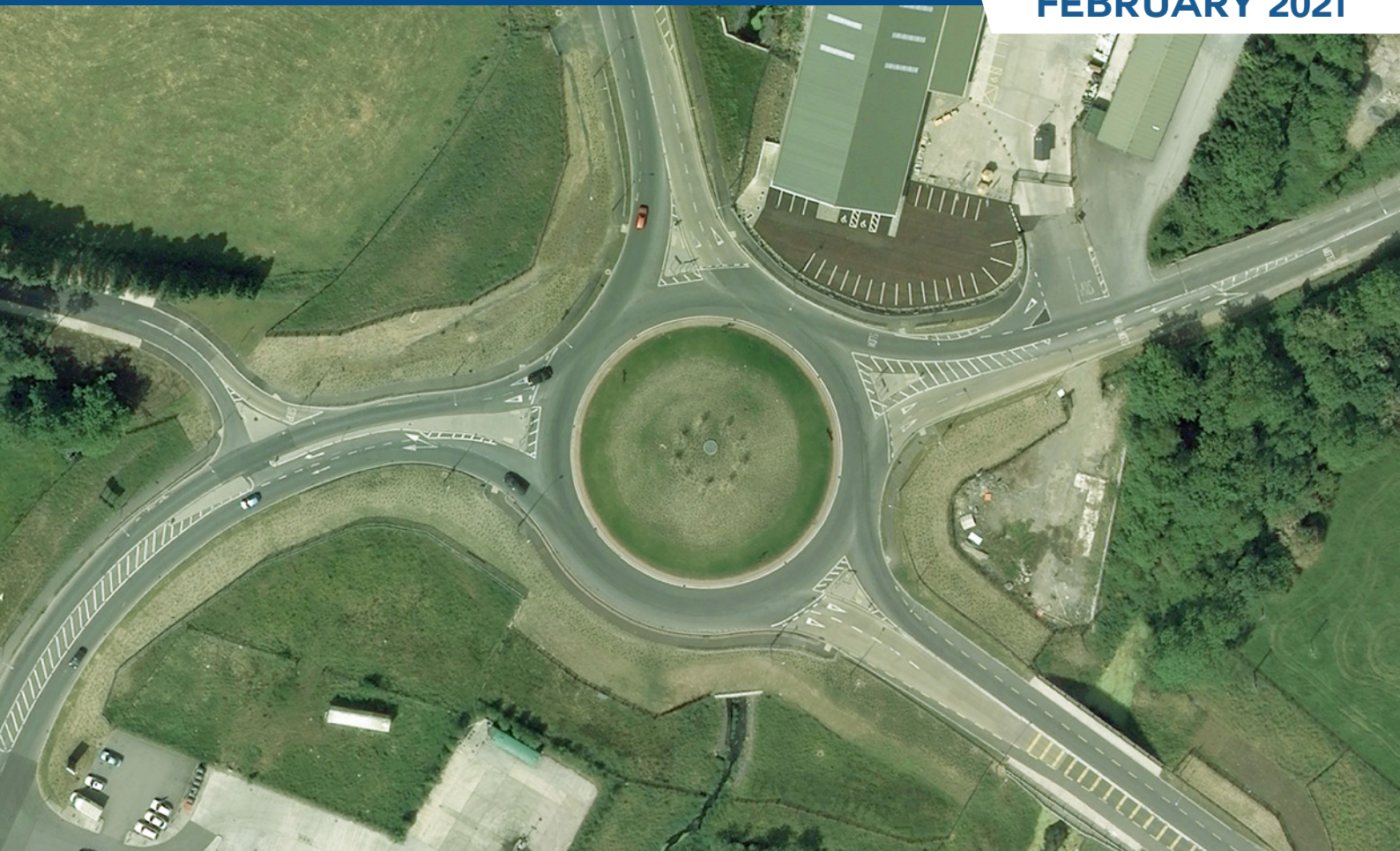


N2 CLONTIBRET TO BORDER ROAD SCHEME

FEBRUARY 2021



OPTION SELECTION REPORT

VOLUME 3 - CONSTRAINTS STUDY REPORT



An Roinn Iompair
Department of Transport



Tionscadal Éireann
Project Ireland
2040



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Transport Infrastructure Ireland



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N2 Clontibret to Border Road Scheme

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Overarching Structure of Option Selection Report

Volume Ref. No. & Title	Contents
Volume 0 – Executive Summary	
Volume 1 - Main Report	
Volume 2 – Drawings	Part A – Route Corridor Drawings Part B – Constraints Drawings
Volume 3 – Constraints Study Report	Main Report
Volume 4 – Phase 2 Stage 1 Working Paper Report	Main Report & Associated Appendices
Volume 5 – Stage 2 Environmental Appraisal Report	Main Report & Associated Appendices
Volume 6 – Engineering Appendices	Part A – Traffic Modelling Report Part B – RSA Stage F Part 1 Report Part C – RSA Stage F Part 2 Report Part D – Cost Benefit Analysis Report
Volume 7 - Non-Statutory Post Consultation Reports	Part A – Public Consultation 1 – Study Area & Constraints Part B – Public Consultation 2 – Route Corridor Options Part C – Public Consultation 3 – Emerging Preferred Corridor
Volume 8 – Project Appraisal Balance Sheet	PABS

Note: The associated Constraints Drawings referred to in this Report are provided in Volume 2, Part B (Drawings). Further information on the Environmental Constraints and the Environmental Constraints Datasets are available in Volume 5 (Stage 2 Environmental Appraisal Report) of the Option Selection Report.

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1. Introduction

The objective of the constraints study in the context of the overall Option Selection Report is in the first instance to identify a suitable Study Area for the examination of alternative routes or options and then to identify key constraints within that Study Area. These constraints and their assessment inform the decision-making process in terms of TII's 3-Stage Option Selection Process as per *Project Management Guidelines (PMGs) PE-PMG-02041* (January 2019), *TII's Project Manager's Manual (PMM) for Major National Road Projects PE-PMG-02042* (February 2019) and *TII's Project Appraisal Guidelines (PAG) for National Roads*.

This report presents the findings of the constraints study and identifies the constraints that have been identified through this process.

1.1 Definition of the Study Area

The first key activity of Phase 2 (Options Selection) is the definition of the Study Area. As per the TII 's PMM, the Study Area is to 'cover an area which will enable appropriate options to be developed and examined.' Furthermore, the PMM states, 'the term "study area" relates to the area under consideration for the physical location of options and may be different to the macroscopic and microscopic study areas identified in the Project Appraisal Plan for use in transport modelling.' As in the case of a different traffic modelling plan study area, the environmental study area may be different/larger in order to capture and consider the zones of influence of particular sensitive areas/ecosystems/species, which may be a considerable distance from the physical location of options but could be potentially impacted by the options.

In defining the Study Area for the N2 Clontibret to Border Road Scheme, the initial Study Area as identified in the N2 Clontibret to Border Road Scheme Phases 0 and 1 Project PAPs (October 2018, February 2019) was reviewed and further refined. The updated Phase 2 Study Area is shown in Figure 1-1 below.

With reference to this Figure 1-1, the defining factors identified for the boundaries of the updated Phase 2 Study Area are as follows:

- **Northern and Southern Boundaries:** The overarching start and end points of Clontibret and The Northern Ireland Border (including the strategic connectivity between the N2 and A5) as identified in the Phases 0 & 1 Project Briefs were maintained. In the case of the Southern extents, the settlements of Corcaghan and the significant natural boundaries of a number of loughs in the townlands of Corcaghan, Greagh and Blackraw restricted the boundary in a southern direction, whilst also recognising the likely physical extremities of a potential option in that direction. In terms of the Northern extents, as stated above, this was restricted by the jurisdiction boundary of Northern Ireland.
- **Western Boundary:** The significant natural barriers of a series of loughs (Including Ballagh, Killnaclay, Annalyty, Mullaghmore and Killy), and the settlements of Three Mile House, Bellanode (Ballinode) and Carrickroe restricted the boundary in a western direction. In addition, the high topography of the area east of Slieve Beagh and around the environs of Carrickroe created a significant natural barrier to the boundary in this area.
- **Eastern Boundary:** The relatively large settlement of Glaslough, along with the jurisdiction boundary of Northern Ireland, restricted the boundary to East.
- **Monaghan Town and Its Environs:** The settlement of Monaghan Town and its urban environs were excluded from the Study Area as its centre and environs are relatively densely populated and create a significant built-environment barrier.

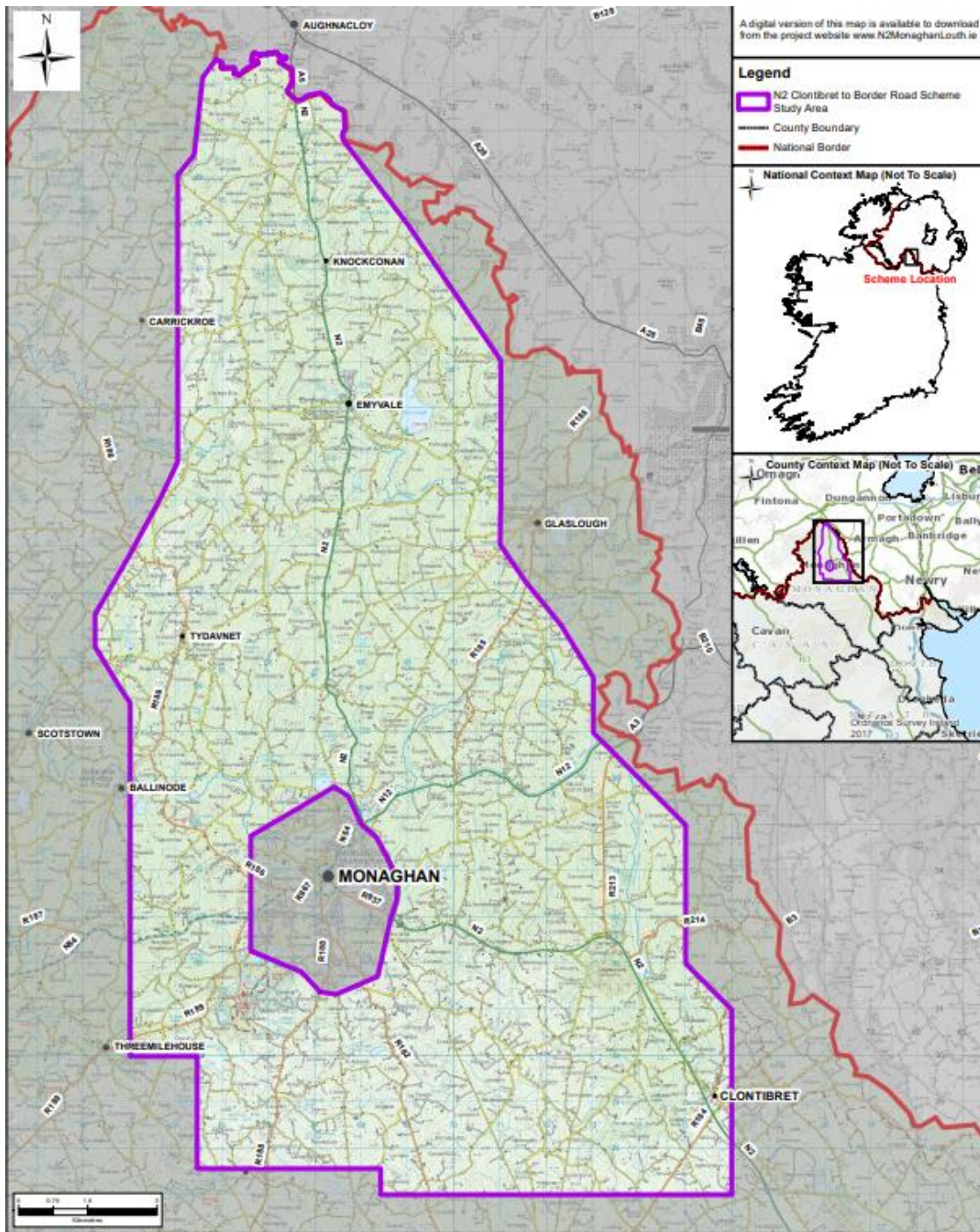


Figure 1-1 Study Area of N2 Clontibret to Border Road Scheme

1.2 Identifying and Mapping Constraints

Following the definition of the Study Area, and prior to undertaking the three-stage options selection process and development of the options, it is necessary to identify the nature and extent of existing constraints within the Study Area. As part of the Constraints Study, these constraints are documented and mapped such that the options/alternatives under consideration can be designed taking cognisance of such constraints, and where feasible and practical avoid the constraints.

The following sources were used to inform the identification of key constraints within the Study Area:

- *Desktop studies to review existing and historical information;*
- *Site surveys to identify physical and environmental features; and*
- *Consultation with statutory and non-statutory consultees (as listed in section 3 below), in relation to their interests within the study area.*

As per Clause 2.1.2.6 of TII's PMM, the formal findings of the constraints study are outlined in this report.

TII's PMM divide constraints into three principal categories:

- **Natural Constraints** (*naturally occurring landscapes and features, including underground features*);
- **Artificial Constraints** (*forming part of the built environment including underground features, e.g. disused landfills*); and
- **External Parameters** (*design standards, policy, procedural, financial, and legal issues*)

A further breakdown of items to be considered under these categories is provided in Appendix A2.2 of TII's PMM. As outlined in the PMM, the Constraints Study is to be primarily a desktop study, supplemented by windshield or walkover surveys where deemed necessary and appropriate.

For the N2 Clontibret to Border Road Scheme, constraints were identified in accordance with TII's PMM and with reference to TII's suite of environmental evaluation guidelines. Constraints information was obtained from various readily available sources (both public and private). The data was then processed and categorised using the project specific GIS based software 'ProjectMapper' and presented across a series of drawings. A list of the categories covered by the Constraints Drawings is shown in Table 1-1 below. A full list and copies of the Constraints Drawings are included in Volume 2 Part B – Constraints Drawings of the Option Selection Report.

Ref Number.	Category
1	LANDSCAPE AREAS
2	LANDSCAPE ELEMENTS
3	VISUAL RECEPTORS
4	BIODIVERSITY – KEY ECOLOGICAL SITES (NATIONAL, EUROPEAN AND INTERNATIONAL)
5	PROTECTED, RED-LISTED OR NOTABLE FLORA AND IMPORTANT ECOLOGICAL SITES
6	GEOLOGY – BEDROCK
7	GEOLOGY – SUBSOILS AND GEOLOGICAL RESOURCES
8	HYDROGEOLOGY – AQUIFERS
9	HYDROGEOLOGY – GROUNDWATER VULNERABILITY
10	HYDROLOGY – RIVER WATERBODY WFD STATUS
11	HYDROLOGY – FLOOD RISK

Ref Number.	Category
12	ARCHAEOLOGICAL HERITAGE
13	ARCHITECTURAL HERITAGE
14	OTHER CULTURAL HERITAGE & ARCHAEOLOGICAL POTENTIAL SITES
15	POPULATION AND MATERIAL ASSETS
16	CARRICKMACROSS TOWN LAND ZONING
17	UTILITIES – WATER SUPPLY AND WASTEWATER
18	UTILITIES – ELECTRICITY
19	UTILITIES – TELECOMMUNICATIONS
20	UTILITIES – GAS NETWORK
21	PLANNING – LAND ZONING & STRATEGY
22	PLANNING – PLANNING APPLICATIONS
23	AGRONOMY – CORINE LANDCOVER

Table 1-1 List of Categories for the Constraints Study

Constraints which were initially identified as being of particular significance within the Study Area were summarised and presented to the public and key stakeholders at the first non-statutory public consultation which was held in June and July 2019 (Public Consultation 1 – Study Area and Constraints). The purpose of these consultations was to assist in the identification of constraints such as existing utilities, geology, archaeology, designated areas, sites of importance for protected flora and fauna, waterways of fisheries value, etc. that might influence the development and appraisal of route options. Figure 1-2 below shows of a copy of Key Constraints displayed at the public consultation.

As the constraints and their associated data is continually being updated (i.e. new planning applications, public feedback, etc.), this information was monitored and reviewed throughout the three-stage options selection process, in order to appropriately inform the development and assessment of the options.

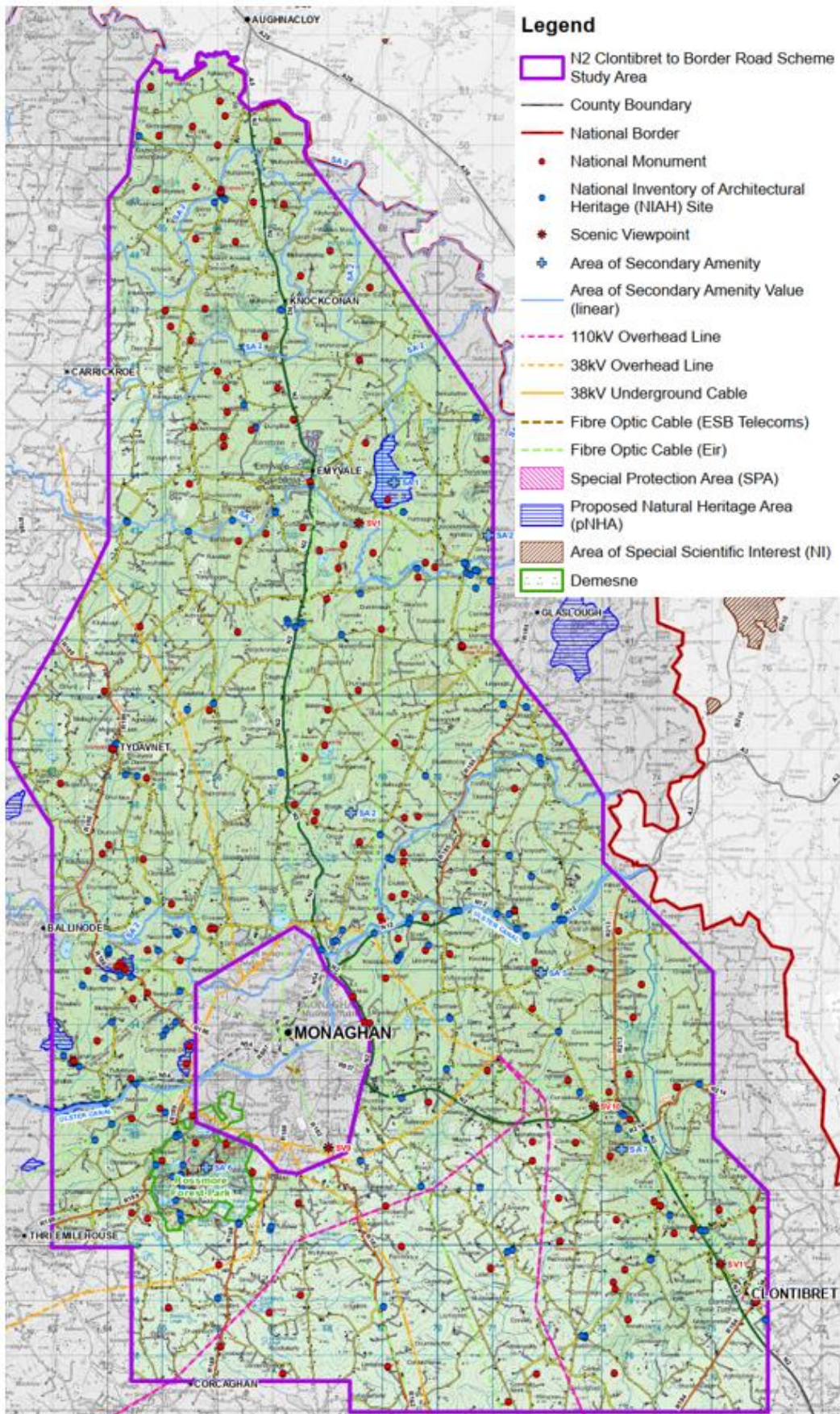


Figure 1-2: Key Constraints of N2 Clontibret to Border Road Scheme (as displayed at Public Consultation 1)

2. Environmental Legislative Constraints

At this stage of the project it is important to consider EU, national, regional and local environmental policy and legislation which has the potential to influence the development of N2 Clontibret to Border Road Scheme. Table 2-1 summarises all legislative, policy and planning constraints and requirements relevant to the project and the Study Area.

Legislation, Policy and Planning	Constraints / Requirements
EU Legislation	
EIA Directive (Directive 2011/92/EU, as amended by Directive 2014/52/EU).	Directive (2014/52/EU) on the assessment of the effects of certain public and private projects on the environment ensures that projects are designed to ensure it is not likely to have significant effect on the environment. The directive requires a full and detailed assessment of environmental effects is conducted prior to planning consent.
Birds Directive (2009/147/EC)	Directive 09/147/EC requires all EU Member States to take measures to protect all wild birds and their habitats. The Birds Directive aims to protect all of the 500 wild bird species naturally occurring in the European Union.
Habitats Directive (92/43/EEC)	Directive 92/43/EEC requires all EU Member States to ensure the conservation of a wide range of rare, threatened or endemic animal and plant species.
Water Framework Directive (2000/60/EC, as amended by Directive 2014/101/EU)	The WFD establishes a standard strategic approach to managing groundwater, wetlands and surface water bodies to meet common environmental objectives.
Directive 2007/60/EC on the Assessment and Management of Flood Risks.	This Directive aims is to reduce and manage the risks that floods pose to human health, the environment, the economy and any natural assets including heritage or critical infrastructure. It establishes a framework for the assessment and management of flood risks.
National Legislation	
Planning and Development Act, 2000 (as amended)	This act sets out the detail of regional planning guidelines, development plans and local area plans as well as the basic framework of the development management and consent system. It provides the statutory basis for protecting our natural and architectural heritage, the carrying out of Environmental Impact Assessment and the provision of social and affordable housing and other infrastructure.
Roads Act (1993) as amended.	The project must undergo screening for Environmental Impact Assessment in accordance of the Roads Act (1993) as amended).
European Communities (Birds and Natural Habitats) Regulations 2011, SI 477/2011.	These regulations transpose the Birds Directive 009/147/EC and the Habitats Directive 92/43/EEC into Irish legislation.
The Inland Fisheries Act 2010. EU (Quality of Salmonid Waters) Regulations 1988.	All works during development and operation of the project must aim to conserve fish and other species of fauna and flora habitat; biodiversity of inland fisheries and ecosystems and protect spawning salmon and trout.
Environmental Quality Standards Directive	These regulations define national policy for water quality for surface waters and groundwaters in Ireland. The project must ensure that standards and requirements within these regulations are followed and objectives are not

<p>2008/105/EC (supporting directive) The Water Policy Regulations (S.I. No. 722 of 2003) European Union (Water Policy) Regulations 2014 (S.I. No. 350 of 2014) The Surface Waters Regulations (S.I. No. 272 of 2009) The Groundwater Regulations (S.I. No. 9 of 2010) WFD River Basin Management Plans 2015-2021</p>	<p>prevented.</p>
<p>The National Monuments Acts 1930-2004.</p>	<p>Under these regulations, it is illegal to do any of the following things to a national monument;</p> <ul style="list-style-type: none"> a) to demolish or remove it wholly or in part or to disfigure, deface, alter, or in any manner injure or interfere with it; or b) to excavate, dig, plough or otherwise disturb the ground within, around, or in proximity to it, without consent. <p>The project must ensure protection of archaeological heritage wherever possible.</p>
<p>Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 1999.</p>	<p>This Act provides for the establishment of a national inventory of architectural heritage and for related matters and to provide for the obligations of sanitary authorities in respect of registered historic monuments.</p> <p>The project must ensure protection of architectural heritage wherever possible.</p>
<p>The Heritage Act 1995.</p>	<p>This Act aims to promote public interest in and knowledge, appreciation and protection of the national heritage.</p> <p>The project must ensure protection of architectural heritage wherever possible.</p>
<p>Arterial Drainage Act (1945)</p>	<p>Section 9 provides details for the modification to or alteration of any watercourse to ensure no increase in flood risk or negative impact on the drainage of land and Section 50 for the construction of any new or modification to existing culverts.</p>
<p>European Communities (Assessment and Management of Flood Risks) Regulations 2010. S.I. No. 122/2010</p>	<p>These regulations also set out various flood management and control measures which may be relevant to this proposed scheme including the regulations for the construction of any new or modification to existing culverts.</p>
<p>National Policies / Frameworks</p>	
<p>National Planning Framework – Project Ireland 2040</p>	<p>NSO2 for Enhanced Regional Accessibility specifically references the N2/A5 (Clontibret to Tyrone/NI Border) roads project.</p> <p><i>“Accessibility to the North-West;</i></p> <ul style="list-style-type: none"> • <i>Upgrading access to the North-West border area, utilising existing routes (N2/N14/A5).”</i> <p>It is considered that the proposed project should be prioritised given its strategic importance in the national road network and the lack of any direct rail infrastructure serving significant urban areas in the northwest along the</p>

	route of the N2/A5.
Project Ireland National Development Plan 2018-2027	<p>The National Development Plan 2018-2027 (NDP) is the national capital investment strategy plan that is integrated and aligned with the NPF. It sets out the framework of expenditure commitments to secure the Strategic Investment Priorities to the year 2027 and support the delivery of the ten NSOs identified in the NPF. It sets out a programme of investment that includes indicative Exchequer allocations.</p> <p>Under Section 4.3 Investing in the Border Region, the project is the first project identified:</p> <p><i>“The National Development Plan provides for investment to support the ambition for development of the border region, including:</i></p> <ul style="list-style-type: none"> <i>the N2/A5 road, serving Meath, Monaghan and Donegal.”</i> <p>The proposed Project is identified as a Major National Infrastructural Project, with an associated investment commitment, which has been determined as central to the delivery of the NPF vision.</p>
River Basin Management Plan for Ireland 2018-2021	<p>This document sets out the condition of Irish waters, and a summary of the WFD status for all monitored waters between 2013 – 2015. The RBMP also provides a trend analysis from the previous reporting period (2007 – 2009). The general trend since the last plan period is that monitored river water bodies and lakes at high or good ecological status, appear to have declined by 3% since 2007 – 2009.</p> <p>The RBMP also identifies the significant pressures on each water body that is At Risk of not meeting the environmental objectives of the WFD. Importantly, the assessment includes a review of trends over time to see if conditions were likely to remain stable, improve or deteriorate by 2021. 32% water bodies were classed At Risk out of a total of 4,775 at the time. An assessment of significant environmental pressures found that agriculture was the most significant pressure in water bodies that are At Risk as well as Urban wastewater, hydromorphology and forestry were also significant pressures amongst others.</p> <p>The objective to achieve good status in Ireland has now been extended to 2027.</p>
Strategic Framework for Investment in Land Transport	<p>The Department of Transport, Tourism and Sport (DTTas) is the Government Department responsible for the development of safe and sustainable transport, tourism, and sport to support economic growth and social progress in Ireland. DTTas has over-sight of the decision-making framework specific to transport investment, and the Strategic Framework for Investment in Land Transport (SFILT) was published in 2015. SFILT is soon to be preceded by the Planning Land Use Transport Outlook 2040 which is discussed below.</p> <p>The main output of the SFILT was to identify high-level priorities for future investment in land transport, against a backdrop of growing, though still constrained, funding after the recession. SFILT identified the following three high-level priorities.</p>
Regional / Local Planning Policy	
North and Western Regional Assembly - Regional Spatial and Economic Strategy (RSES)	<p>The Northern and Western Region adopted its RSES in January 2020. The vision is: <i>“To play a leading role in the transformation of this region into a vibrant, connected, natural, inclusive and smart place to work and live.”</i> There are Regional Policy Objectives (RPOs) as goals to be followed throughout the planning process in the region; four RPOs are aimed at national roads and projects highlighted to integrate with the targeted development of major urban centres in the region.</p>

	<p>RPO 6.7 highlights the N2 project: <i>"In accordance with National Development Plan investment commitments to progress the following schemes through pre-appraisal and early planning, the following projects shall be progressed through pre-appraisal and early planning in the short term and shall thereafter proceed to construction and be delivered to an appropriate level of service within the lifetime of the RSES:</i></p> <ul style="list-style-type: none"> • <i>N2 Clontibret to the Border connecting to the A5;</i> • <i>N2 Ardee to south of Castleblayney..."</i> <p>RPO 8.10 highlights the N2 Clontibret to Border as one of 11 road projects which: <i>"The RSES supports appraisal and or delivery of ... subject to the outcome of appropriate environmental assessment and the planning process."</i></p> <p>RPO 11.1 highlights the cross-border relationship on road development: <i>"In co-operation with relevant departments in Northern Ireland, the Eastern and Midland Regional Assembly, and where appropriate in association with the Northern and Western Regional Assembly, will support mutually beneficial policy development and activity in the areas of spatial and infrastructure planning, economic growth and related spheres."</i></p>
<p>Monaghan County Development Plan 2019-2025</p>	<p><i>BRE 01 - To facilitate necessary infrastructure as required to manage the consequences of the United Kingdom leaving the European Union in order to ensure strong links along the border are maintained".</i></p> <p>The N2/A5 Clontibret to Northern Ireland Border route and the N2 Ardee to Castleblayney Road Upgrade route are listed in Table 7.2 for the Strategic National Road Proposals for the County.</p> <p><i>"NRP 1 - To protect the traffic carrying capacity of national roads, the level of service they deliver and the period over which they continue to perform efficiently, by avoiding the creation of new access points or the generation of increased traffic from existing accesses onto the N2, N53, N54, and N12 outside the 60 km/h speed limit, in accordance with the DoECLG's publication Spatial Planning and National Roads - Guidelines for Planning Authorities (2012)".</i></p> <p><i>"NRP 5 - To seek to progress and ensure the upgrade of the N2 in co-operation with Transport Infrastructure Ireland and the relevant adjoining local authorities".</i></p> <p>In addition to NRP 5, Monaghan County Development Plan states that: <i>"TII have committed to providing additional funding for an online upgrade of the N2 extending from north of Ardee to south of the Castleblayney bypass and this project is at preliminary stages".</i></p>
<p>Variation No.1 of Monaghan County Development Plan 2019-2025</p>	<p><i>"NRP 7: To protect the selected route of the N2 upgrade road scheme between Ardee and Castleblayney and the selected route between Clontibret and the border with Northern Ireland, and to prohibit development that could prejudice their future delivery."</i></p>

Table 2-1: Environmental Legislation

3. Consultations

3.1 Stakeholder Consultations

As part of the Constraints Study for the N2 Clontibret to Border Road Scheme, a consultation exercise was undertaken with those statutory and non-statutory organisations that have responsibilities for and/or interests within the study area.

The following organisations were consulted to obtain information on constraints within the study area:

- National Parks and Wildlife Service – ecological constraints;
- Environmental Protection Agency – waterbodies, peat, mines, quarries, contaminated land and land use;
- Geological Survey of Ireland – soils, geological and hydrogeological constraints;
- Office of Public works – Flood risk;
- Department of Culture, Heritage and Gaeltacht – build heritage;
- Monaghan County Council – GeoDirectory, material and community assets, contaminated land, land use and Development Plans, mines and quarries.

The purpose of these consultations was to assist in the identification of constraints such as existing utilities, geology, archaeology, designated areas, sites of importance for protected flora and fauna, waterways of fisheries value, etc. that might influence the development and appraisal of route options. A more detailed list of the consultees and the constraint topics that were identified within the Study Area is presented in Table 3-1 below:

Constraint Topic	Query	Data Source
Ecology	Ramsar	NPWS
	SAC	
	SPA	
	NHA	
	pNHA	
	pNHA	
	pNHA	
	ASSI	
	ALE Woodland	
	ALE Woodland	
	Native Woodland	
	Semi-Natural Grasslands	
WFD Waterbodies (Surface Water)	EPA	
Geology & Soils	Peat (Blanket Peat, Fen Peat, Cutover Peat)	Subsoils GSI / EPA
	Mines	GSI / EPA
	Quarries	
	Economic Deposits - Sand & Gravel	GSI
	Economic Deposits - Potential Granular Aggregate (High/Very High)	GSI

Constraint Topic	Query	Data Source
	Economic Deposits - Potential Crushed Rock (High/Very High)	GSI
	Contaminated land sites (Landfills, Infilled quarries, Former industrial sites)	GSI
	Wells	GSI
	Karst Landforms	GSI
	Geological Heritage Sites	GSI
Hydrogeology	Vulnerable and Regionally Important Aquifer (Karstified bedrock (Rk), Fissured bedrock (Rf) and Extensive sand & gravel (Rg))	GSI
	Sand & Gravel Aquifer	
	Bedrock Aquifer	
	Groundwater Vulnerability (Extreme, High, Rock near surface or Karst)	
	Public & Group Supply Source Protection Area (Inner & Outer)	
	Group Water Schemes	
	Vulnerable and Regionally Important Aquifer (Karstified bedrock (Rk), Fissured bedrock (Rf) and Extensive sand & gravel (Rg))	
	Sand & Gravel Aquifer	
	Bedrock Aquifer	
	Groundwater Vulnerability (Extreme, High, Rock near surface or Karst)	
	Public & Group Supply Source Protection Area (Inner & Outer)	
	Group Water Schemes	
Hydrology	WFD Surface Water Waterbodies	EPA
	Flood Risk (Fluvial Extents, Flood Risk Types)	OPW
Archaeological, Architectural & Cultural Heritage	NIAH	buildingsofireland.ie/niah-data-download, Data.gov.ie, records held by AMS (project cultural heritage specialists).
	Historic demesnes	
	National Monuments	
	RMP	
	SMR	
	Record of Protected Structures	
Material Assets (Agricultural)	Agricultural land (CORINE)	EPA
	Commercial Forestry	CORINE - EPA

Constraint Topic	Query	Data Source
Material Assets (Non-Agricultural)	WWTP	WWTP
	IPCC Licensed Facility	EPA
	Licensed Waste Facility	EPA
	Historic Landfill Site	EPA
	Commercial and industrial businesses (GeoDirectory)	GeoDirectory - County Council
	Major infrastructure (Greenways, Cycle Trails and Walking Trails, Ulster Canal)	On-line data sources, aerial photography and county council information.
	Community Assets (schools, churches, sports clubs, community halls, hospitals)	On-line data sources, aerial photography, GeoDirectory and county council information.
Landscape and Visual	Areas of Primary Amenity Value	On-line data sources, aerial photography, GeoDirectory and county information.
	Areas of Secondary Amenity Value	
	Area of High Scenic Quality	
	Area of Outstanding Natural Beauty	
	Landscape Character Areas	
	Scenic Viewpoint	
	Area Under Strong Urban Influence	
	Settlements	
	Heritage Trees	
	Areas of Primary Amenity Value	
Air Quality & Climate	Location of Properties	GeoDirectory
	Nitrogen sensitive sites	NPWS and Scott Cawley (project ecologists)
Noise & Vibration	Location of Properties	GeoDirectory
Planning	Local Area Action Plan	County Council
	Planning Applications	County Council
	MCC Development Plan 2019 2025 GIS Files	County Council
	LCC Development Plan 2015 2021 GIS Files	County Council

Table 3-1: List of Consultees during Constraints Study

3.2 Public Consultations

Three separate non-statutory public consultations were held during the Phase 2 Option Selection Process as per Table 3-2. Summary details of these public consultations is provided in Chapter 6 of the Volume 1 of the Option Selection Report, with copies of the associated Post-Consultation Reports in Volume 7.

Public Consultation Event	Date
Public Consultation 1 (Study Area & Constraints)	June & July 2019
Public Consultation 2 (Route Corridor Options)	October/November/ December 2019
Public Consultation 3 (Emerging Preferred Route Corridor Option)	August/September/October 2020

Table 3-2 Details of Public Consultation Events

4. Constraints

Details of the Constraints identified during the constraints study are provided below. The mapping of these constraints is provided in Volume 2 – Drawings, Part B – Constraints Drawings as part of the Option Selection Report. Further information on the Environmental constraints and the Environmental Constraints Datasets are available in Volume 5 (Stage 2 Environmental Appraisal Report) as part of the Option Selection Report.

4.1 Natural Constraints

4.1.1 Ecology

4.1.1.1 Introduction

This section aims to identify the baseline geological conditions to identify constraints that may influence the development of the N2 Clontibret to the Border Road Scheme.

This assessment has been conducted in line with the following guidelines:

- *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009);
- *Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater, Coastal and Marine* (CIEEM, 2019).

Data and information collected as part of the desk study was sourced from the following locations:

- Online data as held by the National Parks and Wildlife Service (NPWS) from www.npws.ie;
- Online data available on European sites and Areas of Special Scientific Interest (ASSIs) from the Northern Ireland Environment Agency (NIEA) www.daera-ni.gov.uk;
- Online data available on protected habitats and species as held by the National Parks and Wildlife Service (NPWS) from www.npws.ie;
- Online data available on protected species as held by the National Biodiversity Data Centre (NBDC) from www.biodiversityireland.ie;
- Online data available on wetland sites as provided by Wetland Surveys Ireland¹ and Foss Environmental Consulting²;
- Online data available on geology, soils and hydrogeology as provided by Geological Survey of Ireland (GSI) www.gsi.ie;
- Online data available on water bodies, water quality and salmonid rivers (Salmonid Regulations S.I. 293) as provided by Environmental Protection Agency (EPA) www.epa.ie;
- Ordnance Survey of Ireland mapping and aerial photography available from www.osi.ie and www.geohive.ie;
- Records of rare and protected flora listed on the Flora Protection Order collected and provided by Botanical Society of Britain and Ireland (BSBI) vice-county recorders;
- Online data available on wintering birds from Irish Wetland Bird Survey (I-WeBS);³
- N2 Clontibret to Northern Ireland Border Road Scheme. Constraints Study Report, March 2010;
- Information collected as part of the Wetland Survey County Monaghan 2012 and Monaghan Wetland Map 2010 projects provided by Monaghan County Council;
- Consultations with National Parks & Wildlife Service (NPWS); Heritage Officer, Monaghan County Council; and Inland Fisheries Ireland (IFI); and
- Aerial imagery and surveys from publicly accessible land.

¹ Available at <https://wetland.maps.arcgis.com/apps/View/index.html?appid=e13b75c3bcab4932b992aa0169aa4a32&extent=-11.9317,51.0620,-3.9117,55.6465> [Last accessed 24 March 2020]

² Available at <http://www.fossenvironmentalconsulting.com/wildlife-photography/map-of-irish-wetlands---20/index.html> [Last accessed 24 March 2020]

³ Available at <https://bwi.maps.arcgis.com/apps/View/index.html?appid=1043ba01fcb74c78bc75e306eda48d3a> [Last accessed 24 March 2020]

4.1.1.2 Existing Environment

4.1.1.2.1 Designated Sites

There are 70 designated areas for nature conservation located within, partially within or in the vicinity of, considered to be within 15km, the study area:

- Three Special Areas of Conservation (SACs);
- Two Special Protection Areas (SPAs);
- One Ramsar site;
- One Natural Heritage Areas (NHAs) and Thirty-four proposed Natural Heritage Areas (pNHAs); and,
- Twenty-nine Areas of Special Scientific Interest (ASSIs – sites in Northern Ireland).

There are no SAC and SPA sites located within the study area. However, downstream of the study area there are:

- Five European sites via the River Blackwater catchment, the River Fane catchment, and, the Erne catchment;
- Two Ramsar sites (Lough Erne and Lough Neagh); and
- Two pNHA and Four ASSIs.

The designated areas for nature conservation are listed below in Table 4-1 and Table 4-2 along with their location in relation to the study area and a summary of the reasons for site designation. Their locations are also shown on Figures 5.1 and 5.2, Volume 2 Part B of this Option Selection Report

Site Name	Distance from study area	Reasons for Designation – Qualifying Interests (QIs) or Special Conservation Interests (SCIs) (*Priority Annex I Habitats)
Special Areas of Conservation (SACs)		
Slieve Beagh SAC NIEA (2017) Slieve Beagh SAC Conservation Objectives. V2.1. Department of Agriculture, Environment and Rural Affairs.	c. 7.3km west	Active blanket bog* [7130] European dry heaths [4030] Natural dystrophic lakes and pools [3160]
Magheraveely Marl Loughs SAC NIEA (2015) Magheraveely Marl Loughs SAC Conservation Objectives. V2.1. Department of Agriculture, Environment and Rural Affairs.	c. 7.9km west	Calcareous fens with Cladium mariscus and species of the Caricion davalliana* [7210] Hard oligo-mesotrophic waters with benthic vegetation of Chara spp. [3140] Alkaline fens [7230] Austropotamobius pallipes (White-clawed Crayfish) [1092]
Kilroosky Lough Cluster SAC NPWS (2018) Conservation objectives for Kilroosky Lough Cluster SAC [001786]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht	c. 13.1km south-west	Hard oligo-mesotrophic waters with benthic vegetation of Chara spp. [3140] Calcareous fens with Cladium mariscus and species of the Caricion davalliana* [7210] Alkaline fens [7230] Austropotamobius pallipes (White-clawed Crayfish) [1092]
Dundalk Bay SAC	c. 34.9km south-west	Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140]

Site Name	Distance from study area	Reasons for Designation – Qualifying Interests (QIs) or Special Conservation Interests (SCIs) (*Priority Annex I Habitats)
NPWS (2011) Conservation objectives for Dundalk Bay SAC [000455]; and, Dundalk Bay SPA [004026]. Version 1.0. Department of Culture, Heritage and the Gaeltacht		Perennial vegetation of stony banks [1220] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) [1330] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]
Special Protection Areas (SPAs)		
Slieve Beagh SPA NPWS (2018) Conservation objectives for Slieve Beagh SPA [004167]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht	c. 2.3km west	Hen Harrier (<i>Circus cyaneus</i>) [A082]
Slieve Beagh-Mullaghfad-Lisnaskea SPA NIEA (2015) Slieve Beagh-Mullaghfad-Lisnaskea SPA [UK9020302] Conservation Objectives. V3. Department of Agriculture, Environment and Rural Affairs.	c. 5.5km west	Hen Harrier breeding population
Lough Neagh and Lough Beg SPA	c. 27.4km north-west	Common Tern breeding population Common Tern breeding population

Site Name	Distance from study area	Reasons for Designation – Qualifying Interests (QIs) or Special Conservation Interests (SCIs) (*Priority Annex I Habitats)
<p>NIEA (2015) Lough Neagh and Lough Beg SPA [UK9020091] Conservation Objectives. V4. Department of Agriculture, Environment and Rural Affairs.</p>		<p>Great Crested Grebe breeding population</p> <p>Great Crested Grebe breeding population</p> <p>Great Crested Grebe passage population</p> <p>Whooper Swan wintering population</p> <p>Bewick's Swan wintering population</p> <p>Golden Plover wintering population</p> <p>Great Crested Grebe wintering population</p> <p>Pochard wintering population</p> <p>Tufted Duck wintering population</p> <p>Scaup wintering population</p> <p>Goldeneye wintering population</p> <p>Little Grebe wintering population</p> <p>Cormorant wintering population</p> <p>Greylag Goose wintering population</p> <p>Shelduck wintering population</p> <p>Wigeon wintering population</p>

Site Name	Distance from study area	Reasons for Designation – Qualifying Interests (QIs) or Special Conservation Interests (SCIs) (*Priority Annex I Habitats)
		Gadwall wintering population Teal wintering population Mallard wintering population Shoveler wintering population Coot wintering population Lapwing wintering population Waterfowl Assemblage wintering population
Dundalk Bay SPA NPWS (2011) Conservation objectives for Dundalk Bay SAC [000455]; and, Dundalk Bay SPA [004026]. Version 1.0. Department of Culture, Heritage and the Gaeltacht	c. 33.6km south-west	Great Crested Grebe (<i>Podiceps cristatus</i>) [A005] Greylag Goose (<i>Anser anser</i>) [A043] Light-bellied Brent Goose (<i>Branta bernicla hrota</i>) [A046] Shelduck (<i>Tadorna tadorna</i>) [A048] Teal (<i>Anas crecca</i>) [A052] Mallard (<i>Anas platyrhynchos</i>) [A053] Pintail (<i>Anas acuta</i>) [A054] Common Scoter (<i>Melanitta nigra</i>) [A065] Red-breasted Merganser (<i>Mergus serrator</i>) [A069]

Site Name	Distance from study area	Reasons for Designation – Qualifying Interests (QIs) or Special Conservation Interests (SCIs) (*Priority Annex I Habitats)
		Oystercatcher (<i>Haematopus ostralegus</i>) [A130] Ringed Plover (<i>Charadrius hiaticula</i>) [A137] Golden Plover (<i>Pluvialis apricaria</i>) [A140] Grey Plover (<i>Pluvialis squatarola</i>) [A141] Lapwing (<i>Vanellus vanellus</i>) [A142] Knot (<i>Calidris canutus</i>) [A143] Dunlin (<i>Calidris alpina</i>) [A149] Black-tailed Godwit (<i>Limosa limosa</i>) [A156] Bar-tailed Godwit (<i>Limosa lapponica</i>) [A157] Curlew (<i>Numenius arquata</i>) [A160] Redshank (<i>Tringa totanus</i>) [A162] Black-headed Gull (<i>Chroicocephalus ridibundus</i>) [A179] Common Gull (<i>Larus canus</i>) [A182] Herring Gull (<i>Larus argentatus</i>) [A184] Wetland and Waterbirds [A999]
Upper Lough Erne SPA	c. 18km south-west	Whooper Swan wintering population

Site Name	Distance from study area	Reasons for Designation – Qualifying Interests (QIs) or Special Conservation Interests (SCIs) (*Priority Annex I Habitats)
NIEA (2015) Upper Lough Erne SPA [UK9020071] Conservation Objectives. V3. Department of Agriculture, Environment and Rural Affairs.		
Donegal Bay SPA NPWS (2012) Conservation objectives for Donegal Bay SPA [004151]. Version 1.0. Department of Culture, Heritage and the Gaeltacht	c. 78km north-west	Great Northern Diver (<i>Gavia immer</i>) [A003] Light-bellied Brent Goose (<i>Branta bernicla hrota</i>) [A046] Common Scoter (<i>Melanitta nigra</i>) [A065] Sanderling (<i>Calidris alba</i>) [A144] Wetland and Waterbirds [A999]
Ramsar		
Slieve Beagh Ramsar	c. 7.3km west	Extensive blanket bog
Upper Lough Erne Ramsar	c. 18km south-west	Large and complex freshwater system
Lough Neagh and Lough Beg Ramsar	c. 22.8km north-west	Large freshwater lake

Table 4-1: European sites (SACs and SPAs) and Ramsar sites within the vicinity of the study area, and downstream of the study area.

Site Name	Distance from study area	Features of Interest ⁴
Natural Heritage Areas (NHAs)		
Eshbrack Bog NHA [001603]	c. 5.1km west	An extensive area of upland blanket bog. Eshbrack Bog NHA contains the last remaining relatively intact bog habitat in Co. Monaghan. Although parts of the site have been affected by hand cutting and mechanical peat extraction, much of the cutover areas are now starting to regenerate.
proposed Natural Heritage Areas (pNHAs)		
Drumreaske Lough pNHA [001602]	Within study area and northwest of Monaghan town.	Calcareous lake with populations of stoneworts (<i>Chara</i> spp.) and <i>Cladium mariscus</i> , freshwater marsh, mixed woodland.
Emy Lough pNHA [000558]	Within study area and east of Emyvale town.	Mesotrophic lake surrounded by fringing wet woodland. Of ornithological importance mainly for greylag goose. Species present include little grebe, cormorant, grey heron, mallard, tufted duck, pochard, whooper swan, moorhen, Greenland white-fronted geese and coot.
Wright's Wood pNHA [001612]	Within study area and west of Monaghan town.	Coppiced ash woodland with good ground flora.
Rosefield Lake And Woodland pNHA [001784]	Partially within study area and west of Monaghan town.	Small calcareous lake surrounded by alder woodland. The lake contains stoneworts (<i>Chara</i> spp.) and is surrounded by reedbed.
Ulster Canal (Aghalisk) pNHA [001611]	Partially within study area and west of Monaghan town.	Disused canal supporting a variety of interesting flora including <i>Butomus umbellatus</i> , <i>Carex remota</i> and stands of <i>Iris pseudacorus</i> .

⁴ Information taken from the site synopses, where available from <https://www.npws.ie/protected-sites>.

Site Name	Distance from study area	Features of Interest ⁴
Mullaghmore Lake (South) pNHA [001785]	c. 0.07km west	Shallow lake which is infilling and becoming colonised by floating vegetation, surrounded by reedbed and wet woodland. Heron colony on island. Supports good numbers of wildfowl including tufted duck, pochard, mute and whooper swan.
Corcreeghy Lake and Woodland pNHA [001786]	c. 0.1km west	Undisturbed lake with a thin margin of marsh and reedbed, with extensive wet willow-alder woodland at eastern end. Marsh fern <i>Thelypteris palustris</i> a rare plant in County Monaghan is found here.
Glaslough Lake pNHA [000559]	c. 0.6km north-west	Calcareous lake with populations of stoneworts (<i>Chara</i> spp.), reedbeds, mixed woodland, heronry, supports main populations of waterfowl in the Blackwater Catchment. Roost site for overwintering Greenland white-fronted goose.
Monmurray Grassland pNHA [000562]	c. 0.7km north-west	Area of improved agricultural grassland used by Greenland white-fronted geese.
Killyhoman Marsh pNHA [001782]	c. 1.5km north	Small area of wet marsh, supporting marshy vegetation in an inter-drumlin hollow. Surrounded by birch woodland. Supports sika deer and snipe.
Rafinny Lough pNHA [001606]	c. 2.6km south-west	Small upland oligotrophic lake with well-developed floating mats occurring at its eastern and western ends. The flora exhibits a strong northern element. Locally sparse floating bur-reed <i>Sparganium angustifolium</i> occurs.
Cordoo Lough pNHA [001268]	c. 2.7km south	Lake surrounded by a reedbed merging into a wet meadow community.
Tassan Lough pNHA [001666]	c. 3.3km south-east	Small lough situated in an area of Silurian outcrops with wet grassland.
Lisarilly Bog pNHA [001781]	c. 5.5km south-west	Lisarilly Bog is a small, fairly remote site situated about 8 km east of Clones. This is an area of poor fen vegetation occurring on a quaking bog in a hollow surrounded by drumlins. The poor fen has developed on a cutover raised bog and may be in transition to a raised bog.
Mullaglassan Lough pNHA [001837]	c. 5.5km west	Mullaglassan Lough is a small fringed lake. On the southern and western shore of which there are reed beds with <i>Schoenoplectus lacustris</i> , <i>Phragmites australis</i> and in one area on the south western shore a species poor <i>Cladium mariscus</i> stand forms a dense community. The open water of the lake supports emergent <i>Nuphar lutea</i> and where reed cover is less dense stands of <i>Iris pseudacorus</i> and <i>Sparganium</i>

Site Name	Distance from study area	Features of Interest ⁴
		erectum. The Carex diandra quaking transition mire, which occurs on the land ward side of the reed zone, is the main fen habitat present, and this occurs along much of the southern shore of the lake.
Kilcorran Lough pNHA [001838]	c. 6.6km west	At about 17ha open water area, Kilcorran Lough is one of the larger of the highly calcareous lakes in the Finn River system. A small catchment in limestone drift ensures a high calcium status, with a substrate of precipitated marl, and a relatively low nutrient status. Swamps are reasonably well developed in a few areas.
Lough Smiley pNHA [001607]	c. 7.1km south-east	Lough Smiley is a reed fringed lake with an extensive wetland area includes lakes, reed swamp, freshwater marsh, transition mire, remnant raised bog, cutover bog and wet scrub woodland lying in a basin between drumlins. The area to the north of the lake is dominated by cutover bog vegetation, with low lying wet hollows generally filled with quaking transition mire communities.
Dromore Lakes pNHA [000001]	c. 7.2km south-west	A group of ten main inter-drumlin lakes plus several smaller areas of water stretching along the River Dromore between Cootehill and Ballybay. Wetland site supporting winter bird populations.
Killyvilly Lough pNHA [001839]	c. 7.7km west	Killyvilly Lough is a small calcareous lake. The southern half of the lake and includes an area of open water, alder woodland and Cladium mariscus fen.
Lislannan Bog pNHA [001840]	c. 8.0km west	Lislannan Bog is an area of floating marsh and fen vegetation located on the border of Monaghan and Fermanagh.
Drumgole Lough pNHA [001601]	c. 8.9km south-west	One of the most striking features of the lake is the presence of large areas of reedswamp dominated by Common Phragmites communis. In addition to reedswamp there are small areas of wet grassland dominated by Soft Rush Juncus effusus and Creeping Buttercup Ranunculus repens. Although birdlife on the lake is limited, Whooper Swans frequent the site during the winter months.
Muckno Lake pNHA [000563]	c. 9.1km south-east	Lake and wet woodland. Wetland site supporting bird populations. Important for invertebrates.
Drumakill Lough pNHA [001600]	c. 12.3km south-east	Lake, marsh and wet grassland.
Lough Egish pNHA [001605]	c. 12.9km south-east	Lake. Wetland site supporting winter bird populations. Raised bog also present. Plant species of note present: greater spearwort Ranunculus lingua and shoreweed Littorella uniflora.

Site Name	Distance from study area	Features of Interest ⁴
Kilroosky Lough Cluster pNHA [001786]	c. 13.1km west	As per Kilroosky Lough Cluster SAC qualifying interests, lake, fens and white-clawed crayfish.
Cootehill Church pNHA [000003]	c. 13.7km south-west	A nursery colony of Natterer's bats <i>Myotis nattereri</i> use the loft and bell tower of the church. The colony is estimated to number approximately 30 bats but is probably larger.
Lisabuck Lough pNHA [001835]	c. 13.9km south-west	The site contains a reed fringed lake with small areas of marsh vegetation behind the reed zone among willow and birch scrub, in addition to a wet woodland area in the east of the reserve. The confirmed presence of <i>Carex acuta</i> adds to the ecological interest of the site
Gibson's Lough pNHA [001604]	c. 14.1km south	This lake is gradually being invaded by the vegetation and surrounded by floating marshes. Around the shoreline grow bottle sedge <i>Carex rostrata</i> with bulrush <i>Typha latifolia</i> and the Cowbane <i>Cicuta virosa</i> . Behind is a community dominated by cotton grass <i>Eriophorum angustifolium</i> with water horsetail <i>Equisetum fluviatile</i> and the sedges <i>Carex curta</i> and <i>C. rostrata</i> . Further back is a wet grassland with hummocks of sphagnum moss and the grass Yorkshire fog <i>Holcus lanatus</i> .
Black And Derrygoony Loughs pNHA [001596]	c. 14.9km south	There are two large lakes within the Black Lough NHA. There is an area of open transition mire to the north of the lake. The floating scragh has typical Transition mire communities although lesser tussock sedge <i>Carex diandra</i> is notably absent. The transition mire grades into a dense reed canary-grass <i>Phalaris arundinacea</i> reed swamp which borders the lake. Wetland site supporting winter bird populations.
Erne Estuary/Finner Dunes pNHA [000139]	c. 78km north-west	Estuary and dune habitats.
Dundalk Bay pNHA [000455]	c. 34.9km south-west	Estuary habitats and wintering birds.
Areas of Special Scientific Interest (ASSI)		
Drummond Quarry ASSI [ASSI373]	c. 2.0km north-east	Geology and geomorphology including carboniferous stratigraphy.
Tullybrick Lough ASSI [ASSI146]	c. 2.4km east	Habitats including fens and marl lakes.
Caledon and Tynan ASSI [ASSI342]	c. 3.3km east	Habitats including parkland and fens, and species such as invertebrate assemblage.

Site Name	Distance from study area	Features of Interest ⁴
Kiltubbrid Loughs ASSI [ASSI031]	c. 3.7km east	Habitats and species including fens and invertebrate assemblage.
Rehaghy Wood ASSI [ASSI255]	c. 4.3km north-east	Habitats including oakwood.
Crossbane Lough ASSI [ASSI183]	c. 4.7km south-east	Habitats and species including fens and invertebrate assemblage.
Drumcarn ASSI [ASSI182]	c. 4.7km south-east	Habitats and species including fens and invertebrate assemblage.
Black Lough (Tyrone) ASSI [ASSI239]	c. 4.7km north-east	Habitats and species including fens and invertebrate assemblage.
Fymore Lough ASSI [ASSI224]	c. 4.8km north-west	Habitats including eutrophic standing waters and fens; and species including invertebrate assemblage.
Roeveagh ASSI [ASSI397]	c. 5.0km north-west	Habitats including purple moor-grass and rush pastures.
Derrycloony Lough ASSI [ASSI237]	c. 5.7km north-west	Habitats and species including fens and invertebrate assemblage.
Lough na blaney bane ASSI [ASSI262]	c. 5.9km north-west	Habitats and species including fens and invertebrate assemblage.
Straghans Lough ASSI [ASSI179]	c. 5.9km south-east	Habitats and species including fens and invertebrate assemblage.
Cavan ASSI [ASSI398]	c. 6.3km north-west	Habitats including purple moor-grass and rush pastures.
Slieve Beagh ASSI [ASSI077]	c. 7.4km west	Habitats such as blanket bog, dry heath and dystrophic lakes; and species including invertebrate assemblage.
Drumacrittin Lough ASSI [ASSI122]	c. 8.0km south-west	Habitats such as fens and marl lakes; and species including white-clawed crayfish and invertebrate assemblage.
Glenmore Wood ASSI [ASSI057]	c. 9.0km north	Habitats such as oakwood.
Knocknacloy ASSI [ASSI307]	c. 9.7km north-east	Habitats such as lowland meadow.
Lough McCall ASSI [ASSI261]	c. 10.0km north-west	Habitats and species including fens and invertebrate assemblage.

Site Name	Distance from study area	Features of Interest ⁴
Cloghcor Lough ASSI [ASSI392]	c. 10.7km north-west	Species including Irish Damselfly.
Annachullion Lough ASSI [ASSI121]	c. 10.8km south-west	Habitats such as fens and marl lakes.
Benburb – Milltown ASSI [ASSI365]	c. 11.3km north-east	Geology and geomorphology including carboniferous stratigraphy and triassic stratigraphy.
Fardross Stream ASSI [ASSI141]	c. 11.4km north-west	Geology and geomorphology including carboniferous stratigraphy.
Benburb ASSI [ASSI100]	c. 12.2km north-east	Geology and geomorphology including Pleistocene.
Burdautien Lough ASSI [ASSI081]	c. 13.4km south-west	Habitats such as fens and marl lakes; and species including invertebrate assemblage.
Kilroosky Lough ASSI [ASSI078]	c. 13.5km south-west	Habitats such as fens and marl lakes; and species including white-clawed crayfish and invertebrate assemblage.
Summerhill Lough ASSI [ASSI080]	c. 13.9km south-west	Habitats such as fens and marl lakes; and species including white-clawed crayfish and invertebrate assemblage.
Drumarg ASSI [ASSI404]	c. 14.9km east	Geology and geomorphology including carboniferous stratigraphy and caves.
Carnmore ASSI [ASSI382]	c. 15.0km west	Geology and geomorphology including carboniferous stratigraphy.
Lough Neagh ASSI [ASSI030]	c. 27.4km north-west	Freshwater & estuarine fish assemblage, invertebrate assemblage, breeding and wintering waterbird and wader assemblage and breeding common tern. Wetland habitats including fens, purple moor-grass and rush pastures, reedbeds and swamps, and wet woodland
Upper Lough Erne – Belleisle [ASSI093]	c. 31km west	Habitats such as eutrophic standing waters, fens, purple moor-grass and rush pastures, reedbeds and swamps, oakwood and wet woodland. Otters and breeding and wintering wader assemblage.
Upper Lough Erne – Trannish [ASSI094]	c. 27km west	Habitats such as eutrophic standing waters, fens, purple moor-grass and rush pastures, reedbeds and swamps, oakwood and wet woodland. Invertebrate assemblage, otters and breeding and wintering wader assemblage.

Site Name	Distance from study area	Features of Interest ⁴
Upper Lough Erne – Crom [ASSI071]	c. 25km west	Habitats such as eutrophic standing waters, fens, purple moor-grass and rush pastures, reedbeds and swamps, oakwood and wet woodland. Bat assemblage, Fungi assemblage, otters and breeding and wintering wader assemblage.
Upper Lough Erne – Galloon [ASSI090]	c. 23km west	Habitats such as eutrophic standing waters, fens, purple moor-grass and rush pastures, reedbeds and swamps, oakwood and wet woodland. Invertebrate assemblage, otters and breeding and wintering wader assemblage.

Table 4-2: Natural Heritage Areas (and proposed Natural Heritage Areas) within the vicinity of the study area, and downstream of the study area.

4.1.1.3 Records of Protected, Rare and Other Notable Species

4.1.1.3.1 Flora

Desktop records of protected, rare and other notable plant species are listed below **Table 4-3**. Where a grid reference is available for the record, the location is mapped on Figure 5.2, Volume 2 Part B of this Option Selection Report.

Common name/scientific name	Legal status ⁵	Red List Status ^{6 7}	Source
Common toadflax <i>Linaria vulgaris</i>	n/a	Near threatened	BSBI vice-county recorder record
Fragrant agrimony <i>Agrimonia procera</i>	n/a	Near threatened	BSBI vice-county recorder record
Common gromwell <i>Lithospermum officinale</i>	n/a	Near threatened	BSBI vice-county recorder record
Irish whitebeam <i>Sorbus hibernica</i>	n/a	Vulnerable	BSBI vice-county recorder record
Least bur-reed <i>Sparganium natans</i>	n/a	Near threatened	BSBI vice-county recorder record
Chives <i>Allium schoenoprasum</i>	n/a	Vulnerable	NBDC online database record
Green-flowered helleborine <i>Epipactis phyllanthes</i>	n/a	Endangered	NBDC online database record
Large bitter-cress <i>Cardamine amara</i>	n/a	Vulnerable	NBDC online database record
Showy feather-moss <i>Eurhynchium speciosum</i>	n/a	Near threatened	NBDC online database record
Rigid bog-moss <i>Sphagnum teres</i>	n/a	Near threatened	NBDC online database record
Felted thyme-moss <i>Rhizomnium pseudopunctatum</i>	n/a	Near threatened	NBDC online database record
Fountain feather-moss <i>Amblystegium tenax</i>	n/a	Near threatened	NBDC online database record

Table 4-4: Records of protected, red-listed⁸ or notable flora within the study area.

4.1.1.3.2 Fauna

There are a number of European and nationally protected mammal, bird, fish, amphibian and reptile species, and/or species of a high conservation concern, which have been recorded within the study area. These include:

- Bat species⁹ – brown long-eared bat *Plecotus auritus*, common pipistrelle *Pipistrellus pipistrellus*, Daubenton's bat *Myotis daubentonii*, lesser noctule *Nyctalus leisleri*, Leisler's bat *Nyctalus leisleri*, Natterer's bat *M. nattereri*, soprano pipistrelle *Pipistrellus pygmaeus* and whiskered bat *Myotis mystacinus*;

⁵ HDII/IV/V = Habitats Directive Annexes II/IV/V; FPO = Flora (Protection) Order, 1999; WA = Wildlife Acts

⁶ Ireland Red List No. 10: Vascular Plants (Wyse Jackson et al., 2016)

⁷ Ireland Red List No. 8: Bryophytes (Lockhart et al., 2012)

⁸ Records of Red-list species only include those that are in 'threatened' International Union for Conservation of Nature (IUCN) categories: Vulnerable, Endangered, Critically Endangered, Extinct in the Wild and Extinct.

⁹ Bat roost records collated by Bat Conservation Ireland (BCI) are available only at a resolution of approximately 1km².

- Other mammal species – otter *Lutra lutra*, badger *Meles meles*, hedgehog *Erinaceus europaeus*, Irish hare *Lepus timidus hibernicus*, pine marten *Martes martes*, red squirrel *Sciurus vulgaris*, pygmy shrew *Sorex minutus* and stoat *Mustela erminea*;
- Amphibian species – common frog *Rana temporaria* and smooth newt *Lissotriton vulgaris*;
- Reptile species – common lizard *Lacerta vivipara*;
- Fish species – including Atlantic salmon *Salmo salmar* and European eel *Anguilla anguilla*;
- Invertebrates – including marsh fritillary butterfly *Euphydryas aurinia*; and,
- Birds – a range of breeding and wintering birds, including species listed on Annex I of the Birds Directive (e.g. kingfisher *Alcedo atthis* and merlin *Falco columbarius*), Special Conservation Interest bird species and species on the Birds of Conservation Concern in Ireland (BoCCI) Red and Amber Lists¹⁰.

The full results of the desktop study are provided in Appendix 5.1, Volume 5 of this Option Selection Report.

4.1.1.4 Ecological Sites (Habitats)

All available information relating to habitats within the study area was reviewed and, where possible, existing habitat classifications were verified during field surveys. The most extensive habitat information available for the study area was information collected as part of the Wetland Survey County Monaghan 2012 and Monaghan Wetland Map 2010 projects provided by Monaghan County Council. This information along with data collected in the field was used to define the boundaries of the ecological sites.

A total of 207 relevant ecological sites were identified within the study area) (see Table 5.5 below for a description of the habitats present, or likely to be present, within each ecological site, including the potential presence of Annex I habitat types). The full list of ecological sites identified with the study area are provided in Appendix 5.2, Volume 5 of this Option Selection Report.

A range of habitat types are present across the study area. The more ecologically valuable habitats present comprise lakes with fringing lake shore habitats of reed swamp and fen, in parts grading into species-rich grassland, freshwater marsh and/or wet woodland/wet willow carr. There are also patches of wet woodland in isolation or along the banks of rivers and/or streams. In addition, there are areas of bog woodland in association with scrub and, in parts, heathland. Other habitats present include: areas of dry semi-natural broadleaved woodland; planted deciduous or mixed woodland, often found in large private gardens/estates; and, large areas of dense scrub. There are hedgerows and treelines located across the entire study area, which often form boundaries to fields of improved agricultural and improved wet grassland fields.

Ecological site no.	Description	Ecological Value
1	Dense scrub and semi-natural broadleaved woodland.	Local High
2	Dense scrub and semi-natural broadleaved woodland fringing improved wet grassland.	Local High
3	Glebe Killydreen consisting of riparian woodland, mature broadleaved woodland and patches of scrub.	Local High
4	Scrub surrounded by improved wet grassland.	Local High
5	Dense scrub and semi-natural broadleaved woodland.	Local High
6	Dense scrub and semi-natural broadleaved woodland.	Local High

¹⁰ According to Birds of Conservation Concern in Ireland 2014-2019 (Colhoun & Cummins, 2013).

Ecological site no.	Description	Ecological Value
7	Isolated area of scrub surrounded by agricultural grassland.	Local High
8	Astrish Lough surrounded by marginal freshwater marsh and reed habitats, with scrub and wet woodland (potentially alluvial woodland [*91E0]).	International
9	Large extent of dense semi-natural broadleaved woodland and scrub adjacent to felled forestry.	County
10	Wet grassland with potential acidic or flush characteristics.	Local High
11	Small isolated area of mixed broadleaved woodland surrounded by agricultural grassland.	Local High
12	Riparian woodland and scrub at Mullaghdermot.	Local High
13	Wet woodland (potentially alluvial woodland [*91E0]) and semi-natural broadleaved woodland and scrub on slopes at Aghaliskeevan.	International
14	Roadside strip of planted broadleaved woodland and scrub.	Local High
15	Artificial pond and surrounding planting associated with Fort Singleton House.	Local High
16	Mature stand of broadleaved woodland.	Local High
17	Corclare transition mire (potentially transition mires [7140]), scattered scrub, wet woodland/willow carr (potentially alluvial woodland [*91E0]) and some planted mixed woodland.	International
18	Mature broadleaved woodland.	Local High
19	Emy Lough pNHA mesotrophic lake surrounded by fringing wet woodland (potentially alluvial woodland [*91E0]) reeds, and wet grassland.	International
20	Killycooly Lough with surrounding habitats of reed swamp, fen and wet woodland (potentially Cladium fen [*7210], alluvial woodland [*91E0], hydrophilous tall-herb swamp [6430], transition mires [7140] and alkaline fen [7230]).	International
21	Buck Lough surrounded by habitats of reed swamp, fen and wet alder-willow woodland (potentially Cladium fen [*7210], alluvial woodland [*91E0], hydrophilous tall-herb swamp [6430], transition mires [7140] and alkaline fen [7230]).	International
22	Edermore Woods consists mature broadleaved woodland (potentially old oak woodlands [91A0]) and riparian wood along watercourses.	National
23	Willow woodland and scrub.	Local High
24	Planted conifer and broadleaved woodland with surrounding scrub and wet grassland.	Local High
25	Grove Lough with surrounding marsh, fen and a small area of wet woodland (potentially alluvial woodland [*91E0], hydrophilous tall-herb swamp (6430), transition mires (7140) and alkaline fen [7230])	International

Ecological site no.	Description	Ecological Value
26	Aghaboy Wood consists wet woodland (potentially alluvial woodland [*91E0]) and marginal gorse scrub including gorse.	International
27	Wet grassland GS4 and numerous drainage ditches.	Local High
28	Small area of scrub and mixed broadleaved woodland in newly planted broadleaf forestry.	Local High
29	Small lake at Dundonagh with marginal habitat reed, scrub and wet woodland habitats (potentially hydrophilous tall-herb swamp [6430] and alluvial woodland [*91E0]).	International
30	Mixed broadleaved woodland adjacent to young planted broadleaf forestry.	Local High
31	River at Knockronaghan consists of broadleaved and riparian woodland.	Local High
32	Derryveen Wood consists bog woodland and wet woodland (potentially bog woodland [*91D0] and alluvial woodland [*91E0]).	International
33	Rossarrell Wood consists bog woodland and wet woodland (potentially bog woodland [*91D0] and alluvial woodland [*91E0]).	International
34	Small stand of broadleaved woodland.	Local High
35	Small stand of broadleaved woodland.	Local High
36	Scrub and wet grassland.	Local High
37	Planted mature broadleaved woodland.	Local High
38	Drumcaw Lough and surrounding habitats reed swamp, fen, species-rich wet grassland and wet woodland (potentially Cladium fen [*7210], alluvial woodland [*91E0], hydrophilous tall-herb swamp [6430], transition mires [7140] and alkaline fen [7230]).	International
39	Mullabrack wet woodland (potentially alluvial woodland [*91E0]).	International
40	Small lake at Drumsheeny with marginal reed swamp habitat (potentially Cladium fen [*7210], hydrophilous tall-herb swamp [6430], transition mires [7140] and alkaline fen [7230]).	International
41	Scattered scrub.	Local High
42	Riparian woodland along the River Blackwater.	County
43	Patches of scrub.	Local High
44	Shelvins Lough with marsh, reed swamp, fen and scrub (potentially Cladium fen [*7210], hydrophilous tall-herb swamp [6430], transition mires [7140] and alkaline fen [7230]).	International
45	Scattered scrub and wet grassland.	Local High

Ecological site no.	Description	Ecological Value
46	Riparian wood and planted coniferous stand.	Local High
47	Griggy Lough with marsh, reed swamp, fen, scrub and wet woodland (potentially Cladium fen [*7210], hydrophilous tall-herb swamp [6430], transition mires [7140], alkaline fen [7230] and alluvial woodland [*91E0]).	International
48	Mixed broadleaved and conifer woodland at Derrynagrew.	Local High
49	Ulster Canal at Knockaconny consists riparian woodland and mixed broadleaved woodland, and marginal freshwater habitats.	Local High
50	Ulster Canal consists riparian woodland and mixed broadleaved woodland, and marginal freshwater habitats.	Local High
51	Killyneill Fen cNHA consists transition mire, reed swamp, poor fen, wet woodland and wet grassland (potentially Cladium fen [*7210], alluvial woodland [*91E0], Molinia meadows [6410], hydrophilous tall-herb swamp [6430], transition mires [7140] and alkaline fen [7230]).	International
52	Riparian woodland.	Local High
53	Wet grassland, scrub and willow woodland.	Local High
54	Mature broadleaved woodland along roadside.	Local High
55	Wet grassland and wet woodland/willow carr (potentially Molinia meadows [6410] and alluvial woodland [*91E0]).	International
56	Roadside strip of planted broadleaved woodland and scrub.	Local High
57	Area of scrub.	Local High
58	Wet grassland, scrub and willow woodland.	Local High
59	Castleshane Demesne consists mature mixed broadleaved woodland and conifer plantation.	County
60	Area of scrub.	Local High
61	Scrub and broadleaved woodland.	Local High
62	River valley at Rackwallace consists riparian and wet woodland (potentially alluvial woodland [*91E0]).	International
63	Patches of scrub and strips of riparian woodland.	Local High
64	Roadside planted broadleaved woodland either side of the existing N2.	Local High
65	Riparian woodland.	Local High
66	Patchy scrub and riparian woodland.	Local High

Ecological site no.	Description	Ecological Value
67	Dungillick North and South consists wet woodland/willow carr, wet grassland and scrub (potentially alluvial woodland [*91E0], bog woodland [*91D0], Cladium fen [*7210], transition mires [7140]).	International
68	Linear strip of mixed broadleaved woodland.	Local High
69	Small area of wet grassland and marsh habitat in improved agricultural field.	Local High
70	Area of scrub.	Local High

Table 4-5: Relevant Ecological sites located within the study area

4.1.1.5 Summary

The most significant ecological receptors within the study area are those ecological sites which contain habitats that may correspond to priority Annex I habitat types, followed by those which may contain habitats that may correspond to non-priority Annex I habitats, and proposed Natural Heritage Areas.

Additionally, the ecological sites identified, in particular those comprising wetland complex with a suite of habitat types, are likely to support populations of a range of these ecological receptors.

4.1.2 Soils and Geology

4.1.2.1 Introduction

This section aims to identify the baseline geological conditions to identify constraints that may influence the development of the N2 Clontibret to the Border Road Scheme. This assessment has been conducted in line with the TII Guidelines on Procedures for the Assessment of Geology, Hydrology and Hydrogeology for National Road Schemes (2008).

Data and information collected as part of the desk study was sourced from the following locations:

- Aerial photography and mapping of Study Area (GSI, OSI and online sources);
- Geological Survey of Ireland (GSI) geological data¹¹;
- Environmental Protection Agency (EPA) online maps¹²;
- Ordnance Survey Ireland¹³;
- Monaghan County Council;
- Department of Communications Energy and Natural Resources (DCENR) minerals licencing information¹⁴;
- Irish Soil Information System (Teagasc) online maps¹⁵;
- Department of Communications, Energy and Natural Resources¹⁶ and
- Aerial imagery.

4.1.2.2 Bedrock Geology

The northern section of the Study Area is predominantly underlain by the Maydown Limestone Formation (argillaceous limestone & siltstone), along with a small area of Carrickaness Sandstone Formation (sandstone, siltstone & mudstone).

¹¹ www.gsi.ie (accessed January 2020)

¹² <http://gis.epa.ie> (accessed January 2020)

¹³ <http://map.geohive.ie/mapviewer.html> (accessed February 2020)

¹⁴ <http://spatial.dcenr.gov.ie/ExplorationAndMining/SpatialViewer/index.html> (accessed March 2020)

¹⁵ <http://gis.teagasc.ie/soils/map.php> (accessed January 2020)

¹⁶ <https://dcenr.maps.arcgis.com/apps/webappviewer/index.html> (accessed May 2020)

The central section of the Study Area is predominantly underlain by the Bundoran Shale Formation (dark shale and minor fine-grained limestone), Ballyshannon Limestone Formation (calcarene limestone) and Ballysteen Formation (dark muddy limestone, shale).

The southern section of the Study Area is predominantly underlain by the Coronea Formation (turbidites, red shale and minor volcanics), Red Island Formation (greywacke, micro-conglomerate & argillite) and Slieve Glah Formation (siltstone, mudstone & thin turbidite).

4.1.2.3 Soils and Quaternary Geology

The northern and central sections of the Study Area are underlain predominantly by Till, mapped as being derived primarily from sandstone parent material. There are also small areas of gravelly Alluvium and sandstone derived Sands and Gravels across the Study Area.

The southern section of the Study Area is underlain predominantly by Till, mapped as being derived primarily from sandstone and shale parent material. There are also areas of bedrock outcrop and small areas of gravelly Alluvium, across the Study Area but concentrated particularly to the east side.

There are small areas of cutover Peat mapped throughout the Study Area, with the largest areas located to the east side of the central section.

There are also small areas of Made Ground in the central section of the Study Area. These are associated primarily with areas of built environment.

4.1.2.4 Geological Heritage and Karst Features

There is one geological heritage site within the Study Area, Clontibret Stream (related to mining and mineral deposits), just to the north of Clontibret.

There is one karst landform (a spring) mapped at the northern end of the Study Area.

4.1.2.5 Mines, Quarries and Mineral Resources

There is one active mine site (limestone) located in the central section of the Study Area. There are four disused mine sites (lead with some zinc and antimony) and one of unknown status (gabbro – a type of igneous rock) in the southern section of the Study Area.

There are no quarries mapped by GSI within the Study Area. There are two quarries registered by Monaghan County Council, in the central and southern sections of the Study Area. The quarry in the southern section (DMN Quarry) is recorded as operational, the material extracted is not stated but the planning permission for the site includes a ready-mix concrete plant. It is located on the Ardagh Road, Carrickanoran, to the south-east of Monaghan town. The other quarry (Donagh Quarry) is recorded as not operational (material extracted is not stated). It is located in the townland of Mullaghbane, to the south-west of the village of Glaslough.

Information from DCENR shows the majority of the central and southern sections of the Study Area to have current prospecting licences issued, these are held for barytes, base metals, gold and silver. Some areas at the northern end of the Study Area and one in the east centre are currently unlicensed, with exploration incentives. There is currently a gold exploration ongoing in the townland of Tullybuck, in the east of the southern part of the Study Area, to the north and north-east of Clontibret village.

4.1.2.6 Contaminated Land

There are no recorded active landfill sites within the Study Area. There is one recorded historical landfill (Closed -Municipal Dump) in the southern section of the Study Area in the townland of Dromore to the east of Monaghan town. No further details on former use or current status were available at this stage of assessment.

No other known potentially contaminated sites within the Study Area were identified at this stage of assessment. This will be investigated further during subsequent stages of assessment.

4.1.3 Hydrogeology

4.1.3.1 Introduction

This section aims to identify the baseline geological conditions to identify constraints that may influence the development of the N2 Clontibret to the Border Road Scheme.

This assessment has been conducted in line with the TII Guidelines on Procedures for the Assessment of Geology, Hydrology and Hydrogeology for National Road Schemes (2008).

Data and information collected as part of the desk study was sourced from the following locations:

- Aerial photography and mapping of Study Area (GSI, OSI and online sources);
- Geological Survey of Ireland (GSI) hydrogeological data (including well database, aquifer classification data and groundwater vulnerability maps)¹⁷;
- Environmental Protection Agency (EPA) online maps¹⁸;
- Ordnance Survey Ireland¹⁹;
- Monaghan County Council;
- Department of Communications, Energy and Natural Resources²⁰ and
- Aerial imagery.

4.1.3.2 Water Framework Directive

The northern section of the Study Area lies within the Aughnacloy WFD Groundwater Body (IEGBNI_NB_G_007), the central section lies within the Tydavnet (IE_NB_G_013) and Monaghan Town (IEGBNI_NB_G_012) WFD groundwater bodies and southern section lies within the Keady WFD Groundwater Body (IEGBNI_NB_G_011). All of these groundwater bodies are currently classified as having Good chemical status.

4.1.3.3 Aquifers

The northern section of the Study Area is underlain by Locally Important Aquifer (Bedrock which is Generally Moderately Productive). The central section of the Study Area is also underlain by areas of Regionally Important Aquifer (Karstified) and Locally Important Aquifer (Bedrock which is Moderately Productive only in Local Zones). The southern section of the Study Area is underlain by Regionally Important Aquifer (Fissured bedrock) and Poor Aquifer (Bedrock which is Generally Unproductive except for Local Zones).

The underlying aquifer vulnerability rating is predominantly Low in the northern section of the Study Area and mixed Low, Moderate and High in the central and southern sections. However, there are also small areas of Extreme vulnerability and Rock at or near Surface or Karst across the whole Study Area.

4.1.3.4 Groundwater Resources

There are a large number (>380) of groundwater abstraction features mapped throughout the Study Area, including wells (dug wells and boreholes) and springs. Recorded uses comprise: Public supply; Group Scheme; Domestic; Industrial; and Agricultural. Recorded yield class ranges from Poor to Excellent. Fourteen of these sources are recorded as being used for Public Supply. These are concentrated in the centre and west of the Study Area, along with one in the north and one in the south. The majority of these locations coincide with the mapped areas of Regionally Important Aquifer (Karstified) and Regionally Important Aquifer (Fissured bedrock).

¹⁷ www.gsi.ie (accessed January 2020)

¹⁸ <http://gis.epa.ie> (accessed January 2020)

¹⁹ <http://map.geohive.ie/mapviewer.html> (accessed February 2020)

²⁰ <https://dcenr.maps.arcgis.com/apps/webappviewer/index.html> (accessed May 2020)

There are Public Supply Source Protection Areas, both Inner and Outer zones, in the central and southern sections of the Study Area, predominantly located to the west side. An Outer Protection Area lies approximately 4km between Kilnadreen and Drumgeeny, to the north of Monaghan town. Within this area there are two Inner Protection Areas, approximately 1km and 1.75km north of Monaghan town. A further outer protection area is located to the south side of Monaghan town. There are also Outer Protection Areas and an associated Inner Protection Area at Cavanreagh, on the N12 north-east of Monaghan town.

The National Federation of Group Water Scheme (NFGWS) maintains a separate database to that of Geological Survey of Ireland. NFGWS has identified the Glaslough Tyholland group water scheme, which covers approximately 48km² and supplies approximately 800 houses²¹. It extends from the north west of the county (Lough More and Eshbrack Bog) to the east, under Emyvale and around the area of Emy Lough.

This assessment was focused on the potential impact of the scheme on high-yielding springs and wells used for public water supply and their surrounding protection zones. In accordance with TII guidance²², the total number of wells and springs in the Study Area has not been used at this phase of the project. This is based on the observation that *"Low yielding wells, used mainly for domestic and farm water supply, are very common in Ireland..."* and that *"It is almost inevitable that any large national road scheme will result in at least a small number of low-yielding water supply wells having to be abandoned"* (and mitigation will be provided)).

4.1.3.5 Groundwater Dependant Water Bodies and Terrestrial Ecosystems

At this stage of assessment, no groundwater dependant water bodies or groundwater dependent terrestrial ecosystems (GWDETs) have been identified and so these features do not contribute to the Stage 2 options assessment presented in this Chapter. However, the potential exists for such features to be present within the Study Area and it cannot be conclusively determined at this stage whether or not they may be a constraint for the proposed scheme. This will be investigated further during subsequent stages of assessment.

Details of surface water features within the Study Area are provided in Chapter 8 (Hydrology) and details of ecology in Chapter 5 (Biodiversity – Flora & Fauna).

4.1.4 Hydrology

4.1.4.1 Introduction

This section outlines the baseline hydrology in the project Study Area. Road schemes have the potential to significantly affect surface water bodies such as rivers, lakes/ponds, estuaries and reservoirs. The hydrology assessment will consider the impacts on the following:

- Surface Water Quality; and
- Flood Risk.

The Hydrology assessment has been completed with the following guidelines:

- TII Guidelines on Procedures for the Assessment of Geology, Hydrology and Hydrogeology for National Road Schemes (2008);
- TII Publications (Standards), 2015. Drainage Systems for National Roads, DN-DNG-03022;
- TII Publications (Standards), 2015. Road Drainage and the Water Environment (including Amendment No. 1 dated June 2015), DN-DNG-03065;
- TII Publications (Standards), 2015. Vegetated Drainage System for Road Runoff, DN-DNG-03063;
- TII Publications (Standards), 2015. Design of Soakaways, DN-DNG-03072;
- TII Publications (Standards), 2015. Grassed Surface Water Channels for Road Runoff, DN-DNG-03073;
- CIRIA C648 Control of Water Pollution from Linear Construction Projects: Technical Guide (Murnane et al. 2006);
- CIRIA C649 Control of Water Pollution from Linear Construction Projects: Site Guide (Murnane et al. 2006);

²¹ NFGWS Annual Report 2019. <https://nfgws.ie/wp-content/uploads/2020/03/NFGWS-annual-report-2019.pdf>

²² NRA. 2008. Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes. Unreferenced. Obtained from: www.tii.ie/technical-services/environment/planning/ (accessed March 2020).

- ‘Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors’ (CIRIA, 2001);
- Inland Fisheries Board document ‘Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters’;
- OPW Guidelines for Planning Authorities, The Planning System and Flood Risk Management Guidelines (2009) and specifically the Justification Test;
- Section 50: Arterial Drainage Act (1945) and EU Assessment and Management Flood Risk Regulations (2010) for the construction of any new or modification to existing culverts; and
- Section 9: Arterial Drainage Amendment Act (1995) for the modification to or alteration of any watercourse to ensure no increase in flood risk or negative impact on the drainage of land.

The following datasets were used to assess surface water quality:

- Aerial photography and mapping of Study Area (GSI, OSI and online sources);
- EPA National rivers dataset; and
- Environmental Protection Agency, (www.epa.ie) – WFD Status Geodatabase (All Waterbodies) (2013-2018) – November 2019.

The following datasets were used to assess flood risk:

- Aerial photography and mapping of Study Area (GSI, OSI and online sources);
- EPA National rivers dataset;
- OPW North Western CFRAM study, fluvial flood extents;
- OPW Preliminary Flood Risk Assessment (PFRA), fluvial flood extents; and
- OPW Preliminary Flood Risk Assessment, pluvial flood extents

It should be noted that the CFRAM study data comprises more accurate flood risk information than the PFRA outputs. Where available, the CFRAM data is therefore used in preference to the PFRA data.

The proposed scheme will also be classified as ‘Highly Vulnerable’ by *The Planning System and Flood Risk Management Guidelines (2009)*. This means that the proposed road should be located on lands designated as Flood Zone C i.e. lands that are outside of the 0.1% AEP flood extent. Where this requirement cannot be met, a Justification Test will need to be passed to justify why a development can be progressed in an area which is at risk of flooding and how it will be mitigated.

4.1.4.2 Existing Environment - Surface Water Quality

To ensure consistency with official mapping, some watercourses in this section are referred to by the codes assigned to them by the EPA. The watercourses will be known locally by other names. However, by using the EPA codes the references in this section will be consistent with EPA mapping and text.

A number of sub-catchments are within the Study Area including Clontibret Stream, Blackwater [Monaghan]_SC_010²³, Mountain [Water]_SC_010, Blackwater Trib_SC_020.

Table 4-5 illustrates the surface water quality information of watercourses within the Study Area.

Catchment	Waterbody Name	WFD Status	At Risk Status	Protected Areas	Water Dependent Habitats	Sensitivity
Clontibret Stream_SC_010	Clontibret Stream_020	Unassigned	Review	Drinking Water Protected Area	N/A	Medium
	Clontibret Stream_030	Poor	At Risk	Drinking Water Protected Area	2	Medium
	Mullamurphy_010	Unassigned	Review	Drinking Water Protected Area	10	High

²³ There are two River Blackwaters in Monaghan - Blackwater (Monaghan) starts near Slieve Beagh and passes through Monaghan town and meets the Corr River to the north east of Tyholland. River Blackwater (Annaghroe) forms part of the border with County Tyrone. Both eventually meet near Caledon and drain to Lough Neagh.

Catchment	Waterbody Name	WFD Status	At Risk Status	Protected Areas	Water Dependent Habitats	Sensitivity
Blackwater [Monaghan] _SC_010	Shambles _010	Poor	At Risk	Drinking Water Protected Area	N/A	Low
	Blackwater (Monaghan) _040	Moderate	At Risk	Drinking Water Protected Area; Nutrient Sensitive Area	4	Medium
Mountain [Water]_ SC_010	Mountain Water_030	Good	Review	Drinking Water Protected Area	N/A	High
	Mountain Water_040	Poor	At Risk	Drinking Water Protected Area	13	Medium
	Mountain Water_050	Moderate	At Risk	Drinking Water Protected Area	3	Medium
	Mountain Water_060	Unassigned	Review	Drinking Water Protected Area	5	High
Blackwater Trib _SC_020	River Blackwater (Annaghroe)	Unassigned	Not at Risk	Drinking Water Protected Area	15	High
	Lisavargy _010	Unassigned	Review	Drinking Water Protected Area	1	High

Table 4-6: Water Quality of Watercourses within Clontibret to the Border Study Area

The most sensitive water bodies within the Study Area include; Mullamurphy_010, Mountain Water_030, Mountain Water_060, River Blackwater (Annaghroe), and Lisavargy_010, all of which have Unassigned Status and the presence of water dependent habitats with the exception of the Mountain Water_030 which has Good status.

4.1.4.3 Existing Environment - Flooding Risk

The River Blackwater (Monaghan) is the largest watercourse in the Study Area. It rises in the Bragan Mountains and flows in an easterly to north-easterly direction, flowing beneath the existing N2 near Monaghan town. The Blackwater (Monaghan) has a known history of flooding characterised by reaches with large and extensive floodplains. In the centre of the Study Area, to the east of Monaghan town, its channel is typically 25m wide with its floodplains being up to 200m wide.

The other named watercourses in the Study Area include various tributaries of Clontibret Stream, Mullamurphy, various streams of the Mountain Water and Lisavargy. These have channel widths in range of 5m to 20m.

The Study Area also includes the Ulster Canal. However, it is not however known as an active source of flooding so has not been considered in this assessment.

4.1.5 Landscape and Visual

4.1.5.1 Introduction

This section identifies the existing landscape character of the Study Area, landscape elements and sensitive visual constraints for the N2 Clontibret to Border Road Scheme. The landscape is the visible environment in its entirety, comprised of both natural and built elements including topography, water bodies, vegetation, wildlife habitats, open spaces, buildings and structures. Landscape and visual sensitivities considered include statutory and non-statutory landscape designations, natural features, landscape character areas, notable deciduous trees of woodland, amenities and historic landscapes.

Landscape and visual constraints are examined as two discrete topics:

- Landscape - Concerned with alteration to the physical landscape and features which contribute to the formation of its character; and
- Visual - Concerned with changes that may arise in the overall visual amenity enjoyed by people.

This assessment has been conducted in line with the following guidelines:

- Design Manual for Roads and Bridges (UK)²⁴;
- Guidelines for Landscape and Visual Impact Assessment (UK)²⁵; and
- Environmental Protection Agency (EPA) Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports²⁶.

Data and information were collected as part of a desk study and surveys from publicly available lands. Material and resources used as part of the desk study included:

- Ordnance Survey mapping accessed online May 2019 (www.osi.ie);
- Aerial photography;
- Monaghan County Development Plan 2019 - 2025²⁷;
- Monaghan Landscape Character Assessment 2008²⁸;
- National Parks and Wildlife Service²⁹;
- The Heritage Council – HeritageMaps.ie³⁰;
- Ordnance Survey maps;
- Discover Ireland³¹;
- More to Monaghan³²;
- Sport Ireland Trails³³; and

4.1.5.2 Existing Environment - Landscape

4.1.5.2.1 Landscape Character Areas

County Monaghan Landscape Character Assessment³⁴, published in 2008 and is incorporated into the Monaghan County Development Plan 2019-2025 (MCDP).

4.1.5.2.2 County Monaghan Landscape Character Assessment

Within the County Monaghan Landscape Character Assessment, 14 different Landscape Character Types (LCTs) and nine Landscape Character Areas (LCAs) are identified. The location and extent of these are indicated on Figure 4.1. The assessment defines LCTs and LCAs as:

- *'Landscape Character Types are distinct types of landscape that are relatively homogenous in character. They are generic in nature in that they may occur in different localities throughout any defined area. Nonetheless, where they do occur, they commonly share similar combinations of geology, topography,*

²⁴ Design Manual for Roads and Bridges Volume 11, Section 3 for Stage Two Assessment (UK DMRB, 1994)

²⁵ Landscape Institute and the Institute of Environmental Management and Assessment (eds.) (2013) Guidelines for Landscape and Visual Impact Assessment. Routledge, Oxon.

²⁶ Environmental Protection Agency (Draft 2017), Guidelines on the Information to be Contained in Environmental Impact Assessment Reports. Available from: <https://www.epa.ie/pubs/advice/ea/EPA%20EIA%20Guidelines.pdf> [Accessed: 09 April 2020]

²⁷ Monaghan County Council (2019) Monaghan County Development Plan 2019-2025. Available from: <https://monaghan.ie/planning/new-county-development-plan/> [Accessed: 16 March 2020]

²⁸ Monaghan County Council (2008) Landscape Character Assessment. Available from: <https://monaghan.ie/planning/landscape-character-assessment/> [Accessed: 16 March 2020]

²⁹ National Parks and Wildlife Service (2020) Map viewer. Available from: <http://webgis.npws.ie/npwsviewer/> [Accessed: 16 March 2020]

³⁰ The Heritage Council (2020) Map Viewer. Available from <http://www.heritagemaps.ie/> [Accessed: 16 March 2020]

³¹ Fáilte Ireland (2020). Available from: <https://www.discoverireland.ie/> [Accessed: 16 March 2020]

³² More to Monaghan (2020). Available from: <https://monaghantourism.com/> [Accessed: 16 March 2020]

³³ Sport Ireland (2020) Sport Ireland Trails. Available from: www.irishtrails.ie [Accessed: 16 March 2020]

³⁴ Monaghan County Council (2008) Landscape Character Assessment. Available from: <https://monaghan.ie/planning/landscape-character-assessment/> [Accessed: 16 March 2020]

land cover and historical land use. For example, blanket bog uplands are distinct landscape character types and are recognisable as such whether they occur in Monaghan or other counties.'

- *'Landscape Character Areas are the unique individual geographical areas in which landscape types occur. They share generic characteristics with other areas of the same type but also have their own particular identity.'*

4.1.5.2.2.1 Landscape Character Types

The LCTs relevant to the proposed scheme are identified in Table 4-6 along with a list of their key characteristics according to the County Monaghan Landscape Character Assessment. The location and extent of these are indicated on Figure 4.1, Volume 2 Part B of this Option Selection Report.

LCT	Key Characteristics
10 - Upland Drumlin Farmland	<i>'Elevated, rolling hills and drumlins with extensive long-range views across the wider landscape. Poor to moderate quality pastoral farmland with wetland grasses. Fields bounded by hedgerows and fences. Small tracts of commercial coniferous forestry. Pockets of peatland habitat and scrub present throughout pasture. Proliferation of minor roads and individual farms and dwellings.'</i>
7 - River Valley Farmland	<i>'Flat to undulating pastoral landscape. Rivers Finn, Blackwater and Cor are principal landscape elements. The landscape is permeated by minor roads, with few settlements. Winding minor roads edged with earthen banks affording restricted views.'</i>
2 - Drumlin Farmland	<i>'Low lying small to medium sized drumlins predominantly in a north to south orientation. A patchwork of predominantly medium sized fields defined typically by native hedgerows and used for pasture. Dispersed small to medium sized loughs. Extensive network of tertiary roads. Isolated and small clusters of farm and residential properties. Minor roads bounded occasionally by large estates, the boundary definition being cut limestone walling.'</i>
3 - Drumlin Foothills	<i>'Rising ground with small to medium sized drumlins predominantly in a north to south orientation. Mid to long ranging views. A patchwork of predominantly small sized well drained fields defined typically by native hedgerows and used for pasture. Patches of heath (<i>Calluna spp</i>) and gorse (<i>Ulex spp</i>). Isolated farm and residential properties.'</i>

Table 4-7: Summary of Landscape Character Types (LCTs) relevant to the proposed scheme

4.1.5.2.3 Landscape Character Areas

There are three relevant LCAs identified in County Monaghan Landscape Character Assessment. These are listed in Table 4-7 along with a summary of the key characteristics and a description of the condition and sensitivity from the County Monaghan Landscape Character Assessment.

LCA	Key Characteristics	Condition & Sensitivity
2 - Blackwater Valley & Drumlin Farmland	<i>'Flat marshy areas and river corridors including the flat marshy vale and floodplain of the River Blackwater. Relatively low-lying drumlin farmland given over to pastoral uses and maintained in good condition.'</i>	<i>'The landscape is in very good condition and contains highly attractive and well maintained villages. Views can be gained over the short or medium range which would suggest that this landscape could</i>

LCA	Key Characteristics	Condition & Sensitivity
	<p>Neatly cut hedgerow as field boundaries featuring frequent mature hedge trees of ash (<i>Fraxinus excelsior</i>) and Beech (<i>Fagus sylvatica</i>)</p> <p>Isolated clumps of deciduous woodland. Occasional loughs some of which contain Crannogs.</p> <p>Attractive and well maintained villages featuring limestone buildings. These include the villages of Emyvale, Tullyree and Glaslough.</p> <p>Stone walled boundaries present as remnants of former estates, demesnes and larger Georgian Dwellings. Significant demesnes or designed landscapes include Castle Leslie and the Castleshane Demesne.'</p>	<p>accommodate small scale changes however large scale or extensive development could be intrusive.</p> <p>From an ecological and indeed scenic standpoint, the Blackwater environs would be highly sensitive to change brought about by development.'</p>
5 - Monaghan Drumlin Uplands	<p>'Elevated landscape featuring drumlin hills and small to medium sized loughs. These drumlins are not so steep sided and they do not follow a particular strong alignment and as such, the pattern of glaciation is not very pronounced.</p> <p>Occasional rock outcrops on the eastern side near the townland of Annyalla.</p> <p>Occasional loughs and areas of marshland located between drumlin hills.</p> <p>Landuses mostly given over to pastoral farming. Hedgerows featuring native species define the field boundaries, some of these are cut and some are not cut or managed. Hedge trees are fairly frequent.</p> <p>Long ranging views to the south and the north can be gained at particular points along the highest elevations of this ridgeline. The views extend for many kilometres.'</p>	<p>'Most of this landscape is in good condition. The summit or highest point along the ridgeline is likely to be highly sensitive to development because it is visually exposed for many kilometres.</p> <p>In general, this landscape would not be regarded as highly scenic and hence, the capacity to accommodate development without undue compromise to the farmed landscape pattern is good.'</p>
6 - Mullyash Uplands	<p>'A variable topography comprising a flat plateau area in the western part of this LCA which extends eastward towards the drumlin foothills leading to the summit of Mullyash Mountain.</p> <p>Drumlins in this LCA are steep sided and are strongly aligned in a north west to south east orientation thereby reflecting the direction of ice flow during the ice ages.</p> <p>Loughs and watercourses are almost absent from this landscape apart from a larger lough featuring a crannog near Drumleck.</p> <p>Landscape pattern is strongly defined as small to medium scale pastoral fields bounded by cut hedgerows with occasional mature trees. This pattern is obliterated and replaced with solid coniferous forest at Mullyash</p> <p>Large tracts of commercial coniferous forestry are present and reach up to the summit of Mullyash Mountain.</p> <p>Long range views towards this Mountain can be gained from many locations.</p> <p>Views of the Mourne Mountains can be gained from the eastern side of Mullyash Mountain.'</p>	<p>'The landscape is in good condition and exhibits an intact pastoral field pattern. The upland flat areas together with the summit of Mullyash Mountain are highly sensitive to development owing to both their scenic quality and visual exposure.'</p>

Table 4-8: Summary of Landscape Character Areas (LCAs) relevant to the proposed scheme

A number of policies are listed within the development plan relating to Heritage, Conservation and Landscape. The following are relevant to the proposed scheme:

- 'HLP 8 - To ensure the preservation of the County's landscapes, by having regard to the character, value and sensitivity of the landscape as identified in the County Monaghan Landscape Character Assessment (2008) or any subsequent versions when considering planning applications.'
- 'HLP 9 - To protect the landscapes and natural environments of the County by ensuring that any new developments in designated sensitive rural landscapes do not detrimentally impact on the character, integrity, distinctiveness or scenic value of the area. Any development which could unduly impact upon such landscapes shall be resisted.'

- *'HLP 10 - To co-operate with adjoining local authorities north and south of the border, to ensure that the natural environment is maintained in a sustainable manner and to encourage a collaborative and consistent policy approach with adjoining areas on matters of environmental and landscape protection and to identify threats to the integrity of such sites through a transboundary approach.'*
- *'HLP 11- To contribute towards the protection of County and local level landscape designations from incompatible developments. Proposals for development that have the potential to significantly adversely impact upon these designations shall be accompanied by an assessment of the potential landscape and visual impacts of the proposed development. This shall demonstrate that landscape impacts have been anticipated and avoided to a level consistent with the sensitivity of the landscape and the nature of the designation.'*
- *'HLP 12 - Support, as appropriate, any relevant recommendations contained in the National Landscape Strategy for Ireland.'*

4.1.5.2.4 Sensitivity Assessment - Landscape Character Areas

The first step in the landscape assessment process was to judge the likely sensitivity of each LCA to the proposed scheme. In accordance with GLVIA guidelines²⁵, Landscape Sensitivity was rated on a five point scale ranging from Negligible, Low, Medium, High or Very High.

Although possessing a variety of landform and character, the landscape of County Monaghan is largely defined by the rounded, undulating drumlin landform and small enclosed fields of the agricultural land use that pervades here. This differs from some of the more open agricultural landscapes in other parts of the country and lends the landscape an enclosed character of intimate scale.

Following a review of the County Monaghan Landscape Character Assessment²⁸ and an on-site verification of this assessment it has been determined that the LCAs identified are appropriate to the scale of this project and should be adopted for use in this assessment. Although there are some localised landscapes areas of varying sensitivity within each LCA, overall sensitivity judgements for each LCA have been made for this stage of assessment. The Landscape Sensitivity assessments for the LCAs are described in Table 4-8.

LCA No.	LCA Name	Assessment of LCA Sensitivity	Overall LCA Sensitivity
6	Mullyash Uplands	A relatively small proportion of the Mullyash Uplands LCA occurs within the southern extents of the study area and is comprised of predominantly the Upland Drumlin Farmland (LCT). This is a pleasant and relatively tranquil rural area of typical agricultural land use and settlement patterns. As described in the landscape character assessment it is in <i>"good condition and exhibits an intact pastoral field pattern"</i> . Landscape value in this LCA relates predominantly to agricultural productivity and the substance of rural livelihoods, rather than distinctive scenic value or a sense of the naturalistic.	Medium
5	Monaghan Drumlin Uplands	Monaghan Drumlin Uplands LCA is comprised of a combination of Upland Drumlin Farmland (LCT), Drumlin Foothills (LCT), the urban area of Monaghan and a tiny portion of River Valley Farmland (LCT) in the south-eastern extents. This is a pleasant and relatively tranquil rural area of typical agricultural land use and settlement patterns. As described in the landscape character assessment <i>"Most of this landscape is in good condition"</i> , however, <i>"In general, this landscape would not be regarded as highly scenic and hence, the capacity to accommodate development without undue compromise to the farmed landscape pattern is good"</i> . Landscape value in this LCA relates predominantly to agricultural productivity and the substance of rural livelihoods, rather than distinctive scenic value or a sense of the naturalistic.	Medium-Low
2	Blackwater Valley & Drumlin Farmland	Blackwater Valley & Drumlin Farmland LCA occupies the largest proportion of the study area and is largely formed of Drumlin Farmland (LCT) with smaller areas of River Valley Farmland (LCT) at the southern and northern extents. This is a pleasant and relatively tranquil rural area of typical agricultural land use and settlement patterns. As described in the landscape character assessment it is in <i>"very good condition and contains highly attractive and well</i>	Medium

LCA No.	LCA Name	Assessment of LCA Sensitivity	Overall LCA Sensitivity
		<p><i>maintained villages". Furthermore "From an ecological and indeed scenic standpoint, the Blackwater environs would be highly sensitive to change brought about by development".</i></p> <p>Outside of the Blackwater corridor landscape value in this LCA relates predominantly to agricultural productivity and the substance of rural livelihoods, rather than distinctive scenic value or a sense of the naturalistic.</p>	

Table 4-9: Summary of Assessment of Landscape Character Area Sensitivity

4.1.5.3 Landscape Elements

Within the broader LCA structure there are finer grained additional discrete and distinct landscape features / areas. These will be referred to herein as 'landscape elements'. These landscape elements have their own unique localised sensitivities, but also contribute to landscape character on a broader scale.

A number of landscape elements occur have been identified in the MCDP²⁷ which occur within the study area.

4.1.5.3.1 Areas of Amenity Value

The MCDP²⁷ identifies two types of amenity areas; Areas of Primary Amenity Value and; Areas of Secondary Amenity Value. Amenity areas comprise of both; linear features, such as river valleys and canal corridors; and spatial areas such as woodlands and lake environments. The relevant the Areas of Secondary Amenity Value are indicated in Figure 4.2, Volume 2 Part B of this Option Selection Report and are:

- 'SA 1 – Emy Lough and Environs' (Area);
- 'SA 2 – Blackwater River Valley' (Linear);
- 'SA 3 – Mountain Water River Valley' (Linear);
- 'SA 5 – Ulster Canal and Environs' (Linear);
- 'SA 6 – Rossmore Forest Park and Environs' (Area); and
- 'SA 7 – Castleshane Woods and Environs' (Area).

The Areas of Secondary Amenity Value indicate a localised increased landscape sensitivity, additionally people in publicly accessible areas within these Areas of Secondary Amenity Value will likely have heightened sensitivity to visual change.

The MCDP²⁷ contains one policy relating to Areas of Secondary Amenity Value:

- 'SAP 1 - To limit development in Areas of Secondary Amenity Value and to only permit compatible amenity developments where they do not unduly impact on visual amenity.'

4.1.5.3.2 Designed Landscapes

All designed landscapes and historic demesnes are considered to be sensitive landscapes within the extents of their boundaries and simultaneously as features which contribute to the landscape character of a wider landscape. There are many historic demesnes in County Monaghan. The MCDP²⁷ contains a list of 10 important historic houses/demesnes within the County. Designed Landscapes and Historic Gardens are indicated on Figure 4.2. Those that occur with the study area are:

- 'Castleshane Demesne, Castleshane, Monaghan';

- *'Rossmore Park, Monaghan';*
- *'Bessmount, Monaghan'; and*
- *'Ronahans, Liscarney'.*

The MCDP contains two policies relating to Designed Landscapes:

- *'DLP1 - To ensure that any new development will not adversely affect the site, setting or views to and from historic houses, gardens and designed landscapes.'*
- *'DLP2 - To require that any proposals for new development in the vicinity of historic houses or demesnes landscapes are accompanied by an evaluation of the impact of the development on the landscape, designed views and vistas to / from such a site.'*

4.1.5.3.3 Designated Ecological Landscapes

Landscapes with ecologically related designations include Special Areas of Conservation, Natural Heritage Areas and Proposed Natural Heritage Areas, and Special Protection Areas (please see Chapter 5 Biodiversity for their ecological assessment). Emy Lough Proposed Natural Heritage Area (pNHA) - Site Code: 000558 occurs within the study area. This pNHA is designated because of its ecological value and is not formal landscape designations however it does have a landscape value in addition to its ecological value. The locations and extents of these are indicated on Figure 5.1-5.3, Volume 2 Part B of this Option Selection Report, and is described National Parks and Wildlife Service²⁹ as follows:

'This mesotrophic lake lies in an inter-drumlin hollow in the Blackwater catchment area, only 1km east of Emyvale. The lough is one of the largest lakes in the area with surrounding sections of Alder and Willow species. It is an important over-wintering sites for birds.'

4.1.5.3.4 Area Under Strong Urban Influence

The area surrounding Monaghan is identified in the MCDP²⁷ as an Area Under Strong Urban Influence. The approximate extents of this area are indicated in Figure 4.1, Volume 2 Part B of this Option Selection Report. The core of the area will be most influenced (decreased sensitivity to development) while the urban influence will decrease towards the edge (increasing landscape sensitivity).

4.1.5.3.5 Amenity Lakes and Rivers

In the MCDP there are a seven of key amenity lake areas identified within the County. Those which occur within the study area are Indicated on Figure 4.2, Volume 2 Part B of this Option Selection Report.

4.1.5.3.6 Woodland and Trees

All woodland, trees and vegetation contribute to the character of a landscape and can provide localised visual amenity. Hedgerow networks form field patterns that also contribute to the character of the landscape. The MCDP²⁷ contains a list of eight groups of Trees of Special Amenity Value within the county. Those that occur with the study area are indicated on Figure 4.2, Volume 2 Part B of this Option Selection Report and are identified as:

- *'Blackwater Vale, Monaghan';*
- *'Knockconan';*
- *'Tullybuck, Clontibret'; and*
- *'Legacurry'.*

The MCDP²⁷ contains two policies relating to Trees and Woodlands:

- *'TWP1 – To minimise loss of tree(s) and hedgerow associated with any development proposal and encourage the retention of existing mature trees, hedgerows and woodlands in new developments. Where removal is unavoidable consideration should be given to transplanting trees and/or providing compensatory planting on the site.'*
- *'TWP2 – To preserve trees and/or groups of trees that have a significant amenity value, and to designate Tree Preservation Orders where appropriate.'*

4.1.5.3.7 Landscape Protection / Conservation Areas

The MCDP contains Village Maps for 10 settlements in County Monaghan, but only the Village Map for Emyvale has landscape receptors with the potential to be impacted, these being the areas indicated on the Emyvale Village Map as 'Landscape Protection / Conservation' which appear to relate to modest areas of vegetation or landscape features that serve local amenity within the village itself. There are three such areas shown on the Emyvale Village Map. These are indicated on Figure 4.2, Volume 2 Part B of this Option Selection Report.

4.1.5.3.8 Sensitivity Assessment - Landscape Elements

Only some of the landscape elements identified in Section 4.3 have the potential to be impacted. These will be assessed for likely sensitivity and importance in **Table 4-10**. The sensitivity of linear landscape elements may vary in different locations across the length of the element. The likely sensitivity rating given are based on the overall likely sensitivity.

Landscape Element	Description of Sensitive Landscape Element	Likely Sensitivity
Trees of Special Amenity Value at Tullybuck	Row of mature trees visible from N2 and area near St Mary's Chapel.	Medium
Castleshane Demesne (Designed Landscape highlighted in the MCDP)	Large intact demesne containing Castleshane Woods (SA7) which includes some areas of broadleaved species near house and along perimeter but is primarily composed of less valuable commercial conifer plantation.	Medium-High
Demesne at St. Macartan College (not highlighted in the MCDP)	Immediate area characterised by adjoining existing N2.	Medium
Demesne at Corlat (not highlighted in the MCDP)	Immediate area characterised by adjoining existing N2.	Medium
SA5 – Ulster Canal and Environs	Linear area along canal usually adjoined by mature vegetation creating an enclosed area. Increased tranquillity when passing through rural areas away from urban infrastructure.	Medium
Trees of Special Amenity Value at Legacurry	Row of mature trees visible along western side of from N2.	Medium
SA2 – Blackwater River Valley (Southern River Blackwater Corridor)	Linear area strongly contained and characterised by the river corridor, which is defined by flanked by a thin ribbon of riparian vegetation.	Medium
St. Macartan College Demesne (not highlighted in the MCDP)	Immediate area characterised by adjoining existing N2.	Medium
Demesne at Tullygony	Currently agricultural fields and multiple industrial buildings with Ulster Canal passing through (SA5).	Low
Demesne at Wallace's Corn and Flax Mill	Contains a well maintained mill situated on the Blackwater River (SA2) with high tranquillity and mature vegetation along road the adjoins river.	Medium-High
Anketell Grove House demesne (not highlighted in the MCDP)	Area of historic demesne containing one woodland block and agricultural fields interspersed with parkland trees.	Low

Landscape Element	Description of Sensitive Landscape Element	Likely Sensitivity
Derrynashallog demesne (not highlighted in the MCDP)	Area of historic demesne retains several woodland blocks with Mountain Water River (SA3) passing through.	Medium
Demesne at Pullis	Some integrity in south-east near Fort Johnston where the SA3 Mountain Water River Valley passes through otherwise apparently ordinary agricultural fields in remaining areas.	Medium
SA3 - Mountain Water River Valley	Linear area characterised by the river and thin buffer of riparian vegetation on river banks.	Medium
Landscape Protection / Conservation areas	Vegetated buffer area to the west and south of Mill Race residential housing estate on the outskirts of Emyvale.	Medium
Dungillick House demesne (not highlighted in the MCDP)	Area contains remnants of avenue of trees and some woodland adjoining house. Scrub in the southern portions but mainly agricultural.	Low
Emy Lough and Environs (SA 1 and pNHA)	Tranquil and picturesque enclosed lake setting.	High
Emy House Demesne	Former house and mill adjoining established dense riparian and bog vegetation on banks of watercourse on the western and northern flanks (SA2).	Medium
SA2 – Blackwater River Valley (northern stream network)	Multiple linear areas pertaining to small watercourses. Generally farmed to the banks with only narrow buffer of riparian vegetation.	Medium
Fort Singleton Demesne (not highlighted in the MCDP)	Notable riparian vegetation on banks and slopes of the Mountain Water River Valley (SA3).	Medium
Demesne at Gorticleave (not highlighted in the MCDP)	Undulating topography with blocks of mature woodland with degree of tranquillity and adjoining SA2 – Blackwater River Valley (northern stream network).	Medium
Designed gardens at Errigal Trough	Historic walled gardens adjacent to historic settlement with church.	High

Table 4-10: Assessment of likely sensitivity of Landscape Elements

4.1.5.4 Existing Environment - Visual Context

4.1.5.4.1 Residential Receptors

Hotels, guesthouses, care homes and all residential dwellings are considered to be sensitive receptors, however the main focus at this route selection stage is substantial settlements on the basis of population intensity and because they are most likely to contain the range of residential receptors described above.

4.1.5.4.2 Scenic Routes/Views

Appendix 3 of the MCDP lists 24 Views from Scenic Routes. Those within the study are indicated on Figure 4.2, Volume 2 Part B of this Option Selection Report. The following have the potential to be impacted by the proposed scheme:

- ‘SV11 - View northwards at Tullybuck’;
- ‘SV9 - View of St. Macartan’s Cathedral Monaghan from Berry Brae’;
- ‘SV10 - View from Castleshane Brae’; and
- ‘SV1 - Scenic views along Emy Lough’.

The MCDP²⁷ contains two policies relating to Scenic Routes/Views:

- ‘SRP1 - To prohibit development that would disrupt or adversely affect a view from/along any scenic route as identified in Appendix 5.’
- ‘SRP2 - To protect the scenic quality of lakes by prohibiting development located between a public road and a lake where the development would interrupt a view of the lake or adversely affect its setting or its wildlife habitat. Development may be permitted between a public road and the lakeshore where the development is screened from the lake by existing topography or vegetation.’
- ‘SRP3 - An exception may be made for short term let tourist accommodation or recreational development where a specific need has been identified. Any such proposal should be sensitively sited and designed. Development on high exposed sites overlooking lakes or waterways shall be resisted.’

In addition to the scenic designations noted in the MCDP, there is the locally signposted ‘Bragan Drive’ a scenic route that follows a local road in the Mountain Water River Valley to the south-west of the settlement of Emyvale that was identified during field work.

4.1.5.4.3 Recreational Trails

People utilising recreational trails generally have a high sensitivity to visual change in their surrounding environment as views of the surrounding landscape are integral to their experience. The following recreational trails occur within the study area and are indicated on Figure 4.2, Volume 2 Part B of this Option Selection Report:

- National Waymarked Trail: Monaghan Way;
- Ulster Canal towpath;
- Locally signposted walking trails in the vicinity of Emy Lough;
- On-Road Cycling Trail: Sliabh Beagh - Route 1 McKenna Trail; and
- Sustrans National Cycle Route 91.

4.1.5.4.4 Sensitivity Assessment - Visual Receptors

The likely sensitivity for all of the visual receptors identified in Section 4.4 are presented in Table 4.9. Residents at home are considered to be highly susceptible to visual change, but the nature and value of such views can vary widely depending on viewing context, particularly within and around settlements. The sensitivity of receptors on linear features such as scenic routes and recreational trails can also vary according to the quality and value of the landscape through which they are passing at the time when views of the proposed scheme are likely to be afforded. Designated Scenic Route / Views represent a consensus (through the Development Plan process) on visual amenity within a county. The context and scenic values of such views can vary widely (confined and naturalistic or vast and anthropogenic) and can also change over time and these factors are taken into account in the sensitivity judgements in Table 4-10.

Receptor Type	Name	Description of Visual Receptor Sensitivity	Likely Sensitivity
Settlement	Monaghan	Represents a high concentration of residential visual receptors, but within the context of a busy settlement where transport infrastructure and general built development is already characteristic feature of views.	Medium
Settlement	Emyvale	Represents a concentration of residential visual receptors, but within the context of a settlement where roads and general built development is already characteristic feature of views.	Medium

Receptor Type	Name	Description of Visual Receptor Sensitivity	Likely Sensitivity
Scenic Route / View	SV11 - View northwards at Tullybuck	Unclear if this designation applies to the former N2 or the currently N2. Old N2 and current alignment of N2 are parallel and form a transport corridor with increased intensity of infrastructure in this area resulting in reduced sensitivity. (Likely that designation has not been updated to account for the changes made by the new road.)	Medium
Scenic Route / View	SV9 - View of St. Macartan's Cathedral Monaghan from Berry Brae	Busy regional road winding through drumlins only intermittent glimpse view to north towards Macartan's Cathedral is afforded. Nature of view not sensitive to the proposed scheme.	Medium
Scenic Route / View	SV10 - View from Castleshane Brae	Short to medium distance views from busy N2 of pastoral drumlins and forestry from within an historic demesne.	Medium
Scenic Route / View	SV1 - Scenic views along Emy Lough	Pleasant views of lake enclosed by drumlins. Tranquil setting.	High
Scenic Route	Bragan Drive	Drummully Rd between local road L11601 (Main St, Emyvale) and L1160 within the SA3 - Mountain Water River Valley Area of Secondary Amenity Value adjacent to the watercourse.	High
Recreational Trail	National Waymarked Trail: Monaghan Way	Linear walking route starting/ending at Clontibret.	Medium-High
Recreational Trail	Ulster Canal towpath	Canals and towpaths are often heavily enclosed by vegetative screening offering only intermittent views but offer high recreational amenity value. This canal corridor is designated as an Area of Secondary Amenity Value (SA5).	Medium-High
Recreational Trail	Locally signposted walking trails in the vicinity of Emy Lough	Short to medium distance naturalistic views in a tranquil setting.	High
Recreational Trail	Sliabh Beagh - Route 1 McKenna (on-road cycling) Trail	Country lanes can be tranquil but less so on larger roads.	Medium-High
Recreational Trail	Sustrans National Cycle Route 91	Long distance (328.1km), mainly on-road between Portadown and Tynan. Country lanes can be tranquil but less so on larger roads.	Medium

Table 4-11: Assessment of Visual Receptor Sensitivity

4.2 Artificial Constraints

4.2.1 Land Use & Planning

4.2.1.1 National Planning Framework – Project Ireland 2040

The National Planning Framework (NPF) is the Government's strategic framework to guide development and investment to enhance the wellbeing and quality of life of Irish people. The NPF, together with the National Development Plan (NDP) 2018-2027, was adopted in May 2018 and comprises Project Ireland 2040 - one vision for one country. The Plan's ambition is to create a single vision and a shared set of goals for each community to shape the growth and development of Ireland by providing a framework up to the year 2040. These goals are expressed as National Strategic Outcomes (NSO), shared benefits which the plan will deliver if implemented according to the objectives of the framework.

The NPF 2040 identifies and outlines ten National Strategic Outcomes. The following NSOs, which are particularly relevant to the N2 Clontibret to Border Road Scheme are noted below:

National Strategic Outcome 2 - Enhanced Regional Accessibility:

As per Section 1.3 of the NPF 2040, the goal of this outcome 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 to Galway as well as access to the North-West is essential.'*

In the introductory to the outcome itself, the NPF states that:

'Better accessibility between the four cities and to the Northern and Western region will enable unrealised potential to be activated as well as better preparing for potential impacts from Brexit.'

It is noted that the N2 /A5, which the proposed N2 Clontibret to Border Road Scheme forms part of, is a key strategic route providing accessibility between Dublin and the North-West.

The National Strategic Outcome 2 objectives are structured under the three headings of *'Inter-Urban Roads', 'Accessibility to the North-West' and 'Public Transport'*. The objectives under these headings, which are of particular relevance to the proposed Scheme, are provided below:

- **Inter-Urban Roads**
 - *'Maintaining the strategic capacity and safety of the national roads network including planning for future capacity enhancements'*
 - *'Improving average journey times targeting an average inter-urban speed of 90kph'*
- **Accessibility to the North-West**
 - *'Upgrading access to the North-West border area, utilising existing routes (N2/N14/A5)';*
- **Public Transport**
 - *'To strengthen public transport connectivity between cities and large growth towns in Ireland and Northern Ireland with improved services and reliable journey times'*

With reference to the above, it is considered that the proposed Scheme objectives align with these NPF objectives, where the proposed Scheme seeks to improve the connectivity and the transport links between the Greater Dublin Area and the North West Region (See Integration Scheme Objective), improve road safety on the route (See Safety Scheme Objective), and support and improve public transport by improving journey times and reliability (See Accessibility & Social inclusion Scheme Objective).

The importance of enhanced accessibility to the North-West, via. key routes, in collaboration with Northern Ireland is further outlined in the NPF Policy Objectives:

- **National Policy Objective 2c** - *Accessibility from the north-west of Ireland and between centres of scale separate from Dublin will be significantly improved, focused on cities and larger regionally distributed centres and on key east-west and north-south routes.*

'North-South Routes' in this regard is considered to include the N2/A5 Route.

- **National Policy objective 43** – *'Work with the relevant Departments in Northern Ireland for mutual advantage in areas such as spatial planning, economic development and promotion, co-ordination of social and physical infrastructure provision and environmental protection and management.*
- **National Policy objective 45** – *'In co-operation with relevant Departments in Northern Ireland, support and promote the development of the North West City Region as interlinked areas of strategic importance in the North-West of Ireland, through collaborative structures and a joined-up approach to spatial planning'.*

- **National Policy Objective 46** – *'In co-operation with relevant Departments in Northern Ireland, enhanced transport connectivity between Ireland and Northern Ireland, to include cross-border road and rail, cycling and walking routes, as well as blueways, greenways and peatways.'*

National Strategic Outcome 3 – Strengthened Rural Economics and Communities:

The goal of this outcome is to support the sustainable development of rural areas by encouraging growth and arresting decline in areas that have experienced low population growths or decline in recent decades.

National Strategic Outcome 3 is structured under the heading of 'Rural Development'. The following objective is of particular relevance to the proposed scheme;

- *'Invest maintaining regional and local roads and **strategic road improvement projects** in rural areas to ensure access to critical services such as education, healthcare and employment.'*

With reference to the above, it is considered that the proposed Scheme objectives align with this NPF objective, where the proposed Scheme seeks to provide a strategic road improvement in a predominately rural Study Area, and aims to reduce social exclusion by enhancing accessibility to services from designated rural zones within the Study Area (See Accessibility & Social Inclusion Scheme Objective)

4.2.1.2 Project Ireland National Development Plan 2018-2027

As stated above, the NDP 2018 – 2027, sets out ten Strategic Investment Priorities that will underpin the implementation of the NPF 2040 over a ten-year period and support the National Strategic Outcomes of the NPF 2040.

The National Road Network forms one of the ten Strategic investment Priorities.

As per Section 4.3 (Investing in the Border Region), the NDP *'represents a particular step change for the northern part of the island of Ireland, including the border counties and the North-West'*.

'As set out in the NPF, the Government wants to work with Northern Ireland authorities across three main dimensions:

- *Working together for economic advantage;*
- *Co-ordination of infrastructure investment; and*
- *Managing our shared environment.*

Working together, we can realise the full potential of the North-West, the Central Border Region, and the Dublin-Belfast Corridor.'

Section 4.3 further outlines that the NDP *'provides for investment to support the ambition for development of the border region'* and specifically references; ***'the N2/A5 road, serving Meath, Monaghan and Donegal'***.

Linked with NPF National Strategic Outcome 2 (Enhanced Regional Accessibility), and the Strategic Investment Priorities 2018 – 2027 (Regional Roads Network and Accessibility to the North-West), the NDP states in the context of linkages between Dublin and the North-West, which the N2 forms part of;

'Under the National Development Plan, the objective is to complete those linkages so that every region and all major urban areas, particularly those in the North-West, which have been comparatively neglected until recently, are linked to Dublin by a high-quality road network'.

To this end, the N2 Clontibret to Border Road Scheme is specifically identified for prioritisation as per the following excerpt from the NDP:

'The following sections of the national road network will be progressed through pre-appraisal and early planning during 2018 to prioritise projects which are proceeding to construction in the National Development Plan.'

- *N2 Clontibret to the Border*
- *N2 Ardee to south of Castleblayney*

In relation to the A5 route, between the Northern Ireland Border and Derry, The NDP states: *'A commitment has been made to provide support and funding for the first part of the A5 road project. The Government is committed to participation in the further development of the A5 and will continue to engage with the Northern Ireland executive in relation to this project.'* It is also noted that the *'A5 Road Development'* is specifically included in the NDPs Strategic Investment Priorities 2018 – 2027 (Accessibility to the North-West).

In conclusion, it is considered that the proposed N2 Clontibret to Border Road Scheme and its objectives align with the NPF 2040 and the NDP 2018 – 2027.

4.2.1.3 PLUTO 2040

As an update and replacement of the Department of Transport, Tourism and Sport's (DTTaS) *'Strategic Investment Framework for Land Transport'* (SIFLT), published in 2015, DTTaS are currently preparing the *Planning Land Use and Transport – Outlook 2040*, known as Pluto 2040. It is expected that PLUTO 2040 will be published in 2020.

PLUTO 2040 is to align with the NPF 2040 and the NDP 2018 – 2027, as DTTAS's response to Project Ireland 2040. Specifically, it will focus on how to ensure the realisation of the National Strategic Outcomes as outlined in the NPF, whilst taking account of the investment plans in the NDP. The development of Pluto 2040 is overseen by a steering group of members from DTTaS, Department of Housing, Planning and Local Government (DHPLG), TII and the National Transport Authority (NTA).

PLUTO 2040 is a long-term framework to support the prioritisation of transport interventions and investment to support the delivery of Project Ireland 2040. Pluto will not identify specific projects or schemes. As part of the development of PLUTO 2040, challenges and constraints on the transport network were identified, with a list of key intervention priorities currently being formalised. As part of the process, PLUTO 2040 has identified a number of key goals. The draft Pluto Goals are listed below:

- A high-level of service on a safe, accessible, reliable and efficient network
- A strong and balanced economy
- A clean, low-carbon and environmentally sustainable transport system
- Supporting successful places and vibrant communities.

As stated above, at the time of writing, PLUTO 2040 is yet to be formally published. Based on the outlined draft information, and the draft goals above, it is considered that the proposed scheme objectives will align and support PLUTO 2040. In terms of its draft goals, the proposed Scheme seeks to provide a high-quality infrastructural improvement to the existing network, which will improve accessibility, safety and reliability in the Study Area. In addition, the proposed Scheme seeks to support the economy, communities, sustainable low-carbon public transport, with the minimisation of environmental impacts. National Planning Framework – Project Ireland 2040.

4.2.1.4 Regional Assemblies

Regional assemblies were established from the Local Government Reform Act 2014 with the function to co-ordinate, promote or support the general welfare, strategic planning and sustainable development requirements of the region and promote effectiveness in local government and public services. There are three Regional Assemblies; the Southern Regional Assembly, the Eastern and Midland Regional Assembly and the Northern and Western Assembly.

County Monaghan is located in the North and Western Regional Assembly. The common thread between the Regional Assemblies is that they support the implementation of the NPF and the relevant economic policies and objectives of Government. Each adopted Regional Spatial and Economic Strategy (RSES) represents the regional tier for planning policy and provides a vision; a spatial plan and investment framework to shape future

development of each region in collaboration with their stakeholders. These RSESs replace the previous Regional Planning Guidelines for the Greater Dublin Area 2010-2022.

The Northern and Western Region adopted its RSES in January 2020. The vision is: *“To play a leading role in the transformation of this region into a vibrant, connected, natural, inclusive and smart place to work and live.”* There are Regional Policy Objectives (RPOs) as goals to be followed throughout the planning process in the region; four RPOs are aimed at national roads and projects highlighted to integrate with the targeted development of major urban centres in the region.

Specifically, RPO 6.7 highlights the N2 project:

“In accordance with National Development Plan investment commitments to progress the following schemes through pre-appraisal and early planning, the following projects shall be progressed through pre-appraisal and early planning in the short term and shall thereafter proceed to construction and be delivered to an appropriate level of service within the lifetime of the RSES:

- *N2 Clontibret to the Border connecting to the A5.*
- *N2 Ardee to south of Castleblayney...”*

(RSES for the Northern and Western Regional Assembly, 2020, p.177).

The Northern and Western RSES identifies the Dublin – Belfast Economic Corridor, the fact it traverses with County Louth in the Eastern and Midlands Regional Assembly concludes:

“It is the largest economic agglomeration on the island of Ireland and is identified in their RSES as a regional growth enabler.” (RSES for the Northern and Western Regional Assembly, 2020, p.230).

The Northern and Western RSES are keen on maximising the potential growth of the Dublin – Belfast Economic Corridor and its significance on international movement as shown in the inclusion of the Regional Policy Objectives in both RSESs. The proposed project will fulfil these regional planning policies.

4.2.1.5 Monaghan County Development Plan 2019-2025

The recently adopted Monaghan County Development Plan provides an overall strategy for the proper planning and sustainable development of County Monaghan over the timescale of the Plan. The vision relates to the settlement hierarchy of the county and that Monaghan town is designated as the principal town under tier 1.

“In the absence of substantial investment in critical infrastructure, partly due to the economic downturn, Monaghan has not yet achieved its potential in terms of economic development and population growth.” (Monaghan County Development Plan, 2019, p.28)

Within the Transport and Infrastructure section of the Monaghan County Development Plan, the N2 national road is identified as of great importance to strengthen the EU's global competitiveness:

“The N2 is part of the Trans-European transport Network (TEN-T). This is a network which comprises roads, railway lines, inland waterways, inland and maritime ports, airports and rail-road terminals throughout the 28 EU Member States. This characteristic is a key factor for the network's efficient, safe and secure operation, using seamless transport chains for passengers and freight.

The N2 is categorised as being part of the “comprehensive network”: a multi-modal network of relatively high density which provides all European regions (including peripheral regions) with an accessibility that supports their further economic, social and territorial development as well as the mobility of their citizens”. (Monaghan County Development Plan, 2019, p.146)

The N2 is of such regional and national importance, with the current political environment of the United Kingdom leaving the European Union, Monaghan County Council future proofed their Development Plan by including a policy to manage this:

“BRE 01 - To facilitate necessary infrastructure as required to manage the consequences of the United Kingdom leaving the European Union in order to ensure strong links along the border are maintained”. (Monaghan County Development Plan, 2019, p.140)

Table 7.2 for the Strategic National Road Proposals for the County specifically lists both the N2/A5 Clontibret to Northern Ireland Border route and the N2 Ardee – Castleblayney Road Upgrade route.

The National Roads Policies from Monaghan County Development Plan that are applicable are:

“NRP 1 - To protect the traffic carrying capacity of national roads, the level of service they deliver and the period over which they continue to perform efficiently, by avoiding the creation of new access points or the generation of increased traffic from existing accesses onto the N-2, N-53, N-54, and N-12 outside the 60 km/h speed limit, in accordance with the DoECLG’s publication Spatial Planning and National Roads - Guidelines for Planning Authorities (2012)”.

NRP 5 - To seek to progress and ensure the upgrade of the N2 in co-operation with Transport Infrastructure Ireland and the relevant adjoining local authorities”.

It is considered that the proposed N2 Clontibret to Border Road Scheme and the N2 Ardee to Castleblayney Road Scheme aligns with the Monaghan County Development Plan and will strengthen the EU's global competitiveness.

4.2.1.6 Variation No.1 of Monaghan County Development Plan 2019-2025

At the time of the decision to upgrade two stretches of the N2 road, the preparation of the Monaghan County Development Plan for the period 2019 to 2025 was at an advanced stage, whereas the selection of the preferred routes for the Clontibret to Border and the Ardee and Castleblayney N2 schemes were at initial stages. Consequently, Policy NRP7 was adopted as a Variation to the County Development Plan 2019-2025 in January 2020. The policy wording for NRP7 was as follows:

“Policy NRP 7: To protect the selected route of the N2 upgrade road scheme between Ardee and Castleblayney and the selected route between Clontibret and the border with Northern Ireland, and to prohibit development that could prejudice their future delivery.”

The Variation applies to Section 7.8.1 of the CDP. This Section sets out National Roads Policy in relation to the N2 National Route and while Policy NRP5 (above) seeks to progress and ensure the upgrade of the N2 in co-operation with Transport Infrastructure Ireland and the relevant adjoining local authorities. The inclusion of Policy NRP 7 by way of variation, is proposed in addition to this general policy.

4.2.2 Engineering – Topography & Landscape

The N2 Clontibret to Border Road Scheme Study Area spans across north County Monaghan. In the case of the Southern extents of Study Area, the settlements of Corcaghan and the significant natural boundaries of a number of loughs in the townlands of Corcaghan, Greagh and Blackraw restricted the boundary in a southern direction, whilst also recognising the likely physical extremities of a potential option in that direction. In the northern extents of the Study Area, this is restricted by the jurisdiction boundary of Northern Ireland. The western boundary of the Study Area is restricted by the natural barriers of a series of loughs (including Ballagh, Killnaclay, Annalyty, Mullaghmore and Killy), and the settlements of Three Mile House, Bellanode (Ballinode) and Carrickroe restricted the boundary in a western direction. In addition, the high topography of the area east of Slieve Beagh and around the environs of Carrickroe created a significant natural barrier to the boundary in this area. The eastern boundary of the Study Area is restricted by the relatively large settlement of Glaslough, along with the jurisdiction boundary

of Northern Ireland. The settlement of Monaghan Town and its urban environs were excluded from the Study Area as its centre and environs are relatively densely populated and create a significant built-environment barrier.

The Study Area covers a predominantly rural setting with a number of small village settlements contained within it.

Using the Landscape Character Areas (LCAs)³⁵ shown on Figure 4-1 contained in Volume 2 Part B the Study Area has been divided into sections for the purpose of the topographical assessment.

To the south, the Study Area commences within the Monaghan LCA defined as the “Monaghan Drumlin Uplands”. The area is dominated throughout by elevated drumlin features together with small to medium sized loughs which are located generally within the southwestern area of the Study Area. These drumlins are not steep sided, but they do not follow a particular strong alignment and as such, the pattern of glaciation is not very pronounced. The valley to summit of the individual drumlin features vary but in general are approximately 50m in height. This section of the LCA within the Study Area raises from the south at approximately 130m OD to the centre of section at approximately to 190m OD. From here, as the LCA approaches Monaghan Town and edge of the Smithborough Hill LCA and Backwater Valley and Drumlin Farmland, the general topography lowers to approximately 100m OD.

The southeast corner of the Study Area commences within the “Mullyash Uplands” LCA which contains the urban environment of Clontibret. As this section is at the extremity of the LCA its features are generally transitioning to the features of the Monaghan Drumlin Uplands to its north west and the Blackwater Valley and Drumlin Farmland to its north east. In general, this section of the Study Area is dominated by drumlin features similar to those described within the Monaghan Drumlin Uplands. In general, the levels are in the region of 100m OD raising to 130m OD the northwest and lowering to 70m OD in the northeast.

The east and north of the Study Area are contained within the “Blackwater Valley and Drumlin Farmland” LCA. This area while still dominated by drumlins, they have relatively low-lying features compared to the neighbouring Monaghan Drumlin Uplands. The valley to summit of the individual drumlin features vary but in general are approximately 25-30m in height. The central area to the east of Monaghan Town is strongly influenced by the River Blackwater which drains west to east across this section of the Study Area. To the north of this section of the Study Area the Mountain Water River drains west to east. To the southeast, the Clontibret Stream drains southwest to northeast direction. Due to the number and nature of the river bodies in the area flat marshy flood plains are present. This section also contains a number of lakes and loughs primarily located to the east of the existing N2 which include the significantly sized Emy Lough to the east of Emyvale. In general, the topographical levels fluctuate from 50m OD to 80m OD

To the west of the Study Area and Monaghan Town the “Smithborough Hills” LCA is present. As this is a relatively small section of the Study Area it shares similar traits of the Neighbouring Monaghan Drumlin Uplands LCA transitioning to adjacent lower lying Blackwater Valley and Drumlin Farmland

³⁵ Monaghan County Council Landscape Character Assessment, <https://monaghan.ie/planning/landscape-character-assessment/>

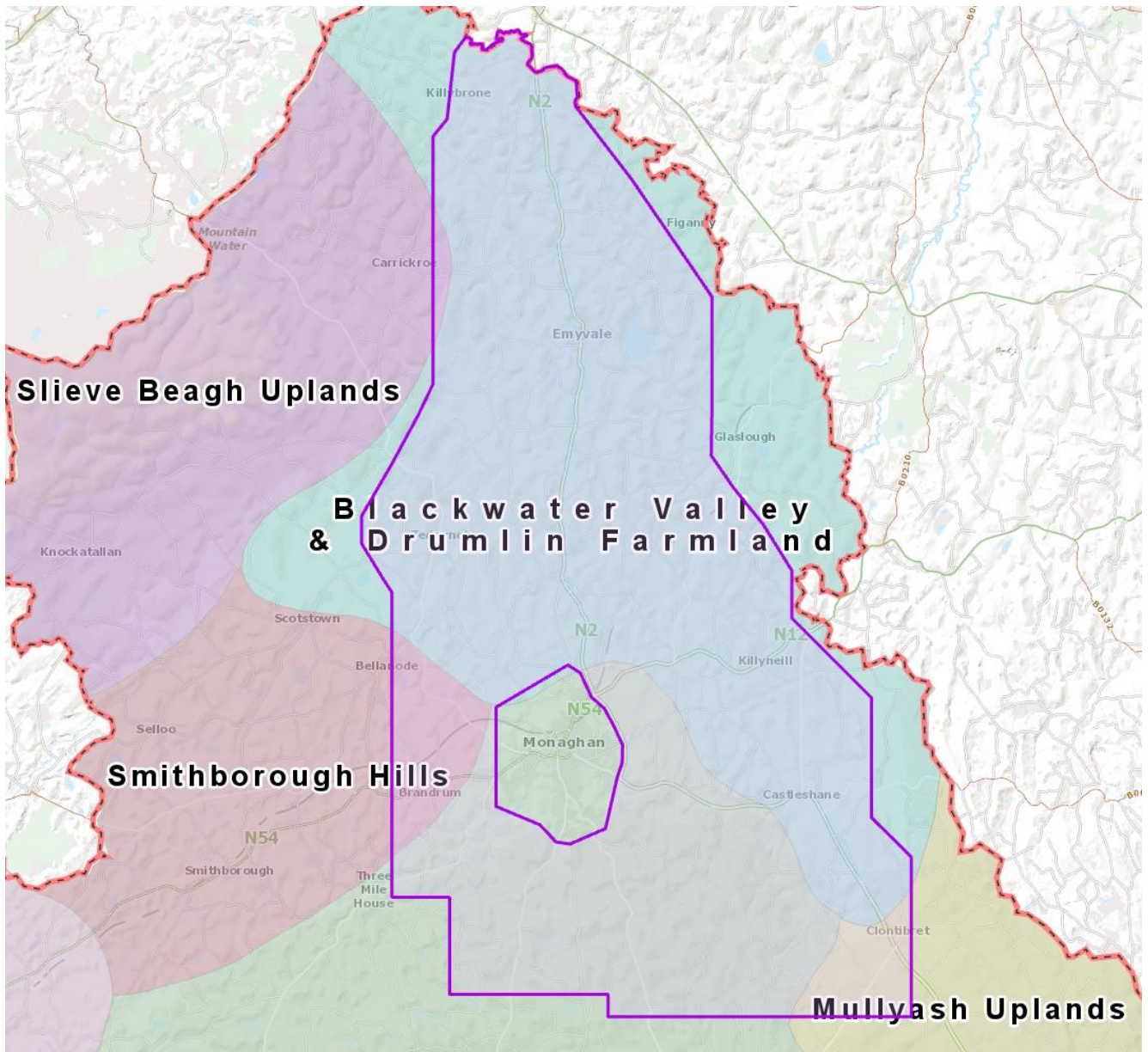


Figure 4-1 Clontibret To Border Road Scheme LCA's Boundaries

4.2.3 Engineering – Roads, Railways, Public Transport, Ports, Airports.

4.2.3.1 Roads

Within the Study Area the national primary route of the N2 provides the strategic north south connection which ultimately links Dublin to Northern Ireland and the North-West of the Country. The significance of the N2 is supported by the fact that the N2 between Clontibret and the Border forms part of the Trans-European Network (TEN-T) corridor. Further information on the Existing Road Network is contained in Section 4.2.3.5 below and also in Sections 1 to 3 of Volume 1 of the Option Selection Report.

4.2.3.2 Rail

There is no existing operational rail network within the Study Area, resulting in a sole reliance on road transport for private, commercial, public and freight vehicles. There are also no current plans to introduce a railway provision to this part of the northwest as part of the National Planning Framework 2040 or within the National Development Plan 2018-2027.

4.2.3.3 Airports and Ports

There are no airport or Ports within the Study Area

4.2.3.4 Walking/Cycle Routes

In the urban centres, general pedestrian facilities can be found alongside most carriageways. However, in the rural areas, dedicated pedestrian facilities are focused around local amenities and housing estates.

The existing N2 cross-section on its western verge from its commencement point at the roundabout of the R184 to approximately 800m north of this location contains a combined cycle and footway facility. From this point to the Coolshannagh Roundabout on the north end of the Monaghan Town Bypass there are no pedestrian or cycle facilities provided. There is some local provision which contains approximately 620m of footway (including an at grade uncontrolled pedestrian crossing) from the entrance of Monaghan Collegiate School to the Corlat Roundabout to the south of the Monaghan Town Bypass. Similarly, just north of the Coolshannagh Roundabout a local footway provision and at grade uncontrolled crossings are provided to the entrance of Saint Macartan's College and onwards to the Cluain Ard Road. For a short section approximately 100m north of Cluain Ard Road junction there is no cycle or pedestrian facility provided. From this point northward for approximately 8km to the south of Emyvale a combined cycleway and footway facility is provided. To the north of Emyvale to the Border the existing cross section of the N2 has no provision for footways and cycleways infrastructure.

Formal walking and cycling infrastructure and facilities within or close proximity to the Study Area include:

- 1) Sliabh Beagh Way (Walking Trail & McKenna Cycling Trail)
- 2) Monaghan Town Greenway
- 3) Sustrans Route 91 (part of the Ulster Canal Cycling Trail)
- 4) Emy Lough Looped Walk
- 5) Rossmore Forest Park
- 6) Ulster Canal Green Way (Phase 1)

In addition to the above there are numerous other proposed formal walking and cycling schemes at various stages of design and planning. These include Phase 2 of the Ulster Canal Green Way and the Emyvale Mountain water Eco Trail

Figure 4-2 below indicates the routes mentioned above location in relation to the Study Area

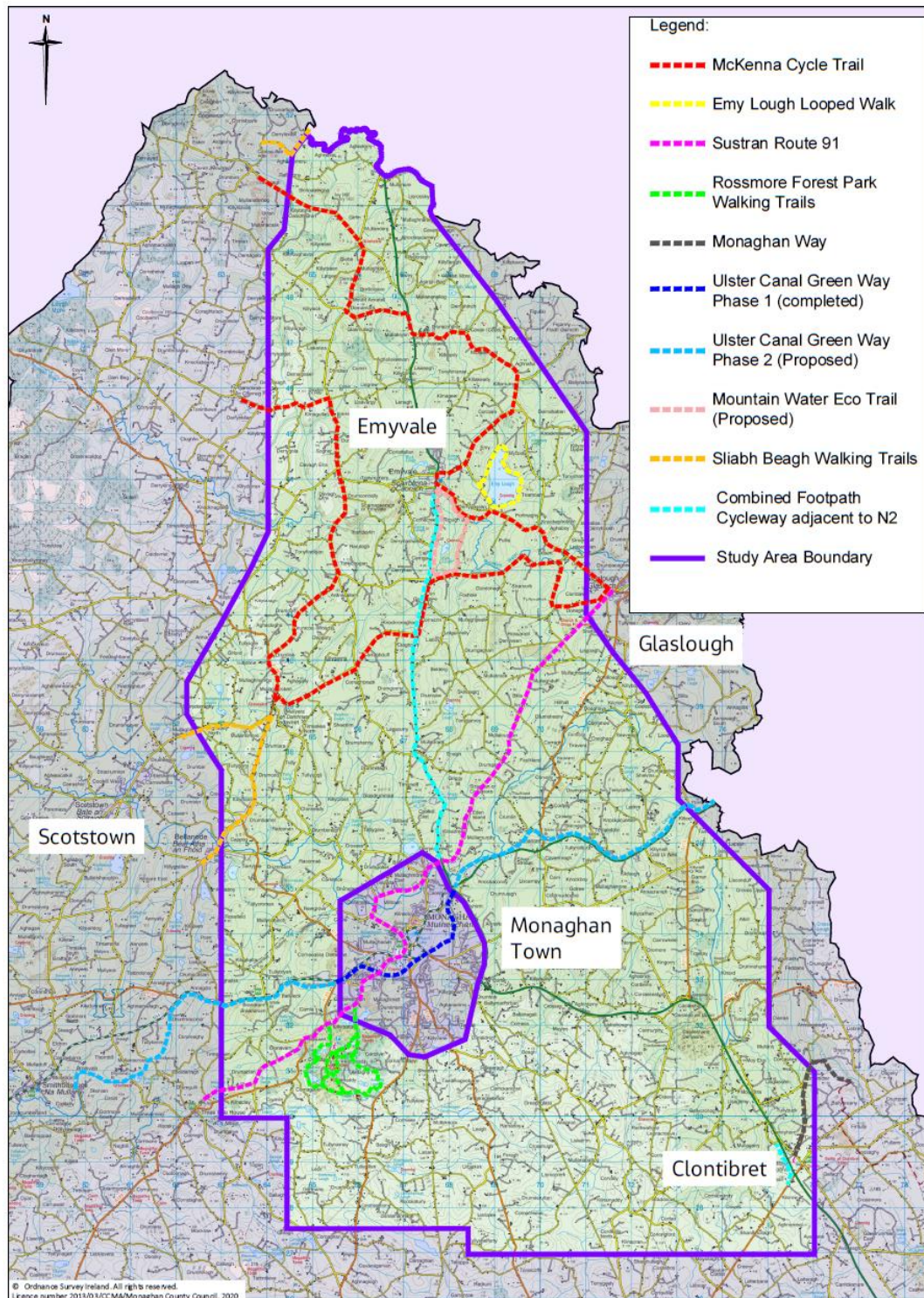


Figure 4-2 Walking and Cycling Routes N2 Clontibret to Border Road Scheme

4.2.3.5 Existing Road Network - General Description

Within the Study Area the national primary route of the N2 provides the strategic north south connection which ultimately links Dublin to Northern Ireland and the North-West of the Country. The significance of the N2 is supported by the fact that the N2 between Clontibret and the Border forms part of the Trans-European Network (TEN-T) corridor.

The section of N2 within the Study Area is approximately 28km in length connecting the main urban centres of Clontibret (bypass), Monaghan Town (bypass) and Emyvale. The cross section varies from Type 3 Dual at Clontibret to Type 1 single with varying nonstandard hard shoulder widths together with various additional climbing lanes sections from north of Clontibret to the north of Monaghan town, to a Type 2 Single from north of Monaghan Town to the south of Emyvale and again reverts to a Type 1 Single with varying nonstandard hard shoulder widths from north of Emyvale to the border. Figure 4-3 below shows the approximate locations of the various cross sections.

In addition, in terms of speed limits the general posted speed limit along the existing route is 100 km/hr. However, throughout the existing route there are various permanent speed limits in place. Figure 4-3 indicates the location of various speed limits zones along the route which include the following:

- 50km/hr posted speed limit from a point 181m south of its junction with the LT-12104 (Old Mill Road) to a point 268m north west of its junction with the LP-1200 (Mullen Road)
- 50km/hr posted speed limit from a point 79m south east of the Coolshannagh Roundabout junction to a point 103m north west of its junction with the LT-16303 (Cluain Ard)
- 60km/hr posted speed limit from a point 268m north west of its junction with the LP-1200 (Old Mill Road) to a point 693m north west of its junction with the LP-1200 (Old Mill Road)
- 60km/hr posted speed limit from a point 134m south of its junction with the LS-5250 (Mullagh Peak Rd) to a point 177m north of its junction with the LS-5207 (Derryhallagh Rd)
- 60kn/hr posted speed limit from a point 61m north of the Corlat Roundabout junction to a point 245m east of said junction.
- 80km/hr posted speed limit from a point 103m north west of its junction with the LT-16303 (Cluain Ard) to a point 134m south of its junction with the LS-5250 (Mullagh Peak Rd)
- 80km/hr posted speed limit from a point 177m north of its junction with the LS-5270 to a point 181m south of its junction with the LT-12104 (Old Mill Road)
- 80km/hr posted speed limit from a point 245m east of the Corlat Roundabout junction to a point 202m west of the LS-5400

In addition, with reference to Table 4-11 and Figure 4-3 below, there are a number of periodic speed limits at the following locations and times. Monaghan County Council have determined that the circumstances applying to the locations, namely the existence of schools, warrant the application of the following periodic special speed limits at the allocated time periods (Monday to Friday) described below;

School	Extents of Periodic Speed Limit	Times	Periodic Speed Limit Applied
Corracrin National School, Emyvale	N2 from a point 43m north east of its junction with the LS-5250 (Mullagh Peak Rd) to a point 61m south west of its junction with the LS-5207 (Derryhallagh Rd)	<p>Morning: Start – 30 mins before school starting time. End – at school starting time.</p> <p>Early Collection – Start – 5 mins before collection time. End – 15 mins after collection time.</p> <p>Late Collection: Start – 5 mins before school collection time End – 15 mins after collection time</p>	40km/hr

School	Extents of Periodic Speed Limit	Times	Periodic Speed Limit Applied
Monaghan Collegiate School	N2 from a point 410m east of the Corlat Roundabout junction to a point 279m west of the LS-5400	<p>Morning: Start – 30 mins before school starting time.</p> <p>Early Collection – Start – 5 mins before collection time. End – 15 mins after collection time.</p> <p>Late Collection: Start – 5 mins before school collection time End – 15 mins after collection time</p>	50km/hr

Table 4-11: Periodic Speed Limits along existing N2 between Clontibret and Northern Ireland Border

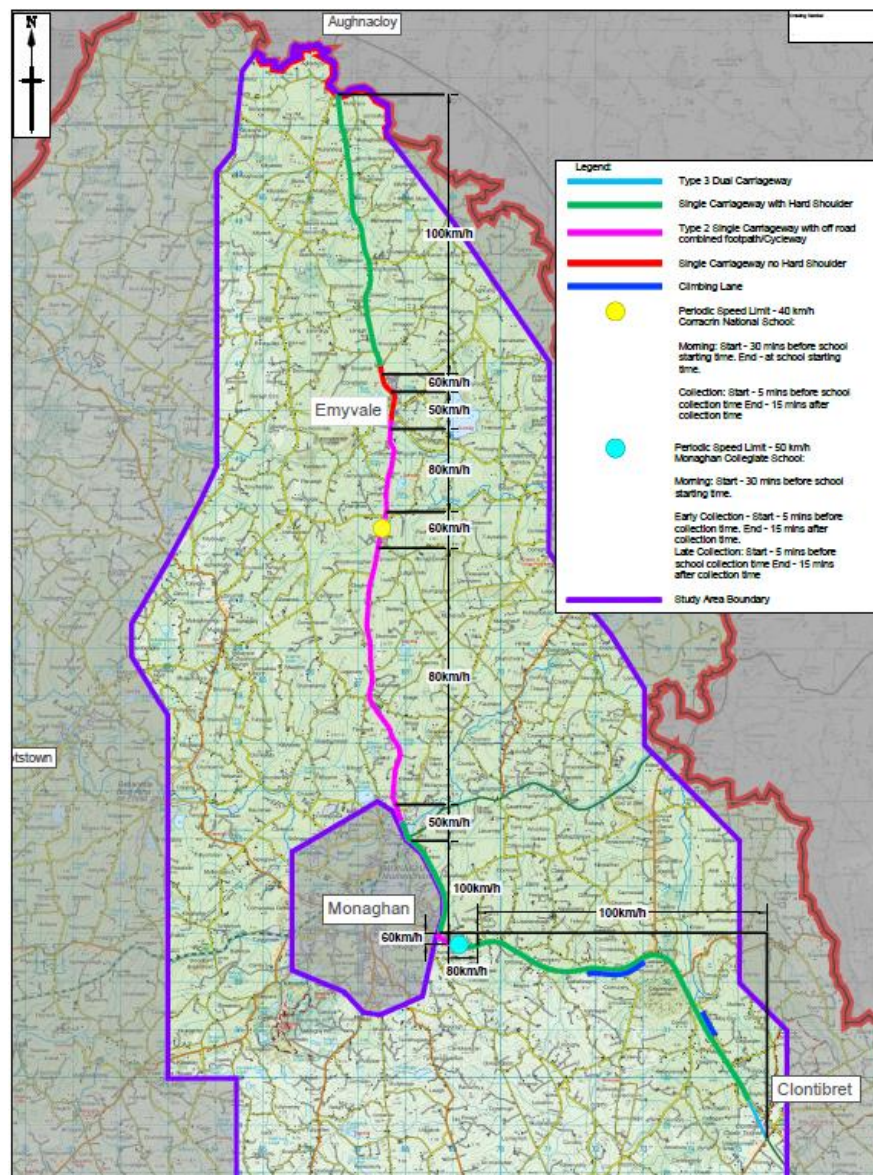


Figure 4-3 N2 Clontibret to Border Road Scheme Existing Speed Limits and Cross Sections

4.2.3.6 Existing Road Network -Geometry

In terms of horizontal geometry, a number of existing radii, as outlined in Table 4-12 below, which are below desirable minimum standard, in accordance with TII Design Standard *Rural Road Link Design - DN-GEO-03031 (2017)*. Table 4-12 contains a non-exhaustive list of locations where horizontal radii at bends are below current desirable minimum standard for the posted speed limit. These characteristics may result in a lesser degree of driving comfort for road users, may result in a reduction of Stopping Sight Distance, and when combined with other existing deficiencies (vertical alignment, proximity and high number of junctions/accesses, and sub-standard visibility from junctions) can lead to Departures from Standard and can further exacerbate operational and safety issues at these locations.

Ref. No.	General Location	Specific Location	Current Desirable Min. Radius (M)	Approx. Radius (M)	Approx. Length (M)	Comment
Existing N2 Section – Clontibret to Townland of Corlat – 100 Km/hr Posted Speed Limit Section (Design Speed 100km/hr Assumed)						
1	Townland of Castleshane	At N2 / R213 Junction	720	500	857	2 Step Relaxation
2	Townland of Kilmarley	At N2/ L14011 (McElvaney Motors)	720	510	443	1 Step Relaxation
Existing N2 Section – North of Monaghan Town (Townland of Kilnadreen) to South of Corracrin Village – 80 Km/hr Posted Speed Limit Section (Design Speed 85 km/hr)						
3	Townland of Derrynagrew	275m North of N2/L16302/L1220 Junction	510	360	169	1 Step Relaxation
4	Townland of Coolkill East	150m South of Access Road to Hackett’s Mushrooms	510	360	365	1 Step Relaxation
5	Townland of Coolkill East	50m North of Access Road to Hackett’s Mushrooms	510	360	136	1 Step Relaxation
6	Townland of Mullabrack	At Tirnanell Crossroads	510	360	334	1 Step Relaxation
Existing N2 Section – North of Corracrin Village to South of Emyvale 80 Km/hr Posted Speed Limit Section (Design Speed 80 km/hr)						
7	Townland of Carrigans	Crossroads of L5170/L5207	510	255 & 360	91 & 222	2 Step Relaxation
8	Townland of Cornacreeve	500m North of L1160	510	360	477	1 Step Relaxation
Existing N2 Section – North of Emyvale to Northern Ireland Border – 100 Km/hr Posted Speed Limit Section (Design Speed 100 km/hr Assumed)						
9	Townland of Lisseagh	350m North of N2/L12012/L5161 Junction	720	450	262	2 Step Relaxation
10	Townland of Lisseagh	700m North of N2/L12012/L5161 Junction	720	450	224	2 Step Relaxation
11	Townland of Derrykinard	200m North of N2/L1120 Junction	720	600	272	1 Step Relaxation
12	Townland of Derrykinard / Elvey	At N2/L1110 Junction	720	510	261	1 Step Relaxation

Table 4-12 Existing Horizontal Radii between Clontibret and Northern Ireland Border below Desirable Minimum Standard

Typically, hard shoulders are provided for Type 1 Single Carriageway types but are varying in size along the route. At locations where ghost islands are provided. At these locations the hard shoulder can reduce to approximately 0.5m. This reduction increases the potential risk of conflict between vulnerable road users and high-speed traffic. Equally, it is noted that there are a number of simple junctions where ghost islands and dedicated right-hand turn lanes are not present.

4.2.3.7 Existing Road Network Overtaking Opportunities

Although, there is an initial 2km section of Type 3 dual carriageway at the start of the existing N2 at Clontibret (two lanes northbound, one lane southbound), an extra climbing lane provided further north at Moy Otra (Southbound, 0.8km) and at Castleshane (Northbound, 0.25 km), the existing N2 is predominantly a single carriageway road. A lack of safe overtaking opportunities on a single carriageway is likely to lead to driver frustration and may lead to unsafe overtaking manoeuvres. A measure of the provision of overtaking opportunities /sections on a road is the Overtaking Value³⁶. TII's Design Standard DN-GEO-03031 - Rural Road Link Design (2017) specifies that a Type 1 single carriageway requires an overtaking value of 30% for online improvements and 50% for newly constructed schemes, and that a Type 2 and Type 3 single carriageway should have a minimum overtaking value of 15% for online improvements and 50% for newly constructed schemes.

The existing overtaking sections were approximately estimated across the length of the existing single carriageway on the N2, and the overtaking values were calculated for individual sections and for the overall length of existing single carriageway between Clontibret and the Northern Ireland Border. These values are presented in Table 4-13 below.

Individual Sections	Approximate Lengths	Estimated length of Overtaking Sections (Approx.)	% Overtaking Sections
Clontibret to Monaghan Town (Coolshannagh Roundabout – Excluding Climbing Lanes at Moy Otra & Castleshane)	9430m	1300m	13.78%
Monaghan Town (Coolshannagh Roundabout) to Emyvale	11470m	1285m	11.2%
Emyvale to the Northern Ireland Border	7150m	1223m	17.1%
Entire Length:	28,050m	3808m	13.58%

Table 4-13 Existing Overtaking Sections on the Existing N2 between Clontibret and the Northern Ireland Border

The overall Overtaking Value of 13.58% does not meet the online improvement targets of 15% and 30% and is considerably lower than the 50% for newly constructed schemes.

4.2.3.8 Existing Road Network -Access Control

This section of the N2 over its length within the Study Area has a total of 391 junctions/direct accesses. Each junction from a regional and local road, and/or a direct private access point (domestic, commercial and agricultural) creates an additional hazard for all road users. A junction/direct access generates a potential conflict area between motorists which may result in collisions. Table 4-14 below details the differing types of access identified.

³⁶ TII Standard DN-GEO-03031 defines the Overtaking Value as the total length of Overtaking Sections for each direction shall be summed and divided by the total length of the road improvement. Target values of 30% and 50% have been obtained from Table 7.3 of TII Standard DN-GEO-03031.

Ref. No.	Description of Access	Total
1	Existing Roads (Regional/Local)	145
2	Private (Domestic/Commercial /Other)	188
3	Field/Agricultural	145
	Total	391

Table 4-14: Breakdown of Junction/Access Type

This figure of 391 access points represents a significant number of potential conflict locations within this 28km section of the N2.

4.2.3.9 Existing Road Network -Safety Inspection observations

In addition to the deficiencies listed above, it is noted that two site safety inspections were undertaken which observed and reported safety issues at access points along with a number of further issues related to the existing layout. A TII Road Safety Inspection (RSI), in accordance with TII Publication AM-STY-06044, was carried out and commissioned by TII in 2016. A site inspection was also undertaken as part of the N2 Clontibret to Border Road Scheme Phase 1 RSIA in December 2018 in accordance with the *TII Standard PE-MG-02001 December 2017 Road Safety Impact Assessment*.

The TII RSI highlighted a number of safety issues relating to the mainline and side road layout along the N2, which can be summarised as follows:

- Junction Layout: Issues relating to junction width, longitudinal gradient, confusing layout or see through effect;
- Public Lighting: Poor visibility of pedestrians at night or layout of junction is unclear;
- Sight Distance: Inadequate sight distance exiting side roads due to road furniture, boundary hedges/ trees and parked cars;
- Signs obscured by vegetation;
- Parapet Wall within clearzone and risk of errant vehicle strike

The Phase 1 RSIA site inspection identified the following road layout and safety issues:

- **Inconsistent Road Cross-section:** The road cross-section along the N2 was inconsistent, varying from Type 3 Dual Carriageway (2+1) to Type 2 single Carriageway, to a single carriageway with/ without hard shoulder. These varying cross sections make the N2 potentially hazardous for cyclists to use. Additionally, standard verge widths are not applied along much of the N2 section, with the potential to increase the severity of collisions that may occur along the carriageway;
- **Horizontal Alignment:** At numerous locations, the horizontal alignment was considered to be significantly below standard with tight radii bends, which was exacerbated in places by overgrown vegetation and roadside hazards, further deteriorating forward visibility;
- **Inconsistent Infrastructure Provision:** The general approach to ghost island provision from the mainline to regional and local side roads was considered inconsistent by the RSIA Auditor. Also, at locations where no-dedicated right-hand turn lanes are provided, vehicles turning from the mainline are exposed to rear shunt collisions.
- **Existing Side Road Junctions – Non-Compliance Issues:** It was observed that a number of side road junctions do not meet current design standards:
 - a) Junctions were observed with a stagger of less than the minimum current design standard of 50m between centrelines (Including L55002 to Ballycannon and L1510 to Ballybay/ L54513 Clerran).

- b) The presence of direct cross road junction layouts was noted (Including L12201 Enagh/ L1155 to Corraghbrack and L5200 to Mullynure/L11123 to Moy);
 - c) There were a number of junctions which were located on bends/skew which may result in insufficient visibility splays.
 - d) A number of junctions had wide bellmouths that may lead to high exit/entry speeds.
- **High Number of Direct Accesses:** There are a high percentage of direct accesses to residential properties and fields along the route. There is also a section of the N2 North of Monaghan Town between the Cluain Ard Road and Coolshannagh Roundabout where a number of commercial premises (LacPatrick Dairies, Circle K) are located, along with a number of Local Road accesses and an entrance to St Macartans College. This was considered complex to navigate through due to the number of right turn pockets required.

4.2.3.10 Engineering – Existing Traffic Conditions

Within the Study Area there are two permanent Traffic Monitoring Units (TMU) owned and operated by TII. The locations of the TMUs within the Study Area on the existing N2 is indicated below in Figure 4-4.

Tables 4-15 and 4-16 below show the annual average daily traffic (AADT) flows (incl. % increase over the previous year) and % of Heavy Goods Vehicles recorded at the two existing TII permanent Traffic Monitoring Units (TMUs) on the existing N2 between Clontibret and the Border for the years 2013 – 2019.

Year	AADT	AADT Annual Growth	% HGV
2019	10,618	1.94%	10.4%
2018	10,415	3.72%	10.6%
2017	10,041	3.53%	10.3%
2016	9,699	10.85%	10.2%
2015	8,750	5.12%	10.2%
2014	8,324	3.52%	10.2%
2013	8,041	-	10.2%

Table 4-15: Traffic Flows at Clontibret - Counter Number (TMU N02 110.0 N) – TMU Location 1

Year	AADT	AADT Annual Growth	% HGV
2019	6,256	-2.33%	12%
2018	6,399	2.86%	12%
2017	6,221	2.32%	11.6%
2016	6,080	6.44%	11.7%
2015	5,712	4.14%	11.2%
2014	5,485	7.89%	10.5%
2013	5,084	-	9.4%

Table 4-16: TMU Location 2 - Traffic Flows at Mullinderg – between Emyvale and NI Border - Counter Number (TMU N02 130.0 S) – TMU Location 2

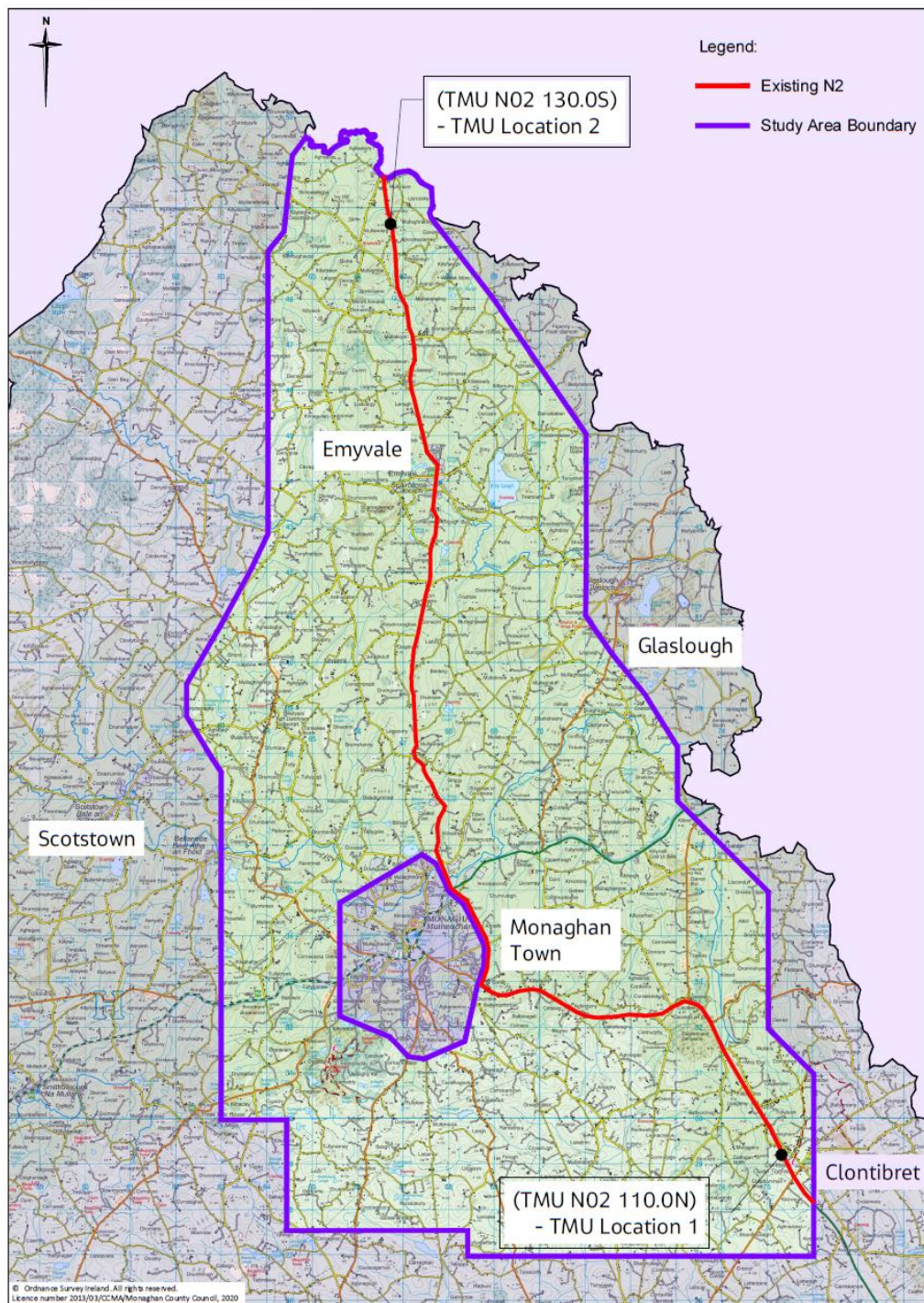


Figure 4-4 Clontibret to Border Road Scheme TII Permanent counter locations

With the exception of 2018 to 2019 at the TMU Location 2, which showed a minor decrease, the TII Counters show that AADT traffic volumes are increasing year on year and have increased between 18% to 24% over the past 7 years. In relation to traffic composition, and with reference to the tables above, it is noted that Heavy Goods Vehicle (HGV) % of the total varies between 10.2% to 10.6% at TMU Location 1 and between 9.4% to 12.0% at TMU Location 2. This HGV% is considerably high when compared to typical averages on the National and National Secondary Road Network. A sample group of National Secondary and National Primary Roads identified an average HGV% of 5.7%.

The high percentage of HGVs on the existing single carriageway section, combined with the lack of an adequate number of overtaking sections (See Section 4.2.3.7), further increases the likelihood of drivers becoming

frustrated and attempting inappropriate unsafe overtaking manoeuvres. Also, it is noted that the practice of HGVs travelling partly in the existing hard shoulder to allow overtaking to occur has been observed. This practice is unsafe as it may encourage drivers to overtake at unsafe locations on the existing N2 and it may compromise the safety of vehicles pulling out of access and junctions on the N2.

4.2.3.11 Level of Service

In relation to existing AADT levels indicated in section 4.2.3.10 above and Table 4-17 below, the TII Design Standard *DN-GEO-03031 - Rural Road Link Design (2017)* outlines that the AADT capacity for a Level of Service (LOS) D³⁷ would have to be less than 11,600 AADT for a Type 1 Single Carriageway and 8,600 AADT for Type 2 Single Carriageway.

Type of Road Capacity	AADT - LOS D
Type 3 Single Carriageway (6.0m)	5,000
Type 2 Single Carriageway (7.0m)	8,600
Type 1 Single Carriageway (7.3m)	11,600
Type 3 Dual (7.0m + 3.5m)	14,000
Type 2 Dual (7.0m x 2)	20,000,
Type 1 Dual (7.0m x 2 with hard shoulder)	42,000

Table 4-17: Road Type and Capacity required for Level of Service (LOS) D

Based on the TII traffic count volumes in Table 4-15 (approximately 10,600 AADT), the existing N2 at Clontibret is nearing capacity for a Type 1 Single Carriageway at LOS D (11,600 AADT). The TII traffic count volumes in Table 4-16 show that the existing N2 between Emyvale and the Northern Ireland Border are within the threshold for a single carriageway. However as previously stated the carriageway and hard shoulder widths are not consistent and, in some cases, do not comply with current design standards leading to safety and operational issues in this location. In addition, the contributory factors such as the high percentage of HGV's on the existing single carriageway at this location (12% HGV) combined with the lack of an adequate number of overtaking sections further increases the likelihood of drivers becoming frustrated and attempting inappropriate unsafe overtaking manoeuvres. These factors contribute significantly to a reduced Level of Service at this location in terms of operating speed, the ability to overtake safely, traffic congestion (in particular through the village of Emyvale), and overall driver safety comfort.

4.2.3.12 Existing Road Network – Highway Structures

Along the N2 between Clontibret and the Border there are a number of existing bridge structures, primarily underpasses, that also include a river and canal crossing are present. The majority of these structures are located in the vicinity of the Monaghan Town Bypass with an additional one located at Clontibret. Primarily the structures are underpasses for local roads and are of a standard design which would be expected for cross section of a Type 1 single carriageway and for Type 3 Dual in the case of structure at Clontibret. There is also one medium river crossing, namely, the currently under construction Blackwater River Crossing and one Canal crossing over the existing Ulster Canal.

4.2.3.13 Existing Road Network – Regional Local Roads

Within the Study Area there are two National Routes (not including the N2 route itself) namely the N12 and N54 which provides national strategic connections for locations contained within the study area. The N12 extends east from its intersection with the N2 at the Coolshannagh Roundabout north of Monaghan Town to the Northern

³⁷ In TII Standard DN-GEO-03031, carriageway cross-sections are categorised on the basis of capacity and level of service (LOS). The capacity of a road is the ability of that section of road to carry the maximum number of vehicles (AADT) in safety at an appropriate LOS. The LOS is an industry standard measure to describe and qualitatively assess the driver experience in terms of operating speed, the ability to overtake in safety, traffic congestion, and overall driver safety comfort. TII Standard DN-GEO-03031 defines a LOS Target of D.

Ireland Border and then onwards east as the A3 to Armagh City and ultimately to Lisburn just southwest of Belfast. The N54 commences in the centre of Monaghan Town and extends southwest to Clones and onward to Butler Bridge just north of Cavan Town. In addition, there are eight regional roads namely the R162, R184, R185, R186, R188, R189, R213, and R214 which provide strategic regional connections within the Study Area. (refer to Figure 1.1 contained in Volume 2 Part B). R162 commences in Monaghan Town and extends south to Ballybay. The R184 commences at Clontibret and extends southwest to just north of Ballybay. The R185 commences 2km northeast of Monaghan town at its intersection with the N12 and extends northeast to Glaslough. The R186 commences in Monaghan Town and extends northwest to Tydavnet and onwards to the North Ireland Border where it continues as the B83 to Clogher. The R188 commences in Monaghan and extends south to Cootehill and ultimately connects to Cavan Town. The R189 commences in Monaghan Town and extends southeast to Newbliss ultimately joining the R188 just north of Cootehill. The R213 extends northwards from its intersection with the N2 north of Castleshane Demesne ultimately joining the N12 adjacent to the Northern Ireland Border. The R214 extends eastwards from its intersection with the N2 at Castleshane to the Northern Ireland Border where it continues on as the B3 connecting to Keady and ultimately Markethill. The remainder of the Study Area is accessed via local roads of various standards whose orientation follows the valleys between the many drumlin formations.

4.2.3.14 Existing Road Network Collision Occurrence

Historic road collision data for the route has been gathered from the Road Safety Authority (RSA) and Transport Infrastructure Ireland (TII) for the period 2005 to 2019, as set out in Table 4-18. There was a total of 102 personal injury collisions in this period on the N2 between Clontibret and the Northern Ireland Border. Six of these collisions were fatal collisions. There were also thirteen serious injury collisions and 83 minor injury collisions recorded along this section of N2 for the same period.

Year	Fatal Collisions	Serious Injury Collision	Minor Injury Collision	Total
2005	0	2	6	8
2006	1	3	6	10
2007	2	0	7	9
2008	0	0	8	8
2009	0	1	5	6
2010	0	1	5	6
2011	0	1	7	8
2012	0	0	4	4
2013	1	1	9	11
2014	0	0	4	4
2015	0	0	8	8
2016	1	0	4	5
2017*	1	3	2	6
2018*	0	1	2	3
2019*	0	0	6	6
Total:	6	13	83	102

* = It is noted at the time of writing that 2017, 2018 and 2019 data, obtained from TII, has not yet been through the RSA validation process.

Table 4-18: Accident Collision Data on the N2 between Clontibret and the Northern Ireland Border 2005 - 2019

It is noted that over 6% of collisions are fatal. This is a high percentage when compared with the average percentage rate of fatalities in collisions (not including material damage only collisions) of 4% based on the RSA website published data, between 2005 and 2019.

An analysis of the 2005 to 2014 data, which was undertaken as part of the Phase 1 Road Safety Impact Assessment (January 2019), highlighted the following:

- The largest defined collision types were 'Rear End on a Straight', 'Head on Conflict' and 'Single Vehicle'. Fifteen collisions (20.5%) on the N2 involved a rear end shunt type collision on a straight and fifteen collisions (20.5%) involved a head on conflict. A further fifteen (20.5%) collisions involved a single vehicle collision.
- Of the six fatal collisions, two involved a pedestrian.
- In relation to defined time periods of collisions, thirty-seven (37%) of the collisions occurred between 10:00-16:00, with sixteen (22%) of the collisions occurring during the period 19:00-23:00.

4.2.3.15 Existing Road Network -TII Network Safety Ranking

TII undertake a Network Safety Ranking of the national road network, based on average collision rates on the various road cross-sections types, to identify high collision locations. The national routes are categorised into four groups ('Twice Above the Expected Collision Rate', 'Above the Expected Collision Rate', 'Below Expected Rate', and 'Twice Below the Expected Rate'). Based on data from 2016 to 2018, the N2 between Clontibret and the Northern Ireland Border contains a number of sections which are 'Above the Expected Collision Rate' and a number of sections which are 'Twice Above the Expected Collision Rate'. Figures 4-5 to 4-8 below illustrate the latest four data sets for the N2 Clontibret to the Northern Ireland Border.

With reference to the figures below, it is noted that there is a relatively high degree of variability between the various time periods. There is a general dis-improvement from the 2010 – 2012 dataset to 2012 – 2014 dataset (i.e. general increase of 'Above the Expected Collision Rate', Yellow Sections, and 'Twice Above the Expected Collision Rate' – Pink Sections). Whilst when comparing 2014 – 2016 and 2016 – 2018 datasets, there is an improvement on certain sections (i.e. section between Monaghan Town and Emyvale with more 'Twice Below the Expected Collision Rate', Green Sections, and 'Below the Expected Collision Rate', Blue Sections) but a dis-improvement in a small section at this location North of Monaghan Town with a 'Below the Expected Collision Rate', Yellow Sections/'Twice Below the Expected Collision Rate', Green Sections being replaced with a section 'Twice Above the Expected Collision Rate' Pink Section. These improvements are reflective of the improvement schemes implemented along this section of the route during the data collection period. The online improvement works were designed to provide interim road safety improvements on the existing N2 between Monaghan Town and Emyvale prior to the delivery of the N2 Clontibret to Border Road Scheme. Namely, Phase 2 & 4 of the N2 Monaghan to Emyvale Improvements scheme which was implemented in 2014 between Coolkill East and Kilnadreen. Notwithstanding this, as stated above, some sections of the route are still indicating 'Above Average' Yellow Sections as well as 'Twice Above Average' Pink Sections, collision rates and would be expected to continue to deteriorate with the anticipated traffic growth as well as the safety and operational issues identified along this section of the route. From Emyvale to the Border there are large sections indicated as 'Twice Below the expected collision rate, however the northern part of this section of the route indicates a constant rate of twice above the expected collision rate.

Taking cognisance of the susceptibility to change between the various time periods and reviewing the historical data as a whole from 2012 to 2018, it is noted that there is a number of sections between Clontibret and the Northern Ireland Border, which are vulnerable to being 'Above the Expected Collision Rate' and 'Twice Above the Expected Collision Rate'.

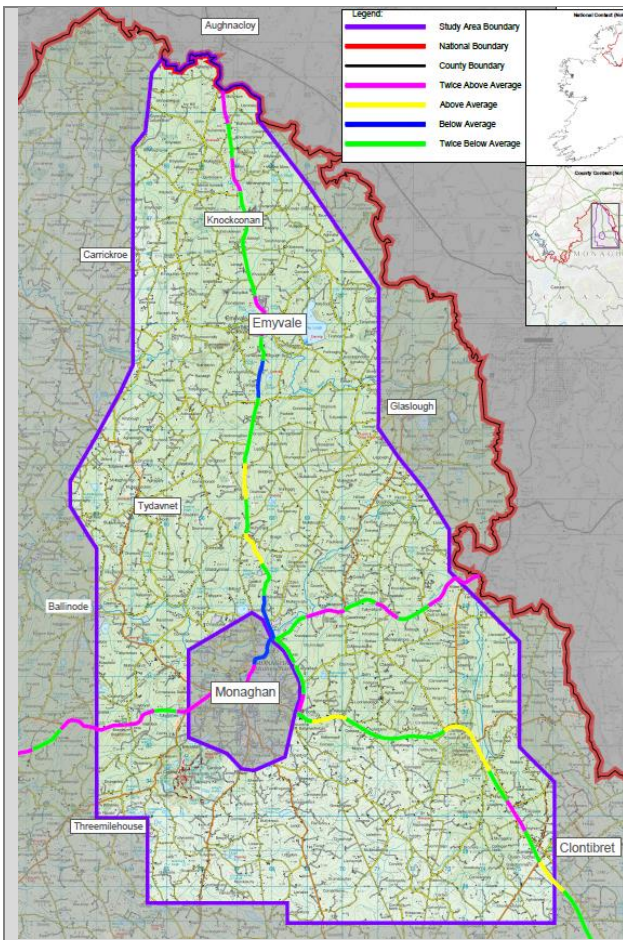


Figure 4-5: TII Network Safety Ranking 2010-2012

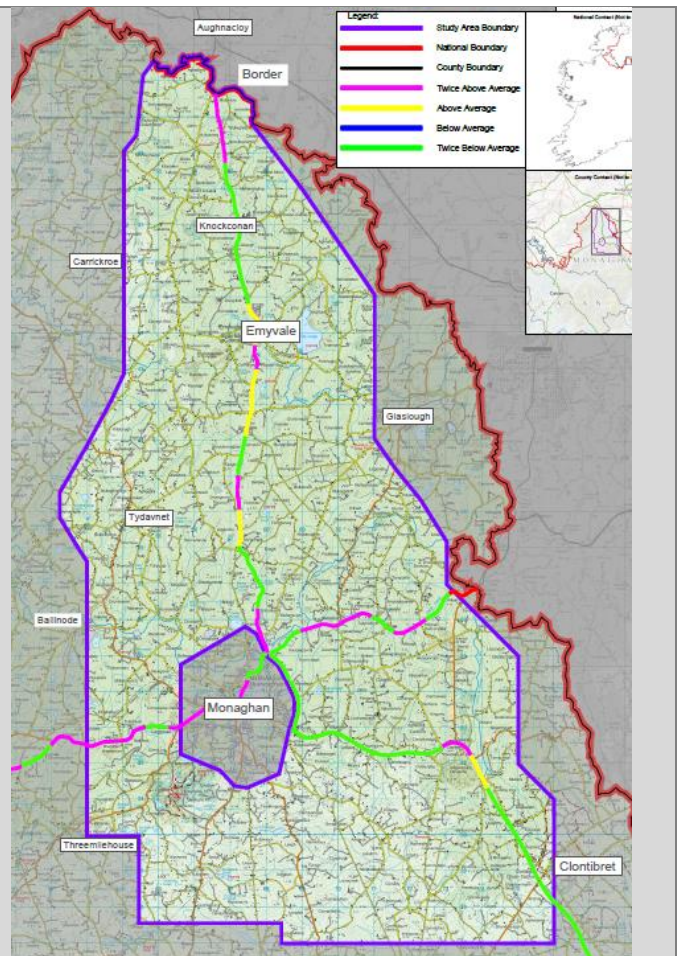


Figure 4-6: TII Network Safety Ranking 2012-2014

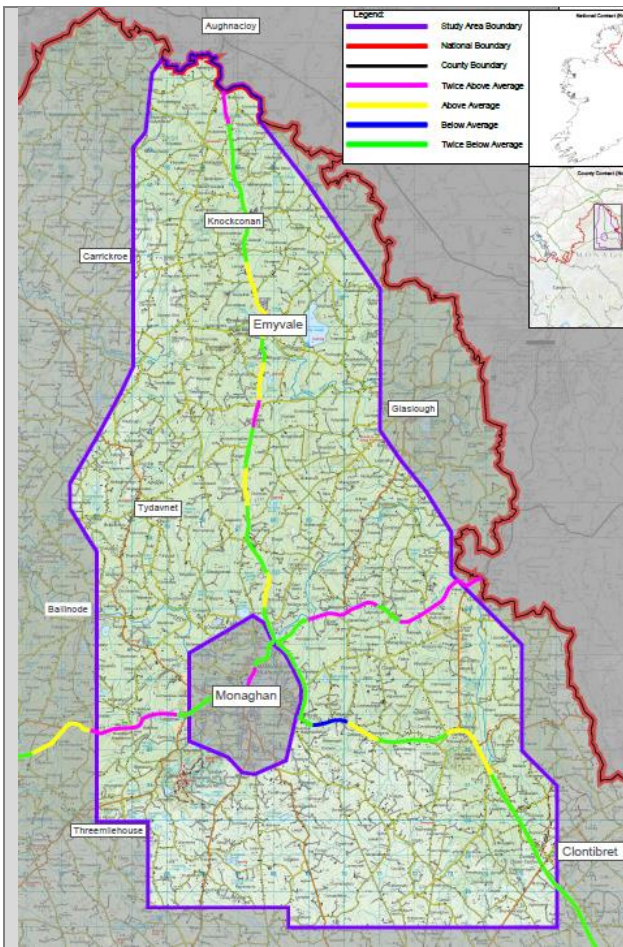


Figure 4-7: TII Network Safety Ranking 2014-2016

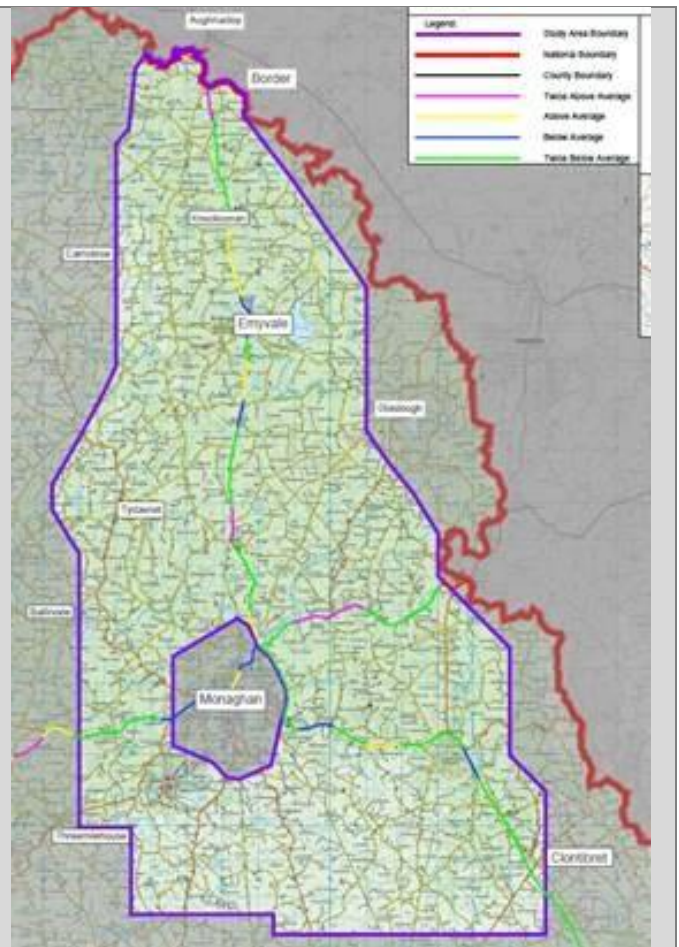


Figure 4-8: TII Network Safety Ranking 2016-2018

4.2.3.16 Future Conditions on the Road Network

In relation to future traffic flows, as part of TII PMG Phase 2 (Options Selection), additional project specific traffic surveys were undertaken within the Study Area in April, May and September 2019. This data collection was undertaken to supplement the existing information (including the above data in section 4.2.3.10) and was used to inform the scheme specific traffic model and traffic assessment, where forecasted traffic flows for 2027 (Opening Year), 2042 (Design Year) and 2057 (Horizon Year) were estimated. Further background information on the scheme specific data collection and traffic modelling/assessment is provided in Option Selection Report, Volume 1, Section 4. Figure 4-9 below shows traffic flows (Incl. % HGV) for the Do-Minimum Option for the Design Year (2042).

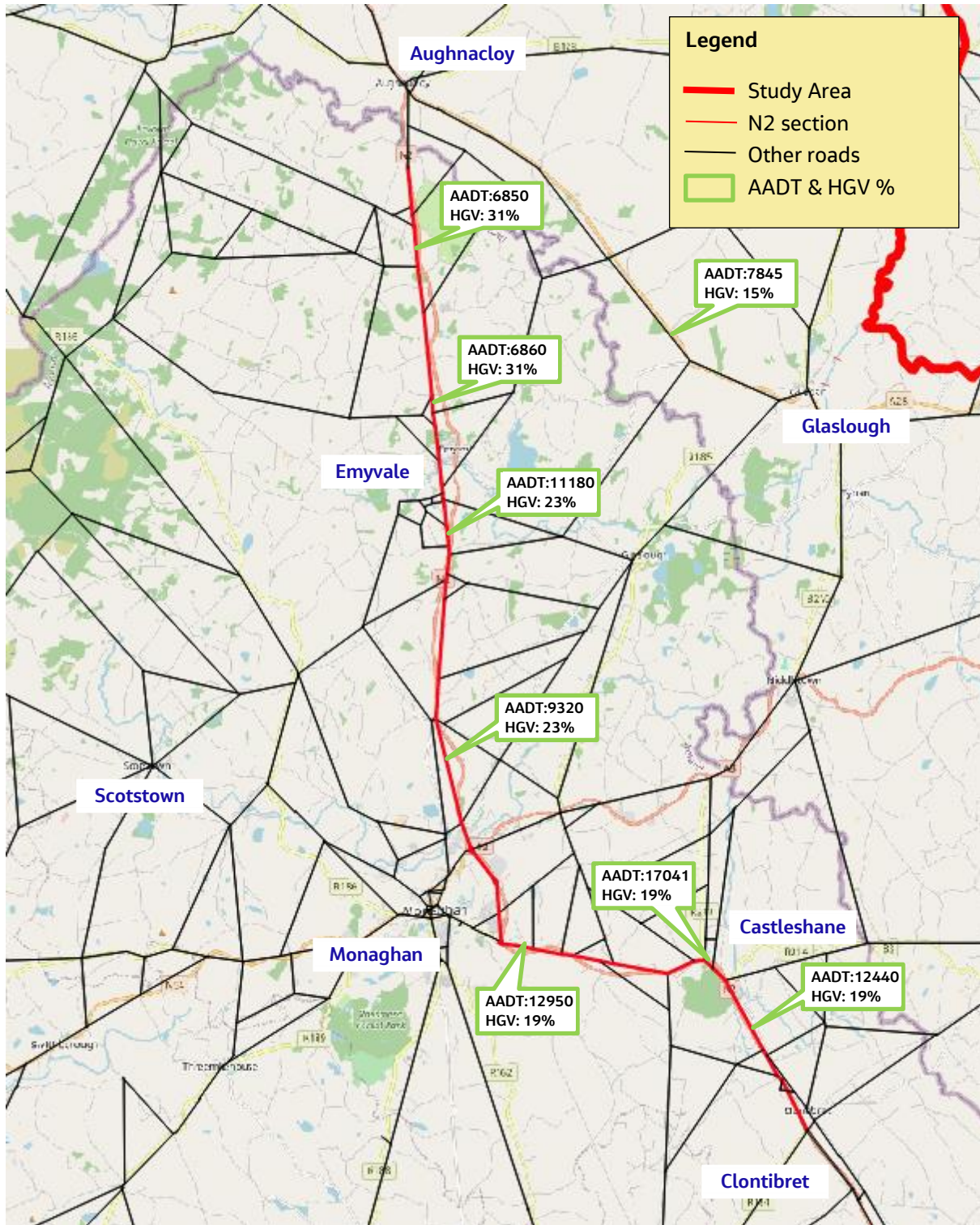


Figure 4-9: Traffic Flows – Design Year (2042) AADTs & HGV % - Do-Minimum Alternative

In terms of future traffic flows, and with reference to Figure 4-9 above, between Clontibret and Monaghan Town the future estimate AADT of 12,440 – 17,000 will exceed the LOS D threshold of 11,600 AADT for the existing cross-section which is similar to Type 1 Single Carriageway. Between Monaghan Town and Emyvale the future estimate AADT of 9,320 – 11,180 will exceed the LOS D threshold of 8,600 for the existing cross-section of a Type 2 Single Carriageway. Between Emyvale and the Border the future estimate AADT of 6,850 - 6,860 will be below the LOS D threshold of 11,600 AADT for the existing cross-section which is similar to Type 1 Single Carriageway.

In conclusion, it is assessed that the majority of existing road cross-sections between Clontibret and the border is currently nearing capacity and is expected to exceed the required level of service in the near future.

4.2.3.17 Existing Road Network -Conclusion

Taking account of the various characteristics of the existing N2 within the Study Area detailed above, individually, and more importantly combined, it can be seen that the standard provided by this section of the N2 corridor is deficient to meet the expected future demands in a safe and efficient manner.

With the estimated increase in traffic levels for future years, it is expected that the Level of Service (LOS) for the majority will breach the minimum standard of D stipulated by TII for the current Type 1 single and Type 2 cross section. This combined with the already high and expected increase in the HGV composition of the traffic flow, the occurrence of slow moving agricultural vehicles in a rural setting, the lack of an adequate number and combined overtaking opportunities, the high levels of permeability in relation to direct accesses, the allowance of unrestricted right turn movements and the identified deficiencies in existing highway geometry will lead to an increased risk to road users. This increase in traffic will ultimately exacerbate these already identified safety issues along this section of the N2 and will consequently lead to an increased risk of collisions.

These issues, if left unaddressed, will continue to form a constraint on the economic, social and culture potential of the immediate area and areas further to the north west. This will continue to constrain the aspirations for the region as detailed in the National Strategic Outcomes and the National Policy Objectives of the National Planning Framework 2040. Consequently, this constraint will negatively impact relevant land-use and transport objectives within the Regional Spatial and Economic Strategy for the Northern and Western Region (Monaghan) and the County Development Plan. Further details of the policy context can be obtained in the Options Selection Report Volume 1 Section 2.2.

4.2.4 Waste

This section identifies the constraints in relation to waste associated with the N2 Clontibret to the Border Road Scheme.

The methodology used to assess the impacts associated with waste had appropriate regard to relevant guidance including, but not limited to:

- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (Environmental Protection Agency (EPA) August 2017 Draft);
- Guidelines for the Management of Waste from National Road Construction Projects Revision 1 (Transport Infrastructure Ireland (TII) 2014);
- Guidelines on Soil and Stone By-products in the context of Article 27 of the European Communities (Waste Directive) Regulations 2011 (EPA 2019);
- Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Waste Projects (Department of Environment Heritage and Local Government 1 July 2006);
- Construction Industry Research and Information Service (CIRIA) document 133 Waste Minimisation in Construction (CIRIA 1997);
- Design Manual for Roads and Bridges (DMRB) LA110 Material assets and waste Revision 0 (Highways England August 2019);
- Project Appraisal Guidelines for National Roads Unit 7.0 – Multi Criteria Analysis October 2016;
- Specification for Road Works Series 900 – Road Pavements – Bituminous Materials;
- Construction and Demolition Waste Statistics for Ireland (EPA October 2019); and
- Design Out Waste factsheet (EPA 2013).

As part of the compilation of this chapter the following EU, national, regional and local policy documents were reviewed with respect to waste management policies:

- EU Construction & Demolition Waste Management Protocol (EC 2016);
- A Resource Opportunity – Waste Management Policy in Ireland (DoCELG 2012);

- Construction & Demolition Waste: Soil and Stone Recovery / Disposal Capacity (RPS on behalf of DCC 2016);
- Connacht-Ulster Region Waste Management Plan 2015-2021;
- Eastern-Midlands Region Waste Management Plan 2015-2021; and
- Monaghan County Development Plan 2019-2025.

In addition to the above, the following documents and legislation have been reviewed:

- The EU Waste Framework Directive (2008/98/EC);
- The Waste Management Act 1996 (as amended);
- The European Communities (Waste Directive) Regulations 2011 (S.I. No. 126 of 2011); and
- Waste Classification – List of Waste and Determining if Waste is Hazardous or Non-Hazardous (EPA 2015).

The online data sources used in the collation of data were:

- Connacht - Ulster Waste region and Eastern - Midlands Waste region Annual statistics;
- www.cso.ie population statistics for small areas; and
- www.ec.europa.eu/Eurostat.com European Union statistics on resource productivity.

Consultation with a number of key stakeholders has also been undertaken.

4.2.4.1 Existing Environment

Ireland Waste Statistics

In the whole of Ireland in 2016 there was 71% material recovery of Construction and Demolition waste. Table 4-19 below shows the statistics for Ireland in 2017.

Waste Type	% of Total waste Arisings
Soil and stones	81%
Mixed C&D waste	8%
Concrete, bricks, tiles and similar	7%
Metals	4%
Bituminous mixtures	0.9%
Wood, glass and plastic	0.4%

Table 4-19: Ireland Waste Statistics 2017

Regional Waste Statistics

Table 4-20 below shows the waste statistics for the three waste regions in Ireland.

Region	C&D Waste (tonnes)	Landfill Capacity (Soils and Stones)
Southern	Total: 1,020,363 (2015) Soil & Stone: 779,852	Non-hazardous-non-inert C&D waste has very few processing options in Ireland and is mainly restricted to being directed to lined landfills with the added pressure of using void space that otherwise might be available for MSW disposal. Export options were found for this waste in 2017 and whilst some national projects were delayed these export options came on stream during 2017. Exporting the non-hazardous C&D waste is set to continue as a necessary option in 2018.

Connacht-Ulster	Total: 319,095 (2012)	Monaghan: Scotch Corner Landfill – constructed to receive a further 60,000 tonnes; consented to receive a further 175,000 tonnes (MSW and other wastes) (2013) Mayo – constructed to receive a further 40,000 tonnes (2013)
Eastern Midlands	Total: 1,910,887 (2012) Soil & stone: 1,328,875	Difficult to find details but management plan talks of ‘sharp decrease’ in landfills – from 11 to 3 over the period to 2012.

Table 4-20: Regional Waste Statistics

The proposed scheme is within the Connacht Ulster Waste Region. The Connacht Ulster Waste Region includes the local authority areas of Cavan County Council, Donegal County Council, Galway City Council, Galway County Council, Leitrim County Council, Mayo County Council, Monaghan County Council, Roscommon County Council and Sligo County Council. The region covers 37% of the land mass of the country with a combined population of 837,350.

As lead authority for the Connacht Ulster, Mayo County Council’s responsibilities include the preparation of the Connacht Ulster Regional Waste Management Plan, which was published in May 2015 and covers the period from 2015 to 2021.

Table 4-21 shows the current waste management facilities and current capacities within County Monaghan

Facility name	Licence number	Operational status	Local Authority	Authorised Capacity Tonnes per annum	Waste sent offsite for 2012 tonnes	2012 waste undergoing final treatment tonnes
Scotch corner landfill	W0020-02	Active	Monaghan County Council	39,500	68,826	13,298

Table 4-21: EPA authorised facilities and data capacity table

4.2.5 Archaeology, Architectural and Cultural Heritage

4.2.5.1 Introduction

Under EIA Directive 2014/52/EU, ‘cultural heritage’ comprises archaeology, architectural heritage, folklore and history.

Archaeology is the study of past societies through surviving structures, artefacts and environmental data, and is concerned with known archaeological sites and monuments, areas of archaeological potential and underwater archaeology.

Architectural heritage comprises structures, buildings, traditional and designed, and groups of buildings including streetscapes and urban vistas, which are of historical, archaeological, artistic, engineering, scientific, social or technical interest, together with their setting, attendant grounds, fixtures, fittings and contents.

Architectural heritage and archaeology together to form ‘built heritage’ or ‘tangible heritage’. Folklore and history are aspects of ‘intangible heritage’, which also includes language, musical traditions, traditional crafts and skills, townland names, poetry and so on. These forms of cultural heritage are “non-moveable, non-material and largely

non environmental although by their associations with certain sites and places, add to the character of an area” (EPA 2015).

In this assessment, tangible cultural heritage assets are captured under the relevant sections on archaeology and architectural heritage, while non-tangible (e.g. historical or folklore) associations with these sites and the wider Study Area are referred to where known.

The methodology for the assessment with regards to archaeological and architectural heritage was based on the following:

- TII Guidelines for the Assessment of Archaeological Heritage Impacts on National Road Schemes (2005);
- Guidelines for the Assessment of Architectural Heritage Impacts of National Road Schemes (2005);³⁸ and
- Environmental Protection Authority’s (EPA’s) Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (2017).

Other guidance of relevance to the assessment includes:

- Department of Arts, Heritage, Gaeltacht and the Island’s Framework and Principles for the Protection of the Archaeological Heritage (1999);
- Department of Arts, Heritage and the Gaeltacht’s Architectural Heritage Protection Guidelines for Planning Authorities (2011);
- Department of Arts, Heritage and the Gaeltacht’s NIAH Handbook (2011);
- EPA’s Advice Notes on Current Practice (in the preparation of Environmental Impact Statements) (2003);
- EPA’s Guidelines on the information to be contained in Environmental Impact Statements (2002); and
- NRA’s Environmental Impact Assessment of National Road Schemes – A Practical Guide (2008); and
- TII’s Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis (PE-PAG-02031 2016).

4.2.5.1.1 Archaeology

At present, archaeological sites and monuments in the Republic of Ireland are protected under the National Monuments Act 1930 (as amended) in one of four ways:

1. Being recorded in the Record of Monuments and Places (RMP);
2. Being registered in the Register of Historic Monuments (RHM);
3. Being a National Monument in the ownership or guardianship of the Minister for Culture, Heritage and the Gaeltacht or a Local Authority; or
4. Being a National Monument subject to a Preservation Order or Temporary Preservation Order.

The principal sources for the identification of archaeological heritage assets are outlined below. Reference numbers (e.g. N2/ AC/ CS-AY001, abbreviated to AY001 etc.) have been assigned to each identified archaeological heritage asset in line with the referencing convention outlined in the NRA guidelines.

World Heritage Sites and Tentative World Heritage List

There are no UNESCO World Heritage Sites or sites included on the Tentative List (an inventory of properties which each State intends to consider for nomination to the UNESCO World Heritage List) within the study area. The closest World Heritage Site, Brú na Bóinne, includes a core area (comprising over 750 hectares) and surrounding buffer zone (comprising some 2,500 hectares). The northern limit of the buffer zone which follows the line of the river Mattock lies almost 60km to the south of the Study Area.

National Monuments Lists

³⁸ The functions of the former NRA have now been assumed by Transport Infrastructure Ireland (TII).

A National Monument, as defined in Section 2 of the *National Monuments Act 1930*, means a monument “the preservation of which is a matter of national importance by reason of the historical, architectural, traditional, artistic or archaeological interest attaching thereto....” The current List of National Monuments in State Care (Ownership and Guardianship) for County Monaghan was published in 2009.

Record of Monuments and Places (RMP)

The Record of Monuments and Places (RMP) is the statutory list of protected places and monuments established under Section 12(1) of the *National Monuments (Amendment) Act 1994*. The RMP for County Monaghan was published in 1996 in paper form with accompanying constraints maps. During the current assessment, the printed lists and maps were used to check whether a monument or place is subject to legal protection under the National Monuments Acts through its inclusion on the RMP.

Sites and Monuments Record (SMR)

The Archive Unit of the National Monuments Service (NMS) of the Department of Culture, Heritage and the Gaeltacht (DCHG) maintains a publicly-accessible database known as the Sites and Monuments Record (SMR) which contains current information on known archaeological sites and monuments, including whether or not they are scheduled for inclusion in the next issue of the statutory Record of Monuments and Places (RMP). The SMR sites dataset includes a ‘Zone of Notification’ for sites and monuments. These do not define the exact extent of the monuments, but rather are intended to identify areas in which archaeological remains are believed to occur for the purposes of notification under Section 12 (3) of the *National Monuments (Amendment) Act 1994*.

List of Monuments Subject to Preservation Orders

Section 8 (1) of the *National Monuments Act 1930* provides for the Minister placing a preservation order on a monument which the Minister considers to be a National Monument under threat. The current list of Preservation Orders detailing all monuments that have had a Preservation Order or a Temporary Preservation Order placed on them was published by the NMS in June 2019. There are no Preservation Orders relating to monuments within the Study Area for the proposed road scheme in County Monaghan.

Database of Irish Excavation Reports

The Database of Irish Excavation Reports, also commonly known as the ‘Excavations Bulletin’ (summary accounts of archaeological excavations in Ireland), is maintained by Wordwell publishers with the support of the DCHG and is accessible online. Transport Infrastructure Ireland (TII) also makes available reports commissioned as a result of their road projects.

Historical Maps and Satellite Imagery

Cartographic sources including the first-edition six-inch Ordnance Survey map (published for Monaghan in 1835) and the first-edition 25-inch Ordnance Survey map (surveyed 1907–09) were reviewed online through the Historic Environment Viewer and Ordnance Survey of Ireland websites. Satellite imagery was also reviewed throughout the assessment. In addition, the Down Survey maps (1657) and Map of the County of Monaghan (McCrea Map of Monaghan) 1793 were also examined. Satellite imagery was also reviewed throughout the assessment.

4.2.5.1.2 Architectural Heritage

The principal sources for the identification of architectural heritage were the Record of Protected Structures (RPS) as published within the *Monaghan County Development Plan 2019-2025*, and the National Inventory of Architectural Heritage (NIAH). Reference numbers (e.g. N2/ CB/ CS-AH001, abbreviated to AH001 etc.) have been assigned to each identified architectural heritage asset in line with the referencing convention outlined in the NRA guidelines.

Record of Protected Structures

Under the *Planning and Development Act 2000*, Local Authorities are required to maintain a Record of Protected Structures (RPS) as part of their Development Plan. These are structures recognised by the Local Authority as having special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest. The legal protections afforded to Protected Structures are set out in Part IV of the *Planning and Development Act 2000*.

The RPS provides positive recognition of a structure's importance and protection from adverse impacts. A Protected Structure, unless otherwise stated in the RPS, includes the interior of the structure, the land lying within its curtilage, any other structures and their interiors lying within that curtilage, plus all of the fixtures and features that form part of the interior or exterior of any of these structures. The *National Monuments Act 1930* (as amended) can also protect elements of the architectural heritage or offer dual/parallel protection. The Development Plan will also contain a list of Architectural Conservation Areas (ACAs).

National Inventory of Architectural Heritage

The National Inventory of Architectural Heritage (NIAH) is a nationwide survey of architectural heritage including buildings, structures and historic landscapes and gardens, carried out under the *Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999*. The NIAH comprises a Building Survey and a Survey of Historic Gardens and Designed Landscapes. These surveys are used to advise Local Authorities in relation to structures of interest within their areas. The purpose of the surveys is to highlight a representative sample of the architectural heritage of each county and to raise awareness of the wealth of architectural heritage in Ireland. However, not all buildings and structures listed on the NIAH are legally protected through inclusion on the RPS.

Folklore and History

A review of published and unpublished source material was undertaken to establish whether the Study Area or particular sites within it has any specific folk or historical significance that would be significantly impacted by the proposed project. This included a search of the Irish Folklore Commission's School Collection, which is a rich source of local information that is gradually being made accessible online as part of UCD's National Folklore Collection Digitization Project (Appendix 9.5, Volume 5 of the Option Selection Report).

4.2.5.2 Existing Environment

4.2.5.2.1 General Description

The Study Area contains 199 previously recorded archaeological heritage assets, all of which are listed on the RMP and/or SMR. The list contains a very high concentration of ringfort – rath sites, numbering 107, and so they account for more than half of the total known assets. The landscape within the Study Area also contains megalithic tombs, a Bronze Age burial site, potential ecclesiastical sites, souterrains, crannogs and an inauguration site, all reflecting extensive and continual occupation of the location over thousands of years.

There are 172 previously recorded architectural heritage assets within the Study Area; this is a combination of buildings/ structures on the National Inventory of Architectural Heritage (NIAH) and structures listed on the Record of Protected Structures (RPS) for County Monaghan. These structures date from the eighteenth to mid-twentieth century and vary from vernacular houses to religious halls, churches and graveyards, to country houses and gate lodges, demesnes, historical places of industry and commerce such as mills and forges, as well as education such as schools and seminaries. The Ulster Canal (AH101 and AH112) crosses through the Study Area. Constructed in 1821–42, the canal links Lough Neagh with Lough Erne and crosses into County Monaghan at the border with Tyrone in Tamlat townland and carries westwards onto Monaghan town. To the east of Monaghan town, the existing N2 crosses the Ulster Canal at Tullyhirm townland.

4.2.5.2.2 Archaeological Background

Previous Archaeological Investigations

A total of 190 test excavations and archaeological monitoring works are recorded on the Database of Irish Excavation Reports (DIER) as having taken place in County Monaghan. Of these 26, were conducted in and around the Study Area. These excavations occurred between 1998 and 2017 and were reviewed online at www.excavations.ie on 09/03/2020. In nine of the 26 cases summarised in the DIER, nothing of archaeological significance was encountered during these works. Investigations that did record archaeological or potential archaeological features or deposits are included in the overview presented below.

Prehistoric Period (c. 7000BC–AD400)

Evidence for Mesolithic activity (7000–4000BC) in Ireland tends to be concentrated around or in close proximity to water. Mesolithic society is believed to have been the preserve of small family-based groups of nomadic hunter fishermen. The archaeological record of this period presents as the remains of temporary settlements, fishing technology, or the debitage of the flint implements.

The earliest recorded evidence for human activity in Monaghan comes from the southeast of the county at Annaghmakerrig Bog with the discovery in 1888 of a flint blade dating to the later Mesolithic, between 5500–4000BC. The blade was heavily trimmed at the butt and slightly tanged (Walsh, 1983, p.166). Flint blades and Bann flakes of a similar age are recorded as having been collected in this part of the county in the nineteenth and twentieth centuries, often near rivers that flowed to the coast. It would appear that our earliest ancestors initially utilised coastal resources and followed river paths to settle the forested interior (McDermott, 2017, p.51). The lithic scatters within the county indicate the potential for more sites of this date to be identified at similar lake and river locations. No finds or features of a Mesolithic date are recorded within the Study Area.

The Neolithic period (4000– 2500BC) saw the construction of a variety of imposing megalithic tombs (court, passage, portal and wedge) which imply the presence of complex and ordered farming communities in existence at that time. While a chronology in terms of tomb types has been suggested (with court tombs being the earliest and wedge tombs the latest), it would appear that an overlap in their construction and use-history exists (Aalen et al; 1997, p.33). Little research has been undertaken on the 51 monuments noted as “megalithic” in County Monaghan (McDermott, 2017, p.51). Within the Study Area, a court tomb (MO013-007 [AY161]) is located in Rossmore Forest in the townland of Killydrutan, overlooking the Barn Hill Lough, whilst c.375m to the north in the townland of Skeagarvey is an unclassified megalithic tomb (MO009-051 [AY118]) which is probably the remains of a wedge tomb (OPW, 1986, p.4). Both sites occupy upland areas. Neither of these sites have undergone archaeological excavation and therefore remain undated.

The Neolithic period is typically associated with Ireland's first farmers, and the century between c.3800–3700BC saw a period of rapid expansion across the country. Finds within the Study Area discovered in the mid-twentieth century may be associated with land clearance and agriculture from this period. Two stone axeheads (NMI 1933:236 and 1935:176) are recorded from the townlands of Aghnagloch and Crosshugh, whilst a wooden ox yoke of possible prehistoric date was recovered from Donogh townland (NMI 1955:4). To date, no direct evidence for settlement sites associated with this period are located within the Study Area. However, to the south of the Study Area, three Neolithic houses (SMR records MO031-124 to MO031-126) dating to c.3700–3500BC were excavated in advance of road construction on the N2 in Monanny townland near Carrickmacross in 2003 (DIER, 2003:1503).

The Bronze Age (2500–500BC) is typically associated with the introduction and development of metal technology and the use of metal tools, and the emergence of a distinct warrior elite class defined by high-status weaponry towards the end of the period. Historic finds of artefacts greatly add to our archaeological understanding of this period, and a substantial number of gold artefacts have been discovered in County Monaghan. Within the Study Area, in the townland of Tydavnet was the discovery in 1872 of a pair of Early Bronze Age (2500–2000BC) gold discs (NMI 1872:34, 35). These discs, also known as sun discs, were among the first metal objects made in Ireland. Displaying a cruciform design with perforations for gold wire, it is believed that these discs were worn in the hair.

Displaying exceptional repousse work, the Tydavnet discs are the largest and most sophisticated of their type discovered in the country. Discovered in the root of an old tree, these discs are now on display in the National Museum of Ireland (NMI).

Funerary monuments of the Bronze Age in the Study Area are represented by three separate sites. A barrow (MO010-015001 [AY153]) and an adjacent ceremonial enclosure (MO010-015 [AY152]) are recorded in Greenmount townland. A cist burial (MO006-030 [AY070]) containing a small pot was uncovered in 1959 during construction works in the townland of Emyvale. However, the Monaghan County Museum file records that the pot was subsequently discarded (OPW, 1986, p.8).

Two cupmarked stones (MO006-022003 [AY061] and MO007-007009 [AY082]) are recorded in the Study Area in the townlands of Tedavnet and Donagh respectively. Both monuments are located in church graveyards and would appear to mark graves in and amongst eighteenth- and nineteenth-century headstones. They do not appear to be in their original location.

Fulachtaí fia are amongst the most common site types in Ireland and are characterised by a mound or mounds of heat-shattered stone discarded from the process of heating water in a subsoil-cut trough. Generally found in low-lying ground where the water table is close to the surface, the often wood-lined troughs filled naturally with water. The use-function of fulachtaí fia were many and varied, from cooking to bathing places to brewing sites and sweat houses. Within the Study Area, there are seven recorded fulachtaí fia/burnt mounds, all of which have been identified through monitoring and subsequent excavation. Three sites were discovered in 2004, prior to road construction of the N2 Monaghan Bypass, one in Tullyhirm townland: MO009-074 [AY133] and two more in Annahagh MO009-075 [AY134] and MO009-076 [AY135]. All three consisted of a spread of charcoal-rich silt and heat shattered stones. Following excavation, C14 dating produced dates of 2140–1740 Cal BC (for SMR MO009-074), 2340–2020 Cal BC (for SMR MO009-076) both Early Bronze Age, and 1690–1490 Cal BC (for SMR MO009-075), a Middle Bronze Age date. In 2012, excavation works were carried out following testing on a N2 road improvement scheme between Monaghan and Emyvale. One of the excavated fulachtaí fia (12E0068) returned C14 dates of 1415–1266BC placing it in the Middle Bronze Age. Three further fulachtaí fia were excavated and returned C14 dates of two sites from the Early Bronze Age (12E0209 and 12E0220) and another from the Middle Bronze Age (12E0208). Another fulacht fia site (MO006-039 [AY199]) dating to the Late Bronze Age was excavated in 2017 and there is a potential that associated sites are in the environs.

Regarding Iron Age (500BC–AD400) activity in the Study Area, there is a possibility that some of the funerary monuments ascribed to the Bronze Age (above) may more accurately belong to this period. Similarly, some of the generic large enclosures may represent sites of Iron Age date. It is worth noting that the OPW Archaeological Inventory of County Monaghan of 1986 was one of the first to be published. Thus, while a pioneering survey, a number of flaws can be noted; the descriptions are much shorter than in later county inventories, and there is a risk that monuments classified as 'enclosures' (a category associated with medieval settlement) are in fact of a scale that is likely to have them classified as Iron Age enclosures in subsequent inventories (McDermott, 2017, p.50). There is a total of 12 enclosure sites in the Study Area. Activity outside of the Study Area can be seen in the linear earthworks in Northern Monaghan with the presence of the Black Pig's Dyke. Ó Drisceoil and Walsh (2018) have shown that elements of this monument were probably constructed in the Middle Bronze Age but that most of the monument was probably constructed in the Iron Age between 220–160BC (Ó Drisceoil and Walsh, 2018, p.69).

Early Medieval Period (AD400–1100)

The early medieval period saw significant social, cultural, political and technological changes in Ireland. The beginning of the period saw the arrival of Christianity, the gradual conversion of the population, the flourishing of Irish monasteries, and development of church sites. The period spans 700 years and encompasses huge changes. A total of six church sites whose origins date to this period appear within the Study Area; these are in the townlands of Mullanacross, Mullanarockan, Donagh, Templetate, Rackwallace and Gallagher. If the folklore, which dates these churches to the sixth and seventh century, is to be believed, then the original churches on these sites were likely to have been constructed of wood and replaced later in the medieval period with what are now the ruined stone churches. The surrounding fields would also have been farmed at this time. The potential for mills and associated

archaeology surviving in low-lying wetland to the east of St Sillian's Church at Templetate [AH105] is considered significant, and the etymology of the Irish name for the adjacent Tuckmilltate (*Táite Mhuileann an Úcaire* – with *táite* being a 60 (Irish) acre measure of land, *muileann* being a mill and *úcaire* being a fuller) indicating the potential for mills through to the post-medieval and modern periods. It would appear that a continuous religious presence was evident in the Study Area since the early medieval period.

Within the Study Area in the townland of Kilnahaltar, is another ancient church which was recorded as being in ruins in 1622. Two bullaun stones are located in the graveyard. The church is listed as *Thechtalbi* in the ecclesiastical taxation (1302–04) of Pope Nicholas IV and ruinous by 1622 according to Royal Visitation papers. The church was built anew in 1788 and it is believed that the foundations of the medieval church lie to the south of the present church (MO009-035001).

The townland of Mullanacross contains the ruins of an ancient church and graveyard (MO003-018002 [AY011] and MO003-018003 [AY012]) and a number of associated archaeological assets: architectural fragments (MO003-018004 [AY013] and MO003-018005 [AY014]), a sheela-na-gig (MO003-018006 [AY015]), a graveslab (MO003-018007 [AY016]), and a holy well (MO003-018001 [AY010]). The church is recorded as being founded by St Mo Lua (or Meallan) in the seventh century and was in ruins by 1622 according to Royal Visitation papers (SMR file). The nearby holy well was known as St Mullin's and there was a two-day pattern to it in the harvest at the end of August which was stopped in the early nineteenth century on account of "rowdiness" and a drowning.³⁹ Clearly the original church and grounds are of antiquity, indicating a continuous presence in the area. The church was replaced by a gothic-style Church of Ireland church in 1834 (RPS 41400303 [AH008]) c.150m to the southwest. The Mullanacross ecclesiastical remains lie within the study area.

In the townland of Mullanarockan, is another church (MO006-022001 [AY059]) with an early medieval association. It is traditionally regarded as a seventh-century foundation associated with St Dymrna, who is reputed to be a granddaughter of Mileac, St Patrick's master during his enslavement. Recorded as "Thechdamnad" (Dymrna's House) in the ecclesiastical taxation (1302–06) of Pope Nicholas IV before being recorded as "ruinous" in 1622 (SMR file).

There is also a ruined church (MO007-001 [AY074]) and graveyard (MO007-007004 [AY077]) located in the townland of Donagh. According to the SMR file, it was also described as ruinous by 1622 and is of a reputed Patrician foundation. Cross fragments and headstones in the graveyard date to the seventeenth century. Noted as the line of a "drain" in the 1st edition OS map, a possible oval enclosure line can be seen encircling the entire western half of the site. In the townland of Templetate is a church (MO010-003001 [AY140]) and graveyard (MO010-003002 [AY141]) which is also believed to have been founded by St Patrick or one of his followers. The church is listed as "Thechtalbi" in the ecclesiastical taxation (1302–04) of Pope Nicholas IV and ruinous by 1622. Two further church sites with potential early medieval origins (MO014-014001 [AY184] and MO014-019001 [AY190]) are located in Rackwallace and Gallagher respectively.

The number of church sites is indicative of an expanding population, and this is further evident in an examination of the most numerous monument type in the Study Area, the ringfort. As stated above, of the 199 recorded archaeological sites and monuments in the Study Area, 107 are ringforts, i.e., defended homesteads of relatively wealthy farmers generally dated to the early medieval period, though some remained in use until much later. Often located on higher ground and with the space to shelter cattle, many ringforts appear to form a network of associated sites, often around a key site. This can be seen with a crannog site often being overlooked by ringforts. Due to the concentration of ringfort – raths in the Study Area, they are the most common sites listed on the tables of potential impacts.

Stout (2015, p.73) suggests that of the c.60,000 ringforts in Ireland, most of these were occupied between the early seventh and ninth centuries AD. Ringforts are also representative of a predominantly cattle economy. Many of the ringforts in the Study Area are prominent in the landscape, though outlying subsurface archaeological remains (e.g., trackways, field systems and souterrains) also have the potential to occur, as do ringfort sites with no surface expression.

³⁹ Irish Folklore Commission Schools Collection. Accessed online at <https://www.duchas.ie/en/cbes/4742067/4732200> 22/05/20.

Three souterrain sites are recorded within the Study Area. The hilltop it is on is marked as 'Cave hill' on the 1907–09 OS 25-inch map. The SMR notes that the site was discovered when a plough displaced a roof lintel. A section of the drystone built passage measures 3.7m in length, with a width of 1.4m, and has a maximum height of 1.5m. The souterrain has a lintelled roof. The west end terminates in a curved chamber, whilst the east end is blocked by collapsed material.

The Study Area contains several small lakes, a number of which have crannog sites on their shores. These dwellings required engineering ingenuity and would have been labour intensive to construct and would have been in close contact with surrounding ringforts. Crannogs were in use from the Late Bronze Age to the late medieval period; however, the most intensive period of construction dates to the early medieval period. Ten such sites are recorded in the Study Area. The site is described in the SMR as “located at the centre of Astrish Lough, a small oval lake measuring c.170m x c.120m. This is an overgrown cairn (diameter. 16m north-south; 15m east-west) composed of a matrix of small stones and charcoal, but there was no evidence of wooden structures”.

An excavation which yielded evidence of activity from this period was carried out in the townland of Tirraneill in 2012⁴⁰. The works were a result of features being identified following testing on a N2 road improvement scheme between Monaghan and Emyvale. An isolated pit filled with burnt mound material was excavated. Charcoal (alder) from the pit was radiocarbon dated to AD 902–1147.

Medieval Period (AD1100–1650)

The Study Area is contained within the medieval territory of “Airghialla” which is anglicised as “Oriel”; the Gaelic translates as “the hostage givers”. The territory of Airghialla was formed in the fourth century AD by the Three Collas, and at its peak in the twelfth century included lands in Counties Monaghan, Louth, Armagh, Tyrone, Fermanagh and Derry. Airghialla was ultimately a confederation of minor dynasties (Haywood, 2009, p.96). The confederation comprised nine dynasties and from the sixth century onwards its king was selected from amongst these different dynasties. The Study Area was under the control of the MacMahon family from the middle of the thirteenth century to the beginning of the seventeenth, with a succession of kings. The MacMahons’ traditional inauguration site (MO013-017 [AY166]) is located within the Study Area, on the summit of a drumlin ridge in the townland of Leck. This is the site at which the McMahan chiefs were inaugurated until the seventeenth century. An Ulster map made in 1609 notes “Mullagh-lest, so called of a stone there, on which McMahan is made”. The stone was removed, according to tradition by the landowner in 1809 and broken up (OPW, 1986, p.11). The machinations and demise of the Gaelic MacMahons is inextricably linked with the history of this part of Monaghan.

Archaeological evidence from the medieval period in the Study Area is partly characterised by seventeenth-century house sites. These include three houses in the townlands of Derrynashallog (MO006-002 [AY043]), Ballyleck (MO009-049 [AY116]) and Faulkland (MO009-059 [AY123]), and these estate homes of former landlords illustrate the impact of plantation on the Study Area.

The house site at Ballyleck (MO009-049 [AY116]) lies to the west of Monaghan town, and was owned by the Burnetts, Scottish settlers who began acquiring land in Monaghan in 1609 and owned land in 130 townlands. The SMR file notes that a castle, probably a fortified house, is depicted at Ballyleck on McCrea’s map of County Monaghan (1793), but its precise location is not known although it could be where Ballyleck House is now. This house appears on all OS mapping and is still standing today.

No trace of the house at Derrynashallog (MO006-002 [AY043]) is seen on historical mapping; however, a geophysical survey was carried out (O8R0058) as part of a PhD thesis by Dr Siobhan McDermott for NUI Galway, revealing a T-plan house (measuring 22m northwest–southeast x 14m northeast–southwest) within a rectangular enclosure (measuring 29m northwest–southeast x 22m northeast–southwest) at the southwest end of the avenue. The SMR entry notes that the house signals were weak, suggesting that the house might have been constructed of wood; a series of pits was also noted. The house was owned by the Anketells, English settlers from Dorsetshire, who came to Ireland in the middle of the seventeenth century and began to acquire land in north Monaghan, probably through direct purchase or the purchase of the interests of Undertakers and soldiers. Anketell

⁴⁰ (DIER entry 2012:481; Excavation licence No. 12E0068)

Estate was the third largest estate in the Study Area, behind the Rossmore and Leslie estates. The house may have been pulled down in 1781, and Taylor and Skinners' map of the roads of Ireland (1778) depicts Anketell Grove as a ruin at Derrynashallog, although McCrea's map of the Barony of Trough (1793) shows it as a roofed house. The 1835 edition of the OS 6-inch map does not indicate the location of the house, but it does portray a designed landscape here (SMR file).

The house site at Faulkland (MO009-059 [AY123]) is in ruins and only some walls survive. According to Shirley (1879, pp.160–61) the land at Falkland, which had been called Drumnaghmore, was acquired under lease from the Glaslough estate early in the reign of Charles II and was bought back by Glaslough in 1871. William Maxwell, High Sherriff of Monaghan, was murdered by one of his own followers at Faulkland in 1691. The house was probably built in the late seventeenth century, but it seems to have been abandoned after 1780 when the Maxwells moved to Bath. It is depicted as a house owned by R. D. Maxwell on the 1777 Taylor and Skinner map of the Roads of Ireland (SMR file). The site of "Faulkland Castle" is noted as being in ruins as late as the Cassini mapping (1948), where it includes a number of outbuildings. The area has been extensively cleared of structures since then.

Historical Background

Monaghan (or *Mhuineachain*) means "place of the shrubs". The lands of medieval (and probably early medieval) Monaghan were divided into tates or townlands, joined into groups of sixteen and collectively known as a ballybetagh. Each ballybetagh was usually named after one of the sixteen townlands but distinguished from it by the prefix *baille* (bally). The concept of the division of land into units apparently originated from the Gaelic agricultural systems of open fields and dispersed rural settlement (Halpin, 2007, p.4)

According to medieval Irish legend and historical tradition, the territory of Airghialla was formed in the fourth century AD by the Three Collas after they had burned Emain Macha (Navan Fort in Armagh) and seized territories in mid-Ulster. The Three Collas were brothers Cairell Colla Uais, Muiredach Colla Fo Chrí, and Áed Colla Menn, whose grandfather Cairbre Lifechair was a High King of Ireland. The legendry tale appears to have a grounding in history with the destruction of Emain Macha and the establishment of Airghialla being carried out in the fourth century. As already mentioned above, at its peak in the twelfth century Airghialla included lands in Counties Monaghan, Louth, Armagh, Tyrone, Fermanagh and Derry (Haywood, 2009, p.96). The seat of the territory was located in the townland of Donaghmoynne, to the south of the Study Area. With pressure for territory and control to the northwest from the Northern Ui Neill dynasty (occupying County Donegal and parts of Derry, Tyrone and Fermanagh) and to the south from the Southern Ui Neill dynasty (occupying parts of Counties Meath, Westmeath, Cavan and Louth), the lands of the Airghialla were gradually reduced to territories solely within County Monaghan. From 1243–1590, the territory was under the control of the McMahan dynasty.

The arrival of the Anglo-Normans in Ireland in 1169 saw immediate and drastic changes in Irish society. Following King Henry II of England's invitation by Diarmuid MacMurrough to intervene in an inter-dynastic row, this was the initial step in the colonisation of Irish society by the Anglo-Normans through the English Crown. The combination of armoured knights and archers of the Anglo-Normans gave a military superiority over their Irish counterparts, who in little technological deviation from the Iron Age fought with spears and were mostly unarmoured. As the Anglo-Norman conquest progressed, earth and timber motte and bailey castle structures were erected and were gradually upgraded with a small number of imposing stone castles and fortress towns (Haywood, 2009, p.114). Whilst Anglo-Norman structures like motte and baileys and stone-walled castles are recorded to the south of the Study Area, no features of this period appear within the Study Area, indicating its position as a Gaelic stronghold. The landscape throughout the country changed during this period following the extensive increase of land clearance for cultivation purposes.

The late Middle Ages saw English lordship and control throughout the country wane and by the 1500s only the area within the Pale (a linked network of linear earthworks) and parts of southern Ireland loyal to the English crown, were securely controlled by the English and Anglo-Irish. The Pale ran through the four 'loyal' counties of Dublin, Kildare, Meath and Louth. The Study Area was the territory under the control of the Gaelic McMahanons and beyond the areas of English governance. During the sixteenth century, internecine feuding took place between the three distinct branches of the McMahan family: the Dartry MacMahons (ruling from a fort at Lisnagore, near Clones), Farney MacMahons (ruling from Lisanisk, near Carrickmacross) and the Luacht-Tighe MacMahons (ruling

the northern part of Monaghan which encompasses the Study Area). These branches of McMahons varied in allegiance to the O'Neills of Tyrone, their traditional overlords, and the English Crown. In 1539, the Luacht-Tighe MacMahons, fighting alongside the O'Neill and a number of Ulster chieftains, were completely defeated by the English in the Battle of Ballahoe (Moore, 1955, p.25). After the battle, the victorious English forces penetrated to Monaghan town and burnt the monastery; the MacMahon chieftains subsequently submitted to the Crown.

In 1585 the county of Monaghan came into existence as it is today, when the McMahons rulers of Airghialla agreed to join the Kingdom of Ireland following discussions with the Lord Deputy of Ireland, Sir John Perrot, who was involved in establishing the plantations of Munster and Connaught. The Kingdom of Ireland was ultimately a client state of England, a relationship existing from 1542 until its ending with the Acts of Union in 1801. The county was shired by the Crown and divided into five baronies for administrative purposes: Farney, Cremore, Dartrey, Monaghan and Truagh, these territories reflecting the pre-existing Gaelic divisions. The Study Area falls within the baronies of Truagh and Monaghan. The last McMahon overlord recognised by the Elizabethan administration, Aodh Rua McMahon, was executed on the orders of the Lord Deputy in 1590, and the 'McMahonship' – the traditional overlordship of the McMahons – was abolished the following year; his holdings were then parcelled out into smaller units more pliable to the Elizabethan administration (Moore 1955, pp.22–32).

The Nine Years War (1594–1603) between the Ulster forces of O'Neill, Earl of Tyrone, and his Gaelic allies, and the Crown forces based in Dublin, was fought in the hinterland between Ulster and the Pale; Monaghan was one of the most disputed areas. This war was the strongest threat to English control in Ireland since Silken Thomas's rebellion (1534–35) and began as a reaction by the Irish nobility to English impingement on their traditional rights and privileges. The opening battle of that war took place in environs of the Study Area in and around Clontibret and alerted the English forces to the potential threat from an Irish alliance. In May 1595, MacMahon and Maguire, probably on O'Neill's orders, laid siege to the English garrison stationed at Monaghan Castle (O Mearain, 1956, p.6). Almost two thousand English troops from Dundalk, under the command of Sir Henry Bagenal, marched to Monaghan via Newry to break the siege. Following an ambush that saw a small number of casualties, Bagenal's troops reached Monaghan Castle unhindered, as the Irish troops surrounding it had withdrawn. The following morning, after changing the ward at Monaghan, Bagenal led his troops in the direction of Crossdall back to Newry. Having got wind that O'Neil was waiting in ambush in Crossdall, Bagenal marched his troops via Clontibret. O'Neill commanded his troops (4,000 in number) consisting of pikemen, cavalry and musketeers to take up position in Clontibret and an ambush was launched at Gallagher Bog, located to the east of Clontibret Church. The assault was relentless, and the battle proved a resounding success for O'Neill and the Irish alliance, with low casualties in comparison to estimates of 300–400 killed and more wounded on the English side prior to their retreat (O Mearain, 1956, p.25). The location of the battle site (MO014-040- as indicated on the SMR (Historic Environment Viewer) is at the townland of Kilcrow near Clontibret. A battle of that magnitude, which included retreating and pursuing forces moving over the landscape, would be spread over a wide area. With regards to future ground-breaking works in the area, the potential for evidence from this event (e.g. musket balls, weapons, burials) being uncovered should be brought to the attention of the monitoring archaeologist.

Following the loss of a company of English Crown forces to Hugh O'Neill and his allies of Ulster chieftains at the Battle of Clontibret, the Elizabethan forces were determined to secure the area, and maintained a garrison in Monaghan town and Newry as one of their bridgeheads into Ulster. For a time, the county passed out of English control and under the ultimate control of O'Neill. In 1601–02 the territory was reduced by the Elizabethan forces using a scorched-earth policy (Moore, 1956, pp.90–99).

Following the defeat of Hugh O'Neill and the Ulster chieftains in 1603, the Study Area was subject to plantation; however, unlike other counties, Monaghan was left in the hands of the loyal native chieftains, i.e. the McMahons and McKennas. Development of English controlled towns in the wider environs of the Study Area can be dated to the early seventeenth century. Following persistent attack from the local Gaelic tribes, travel between the Crown forces' outposts became hazardous. Edward Blayney, a Welsh soldier, appointed seneschal or governor of the county and who sat in the Irish House of Commons as MP for Monaghan, was tasked with erecting a small fort in Monaghan town where he garrisoned a company of foot soldiers (Lewis, 1837). Monaghan town also saw expansion around this time, with a street pattern radiating from its original marketplace.

The McMahons were centrally involved in the rebellion of 1641, which was organised by a small group of Gaelic Irish landowners and led to one of “the bloodiest episodes in the relationship between the islands of Ireland and Britain” (Robinson, 2017, p.225). Atrocities followed, and the 1641 Depositions kept in Trinity College Dublin contain the testimonies of 8,000 Protestant victims and survivors. Records detail massacres of large numbers of imprisoned Glaslough Protestants, Scottish settlers at Clones and mass drownings of men, women and children (Robinson, 2017, pp.236–40). The rebellion lasted seven months and ended with the formation of the Catholic Confederation in 1642 and is seen as the catalyst for the Confederate Wars of the subsequent decade and Oliver Cromwell’s ultimate recapturing of the country and restoration of English rule in the name of the new republican government. Vast numbers died during the rebellion and following decade from disease and starvation rather than massacres committed by both sides, with countrywide estimates of approximately one-third of Ireland’s population at the time (Haywood, 2009, p.120).

Following the Cromwellian conquest of Ireland, subsequent land confiscation and settlement meant that in 1657 lands in the Study Area that had been left to the native Irish were taken from the “Irish Papists” and given to the Cromwellian undertakers and soldiers for arrears of pay. Rushe notes that:

“the Cromwellian undertakers and soldiers do not appear to have taken root in the soil, and many of them sold estates, but both those who held on and the new purchaser preferred receiving rents from old tenants than bothering themselves with tilling the land. In a few localities the landlords brought in planters from other parts of Ulster, who were principally the sons and grandsons of the anglicised Scotch of James I period.... As a general rule the method of planting the land with alien tenants was not followed in County Monaghan, as it had been in other parts of Ulster. The manner was much more subtle and gave less cause for irritation by evicting an occasional tenant and gradually filling the vacant holdings with the descendants of planters, which was continued with occasional periods of cessation until the rise of the Land League in 1878-79” (Rushe, 1921, p.3).

The imposition of penal laws meant that Catholics were prohibited from holding land, possessing arms, keep schools, or teaching their religion. Catholics were prohibited from living in the towns of settlers, which have been compared to “small islands of settlers in a largely Gaelic rural landscape... in Monaghan and Carrickmacross Catholics were compelled to leave town after the curfew bell” (Duffy, 2017, p.288). These discriminatory laws resulted in the development of large settler leaseholds with middlemen tenants managing numerous smaller tenants in fragmented large estates, owned by often absentee landlords. A gradual relaxation of these laws saw merchants and traders join the commerce in these towns.

The estates established by absentee landlords in the seventeenth century became the location of the mansion homes and demesnes of the ascendancy class in the eighteenth century. The Study Area contains three large estates: Leslie (5,500 acres), Anketell (7,500 acres) and Rossmore (15,000 acres) and includes smaller estates c.500–1,000 acres in size. Fragmented properties and absentee landlords of the smaller estates resulted in variations in management and rental valuations. The larger estates such as Rossmore and Leslie enabled greater control of their properties and tenant population. The landscape in the area still reflects its tenancy history, primarily that of farm holdings in origin and layout (Duffy, 2017, p.290).

The region was among the hardest hit by the Great Famine with estimates that the population of Co. Monaghan was reduced by one-third between 1841 and 1851 due to starvation and emigration. Newspaper archives record hardship and large-scale evictions and reprisal murders of rent collecting agents. Fitzgerald notes that “the population loss was amongst the heaviest on the island. While excess loss mortality was certainly heavy by Ulster standards it remains likely that outward migration was the single greatest driver of this demographic decline” (Fitzgerald, 2017, p. 471).

Post Famine agricultural change in the latter half of the nineteenth century had a major impact on farming within the Study Area. In 1855 almost half of all agricultural land was devoted to tillage, with a focus on oats, potato and flax (feeding into the lucrative linen industry). Between 1880 and 1914, the focus shifted from tillage to pig and poultry production and again later in the early twentieth century with the introduction of the creamery system and the rearing and milking of dairy cows. These changes are reflective of the adaptable agricultural landscape of the Study Area.

4.2.6 Material Assets – Agriculture

4.2.6.1 Introduction

A summary of the key agricultural constraints for the N2 Clontibret to the Border Road Scheme is documented within this section of the report.

In the absence of TII Guidelines or Irish EIA guidance on the assessment of agricultural impacts, this assessment was prepared having regard to the following documents:

- Draft guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2017);
- Project Management Guidelines (TII, 2017); and
- Project Management Guidelines (NRA, 2010) Project Appraisal Guidelines (TII, 2016).

The assessment of the agricultural impact consisted of a desktop survey of available aerial photography mapping, land folio, Census of Agriculture Data, and a survey of publicly accessible lands and local knowledge of the Study Area. Land ownership information was not provided at this stage.

Consultation also took place with local Teagasc advisors, agricultural consultants along with representatives from the main farming organisations to compile information on agricultural enterprises within the Study Area.

Consultation with landowners was not undertaken at this stage therefore specific information in relation to farming systems is not known. Consultation with affected landowners will take place during the Phase 3 Design & Environmental Phase of the project. Both qualitative and quantitative assessments of the impacts to key agricultural enterprises within the Study Area were carried out.

4.2.6.2 Existing Environment

The N2 Clontibret to Border Study Area is located entirely in Co. Monaghan. The Study Area is mainly rural in nature and commences south of Clontibret, in the townland of Avalbane and continues north towards the border and terminates in Aghaderry. The land within the Study Area is primarily in agricultural use. Long term grassland pastures account for practically all of the land within the Study Area and land use is almost entirely grassland based. Farming practices are predominantly beef and or sheep related with some dairy farms located within the Study Area.

The farmland is good quality and suited to intensive farming. Intensive farming is carried out in the Study Area with some intensive dairy, beef and/or sheep farms dispersed throughout the Study Area.

4.2.6.3 Agriculture in County Monaghan

According to the Central Statistics Office (CSO) in the Census of Agriculture (2010), the total agricultural area of Co. Monaghan is 106,288ha excluding commonage. There are 4,565 farms with an average farm size of 23.3 ha which is considerably lower than the national average of 32.7ha.

Grassland based livestock farming is very important in Co. Monaghan. Some 3,115 farms (68% of total) are involved in specialised beef farming, while 98 farms are involved in specialised sheep farming and 599 farms are specialist dairy farms.

Cereals and other arable crops are of less significance in Co. Monaghan. Some 25 farms are specialist tillage farms and 728 farms are mixed enterprises. The Census of Agriculture collects information on the structural characteristics of agricultural holdings such as land use, farm size, and enterprise type every 10 years.

4.2.6.4 Agriculture within the Study Area

The data from the Central Statistics Office (CSO 2010) indicates four rural districts for Co. Monaghan, the rural district of Monaghan, Clones, Castleblayney, and Carrickmacross. The Study Area for the N2 Clontibret to Border Road scheme is situated in the rural district of Monaghan.

The total number of farms for the rural district of Monaghan is 1,737, the total area farmed (UAA) was 40,196 ha.

The main farming enterprises are grassland based with pasture, silage and hay accounting for 95.6% of land use. Crops account for 0.6% and rough grazing accounts 3.8% of land use.

The low level of rough grazing confirms the land is good quality land. The high level of pasture and silage demonstrates the intensive nature of farming within the Study Area.

The dominant agricultural use in the Study Area is beef and/or sheep farming. Dairy farms are located in the townlands of Glennyhorn, Mullagarry, Legacurry, Dungillick, Lisaginny, Drungolat, Aghalaverty, Culdaloo, Faulkland, Letgonnelly Carrigans, Billis Tonygarvey, Mullaghmore, Portinaghy, Corrygarry and Killycooley.

Poultry units were identified in the townlands of Corbeg, Mullinalog, Fedoo, and Lisgoah.

Pig and equine enterprises are located within the Study Area. There are also some areas of forestry within the Study Area.

Mushroom enterprises were identified in the townlands of Coolkill East, Drumduinney and Drummully.

4.2.6.5 Soils

Soil types influence the intensity of farming that can be carried out. In this section reference is made to the Irish Soil Information System digital data downloaded from the Irish Soil Information website in February 2020. Five main soil associations are identified within the Study Area. The most prevalent soil association in the south section of the Study Area is Duarrigle, the soil association Moorad is also present. Ballincurra, Kilrush and Clashmore are prevalent in the mid- Study Area while Kilrush soil association is prevalent in the northern section of the Study Area. Pockets of peat soil are dispersed throughout the Study Area.

Kilrush and Moorad soil associations are described as a fine loamy drift with siliceous stones. Duarrigle is described as a fine loamy over shale bedrock and Ballincurra is described as fine loamy over limestone. Clashmore is described as coarse loamy drift with siliceous stones. Moorad, Duarrigle, Ballincurra and Clashmore are all brown earth soils. Brown earth is a well-drained productive soil. Kilrush is a surface-water gley soil, gley soils tend to be gleyed at the subsurface horizon which can have a slow permeability. These soil associations are best suited to grass-based farming than arable cropping and the degree of drumlin slopes is a limitation for machinery use.

The land quality in the N2 Clontibret to Border Study Area is considered good with the land undulation ranging in height from 33m to 140m above ordnance datum.

4.2.7 Material Assets – Non-Agriculture

4.2.7.1 Introduction

This section identifies the key non-agricultural material assets in the project Study Area.

Material Assets can be defined as economic assets of natural and human origin, or cultural assets of a physical and social type, and therefore often include an assessment of the impacts of key infrastructure such as transport, waste management and utilities such as energy and water. However, these elements have been assessed as part of the engineering assessment and as a result, to avoid double counting have not been included in this assessment.

The Non-Agricultural Properties/Material Assets (receptors types) included in the assessment comprise the following:

- Commercial properties;
- Community properties – hospitals, schools, religious institutions, public parks, open spaces or lands that are used for recreation amenity; and
- Development land – lands or sites including lands zoned for development within the County Development Plan and/or with planning permission.

The purpose of the assessment on Human Beings is to identify locations where impacts on human beings and communities could potentially occur. This can include, but is not limited to, examining the impacts on the economy, business, tourism, amenities, the views of public bodies and local interest groups, and community facilities and the like.

Therefore, the Human Beings aspects are covered under the Material Assets (Non-Agricultural) assessment.

Residential properties are not included in this section as they have already been considered as part of the Air Quality and Noise sections. Residential properties are important non-agricultural properties but similarly to infrastructure, inclusion in this section would result in double counting in the assessment.

In the absence of TII Guidelines or EIA guidelines for the assessment of Non-Agricultural Material Assets, this assessment has been completed considering the DMRB Sustainability and Environmental Appraisal Guidelines for Population and Human Health.

The following datasets were used to assess the impact on Non-Agricultural Material Assets:

- Aerial photography and mapping of Study Area (GSI, OSI and online sources);
- Surveys from publicly accessible lands;
- Monaghan County Development Plan (2019 – 2025) (<https://monaghan.ie/planning/new-county-development-plan/>)
- Louth County Development Plan (2015 – 2021) (<https://www.louthcoco.ie/en/publications/development-plans/louth-county-council-development-plans/louth-county-development-plan-2015-2021.html>)

4.2.7.2 Existing Environment - Key Communities

The Study Area is mainly rural in nature and the largest key communities include Monaghan, the largest town in County Monaghan. Monaghan is identified as a Tier 1 Principal Town; it is a key County Town that occupies a strategic border location along the Dublin to Letterkenny/Derry City corridor, and adjacent to the Dublin/Belfast eastern economic corridor. The draft Regional Spatial and Economic Strategy (RSES) recognises its importance as an economic driver in the Central Border Region and how it is crucial that it continues to expand seamless cross border links, aided by, for example the upgrade of the N2 / A5.

There are smaller settlements within the Study Area including Emyvale village and the rural settlements of Clontibret, and Knockconan.

4.2.7.3 Existing Environment - Zoned Land

A small area of lands which are zoned for development within the Monaghan County Development Plan 2019-2025 are within the Study Area. These lands are within Monaghan; the key zoned land types are the following (and are illustrated in Figure 4-10 below):

- Proposed Residential;
- Industry / Enterprise / Employment.
- Landscape Protection/Conservation;
- Existing Residential;
- Strategic Residential Reserve;

- Existing Commercial;
- Community Services / Facilities; and
- Industry / Enterprise / Employment.

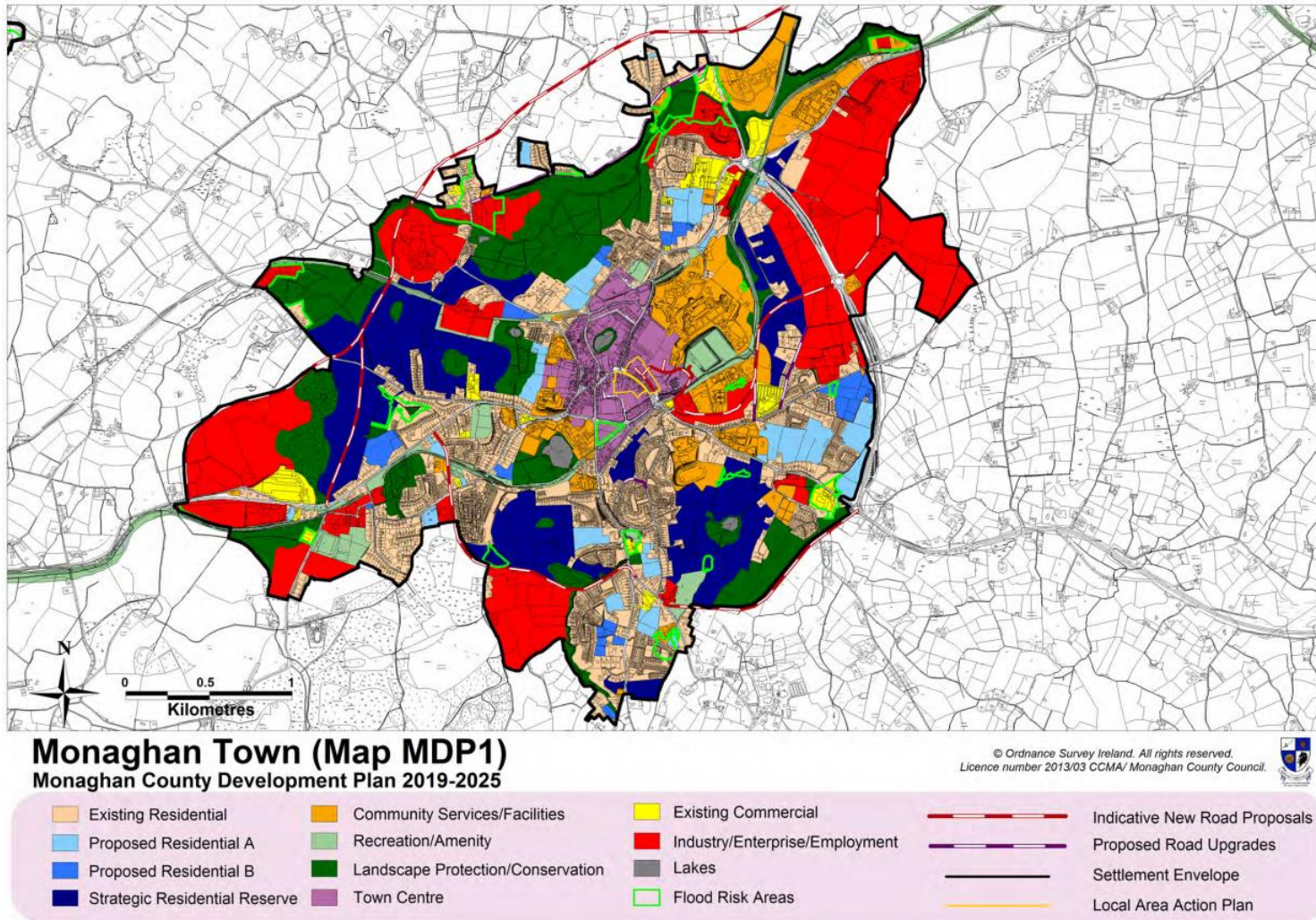


Figure 4-10: Monaghan Town Zoned Lands

4.2.7.4 Key Receptors

Identified community assets collated from the desktop and windscreen survey are mapped in Figure 10.1 (Volume 2, Part B of this Option Selection Report). Significant receptors within the Study Area are detailed in Table 4-22 below.

Community Assets	Receptor Category	Sensitivity Rating	Rationale
Corracrin Primary School	School	High	Key Educational Building with a high level of frequent use (daily by pupils and staff). Pupils may have little capacity to experience change without resulting in disruption to the quality of their education.
Corracrin Church	Place of Worship	High	Key Religious Building with a high level of frequent use (weekly or more). The church would have little capacity to experience change without resulting in disruption to the quality and integrity of its use.
St. McCartan's College	School	High	Key Educational Building with a high level of frequent use (daily by pupils and staff). Pupils may have little capacity to experience change without resulting in disruption to the quality of their education.
Monaghan Collegiate School	School	High	Key Educational Building with a high level of frequent use (daily by pupils and staff). Pupils may have little capacity to experience change without resulting in disruption to the quality of their education.
Scoil Naomh Mhuire	School	High	Key Educational Building with a high level of frequent use (daily by pupils and staff). Pupils may have little capacity to experience change without resulting in disruption to the quality of their education.
Knockconan N S	School	High	Key Educational Building with a high level of frequent use (daily by pupils and staff). Pupils may have little capacity to experience change without resulting in disruption to the quality of their education.
The Billis National School	School	High	Key Educational Building with a high level of frequent use (daily by pupils and staff). Pupils may have little capacity to experience change without resulting in disruption to the quality of their education.
Scoil Bhríde	School	High	Key Educational Building with a high level of frequent use (daily by pupils and staff). Pupils may have little capacity to experience change without resulting in disruption to the quality of their education.
St Mary's Church, Knockconan	Place of Worship	High	Key Religious Building with a high level of frequent use (weekly or more). The church would have little capacity to experience change without resulting in disruption to the quality and integrity of its use.
St. Sillian's Church	Place of Worship	High	Key Religious Building with a high level of frequent use (weekly or more). The church would have little

Community Assets	Receptor Category	Sensitivity Rating	Rationale
			capacity to experience change without resulting in disruption to the quality and integrity of its use.
Glennan Presbyterian Church	Place of Worship	High	Key Religious Building with a high level of frequent use (weekly or more). The church would have little capacity to experience change without resulting in disruption to the quality and integrity of its use.
St Mary's Church, Glennan, Emyvale	Place of Worship	High	Key Religious Building with a high level of frequent use (weekly or more). The church would have little capacity to experience change without resulting in disruption to the quality and integrity of its use.
St. Maudain's Church	Place of Worship	High	Key Religious Building with a high level of frequent use (weekly or more). The church would have little capacity to experience change without resulting in disruption to the quality and integrity of its use.
St. Maudain's Church Graveyard	Place of Worship	High	Key Religious Building with a high level of frequent use (weekly or more). The church would have little capacity to experience change without resulting in disruption to the quality and integrity of its use.
Castleshane Demesne	Local Recreational / Community	Medium	Local recreational site. Users would have an average capacity to experience changes without resulting in disruption to the quality and integrity of the receptor.
Clontibret Community Centre	Local Community	Medium	Local community centre with frequent use (for some it may be daily but for the majority of the community it would be weekly to monthly). Users would have an average capacity to experience the change without resulting in disruption to the quality and integrity of the receptor. There are some limited alternatives in adjacent communities.
Tyholland Community Centre	Local Community	Medium	Local community centre with frequent use (for some it may be daily but for the majority of the community it would be weekly to monthly). Users would have an average capacity to experience the change without resulting in disruption to the quality and integrity of the receptor. There are some limited alternatives in adjacent communities.
Renaghan's Pub	Local Commercial	Low	Local business where users would have an adequate capacity to experience the change without resulting in disruption to the quality and integrity of the receptor.
Circle K Petrol Station, Mullamurphy	Local Commercial	Low	Local business where users would have an adequate capacity to experience the change without incurring significant impact. There are several alternative facilities available within the same community or at a local level within the wider community.

Community Assets	Receptor Category	Sensitivity Rating	Rationale
Dunmoran Service Station	Local Commercial	Low	Local business where users would have an adequate capacity to experience the change without incurring significant impact. There are several alternative facilities available within the same community or at a local level within the wider community.
McAnenlys Service Station Moybridge	Local Commercial	Low	Local business where users would have an adequate capacity to experience the change without incurring significant impact. There are several alternative facilities available within the same community or at a local level within the wider community.
Blackwater Cottage Restaurant	Local Commercial	Low	Local business where users would have an adequate capacity to experience the change without resulting in disruption to the quality and integrity of the receptor.
Tyholland GFC	Local Recreational / Community	Low	Local recreational/sports facility. where users would have an adequate capacity to experience the change without resulting in disruption to the quality and integrity of the receptor.
Glaslough Villa GFC	Local Recreational / Community	Low	Local recreational/sports facility. where users would have an adequate capacity to experience the change without resulting in disruption to the quality and integrity of the receptor.
Truagh GFC	Local Recreational / Community	Low	Local recreational/sports facility. where users would have an adequate capacity to experience the change without resulting in disruption to the quality and integrity of the receptor.

Table 4-22: Receptors and Sensitivity

4.2.8 Planning Control

The relevant national, regional, local development policies and their context is discussed in section 4.2.1 of this report. Land zoning in the Study Area is shown on Figure 10.7 contained in Volume 2 Part B Constraints Drawings. Planning permissions granted within the Study Area within the last 5 years is shown on Figure 10.8 contained in Volume 2 Part B Constraints Drawings. This gives an indication of the range of development activity that is currently proposed within the study area

4.2.9 Utilities

The location of utilities data within the Study Area have been obtained through freely available data sets provided by the various bodies listed below:

- Monaghan County Council
- ESB Networks
- ESB Telecoms
- Gas Networks Ireland
- Irish Water
- Open Eir

- Virgin Media
- Comreg

The information received from the bodies listed above are presented in Figures 10.3 – 10.6 contained in Volume 2 Part B Constraints Drawings.

4.2.9.1 ESB Networks

ESB Networks' network is shown on Figure 10.4 contained in Volume 2 Part B. Within the Study Area approximately 2.5km east of Monaghan Town and approximately 1km north of the existing N2 lies the Lisdrum 110kV Substation. Due to the size of substation and its location within the Study Area boundary there are numerous high voltage (HV) and Medium voltage (MV) overhead line (OHL) routes converging/diverging from this location.

From the Lisdrum 110kV substation two 110kV OHL's are present, the first which travels in a general southwest direction crossing the existing N2 approximately 2.5km east of Corlat roundabout and then exiting the Study Area via the southwest boundary where it ultimately connects to the 110kV substation located to the west of Cavan Town. The second 110kV OHL travels from the Lisdrum Substation in a general south-southeast direction crossing the existing N2 approximately 3km east of Corlat Roundabout exiting the Study Area via the southern boundary where it ultimately connects to the 220kV substation located at Moavallet in Co. Louth. In addition, there are a number of 38kV OHL within the Study Area. From the Lisdrum 110kV substation a 38kV OHL commences and finishes where it and forms a ring around Monaghan Town and also connects to the Telaydon 38kV substation located to the northwest of Monaghan Town. This OHL crosses the existing N2 approximately 1.5km east of Corlat and again to north approximately 1km north of the Coolshannagh Roundabout. From the Telaydon 38kV substation a 38kV travels in northwest direction exiting the Study Area through the west boundary at Derrilla.

In addition to the above HV and MV lines, there is an extensive LV distribution network throughout the Study Area. As described above, the Study Area contains a number of significant ESB transmission lines where OHL routes cross the Study Area in its entirety. The greatest concentration of such cables is in the southeast of the Study Area.

4.2.9.2 Gas Networks Ireland

Gas Network Ireland network is shown on Figure 10.6 contained in Volume 2, Part B of the Option Selection Report. As the Study Area is predominantly rural, there are no Gas Mains within the area.

4.2.9.3 Potable and Wastewater Networks

Irish Water potable and sewer water together with various group water schemes are shown on Figure 10.3 contained in Volume 2 Part B of the Option Selection Report. Due to the rural and dispersed nature of the development patterns within this section of the Study Area the potable water supply is dominated by various group water schemes (GWS). In and around the urban centres of Clontibret, Monaghan Town and Emyvale Irish Water are the primary provider. The coverage by potable water mains is extensive and follows the road network closely. The watermains within this section of the Study Area are general standard size for distribution ranging from 100mm – 150mm. The GWS located within the Study Area are namely:

- Aughnashalvey GWS located in a small pocket along the western boundary of the Study Area
- Glaslough GWS located in the east of the Study Area
- Stronoodan GWS located to the South of the Study Area
- Tydavnet GWS located to West and North West of the Study Area
- Truagh GWS located to the North of the Study Area

In addition, within the Study Area there are three potable water treatment (WTP) plants namely:

- Crosses Water (Milltown) Treatment Plant located approximately 0.5km northwest of Monaghan Town within the Study Area

- Lambs Lake Water Treatment Plant located Approximately 0.5km north of Monaghan Town within the Study Area
- Emyvale Water Treatment Plant Located adjacent to Grove Lough 1km south of Emyvale.

Crosses WTP and Lambs Lake WTP are located off the L16302-0 and service Monaghan Town and the surrounding areas. A large 450mm trunk watermain is located within the L16302-0 and extends and services the north of Monaghan Town. This main continues onward to the east along the N12 as a 300mm watermain. Also, to the west of Crosses WTP and Lambs Lake WTP a 400mm trunk watermain extends west along the L 1610-0 and connects to the neighbouring town of Ballinode. Lastly, to the south of Crosses WTP and Lambs Lake WTP a 400mm trunk water main extends south along the western edge of Monaghan Town serving the west and south of the town. The main then extends from the south west side of Monaghan Town along the R189 before following the L6420 and exiting the Study Area through the south west boundary and ultimately connecting to Togan WTP located outside the Study Area.

Emyvale Water Treatment Plant is located on the L1160-0 and services Emyvale and the surrounding areas. A number of trunk watermains are located in the surrounding road network and they follow the existing N2 to Emyvale.

Regarding wastewater collection systems, these are generally confined to the urban areas of Monaghan Town, Emyvale, Clontibret with schemes also in Ballinode and Tyholland. Six wastewater treatment plants (WWTP) are located within the Study Area, namely:

1. Emyvale WWTP
2. Tedavnet WWTP
3. Ballinode WWTP
4. Knockacony WWTP
5. Tyholland WWTP
6. Clontibret WWTP

Emyvale WWTP is located to the south east of Emyvale approximately 250m east of the existing N2. The WWTP services the central urban areas of the town as well as the immediate residential developments.

Tydavnet WWTP is located in the mid-west of the Study Area, 300m east of the village of Tydavnet and approximately 3km west of the existing N2. The WWTP is accessed from the L1171-0. The WWTP services the central urban areas of the village.

Ballinode WWTP is located on the extreme western boundary of the Study Area just east of Ballinode. The WWTP services the central urban areas of the village.

Knockaconny WWTP is located to the northeast of Monaghan Town adjacent to the N12, approximately 1km east of its intersection with N2 at Coolshannagh Roundabout. The WWTP services the immediate local area.

Tyholland WWTP is located to the east of the Study Area adjacent to the N12, approximately 4.5 km east of its intersection with N2 at Coolshannagh Roundabout. The WWTP services the immediate local area.

Clontibret WWTP is located to the south east of the Study Area north of Clontibret West of the existing N2. The WWTP services the immediate local area

While difficult to not interact with general distribution mains, trunk mains (where possible) should be avoided due to their strategic nature, cost and extensive lead times if modification is deemed required. In addition, major infrastructure associated with treatment plants should also be best avoided where possible.

4.2.9.4 Telecommunication

The various telecommunication fibre networks within the Study Area are shown on Figure 10.5 contained in Volume 2 Part B of the Option Selection Report. There are seven Open Eir fibre optic lines within the Study Area primarily radiating from Monaghan Town. To the north of Monaghan Town two lines travel in a northerly direction. The first of which loosely follows the N2 north and terminates in Emyvale. The second initially travels east along the N54 and N12 for approximately 2.2kms and then travels northwards exiting the Study Area through the northeast boundary at Drumarrell ultimately entering and crossing the Northern Ireland Border. To the east of Monaghan Town, a third line loosely follows the existing N2 in a south east direction ultimately terminating at Clontibret. To the south of Monaghan Town two lines travel in a southerly direction. The first of the southern lines loosely follows the L 5530-0 and exits the Study Area through the southern boundary. The second southern line loosely follows the R162 and exits the Study Area through the southern boundary. To the west of Monaghan Town two further lines emanate from the town. The first of which travels in a south-westerly direction loosely following the N54 exiting the Study Area via the southwest boundary at Trimadown and ultimately continuing to Clones and beyond. The second of the westerly lines loosely follows the R186 exiting the Study Area through the western boundary at Ballinode.

Within the Study Area boundary there are several telecommunication masts used by telecommunication companies such as mobile phone service providers. Comreg, the Irish communication regulator, provides access to mapped data of mast locations throughout the country⁴¹. In total there are 14 mast structures within the Study Area. The majority are located adjacent to the existing National and Regional corridors within the Study Area.

Monaghan has benefited from the recently completed Project Kelvin linking Monaghan Town to high speed broadband. Also, Metropolitan Area Networks (MANs) have been provided in the towns of Monaghan, Carrickmacross, Clones and Castleblayney, which is allowing licensed telecom providers to connect their services and provide high speed broadband to commercial premises and buildings. The Monaghan Development Plan 2019 -2025 contains the telecommunication objective

TC01 "To facilitate the development of a high quality and sustainable telecommunications network for County Monaghan to support economic growth, improve quality of life and enhance social inclusion"

In tandem with the above, the County Development Plan provides three Telecommunication Policies to promote and support the expansion and provision of high capacity information communication technology within the county

"TCP 1 To support the delivery of high capacity Information Communications Technology Infrastructure and broadband connectivity throughout the county, in order to promote economic competitiveness and to facilitate more flexible work practices".

"TCP 2 To co-operate with the Department of Communications, Energy and Natural Resources and public and private agencies where appropriate, in improving high quality broadband infrastructure throughout the County".

TCP 3 To achieve a balance between facilitating the provision of telecommunications infrastructure in the interests of economic and social progress and maintaining residential amenity and environmental quality

In addition to the County Development Plans support for telecommunication provision, it is also addressed within The National Planning Framework, Project 2040 under National Policy objective 24

"Support and facilitate delivery of the National Broadband Plan as a means of developing further opportunities for enterprise, employment, education, innovation and skills development for those who live and work in rural areas"

⁴¹ Data obtained from Comreg website <https://siteviewer.comreg.ie/> accessed on May 20th 2020

Also, under National Objective 48

“In co-operation with relevant Departments in Northern Ireland, develop a stable, innovative and secure digital communications and services infrastructure on an all-island basis”

The above objectives and policies lead a path for further telecommunication infrastructure to be installed throughout the counties within both urban and rural environments.

4.2.10 Air Quality & Climate

4.2.10.1 Introduction

This section describes the receptors sensitive to changes in relation to Air Quality and Climate which have the potential to be impacted by the N2 Clontibret to the Border Road Scheme.

The Air Quality assessment has been conducted in accordance with the relevant guidance and requirements contained in the following documents:

- Transport Infrastructure Ireland (TII) (2011) Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes;
- UK Design Manual for Roads and Bridges (DMRB) Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 1 LA 105 Air quality (UK Highways Agency 2019);
- EC Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the “Habitats Directive”;
- UK DEFRA (2007) Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1 - HA207/07 (Document & Calculation Spreadsheet)

4.2.10.2 Existing Environment - Air Pollution Sources

The major source of air pollution within the Study Area is road traffic, predominantly that from the existing N2. Air quality is variable and subject to significant spatial variation, with concentrations generally falling significantly with distance from major road sources. The highest levels of air pollution are experienced along the existing N2 with the remainder of the Study Area generally experiencing rural background concentrations of pollutants.

A review of IPPC/IED licences issued by the EPA for the region show that there are a number of IPPC/IED licenced facilities with emissions to the atmosphere within the Study Area for this project (EPA, 2019a).

- Woodland Products Limited. NO_x and PM emissions. Licence: P0198. Location: Drumully, Emyvale, Monaghan;
- Mr Trevor McBride. No significant emissions to Air. Licence: P1036. Location: Mullagarry, Castleshane, Monaghan;
- IJM Timber Engineering Limited. NO_x and PM emissions. Licence: P0363 Location: Latlurcan, Monaghan, Monaghan; and
- Lacpatrick Dairies Limited. Licence: NO_x and PM emissions. Licence: P0815. Location: Coolshannagh, Monaghan, Monaghan.

4.2.10.3 Meteorological Data

A key factor in assessing temporal and spatial variations in air quality are the prevailing meteorological conditions. Depending on wind speed and direction, individual receptors may experience very significant variations in pollutant levels under the same source strength (i.e. traffic levels) (World Health Organisation, 2006). Wind is of key importance in dispersing air pollutants and for ground level sources, such as traffic emissions, pollutant concentrations are generally inversely related to wind speed. Thus, concentrations of pollutants derived from traffic sources will generally be greatest under very calm conditions and low wind speeds when the movement of air is restricted. In relation to PM₁₀, the situation is more complex due to the range of sources of this pollutant. Smaller particles (less than PM_{2.5}) from traffic sources will be dispersed more rapidly at higher wind speeds.

However, fugitive emissions of coarse particles (PM_{10} - $PM_{2.5}$) will actually increase at higher wind speeds. Thus, measured levels of PM_{10} will be a non-linear function of wind speed.

There are no meteorological stations in close proximity to the scheme. Ballyhaise meteorological station is the most representative station available. It is located approximately 35km south west of Clontibret.

Long-term hourly observations at Ballyhaise meteorological station provide an indication of the prevailing wind conditions for the region⁴². Results indicate that the prevailing wind direction is south-westerly to westerly in direction with a mean wind speed of approximately 3.2 m/s over the period 2014-2019.

4.2.10.4 EPA Monitoring Data and Background Concentrations

As part of the implementation of the Framework Directive on Air Quality (1996/62/EC), four air quality zones have been defined in Ireland for air quality management and assessment purposes. In terms of air monitoring, the Study Area is categorised as Zone D (rural areas and towns with a population of less than 15,000).

Air quality monitoring programs have been undertaken throughout Ireland in recent years by the EPA and Local Authorities. The most recent EPA annual report on air quality monitoring undertaken throughout Ireland is entitled "Air Quality in Ireland 2018" (EPA, 2019a). The TII Guidelines (2011) state that the local air quality assessment should focus on NO_2 and PM_{10} , as these are the pollutants of greatest concern with respect to road traffic conditions. A review of data from representative Zone D locations in Ireland can be used to provide an indication of the prevailing air quality conditions within the Study Area.

NO_2 monitoring was carried out at two rural Zone D locations in Emo and Kilkitt in recent years (EPA, 2019a). The NO_2 annual average in 2018 was $3 \mu g/m^3$ at both rural sites. Hence long-term average concentrations measured at all locations were significantly lower than the annual average limit value of $40 \mu g/m^3$. The maximum 1-hour limit value of $200 \mu g/m^3$ (measured as a 99.8th percentile i.e. 18 exceedances are allowed per year) was not exceeded in any year for any of the Zone D locations. The average results at rural Zone D locations over the last five years suggests an average of $3 \mu g/m^3$ as a background concentration. Based on the above information, a conservative estimate of the current background NO_2 concentration for the region of the scheme is $5 \mu g/m^3$.

Long-term PM_{10} measurements carried out at the rural Zone D location in Kilkitt in 2018 gave an average level of $9 \mu g/m^3$ (EPA, 2019a). Results are also available for Kilkitt to observe the trend in concentrations over the last five years. The average result at Kilkitt over the last five years is $9 \mu g/m^3$. Based on the above information, a conservative estimate of the current background PM_{10} concentration for the region of the scheme is $10 \mu g/m^3$.

The results of $PM_{2.5}$ monitoring at Claremorris in 2018 indicated an average $PM_{2.5}/PM_{10}$ ratio of 0.50. Results are also available for Claremorris to observe the trend in $PM_{2.5}/PM_{10}$ ratios over the last five years. The average result at Claremorris over the last five years is $0.54 \mu g/m^3$. Based on this information, a conservative ratio of 0.6 was used to generate a background $PM_{2.5}$ concentration for the region of the scheme of $6 \mu g/m^3$.

4.2.10.5 Impacts on Sensitive Receptors

Receptors for the purpose of this assessment are regarded as residential buildings. These have been located in the Study Area through mapping and GeoDirectory.

4.2.10.6 Impacts on Sensitive Ecosystems

The EC Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the "Habitats Directive") requires an Appropriate Assessment to be carried out where there is likely to be a significant impact upon a European protected site. TII requires the Air Quality Specialist to liaise with an ecologist on schemes where there is a European protected site within 2km of a route option. However, as the potential impact of a scheme is limited to 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. Where these two requirements are fulfilled, the assessment at the option selection stage involves a calculation of nitrogen oxides (NO_x) concentrations using the UK DMRB screening method as recommended by TII (2011). The Proposed Natural

⁴²Met Eireann (2020) Met Eireann website www.met.ie

Heritage Area (pNHA) at Emy Lough Wildfowl Sanctuary is one such sensitive ecosystem within the study area. It is located approximately 1km to the east of Emyvale.

4.2.10.7 Climate Change

According to the Environmental Protection Agency⁴³, transportation account for about 20% of Ireland's greenhouse gas emissions – agriculture is responsible for 34%, energy production 17%, residential 10% and the remainder is a mixture of industrial, commercial and a very small amount of natural sources. In road transport in 2018, petrol use decreased by 9.2% while diesel use increased by 4.6% and biofuels use decreased by 4.0%. Looking at the underlying drivers, the number of passenger diesel cars increased by 7.7% in 2018 while the number of passenger petrol cars decreased by 4.5%, commercial vehicle numbers increased by 1.7% and employment grew by 2.3% between Q4 2017 and Q4 2018 (latest data available at the timing of writing).

The Environment Protection Agency⁴⁴ has identified that despite increasing use of public transport, the private car remains the dominant mode of transport in Ireland, accounting on average for 74% of all journeys, rising to 79% outside of Dublin. The roads network is an essential piece of national public infrastructure that has developed to serve the settlement patterns unique to Ireland, which is characterised by a large proportion of rural clusters, one-off housing and ribbon development along roads. A key challenge, therefore, is to balance connectivity and sustainable settlement patterns with ensuring that the rural population has access to employment and services to avoid social exclusion.

The 2016 Paris Agreement sought to strengthen the global response to climate change, restricting temperature increases to 2°C over pre-industrial levels. The EU committed to a reduction of 40% in Greenhouse Gas emissions by 2030. The Irish Government set the target of a 20% reduction on 2005 levels by 2020, and a minimum of 80% reduction on 1990 levels by 2050⁴⁵.

In 2019, the Government has declared a Climate Emergency making it the second country in the world to do so. The 2019 Climate Action Plan⁴⁶ for the nation set out a wide range of measures to meet Ireland's targets across all sectors, including transportation. By 2030 Ireland was committed to 100% of all new cars and vans being electric vehicles with an eventual ban on all new petrol and diesel vehicles. This will mean a significant decrease in emissions as a result of vehicles.

Part of TII's overarching strategy is to ensure the national road infrastructure is safe, sustainable and resilient. Part of this requires the assessment of the environmental impact of roads schemes in line with the 2014 EIA Directive and the national EIA Regulations. A robust assessment allows for climate change to be considered alongside other interrelated environmental factors including air quality, soils and geology, biodiversity, surface and groundwater, noise and vibration, and population and human health. Examples of practical steps for mitigating the potential climate impact of road schemes at construction stage include the recycling/reuse of pre-existing road materials and the use of materials produced as close to the scheme location as possible.

4.2.11 Noise & Vibration

4.2.11.1 Introduction

This section describes the receptors sensitive to changes in Noise and Vibration which have the potential to be impacted by the N2 Clontibret to the Border Road Scheme.

The noise assessment has been conducted in accordance with the relevant guidance and requirements contained in the TII documents:

- Guidelines for the Treatment of Noise and Vibration in National Road Schemes (TII 2004);

⁴³ <http://www.epa.ie/ghg/transport/>

⁴⁴ https://www.epa.ie/media/Chapter10_Environment_Transport.pdf

⁴⁵ <https://www.oireachtas.ie/en/committees/32/climate-action/>

⁴⁶ <https://static.rasset.ie/documents/news/2019/06/climate-action-plan.pdf>

- Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (TII 2014);
- TII Project Management Guidelines 2010; and
- TII Project Appraisal Guidelines (TII PAG) for National Roads Unit 7.0 - Multi Criteria Analysis PE-PAG-02031, October 2016.

4.2.11.2 Existing Environment

The baseline noise environment in the vicinity of existing noise sensitive locations (NSLs) adjacent to the existing N2 road will be dominated by road traffic movements along the existing N2. The round 3 road traffic noise maps published by the EPA⁴⁷ as part of the Environmental Noise Regulations have been reviewed to determine the range of predicted traffic noise in the vicinity of the existing section of the N2 under consideration within this Study Area. These maps indicate that road traffic noise levels are typically greater than 60dB L_{den} within 50m from the edge of existing section of the N2.

Noise sensitive locations away from the existing N2 are influenced by distant traffic along the N2, local traffic movements, agricultural activity, and other anthropogenic noise sources typical of rural and semi-rural areas and in turn the Study Area under consideration. A full and detailed baseline noise survey will be undertaken in accordance with TII Guidelines at EIAR stage.

4.2.12 Human Beings

The purpose of the assessment on Human Beings is to identify locations where impacts on human beings and communities could potentially occur. This can include, but is not limited to, examining the impacts on the economy, business, tourism, amenities, the views of public bodies and local interest groups, and community facilities and the like. There is no single definitive list of environmental topics for inclusion in an Environmental Impact Assessment process. The 2014 Environmental Impact Assessment Directive (2014/52/EU) as transposed into Irish law, outlines factors for inclusion in an Environmental Impact Assessment Report (which will be completed at Phase 3). These factors have been elaborated on by TII and EPA guidelines and professional judgement plays a role. Human Beings is covered by the following topics: Air Quality and Climate, Noise, Landscape and Visual, Material Assets (non-agricultural), Agriculture, and Physical Activity.

⁴⁷ Environmental Protection Agency (EPA) - Noise Round 3 Road – L_{den} [Online Maps] Available from gis.epa.ie/EPAMaps/ [Accessed 24 April 2020]

4.3 External Parameters

4.3.1 Funding & Scope

The N2 Clontibret to Border is currently being brought through Phases 0 to 4 of the TII Project Management Guidelines see (Figure 4-11 below). The project is not currently committed or funded beyond Phase 4



Figure 4-11: TII Project Management Guidelines' Project Phases (Excerpt from TII PMGs)

The scope of this Constraints Study is based on the current defined Study Area which was fixed at the time of writing. At the time of writing there were no proposed changes to the scope of the project and therefore has been assessed as such.

In terms of funding, it has been assumed at this initial stage that the N2 Clontibret to Border Road Scheme will be 100% Irish Exchequer funded. EU grants or developer contributions have not been identified at this stage.

The exact location of the start and end points of the proposed N2 Clontibret to Border Road Scheme will be determined during the later stages of the planning and design of the Scheme. For the purposes of the option comparative assessment, a starting point of the existing N2/R184 roundabout has been assumed together with an end point at the existing N2 border crossing with Northern Ireland.

The proposed scheme is not dependent on the delivery of any other scheme. It is intended that the delivery of the scheme will be such that its implementation can be carried out without dependency on any other scheme.

4.3.2 Construction Phasing

The proposed N2 Clontibret to Border Road Scheme is being delivered in accordance to TII's PMGs and PAGs. TII PMGs provide a framework for a phased approach to the management, development and delivery of National Road and Public Transport Capital Projects in Ireland. The PMG's divide the evolution and progression of a Project into an eight-phase process (Phase 0 to Phase 7 inclusive) as per Figure 4-11 above.

The proposed scheme is currently at TII PMG Phase 2 (Option Selection). In terms of immediate subsequent TII PMG Phases (i.e. Phase 3 – Design and Environmental Evaluation and Phase 4 – Statutory Processes), and subject to necessary approvals, it is currently envisaged as part of Phase 4 that the planning submission and Statutory Orders for the proposed scheme would be submitted in 2022. In terms of the later construction and implementation phases (TII PMG Phases 5 – 7), the programme for these phases are subject to necessary approvals

and are yet to be fully determined. For purposes of the traffic modelling assessment the Phase 2 cost estimation and scheme appraisal a mid-construction date of 2026 and Opening Year of 2027 have been initially identified. As part of TII PMG Phase 3 (Design and Environmental Evaluation), the overall programme of the proposed scheme, along with the dates of mid-construction and the Opening Year will be reviewed again, and updated, if required

In relation to phasing and methodology of the construction works, potential implementation measures will be identified and assessed as part of TII PMG Phase 3 (Design and Evaluation), where potential environmental impacts will be further assessed, and mitigation requirements identified. The exact phasing and methodology of the construction will be identified and developed by the Contractor in accordance with statutory requirements in the latter construction and implementation phases. At this initial stage of the scheme development, and in the context of the Preferred Option, it is envisaged that elements of the construction works will interface with existing live traffic, requiring temporary traffic management (including temporary road diversions) and temporary road works.

4.3.3 Required Levels of Service

As outlined in section 4.2.3.11 above many parts of the existing N2 Clontibret to Border traffic volumes are approaching the limit advised by TII in their design standard Rural Road Link Design (DN-GEO-03031) for a minimum Level of Service "D". The Traffic Model developed for the assessment of the N2 Clontibret to Border Road Scheme as outlined in Volume 1 Chapter 4 of the Option Selection Report indicates that in Do Minimum Design Year scenario 2042 this Level of service D will be breached for the majority of the existing route. This will lead to increased and unreliable journey times through increased congestion. It will also lead to greater risk to road users leading to increased collisions and collision severity. Such a scenario would not meet a number of the Scheme Objectives namely; the Safety, Accessibility & Social Inclusion, the Integration Scheme Objectives (See Section 1.5 of this Report).

Therefore, as outlined in TII's standard for Rural Road Link Design (DN-GEO-03031) the minimum acceptable LOS expected on the National Road network is "D" and shall be the minimum aim for the proposed scheme within the its forecasted Design Year of 2042.

4.3.4 Technical Standards

The proposed scheme will follow the process as set down by TII in its Project Management Guidelines 2017 (PE-PMG-02041) and Project Manager's Manual for Major National Road Projects 2019 (PE-PMG-02042) together with the latest TII Project Appraisal Guidelines. The design will be in accordance with the requirements of the TII Design Standards and the Manual of Contract Documents for Road Works (TII MCDRW). in particular but not limited to the following standards list below in Table 4-23;

TII Number	TII Publication Title
DN-DNG-03022	Drainage Systems for National Roads (including Amendment No. 1 dated June 2015)
DN-DNG-03061	Design of Outlets for Surface Water Channels (including Amendment No. 1 dated June 2015)
DN-DNG-03062	Edge of Pavement Details (including Amendment No. 1 dated June 2015)
DN-DNG-03063	Vegetated Drainage Systems for Road Runoff (including Amendment No. 1 dated June 2015)
DN-DNG-03064	Drainage of Runoff from Natural Catchments (including Amendment No. 1 dated June 2015)
DN-DNG-03065	Road Drainage and the Water Environment (including Amendment No. 1 dated June 2015)
DN-DNG-03066	Design of Earthworks Drainage, Network Drainage, Attenuation & Pollution Control
DN-DNG-03067	Spacing of Road Gullies (including Amendment No. 1 dated June 2015)
DN-DNG-03068	Hydraulic Design of Road-Edge Surface Water Channels (including Amendment No. 1 dated June 2015)

DN-DNG-03070	Determination of Pipe and Bedding Combinations for Drainage Works (including Amendment No. 1 dated June 2015)
DN-DNG-03071	Design of Outfall and Culvert Details (including Amendment No. 1 dated June 2015)
DN-DNG-03072	Design of Soakaways (including Amendment No. 1 dated June 2015)
DN-DNG-03073	Grassed Surface Water Channels for Road Runoff (including Amendment No. 1 dated June 2015)
DN-ERW-03083	Managing Geotechnical Risk
DN-GEO-03031	Rural Road Link Design
DN-GEO-03036	Cross Sections and Headroom
DN-GEO-03040	Subways for Pedestrians and Pedal Cyclists Layout and Dimensions
DN-GEO-03041	The Design of Major Interchanges
DN-GEO-03060	Geometric Design of Junctions (priority junctions, direct accesses, roundabouts, grade separated, and compact grade separated junctions)
DN-PAV-03021	Pavement & Foundation Design
DN-PAV-03026	Footway Design

Table 4-23 TII Technical Standards

The above list will be added to from the list of TII publication available from www.tiipublications.ie or removed as deemed necessary as the scheme is progressed through Phase 3.

Where alterations are deemed necessary to various statutory undertakers' assets, these will be carried out in accordance with the relevant design standard and guidance advised by each effected statutory undertaker.

4.3.5 Access Control

Under Section 28 of the Planning and Development Act 2000-2010 the Department of Environment Community and Local Government published Guidelines on the Spatial Planning and National Road 2012. One of key principals stated in the above document is;

“Proper planning is central to ensuring road safety: The creation of new accesses to and intensification of existing accesses to national roads gives rise to the generation of additional turning movements that introduce additional safety risks to road users. Therefore, from a road safety perspective, planning authorities, the NRA, road authorities and the Road Safety Authority must guard against a proliferation of roadside developments accessing national roads to which speed limits greater than 50-60 kmh apply as part of the overall effort to reduce road fatalities and injuries”

As discussed in Section 4.2.3.8 above, the existing N2 carriageway has a significant number of potential conflict areas associated with the high number of existing private and commercial accesses and side road junctions, which interface with the existing N2 carriageway.

The proposed cross-section of the N2 Clontibret to Border Road Scheme will be determined in the subsequent TII Phases as the design is further developed and refined. For comparative purposes of the Stage 2 Options, and in order to inform a number of Stage 2 criteria and Cost Benefit Analysis, an initial carriageway cross-section of a Type 2 Dual Carriageway in accordance with TII Design Standard *DN-GEO-03036 Cross Sections and Headroom (May 2019)* was selected.

4.3.6 Policy Documents

The European, National and Regional policy documents relevant to the N2 Clontibret to Border Road Scheme have been identified and discussed in Volume 1, Section 2 of the Option Selection Report. The scheme has been identified as being compatible with the identified documents and as such, the policy documents do not impose constraints on the scheme.

4.3.7 Procedural & Legal Requirements

There is a significant amount of Irish and EU legislation that must be complied with when planning and developing new road schemes. These must be considered at the inception of a project and continually referred to throughout the project lifetime to ensure that the relevant procedural and legal constraints are addressed at the appropriate time by the appropriate means. Such legislation includes, but not limited to, the following:

- Planning and Development Act 2000 as amended;
- Roads Traffic Act, 2016; and
- Roads Regulations, 1994.
- Housing Act, 1966 (as amended)
- Safety, Health and Welfare at Work Act 2005
- Safety, Health and Welfare at Work Construction Regulations 2013 (SI No 291 of 2013)
- Section 50 of the 1945 Arterial Drainage Act

In addition to the above, and regarding the relevant environment legislation, this is listed in Table 2-1 in Section 2 of this report.

Guidance on the procedural and phased approach in relation to appraisal, planning and design development of the proposed scheme is outlined in the TII's Project Management Guidelines (PE-PMG-02041), Project Appraisal Guidelines for National Roads and Project Manager's Manual for Major National Road Projects (PE-PMG-02042).