records maintained.

4.6.2.2 Accidental Spills and Leaks

In order to prevent spillages to ground of fuels, and to prevent any consequent migration through the subsurface to surface waters or direct spillages to watercourses, it will be necessary to adopt mitigation measures during the construction phase, which include:

- Designating a bunded storage area at the Contractor's compound for all oils, solvents and chemicals used during construction. Oil and fuel storage tanks will be bunded to the greater volume of either 110% of the capacity of the largest tank/container within the bunded area or to a volume of 25% of the total capacity of all the containers. Drainage from the bunded area will be diverted for collection and safe disposal. All containers within the storage area will be clearly labelled so that appropriate remedial action can be taken in the event of a spillage. When moving drums from the bunded storage area to locations along the Proposed Road Development site a suitably sized spill pallet will be used for containing any spillages during transit;
- Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in designated areas which will be away from surface water gullies or drains. Spill kit facilities will be provided at the fuelling areas in order to provide for accidental releases or spillages in and around the area. Any used spill kit materials will be disposed of using a hazardous waste contractor; and
- Drip trays will be used during refuelling operations if performed outside of a contained area and spill kits will be carried in the fuel bowser vehicle. Any used spill kits will be disposed of using a hazardous waste disposal contractor and in accordance with all relevant EU and Irish waste management legislation;
- Where mobile fuel bowsers are used on the Proposed Road Development site, in the event of a machine requiring refuelling outside of the designated area, fuel will be transported in a mobile double-skinned tank. Any flexible pipe tap, or valve will be fitted with a lock where it leaves the container and locked shut when not in use. The pump will also be locked shut when not in use. Each bowser will carry a spill kit and each bowser operator will have spill response training.
- All water runoff from designated refuelling areas shall be channelled to an oil interceptor or an alternative treatment system prior to discharge;
- Leaking or empty fuel drums shall be removed from site immediately and disposed of via an appropriately licensed waste disposal contractor;
- The Contractor will develop an emergency response plan to be followed in the event of spills and leaks;
- Where use of herbicides, pesticides or artificial fertilisers is required, this will be done in accordance with legislation. The use of plant protection products (PPPs) will be in accordance with TII's guidance document *The Management of Invasive Alien Plant Species on National Roads – Technical Guidance*.

4.6.2.3 Control of Concrete and Lime

Mitigation measures will include the following:

- Ready-mixed concrete will be brought to the Proposed Road Development site by truck;
- A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated water to the underlying subsoil and groundwater, from which it could migrate to surface water;
- The pouring of concrete will take place within a designated area protected to prevent concrete runoff into surface water;
- Washout of concrete transporting vehicles will take place at an appropriate facility, offsite where possible, alternatively, where wash out takes place onsite, it will be carried out in carefully managed onsite wash out areas;
- In order to minimize potential impacts to the river SAC from the bridge construction works, abutments and embankments will be outside the SAC and abutments will be set back from the river by a minimum of 5 m; and
- During construction works suitable drainage, settlement and silt control measures will be implemented to mitigate disturbance to the SAC. The bridge span will be constructed using precast beams.

4.6.2.4 Additional Mitigation

Works to proposed structures over existing watercourses will be undertaken following approval by the OPW under Section 50 of the Arterial Drainage Act.

Ongoing consultation will be undertaken with relevant statutory bodies, including IFI and NPWS. Construction works over/near watercourses will be undertaken with cognisance of the relevant guidance, including:

- CIRIA C532 Control of Water Pollution from Construction Sites. Guidance for Consultants and Contractors;
- CIRIA C648 Control of Water Pollution from Linear Construction Projects, technical guidance;
- CIRIA C649 Control of Water Pollution from Linear Construction Projects, site guide;
- CIRIA C793 The SuDS Manual; and
- Guidelines on Protection of Fisheries During Construction Works (IFI, 2016).

4.7 Noise and Vibration

4.7.1 Potential Impacts

Noise and vibration impacts may arise from a wide variety of sources during construction and to varying degrees during the course of the works, depending upon the stage of construction (i.e. ground works, etc.). Due to the nature of the activities undertaken on a linear construction site such as the Proposed Road Development, there is the potential for the generation of noise and vibration levels above those currently experienced in the surrounding environment.

The Contractor shall identify potential sources of noise and vibration from selected plant and equipment and from activities that will be carried out during the works. This shall also include offsite noise and vibration generation from road traffic directly associated with the works (e.g. deliveries to the Site, waste transportation from the Site, etc.).

4.7.2 Environmental Mitigation and Control Measures and Proposals

For each of the potential sources of an environmental impact on the existing environment, the Contractor will identify the control and protection measures to be implemented. The following mitigation and general control measures should be followed as a minimum to ensure no significant adverse direct and indirect effects on the environment arise from the Proposed Road Development.

4.7.2.1 General Measures

This section prescribes the mitigation measures necessary for the Contractor to minimise and monitor noise and vibration impacts and effects associated with the Proposed Road Development.

The Contractor undertaking the construction of the works will be obliged to take specific noise abatement measures and comply with the recommendations of BS 5228 – 1 (BSI 2009 + A1 2014a) and BS 5228 – 2 (BSI 2009 + A1 2014b) and the Noise and the European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001.

- The Contractor shall comply with mitigation measures that may be provided in a planning consent, , GCC's requirements, and any updated or new supplementary environmental reports made available to the Contractor as necessary;
- The Contractor shall select construction plant with low inherent potential for generation of noise and/or vibration;
- The Contractor shall be responsible for implementing noise and vibration mitigation on site related to construction activities.;
- It will be necessary for the Contractor to liaise with GCC to ensure that noise and vibration during construction is effectively managed. This will include communicating details of the various phases of work, demonstrating how good site practices will be adopted in order to mitigate construction noise and vibration impacts;
- The Contractor shall designate an SEM/Responsible Person who, amongst a range of other responsibilities, will liaise with environmental advisors, relevant authorities/environmental bodies and the local community as required with respect to noise and vibration impacts during the construction phase.
- The Contractor will highlight through method statements and/or risk assessment specific activities that will create significant noise and vibration levels. Contractors will demonstrate how they will mitigate/manage these emissions. Where significant noise or vibration levels are expected, this will be communicated with any affected parties.

4.7.2.2 Methods of Work and Noise Reduction

The following noise control measures shall be employed on site as a minimum:

- No plant used onsite will be permitted to cause an ongoing public nuisance due to noise;
- The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by onsite operations;
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract;
- Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers; and
- Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use.
- Stationary noise sources shall be located as far away as possible from residential noise sensitive receptors (NSR), and where necessary acoustic barriers shall be used to shield them; and,
- Site staff shall be informed about the need to minimise noise and shall be supervised to ensure compliance with the noise control measures adopted.

4.7.2.2.1 Selection of Quiet Plant

The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the Proposed Road Development site. The least noisy item of plant will be selected wherever possible. Should a particular item of plant already on the site be found to generate high noise levels, the first action will be to identify whether or not said item can be replaced with a quieter alternative.

For static plant such as compressors and generators used at work areas such as construction compounds etc., the units will be supplied with manufacturers' proprietary acoustic enclosures where possible.

The contractor will evaluate the choice of excavation, breaking or other working method taking into account various ground conditions and site constraints. Where possible, where alternative lower noise generating equipment that will economically achieve, in the given ground conditions, equivalent structural/ excavation/ breaking results, these will be selected to minimise potential disturbance.

4.7.2.2.2 Noise Control at Source

If replacing a noisy item of plant is not a viable or practical option, consideration will be given to noise control 'at source'. This refers to the modification of an item of plant, or the application of improved sound reduction methods in consultation with the supplier or the best practice use of equipment and materials handling to reduce noise.

Proposed techniques will also be evaluated in light of their potential effect on occupational health and safety. The following outline guidance relates to practical noise control at source techniques which relate to specific site considerations:

- For mobile plant items such as cranes, dump trucks, excavators and loaders, the installation of an acoustic exhaust and/or maintaining enclosure panels closed during operation can reduce noise levels by up to 10 dB. Mobile plant will be switched off when not in use and not left idling;
- For percussive tools such as pneumatic concrete breakers or tools a number of noise control measures include fitting a muffler or sound reducing equipment to the breaker 'tool' and ensuring any leaks in the air lines are sealed and erection of localised screens around breaker or drill bit when in operation in close proximity to noise sensitive boundaries are other suitable forms of noise reduction;
- For all materials handling, the contractor will ensure that best practice site noise control measures are implemented including ensuring that materials are not dropped from excessive heights;
- Where compressors, generators and pumps are located in areas in close proximity to noise sensitive properties/areas and have potential to exceed noise criterion, these will be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation;
- Resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can be controlled by fixing resilient materials in between the surfaces in contact;
- Demountable enclosures could also be used to screen operatives using hand tools and could be moved around Site as necessary, and
- All items of plant will be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.

4.7.2.2.3 Screening

Typically, screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to other forms of noise control. The effectiveness of a noise screen will depend on the height and length of the screen, its mass, and its position relative to both the source and receiver.

The length of the screen will in practice be at least five times the height; however, if shorter sections are necessary then the ends of the screen will be wrapped around the source.

BS 5228 -1:2009+A1 2014 states that on level sites the screen should be placed as close as possible to either the source or the receiver. The construction of the barrier will be such that there are no gaps or openings at joints in the screen material. In most practical situations the effectiveness of the screen is limited by the sound transmission over the top of the barrier rather than the transmission through the

barrier itself. In practice screens constructed of materials with a mass per unit of surface area greater than 10 kg/m^2 will give adequate sound insulation performance. As an example, the use of a standard 2.4 m high construction Site hoarding will provide a sufficient level of noise screening once it is installed at a suitable position between the source and receiver.

4.7.2.2.4 Working Hours

Normal working times will be 07:00 to 19:00hrs Monday to Friday and 08:00 to 13:00hrs Saturday. 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 Contracting Authority.

Works other than the pumping out of excavations, security and emergency works will not be undertaken at night and on Sundays without the written permission of the GCC.

4.7.2.3 Noise and Vibration Limits

Guidelines relating to construction noise and vibration limits are set out within the TII guidance documents and other relevant national and international documentation for the control of noise and vibration from construction sites. These are discussed in the following sections.

Construction Noise

The TII Noise Guidelines 2004 (TII, 2004) and TII Noise Guidelines 2014 (TII, 2014) guidance documents specify noise levels that are typically deemed acceptable in terms of construction noise for new national roads. These design goals are set out in Table 4-3.

Table 4-3 Maximum Permissible Noise Levels at the Facade of Dwellings during Construction Phase

	Noise Levels (dB re 2 x 10^{-5} Pa)	
Period	**dB $L_{Aeq,1hr}$**	**dB $L_{AS,\ Max\ ,1hr}$**
Monday to Friday 07:00 to 19:00 hrs	70	80
Monday to Friday 19:00 to 22:00 hrs	60*	65*
Saturday 08:00 to 16:30 hrs	65	75
Sundays and Bank Holidays 08:00 to 16:30 hrs	60*	65*

*Note * Construction activity at these times, other than that required for emergency works, will normally require the explicit*

Construction Vibration

Vibration standards are generally split into two categories, those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. For construction phase vibration effects, it is appropriate to consider the magnitude of vibration in terms of Peak Particle Velocity (PPV) for both.

With regards to building response, the TII guidelines outline the following vibration limit values with respect of ensuring that no cosmetic or structural damage occurs to buildings in the vicinity of construction works.

Table 4-4 Allowable Vibration during Road Construction in order to Minimise the Risk of Building Damage

Allowable Vibration Velocity (Peak Particle Velocity) at the Closest Part of Any Sensitive Property to the Source of Vibration, at a Frequency of		
Less than 10 Hz	10 to 50 Hz	50 to 100 Hz
8 mm/s	12.5 mm/s	20 mm/s

Source: TII Noise Guidelines 2004

4.8 Traffic Management

This section prescribes the mitigation and general control measures necessary for the Contractor to minimise impacts upon construction operatives, the local community, residents and landowners directly affected by the works and associated traffic, travel management and vehicle usage.

A Construction Traffic Management Plan will be prepared by the Contractor during the detailed design stage. The CTMP will be implemented to minimise the effect of construction traffic on the surrounding network, local community and the environment. The CTMP will be a separate document to the CEMP.

4.8.1.1 Construction Parking

Details on parking to be added by the Contractor within the Contractors CEMP when construction access points are finalised.

4.8.2 Environmental Mitigation, Control Measures and Proposals

For each of the potential sources of an environmental impact on the existing environment, the Contractor will identify the control and protection measures to be implemented. The following mitigation and general control measures should be followed as a minimum to ensure no significant adverse direct and indirect effects on the environment arise from the Proposed Road Development.

4.8.2.1 General Control Measures

the enforcement of a CEMP and a CTMP will ensure that construction traffic impacts are minimised through the control of site access/egress routes and site access locations and any necessary temporary lane closure requirements.

The CTMP will incorporate any specific additional requirements of statutory authorities and any conditions imposed by An Bord Pleanála. The CTMP will clearly set out any temporary traffic restrictions and will be prepared during the detailed design phase. The CTMP will include the following measures:

- Traffic control would be in place for all vehicles entering and exiting the site;
- Parking would be allowed only in designated parking areas onsite;
- Segregated pedestrian walkways would be introduced;
- Public pedestrian access would be restricted throughout the proposed works;
- Access to the site would be strictly controlled with all personnel being required to have a Solas Safe Pass and to have undergone a specific Sisk Site Safety Induction before being allowed into the site;
- Traffic on the Proposed Road Development site would remain on hardcore areas wherever possible. Where this is unavoidable, traffic exiting the site would go through a wheel wash;
- All plant and equipment would be fitted with flashing amber warning lamps and hazard lights and would be required to have reversing alarms for operations within the work site;
- The need for reversing vehicles, would be reduced by introduction of one way system;
- Speed limit of 15 km/h would be put in place on the construction site;
- Safe working procedures would be followed by plant and vehicles required to enter and leave the construction site into trafficked lanes;
- All workers would be required to wear high visibility reflective protective clothing; and
- Site foreman and supervisors would be in two-way communication with each other and the traffic controllers for the duration of the work shift.

4.8.2.2 Traffic Management Measures

Construction debris particularly site clearance, spoil removal and dirty water run off can have a significant impact on footpaths and roads adjoining a construction site, if not adequately dealt with.

The Contractor shall establish the control measures necessary to manage all traffic activity associated with its works. In identifying the appropriate controls, the Contractor shall conduct a Traffic Risk Assessment prior to implementation of traffic management measures. The traffic management measures should enable site-based staff to manage all these risks efficiently and effectively.

In terms of general traffic management measures, typical controls will include barriers defining footways and safety zones to prevent construction vehicles encroaching on pedestrian areas, segregated pedestrian routes (where appropriate), temporary warning signs erected to highlight particular hazards, including site accesses and temporary traffic management measures. Control measures may also include those considered within other sections of the CEMP (i.e. noise and dust control).

Below is a list of the proposed traffic management measures to be adopted during the construction works. Please note that this is not an exhaustive list, and that it will be the appointed contractor's responsibility to prepare a detailed CTMP:

- Clear signage of any temporarily diversions to existing motorised and non-motorised routes (including pedestrians and cyclists);
- Warning signs / advanced warning signs will be installed at appropriate locations in advance of the construction access locations;
- Maintain access for non-motorised users to community assets with minimal disruption as far as is possible, where diversion are required non-motorised users should be considered and facilitated to continue their journey with minimal disruption as far as possible. This should include provisions for vulnerable non-motorised users such as the elderly and school children;
- Road closures and restrictions should be planned in agreement with the appropriate stakeholders including GCC.
- Minimise journeys to and from the site by the workforce, sub-contractors, suppliers and anyone else who is likely to visit the site regularly;
- Provide protection from traffic hazards that may arise as a result of the construction activities and journeys to and from the site;
- Manage potential adverse impacts on the public road network and ensure network performance is maintained at an acceptable level;
- Plan deliveries to the site;
- Ensure that the roads and footways in the vicinity of the construction site are kept clear of debris, soil and other material;
- Construction and delivery vehicles will be instructed to use only the approved and agreed means of access; and movement of construction vehicles will be restricted to these designated routes;
- Appropriate vehicles will be used to minimise environmental impacts from transporting construction material, for example the use of dust covers on trucks carrying dust producing material;
- Speed limits of construction vehicles to be managed by appropriate signage, to promote low vehicular speeds within the Site;
- Parking of site vehicles will be managed and will not be permitted on public road, unless proposed within a designated area that is subject to traffic management measures;
- A road sweeper will be employed to clean the public roads adjacent to the site of any residual debris that may be deposited on the public roads leading away from the construction works;
- On site wheel washing will be undertaken for construction trucks and vehicles to remove any debris prior to leaving the site and to remove any potential debris on the local roads;
- All vehicles will be suitably serviced and maintained to avoid any leaks or spillage of oil, petrol or diesel. Spill kits will be available on site. All scheduled maintenance carried out off site will not be carried out on the public road. Any used spill kits will be disposed of using a hazardous waste disposal contractor and in accordance with all relevant EU and Irish waste management legislation;

- Safe and secure pedestrian facilities are to be provided where construction works obscure any existing pedestrian footways. Alternative pedestrian facilities will be provided in these instances, supported by physical barriers to segregate traffic and pedestrian movements, and to be identified by appropriate signage. Pedestrian facilities will cater for vulnerable users including mobility impaired persons;

Also consider:

- Use of sustainable modes of transport (i.e. use of public transport, encouraging cycling);
- The health and wellbeing of the workforce;
- Identify sensitive areas (e.g. schools and homes);
- Measures aimed at avoiding disruption and inconvenience to local residents and businesses;
- Safety of vulnerable users (i.e. children, the elderly); and
- Take into account other developments whose activities could affect the Proposed Road Development.

The mitigation measures identified above will contribute to ensuring there will not be any significant environmental degradation in the vicinity of the proposed works. Furthermore, it is in the interest of the construction programme that deliveries, particularly concrete deliveries are not unduly hampered by traffic congestion, and as a result continuous review of haulage routes, delivery timings and access arrangements will be undertaken as construction progresses to ensure smooth operation.

The Contractor shall comply with mitigation measures that may be set out in planning consent documents, GCCs Requirements, and any updated or new supplementary environmental reports made available to the Contractor as necessary.

Advice on the preparation of Green Travel Plans can be found in 'The Essential Guide to Travel Planning' published by the Department for Transport (DfT). Advice on the preparation of traffic mitigation measures can be found in the fourth edition of CIRIA's 'Environmental good practice on site guide' (C741) (2015).

4.8.2.3 Traffic Management Measures Implementation and Monitoring

The traffic management measures shall be implemented from the work start date and shall be monitored on a regular basis to ensure that they are being adhered to and targets are being met. Every effort shall be made to ensure the safety of the local road users is maintained.

The Contractor shall implement and adhere to the conditions set out by GCC.

4.9 Waste Management

4.9.1 Potential Impacts

During the construction phase a range of waste materials will be generated; for example, from construction works, site offices and temporary works facilities.

There will be a requirement to remove 2,000 m^3 of unacceptable material (U1) offsite, as defined in the Specification for Road Works Series 600 (TII, 2013).

It is anticipated that the generation of waste from the Proposed Road Development will not result in significant effects on waste management infrastructure capacity in the region.

4.9.2 Environmental Mitigation and Control Measures and Proposals

For each of the potential sources of an environmental impact on the existing environment, the Contractor will identify the control and protection measures to be implemented. The following mitigation and general control measures should be followed as a minimum to ensure no significant adverse direct and indirect effects on the environment arise from the Proposed Road Development.

4.9.2.1 Construction and Demolition Waste Management Plan

The Contractor shall be responsible for developing the Waste Management Plan (WMP) related to its construction activities. In preparing the plan, the Contractor shall consider any measures set out in any planning consent document, the relevant legislation, and industry best practice. The WMP should be in accordance with the new EPA guidance 'Best Practice Guidance for the Preparation of Resource and Waste Management Plans for Construction and Demolition Projects'. In developing the plan, the Contractor shall also consider the requirements of GCC.

The WMP will clearly set out the Contractor's proposals regarding the treatment, storage and recovery or disposal of waste. The WMP shall apply to all works carried out by the Contractor and any subcontractors under its control.

The plan will outline procedures for the correct segregation, storage, handling and transport of waste, which will ensure large volumes of waste are not generated at the Proposed Road Development site, and subsequently do not become a nuisance to the public. It will also ensure that the use of non-permitted waste contractors or unlicensed facilities, which could give rise to inappropriate management of waste, will not take place.

Soil requiring offsite disposal will be managed in accordance with relevant waste legislation (Classification, Labelling and Packaging Regulation (CLP) European Waste Catalogue and Hazardous Waste List (EPA, 2002), EU Council Decision (2003/33/EC) of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of Annex II to Directive 19999/31/EC, Council Directive 1999/31/EC on the landfill of waste, Waste Management Act 1996, the Environment (Miscellaneous Provisions) Act 2011 (No. 20 of 2011).

In developing the WMP, the Contractor shall consider the reuse of materials where practicable, where permitted under the relevant waste legislation, and where the material meets the engineering requirements.

4.9.2.1.1 Construction and Demolition Waste Management Plan

Included within the CEMP will be (but not be limited to) the following measures:

- Details of waste storage (e.g. skips, bins, containers) to be provided for different waste and collection times;
- Details of where and how materials are to be disposed of - landfill or other appropriately licensed waste management facility;
- Details of storage areas for waste materials and containers;
- Details of how unsuitable excess materials will be disposed of where necessary;
- Details of how and where hazardous wastes such as oils, diesel and other hydrocarbon or other chemical waste are to be stored and disposed of in a suitable manner;
- Any waste/litter generated onsite will be removed offsite to a waste licensed facility and litter will be collected if seen; and
- Staff will be made aware of a zero-litter policy.

4.9.2.2 Waste Management Strategy

The Contractor shall establish a system for the management of wastes in accordance with the Waste Management Hierarchy. This hierarchy outlines that waste prevention and minimisation are the first priority in managing wastes, followed by waste reuse and recycling. Disposal of waste shall only be considered as a last resort.

- Prevention;
- Minimisation;
- Reuse;
- Recycling;
- Disposal.

4.9.2.3 Waste Identification and Classification

The Contractor shall establish a procedure to identify and classify all waste arising at the site in accordance with the List of Waste (LoW) Code. The Contractor shall ensure that the waste materials generated during the works are clearly identified as either hazardous or non-hazardous wastes, with reference to the guidance from the Environmental Protection Agency (Paper Tool of the Procedure for the Identification of the Hazardous Components of Waste) where required and shall establish designated waste storage areas for the different types of waste that may arise.

For each waste stream identified by the Contractor, and for each additional waste stream that may arise during the course of the works, the Contractor shall identify the following:

- The appropriate LoW Code;
- A suitable Waste Collection Contractor in possession of a valid Waste Collection Permit for the collection of the particular waste within County Galway;
- The waste recovery or disposal site, including the transfer station where the waste may be transferred to upon leaving the site in possession of a valid Waste Facility Permit or Waste License, as appropriate; and
- The recovery or disposal method for the waste.

Only Contractors in possession of a valid Waste Collection Permit shall collect wastes from the Site. The Contractor responsible for the waste shall ensure that the Waste Collection Contractor:

- Is permitted to collect the particular waste;
- Is permitted to collect waste within County Galway;
- Uses a waste collection vehicle identified on the Waste Collection Permit; and
- Transfers the waste to a licenced waste facility identified on the Waste Collection Permit.

Prior to the commencement of the Proposed Road Development, the Contractor shall ensure the following information is provided:

- Transfer notes for controlled waste and consignment notes for hazardous waste must include an accurate description of the type, quantity and containment of waste; Standard Industrial Classification; the LoW Code; and details of the waste carrier, who must be licensed;
- Sufficient information must be provided to ensure that the waste disposal operator is aware of the potential hazards of the substance;
- The Trade Contractor should also ensure that returns for consignment notes are collected and retained; and
- All documentation must be retained for a minimum of two years for transfer notes and three years for consignment notes and be available for inspection.

The Logistics Contractor and all Trade Contractors removing waste directly from Site must provide the following documentation:

- Waste forecast;
- Licence documentation for all waste carriers removing waste and for all waste destinations receiving waste (to be approved before use);
- Recycling rates from facilities being used;
- Waste consignment notes (for a minimum of three years) for all hazardous waste. These must include the following:
  - Consignment note code;
  - Details of the site that the hazardous waste is removed from;
  - Details of waste disposal site;
  - Waste producer details if different to site details;
  - Description of the waste (written description, LoW code and SIC number);

  - Details of process that has generated this waste;
  - Specific details of the waste- quantity, chemical / biological components, physical form and hazardous properties Any special handling requirements; and
  - Signature of consignor once completed;
- Waste transfer notes (for a minimum of two years) for all non-hazardous waste. These must include the following and should be reported:
  - Accurate description of the waste type (written description, LoW code and SIC number);
  - Quantity and containment of waste;
  - Location, time and date of the waste transfer;
  - Names of both persons involved in the waste transfer ;
  - Details of the waste carrier and facility, both must be licensed;
  - Waste carrier's registration number.

The Contractor shall advise GCC or its representatives in advance if it proposes to act as the Waste Collection Contractor, subject to agreement. In the event that the Contractor acts as the Waste Collection Contractor, it shall ensure that it has the relevant Waste Collection Permit(s) in place prior to commencement of the Proposed Road Development.

4.9.2.4 Documentation of Waste

The Contractor shall develop a Waste Documentation System within the overall documentation system for the works. The documentation to be maintained in relation to wastes includes the following (where applicable):

- The names of the agent(s) and the transporter(s) of the wastes;
- The name(s) of the person(s) responsible for the ultimate recovery or disposal of the wastes;
- The ultimate destination(s) of the wastes;
- Written confirmation of the acceptance and recovery or disposal of any hazardous waste consignments;
- The tonnages and LoW Code for the waste materials;
- Details of any rejected consignments;
- The Waste Transfer Forms for hazardous wastes transferred from the site;
- The Transfrontier Shipment of Waste forms for hazardous wastes transferred abroad;
- The Certificates of Recycling, Reuse or Disposal for all wastes transferred from the site;
- The results of any analysis conducted on wastes; and
- The results of any analysis conducted on excavated soil.

The Contractor shall provide a report of all waste arising at the Site to include the information set out above. Information on the management of waste at the Site shall be made available to the Client or its representatives upon request. The original documentation relating to the management of waste shall be maintained at the Site.

Waste Audits and monitoring will be carried out at regular intervals through the life of the Proposed Road Development.

4.9.2.5 Litter or Debris

- The Contractor shall be required to maintain a tidy site as far as practicable and shall be required to dispose of materials in a controlled and responsible manner. These measures should assist in reducing the potential for adverse impacts on surface waters arising from construction activities.
- Areas of hard standing and surface roads shall be swept regularly to prevent the build-up of material which could be washed into watercourses.
- A high standard of housekeeping will be maintained at all times and waste materials will be stored in waste bins or skips only.

4.9.2.6 Waste Audits

Waste Audits will be carried out by the Contractor monthly at a minimum or in line with requirements of GCC or any planning consent conditions.

4.10 Additional Mitigation Measures

Additional mitigation measures during construction to reduce impacts on population and human health should be written into the CEMP and CTMP and include:

- Clear signage of any temporarily diversions to existing motorised and non-motorised routes (including pedestrians and cyclists);
- Road surfaces in proximity to the construction site are to be kept clear of mud and debris as much as is possible; and
- All temporary lane closures, one-way systems, signage, and temporary safety measures will be carried out in accordance with Section 8 of the Traffic Signs Manual (2010). The traffic management plans and diversions will be implemented at the interface between the works and traffic will be the contractor's responsibility. Issues relating to temporary diversions will be defined in traffic management plans produced by selected contractors.

The following best practice measures will be implemented during the construction phase relating to utilities:

- Prior to excavation diversion works, the appointed Contractor will be supplied with accurate service drawings and additional site investigations will be carried out if necessary, to ensure services are not damaged during construction works. The Contractor will be obliged to put measures in place during the construction phase to ensure that there are no interruptions to existing services and all services and utilities are maintained unless this has been agreed in advance with the relevant service provider and local authority. When service suspensions are required during the construction phase, reasonable prior notice will be given to the residencies in the area. The disruption to services or outages will be carefully planned so the duration is minimised. The timing of local domestic connections will be addressed between the contractor and the local community at the detailed design stage;
- Works during the construction phase, including service diversions and realignment will be carried out in accordance with relevant guidance documents, including Gas Networks Ireland's publication 'Safety advice for working in the vicinity of natural gas pipelines'; the ESB's Code of Practice for Avoiding Danger from Overhead Electricity Lines', 2008 and the HSA 'Code of Practice for Avoiding Danger from Underground Services', 2010; and
- All potential temporary connections will be agreed in advance with the relevant service provider.

The following mitigation measures will be implemented during the construction phase relating to agriculture:

- A key contact person will be appointed during the construction phase to facilitate communications between affected landowners and to facilitate the re-organisation of farm enterprises by farmers during critical times;
- The landowner would be provided with access to all separated land parcels during the construction of the Proposed Road Development. Where temporary disruptions to this access occur landowners would be notified in advance;
- Where existing water and electricity supplies are disrupted during the construction phase an alternative water source or electricity supply would be made available e.g. water tanker or electric cable ducting. If access to surface drinking water sources are permanently restricted alternative groundwater supplies would be provided (or compensation to allow farmer to drill his own well);
- Suitable boundary fencing would be erected to delineate the line of the Proposed Road Development site boundary and prevent disturbance/trespass to, and containment of livestock within, adjacent land;
- Landowners with lands adjoining sites where either rock breaking, piling takes place would be notified in advance of these activities, and where necessary, this could facilitate in the movement of farm animals to avoid undue disturbance';

- The impacts on water quality would be minimised by way of a programme of mitigation measures for surface and ground water sources as described in Section 4.5 Land and Soils and Section 4.6 Water;
- The spread of dust onto adjoining lands would be minimised by way of mitigation measures set out in under Air Quality; and
- Where drainage outfalls are temporarily altered, or land drains blocked or damaged an adequate drainage outfall will be maintained and land drains would be repaired.

In terms of landscape and visual mitigation includes:

- Disturbance of existing vegetation will be minimised where possible and proposed planting will help integrate the Proposed Road Development into the surrounding landscape, provide screening where needed, reflect vegetation patterns of local habitats, re-connect hedgerows to re-establish field patterns, and minimise the effect on the landscape character of the area;
- Road boundaries will be planted to reduce headlight glare intrusion into adjacent properties;
- Signage will be located sensitively so that it does not increase the visual effect upon dwellings;
- Rounding of the top and bottom of cut and fill slopes to tie in smoothly with existing adjacent landform; and
- Provision of sufficient protection for trees to be retained in areas close to construction works (as described in BS 5837:2005).

The Proposed Road Development will run through agricultural fields, which have established field boundaries made up of stone walls, fences and hedgerows. The design intent of the landscape mitigation is to provide a proposal that addresses and responds sympathetically to the surrounding context through scale, proportion and materiality. The landscape mitigation proposals form a strategy for integrating the Proposed Road Development into the existing river valley by introducing tree and woodland planting and re-connecting the field patterns with new hedgerows. Positive impact will be experienced locally through the planting of non-annex habitats, including species-rich wildflower meadow, wetland habitat reinstatement and the reuse of spoil/vegetated turves. Hedgerow planting of native mixed species will be used to integrate the road in the existing field patterns but will also improve local bio-diversity with the substantial planting of native hedgerow mixes containing hawthorn, blackthorn, alder buckthorn, guelder rose and dog rose. When planted along the banks and roadsides the hedgerows will form a physical barrier to encourage Barn Owls to fly up and over the road and avoid potentially high risk of collision with on-coming traffic. Tree planting will be introduced in clusters or copses of native trees within the field patterns, combined with the new hedgerows they will provide both new habitat creation and commuting routes for local species

Key Principles for the landscape mitigation include:

- The Proposed Road Development will include a new viewing area looking towards the Cistercian Abbey. The viewing area will be elevated to maximise the views, it will include layby space for motorists to pull over and walk to the viewing point and it will have a footpath connecting the viewing area with Abbeyknockmoy village. Planting to screen the proposed roundabout will frame views of the Abbey and restrict views to the new road.
- Minimise disturbance of existing vegetation, provide tree and hedgerow protection during construction works (as described in BS 5837:2005).
- Mainly native screen planting will be provided where the road will have an adverse visual effect on adjacent properties or views (further details about the species mix is included in the planting schedule in the landscape mitigation drawings accompanying the planning application, refer to Volume 03 & Volume 04 of the EIAR);
- Reflect field patterns and local habitats to re-connect field boundaries bisected by the Proposed Road Development in order to establish field patterns. Hedgerow planting will be a mix of native shrub and tree species that will provide good range of flowering and fruiting trees to improve the local biodiversity.
- Introduce stands of trees in informal pockets of woodland. Denser planting of trees and native woodland copses will be introduced at the proposed roundabout to provide additional screening and to improve the volume of woodland cover in the local area.

- Construction compounds and former areas of material stockpiles will be fully reinstated and landscaped, matching the vegetation and land use in the vicinity, following completion of the works.
- Wildflower mixes will be used on verges to maximise biodiversity;
- Wetland wildflower meadow (Annex I *Molinia* Meadows) will be impacted by the Proposed Road Development. To mitigate the loss of protected habitat it is proposed to undertake habitat creation and translocate grass sods from the affected area to a nearby field. These works will require specialist design, monitoring and maintenance to ensure the correct hydrological characteristics and soil conditions are retained. Construction compounds and former areas of material stockpiles will be fully reinstated and landscaped, matching the vegetation and land use in the vicinity, following completion of the works;
- Attenuation ponds will be naturalised with planting of marginal wetland species to the edges;
- All contracted landscape works will be monitored and maintained over an agreed establishment period, trees and shrubs that fail will be replaced with species matching the original planting proposals. Replacement stock size must reflect the size and form of adjacent planting of the same species; and
- Planting works will be in compliance with British Standard BS 3998 ‘Recommendations for tree work’ and should be implemented in suitable weather conditions during the winter planting season.

Appendix A Construction, Erosion and Sediment Control Plan

1. Construction, Erosion and Sediment Control Plan

A Construction Erosion and Sediment Control Plan (CESCP) will be prepared at detail design stage for the Proposed Road Development. All of the measures, mitigations, controls, requirements, procedures, etc. will be developed from industry environmental best practice to ensure that there are no significant adverse effects on the receiving environment during the construction of the Proposed Road Development. These mitigation measures will be implemented in full and will aim to ensure that sediment laden runoff from the construction site does not pollute watercourses or water bodies with an emphasis on the Lough Corrib SAC.

1.1 Introduction

The purpose of a Construction, Erosion and Sediment Control Plan (CESCP) is to:

- Minimise erosion potential by effective planning, procedures and water management;
- Apply erosion control measures to prevent the movement of sediment; and
- Apply sediment control measures to prevent offsite sediment release in the event of sediment movement.

A CESCP report provides an effective tool for reducing potential environmental effects by:

- Identifying erosion and sediment control objectives before construction;
- Encouraging planning to manage water, control erosion and control sediment by identifying potential impacts and mitigation measures;
- Providing a mechanism for clear communication to workers;
- Defining a performance expectation; and
- Assuring owners and regulators that due diligence has been exercised.

The CESCP will be a live document that will be updated, added to and amended through the construction phase of the Proposed Road Development. The appointed Contractor will be required to comply with any obligations as set out within the environmental Impact Assessment Report (EIAR), Natura Impact Assessment (NIS) and the planning consent and any associated conditions for the Proposed Road Development. All erosion and sediment controls will be inspected regularly, especially after rainfall, and will be effective until disturbed soils are stabilised. Inspection and maintenance checklists will be developed and records will be kept by the Contractor.

The CESCP will contain the below information at a minimum:

- Identify existing land use, surface water features, low-lying areas and natural drainage pathways. These will be illustrated on a map.
- An outline of the main construction activities likely to be relevant to erosion and sediment generation. These activities will be illustrated on a map.
- Identify areas most likely to have the potential for runoff, such as steep slopes, cuttings, embankments, stockpiles, haul roads etc. These will be illustrated on a map.
- Collect information on soil types and rainfall data and estimate runoff.
- Select the best control measures to avoid and reduce as far as is practicably possible runoff and erosion for the site conditions.

- Ensure control measures are correctly installed and adequately sized. Runoff controls must be in place before site works begin.
- Programme inspection and maintenance of control measures throughout construction of the Proposed Road Development to ensure adequate controls are in place and to determine the adequacy of control measures. Where a requirement for additional control measures are identified the necessary controls will be put in place by the Contractor.
- Develop emergency procedures.

Advance planning of runoff and sediment control can minimise the risk of pollution, reduce the risk of delays to construction works from wet ground conditions, and reduce space requirements. The EIAR has identified any protected or sensitive sites that should be considered.

1.1.1 Principles of Erosion and Sediment Control

The principles of Erosion and Sediment Control as identified in CIRIA (C648) include[2]:

- *"Erosion control (preventing runoff) is more effective than sediment control in preventing water pollution. Erosion control is less subject to failure from high rainfall, requires less maintenance and is also less costly.*
- *Plan erosion and sediment controls early in the project lifecycle and incorporate into the design and construction programme.*
- *Install drainage and runoff controls before starting site clearance and earthworks.*
- *Minimise the area of exposed ground.*
- *Prevent runoff entering the site from adjacent ground, as this creates additional polluted water.*
- *Provide appropriate control and containment measures on site.*
- *Monitor and maintain erosion and sediment controls throughout the project.*
- *Establish vegetation as soon as practical on all areas where soil has been exposed*".

1.2 Appointment of a Contractor

The design of the Proposed Road Development has been developed to a stage where all potential environmental impacts can be identified, and a fully informed environmental impact assessment has been carried out. It is likely that the Proposed Road Development will be constructed by a contractor appointed under a Design and Build Contract (D&B). The contractor engaged will be responsible for finalising the design of the Proposed Road Development in compliance with the Employer's Requirements, including compliance with the requirements of the EIAR and NIS (including all mitigation measures) and any planning consent conditions.

1.3 Key Elements of the Proposed Road Development

The Proposed Road Development runs in a south-west to north-east direction across the Abbert River. Starting on the eastern edge of Abbeyknockmoy and running north-east to the proposed tie-in with the existing N63 at the L6234 junction.

Beginning at Abbeyknockmoy village, the Proposed Road Development will deviate offline to the north of the existing N63 and be connected to the existing road network through a three-armed roundabout. From there, it will continue in a north-easterly direction through agricultural land before crossing the Abbert River at a skewed angle of approximately thirty-five degrees. The proposed alignment will then sweep east and continue through more agricultural land, running parallel to the existing N63. The alignment then crosses the L6159 and continues east through an area of existing woodland until it ties in with the existing N63 at its junction with the L6234. The existing L6159 will be realigned to create a

[2] CIRIA C648:
Control of water pollution from linear construction projects. Technical Guidance (2006)

north/south staggered junction with the proposed alignment, and the L6234 will be realigned to tie in with the proposed alignment.

The Proposed Road Development comprises the following major elements:

- Approximately 2.3 km of new Type 2 Single Carriageway road (predominantly offline);
- One new roundabout at the western end of the Proposed Road Development to provide connection with the existing N63;
- Two new priority junctions to provide connection to the existing L6159 and L6234, including some minor local road realignments;
- One new clear span steel girder bridge crossing of the Abbert River;
- Seven new piped culverts and two new box culverts over existing field ditches;
- Three new flood alleviation culverts (box culverts);
- New pedestrian and cycle facilities, predominantly located along the existing N63;
- Associated earthworks including excavation of unacceptable material (2000 m3), excavation and processing of rock and other material, and recovery of unacceptable material for re-use in the works;
- Accommodation works, including the provision of access roads and accesses;
- Drainage works, including the construction of attenuation ponds in accordance with sustainable drainage design principles and guidance;
- Treatment of surface water run-off prior to outfall discharge, spill containment measures and attenuation treatment facilities;
- Utilities and services diversion works including medium voltage (10 kV/20 kV) overhead lines and EIR overheard lines;
- Safety barriers, public lighting, fencing;
- Viewing area for Liss Abbey with parking;
- Landscaping planting works, signage, lighting and other works ancillary to the construction and operation of the Proposed Road Development;
- Construction of farm access tracks with accommodation works ancillary to the Proposed Road Development; and
- Environmental measures and other ancillary works.

1.4 Site Characteristics

The CORINE (2018) land cover dataset indicates the Proposed Road Development site consists of 'Agricultural Areas', described as 'Pastures'. The existing N63 forms part of the Proposed Road Development site and crosses the Abbert River at the approximate chainage 11+600. A number of drainage ditches pass through the Proposed Road Development site.

The topography of the Proposed Road Development site is generally flat, particularly along the Abbert River which flows parallel to the N63. South of the N63, the land rises gradually from approximately 50 m above sea level to approximately 170 m (Knockroe) over a two-kilometre distance. Surrounding land uses are summarised in Table 1-1.

Table 1-1: Summary of Surrounding Land Uses

Direction	Description
North	Agricultural land, the Abbert River and single residential properties. A cemetery is approximately 500 m to the north-west.
East	Agricultural land, woodland and some residential properties.
South	Agricultural land and residential properties.
West	Residential properties with agricultural land beyond.

The classification of groundwater vulnerability beneath the Proposed Road Development site varies from 'Moderate' to 'Rock at or near surface or karst' (see Volume 03; Figure A8.4 of the EIAR).

The Abbert River, a tributary river of Lough Corrib forms part of the Lough Corrib SAC, and is the main watercourse flowing through the Proposed Road Development. The Abbert River is noted for its fishery potential with respect to salmon and brown trout. Two tributaries of the Abbert River – labelled as 'Lindsay's Farm' and 'Derreen' on EPA mapping – join the Abbert from the south immediately to the south of the Proposed Road Development at a chainage of approximately 1+630. The Lecarrow flows from the northeast into the Abbert River approximately 250 m upstream of the Proposed Road Development. The Feagh East flows from the northeast into the Abbert River approximately 500 m to the west (downstream) of the Proposed Road Development. In addition to these, a number of field drains and springs are present within the Proposed Road Development site, discharging into the Abbert River. EPA-recognised surface water features within the Proposed Road Development site are shown on Figure 9.1, Volume 03 of the EIAR.

Annex I *Molinia* Meadows and Calcareous spring habitat are located within the Proposed Road Development site (see Volume 03; Figure A7-2).

Further information and drawings are contained in Volume 02 and Volume 03 of the EIAR.

1.5 Potential Sources of Runoff

Potential sources of runoff include earthworks, structure and concrete, watercourse crossings and instream works, and construction compounds and machinery re-fuelling and lubrication, all of which can be sources of pollution.

Topsoil, subsoil and peat surfaces can become exposed during the initial site clearance works/topsoil strip, excavation and backfilling, construction of fill slopes, borrow pits and material deposition areas, the transportation of soils, and during the stockpiling of materials.

Lime and concrete (specifically, the cement component) is highly alkaline and any spillage could enter surface water or migrate though subsoils and groundwater impacting surface water quality or potentially smothering the river bed, given a spill of sufficient volume. Any spillage which migrates through subsoil could impact groundwater quality. The activities most likely to result in contamination include concreting during road and bridge construction, piling for bridge foundations and concreting for culverts and ponds.

Diversion, crossing or maintenance of watercourses have the potential to generate sediment through disturbance. The Abbert River, is the main watercourse in the area. The Proposed Road Development will require the implementation of a clear span bridge across the Abbert River.

A minimum of one temporary construction compound will be required along or in the vicinity of the Proposed Road Development to provide storage of construction equipment and materials, as well as for offices, parking, and welfare facilities for staff. An alternative and secondary compound is proposed to the north of the existing N63 (Ch. 0+200), in proximity of the proposed roundabout. Particular considerations in relation to the location of such facilities and their generation of pollution during the construction stage include:

- Sanitary Wastewater treatment;
- Hard-standing surface water runoff;
- Potential for hydrocarbon pollution to groundwater and surface water;
- Avoidance of flood risk areas;
- Set back distances from sensitive watercourses and ecological receptors.

1.5.1 Watercourses, Crossings, and In-stream Works

The Proposed Road Development requires the crossing of the River Abbert. The bridge over the Abbert River is located north-east of Abbeyknockmoy at coordinates 551020, 743507 (ITM). The River Abbert is a significant river with a catchment area of circa 172km^2 at the L2128 bridge, downstream of the proposed crossing. The River Abbert flows in an east to west direction through the Proposed Road Development site and confluences with the Clare River circa 10.5km downstream.

Also, of note is a substantial weir across the River Abbert just upstream of the L2128 bridge. While the mill is no longer in operation, the weir and mill race are still present and could potentially create a significant backwater effect on the river heading upstream.

There are a significant number of land drains and ditches along the field boundaries which discharge into the River Abbert.

Small local watercourses can function as a conduit to more sensitive areas or watercourses downstream while impacts to larger watercourses can impact upon the aquatic ecology of the watercourse. Streams and interceptor ditches crossed by the Proposed Road Development will be culverted. Table 1-2 identifies the area where culverts will occur.

Table 1-2 Proposed Culverts

Culvert	Chainage	Proposed Culvert Dimensions
PC01	N63 Mainline - Ch. 1+030	Piped Culvert – 525 mm Diameter
PC02	N63 Mainline - Ch. 1+415	Box Culvert – 2.0 m x 2.3 m
PC02A	N63 Mainline - Ch. 1+230	Piped Culvert – 1200 mm Diameter
FC01	N63 Mainline - Ch. 1+460	Box Culvert – 2.0 m x 2.3 m
FC02	N63 Mainline - Ch. 1+515	Box Culvert – 2.0 m x 2.3 m
FC03	N63 Mainline - Ch. 1+650	Box Culvert – 2.0 m x 1.5 m
PC03	N63 Mainline - Ch. 1+800	Box Culvert – 2.0 m x 1.6 m
PC04	L6159 North South – Ch. 70	Piped Culvert – 450 mm Diameter
PC05	N63 Mainline - Ch. 2+270	Piped Culvert – 450 mm Diameter
PC06	N63 Mainline - Ch. 2+340	Piped Culvert – 450 mm Diameter
PC07	N63 Mainline - Ch. 2+395	Piped Culvert – 450 mm Diameter
PC08	N63 Mainline - Ch. 2+530	Piped Culvert – 750 mm Diameter

Where possible, watercourse diversions will be avoided, but some are necessary to avoid excessively long culvert crossings, these are summarised in Table 1-3 below.

Table 1-3 Proposed Watercourse Diversions

Watercourse Diversion	Chainage	Proposed Dimensions
WD-01A	1+030 – 1+170	Length: 144 m
WD-01B	1+000 – 1+030	Length: 43 m
WD-02A	1+280 – 1+400	Length: 116 m
WD-02B	1+450 – 1+530	Length: 75 m
WD-02C	1+400 – 1+500	Length: 97 m
WD-03	1+590 – 1+650	Length: 65 m
WD-04	1+800 – 1+900	Length: 95 m
WD-05	2+250	Length: 20 m
WD-06	2+530 – 2+670	Length: 145 m

1.5.2 Earthworks

Quaternary geology of the site locality predominantly comprises till derived from limestone, with areas of alluvium associated with the Abbert River (see Volume 03; Figure A8-1 of the EIAR). The underlying bedrock is described as 'pale grey clean skeletal limestone' of the Burren Formation. No mapped faults are located within the Proposed Road Development site (see Volume 03; Figure A8-2 of the EIAR).

Ground investigations were carried out in 2020 during design development for the Proposed Road Development. The scope of the investigations was to determine the soil, bedrock, and groundwater conditions and to establish the presence of any contaminants along the route. Based on the results, the shallow deposits comprise topsoil over peat (particularly in close proximity to the river) and glacial till. To the south of the Abbert River, coarse grained glacial till was encountered in the form of gravels, while fine-grained glacial till was encountered to the north. Bedrock was encountered in the form of limestone, with the surface of the stratum between 9.4 m bgl and 13.2 m bgl, generally becoming shallower towards the northeast.

Excavation earthwork impacts will mainly relate to removal of topsoil and shallow subsoils, although piles for the bridge foundations will extend approximately 2 m into bedrock, while infill earthwork will mainly relate to the import and compaction of acceptable fill material for the construction of embankments to achieve the required engineering design and road grades.

To achieve the required engineering design, the Proposed Road Development will consist of approximately 21% at-grade (i.e. no cut as level with surrounding land), 6% cut and 73% formed along raised embankments created using fill.

Table 1-4 At-grade, Embankment and Cutting Requirements for the Proposed Road Development

	Overall Length [m]	%
At-grade	475	21
Embankment	1,685	73
Cutting	140	6
Total	**2,300**	**100**

Excavation of soils (till and alluvium) will be required as part of the bridge foundation construction for the river crossing and in areas along the Proposed Road Development where levels need to be reduced. These excavations are likely to be limited in area and depth (approximately 6% of the Proposed Road Development will require soil removal).

Rock, soil and materials will likely be stockpiled on site. These stockpile areas have the potential to produce sediment and polluting substances which can become mobilised and become sources of pollution. Stockpiling of unsuitable soils will be undertaken prior to removal from site. In the absence of mitigation, this will have the potential to impact on soil and groundwater, through the leaching of contaminants.

Additional fill material will be required for the Proposed Road Development and will be imported from offsite locations. Fill material will be sourced where possible from local quarries, providers of recycled aggregates or suitable donor sites under Article 27 of the European Communities (Waste Directive) Regulations 2011. A number of local quarries have been identified, and prior to construction, these shall be reviewed and only those quarries that conform to all necessary statutory consents will be used in the construction phase. Soils/fill material to be brought to the Proposed Road Development site will be vetted with chemical soil testing if necessary, in order to check that it is of a reputable origin and that it is 'clean' (i.e. will not introduce contamination to the environment; soil and groundwater). All potential suppliers will be vetted for the following criteria:

- Environmental management status; and
- Regulatory and legal compliance status of the company.

'Clean' fill material will be sourced from suppliers which comply with the above requirements. If recycled aggregate is used as imported fill, chemical testing will be undertaken to confirm that it is 'clean' (i.e. would not introduce contamination to the environment).

According to the Geological Survey Ireland (GSI) Spatial Resources website, the following active quarries are located within a 20 km radius of the Proposed Road Development:

Table 1-5 Active Quarries identified within 20 km of the Proposed Road Development

Quarry Name	Resource	Distance from Proposed Road Development Site (approximately)
Cortoon Pit	Sand and gravel	13 km north
Mortimers Quarry	Limestone	14 km west
Coshla Quarries	Limestone	15 km south-west
Cathill Pit	Sand and gravel	18 km north
Esker Readymix Quarry	Limestone	19 km south

Source: Geological Survey of Ireland Spatial Resources Website (January 2021)

Only quarries that conform to all statutory consents will be used in the construction phase. The construction contract will require the contractor to develop a detailed Waste Management Plan (WMP) with respect to all other waste materials arising from the works.

1.5.3 Construction Compounds & Machinery Re-fuelling/Lubrication

A minimum of one temporary construction compound will be required along or in the vicinity of the Proposed Road Development to provide storage of construction equipment and materials, as well as for offices, parking, and welfare facilities for staff. An alternative and secondary compound is proposed to the north of the existing N63 (Ch. 0+200), in proximity of the proposed roundabout.

The main compound will be 4000 m^2 (0.4 ha) in size and shall include stores, offices, material storage areas, plant storage and parking for site and staff vehicles. The potential secondary compound will also be 4000 m^2 (0.4 ha) in size. The layout of the construction compounds will, incorporate the protection and control measures outlined in the EIAR, and conform to the requirements outlined in the Outline CEMP, NIS and planning consent conditions. Following completion of construction, these areas will be cleared and re-instated; temporary buildings and containers, parking areas and material such as rubble, aggregates and unused construction materials will be removed as appropriate.

Also see sections 4.5.2.3 and 4.6.2.2 for mitigation measures related to accidental spills and leaks.

1.6 Erosion and Sediment Control

The objectives during the construction phase will be to keep exposed surface area to a minimum, minimise runoff from site, organise works to progress from the low point to the high point within each outfall catchment, ensure efficient earthworks with fill placed as soon as material is removed, and ensure unacceptable material is managed efficiently, placed in a controlled deposition area and removed from site as soon as possible.

All proposed construction activities should be indicated on a map which also includes information on graded slopes, fill areas, stockpile locations, storage locations and the potential for runoff, ponding, and flooding should be assessed. This should take into consideration soil type, topography and rainfall patterns. Selection of appropriate mitigation and controls should be in line with the site evaluation and runoff estimations. The contractors CESCP should also include controls for vehicle washing, works in or near water, storage of equipment and material, waste management and water use and disposal. The CESCP should be in line with the Outline CEMP, the EIAR, the NIS and any planning consent conditions.

1.6.1 General Mitigation Measures

- As a result of Lough Corrib SAC, the bridge over the Abbert River will be single span to minimise the impact on the SAC and Abbert River. To protect water quality in the river, a temporary drainage system will be provided at the works areas on the riverbanks, with all water directed away from the river and into a collection system that will be fitted with suitable pollution control measures prior to discharge to the existing drainage system. These measures will protect against accidental spillages from the construction machinery and processes from entering the river channel. Further measures will be adopted during the pouring of concrete for the bridge deck above the steel beams so as to prevent accidental spillages of pollutant materials directly into the river (also see the EIAR and Outline CEMP for further mitigation measures).
- The Contractor will select the best control measures to avoid and reduce as far as is practicably possible runoff and erosion for the site conditions.
- The Contractor will ensure control measures are correctly installed and adequately sized. Runoff controls must be in place before site works begin.
- The Contractor will programme inspection and maintenance of control measures throughout construction of the Proposed Road Development to ensure adequate controls are in place and to determine the adequacy of control measures. Where a requirement for additional control measures are identified the necessary controls will be put in place by the Contractor.
- The Contractor will construct elements of the permanent drainage system as early as practicable, such as the interceptor drains, to facilitate earthworks haul routes and control drainage from the works, to avoid flows onto adjacent land and/or untreated discharges to watercourses.
- Site clearance involving topsoil stripping will progress along with the earthworks and will not be carried out over large areas in advance of the earthworks.
- Excavations will only remain open for limited time periods to reduce groundwater and surface water ingress and water containing silt will be passed through a settlement tank or adequate filtration system prior to discharge. A discharge consent will be obtained as necessary for disposal of water arising from pumping (if any) or such water may be disposed of as construction site run off where appropriate.
- Spoil and temporary stockpiles including stone stockpile areas will be positioned in locations which are distant from drainage systems and retained drainage channels, away from areas subject to flooding. They will be appropriately graded and kept to maximum heights to reduce the potential for sediment run-off. Runoff from spoil heaps will be prevented from entering watercourses by diverting it through onsite settlement ponds and removing material as soon as possible to designated storage areas.
- Drainage channels and streams will be clearly identified onsite and shown on method statements and site plans. Construction compounds will be located at least 25 m from watercourses and 10 m from field drains.
- Drains carrying high sediment load will be diverted through settlement ponds, located between the construction area and the nearest surface water drain. Surface water runoff from working areas will not be allowed to discharge directly to the local watercourses. To achieve this, the drainage systems will be constructed prior to the commencement of major site works or the Contractor will provide an alternative means of silt management. Discharge from settlement/treatment ponds will be controlled and maintained at greenfield runoff rates to avoid impacting existing surface water flow rates. The attenuation systems have been designed to accommodate a 1 in 100-year event plus 20% for climate change without increasing the discharge rate to the receiving watercourse
- Silt traps will be placed across the works boundary in any areas adjacent to watercourses to avoid siltation of watercourses. These will be maintained and cleaned regularly throughout the construction phase. Attention will also be paid to preventing the build-up of dirt on road surfaces, caused by trucks and other plant entering and exiting the Proposed Road Development site.
- During the construction activities, there will be a requirement for diverting rainwater away from the construction areas, into nearby drainage channels and streams. Water will be filtered to prevent sediment from entering drainage channels and water streams.

- A monthly water sampling regime for the Abbert River will be put in place by the Contractor during construction activity onsite, to include sampling for pH and total suspended solids. Parameters will be agreed with GCC and Inland Fisheries Ireland (IFI) ahead of works. The frequency of monitoring will be increased to weekly during works over the river, including bridge construction. In addition daily visual checks of the Abbert River will be in place for the duration of the Proposed Road Development
- A temporary cut-off wall will be installed, in order to reduce the risk of sediments generated during bridge construction works mobilising to the Abbert River.
- Works will, where possible, be phased taking into account sensitive periods for aquatic ecology, such as spawning seasons.
- The drainage system has also been designed to offset risks to the *Molinia* meadows, by allowing drainage beneath the carriageway at Chainage 1+950 to 2+050. In order to mitigate the impact of the Proposed Road Development it is proposed to provide a layer of free-draining granular material at the base of the embankment to maintain the hydraulic connectivity across the embankment. It is also proposed to omit any pre-earthworks drainage/interceptor ditches within the area of the *Molinia* Meadow to prevent over drainage of the area. Weekly visual checks of the *Molinia* Meadow will be undertaken during construction works, with photographic records maintained.
- Site personnel will be made aware of the importance of freshwater habitats and the requirement to avoid pollution of all types throughout construction.
- All mitigation measures outlined within the EIAR, NIS, OCEMP and Contractors CEMP will be adhered to at all times.

1.6.2 Vegetation and topsoil strip

- Leave as much existing vegetation as possible and specify proper care of this vegetation during construction. Vegetation will be fenced off and signage erected.
- Vegetation will be maintained along the perimeter of the site, haul roads or stockpiles to provide a buffer against sediment.
- Seed cut and fill slopes as works progress.
- Close and stabilise open trenches as soon as possible and sequence works so that most open portions of trenches are closed before new trenches are begun where possible.

1.6.3 Soil Excavation and Filling

Temporary storage of soil will be carefully managed in such a way as to prevent potential negative impact on the receiving environment. Spoil and temporary stockpiles including stone stockpile areas will be positioned in locations which are distant from drainage systems and retained drainage channels and away from areas subject to flooding so as not to cause potential run off to soil and groundwater. Movement of material will be minimised in order to reduce degradation of soil structure and generation of dust. In order to minimise the potential environmental impact of stockpiles, the following mitigation measures will be implemented during the construction phase:

- Position spoil and temporary stockpiles in locations which are distant from drainage systems;
- Defined maximum stockpile heights; and
- To help shed rainwater and prevent ponding and infiltration, the sides and top of the stockpiles will be regraded to form a smooth gradient with compacted sides reducing infiltration and silt runoff.

It is estimated that approximately 20,500 m^3 of spoil will be generated from the removal of topsoil and cutting to lower sections of the Proposed Road Development to the appropriate level. This spoil will primarily consist of topsoil, alluvium and till.

Soil requiring offsite disposal will be managed in accordance with relevant waste legislation (Classification, Labelling and Packaging Regulation (CLP) European Waste Catalogue and Hazardous Waste List (EPA, 2002), EU Council Decision (2003/33/EC) of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of Annex II to Directive 19999/31/EC, Council Directive 1999/31/EC on the landfill of waste, Waste Management Act 1996, the Environment (Miscellaneous Provisions) Act 2011 (No. 20 of 2011).

In general, materials will be hauled along the route of the Proposed Road Development between the various sections without the need to use the public road network. The imported fill materials will be brought to the Proposed Road Development site on the public road network, prior to being distributed along the path of the Proposed Road Development site via the haul routes. Any hard core required to form this haul route during the construction stage will be re-used, where possible (most likely in the capping layer).

Some localised construction stage access routes will be needed close to the bridge abutment to cater for beam lifting; these will represent minor elements in terms of earthworks volumes.

Temporary drainage during construction stage will be addressed in the Contractors CEMP and will be managed so as to reduce the direct runoff to ground and water.

1.6.4 Soil Management Plan

The Contractor shall develop a Soil Management Plan (SMP) outlining its proposal for the management and reuse of excavated materials from the Site, where permitted in accordance with the relevant legislation, and provided that the reuse meets the engineering requirements for material used within the works. The SMP will be required to include details such as:

- Depth and method of topsoil stripping and stockpiling, including separation of topsoil resources of different potential;
- Detail relevant stockpile procedures to track dates of creation, sources of materials, classification and disposal/recovery information;
- Methods of stripping and stockpiling of higher quality re-useable subsoil (if appropriate);
- Identification of landscaping topsoil requirements and assessment of suitability and availability of onsite resources (if appropriate);
- Detail relevant procedures for the unexpected finds of contaminated materials onsite including measures for the handling, treatment and management of contaminated materials;
- Means of protection of subsoil from compaction damage and remedial measures (ripping/subsoiling) for reinstatement; and
- Means of erosion control and measures to prevent sediment laden run-off entering watercourses/standing water bodies.

In addition, where the Contractor proposes to maximise the reuse of excavated soil in order to minimise the generation of waste, it shall set out how it proposes to manage and document this reuse to the satisfaction of GCC or its representatives and must comply with legal and legislative requirements.

The SMP should detail:

- Identification and recording of the location from where the material was excavated;
- Delineation of areas where excavated soil is intended for disposal as waste, and where it is intended for reuse (where permitted);
- Delineation of areas of contaminated and uncontaminated soil (if present);
- Sampling of excavated soil (the number and location of soil samples);
- The proposal for the laboratory to carry out the testing;
- The suite of parameters for which the soil is to be tested;
- The criteria for assessing whether the soil is contaminated or uncontaminated;
- Geotechnical criteria for reuse; and
- The Contractor shall establish the controls necessary to manage the generation, handling and storage of waste at the Site.

1.6.5 Control of Concrete and Lime

Mitigation measures will include the following:

- Ready-mixed concrete will be brought to the Proposed Road Development site by truck.
- A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated water to the underlying subsoil and groundwater from which it could migrate to surface water.
- The pouring of concrete will take place within a designated area protected to prevent concrete runoff into surface water and soil/groundwater media.
- Washout of concrete transporting vehicles will take place at an appropriate facility, offsite where possible, alternatively, where wash out takes place onsite, it will be carried out in carefully managed onsite wash out areas.
- In order to minimize potential impacts to the river SAC from the bridge construction works, abutments and embankments will be outside the SAC and abutments will be set back from the river by a minimum of 5 m; and
- During construction works suitable drainage, settlement and silt control measures will be implemented to mitigate disturbance to the SAC. The bridge span will be constructed using precast beams.

1.6.6 Watercourses

Works to proposed structures over existing watercourses will be undertaken following approval by the OPW under Section 50 of the Arterial Drainage Act.

Ongoing consultation will be undertaken with relevant statutory bodies, including IFI and NPWS. Construction works over/near watercourses will be undertaken with cognisance of the relevant guidance, including:

- CIRIA C532 Control of Water Pollution from Construction Sites. Guidance for Consultants and Contractors;
- CIRIA C648 Control of Water Pollution from Linear Construction Projects, technical guidance;
- CIRIA C649 Control of Water Pollution from Linear Construction Projects, site guide;
- CIRIA C793 The SuDS Manual; and
- Guidelines on Protection of Fisheries During Construction Works (IFI, 2016).

1.6.6.1 Mitigation of Potential Hydrological Impacts and Pollution Control Mitigation

See Section 4.4.2.2.7, Section 4.4.2.2.8, and Section 4.4.2.2.1.6 of the Outline CEMP (see Volume 04 of the EIAR).

1.6.6.2 Dewatering

Where dewatering is required in order to facilitate excavations, a risk assessment should be undertaken to determine the risk to sensitive receptors. Where an unacceptable risk is identified, suitable mitigation will be put in place.

Procedures for dewatering the working area will include adequate treatment of any resulting silt-laden surface water prior to discharge. Use of silt dewatering bags or tubes in conjunction with filter drains/check dams, silt fencing and other means necessary (including swales) to capture, attenuate, and treat surface water generated during construction prior to any discharge to watercourses. No polluted waters/contaminated water is to be released/discharged to a watercourse without a required discharge licence.

1.6.7 Material Deposition Areas

Material deposition areas will occur away from ecologically sensitive areas and will be enclosed within silt fences where required. Silt fences will be provided outside the footprint of the material deposition areas in advance of commencement of construction works. Runoff from the material deposition areas will be directed to sedimentation ponds.

1.6.8 Construction Sequencing

Due to the size and scope of the works, it is envisaged that all construction works will be carried out in one phase.

Construction works will occur in a sequence which will mitigate potential impacts on receiving waters. A layer of silt fence will be provided along any identified work areas adjacent to watercourses in advance of works commencing on site to contain silt and sediment runoff.

Vegetation clearance for most areas will be restricted to the period from March to August (inclusive) during the 'nesting season'. The exception of this is to facilitate earthworks required from the period July to September inclusive, at the proposed bridge abutments, in line with Inland Fisheries Ireland Guidelines. For the avoidance of doubt, it should be noted that birds may nest in grass and low scrub, in addition to hedgerows and trees.

Sheet piling will be required for abutment construction within 10 m of the riverbank. Piling of the proposed bridge abutments adjacent to the Abbert River should be programmed so as to avoid sensitive lifecycle periods for QI Atlantic Salmon and Brook Lamprey. Piling is advised to be scheduled from July to September inclusive, unless otherwise agreed with IFI.

Grassland or scrub vegetation will be removed during the winter period, where possible, avoiding potential common lizard hibernacula sites (dry sites which provide frost-free conditions e.g. stone walls, underground small mammal burrows, piles of dead wood or rubble).

Construction works will avoid vegetation removal/destruction where possible. There will be no requirement for vegetation removal of riparian habitats within 5 m of the Abbert River, given the setback distances associated with the bridge abutments. In the event where the Contractor identifies a potential future flood event, the Contractor will communicate the details to GCC, the ER Team, and the ECoW who will agree the appropriate response to protect the working area and environment. Works area will be strictly adhered to for the duration of works.

The sequence of works will occur in accordance with habitat and species-specific ecological recommendations i.e. bird nesting season, Common Lizard mitigation, amphibian mitigation, bat mitigation and the season for instream/drain works and piling and any other relevant considerations highlighted in the EIAR and Outline CEMP (also see Section 4.4 of the Outline CEMP Volume 04 of the EIAR).

The sequence of works including piling, earthworks, and vegetation clearance will take into consideration potentially unforeseen weather conditions.

1.7 Monitoring and Audit

Discussion with the GCC shall be undertaken at an early stage by the Contractor to determine any specific monitoring requirements and to agree to any proposed trigger/action levels.

The contractor will be required to undertake continuous monitoring of the works to ensure compliance with the Outline CEMP, EIAR, NIS and any planning consent conditions. Regular monitoring and recording of the effectiveness of the control measures will be implemented with additional control measures employed if and when required.

The Contractor will carry out a continuous programme of water quality monitoring during the construction phase, whose parameters and requirements will be agreed with the NPWS, IFI and the Client's Ecological Specialist. This monitoring programme will require, at a minimum, the deployment of an upstream and downstream continuous recording meter in the Abbert River between 50 m -500m upstream and 250m-1 km downstream of the works area). These meters will monitor water quality and upload results, so that water parameters can be read in real time by the contractor and client to monitor water quality within the Abbert River (within Lough Corrib SAC).

A monthly water sampling regime for the Abbert River will be put in place, to include sampling for pH and total suspended solids. Parameters will be agreed with GCC and Inland Fisheries Ireland (IFI) ahead of works. The frequency of monitoring will be increased to weekly during works over the river, including bridge construction. In addition daily visual checks of the Abbert River will be in place for the duration of the Proposed Road Development

Ecological monitoring will be undertaken by the Contractor's Ecological Clerk of Works (ECoW), through site inspections. Additional monitoring will be undertaken by the client's Ecological Specialist. Visual surveys will be undertaken of works to ensure that all required environmental protection measures are in place. Visual surveying of watercourses will also be undertaken, and water quality will be tested by the ECoW through the use of calibrated handheld equipment. Turbidity, pH and conductivity measurements will be taken at drain and riverine locations to assess the effectiveness of mitigation measures. The monitoring programme will require monitoring during construction works, at drain outfalls, and the main channel (both upstream and downstream of works). Ecological monitoring by the ECoW will focus on assessing and highlighting pollution risk and ensuring adequate mitigation and works practices are ongoing in line with this EIAR and CEMP, to ensure no adverse effects of works on the environment. The chronicling of mitigation, monitoring, and reporting of aspects of the Ecological Monitoring Strategy (EcMS) is the responsibility of the ECoW.

The Ecological Specialist will review the EIAR, the NIS, planning conditions, post-consent consultations with statutory bodies, and the results of pre-construction surveys, to inform production of an 'Ecological Monitoring Strategy" (EcMS). The EcMS will be followed by the contractor, through their ECoW.

The function of the EcMS will be to:

- Monitor and chronicle installation of mitigation, effectiveness of mitigation, results of mitigation and plan mitigation.
- Inform adaptive management measures to be agreed with GCC and advised to the Contractor; and,
- Provide an evidence-base to be communicated to the NPWS and IFI, on the effectiveness of mitigation measures proposed, to inform improvements to industry practice.
- Track contractor performance in relation to implementation of the ISSAMP; CEMP, WMP, CESCP.
- Assess condition and performance of silt fencing, silt de-watering sacs and other aspects of the CESCP, as informed by site observations by the ECoW, and the results of the Contractor's water quality monitoring.

Further information on ecological monitoring can be found in Section 4.4 of the Outline CEMP (Volume 04 of the EIAR). Planned and documented audits aimed at evaluating the conformance of the Proposed Road Development shall be carried out. The frequency of the audits will be agreed in advance with GCC.

The inspection/monitoring regime should also include as a minimum:

- Control measures for works at or near water bodies shall be inspected on a daily basis;
- Daily visual inspection of watercourses;
- Wheel wash facilities will be inspected on a weekly basis;
- Stockpiles will be monitored on a daily basis while being filled or emptied and otherwise on a weekly basis;
- Concrete operations at or near watercourses shall be supervised;

- Designated chute washing out facilities (if present on site) will be located within a designated area away from environmentally sensitive locations and will be inspected on a regular basis;
- The site compound shall be inspected on a weekly basis;
- Any and all exceedances of monitored requirements of the Proposed Road Development will be reported to the Employer and will be investigated thoroughly by the Contractor. Where the works are identified as the source causing the exceedance, the contractor will be required to take immediate action and to implement measures to ensure that such exceedances do not re-occur. If works are stopped, they will not recommence until written consent is received from the Site Environmental Manager (SEM) and corrective measures have been carried out and measures to avoid repetition have been put in place.

As a minimum, the CESCP will be reviewed and audited every 6 months or as per any planning condition requirements or GCC requirements and updated in line with current guidance and legislation.

1.8 Emergency Procedures

The Contractor will produce an Emergency Response Plan (ERP) based on the Contractor's own Risk Assessment, which will be reviewed by the ECoW and Employer's Representative Team. This will occur prior to commencing works. The ERP will include:

- The Contractor's proposed training of relevant staff, including cover staff, in the implementation of the ERP and the use of spill kits;
- Details of procedures to be carried out by the Contractor in the event of the release of any sediment into a watercourse, or any spillage of chemicals, fuel or other hazardous wastes, non-compliance incidents with any permit or licence, or other such risks that could lead to a pollution incident, including flood risks;
- A full list of pollution control equipment and plant and their locations on site. All equipment and plant will be maintained and in place for the duration of construction works.
- Confirmation of the number and specification of spill kits which will be carried by the Contractor; and
- Information on spill control procedures as specified in the EIAR and Outline CEMP. The spill response procedure should also include instructions related to stopping works, instructions related to containing the spill, details of spill clean-up equipment locations, names and contact details of responsible staff, and any measures specific to locations and/or construction activities.

Appendix B Contractor Method Statements

Appendix C Environmental Risk Assessment

This procedure has been developed in order to define the criteria used to:

- Identify the environmental impacts and aspects associated with work activities;
- Identify a procedure for assessing the significance of environmental impacts and aspects; and
- Develop an environmental aspect register specific to site constriction works.

C.1 Scope

This document applies to all activities associated with site construction works including the activities of its staff, contractors and subcontractors.

C.2 Responsibilities

The Environmental Coordinator has the responsibility for ensuring the Register of Environmental Aspects and Impacts is reviewed on a monthly basis and updated as necessary.

C.3 Procedure – Environmental Aspect Identification

The procedure for developing an aspects register is as follows:

- Representatives from relevant functional areas should be co-ordinated to participate in the identification and assessment process to ensure affectivity
- The environmental aspects associated with all construction works shall be documented in the aspect evaluation table
- The impact associated with each aspect shall then be listed. Impacts can range from global impacts such as an increase in greenhouse gases to local impacts such as change to local air quality as a consequence of works
- For each aspect, a rank order is assigned in respect of:
- Likelihood of Occurrence (L)
- Severity of Consequences (S)
- To obtain an overall significance rating factor (C), the values for (L) and (S) are multiplied, C = L x S
- Table 1 and Table 2 detail the criteria for assessing Likelihood of Occurrence (L) and the Severity of Consequences (S)
- An aspect with a score of 9 or greater (post-control measure) is considered to be a significant environmental risk and must be controlled.

Table 1 Rating (L) the Likelihood of Occurrence

Rating value	1	2	3	4	5
	Never/ cannot occur	Unlikely to occur	Likely to occur once/twice	Possibility of a number of occurrences	Highly likely

Rating (S) the Severity of Consequences takes into account the following six categories:

- Legislative and regulatory compliance;
- Community/employee sensitivity;
- Impact on air, land or water;
- Cost to organisation;
- Potential for resource depletion;
- Accident and emergency situations.;

Table 2 Rating (L) the Severity of Consequences

Rating value	1	2	3	4	5
	Unlikely to have an impact on any of the previous categories	May have a low impact on some of the previous categories	May have a moderate impact on three or more of the previous categories	Likely to have a moderate to major impact on most of the previous categories	Likely to have a major impact on all of the previous categories

Ref.	Work Activity	Environmental Aspect	Environmental Impact before Controls	Initial Risk Level (without controls)			Risk Control Measures: Design action taken, record of decision process including option considered, design constraints and justification for options/actions not taken	Residual Risk Level (with controls)			Is there a "significant" residual risk to be passed on? (Y/N)	Actions necessary to control the risk – comments, recommendations	Responsibility	Status (Active/Closed)

Appendix D List of Relevant Legislation and Guidance

This section should be completed by the Appointed Contractor when creating the CEMP for the Proposed Road Development.

Appendix E Figures

To be added by the Contractor into the Contractors CEMP

Appendix F Waste Licence

To be added by the Contractor into the Contractors CEMP

Appendix A7:

Biodiversity

Appendix A7-1

Zones of Influence Informing the Assessment

Table A.7-1-1 Zones of Influence – Habitats and Flora

Habitats	Type of Potential Impact	ZoI (m) for Potentially Significant Effects	Rationale
Terrestrial habitats and plant species without significant groundwater (as described in Kilroy et al 2008) or surface-water (i.e. relative to examples in the next two rows of this table) dependency	Direct habitat loss.	Footprint of construction including temporary works	No habitat loss / damage predicted beyond this area based on works proposed. Assumes no indirect and / or far-field effects, e.g. from flooding or shading arising as a result of the Proposed Road Development.
	Indirect effects resulting from spread of weedy species into terrestrial habitats during construction works	Footprint of construction including temporary works, plus a precautionary buffer of at least 100 m	Significant passive spread of weedy species (e.g. by wind-borne seed or plant fragments, or 'creep' of stoloniferous or rhizomatous perennials) is not predicted beyond 100 m from the working area.
Habitats and plant species with relatively high ground-water dependency relative as described in Kilroy et al 2008 (e.g. turloughs, Molinia meadows, petrifying springs)	Direct habitat loss or indirect impacts to groundwater supply or yield.	Groundwater body in which the development is located, which is connected to the habitats dependent on this groundwater.	Assumes no significant impacts predicted on flow or yield of groundwater to groundwater-dependent habitats beyond this area.
Habitats and plant species with relatively high surface-water dependency relative to terrestrial habitats above (e.g. rivers, mudflats, saltmarsh, reefs)	Direct habitat loss.	Footprint of construction for direct impacts.	No habitat loss / damage predicted beyond this area.
	Indirect loss (reduced surface water retention) (i.e.*Molinia* Meadows)	100m either side of the works footprint	No habitat loss / damage predicted beyond this area. Bares in mind the limited extent of Annex I Molinia Meadows.
	Indirect pollution impacts (with significant regard for suspended solids).	Catchment downstream of Proposed Road Development	Assumes pollutants will settle, dilute and/or be adsorbed such that significant volumes/concentrations of pollutants are not likely to occur 5km downstream. This was based on professional judgement, following River Habitat Surveying, consideration of works with no instream element within the Abbert River, the embedded design (use of a clear span structure with piled abutments) and the flat nature of the surrounding landscape environment. This assessment also took into consideration the nature of the environment i.e. an upland eroding river, in a system where downstream habitats have evolved around sediment transport.

Table A.7-1-2 Zone of Influence (ZoI) informing the EIAR – Fauna

Fauna Species and Their Habitat Features	Type of Potential Impact	ZoI (m) for Potentially Significant Effects	Rationale
Bats and their roosts (direct effects)	'Direct' disturbance of roost sites including noise, vibration, or light spill. Direct loss of habitat or injury.	Typically estimated as a minimum of 50 m from potential or confirmed roost sites but informed by on a case-by-case basis by relevant data (e.g. isoline drawings of lux levels in the case of light spill).	Professional judgement, having regard for guidance including Collins (2016).
Bats and their roosts (indirect effects)	Fragmentation of foraging / commuting habitats.	The ZoI for informing the impact on bats through fragmentation of foraging / commuting habitats was estimated as being 2km..	Given that no bat roosts were identified within the footprint of the Proposed Route Development, the Zone of Influence of the Proposed Road Development on Bats was estimated as being 2km. This was assessed through Professional judgement based on ecological requirements of bats and the relatively low landscape suitability within the Proposed Road Development Area for most bat species.
Breeding or resting sites of Otter, Badger, Hedgehog, Stoat, Irish Hare	Physical disturbance to breeding or resting sites including 'entombment 'in the case of otter and badger (i.e. following collapse of hole / nest due to vibration). Direct loss of habitat.	Breeding/resting sites within up to 150 m of disturbance in the case of rock-breaking/piling. Breeding/resting sites within 50 m of other site works. The ZoI is deemed to be within the surveyed area.	150 m is the potential limit of disturbance from and piling from NRA (2006b). Distances are subject to case-by-case assessment of local ground conditions (e.g. holes in unstable clay substrates are more sensitive than those protected from vibration from sheet rock).
Pygmy Shrew	Pygmy shrew hibernating or breeding within vegetation to be disturbed.	Habitat within approximately 100 m of vegetation removal.	Professional judgement given territory sizes reported by Hayden and Harrington (2001).
Birds: Kingfisher, Grey Wagtail	Nest disturbance, disturbance, habitat loss.	Populations within 2 km upstream or downstream of the proposed bridge development	Direct damage from physical impact or vibration, and disturbance.
Birds: Barn owl	Disturbance to nest site from noise or physical disturbance. Collision risk.	Nests within 5km of disturbance.	Collision Risk (O'Clery et al.2016), TII (2021).
Birds: Breeding birds including meadow pipit of high conservation concern	Nesting birds including any singing males potentially affected by noise, disturbance, loss of habitat.	Territories within 150 m of disturbance.	Professional judgement

Fauna Species and Their Habitat Features	Type of Potential Impact	ZoI (m) for Potentially Significant Effects	Rationale
Non-breeding (wetland and wintering) birds	Feeding or roosting birds disturbed by noise or visual presence of humans, loss of habitat.	Generally assessed within 500 m of the proposed development footprint for wintering birds.	Professional judgement applied to data from Madsen (1985); Smit and Visser (1993) and Rees et al. (2005).
Hibernating common frog	Disturbance to hibernating individuals, loss of habitat.	50 m from hibernation sites.	Professional judgement using application of Precautionary Principle, in absence of published estimates, and subject to case-by-case assessment of local ground conditions.
Invertebrates including butterflies	Direct loss of habitat or injury.	Footprint of construction for direct impacts.	Similarly to habitats; no habitat loss / direct injury predicted beyond this area.
Fish (direct impacts)	Direct impacts to spawning/nursery habitats if bankside habitat damaged.	Footprint of instream works.	Professional judgement.
Fish (disturbance impacts from bankside drilling impacts)	Displacement of fish from spawning/nursery habitats if present.	Footprint of instream works.	Professional judgement.
Fish (obstruction to migration)	Physical obstacle to migratory fish populations.	Any fish populations upstream and/or downstream of instream obstacle subject to assessment of fish lifecycle and known migratory corridors etc.	Professional judgement.
Fish (physical damage)	Physical damage from construction operations ((pumping, excavation, backfilling, drying out of drain area) on drain with fish potential.	Footprint of instream and drain works.	Professional judgement.
Fish (pollution impacts)	Siltation or other pollution effects on spawning, feeding, or nursery areas.	Within 5km downstream of proposed development	Professional judgement.

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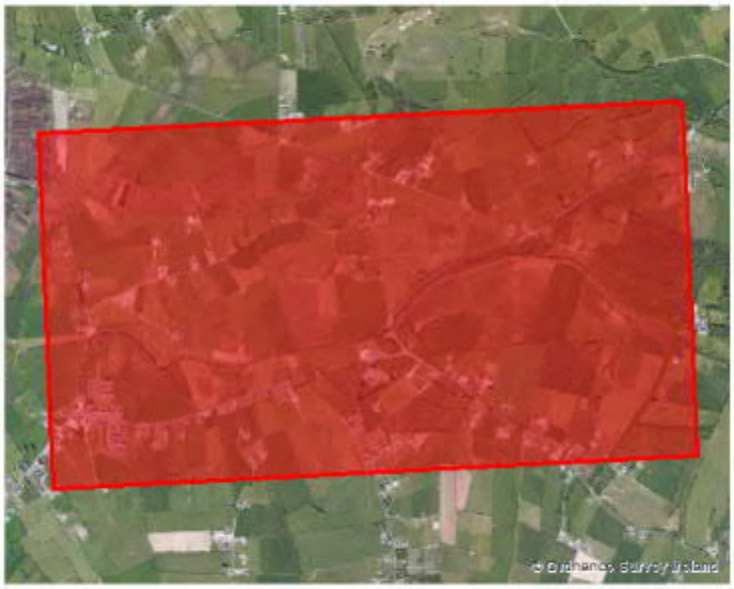
Appendix A7-2

National Biodiversity Data Centre Species Records

National Biodiversity Data Centre

Species list for a User-Defined Polygon (Intersect)



Quality of information

The National Biodiversity Data Centre makes every effort to ensure the quality of the information available on this website and updates the information regularly. Before relying on the information on this site, however, users should carefully evaluate its accuracy, currency, completeness and relevance for their purposes. The National Biodiversity Data Centre cannot guarantee and assumes no legal liability or responsibility for the accuracy, currency or completeness of the information.

To assist the Centre in the provision of high quality information, should you identify an error in any of the information provided, please notify the Centre and every effort will be made to rectify the error.

Table A.7-2-1 National Biodiversity Data Centre Species Records

Species Group	Species Name	Record Count	Date of Last Record	Title of Dataset	Designation
bird	Barn Swallow (Hirundo rustica)	12	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
bird	Black-billed Magpie (Pica pica)	13	31/12/2011	Bird Atlas 2007 - 2011	
bird	Blackcap (Sylvia atricapilla)	2	31/12/2011	Bird Atlas 2007 - 2011	
bird	Black-headed Gull (Larus ridibundus)	5	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
bird	Blue Tit (Cyanistes caeruleus)	13	19/03/2015	Birds of Ireland	
bird	Chaffinch (Fringilla coelebs)	14	19/03/2015	Birds of Ireland	
bird	Coal Tit (Periparus ater)	10	31/12/2011	Bird Atlas 2007 - 2011	
bird	Common Blackbird (Turdus merula)	14	19/03/2015	Birds of Ireland	
bird	Common Bullfinch (Pyrrhula pyrrhula)	6	31/12/2011	Bird Atlas 2007 - 2011	
bird	Common Chiffchaff (Phylloscopus collybita)	5	31/12/2011	Bird Atlas 2007 - 2011	
bird	Common Coot (Fulica atra)	5	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section I Bird Species || Protected Species: EU Birds Directive >> Annex III, Section II Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
bird	Common Cuckoo (Cuculus canorus)	5	31/12/2011	Bird Atlas 2007 - 2011	
bird	Common Kestrel (Falco tinnunculus)	6	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
bird	Common Kingfisher (Alcedo atthis)	4	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List

Species Group	Species Name	Record Count	Date of Last Record	Title of Dataset	Designation
bird	Common Linnet (Carduelis cannabina)	8	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
bird	Common Moorhen (Gallinula chloropus)	8	31/12/2011	Bird Atlas 2007 - 2011	
bird	Common Pheasant (Phasianus colchicus)	12	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section I Bird Species || Protected Species: EU Birds Directive >> Annex III, Section I Bird Species
bird	Common Pochard (Aythya ferina)	2	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section I Bird Species || Protected Species: EU Birds Directive >> Annex III, Section II Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
bird	Common Raven (Corvus corax)	4	31/12/2011	Bird Atlas 2007 - 2011	
bird	Common Redshank (Tringa totanus)	1	31/07/1972	The First Atlas of Breeding Birds in Britain and Ireland: 1968-1972.	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
bird	Common Snipe (Gallinago gallinago)	7	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section I Bird Species || Protected Species: EU Birds Directive >> Annex III, Section III Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
bird	Common Starling (Sturnus vulgaris)	12	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
bird	Common Swift (Apus apus)	4	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
bird	Common Whitethroat (Sylvia communis)	5	31/12/2011	Bird Atlas 2007 - 2011	
bird	Common Wood Pigeon (Columba palumbus)	13	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section I Bird Species || Protected Species: EU Birds Directive >> Annex III, Section I Bird Species
bird	Corn Crake (Crex crex)	1	31/07/1972	The First Atlas of Breeding Birds in Britain and Ireland: 1968-1972.	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List

Species Group	Species Name	Record Count	Date of Last Record	Title of Dataset	Designation
bird	Eurasian Collared Dove (Streptopelia decaocto)	6	31/12/2011	Bird Atlas 2007 - 2011	
bird	Eurasian Curlew (Numenius arquata)	6	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section II Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
bird	Eurasian Jackdaw (Corvus monedula)	13	31/12/2011	Bird Atlas 2007 - 2011	
bird	Eurasian Jay (Garrulus glandarius)	4	31/12/2011	Bird Atlas 2007 - 2011	
bird	Eurasian Siskin (Carduelis spinus)	6	31/12/2011	Bird Atlas 2007 - 2011	
bird	Eurasian Sparrowhawk (Accipiter nisus)	5	31/12/2011	Bird Atlas 2007 - 2011	
bird	Eurasian Teal (Anas crecca)	4	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section I Bird Species || Protected Species: EU Birds Directive >> Annex III, Section II Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
bird	Eurasian Tree Sparrow (Passer montanus)	1	29/02/1984	The First Atlas of Wintering Birds in Britain and Ireland: 1981/82-1983/84.	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
bird	Eurasian Treecreeper (Certhia familiaris)	8	31/12/2011	Bird Atlas 2007 - 2011	
bird	Eurasian Wigeon (Anas penelope)	2	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section I Bird Species || Protected Species: EU Birds Directive >> Annex III, Section II Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
bird	Eurasian Woodcock (Scolopax rusticola)	4	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section I Bird Species || Protected Species: EU Birds Directive >> Annex III, Section III Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List

Species Group	Species Name	Record Count	Date of Last Record	Title of Dataset	Designation
bird	European Golden Plover (Pluvialis apricaria)	2	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species || Protected Species: EU Birds Directive >> Annex II, Section II Bird Species || Protected Species: EU Birds Directive >> Annex III, Section III Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
bird	European Goldfinch (Carduelis carduelis)	12	31/12/2011	Bird Atlas 2007 - 2011	
bird	European Greenfinch (Carduelis chloris)	12	31/12/2011	Bird Atlas 2007 - 2011	
bird	European Robin (Erithacus rubecula)	14	19/03/2015	Birds of Ireland	
bird	Fieldfare (Turdus pilaris)	2	31/12/2011	Bird Atlas 2007 - 2011	
bird	Gadwall (Anas strepera)	1	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
bird	Goldcrest (Regulus regulus)	8	31/12/2011	Bird Atlas 2007 - 2011	
bird	Great Black-backed Gull (Larus marinus)	1	14/05/2010	Kingfisher Survey 2010	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
bird	Great Cormorant (Phalacrocorax carbo)	2	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
bird	Great Crested Grebe (Podiceps cristatus)	1	29/02/1984	The First Atlas of Wintering Birds in Britain and Ireland: 1981/82-1983/84.	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
bird	Great Tit (Parus major)	11	31/12/2011	Bird Atlas 2007 - 2011	
bird	Green Sandpiper (Tringa ochropus)	2	31/12/2011	Bird Atlas 2007 - 2011	
bird	Grey Heron (Ardea cinerea)	10	31/12/2011	Bird Atlas 2007 - 2011	

Species Group	Species Name	Record Count	Date of Last Record	Title of Dataset	Designation
bird	Grey Partridge (Perdix perdix)	1	31/07/1972	The First Atlas of Breeding Birds in Britain and Ireland: 1968-1972.	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section I Bird Species || Protected Species: EU Birds Directive >> Annex III, Section I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
bird	Grey Wagtail (Motacilla cinerea)	9	19/03/2015	Birds of Ireland	
bird	Hedge Accentor (Prunella modularis)	14	19/03/2015	Birds of Ireland	
bird	Herring Gull (Larus argentatus)	1	29/02/1984	The First Atlas of Wintering Birds in Britain and Ireland: 1981/82-1983/84.	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
bird	Hooded Crow (Corvus cornix)	10	31/12/2011	Bird Atlas 2007 - 2011	
bird	House Martin (Delichon urbicum)	7	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
bird	House Sparrow (Passer domesticus)	10	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
bird	Lesser Redpoll (Carduelis cabaret)	8	31/12/2011	Bird Atlas 2007 - 2011	
bird	Little Grebe (Tachybaptus ruficollis)	5	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
bird	Long-tailed Tit (Aegithalos caudatus)	4	31/12/2011	Bird Atlas 2007 - 2011	
bird	Mallard (Anas platyrhynchos)	13	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section I Bird Species || Protected Species: EU Birds Directive >> Annex III, Section I Bird Species
bird	Meadow Pipit (Anthus pratensis)	11	31/12/2011	Bird Atlas 2007 - 2011	
bird	Merlin (Falco columbarius)	1	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List

Species Group	Species Name	Record Count	Date of Last Record	Title of Dataset	Designation
bird	Mew Gull (Larus canus)	1	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
bird	Mistle Thrush (Turdus viscivorus)	9	31/12/2011	Bird Atlas 2007 - 2011	
bird	Mute Swan (Cygnus olor)	7	19/03/2015	Birds of Ireland	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
bird	Northern Lapwing (Vanellus vanellus)	6	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section II Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
bird	Northern Shoveler (Anas clypeata)	2	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section I Bird Species || Protected Species: EU Birds Directive >> Annex III, Section III Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
bird	Pied Wagtail (Motacilla alba subsp. yarrellii)	1	19/03/2015	Birds of Ireland	
bird	Red Grouse (Lagopus lagopus)	1	31/07/1972	The First Atlas of Breeding Birds in Britain and Ireland: 1968-1972.	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section I Bird Species || Protected Species: EU Birds Directive >> Annex III, Section I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
bird	Redwing (Turdus iliacus)	3	31/12/2011	Bird Atlas 2007 - 2011	
bird	Reed Bunting (Emberiza schoeniclus)	8	31/12/2011	Bird Atlas 2007 - 2011	
bird	Rock Pigeon (Columba livia)	1	31/07/1972	The First Atlas of Breeding Birds in Britain and Ireland: 1968-1972.	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section I Bird Species
bird	Rook (Corvus frugilegus)	14	19/03/2015	Birds of Ireland	
bird	Sand Martin (Riparia riparia)	12	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
bird	Sedge Warbler (Acrocephalus schoenobaenus)	4	31/12/2011	Bird Atlas 2007 - 2011	

Species Group	Species Name	Record Count	Date of Last Record	Title of Dataset	Designation
bird	Sky Lark (Alauda arvensis)	10	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
bird	Song Thrush (Turdus philomelos)	13	31/12/2011	Bird Atlas 2007 - 2011	
bird	Spotted Flycatcher (Muscicapa striata)	5	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
bird	Stock Pigeon (Columba oenas)	3	31/07/1991	The Second Atlas of Breeding Birds in Britain and Ireland: 1988-1991	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
bird	Stonechat (Saxicola torquata)	4	31/12/2011	Bird Atlas 2007 - 2011	
bird	Tufted Duck (Aythya fuligula)	3	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex II, Section I Bird Species || Protected Species: EU Birds Directive >> Annex III, Section II Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
bird	White Wagtail (Motacilla alba)	13	31/12/2011	Bird Atlas 2007 - 2011	
bird	White-throated Dipper (Cinclus cinclus)	5	31/12/2011	Bird Atlas 2007 - 2011	
bird	Whooper Swan (Cygnus cygnus)	1	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive || Protected Species: EU Birds Directive >> Annex I Bird Species || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
bird	Willow Warbler (Phylloscopus trochilus)	10	31/12/2011	Bird Atlas 2007 - 2011	
bird	Winter Wren (Troglodytes troglodytes)	14	19/03/2015	Birds of Ireland	
bird	Yellowhammer (Emberiza citrinella)	6	31/12/2011	Bird Atlas 2007 - 2011	Protected Species: Wildlife Acts || Threatened Species: Birds of Conservation Concern || Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
crustacean	Freshwater, White-clawed Crayfish (Austropotamobius pallipes)	4	18/08/2005	Crayfish of Ireland	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts

Species Group	Species Name	Record Count	Date of Last Record	Title of Dataset	Designation
crustacean	Gammarus duebeni	1	23/07/2009	River Biologists' Database (EPA)	
fern	Polypodium vulgare Sensu lato	1	08/04/2020	Online Atlas of Vascular Plants 2012-2020	
flowering plant	Ash (Fraxinus excelsior)	2	23/07/2009	River Biologists' Database (EPA)	
flowering plant	Branched Bur-reed (Sparganium erectum)	2	23/07/2009	River Biologists' Database (EPA)	
flowering plant	Fine-leaved Water-dropwort (Oenanthe aquatica)	1	24/07/2006	River Biologists' Database (EPA)	
flowering plant	Ivy-leaved Duckweed (Lemna trisulca)	2	23/07/2009	River Biologists' Database (EPA)	
flowering plant	Primrose (Primula vulgaris)	2	08/04/2020	Online Atlas of Vascular Plants 2012-2020	
flowering plant	Reed Canary-grass (Phalaris arundinacea)	2	23/07/2009	River Biologists' Database (EPA)	
insect - beetle (Coleoptera)	Elmis aenea	2	23/07/2009	River Biologists' Database (EPA)	
insect - beetle (Coleoptera)	Limnius volckmari	1	24/07/2006	River Biologists' Database (EPA)	
insect - butterfly	Brimstone (Gonepteryx rhamni)	1	25/02/2019	Butterflies of Ireland	
insect - butterfly	Green-veined White (Pieris napi)	2	31/12/1972	Distribution Atlas of Butterflies in Ireland 1979 (An Foras Forbartha)	
insect - butterfly	Large White (Pieris brassicae)	1	31/12/1969	Distribution Atlas of Butterflies in Ireland 1979 (An Foras Forbartha)	

Species Group	Species Name	Record Count	Date of Last Record	Title of Dataset	Designation
insect - butterfly	Marsh Fritillary (Euphydryas aurinia)	3	31/12/2010	All Ireland Marsh Fritillary Database	Protected Species: EU Habitats Directive || Protected Species: EU Habitats Directive >> Annex II || Threatened Species: Vulnerable
insect - butterfly	Meadow Brown (Maniola jurtina)	1	31/12/1969	Distribution Atlas of Butterflies in Ireland 1979 (An Foras Forbartha)	
insect - butterfly	Orange-tip (Anthocharis cardamines)	1	31/12/1969	Distribution Atlas of Butterflies in Ireland 1979 (An Foras Forbartha)	
insect - butterfly	Peacock (Inachis io)	1	31/12/1969	Distribution Atlas of Butterflies in Ireland 1979 (An Foras Forbartha)	
insect - butterfly	Ringlet (Aphantopus hyperantus)	1	31/12/1972	Distribution Atlas of Butterflies in Ireland 1979 (An Foras Forbartha)	
insect - butterfly	Small Tortoiseshell (Aglais urticae)	1	31/12/1969	Distribution Atlas of Butterflies in Ireland 1979 (An Foras Forbartha)	
insect - butterfly	Small White (Pieris rapae)	1	31/12/1969	Distribution Atlas of Butterflies in Ireland 1979 (An Foras Forbartha)	
insect - butterfly	Speckled Wood (Pararge aegeria)	1	31/12/1969	Distribution Atlas of Butterflies in Ireland 1979 (An Foras Forbartha)	
insect - butterfly	Wall (Lasiommata megera)	1	31/12/1969	Distribution Atlas of Butterflies in Ireland 1979 (An Foras Forbartha)	Threatened Species: Endangered
insect - dragonfly (Odonata)	Banded Demoiselle (Calopteryx splendens)	1	25/06/2001	Dragonfly Ireland	

Species Group	Species Name	Record Count	Date of Last Record	Title of Dataset	Designation
insect - mayfly (Ephemeroptera)	Baetis rhodani	1	23/07/2009	River Biologists' Database (EPA)	
insect - mayfly (Ephemeroptera)	Serratella ignita	2	23/07/2009	River Biologists' Database (EPA)	
insect - stonefly (Plecoptera)	Isoperla grammatica	1	04/12/1981	Stoneflies (Plecoptera) of Ireland	
insect - stonefly (Plecoptera)	Protonemura meyeri	1	04/12/1981	Stoneflies (Plecoptera) of Ireland	
liverwort	Bifid Crestwort (Lophocolea bidentata)	3	09/03/2014	Bryophytes of Ireland : Data Compiled Post-Atlas	Threatened Species: Least concern
liverwort	(Metzgeria violacea)	1	09/03/2014	Bryophytes of Ireland : Data Compiled Post-Atlas	Threatened Species: Least concern
liverwort	Bog-moss Flapwort (Odontoschisma sphagni)	1	09/03/2014	Bryophytes of Ireland : Data Compiled Post-Atlas	Threatened Species: Least concern
liverwort	Conocephalum conicum s.l.	1	30/04/1966	Bryophytes of Ireland	
liverwort	Creeping Fingerwort (Lepidozia reptans)	1	09/03/2014	Bryophytes of Ireland : Data Compiled Post-Atlas	Threatened Species: Least concern
liverwort	Dilated Scalewort (Frullania dilatata)	1	09/03/2014	Bryophytes of Ireland : Data Compiled Post-Atlas	Threatened Species: Least concern
liverwort	Endive Pellia (Pellia endiviifolia)	1	09/03/2014	Bryophytes of Ireland : Data Compiled Post-Atlas	Threatened Species: Least concern

Species Group	Species Name	Record Count	Date of Last Record	Title of Dataset	Designation
liverwort	Even Scalewort (Radula complanata)	1	09/03/2014	Bryophytes of Ireland : Data Compiled Post-Atlas	Threatened Species: Least concern
liverwort	Fairy Beads (Microlejeunea ulicina)	1	09/03/2014	Bryophytes of Ireland : Data Compiled Post-Atlas	Threatened Species: Least concern
liverwort	Fingered Cowlwort (Colura calyptrifolia)	1	09/03/2014	Bryophytes of Ireland : Data Compiled Post-Atlas	Threatened Species: Least concern
liverwort	Forked Veilwort (Metzgeria furcata)	1	09/03/2014	Bryophytes of Ireland : Data Compiled Post-Atlas	Threatened Species: Least concern
liverwort	Notched Pouchwort (Calypogeia arguta)	1	09/03/2014	Bryophytes of Ireland : Data Compiled Post-Atlas	Threatened Species: Least concern
liverwort	Sea Scalewort (Frullania teneriffae)	1	30/04/1966	Bryophytes of Ireland	Threatened Species: Least concern
liverwort	Tamarisk Scalewort (Frullania tamarisci)	1	09/03/2014	Bryophytes of Ireland : Data Compiled Post-Atlas	Threatened Species: Least concern
liverwort	Toothed Pouncewort (Drepanolejeunea hamatifolia)	1	09/03/2014	Bryophytes of Ireland : Data Compiled Post-Atlas	Threatened Species: Least concern
liverwort	Tumid Notchwort (Lophozia ventricosa)	1	09/03/2014	Bryophytes of Ireland : Data Compiled Post-Atlas	Threatened Species: Least concern
liverwort	Western Earwort (Scapania gracilis)	1	09/03/2014	Bryophytes of Ireland : Data Compiled Post-Atlas	Threatened Species: Least concern
mollusc	Ancylus fluviatilis	2	23/07/2009	River Biologists' Database (EPA)	
mollusc	Arion (Kobeltia)	1	13/01/1972	All Ireland Non-Marine Molluscan Database	

Species Group	Species Name	Record Count	Date of Last Record	Title of Dataset	Designation
mollusc	Brown Lipped Snail (Cepaea (Cepaea) nemoralis)	1	01/10/1965	All Ireland Non-Marine Molluscan Database	
mollusc	Cellar Snail (Oxychilus (Oxychilus) cellarius)	2	13/01/1972	All Ireland Non-Marine Molluscan Database	
mollusc	Common Bithynia (Bithynia (Bithynia) tentaculata)	1	13/01/1972	All Ireland Non-Marine Molluscan Database	
mollusc	Common Bladder Snail (Physa fontinalis)	1	13/01/1972	All Ireland Non-Marine Molluscan Database	
mollusc	Common Chrysalis Snail (Lauria (Lauria) cylindracea)	2	13/01/1972	All Ireland Non-Marine Molluscan Database	
mollusc	Common Garden Snail (Cornu aspersum)	1	13/01/1972	All Ireland Non-Marine Molluscan Database	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> Medium Impact Invasive Species
mollusc	Dwarf Pond Snail (Galba (Galba) truncatula)	2	13/01/1972	All Ireland Non-Marine Molluscan Database	
mollusc	Dwarf Snail (Punctum (Punctum) pygmaeum)	1	01/10/1965	All Ireland Non-Marine Molluscan Database	
mollusc	Eccentric Grass Snail (Vallonia cf. excentrica)	1	01/10/1965	All Ireland Non-Marine Molluscan Database	

Appendix A7-3

Bird Desktop and Field Survey Data

Table A7-3-1: Species recorded in various survey areas and sections (timed tetrad visit (TTV) and Roving Records (RR's) surveys from specific Atlas data (2007-2011) is shown (Balmer et al (2007-2011)).

Common Name	Scientific Name	M54 (TTVs and RRs) (2007-2011) (10km x 10km)	M54B (TTs) (2007-2011) (2 x 2km)	Flynn Furney Breeding bird survey (2019-2020)	Flynn Furney Wintering and wetland bird survey (2019-2020)
Blackbird	*Turdus merula*	*	*	*	
Blackcap	*Sylvia atricapilla*	*		*	
Black-headed Gull	*Larus ridibundus*	*			
Blue Tit	*Cyanistes caeruleus*	*	*	*	
Bullfinch	*Pyrrhula*	*		*	
Buzzard	*Buteo buteo*			*	
Chaffinch	*Fringilla coelebs*	*	*	*	
Chiffcaff	*Phylloscopus collybita*	*		*	
Coal Tit	*Periparus ater*	*	*	*	
Collared Dove	*Streptopelia decaocto*	*		*	
Common Gull	*Larus canus*	*			
Common Sandpiper	*Actitus hypoleucos*			*	
Common Whitethroat	*Sylvia communis*	*	*	*	
Coot	*Fulica atra*	*			
Cormorant	*Phalacrocorax carbo*	*		*	
Cuckoo	*Cuculus canorus*	*			
Curlew	*Numenius arquata*	*			
Dipper	*Cinclus cinclus*	*	*		
Dunnock	*Prunella modularis*	*	*	*	
Eurasian Sparrowhawk	*Accipiter nisus*	*		*	
Eurasian Wigeon	*Anas penelope*	*			
Fieldfare	*Turdus pilaris*	*			*
Gadwall	*Anas strepera*	*			
Goldcrest	*Regulus regulus*	*	*		
Goldfinch	*Carduelis carduelis*	*	*	*	
Great Tit	*Parus major*	*	*	*	
Green Sandpiper	*Tringa ochropus*	*			
Greenfinch	*Carduelis chloris*	*	*	*	
Grey Heron	*Ardea cinerea*	*	*	*	
Grey Wagtail	*Motacilla cinerea*	*		*	
Hooded Crow	*Corvus cornix*	*	*	*	
House Martin	*Delichon urbicum*	*	*	*	
House Sparrow	*Passer domesticus*	*	*	*	
Jack Snipe	*Lymnocryptes minimum*				*
Jackdaw	*Corvus monedula*	*	*	*	
Jay	*Garrulus glandarius*	*			
Kestrel	*Falco tinnunculus*	*	*	*	
Kingfisher	*Alcedo atthis*	*		*	
Lesser Redpoll	*Carduelis cabaret*	*	*		

Common Name	Scientific Name	M54 (TTVs and RRs) (2007-2011) (10km x 10km)	M54B (TTs) (2007-2011) (2 x 2km)	Flynn Furney Breeding bird survey (2019-2020)	Flynn Furney Wintering and wetland bird survey (2019-2020)
Linnet	*Carduelis cannabina*	*	*	*	
Little Egret	*Egretta garzetta*			*	
Little Grebe	*Tachybaptus ruficollis*	*			
Long-tailed Tit	*Aegithalos caudatus*	*		*	
Magpie	*Pica pica*	*	*	*	
Mallard	*Anas platyrhynchos*	*	*	*	*
Meadow Pipit	*Anthus pratensis*	*	*	*	
Merlin	*Falco columbarius*	*			
Mistle Thrush	*Turdus viscivorus*	*		*	
Moorhen	*Gallinula chloropus*	*			
Mute Swan	*Cygnus olor*	*			
Northern Lapwing	*Vanellus vanellus*	*			*
Pheasant	*Phasianus colchicus*	*	*	*	
Pied Wagtail	*Motacilla alba*	*	*	*	
Pluvialis apricaria	*Golden plover*	*			
Pochard	*Aythya ferina*	*			
Raven	*Corvus corax*	*		*	
Redwing	*Turdus iliacus*	*			
Reed Bunting	*Emberiza schoeniclus*	*	*	*	
Robin	*Erithacus rubecula*	*	*	*	
Rook	*Corvus frugilegus*	*	*	*	
Sand Martin	*Riparia riparia*	*	*	*	
Sedge warbler	*Acrocephalus schoenobaenus*	*	*	*	
Shoveler Duck	*Anas clypeata*	*			
Siskin	*Carduelis spinus*	*		*	
Skylark	*Alauda arvensis*	*	*		
Snipe	*Gallinago gallinago*	*			*
Song Thrush	*Turdus philomelos*	*	*	*	
Spotted Flycatcher	*Muscicapa striata*	*			
Starling	*Sturnus vulgaris*	*	*	*	
Stonechat	*Saxicola torquata*	*		*	
Swallow	*Hirundo rustica*	*	*	*	
Swift	*Apus apus*	*	*	*	
Teal	*Anas crecca*	*			
Treecreeper	*Certhia familiaris*	*			
Tufted Duck	*Aythya fuligula*	*			
Whooper Swan	*Cygnus cygnus*	*			
Willow Warbler	*Phylloscopus trochilus*	*	*	*	
Wood Pigeon	*Columba palumbus*	*	*	*	
Woodcock	*Scolopax rusticola*	*			
Wren	*Troglodytes troglodytes*	*	*	*	

Common Name	Scientific Name	M54 (TTVs and RRs) (2007-2011) (10km x 10km)	M54B (TTs) (2007-2011) (2 x 2km)	Flynn Furney Breeding bird survey (2019-2020)	Flynn Furney Wintering and wetland bird survey (2019-2020)
Yellowhammer	*Emberiza citrinella*	*			

Table A7-3-2 Species Recorded During the 2020 Field Survey. * indicates breeding migrants. The habitat association of species are also noted; W/Scr – Woodland Scrub association; O – Open grassland and bog association; L/R – Lake/River association.

Common Name	Scientific Name	BTO Code	Bird Habitat Associations	Status	Survey Days
Sparrowhawk	*Accipiter nisus*	SH	W/Scr	Female in flight over area – breeding not proved	1
Sedge warbler *	*Acrocephalus schoenobaenus*	SW	L/R and W/Scr	Three males in song and Two pairs holding territory	3
Long-tailed tit	*Aegithalos caudatus*	LT	W/Scr	One family party recorded	1
Kingfisher	*Alcedo atthis*	KF	L/R	Pair nesting on the river	2
Mallard	*Anas platyrhynchos*	MA	L/R	Several birds present	3
Meadow pipit	*Anthus pratensis*	MP	O	Up to ten pairs holding territories on land adjacent to river	3
Swift *	*Apus apus*	SI		Recorded feeding over area – breeding not proved	3
Grey Heron	*Ardea cinerea*	H.	O and W/Scr and L/R	Two feeding along river – nesting not proved	2
Buzzard	*Buteo buteo*	BZ	O and W/Scr	Single bird recorded – breeding not proved	1
Linnet	*Carduelis cannabina*	LI	O and W/Scr	Recorded over a wide area	3
Goldfinch	*Carduelis carduelis*	GO	O and W/Scr	Recorded over a wide area	3
Siskin	*Carduelis spinus*	SK	W/Scr	Two birds in song in woodland to the eastern side of area	2
Greenfinch	*Carduelis chloris*	GR	W/Scr	Two males in song	2
Wood pigeon	*Columba polumbus*	WP	O and W/Scr	Abundant	3
Raven	*Corvus corax*	RN	O and W/Scr	Recorded over area	2
Hooded crow	*Corvus cornix*	HC	O and W/Scr	Recorded over a wide area	3
Rook	*Corvus frugilegus*	RO	O and W/Scr	Abundant	3
Jackdaw	*Corvus monedula*	JD	O and W/Scr	Abundant	3
Blue Tit	*Cyanistes caeruleus*	BT	W/Scr	Recorded over a wide area	3
House martin *	*Delichon urbicum*	HM		Nesting on nearby houses and feeding over river.	3
Little egret	*Egretta garzetta*	ET	O and L/R and W/S	Juvenile recorded along river	1
Reed bunting	*Emberiza schoeniclus*	RB	L/R and W/Scr	Two males holding territory	3
Robin	*Erithacus rubecula*	R.	O and W/Scr	Abundant	3
Kestrel	*Falco tinnunculus*	K.	O and W/Scr	Males recorded hunting over area – breeding not proved	1
Chaffinch	*Fringilla coelebs*	CH	O and W/Scr	Recorded over a wide area	3
Swallow *	*Hirundo rustica*	SL		Nesting in nearby farmyards and feeding over river.	3
Pied wagtail	*Motacilla alba*	PW	O and L/R	Several pairs in the area	3
Grey wagtail	*Motacilla cinerea*	GL	L/R	Two pairs with juveniles	3
Great tit	*Parus major*	GT	W/Scr	Recorded over a wide area	2
House sparrow	*Passer domsticus*	HS	O and W/S	Abundant around houses	3
Coal tit	*Periparus ater*	CT	W/Scr	Recorded over a wide area	3
Pheasant	*Phasianus colchicus*	PH	O and W/Scr	Three males calling at various sites	3

Common Name	Scientific Name	BTO Code	Bird Habitat Associations	Status	Survey Days
Chiffchaff *	*Phylloscopus collybita*	CC	W/Scr	Recorded at various locations in hedgerows	3
Willow warbler *	*Phylloscopus trochilus*	WW	W/Scr	Recorded at various locations in hedgerows	3
Magpie	*Pica pica*	MG	O and W/Scr	Abundant	3
Dunnock	*Prunella modularis*	D.	O and W/Scr	Abundant	3
Bullfinch	*Pyrrhula pyrrhula*	BF	W/Scr	One pair recorded	1
Sand martin *	*Riparia riparia*	SM		Up to 30 feeding along river – nesting not proved	3
Stonechat	*Saxicola torquata*	SC	O and W/Scr	Two pairs recorded – one pair with 2 juveniles	3
Starling	*Sturnus vulgaris*	SG	O and W/Scr	Abundant	3
Blackcap *	*Sylvia atricapilla*	BC	W/Scr	Recorded at various locations in hedgerows	3
Whitethroat	*Sylvia communis*	WH	W/Scr	Two males in song	3
Wren	*Troglodytes troglodytes*	WR	W/Scr	Abundant	3
Blackbird	*Turdus merula*	B.	W/Scr	Abundant	3
Song thrush	*Turdus philomelos*	ST	W/Scr	Several pairs breeding in hedgerows	3
Mistle thrush	*Turdus viscivorus*	M.	O and W/Scr	Several pairs breeding in hedgerows	3
Collared Dove	*Streptopelia decaocto*	CD	O and W/Scr	Recorded at houses and village	3

References

- BirdWatch Ireland (2021), Bird Atlas (2007 – 2011). National Biodiversity Data Centre, Ireland, accessed 16 December 2020, https://maps.biodiversityireland.ie/Dataset/220

Appendix A7-4

Ecological Valuation from NRA (Now TII) guidelines

Ecological valuation: Examples

International Importance:

- 'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation.
- Proposed Special Protection Area (pSPA).
- Site that fulfills the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended).
- Features essential to maintaining the coherence of the Natura 2000 Network.[4]
- Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive.
- Resident or regularly occurring populations (assessed to be important at the national level)[5] of the following:
  - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or
  - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive.
- Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971).
- World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972).
- Biosphere Reserve (UNESCO Man & The Biosphere Programme).
- Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979).
- Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979).
- Biogenetic Reserve under the Council of Europe.
- European Diploma Site under the Council of Europe.
- Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).[6]

National Importance:

- Site designated or proposed as a Natural Heritage Area (NHA).
- Statutory Nature Reserve.
- Refuge for Fauna and Flora protected under the Wildlife Acts.
- National Park.
- Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park.
- Resident or regularly occurring populations (assessed to be important at the national level)[7] of the following:
  - Species protected under the Wildlife Acts; and/or
  - Species listed on the relevant Red Data list.
- Site containing 'viable areas'[8] of the habitat types listed in Annex I of the Habitats Directive.

4 See Articles 3 and 10 of the Habitats Directive.

5 It is suggested that, in general, 1% of the national population of such species qualifies as an internationally important population. However, a smaller population may qualify as internationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

6 Note that such waters are designated based on these waters' capabilities of supporting salmon (*Salmo salar*), trout (*Salmo trutta*), char (*Salvelinus*) and whitefish (*Coregonus*).

7 It is suggested that, in general, 1% of the national population of such species qualifies as a nationally important population. However, a smaller population may qualify as nationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

8 A 'viable area' is defined as an area of a habitat that, given the particular characteristics of that habitat, was of a sufficient size and shape, such that its integrity (in terms of species composition, and ecological processes and function) would be maintained in the face of stochastic change (for example, as a result of climatic variation).

County Importance:

- Area of Special Amenity.[9]
- Area subject to a Tree Preservation Order.
- Area of High Amenity, or equivalent, designated under the County Development Plan.
- Resident or regularly occurring populations (assessed to be important at the County level)[10] of the following:
  - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;
  - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;
  - Species protected under the Wildlife Acts; and/or
  - Species listed on the relevant Red Data list.
- Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance.
- County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or Local BAP,[11] if this has been prepared.
- Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county.
- Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.

Local Importance (higher value):

- Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared;
- Resident or regularly occurring populations (assessed to be important at the Local level)[12] of the following:
  - Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;
  - Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;
  - Species protected under the Wildlife Acts; and/or
  - Species listed on the relevant Red Data list.
- Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality;
- Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.

Local Importance (lower value):

- Sites containing small areas of semi-natural habitat that are of some local importance for wildlife;
- Sites or features containing non-native species that are of some importance in maintaining habitat links.

Table 1: *Examples of valuation at different geographical scales*

9 It should be noted that whilst areas such as Areas of Special Amenity, areas subject to a Tree Preservation Order and Areas of High Amenity are often designated on the basis of their ecological value, they may also be designated for other reasons, such as their amenity or recreational value. Therefore, it should not be automatically assumed that such sites are of County importance from an ecological perspective.

10 It is suggested that, in general, 1% of the County population of such species qualifies as a County important population. However, a smaller population may qualify as County important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

11 BAP: Biodiversity Action Plan

12 It is suggested that, in general, 1% of the local population of such species qualifies as a locally important population. However, a smaller population may qualify as locally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

Appendix A7-5

SACs and SPAs within 15 km of the Proposed Road Development

Table A7-5-1 SACs and SPA's within 15 km of the Proposed Road Development

Site Type	Site Code	Site Name	Distance To (m)	Qualifying Interests (* denotes a priority habitat)	Conservation Objectives
SAC	297	Lough Corrib SAC	0	**Habitats**	http://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000297.pdf
				3110 Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)	
				3130 Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea	
				3140 Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.	
				3260 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	
				6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	
				6410 Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	
				7110 Active raised bogs*	
				7120 Degraded raised bogs still capable of natural regeneration	
				7150 Depressions on peat substrates of the Rhynchosporion	
				7210 Calcareous fens with Cladium mariscus and species of the Caricion davallianae*	
				7220 Petrifying springs with tufa formation (Cratoneurion)*	
				7230 Alkaline fens	
				8240 Limestone pavements*	
				91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles	
				91D0 Bog woodland*	
				Species	
				1096 Brook Lamprey *(Lampetra planeri)*	

Site Type	Site Code	Site Name	Distance To (m)	Qualifying Interests (* denotes a priority habitat)	Conservation Objectives
				1092 White-clawed Crayfish *(Austropotamobius pallipes)*	
				1095 Sea Lamprey *(Petromyzon marinus)*	
				1393 Slender Green Feather-moss *(Drepanocladus vernicosus)*	
				1106 Salmon *(Salmo salar)*	
				1303 Lesser Horseshoe Bat *(Rhinolophus hipposideros)*	
				1355 Otter *(Lutra lutra)*	
				1029 Freshwater Pearl Mussel *(Margaritifera margaritifera)*	
				1833 Slender Naiad *(Najas flexilis)*	
SAC	2352	Monivea Bog SAC	8506.65	**Habitats**	http://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002352.pdf
				7110 Active raised bogs*	
				7120 Degraded raised bogs still capable of natural regeneration	
				7150 Depressions on peat substrates of the Rhynchosporion	
SAC	295	Levally Lough SAC	9858.25	**Habitats**	http://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000295.pdf
				3180 Turloughs*	
SAC	2197	Derrinlough (Cloonkeenleananode) Bog SAC	12346.77	**Habitats**	http://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002197.pdf
				7120 Degraded raised bogs still capable of natural regeneration	
SAC	326	Shankill West Bog SAC	14415.89	**Habitats**	http://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000326.pdf
				7110 Active raised bogs*	
				7120 Degraded raised bogs still capable of natural regeneration	
				7150 Depressions on peat substrates of the Rhynchosporion	

Appendix A7-6

Detailed Botany Survey Data

Drainage Ditches

FW4 Drainage Ditches

Common Name	*Scientific Name*
Creeping bent grass	*Agrostis stolonifera*
Great willowherb	*Epilobium hirsutum*
Marsh willowherb	*Epilobium palustre*
Marsh horsetail	*Equisetum palustre*
Marsh bedstraw	*Galium palustre*
Floating sweet grass	*Glyceria fluitans*
Yorkshire fog	*Holcus lanatus*
Watermint	*Mentha aquaticum*
Redshank	*Persicaria maculosa*
Reed canary grass	*Phalaris arundinacea*
Watercress	*Rorippa nasturtium-aquaticum*

FS1 Reed swamp

FS1 Reed Swamp

Common Name	*Scientific Name*
Great willowherb	*Epilobium hirsutum*
Common hogweed	*Heracleum sphodylium*
Reed canary grass	*Phalaris arundinacea*
Creeping buttercup	*Ranunculus repens*
Nettle	*Urtica dioica*

GS4 Wet Grassland(GS4/GA1 Improved wet grassland)

GS4/GA1 Improved Wet Grassland

Common Name	*Scientific Name*
Marsh ragwort	*Cirsium aquaticus*
Creeping thistle	*Cirsium arvense*
Marsh thistle	*Cirsium plaustre*
Spear thistle	*Cirsium vulgare*
Crested dog's tail	*Cynosurus cristata*
Hoary willowherb	*Epilobium parviflorum*
Red fescue	*Festuca rubra*
Marsh besstraw	*Galium palustre*
Perennial rye grass	*Lolium perenne*
Creeping buttercup	*Ranunculus repens*
Common sorrel	*Rumex acetosa*
Dandelion	*Taraxacum officinale agg.*
Red clover	*Trifolium pratense*

GS4/GA1 Improved Wet Grassland

Common Name	*Scientific Name*
White clover	*Trifolium repens*

GS4 (moderately species rich)

GS4 (Moderately Species Rich)

Common Name	*Scientific Name*
Creeping bent	*Agrostis* sp
Wild Angelica	*Angelica sylvestris*
Common bindweed	*Calystegia sepium*
Hedge bindweed	*Calystegia sepium*
Hairy sedge	*Carex hirta*
Long stalked yellow sedge	*Carex viridula*
Cuckooflower	*Cardamine pratensis*
Common knapweed	*Centaurea nigra*
Tuft hair grass	*Deschmpsia cespitosa*
Great willowherb	*Epilobium hirsutum*
Marsh willowherb	*Epilobium palustre*
Meadowsweet	*Filipendula ulmaria*
Calystegia sepium	*Hedge bindweed*
Yorkshire fog	*Holcus lanatus*
Cat's-ear	*Hypochaeris radicata*
Flag iris	*Iris pseudocorus*
Jointed rush	*Juncus acutiflorus/Juncus articulatus*
Soft rush	*Juncus effuses*
Meadow vetchling	*Latyrus pratensis*
Purple loosestrife	*Lythrum salicaria*
Water mint	*Mentha aquatic*
Purple moor grass	*Molinia caerulea*
Ribwort plantain	*Plantago lanceolate*
Silverweed	*Potentilla anserine*
Tormentil	*Potentilla erecta*
Meadow buttercup	*Ranunculus acris*
Springy turf moss	*Rnytidiadelphus squarrosus*
Common sorrel	*Rumex acetosa*
Curled dock	*Rumex crispus*
Willow	*Salix sp.*
Marsh ragwort	*Senecio aquaitcus*
Marsh woundwort	*Stachys palustris*

GS4 (Moderately Species Rich)

Common Name	*Scientific Name*
Lesser stitchwort	*Stellaria graminea*

GS4 Wet Grassland – Molinia Meadows on Calcareous, Peaty or Clayey-Silt-Laden Soils

Annex I Molinia Meadow 6410

Common Name	*Scientific Name*
Bent grass sp.	*Agrostis sp.*
Sweet vernal grass	*Anthoxantum odoratum*
Quaking grass	*Briza media*
Pointed spear-moss	*Calliergonella cuspidata*
Star sedge	*Carex echinata*
Galucous sedge	*Carex flacca*
Long staked yellow sedge	*Carex viridula*
Marsh thidtle	*Cirsium palustris*
Crested dog's-tail	*Cynosurus cristata*
Tufted hair grass	*Deschampsia cespitosa*
March willowherb	*Epilobium palustre*
Hoary willowherb	*Epilobium parviflorum*
Red fescue	*Festuca rubra*
Meadowsweet	*Filipendula ulmaria*
Marsh bedstraw	*Galium palustre*
Yorkshire Fog	*Holcus lanatus*
Glittering wood-moss	*Hylocomium splendens*
Square-stalked St. John's wort	*Hypericum tetrapterum*
Flag iris	*Iris pseudocorus*
Sharp rush/ Jointed rush	*Juncus acutiflorus/articulatus*
Bulbous rush	*Juncus bulbosus*
*Compact rush**	*Juncus conglomeratus**
Soft rush	*Juncus effusus*
Common bird'- foot trefoil	*Lotus corniculatus*
Heath woodrush	*Luzula multiflora*
Ragged robin	*Lynis flos cuculi*
Water mint	*Mentha aquatica*
Purple moor grass	*Molinia caerulea*
Silverweed	*Potenilla anserina*
Tormentil	*Potentilla erecta*
Selheal	*Prunella vulgaris*
Meadow buttercup	*Ranucululus acris*

Annex I Molinia Meadow 6410

Common Name	*Scientific Name*
Lesser spearwort	*Ranunculus flammula*
Creeping buttercup	*Ranunculus repens*
Springy turf-moss	*Rhytidiadelphus squarrosus*
Common sorrel	*Rumex acetosa*
Marsh ragwort	*Senecio aquaticus*
Devil's-bit scabious	*Sucissa pratensis*
Red clover	*Trifolium pratense*
White clover	*Trifolium repens*

GS1 Dry Calcareous Grassland

GS1 Dry Calcareous Grassland

Common Name	*Scientific Name*
Yarrow	*Achillea millefolium*
Quaking grass	***Briza media***
Glaucous sedge	***Carex flacca***
Common knapweed	*Centaurea nigra*
Marsh thistle	*Cirsium palustre*
Red fescue	*Festuca rubra*
Wild strawberry	*Fragaria vesca*
Cat's-ear	*Hypochaeris radicata*
Fairy flax	***Linum catharticum***
Common bird's-foot trefoil	*Lotus corniculatus*
Mouse-ear hawkweed	***Pilocella officinarum***
Ribwort plantain	*Plantago lanceolate*
Tormentil	*Potentilla erecta*
Creeping buttercup	*Ranunculus repens*
Springy turf moss	*Rhytidiadelpus squarrosus*
Devil's bit scabious	*Succisa pratensis*
Dandelion	*Taraxacum officinale agg.*
Lesser trefoil	*Trifolium dubium*
Red clover	*Trifolium pratense*
White clover	*Trifolium repens*

GA1: Improved Grassland

GA1 Improved Agricultural Grassland

Common Name	*Scientific Name*
Hairry sedge	*Carex hirta*
Marsh thistle	*Cirsium palustre*
Crested dog's tail	*Cynosurus cristata*
Red fescue	*Festuca rubra*
Yorkshire fog	*Holcus lanatus*
Soft rush	*Juncus effusus*
Hard rush	*Juncus inflexus*
Perennial rye grass	*Lolium perenne*
Meadow buttercup	*Ranunculus acris*
Creeping buttercup	*Ranunculus repens*
Broadleaved dock	*Rumex obtusifolius*
Dandelion	*Taraxacum officinalle agg.*
White clover	*Trifolium repens*
Timothy	*Phleum pratense*
Nettle	*Urtica dioica*

FP1: Calcareous Springs

FP1 Calcareous Spring

Common Name	*Scientific Name*
Creeping bent-grass	*Agrostis stolonifera*
Fool's water parsley	*Apium nodiflorum*
Floating sweet grass	*Glyceria fluitans*
Jointed rush	*Juncus articulatus*
Hard rush	*Juncus inflexus*
Duckweed	*Lemna sp.*
Brooklime	*Veronica beccabunga*
Alga	

FP1: Annex 1 7220 Petrifying Spring

Annex 1 7220 Petrifying Spring

Common Name	*Scientific Name*
Fern-leaved hook-moss	***Cratoneuron filicinum***
Curled hook-moss	***Palustriella commutata***
Endive pellia	***Pellia endivifolia***
Lesser featherwort	*Plagiochila porelloides*
Water cress	*Rorripa nasturtium-aquaticum*

Appendix A7-7

Considerations Relating to Annex I Molinia Meadows

The 6410 habitat is represented within Ireland by both fen and grassland communities on nutrient-poor soils. Sites with this habitat are either managed as traditional hay meadows (cut only once a year in late summer or autumn with the hay crop removed) or more usually as extensive pasture. Within Ireland 6410 habitat occurs in lowland plains on neutral to calcareous gleys, sometimes with a marl layer beneath the surface, or on peaty soils both in lowland and upland situations (Martin et al., 2018). These communities can be classified within the GL1C *Molinia caerulea – Succisa pratensis* grassland (Perrin, 2018b).

GL1C is described as "typically a species-rich grassland community with a number of constant species. *Molinia caerulea* is often an abundant species, but tends not to form large, dominating tussocks and may even be absent. *Succisa pratensis* is a strong indicator and can be plentiful, while *Calliergonella cuspidata* is usually abundant beneath the sward. Other constant graminoids include *Carex panicea*, *Carex flacca*, *Juncus acutiflorus*, *Holcus lanatus*, *Festuca rubra* and *Anthoxanthum odoratum* (mean graminoid height = 32.0 cm, n = 225). Apart from *Succisa*, the main forbs are *Potentilla erecta*, *Ranunculus acris*, *Trifolium* spp., *Plantago lanceolata*, *Prunella vulgaris*, *Filipendula ulmaria* and *Cirsium dissectum* (mean forb height = 19.6 cm, n = 255). *Briza media* and *Carex pulicaris* occur on the more calcareous soils" (Perrin, 2018b).

The recent Grassland Monitoring Survey (GMS) of Annex I grassland types in Ireland targeted 33 /110 sites surveys for 6410 habitat. During the GMS, 167.87ha of 6410 habitat were surveyed, representing 29% of the 586ha of 6410 habitat that is currently mapped within the State. During the GMS, a net loss of 12.19ha of 6410 habitat between the baseline ISGS and the GMS, which represents a 7% loss in habitat area. All of the 12.19ha area loss occurred outside the SAC network. The main pressures that were contributing to the loss in area were abandonment or undergrazing, recorded at two sites, and new conifer plantations, also recorded at two sites. In the GMS 28% (8 sites) received a Favourable assessment across the three parameters, 14% (4 sites) received an Unfavourable-Inadequate assessment, and 59% (17 sites) received an Unfavourable-Bad assessment.

The overall National Conservation Assessment (NCA) for 6410 is Unfavourable-Bad and decreasing, as it was when it was previously reported in NPWS (2013); Martin et al,(2018). The Irish Semi Natural Grassland Survey (ISGS) (Devaney et al (2013) undertaken in 2012 surveyed 91 grassland sites covering 837 ha of grasslands in County Galway with a median site area of 5.9 ha. 42 of these sites were within an SAC, 39 within a pNHA. 34 sites were identified to contain an Annex I grassland (not limited to Molinia meadows). 11.5 ha of Annex I Molinia Meadow were identified in County Galway in the ISGS.

In the recent GMS, non-intensive cattle grazing was the most frequently recorded positive impact within the 6410 habitat, and all non-intensive grazing activities, including cattle, horses and sheep, account for 24 of the 40 positive impacts that were recorded within the habitat. Non-intensive mowing is the second most frequent positive impact recorded within the 6410 habitat. Grazing by non-domestic animals such as hare, rabbits and deer is also an important positive impact at four sites.

Site Important - Site Specific Importance and National Context

The subject site, with an area of 1.5 ha is approximately, is 0.26% of the area of 6410 currently mapped nationally. The site may not fulfil the criteria to be evaluated as of National Importance given its limited size (2.5 ha) and given the surrounding land use and farming intensity. The surrounding fields are improved agricultural grassland or improved wet grassland and are of low species diversity. Depending on land ownership and grassland management, the area of grassland is vulnerable to change in management.

A site evaluated as of National Importance according to the NRA conservation valuation scheme is a site "containing 'viable areas' of the habitat types listed in Annex I of the Habitats Directive" with viable areas defined as "an area of a habitat that, given the particular characteristics of that habitat, was of a sufficient size and shape, such that its integrity (in terms of species composition, and ecological processes and function) would be maintained in the face of stochastic change (for example, as a result of climatic variation)".

Recommended conservation measures in the Grassland Monitoring Assessment included that all three target Annex I grassland habitats require restoration initiatives to be undertaken for areas of habitat that have been lost or degraded. With reference to CIEEM guidance a sequential process should be adopted to avoid, mitigate and compensate negative ecological impacts and effects. This is often referred to as the 'mitigation hierarchy". The following lists recommendations for mitigation measures that were considered in the event that an impact to the Annex I grassland could not be avoided.

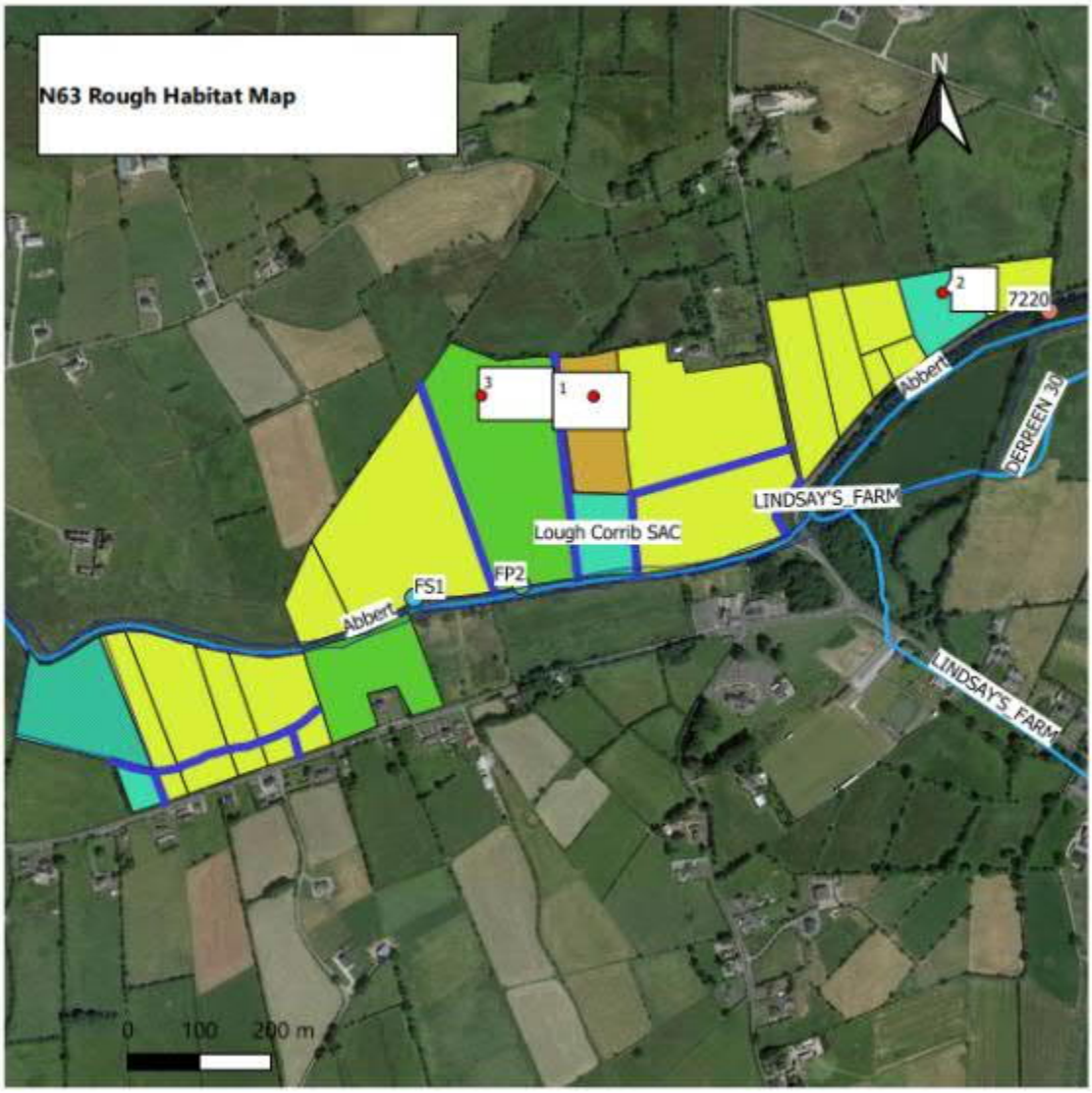


Figure 1 Locations of Various Habitats from Detailed Botany Survey.

Considerations

Firstly, consideration have been given to minimising the area of land take within the Annex I habitat by altering the alignment. Any impact on the local hydrology of the remaining habitat, due to the Proposed Road Development, would have to be investigated and the hydrology of the remaining areas protected.

Translocation: Translocation of sods from Field 1 containing the Annex I grassland. The successful translocation of grassland sods would be dependent on choosing a site with similar soil characteristics and hydrology. The field adjacent to the west of Field 1 may present such an opportunity.

Further surveys would be required to investigate the potential for successful translocation. A detailed translocation plan would be required, and an appropriate management plan would need to be implemented such as extensive grazing and/or mowing regime with annual monitoring to assess the success of the translocation and to assess the success of the management regime.

Retention: Efforts should be made to protect areas of this habitat either side of the development. Therefore, areas outside of the immediate works footprint should be protected (cordoned off), managed and monitored. Hydrological impacts of road development should be considered, retention of hydrological characteristics of retained areas should be accounted for in design stage.

Restoration: Restoration of grassland of similar area (1.5ha minimum).

Field 2 which appears to be an abandoned field was considered as an opportunity for restoration as it currently presents as a moderately species rich abandoned meadow which with appropriate management may develop into a species rich meadow. The area of Field 2 is 1.5 ha.

The potential for restoration of the grassland would needed to have been investigated and to do this further botanical surveys, soil analysis, desktop research and local research of the past land use and management of the subject site (Field 1) and any potential candidate of restoration (e.g. Field 2) would be advised to be undertaken, in order to assess the potential for successful restoration of a grassland Annex I habitat *Molinia* meadows.

A site-specific restoration management plan would have been required. This is likely to have include the introduction of extensive grazing and/or mowing regime along with some scrub management. The sustainability of any such restoration plan would require long term continued appropriate management into the future should be secured. Other restoration techniques that could have been incorporated into the restoration plan to encourage a species rich sward such as spreading green hay saved from a local species rich grassland (e.g. Field 1) .

The restored grassland would need to be monitored annually to access the success of the management plan/grazing regime to evaluate its success and to make recommendations for any changes or alterations to the management that are needed.

The long-term management of the grassland and the feasibility of administration and securing long term appropriate management would need to have been considered. Consideration could have been given to the involvement of a local community group in this regard.

Other potential candidates for restoration include the field adjacent west of the Field 1 which is an improved wet grassland but may still be capable of restoration with or without translocation of sods. Depending on the level of nutrient enrichment and the history of past management it may also be possible to restore this grassland (the field has an area of 3.5 ha). There may be other local sites with good potential also. The potential for a grassland site to be restored to a species rich wet grassland will depend on the current species richness , the past management, the presence of a seed bank, the local hydrology and the soil type as well as the feasibility of securing long term appropriate management.

Conclusion

It was deemed that translocation of sods to a suitable area, and retention of unimpacted areas, outside of the works area (through hydrological protection measures) be undertaken to prevent adverse impacts to this Annex I habitat as part of this road scheme. Restoration was not chosen given the possibility that this may not be effective at compensating for lost habitat.

References

- Devaney F.M, Martin J.R., O'Neill F.H. and Delaney A. (2013) Irish Semi-natural Grassland Survey Annual Report No. 4 western Seaboard Counties (Clare, Galway, Kerry, Limerick, Mayo) & county Tipperary.
- Martin, J.R., O'Neill, F.H. & Daly, O.H. (2018) The monitoring and assessment of three EU Habitats Directive Annex I grassland habitats. *Irish Wildlife Manual*s, No. 102. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.
- Perrin. (2018). Irish Vegetation Classification: Community synopsis *Molinia caerulea–Succisa pratensis* grassland. http://www.biodiversityireland.ie/wordpress/wp-content/uploads/GL1C.pdf.

Appendix A7-8

Q Value Assessment

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BIOLOGICAL WATER QUALITY ASSESSMENT

c/o Flynn Furney Environmental Consultants
Ballynagaragh House
Kilbrittain
Co. Cork

October 2020

TABLE OF CONTENTS

1 INTRODUCTION

1.1 BACKGROUND

In October 2020, Whitehill Environmental was commissioned by Flynn Furney Environmental Consultants to undertake an assessment of the biological water quality of the Abbert River in Co. Galway. Samples were taken at three locations along this river.

1.2 Q VALUE ASSESSMENT

Along with other parameters (fish, morphology, chemistry), the Q value is used to determine the ecological status of the waterbody, which is an action required under the obligations set out in the EU Water Framework Directive. Under this Directive, all water bodies are required to meet good status within a certain time period. Ireland is now in the second cycle of the Water Framework Directive and therefore good status should be achieved in all water bodies by the end of this current cycle, i.e., 2021. If a waterbody is unlikely to achieve this status, then it is deemed to be *At Risk.* Table 1 summaries the Q values in relation to Water Framework Directive status.

Q Value	WFD Status	Pollution Status	Condition
Q5, Q4-5	High	Unpolluted	Satisfactory
Q4	Good	Unpolluted	Satisfactory
Q3-4	Moderate	Slightly polluted	Unsatisfactory
Q3, Q2-3	Poor	Moderately polluted	Unsatisfactory
Q2, Q1-2, Q1	Bad	Seriously polluted	Unsatisfactory

Table 1 – Q Rating in Relation to WFD Status

2 METHODOLOGY

2.1 PERSONNEL

This ecological assessment was carried out by Noreen McLoughlin, BA, MSc, MCIEEM, of Whitehill Environmental. Noreen has an honours degree in Zoology and an MSc in Freshwater Ecology from Trinity College, Dublin and she has been a full member of the Chartered Institute of Ecology and Environmental Managements for 13 years. Noreen has over 15 years' experience as a professional ecologist in Ireland.

2.2 BIOLOGICAL ASSESSMENT

SAMPLE COLLECTION

Biological water quality assessment was carried out at three separate locations on the River Abbert. These locations are summarised in Figure 1.

Figure 1: Site location.

Fieldwork was carried out on October 16th by trained personnel from Flynn Furney Environmental Consultants. The three proposed sites chosen proved suitable for sampling. Samples were then subsequently preserved in ethanol delivered to Whitehill Environmental on the evening of the 16th.

At each station, the surrounding habitats were noted along with other parameters such as water flow, stream depth and the predominance of vegetation. All samples were taken with a Freshwater Biological Association approved hand held sweep net with a mesh diameter of 500µm. At all stations, a two minute kick sample (the travelling kick) method was taken, which ensures that all habitats within a riffle area are sampled. Samples were deposited in a tray on the bank of the river. Bigger stones were washed and any macro-invertebrates clinging to the stones were removed and placed in the tray. Once the debris in the sample was removed, the sample containing the macro-invertebrates and the finer substrates were placed into containers and preserved with isopropyl alcohol.

Once the samples were delivered to Whitehill Environmental, all macro-invertebrates were removed from the sample, identified to the appropriate taxonomic level and then counted.

Q VALUE

Based on the relative abundance of indicator species, the Q value was determined for the sites in accordance with the biological assessment procedure used by the Environmental Protection Agency (Toner *et al.* 2005). The method categorises invertebrates into one of five different groups based on their sensitivity or tolerance to pollution. Group A are the most sensitive forms, Group B are less sensitive, Group C are tolerant, Group D are very tolerant and Group E are the most tolerant. Overall, the higher the biological diversity and the greater the abundance of invertebrate species that are sensitive to organic pollution, then the higher the water quality is assumed to be and the higher the Q value assigned to that sampling station.

The relative abundance of each group of invertebrates in the samples was assigned as follows:

- Present (1/2 individuals)
- Scarce/Few (<1%)
- Small Numbers (<5%)
- Fair Numbers (5-10%)
- Common (10-20%)
- Numerous (25-50%)
- Dominant (50-75%)
- Excessive (>75%)

3 RESULTS OF THIS ASSESSMENT

Results of the biological water quality monitoring are summarised in Table 2.

Station	Q Value & Status	Status
1	Q3-4	Moderate
2	Q3-4	Moderate
3	Q3-4	Moderate

Table 2 – Summary of Findings of the Biological Water Quality Assessment

SAMPLING SITE 1 –

Physical Characteristics and Field Observations

See EIAR river habitat survey.

Biological Assessment and Q Rating

The total number of organisms obtained in this sample was 378. Overall, biodiversity in the sample was moderate and no single taxon dominated the faunal assemblage or occurred in excessive numbers. The most common taxon overall in the sample were beetles from the Elminthidae family. This is a Group C taxon and is therefore relatively tolerant of organic pollution. Overall, Group C taxon were recorded in the sample in excessive numbers (~90%). Other Group C fauna recorded included the freshwater shrimp *Gammarus duebeni*, caseless caddis from they Hydropsychidae family and the mayfly *Baetis rhodani*. These were all common to numerous in the sample. Group A taxa are the most sensitive to pollution, and they were recorded in fair numbers (8.7%). They were represented by mayflies from the Heptageniidae family and by stoneflies from the Perlodidae family. Groups B (more tolerant than Group A) and Group D (more tolerant than Group C) were barely present in the sample, whilst the most pollution tolerant Group E were absent.

Overall, based on the relative abundance of the indicator groups and the occurrence of Group C taxa in excessive numbers and the presence of Group A in fair numbers, this station was assigned a Q3-4, i.e., moderate ecological status. Under the requirements of the Water Framework Directive, this is unsatisfactory.

SAMPLING SITE 2 –

Physical Characteristics and Field Observations

See EIAR river habitat survey.

Biological Assessment and Q Rating

The total number of organisms obtained in this sample was 280. Overall, biodiversity in the sample was moderate but lower than Sample 1. No single taxon dominant the faunal assemblage. As in the previous sample, Group C taxon occurred in excessive numbers. Beetles from the Elminthidae family were numerous in the sample (37%), as was *Gammarus duebeni* (25%) and the caseless caddie Hydropsychidae (13%). *Baetis rhodani* was present in fair numbers (7.8%). The most sensitive Group A taxa were also only represented in small numbers. They were represented by mayflies from the Heptageniidae family and by stoneflies from the Perlodidae family. Group B was present in small numbers (cased caddis from the Phryganeidae family), Group D was barely present and Group E was absent.

Overall, based on the relative abundance of the indicator groups and the occurrence of Group C taxa in excessive numbers and the presence of Group A in small numbers, this station was assigned a Q3-4, i.e., moderate ecological status. Under the requirements of the Water Framework Directive, this is unsatisfactory.

SAMPLING SITE 3 –

Physical Characteristics and Field Observations

See EIAR river habitat survey.

Biological Assessment and Q Rating

The number of organisms obtained in this sample was moderate at 325 and diversity was also moderate. As at the previous two stations, Group C taxa occurred in this sample in excessive numbers (~90%). *Gammarus duebeni* were numerous in the sample, comprising over 38% of the total fauna. Beetles from the Elminthidae family were also numerous in the sample (31%). *Baetis rhodani* was present in fair numbers (6.1%). All other Group C taxa were present in small numbers only. The most sensitive Group A taxa were present in fair numbers (7%) and as before they were represented by mayflies from the Heptagenaiidae family and by stoneflies from the Perlodidae family. Group B was present in small numbers (cased caddis from the Phryganeidae family), Group D was represented by three individuals (*Lymnaea peregra* and *Asellus aquaticus)* and E taxa were absent.

Overall, based on the relative abundance of the indicator groups and the occurrence of Group C taxa in excessive numbers and the presence of Group A in small numbers, this station was

assigned a Q3-4, i.e., moderate ecological status. Under the requirements of the Water Framework Directive, this is unsatisfactory.

4 DISCUSSION

Overall, based on the results as part of this survey, it can be concluded that the ecological status of this water body at all stations is moderate, as all stations achieved a Q3-4. These values are lower than the EPA estimates, which note that the Abbert River has a Q-value of 4. The reason for these differences could be due to changes in river chemistry and land management practices and/or environmental conditions since the last round of ecological surveying by EPA.

5 APPENDIX I- RESULTS OF MONITORING

Sampling Site 1

Indicator Group	Taxon	Number	%
Group A	**Total No.**	**33**	**8.7**
(Very sensitive)	**Ephemeroptera**		
	Heptageniidae	14	3.7
	Plecoptera		
	Perlodidae	19	5
Group B	**Total No.**	**3**	**0.8**
(Moderately sensitive)	**Ephemeroptera**		
	Baetis muticus	1	0.26
	Cased Trichoptera		
	Phryganeidae	2	0.5
Group C	**Total No.**	**340**	**89.9**
(Moderately tolerant)	**Amphipoda**		
	Gammarus duebeni	97	25.6
	Gammarus pulex	3	0.8
	Ephemeroptera		
	Baetis rhodani	44	11.6
	Ephemerella ignita	4	1
	Caseless Trichoptera		
	Hydropsychidae	43	11.3
	Polycentropodidae	1	0.26
	Rhyacophilidae	9	2.4
	Psychomyiidae	2	0.5
	Diptera		
	Chironomidae	3	0.8
	Dicranota	1	0.26
	Simuliidae	9	2.4
	Muscidae	1	0.26
	Coleoptera		
	Elminthidae	114	30.1
	Gastropoda		
	Lymnaea glabra	5	1.3
	Ancylidae	4	1
Group D		**1**	**0.26**
(Very tolerant)	**Amphipoda**		
	Crangonyx pseudogracilis	1	0.26
Group E	**Absent**	**0**	**0**
(Most tolerant)			
Not Assigned to Group		**1**	**0.26**
	Oligochaetes		
	Lumbriculidae	1	0.26
Total		**378**	
Q Value	**Q3-4 – Moderate Status**		

Sampling Site 2

Indicator Group	Taxon	Number	%
Group A	**Total No.**	**13**	**4.6**
(Very sensitive)	**Ephemeroptera**		
	Heptageniidae	8	2.8
	Plecoptera		
	Perlodidae	5	1.8
Group B	**Total No.**	**14**	**5**
(Moderately sensitive)	**Cased Trichoptera**		
	Phryganeidae	12	4.3
	Limnephilidae	2	0.7
Group C	**Total No.**	**250**	**89.2**
(Moderately tolerant)	**Amphipoda**		
	Gammarus duebeni	70	25
	Ephemeroptera		
	Baetis rhodani	22	7.8
	Ephemerella ignita	3	1
	Caseless Trichoptera		
	Hydropsychidae	38	13.5
	Diptera		
	Chironomidae	1	0.35
	Dicranota	2	0.7
	Simuliidae	2	0.7
	Muscidae	1	0.35
	Coleoptera		
	Elminthidae	104	37.1
	Gastropoda		
	Lymnaea glabra	9	3.2
Group D		**1**	**0.35**
(Very tolerant)	**Isopoda**		
	Asellus aquaticus	1	0.35
Group E	**Absent**	**0**	**0**
(Most tolerant)			
Not Assigned to Group	**Absent**	**0**	**0**
Total		**280**	
Q Value	**Q3-4 – Moderate Status**		

Sampling Site 3

Indicator Group	Taxon	Number	%
Group A	**Total No.**	**23**	**7**
(Very sensitive)	**Ephemeroptera**		
	Heptageniidae	19	5.8
	Plecoptera		
	Perlodidae	4	1.2
Group B	**Total No.**	**8**	**2.4**
(Moderately sensitive)	**Cased Trichoptera**		
	Phryganeidae	8	2.4
Group C	**Total No.**	**302**	**92**
(Moderately tolerant)	**Amphipoda**		
	Gammarus duebeni	126	38.7
	Ephemeroptera		
	Baetis rhodani	20	6.1
	Ephemerella ignita	4	1.2
	Caseless Trichoptera		
	Hydropsychidae	16	4.9
	Rhyacophilidae	4	1.2
	Diptera		
	Dicranota	8	2.4
	Simuliidae	1	0.3
	Coleoptera		
	Elminthidae	101	31
	Haliplidae	1	0.3
	Gastropoda		
	Lymnaea glabra	9	2.7
	Planorbidae	1	0.3
Group D		**3**	**0.92**
(Very tolerant)	**Isopoda**		
	Asellus aquaticus	2	0.6
	Gastropoda		
	Lymnaea peregra	1	0.3
Group E	**Absent**	**0**	**0**
(Most tolerant)			
Not Assigned to Group	**Absent**	**0**	**0**
Total		**325**	
Q Value	**Q3-4 – Moderate Status**		

Appendix A7-9

Bat Survey Photos of Buildings Assessed

Plate 1. Building BLD01. Renovation works are planned. Classified as having ‘Moderate’ bat roost potential

Plate 2. Rear view of Building BLD01.

Plate 3. Front view of Building BLD02

Plate 4. Roofs of Building BLD02 offering some potential roost locations

Plate 5. Rear view of Building BLD03. Classified as having ‘Moderate’ bat roost potential.

Plate 6. Intact roof on Building BLD03 increasing the possibility of this building being used by bats

Plate 7. Building BLD04. Classified as having ‘Low’ bat roost potential

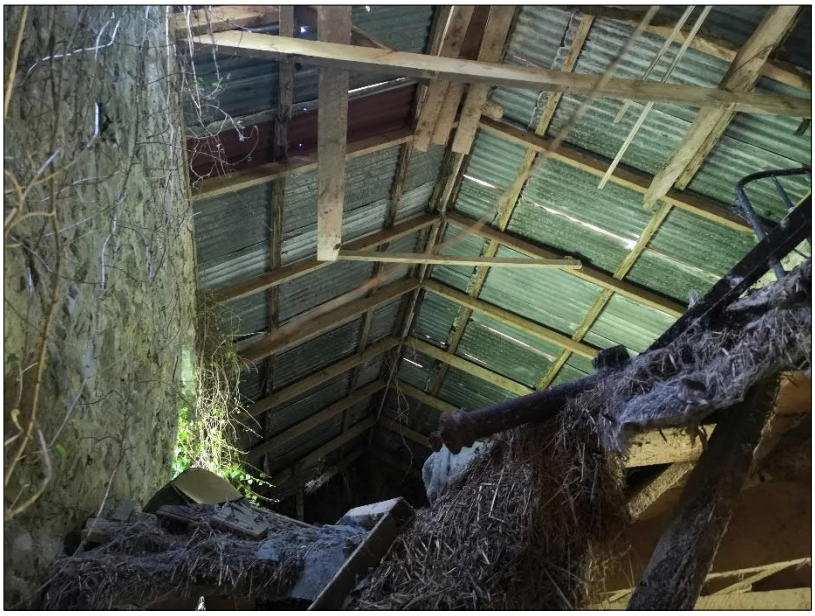


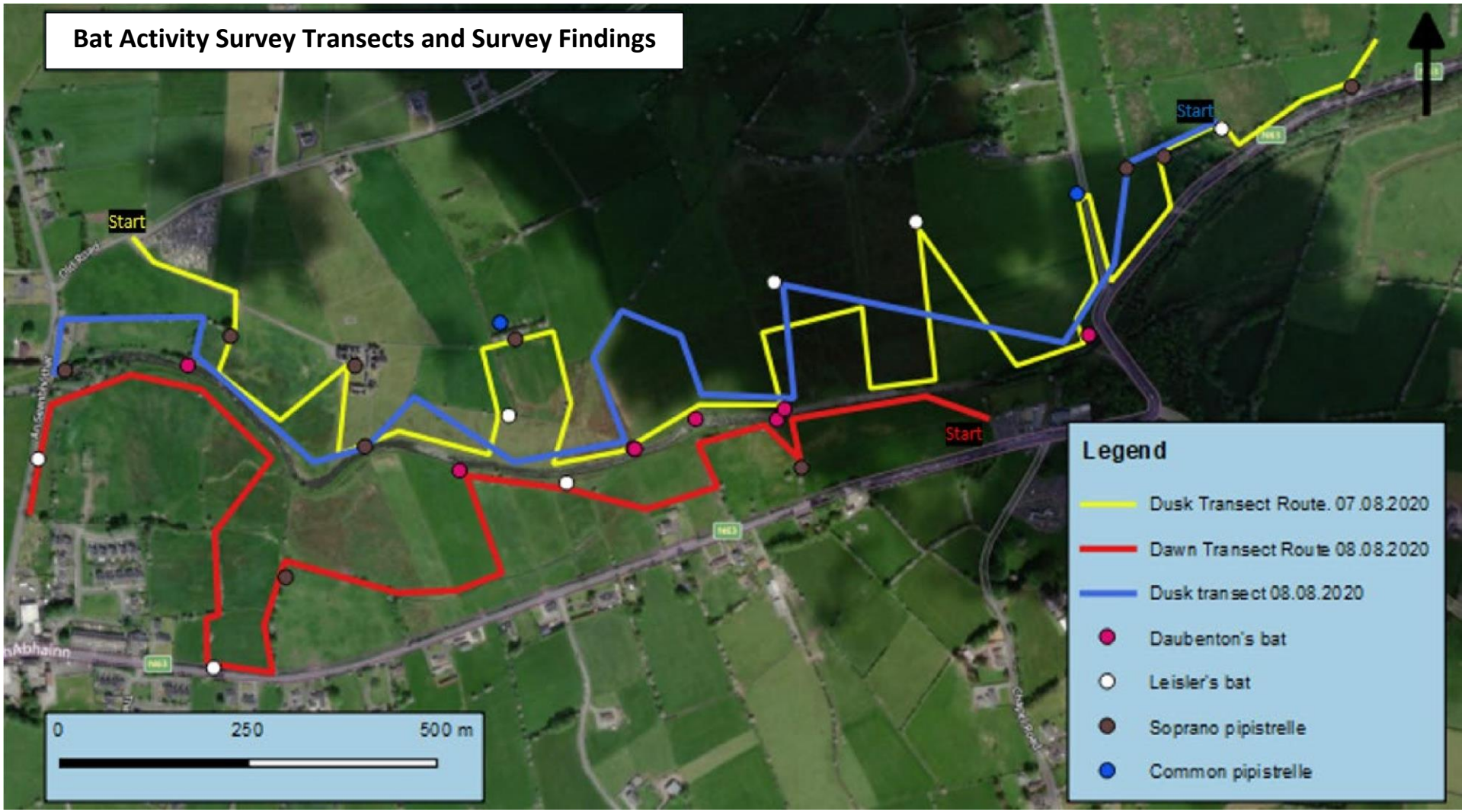
Plate 8. Interior of Building BLD04 showing. Access to the loft was not possible due to collapsed floor

Plate 9. Front of Building BLD05. Immature trees in the former front garden conceal the building. Classified as having a 'Low' bat roost potential following an internal search.

Plate 10. Much of the roof of Building BLD05 is missing, reducing bat roosting opportunities.

Appendix A7-10

Bat Activity Transect


Bat Activity Survey Transects and Survey Findings
Start
Start
Start
Legend
Dusk Transect Route. 07.08.2020
Dawn Transect Route 08.08.2020
Dusk transect 08.08.2020
Daubenton's bat
Leisler's bat
Soprano pipistrelle
Common pipistrelle
0
250
500 m