M11 Gorey to Enniscorthy Scheme

Environmental Impact Statement

Volume 2

Main Text

Ryan Hanley WSP

PREAMBLE

Wexford County Council (WCC), as directed by the National Roads Authority (NRA), proposes to realign the N11 national primary road from south of Gorey (Clogh) to south of Enniscorthy (Oilgate). The realigned route will comprise the provision of approximately 26 km of M11 Mainline, with a standard dual motorway carriageway type, along with approximately 1 Km of N11 Mainline, with standard single carriageway type. The proposed M11/N11 Mainline will be located to the east of the existing N11 and will bypass Camolin, Ferns and Enniscorthy. In addition it is proposed to provide approximately 8 km of single carriageway to bypass Enniscorthy to the west by linking the existing N11 to the existing N30. Approximately 4 km of dual carriageway link road will connect the existing N11 / N80 junction north of Enniscorthy to the M11 Mainline.

Comprising four lanes over a stretch of approximately 31 km, and a bridge with a span of approximately 153m in length, the requirement to carry out an Environmental Impact Assessment (EIA) is mandatory for the proposed scheme under Articles 8(a) and 8(b) of the *Roads Regulations, 1994* (the prescribed types of proposed road development prescribed for the purposes of Section 50(1)(a)(iii) of the *Roads Act 1993*) and Second Schedule (Article 25) of the *EC (Environmental Impact Assessment) (Amendment) Regulations, 1999 (S.I. No. 93 of 1999)* (as amended) and under Schedule 6 of the *Planning and Development Regulations, 2001 (S.I. No. 600 of 2001)*.

This Environmental Impact Statement (EIS) considers and assesses the likely environmental impacts of the M11 Gorey to Enniscorthy Scheme (the Proposed Scheme), and has been prepared taking into consideration the guidance included in the National Roads Authority publication *Environmental Impact Assessment of National Road Schemes – A Practical Guide (NRA, 2006)*.

For the purposes of the Constraints Study and Route Selection phases, the N11 Enniscorthy Bypass and the N11 Clogh to Enniscorthy Scheme were assessed as separate schemes. Separate Constraints Study and Route Selection reports were prepared as follows:

- N11 Enniscorthy Bypass Constraints Study Report (RHWSP, July 2001)
- N11 Enniscorthy Bypass Route Selection Report (RHWSP, November 2002)
- N11 Clogh to Enniscorthy Constraints Study Report (RHWSP, August 2007)
- N11 Clogh to Enniscorthy Route Selection Report (RHWSP, May 2008)

This EIS follows the preparation of the N11 Enniscorthy Bypass Route Selection Report (RHWSP, November 2002) and the N11 Clogh to Enniscorthy Route Selection Report (RHWSP, May 2008). These route selection reports included a thorough examination of the potential

environmental impacts of various route corridor options, which were chosen after the completion of the relevant constraints studies.

Copies of the EIS are available for examination at the locations detailed in the published newspaper notices.

The EIS is also available to purchase in electronic (PDF) and hardcopy format from:

Wexford County Council

Enniscorthy District Office

Old Dublin Road

Enniscorthy

Wexford

Prices are as shown in the published newspaper notices.

Construction of the Proposed Scheme is dependent on approval from An Bord Pleanála (the Board) in relation to this EIS and the statutory land acquisition procedures. It is also subject to the availability of finance and the satisfactory completion of procurement procedures.

Written submissions relating to the likely environmental effects of the Proposed Scheme may be made to the Board prior to the date specified in the published newspaper notices.

The written submissions, together with any representations made at any Oral Hearing, will be considered by the Board before making its decision on whether or not to approve the Proposed Scheme (with or without modifications). The Board's decision will be published in one or more newspapers circulating in the area. It will include, where appropriate, particulars of any modification to the Proposed Scheme.

The M11 Gorey to Enniscorthy Scheme EIS consists of four volumes as described below.

Volume 1 - Non-Technical Summary

A non-technical summary of the information contained within Volume 2. This is a separate and self-contained document.

Volume 2 – Main Text

This volume deals with the likely environmental impacts of the Proposed Scheme including the mainline, ancillary roads and road realignments arising from the proposed scheme. Information on the design of the scheme including a description of the traffic and alternatives considered is also included. This volume contains the substantial text of the EIS and various drawings, maps and data used in preparing the submission.

Volume 3 – Appendices

Relevant detailed specialist technical information, data and reports are contained in this volume.

Volume 4 – Figures Relevant figures are contained in this volume.

Note on Stage of Design

The consideration and assessment of likely significant effects/impacts and the measures envisaged to avoid, reduce and where possible remedy significant adverse effects/impacts [mitigation measures] are based on the preliminary design of the scheme as detailed in this Environmental Impact Statement.

The preliminary design and the environmental mitigation measures will be further progressed and refined during the detailed design of the scheme, including the mitigation measures contained in such Approval as may be granted.

The detailed design will seek to develop the preliminary design in a manner such that there is no material change in terms of significant adverse effect on the environment. Opportunities may be identified to further reduce the significance of adverse effect/impact and, in some cases, improve the residual effect/impact.

ACKNOWLEDGEMENTS

This Environmental Impact Statement has been prepared by Ryan Hanley WSP Ltd. in conjunction with Scott Cawley Ltd., the project's Environmental Co-ordinators, and with the assistance of staff based at the Tramore House Regional Design Office, and Wexford County Council. A number of environmental sub-consultants have also provided input into this EIS as listed below. Together all of these organisations make up the EIS Project Team, and are referenced as such in this EIS.

Specialist Consultants	EIS Contributions
Scott Cawley Ltd. 27 Lower Baggot Street Dublin 2	Ecology
SLR Consulting CSA House Unit 7 Dundrum Business Park Windy Arbour Dublin 14	Soils and Geology Hydrogeology
Hydroenvironmental Ltd 2 St Mary's Road Galway	Flood Risk Assessment
AWN Consulting Ltd. The Tecpro Building Clonsaugh Industrial Estate Dublin 16	Hydrology Air and Climate Noise and Vibration Waste
Tíros Resources Ltd. Armitage House 10 Hatch Street Lower Dublin 2	Landscape and Visual Impacts
Philip Farrelly & Co. Roof Garden Offices Clarehall Malahide Road Dublin 17	Agriculture
Joyce Environmental Ltd. Unit 5A Ashbourne Town Centre Ashbourne Co. Meath	Socio-economic / Human Beings
Irish Archaeological Consultancy 120b Greenpark Road Bray Co. Wicklow	Archaeological, Architectural and Cultural Heritage Impact.
WSP Group Mountbatten House Basing View Basingstoke Hampshire RG21 4HJ United Kingdom	Traffic and Economics

M11 Gorey to Enniscorthy Scheme

ENVIRONMENTAL IMPACT STATEMENT

VOLUME 2 MAIN TEXT

CONTENTS

M11 Gorey to Enniscorthy Scheme

ENVIRONMENTAL IMPACT STATEMENT

VOLUME 2 MAIN TEXT

LIST OF APPENDICES

Chapter Number	Appendix Number	Description
1	Appendix 1.1	M11 *Gorey to* Enniscorthy Scheme *Scoping Report for an Environmental Impact Statement*, 30th March 2009
	Appendix 1.2	Consultation Responses Received
3	Appendix 3.1	Hydraulic assessment of the proposed River Slaney bridge crossing
6	Appendix 6.1	Soil Associations
	Appendix 6.2	Individual Farm assessments
9	Appendix 9.1	Consultation on Ecological Issues
	Appendix 9.2	*A Survey for the Freshwater Pearl Mussel Margaritifera Margaritifera (L., 1758) in the River Slaney and its Tributaries in the Vicinity of Enniscorthy, Co. Wexford.* Dr. Evelyn Moorkens, December 2008.
	Appendix 9.3	Photographs of Habitats
	Appendix 9.4	Badger Sett Data
	Appendix 9.5	Appropriate Assessment of Impacts on the River Slaney SAC.
	Appendix 9.6	FONSE for Wexford Harbour and Slobs SPA
	Appendix 9.7	Bat Derogation Licence Application
	Appendix 9.8	Otter Derogation Licence Application
10	Appendix 10.1	Glossary of Geological Terms
	Appendix 10.2	Historical and Existing Land Uses
11	Appendix 11.1	Hydrology Assessment Methodology
	Appendix 11.2	Information on the Water Framework Directive
	Appendix 11.3	Information on the Hydrological Environment
	Appendix 11.4	Relevance of the Proposed Scheme Design to the Hydrology Assessment
	Appendix 11.5	Ground Water Level Readings
12	Appendix 12.1	Ambient Air Quality Standards.
	Appendix 12.2	EPA Monitoring Data and Background Concentrations

13	Appendix 13.1	Noise Survey Results.
14	Appendix 14.1	Tag Significance Criteria and Worksheets
	Appendix 14.2	Visual Impact Schedule.
15	Appendix 15.1	Archaeological Heritage Sites
	Appendix 15.2	Areas of Archaeological Potential
	Appendix 15.3	Sites of Archaeological Potential
	Appendix 15.4	Built Heritage Sites
	Appendix 15.5	Cultural Heritage Sites
	Appendix 15.6	Legislative Framework Protecting the Archaeological Resource
	Appendix 15.7	Legislative Framework Protecting the Architectural Resource

M11 Gorey to Enniscorthy Scheme

ENVIRONMENTAL IMPACT STATEMENT

VOLUME 2 MAIN TEXT

LIST OF FIGURES

Chapter Number	Drawing Number	Description
9	Figure 9.4	Designated Sites
10	Figure 10.1	Soils Map
	Figure 10.2	Geomorphology
	Figure 10.3	Subsoils Map
	Figure 10.4	Bedrock Geology
11	Figure 11.1	Hydrological M11 Mainline Environment
	Figure 11.2	Hydrological N30 Mainline Environment
	Figure 11.3	Bedrock Aquifer
	Figure 11.4	Aquifer Vulnerability
12	Figure 12.1	Rosslare Windrose
	Figure 12.2	Air Monitoring Locations & Sensitive Receptors
13	Figure 13.1	Noise Monitoring Locations
	Figure 13.2	Noise Model Extents
	Figure 13.3	Noise Receiver Locations
	Figure 13.4	Noise Mitigation Measures
14	Figure 14.1	Landscape Character Areas
	Figure 14.2	Visual Impact Assessment & Landscape Masterplan
15	Figure 15.1	Archaeology

M11 Gorey to Enniscorthy Scheme

ENVIRONMENTAL IMPACT STATEMENT

VOLUME 2 MAIN TEXT

ABBREVIATIONS

Abbreviation	Definition
AADT	Annual Average Daily Traffic
AAP	Area of Archaeological Potential
AH	Archaeological Heritage
AOD	Above Ordnance Datum
BCR	Benefit to Cost Ratio
BH	Built Heritage
By	Barony
CBA	Cost Benefit Analysis
CH	Chainage
COBA	Cost Benefit Appraisal
cSAC	Candidate Special Area of Conservation
D-AH	Delisted – Archaeological Heritage
DED	District Electoral Division
DEFRA	Department for the Environment , Food and Rural Affairs
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
DoEHLG	Department of Environment, Heritage and Local Government
Ed.	Electoral District
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ERFB	Eastern Regional Fisheries Board
ESB	Electricity Supply Board
EU	European Union

Abbreviation	Definition
HCV	Heavy Commercial Vehicles
HGV	Heavy Goods Vehicles
HV	Heavy Vehicles
Hz	Hertz
JTC	Junction Turning Count
Km	Kilometre
Km/h	Kilometres per hour
KV	Kilovolt
LOS	Level of Service
LV	Light vehicles
m^3	Metres cubed
mm	Millimetres
MCC	Manual Classified Count
Mm/s	Millimetres per second
NSS	National Spatial Strategy
NB	North Bound
NDP	National Development Plan
NHA	Natural Heritage Areas
No.	Number
NO_2	Nitrogen Oxide
NPV	Net Present Value
NPWS	National Parks and Wildlife Service
NRA	National Roads Authority
NRNS	National Road Needs Study
OCE	Option Comparison Estimate
OPW	Office of Public Works
OS	Ordnance Survey
OSi	Ordnance Survey Ireland

Abbreviation	Definition
PM	Post Meridiem
PM_{10}	Particulate Matter
pNHA	Proposed Natural Heritage Area
PPP	Public Private Partnership
Proposed Scheme	M11 Gorey to Enniscorthy Scheme
PVB	Present Value of Benefits
PVC	Present Value of Costs
RHWSP	Ryan Hanley WSP Ltd
RMP	Record of Monuments and Places
RSI	Road Side Interview
RSR	Route Selection Report
SAC	Special Areas of Conservation
SATURN	Simulation and Assignment of Traffic to Urban Road Networks
SPA	Special Protection Area
TAG	Transport Analysis Guidance
TD	Technical Directive
UK	United Kingdom
VAT	Value Added Tax
VOC	Value of Costs
WCC	Wexford County Council

1 INTRODUCTION

1.1 THE PURPOSE OF THE ENVIRONMENTAL IMPACT STATEMENT

The aim of the Environmental Impact Statement is to consider and assess (for a given proposed development) any impacts of significance; to describe the means and extent by which they can be reduced or ameliorated; to interpret and communicate information about the impacts; and to provide appropriate information at the commencement of the EIS process.

1.2 SCOPING

1.2.1 Project Scoping

An informal scoping process was conducted to establish the range and aspects of the environment to be considered within this EIS. This process was conducted by Ryan Hanley WSP Ltd. (RHWSP), Scott Cawley Ltd., Wexford County Council, and where relevant the various specialist environmental sub-consultants on the EIS Project Team. The results of this scoping process were produced in a report entitled *M11 Gorey to Enniscorthy Scheme EIS Scoping Report for an Environmental Impact Statement (Scott Cawley, March 2009)* a copy of which is provided in Appendix 1.1 in Volume 3 of this EIS. The scoping for the EIS conducted in respect of the Proposed Scheme had regard, *inter alia*, to the following:

(i) Environmental Impact Assessment of National Road Schemes – A Practical Guide (NRA, 2006);
(ii) NRA Environmental Assessment and Construction Guidelines, (NRA, 2006);
(iii) Guidelines on the Information to be Contained in Environmental Impact Statements (EPA, 2002);
(iv) Advice Notes On Current Practice (in preparation of Environmental Impact Statements) (EPA, 2003);
(v) National Roads Project Management Guidelines (NRA, 2000);
(vi) The concerns of local residents, adjoining land users, and other interested third parties;
(vii) The nature, location and scale of the Proposed Scheme;
(viii) The existing environment, including any vulnerable or sensitive features and current uses;
(ix) The likely significant impacts on the environment, with particular attention to candidate Special Areas of Conservation, Special Protection Areas and proposed Natural Heritage Areas within the locality; and
(x) Available methods of reducing or eliminating undesirable impacts.

The scoping process was an important element in the preparation of an EIS, incorporating inputs from relevant experts, statutory bodies, the applicant, and third parties.

The criteria used during the scoping process to identify whether impacts were likely to occur and likely to be of significance followed the criteria set out in the following guidelines:

- Guidance on EIA Scoping (European Commission, June 2001)
- Environmental Impact Assessment of National Road Schemes – A Practical Guide (NRA, 2004), Section 3.3
- *Guidelines on the Information to be Contained in Environmental Impact Statements (EPA, 2002)*

The criteria used in ascertaining the likely significant impacts in the scoping process included:

(i) Magnitude & Intensity - Any development which can cause effects over a wide area, to a large number of receptors, or effects which are of an intensity which is significantly in excess of those normally experienced *E.g.* large direct negative impacts, small positive indirect impacts, large cumulative negative impacts;

(ii) Integrity - The degree to which the character or attributes of the baseline environmental topic is continued, enhanced or reduced. *E.g.* imperceptible, slight, moderate, significant or profound impacts;

(iii) Duration - Any development which can cause impacts for a long period of time (more than one generation) or which will cause permanent changes to any aspect of the environment. *E.g.* impacts which are short, medium, or long term, permanent or temporary;

(iv) Probability- Where the magnitude, intensity, duration or consequences of any change cannot be anticipated with a reasonable level of certainty.

The intention behind the scoping process is to identify a worst case scenario for the Proposed Scheme, thus ensuring that all possible effects are afforded the appropriate level of assessment.

Table 1.1 below summarises the findings of the initial scoping process. As is indicated by Table 1.1, it was decided that there could be a potential positive or negative impact with respect to most aspects of the environment.

Table 1.1 Graphic Representation of Findings from Preliminary Scoping Exercise – Potential Impacts Associated with the Proposed Scheme

	No Development	Construction Phase	Operational Phase
Socio-economic	×××	×××	✓✓✓
Agriculture	-	×××	×
Material Assets - Properties	-	×××	×
Material Assets - Infrastructure	-	××	-
Ecology	-	×××	×××
Soil & Geology	-	××	×
Hydrology and Hydrogeology	-	×××	×××
Air and Climate	××	×	✓✓
Noise and Vibration	-	×	×
Landscape	-	×	××
Archaeology, cultural and architectural heritage	-	×××	×
Waste Management	-	××	×

Key:

×	Slight Negative Impact	✓	Slight Positive Impact
××	Moderate Negative Impact	✓✓	Moderate Positive Impact
×××	Significant Negative Impact	✓✓✓	Significant Positive Impact
-	Neutral		

1.2.2 Informal Consultation

Throughout the preparation of the EIS, consultation was held by each specialist with relevant government departments, agencies and bodies, and where necessary non-governmental organisations, according to the needs of the particular area of study. Copies of any such correspondence received is included in the scoping document in Appendix 1.2 in Volume 3 of this EIS.

A series of public consultation has also taken place between 1999 and 2008. The full details of this exercise are described in Chapter 2 of this EIS the date of which are listed below:

- November 1999;
- April / May of 2001;
- May and June 2002;
- April 2007; and
- February / March 2008

1.2.3 Format of the Environmental Impact Statement

Environmental Impact Statements require the assimilation, co-ordination and presentation of a wide range of relevant information in order to allow for the overall assessment of a proposed development.

To allow for ease of presentation and consistency when considering the various elements of the environment, a systematic structure is proposed for the main body of the statement. The structure proposed is a "Grouped format" with an outline of each stage given below.

Introduction
Introduces the purpose of the section and specifies the specialist who implemented the assessment.

Methodology
This section outlines the method by which the relevant impact assessment has been conducted within that Chapter.

Receiving Environment
In describing the receiving environment, an assessment is made of the context into which the proposed development will fit. For each specialist chapter this description is relevant to that item; for example Chapter 9 concerning ecology describes the natural habitats present in the area, while Chapter 15 concerning archaeology describes the existing archaeological features.

Characteristics of the Proposed Development

Consideration of the "Characteristics of the Proposed Development" allows for a projection of the "Level of Impact" on any particular aspect of the environment which could arise. For each chapter those characteristics of the proposed works which are relevant to the area of study are described; for example Chapter 14 (Landscape and Visual Impact) describes those elements of the Proposed Scheme which could present a visual impact.

Potential Impact of the Proposed Development

This section allows for a description of the specific potential direct and indirect impacts which the Proposed Scheme may have, without the benefit of mitigating factors being taken into account. This is done with reference to the sections within each chapter on the *Receiving Environment* and *Characteristics of the Proposed Development*, while also referring to the magnitude, duration, consequences and significance of the development.

Do Nothing Scenario

In order to provide a qualitative and equitable assessment of the Proposed Scheme, this section considers the likely impacts upon the receiving environment should the Proposed Scheme not take place.

Mitigation Measures

This section includes a description of all mitigation measures that are reasonable and feasible which Wexford County Council proposes to take having regard to the potential impacts of the Proposed Scheme. Mitigation measures are recommended, where appropriate, to avoid, reduce or where possible remedy the likely significant negative impacts identified.

Predicted Impact of the Proposed Development

This section allows for a qualitative description of the resultant specific, direct and indirect, impacts which the Proposed Scheme may have, assuming all mitigation measures are fully and successfully applied. This is done with reference within each chapter, to the sections *Potential Impact of the Proposal* and *Mitigation Measures*, producing a definitive and concise statement of the residual impact for the Proposed Scheme.

Monitoring

This section provides a description of monitoring required during the construction, operation, and post-operation phases where required. This section addresses the effects which require monitoring, and any agencies which may be responsible for specifying, approving and assessing such monitoring.

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2.0 OUTLINE OF ALTERNATIVES CONSIDERED

This chapter provides an outline of the main alternatives considered for the Proposed Scheme.

2.1 BACKGROUND

The M11 Gorey to Enniscorthy Scheme was progressed through the initial phases as two separate projects, namely:-

(i) N11 Enniscorthy Bypass; and

(ii) N11 Clogh to Enniscorthy Scheme.

This EIS examines the entire M11 Gorey to Enniscorthy Scheme (Proposed Scheme). Refer to Figure 1.1 - Proposed Scheme Location Plan, in Volume 4 of this EIS.

ROUTE SELECTION

2.1.1 N11 Enniscorthy Bypass

The findings of the Route Selection phase are presented in the N11 Enniscorthy Bypass Route Selection Report (RHWSP, November 2002) and are outlined below.

Consideration was given to route corridor options passing generally to the west as well as to the east of Enniscorthy as follows:-

(i) The Blue and Green Routes comprise a proposed N11 mainline passing to the west of Enniscorthy that connect to the existing N30 along the way;

(ii) The Gold Route comprises a proposed N11 mainline passing to the east of Enniscorthy that continues south of Enniscorthy to connect to the existing N11 and the existing N30;

(iii) The Red Route comprises a proposed N11 mainline passing to the east of Enniscorthy and a proposed N30 link passing to the south of Enniscorthy connecting the existing N30 to the proposed N11 mainline; and

(iv) The Purple Route is a combination of sections of the Green, Red and Gold Routes and comprises a proposed N11 mainline located to the east of Enniscorthy and a proposed N30 mainline located to the north-west of Enniscorthy.

From an environmental effects perspective, it was considered there was little to no overall discernable difference between the Purple Route and the Green Route. In terms of satisfying the project objectives, the five route corridor options were also assessed to determine order of preference with respect to engineering, economic and traffic criteria. For each of these criteria it was concluded the Purple Route performed the best. The overall conclusion was, on balance the Purple Route performed the best followed in decreasing order of preference by the Red Route, Gold Route, Green Route and Blue Route.

A preferred route public consultation was held in May and June 2002.

During the Route Selection phase interactions took place with representatives of various landowner / residents groups, individual landowners and interested parties. Leading on from this, and in response to comments received from the preferred route public consultation, 16 route amendment options were identified and assessed. The route amendment options generally comprised localised realignments to reduce severance and minimise impact on landholdings and / or residences. They were assessed under three principal criteria, namely environmental, engineering and economics. Of the 16 route amendments, 5 were included within a revised preferred route.

The Preferred Route taken forward to be developed further during the Preliminary Design / Land Acquisition Procedures / Environmental Impact Statement phase comprised a:-

(i) Proposed N11 mainline located to the east of Enniscorthy connecting the existing N11 in Ballynahallin, approximately 4.0 km north of Enniscorthy, to the existing N11 in Scurlocksbush, approximately 6 km south of Enniscorthy; and

(ii) Proposed N30 mainline located to the west of Enniscorthy connecting the existing N11 (and existing N80) in Ballynahallin, approximately 4.0 km north of Enniscorthy, to the existing N30 in Templescoby.

2.1.2 N11 Clogh to Enniscorthy Scheme

The identification of specific constraints within the study area for the N11 Clogh to Enniscorthy Scheme allowed for the development of six, initial route corridor options. Three of these were located predominantly to the west of the existing N11, and are referred to as the Orange, Magenta and Gold Routes. The remaining three were located predominantly to the east of the existing N11, and are referred to as the Cyan, Red and Yellow Routes. As the Route Selection phase progressed a seventh route corridor option was identified and assessed, referred to as the Blue Route. The Blue Route was developed primarily to assess a route corridor option located to the east of the existing N11, which was considered may minimise the likely effects on the surrounding landscape and in particular minimise the likely visual effects with respect to Carrigroe Hill. Refer to Figure 2.2 - N11 Clough to Enniscorthy Scheme Route Corridor Options, in Volume 4 of this EIS.

A public consultation in relation to the seven route corridor options, including the identification of the Emerging Preferred Route, was undertaken in February /March 2008.

The findings of the assessments outlined above are presented in the N11 Clough to Enniscorthy Scheme Route Selection Report (RHWSP, May 2008) and are outlined below.

When identifying route corridor options for the realignment of the existing N11 as part of the N11 Clogh to Enniscorthy Scheme, one of the major influences was where the proposed route corridors would tie back into the national road network. At the northern end of the study area the route corridor options needed to tie into the existing N11 Arklow / Gorey Bypass. At the southern

end of the study area the Preferred Route for the proposed N11 Enniscorthy Bypass needed to be taken into account. The seven route corridor options assessed included a number of alternative tie-in options at both the northern and the southern extents of the N11 Clogh to Enniscorthy Scheme.

Determining the optimum location for the connection between the proposed N11 mainline and the existing N80 was also an important consideration. For the Red, Cyan, Yellow and Blue Routes, this connection is achieved via a proposed section of link road, referred to as the N80 Link Road. Initially the majority of the route corridor options included for an indirect connection between the existing N80 and the proposed N11 mainline, with the N80 traffic heading northwards along a section of the existing N11 into Ballylough to ultimately connect to the proposed N11 mainline via Clone and Tomsallagh. However, examination of the available traffic survey data and of the traffic model revealed that a substantial proportion (approximately 40%) of traffic using the N80 wishes to bypass Enniscorthy and continue in a southerly or easterly direction. To adequately cater for this traffic it was considered that a more direct connection between the existing N80 and the proposed N11 mainline would be desirable, that is to say one in which the N80 traffic continues in a generally south-easterly direction towards the proposed N11 mainline.

Consequently, three new N80 Link Road route corridor options were developed. Options 1 and 3 provided a direct connection between the existing N80 and the proposed N11 mainline without utilising a section of the existing N11. Option 2 utilised a shorter section of the N11 and connected to the proposed N11 mainline via Scarawalsh, Killabeg and Tomsallagh. Refer to Figure 2.3 - N11 Clough to Enniscorthy Scheme N80 Link Road Route Corridor Options, in Volume 4 of this EIS. These three route corridor options were assessed under main headings of environment, traffic, engineering and cost. The preferred location for the N80 Link Road was determined to be Option 3, and this connection was therefore incorporated into the Red, Cyan, Yellow and Blue Routes. Option 3 follows a similar line to that taken by the Preferred Route for the N11 Enniscorthy Bypass but crosses the River Slaney further to the south. The route corridor option was specifically revised southwards in order to lessen its likely effects on the ecology and archaeology in this area.

In terms of satisfying the project objectives, the five route corridor options were also assessed to determine order of preference with respect to engineering, economic and traffic criteria. The overall conclusion was, on balance the Cyan Route performed the best on the basis that it was considered the most preferable from an environmental and economic perspective, was ranked jointly most preferable from a traffic perspective and was second most preferable from an engineering perspective. The remaining route corridor options followed in decreasing order of preference as follows: the Yellow Route; Gold Route; Blue Route; Red Route; Orange Route; and Magenta Route.

During the Route Selection phase interactions took place with individual landowners and interested parties. Leading on from this, and in response to comments received from the emerging preferred route public consultation, 9 route amendment options were identified and assessed. 6 of these involved a significant relocation of sections of the emerging preferred route and included options in relation to:-

(i) An additional junction on the proposed N11 mainline, to accommodate a link road to Ferns;

(ii) Alternative route corridors for the N80 Link Road to:- minimise the impact on the River Slaney flood plain; reduce the length of the N80 Link Road; and / or reduce the impact on adjacent properties; and

(iii) Mainline realignments, to reduce severance and minimise impact on landholdings and / or residences.

These 6 options were assessed under three principal criteria, namely environmental, engineering and economics. One route amendment option, relating to a mainline realignment, was included within the Preferred Route.

The remaining 3 route amendment options comprised slight realignments to reduce severance and minimise impact on landholdings and / or residences. All 3 were identified to be incorporated into the Proposed Scheme and developed further during the Preliminary Design / Land Acquisition Procedures / Environmental Impact Statement phase.

The Preferred Route taken forward to be developed further during the Preliminary Design / Land Acquisition Procedures / Environmental Impact Statement phase comprised a:-

(i) Proposed N11 mainline located to the east of the existing N11, and to the east of the towns of Camolin and Ferns, connecting the existing N11 in Clogh to the N11 Enniscorthy Bypass proposed N11 mainline in Tomnafunshoge; and

(ii) Proposed N80 Link Road located to the north of Enniscorthy connecting the existing N11 (and existing N80) in Ballynahallin to the Proposed N11 mainline in Ballydawmore.

2.1.3 N11 Gorey to Enniscorthy Realignment Scheme

The NRA confirmed in May 2008 that the N11 Enniscorthy Bypass and the N11 Clogh to Enniscorthy Scheme were to be taken through to the completion of the Preliminary Design / Land Acquisition Procedures / Environmental Impact Statement phase as a single project.

The route for the proposed N11 Mainline was influenced by the:-

(i) Overall likely environmental effects;

(ii) Likely effects on ecologically designated sites and other sites of environmental interest;

(iii) Strategic traffic that would be attracted to the proposed route;

(iv) Tie-in with the proposed N80 Link Road;

(v) Tie-in with the existing N11 Arklow – Gorey Bypass;

(vi) Dublin – Wexford railway;

(vii) Avoidance of unnecessary demolitions, severance and landtake;

(viii) ESBi 110 kV overhead power lines and associated pylons;

(ix) Locations of existing landfill / waste disposal areas;

(x) Topography;

(xi) Tie-in with the existing N11 to the south of Enniscorthy;

(xii) Availability of a corridor to continue the route southwards should this be required in the future;

(xiii) Local road and watercourse crossings.

The route for the proposed N80 Link Road was influenced by:-

(i) Overall likely environmental effects and in particular the location of the River Slaney crossing and the impact on the River Slaney cSAC / pNHA;

(ii) Likely effects on ecologically designated sites and other sites of environmental interest;

(iii) Strategic traffic that would be attracted to the proposed route;

(iv) Tie-in with the proposed N11 Mainline;

(v) Avoidance of unnecessary demolitions, severance and landtake;

(vi) Topography;

(vii) Dublin – Wexford railway;

(viii) Local road and watercourse crossings.

The route for the proposed N30 Mainline was influenced by:-

(i) Overall likely environmental effects;

(ii) Likely effects on ecologically designated sites and other sites of environmental interest;

(iii) Strategic traffic that would be attracted to the proposed route;

(iv) Tie-in with the existing N80 and proposed N80 Link Road;

(v) Avoidance of unnecessary demolitions, severance and landtake;

(vi) Topography;

(vii) Crossing of the River Urrin;

(viii) Local road and watercourse crossings.

The Wexford County Development Plan 2007 to 2013, as well as the previous 2000 to 2006 plan, includes a commitment in relation to National Roads to preserve free from development,

proposed road realignment / improvement lines and associated corridors, where such development would prejudice the implementation of NRA or County Council plans. The N11 Gorey to Enniscorthy and the N11 Enniscorthy Bypass are specific projects that are incorporated within the current and the previous plan. The N11 Enniscorthy Bypass is also incorporated within the Enniscorthy Town and Environs Development Plan 2008 to 2014, as well as the previous 2001 to 2007 plan, and the Draft Ferns Local Area Plan 2009 to 2015.

PRELIMINARY DESIGN / LAND ACQUISITION PROCEDURES / ENVIRONMENTAL IMPACT STATEMENT

2.1.4 Preferred Routes to Proposed Scheme

The informal route selection process for the M11 Gorey to Enniscorthy Scheme concluded with the identification of the preferred routes for the N11 Mainline, N80 Link Road and the N30 Mainline. During the Preliminary Design / Land Acquisition Procedures / Environmental Impact Statement phase these preferred routes continued to be developed. This development included identifying and considering various alternative design elements as an integral part of the progression from the preferred routes to the Proposed Scheme as described and assessed in this EIS. These alternative designs formed part of the iterative process during which the preliminary design of the various elements that make up the Proposed Scheme, such as the environmental mitigation measures and the horizontal and vertical alignments, were developed, assessed and revised. In this way a close correlation was established between the environmental and engineering elements of the preliminary design. The most significant issues are discussed within the various specialist chapters of this EIS.

The Proposed Scheme as described in this EIS, therefore, includes adjustments to the preferred routes. These adjustments arose, in general, from the more detailed information and assessments undertaken during the Preliminary Design / Land Acquisition Procedures / Environmental Impact Statement phase, including mitigation measures that were proposed as part of the specialist environmental assessments.

The Proposed Scheme is a balance between environmental, engineering and economic factors. The Proposed Scheme was designed to have overall the least feasible impact on ecologically designated sites and other sites of environmental interest. In other words, it was developed in such a way that avoidance of ecologically designated sites and other sites of environmental interest and properties were primary project objectives that had to be balanced against engineering and economic constraints.

The proposed location of the River Slaney crossing is at an optimum location, which accommodates the N80 Link Road crossing the River Slaney at right angles. In this way the length of the crossing is minimised, which in turn minimises the impact on a number of areas of high ecological value.

The environmental sensitivity of the area through which the Proposed Scheme passes is well

documented as it contains designated areas such as cSAC's and pNHA's. During the identification of the preferred routes and the development of the Proposed Scheme, the National Parks and Wildlife Service (NPWS) and the Eastern Regional Fisheries Board (ERFB) were consulted and the proposed routes were, generally, modified to avoid the sensitive areas containing specific protected species. Ecologists have undertaken site inspections to ascertain the actual species located along the proposed route.

Although there is potential for contamination of soil and water, as with any construction project, mitigation measures have been identified that will be put in place during both construction and operation of the Proposed Scheme to minimise the risk of contamination. Significant efforts have been made to avoid, reduce and, where possible, remedy any adverse impacts to an appropriate level. These are detailed throughout the relevant chapters of this EIS and illustrated in the figures included in Volume 4 of this EIS.

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3.0 DESCRIPTION OF THE PROPOSED SCHEME

3.1 INTRODUCTION

The procurement process for the construction of the Proposed Scheme will be by either design and build or as part of a Public Private Partnership (PPP) project. In design and build schemes the contractor is the organisation responsible for the design and construction of a scheme. In PPP projects the concession company has these responsibilities. Within this EIS the term Contractor covers both such organisations. Whichever method of procurement is chosen it is important to note that the successful Contractor will be bound by the requirements of the mitigation measures set out in the Environmental Impact Statement and also by the determination of An Bord Pleanála.

The consideration and assessment of likely significant effects/impacts and the strategy proposed to avoid, reduce and where possible remedy significant adverse effects/impacts (mitigation measures) are based on the preliminary design of the Proposed Scheme as detailed in this Environmental Impact Statement.

The preliminary design and the environmental mitigation measures may be further enhanced and refined by the Contractor during the detailed design of the Proposed Scheme, including the mitigation measures contained in such Approval as may be granted. This may result in some changes to the preliminary design as published in this EIS.

The detailed design will seek to develop the preliminary design in a manner such that there is no material change in terms of significant adverse effect on the environment. Opportunities may be identified to further reduce the significance of adverse effect/impact and, in some cases, improve the residual effect/impact.

Stringent contract requirements will ensure that the detailed design, including environmental mitigation measures, will be of the required quality and that through the construction process the detailed design will be translated into the final product.

3.2 OVERVIEW OF THE SCHEME

The Proposed Scheme (refer to Figure 3.1 – Proposed Scheme General Layout and Figure 3.2 – Proposed Scheme Plan and Profile, in Volume 4 of this EIS) comprises the construction of three new sections of road, which will form part of the National Road network, namely:-

(i) M11/N11 Mainline;

(ii) N80 Link Road; and

(iii) N30 Mainline.

A summary of technical information relating to the Proposed Scheme is included in Table 3.2.1.

Table 3.2.1: Summary of Technical Information for Proposed Scheme

Length of proposed M11/N11 Mainline	27.2 Km
Length of proposed N80 Link Road	4.2 Km
Length of proposed N30 Mainline	8.2 Km
Length of proposed Access Roads	15.0 Km
Length of National Primary Road realignments	0.8 Km
Length of National Secondary Road realignments	0 Km
Length of Regional Road realignments	4.1 Km
Length of Local Road realignments	7.0 Km
Number of road structures (1)	42
Number of combined river / rail / road structures (2)	1
Number of rail structures	1
Number of watercourse structures	43

Note: (1) For proposed junctions, Side Roads and Access Roads.

(2) Structure over the River Slaney / Dublin-Wexford Railway / Local Road L-2020.

(3) All lengths shown are approximate.

3.2.1 M11/N11 Mainline

The M11/N11 Mainline is approximately 27km in length and is of standard dual motorway standard (D2M) (refer to Figure 3.3 – Typical Carriageway Types Cross Sections, in Volume 4 of this EIS). It connects the existing N11 in Clogh at the north, approximately 19 kilometres north-east of Enniscorthy, to the existing N11 in Scurlocksbush at the south, approximately 7km south of Enniscorthy. The existing N11 in Clogh comprises a Type 1 dual carriageway and is part of the N11 Arklow / Gorey Bypass which opened to traffic in September 2007. The existing N11 in Scurlocksbush comprises a single carriageway.

The M11 Mainline departs from the N11 Arklow / Gorey Bypass in a southerly direction, and at this location the Proposed Scheme includes the provision of a grade separated junction referred to as the Frankfort Junction. From the Frankfort Junction the M11 Mainline continues in a generally south-south-west direction through Ballinclay and into Ballygullen where it crosses Local Road L-1027, the Dublin – Wexford railway and the Brackan River. It continues into Balloughter where it bears south-west. Exiting Balloughter the route continues through Tullabeg, Ballyeden where it crosses Local Road L-5092, Medophall, Knockrobin Lower and Upper. Travelling through Ballymore, the M11 Mainline crosses Local Road L-5093 continues in a south-westerly direction through Rockspring where it crosses the L-5096 and into Quarry where it crosses the Tinnacross Stream. The route then continues in a south-westerly direction through Mountgeorge, Ballycarrigeen Lower where it crosses the Local Roads L-10241 and L-1023,

Carrigeen and into Knockavocka where it crosses the Tinnacross Stream. Exiting Knockavocka the route progresses in a generally south-westerly direction through Effernoge, where it crosses the Tinnacross Stream, Myaugh, Tinnacross, where it crosses the Local Road L-2011 and the Tinnacross Stream, Tomsallagh, Oulartard and back into Tomsallagh crossing the Tinnacross Stream on two more occasions. Entering Crane the M11 Mainline straightens in a south-south-west direction, crosses the Tinnacross Stream and Local Road L-2021 before entering Toom where it turns south-eastwards, crosses the Ballydawmore Stream and continues into Ballydawmore. In Ballydawmore the M11 Mainline connects to the N80 Link Road via a grade separated junction, referred to as the Ballydawmore Junction.

A proposed length of Side Road will commence at the Ballydawmore Junction and proceed in a generally southerly direction to connect to the Regional Road R744 in Tomnafunshoge at an at grade roundabout. It will be located immediately east of the M11 Mainline. The proposed Side Road is referred to as the R744 Link Road and the proposed roundabout as the Tomnafunshoge Roundabout.

After the Ballydawmore Junction, the M11 Mainline continues initially south-eastwards and then begins to turn south westwards, entering Corbally where it crosses the Local Road L-2024. The route continues to turn to a south-westerly direction crosses the Corbally Stream and then passes into Tomnafunshoge where it crosses the R744 Enniscorthy to Blackwater road.

From the Tomnafunshoge the M11 Mainline passes into Drumgold where it crosses the Local Road L-6055 and turns south-east entering Cooladine where it crosses the Drumgold Stream. The route then turns to a generally southerly direction and enters Ballycourcy More where it crosses the Local Road L-2040. The M11 Mainline continues generally southwards passing through Knockrathkyle where it crosses Local Road L-6046, Ballybanoge, Monroe, Craanroe, Glenteige where it crosses the Local Road L-6048 and the Monroe Stream and into Riverview.

In Riverview the M11 Mainline motorway ends and the N11 Mainline continues with a type 3 dual carriageway (2+1) standard of carriageway. The N11 Mainline continues in a southerly direction through Roperstown into Scurlocksbush, crossing the Local Road L-6052 and connects to the existing N11 at an at-grade roundabout in Scurlocksbush, referred to as the Scurlocksbush Roundabout.

3.2.2 N80 Link Road

The N80 Link Road is approximately 4km in length and is of type 2 dual carriageway (2+2) standard. It connects the existing N11 and existing N80 in Ballynahallin at its eastern end to the M11 Mainline in Ballydawmore to the west. The existing N11 and N80 in Ballynahallin each comprise a single carriageway.

The N80 Link Road commences at a proposed at grade junction referred to as the Clavass Junction. This junction comprises a dumbbell roundabout layout, which provides connectivity

between the existing N80, existing N11, existing Old Dublin Road, N80 Link Road, and N30 Mainline. From the Clavass Junction the N80 Link Road travels in a generally southerly direction through Ballynahallin, where it crosses the Kilcannon Stream, and into Kilcannon. In Kilcannon the route begins to turn to a generally easterly direction and crosses the River Slaney at a point approximately 3km upstream of Enniscorthy. To the east of the River Slaney the N80 Link Road passes through Ballynabarny where it crosses the Dublin – Wexford railway and Local Road L-2020 before completing the turn to a generally easterly direction. The route continues through Ballynabarny and connects to the M11 Mainline at the Ballydawmore Junction in Ballydawmore.

3.2.3 N30 Mainline

The N30 Mainline is approximately 8km in length and is of standard single carriageway standard (S2). It connects the existing N11 and existing N80 in Clavass to the north to the existing N30 in Templescoby to the south. The existing N30 in Templescoby comprises a standard single carriageway.

The N30 Mainline commences at the Clavass Junction and travels in a south-westerly direction through Clavass where it crosses the Clavass Stream, Coolnahorna where it crosses the Local Road L-2015 and into Ballyorril. The route continues in a south-westerly direction entering Moyne Middle before passing back into Ballyorril where it turns to head in a westerly direction crossing the Local Road L-2014 and the Hollyfort Stream along the way. The N30 Mainline continues in a westerly direction through Killalligan North where it crosses the Local Road L-2012, Askunshin where it turns to a generally south-westerly direction and Milehouse where it crosses the Regional Road R702 at a proposed at grade junction referred to as the Milehouse Roundabout .

After the Milehouse Roundabout the N30 Mainline continues in a south-westerly direction into Monart East crossing the Pullinstown Stream along the way. In Monart East it crosses the Local Road L-6125 and continues into Bessmount where it turns south before crossing Local Road L-2030 and the River Urrin. The N30 Mainline continues in a southerly direction through Templescoby where it crosses the Local Roads L-6122 and L-6121 and continues into Dunsinane. In Dunsinane the N30 Mainline crosses the Old N30 before continuing to connect to the existing N30 in Templescoby at a proposed at grade junction referred to as the Templescoby Roundabout.

3.3 CARRIAGEWAY LAYOUTS

The design speeds adopted for the various elements of the Proposed Scheme are shown in Table 3.3.1. The NRA Design Manual for Roads and Bridges (NRA DMRB) TD 9 advises that a proposed road alignment should be designed so as to ensure that the standards of curvature, visibility, super-elevation and the like are provided to a design speed which will be consistent with the anticipated vehicle speeds on the road.

The carriageway types for the various elements of the Proposed Scheme are shown in Table 3.3.1 and in Figure 3.3 – Typical Carriageway Types Cross-Sections, in Volume 4 of this EIS.

Table 3.3.1: Carriageway Design Criteria for the Proposed Scheme

Section of Proposed Scheme	Carriageway Type	Design Speed Km/h
M11 Mainline - Motorway	Standard Dual Motorway (D2M)	120
N11 Mainline – Non-Motorway	Type 3 Dual Carriageway (2+1)	100
N80 Link Road	Type 2 Dual Carriageway (2+2)	100
N30 Mainline	Standard Single (S2)	100
National Primary Road	Standard Single (S2)	100
National Secondary Road	Standard Single (S2)	100
Regional Road	Reduced Single (S2)	85
Local Road	Single	Varies(1) 60, 70 or 85

Note: (1) Reflects the layout of the existing road in the region of the realignment.

Cross-section specifications for the standard dual motorway as well as the type 3 dual, type 2 dual, standard single and reduced single carriageway types are included within the NRA DMRB Volume 6, Road Geometry. The standard cross-sections for these carriageway types, as detailed in NRA DMRB TD 27, describe the roadway width from the back of verge to back of verge.

Cross-section specifications for Access Roads are included within the NRA Manual of Contract Documents for Road Works (NRA MCRW), Volume 4, Road Construction Details, RCD/700/006. As above, the roadway width is described from the back of verge to back of verge.

The standard cross-sections, as detailed in NRA DMRB TD 27 and RCD/700/006, may vary at certain locations within the Proposed Scheme, to take into account specific design aspects. For example, verge and / or central reserve widening to provide desirable forward visibility. Other elements of the design that may change the standard cross-sections are discussed below.

In relation to Regional and Local Roads, the NRA DMRB TD 27 recommends that where such side roads are diverted or improved on-line as part of a scheme the cross-section of the revised section of side road should, in general, be similar to that of the existing road.

In compliance with NRA DMRB TA 66, garda observations platforms will be provided on the M11 Mainline at a minimum of one platform per each length of road between junctions. The layout will be as per NRA DMRB TA 66/95 Figure 4/2. Within the preliminary design observations platforms have been included for as follows:-

(i) Southbound carriageway – approximate chainages M11:5,150m and M11:24,275m; and;

(ii) Northbound carriageway – approximate chainages M11:13,780m and M11:26,380m.

Garda enforcement areas will be provided on the M11 Mainline motorway at intervals of approximately 20Km to 25Km, in compliance with NRA DMRB TA 69. The layout will be as per NRA DMRB TD 69/08 Figure 4/1. Within the preliminary design Garda enforcement areas have been included for on the M11 Mainline as follows:-

(i) Southbound carriageway – approximate chainages M11:6,600m and M11:26,100m; and

(ii) Northbound carriageway – approximate chainages M11:4,500m and M11:23,800m.

Emergency telephones may be provided on the M11 Mainline in accordance with NRA policy at an approximate spacing of 1.5 Km, in accordance with UK DMRB TA 73 and with a layout as per NRA MCRW RCD/1500/1.

Emergency access will be provided on the M11 Mainline motorway, in compliance with NRA DMRB TD 9. The primary purpose of such accesses is to provide emergency services access in the event of an incident. Emergency access will be provided on the M11 Mainline motorway as follows:-

(i) Chainage M11:6,000m Emergency crossing point with emergency turnaround areas on the northbound and southbound carriageways;

(ii) Chainage M11:11,230 and M11:11,570m Emergency access links to the northbound and southbound carriageways from Local Road L-1023;

(iii) Chainage M11:13,950m Emergency crossing point with emergency turnaround areas on the northbound and southbound carriageways; and

(iv) Chainage M11:25,130m Emergency access links to the northbound and southbound carriageways from Local Road L-6047.

A climbing lane will be included on the N30 Mainline on all hills with gradients greater than 2% and longer than 500m, which will comply with NRA DMRB TD 9. A climbing lane is an additional lane added to a road for the uphill traffic in order to improve capacity and/or safety because of the presence of a steep gradient. Within the preliminary design a climbing lane has been included for on the N30 Mainline between approximate chainages N30:6,400m and N30:7,300m.

Access Roads will accommodate the swept paths of agricultural vehicles, turning requirements of agricultural vehicles into / out of field entrances and will be designed to comply with NRA DMRB TD 41-42. The design of the Access Roads will also include for a maximum spacing for passing places of approximately 250 metres.

3.4 MAJOR JUNCTIONS

The integration of the Proposed Scheme with the existing road network includes the retention of an existing junction and the introduction of new junctions. The existing junction that will be retained is the roundabout at the interface of the N11 and R772 north of Enniscorthy in Ballinclay, referred to in this EIS as the Ballinclay Roundabout.

The major junctions along the proposed national routes are described in Table 3.4.1. Within this table, a dumb-bell layout comprises two roundabouts with a connecting section of road between them.

Table 3.4.1: Major Junctions on the Proposed National Routes

Name of Junction	Type
M11/N11 Mainline:	
Frankfort Junction	Grade separated, dumbbell layout
Ballydawmore Junction	Grade separated, two bridge roundabout
Scurlocksbush Roundabout	At grade roundabout
N80 Link Road:	
Clavass Junction	At grade, dumbbell layout
N30 Mainline:	
Milehouse Roundabout	At grade roundabout
Templescoby Roundabout	At grade roundabout
Existing N11 / R772:	
Ballinclay Roundabout	At grade roundabout

Access to / from the M11/N11 Mainline and N80 Link Road will only be permitted via the major junctions identified above. The exceptions to this are the access points that have been included for along the:

(i) M11 Mainline for the use of the emergency services, which are required in compliance with NRA DMRB TD 9; and

(ii) M11/N11 Mainline and N80 link Road for the use of the maintaining authority, which are required to provide access to balancing ponds and/or bypass interceptors for maintenance purposes.

The integration of the Proposed Scheme with the existing road network also includes for the proposed at grade Tomnafunshoge Roundabout to be located on the existing R744 in Tomnafunshoge. This roundabout will form the junction between the existing Regional Road R744 and the proposed R744 Link Road.

3.5 STRUCTURES

Structures, including culverts, will be required to carry the Proposed Scheme over or under the existing and proposed features and infrastructure. The detailed design of all such structures will be compliant with the NRA DMRB. As regards structures provided for Access Roads, or provided to minimise severance of agricultural lands, those that are to facilitate the passage of agricultural vehicles will generally have a minimum headroom clearance of 4.5m and a minimum

width of 4.0m and those that are to facilitate the passage of livestock, but not agricultural vehicles, will generally have a minimum headroom clearance of 3.0m and a minimum width of 3.0m.

The structures included within the preliminary design, as described and assessed in this EIS, are described in Table 3.5.1. Also included in Table 3.5.1 are the locations where retaining walls have been included for, based on the preliminary design as described in this EIS.

Table 3.5.1: Structures on the Proposed Scheme

Ref.	Chainage (m)	Description
M11/N11 Mainline:		
M11-AS-G1	1,400	Existing access structure to be extended. The extension will have minimum clear dimensions of 4.0m wide by 4.5m high
M11-G-CXT	1,440	Existing culvert for unnamed watercourse to be extended.
M11-AS- G2	1,500	Existing access structure to be extended. The extension will have minimum clear dimensions of 5.0m wide by 4.5m high
M11-S1	1,800	Structure forming part of Frankfort Junction
M11-AS1	2,270	Access structure, suitable for agricultural vehicle and livestock use
M11-AS2		Not used
M11-C-01	2,550	Culvert for unnamed watercourse
M11-AS3	2,960	Access structure, suitable for agricultural vehicle and livestock use
M11-S2	3,100	Structure for Local Road L-1027
M11-S3	3,250	Structure for Dublin-Wexford Railway (Ballygullen)
M11-C-02	3,350	Culvert for Bracken River
M11-AS4	3,400	Access structure, suitable for agricultural vehicle and livestock use
M11-S4	4,880	Structure for Local Road L-5092
M11-AS5		Not used
M11-C-03A	6,310	Culvert for tributary of the Bracken River
M11-C-03B		Not used

Table 3.5.1: Structures on the Proposed Scheme (Cont.)

Ref.	Chainage (m)	Description
M11-C-03C		Not used
M11-S5	7,590	Structure for Local Road L-5093
M11-S6		Not used
M11-AS6	9,240	Access structure, suitable for agricultural vehicle and livestock use
M11-C-04	9,300	Culvert for the Tinnacross Stream, which will be a bottomless culvert
M11-C-05	9,350	Culvert for tributary of the Tinnacross Stream
M11-AS7		Not used
M11-C-06	10,250	Culvert for unnamed watercourse
M11-AS8	10,280	Access structure, suitable for agricultural vehicle and livestock use
M11-S7	11,500	Structure for Local Road L-1023
M11-AS9		Not used
M11-C-07	12,320	Culvert for tributary of the Tinnacross Stream
M11-AS10	12,710	Access structure, suitable for agricultural vehicle and livestock use
M11-AS11		Not used
M11-C-08	13,140	Culvert for the Tinnacross Stream, which will be a bottomless culvert
M11-AS12		Not used
M11-C-09	13,350	Culvert for the Tinnacross Stream, which will be a bottomless culvert
M11-AS13		Not used
M11-C-10A	14,220	Culvert for tributary of the Tinnacross Stream
M11-C-10B	14,220	Culvert for tributary of the Tinnacross Stream
M11-AS14	14,320	Access structure, suitable for agricultural vehicle and livestock use
M11-S8	14,480	Structure for local Road L-2011
M11-C-11	14,700	Culvert for the Tinnacross Stream, which will be a bottomless culvert
M11-AS15		Not used
M11-C-12	15,110	Culvert for drainage ditch
M11-AS16	15,460	Access structure, suitable for agricultural vehicle and livestock use

Table 3.5.1: Structures on the Proposed Scheme (Cont.)

Ref.	Chainage (m)	Description
M11-C-13	15,520	Culvert for the Tinnacross Stream, which will be a bottomless culvert
M11-C-14	15,540	Culvert for unnamed watercourse
M11-AS17	15,580	Access structure, suitable for agricultural vehicle and livestock use
M11-AS18	16,030	Access structure, suitable for agricultural vehicle and livestock use
M11-C-15	16,130	Culvert for the Tinnacross Stream, which will be a bottomless culvert
M11-C-16		Not used
M11-AS19		Not used
M11-AS20		Not used
M11-C-17	16,750	Culvert for the Tinnacross Stream, which will be a bottomless culvert
M11-S9	17,370	Structure for Local Road L-2021
M11-C-18	18,400	Culvert for the Ballydawmore Stream, which will include light ports between the M11 Mainline and associated Ballydawmore Junction Slip Roads
M11-S10a	18,480	Structure forming part of Ballydawmore Junction
M11-S10b	18,570	Structure forming part of Ballydawmore Junction
M11-C-19	19,540	Culvert for tributary of the Corbally Stream
M11-S11	19,680	Structure for Local Road L-2024
M11-AS21		Not used
M11-C-20	20,380	Culvert for the Corbally Stream, which will be a bottomless culvert.
M11-AS22	20,400	Access structure, suitable for agricultural vehicle and livestock use
M11-S12	21,270	Structure for R744
M11-C-21	21,700	Culvert for tributary of the Corbally Stream.
M11-S13	22,300	Structure for Local Road L-6055
M11-C-22	22,750	Culvert for tributary of the Drumgold Stream.
M11-C-23	23,290	Culvert for the Drumgold Stream.
M11-C-24	24,100	Culvert for tributary of the Drumgold Stream.
M11-S14	24,900	Structure for Local Road L-2040
M11-AS23	25,790	Access structure, suitable for agricultural vehicle and livestock use
M11-C-25	25,870	Culvert for tributary of the Monroe Stream.

Table 3.5.1: Structures on the Proposed Scheme (Cont.)

Ref.	Chainage (m)	Description
M11-S15	26,600	Structure for Local Road L-6048
M11-C-26	26,550	Culvert for the Monroe Stream.
M11-C-27	26,680	Culvert for the Monroe Stream.
M11-C-28	27,140	Culvert for tributary of the Monroe Stream.
M11/N11-AS24	28,000	Access structure under existing N11 north-west of the Scurlocksbush Roundabout, suitable for livestock use
N80 Link Road:		
N80-AS1	1,220	Access structure, suitable for agricultural vehicle and livestock use
N80-AS2	1,680	Access structure, suitable for agricultural vehicle and livestock use
N80-C-01	1,690	Culvert for the Kilcannon Stream.
N80-AS3	1,700	Access structure, suitable for agricultural vehicle and livestock use
N80-AS4	2,080	Access structure, suitable for agricultural vehicle and livestock use
-	2,550 to 2,700	Series of flood relief culverts across River Slaney flood plain
N80-S1	2,800	Structure for River Slaney, Dublin – Wexford Railway (Ballynabarney) and Local Road L-2020.
N80-C-02	3,740	Culvert for tributary of the Ballydawmore Stream.
N80-C-03	3,885	Culvert for tributary of the Ballydawmore Stream.
N80-AS5	3,900	Access structure, suitable for agricultural vehicle and livestock use
N80-C-04	4,105	Culvert for tributary of the Ballydawmore Stream.
N30 Mainline:		
N30-C-01	530	Culvert for the Clavass Stream.
N30-S1	1,390	Structure for Local Road L-2015
N30-C-02	1,450	Culvert for the Clavass Stream.
N30-C-03	2,150	Culvert for tributary of the Hollyfort Stream.
N30-C-04	2,550	Culvert for tributary of the Hollyfort Stream.
N30-S2	2,950	Structure for Local Road L-2014, will include a segregated access suitable for livestock use
N30-AS1		Not used
N30-C-05	3,290	Culvert for the Hollyfort Stream.
N30-AS2		Not used

Table 3.5.1: Structures on the Proposed Scheme (Cont.)

Ref.	Chainage (m)	Description
N30-S3	3,890	Structure for Local Road L-2012
N30-C-06	5,100	Culvert for Pullinstown Stream, which will be a bottomless culvert
N30-S4	5,360	Structure for Local Road L-6125
N30-C-07	6,310	Culvert for River Urrin tributary
N30-S5	6,310	Structure for Local Road L-2030
N30-C-08	6,370	Culvert for tributary of the River Urrin
N30-S6	6,520	Structure for River Urrin, which will accommodate a 3m wide access suitable for livestock use on the southern bank of the River Urrin.
N30-S7	6,940	Structure for Local Road L-6122
N30-C-09	7,230	Culvert for tributary of the River Urrin
N30-S8	7,820	Structure for Old N30
Retaining Walls:		
-	N80:3,800	Northern verge of N80 Link Road
-	N30:4,750	Southern verge of Realigned R702
-	N30:6,300	Eastern verge of N30 Mainline

Note: All chainages shown are approximate

River Slaney Structure

A structure with a main, central span of approximately 70m is the option chosen to cross over the River Slaney (refer to Figure 3.4 – Proposed River Slaney Bridge Elevation and Section, in Volume 4 of this EIS). This main span includes a 5m minimum width immediately adjacent to the western bank of the River Slaney that is clear of any structural elements, such as piers. The main span also crosses over the Dublin – Wexford railway in Ballynabarney. The span arrangement therefore, avoids the River Slaney and its banks and provides for a clear span over the Slaney River Valley candidate Special Area of Conservation (cSAC).

The total length spanned by the structure at this location is approximately 153m. This total span length includes two side spans, each of approximately 42m. One is over Local Road L-2020 whilst the other facilitates uninterrupted flow of flood waters immediately adjacent to the western (right) bank of the river channel.

On the western approach to this structure is an earthworks embankment, which takes the N80 Link Road over an area of the River Slaney flood plain. Included within this embankment will be

a series of flood relief culverts, evenly spaced over the remaining width of the flood plain. These culverts, together with the structure side span on the western bank of the river channel, will facilitate the continued migration of flood waters along the important right conveying overbank, across the full width of the River Slaney flood plain.

The design flow for the structure together with the adjacent flood relief culverts will be a 100 year flood rate plus a proposed climate change allowance of a 20% increase in peak flow rates. The structure together with the adjacent flood relief culverts will result in minimal changes to the flood regime and will avoid contraction of the overbank flood flow. Consequently the predicted impact upstream of the structure for the design flood condition is small (refer to the hydraulic assessment of the proposed River Slaney bridge crossing included in Appendix 3.1 in Volume 3 of this EIS).

Within the preliminary design, as described in this EIS, the flood relief provisions comprise 10 No. flood relief culverts, 4.8m wide by 3.0m high spaced equally at 14.4m centres.

3.6 SIDE ROADS

Where existing Side Roads are intersected by the proposed national routes continuity along the Side Road can either be permanently severed or maintained.

It is proposed that Local Road L-6052 in Roperstown will be permanently severed. Turning heads will be included for within the Proposed Scheme.

Continuity along Side Roads can be maintained by either providing structures that facilitate the Proposed Scheme or by re-routing Side Roads to an alternative crossing location. It is proposed that the following Local Roads will be re-routed:-

(i) L-5096 in Rockspring will be re-routed to Local Road L-5093, to the west of the M11 Mainline. The existing section of Local Road L-5096 located on to the east side of the M11 Mainline will severed. A turning head will be included for within the Proposed Scheme;

(ii) L-6047 in Knockrathkyle will be re-routed to Local Road L-2040; and

(iii) L-6121 in Templescoby will be re-routed to Local Road L-6122.

The permanent realignments, including re-routings, and proposed lengths of Side Roads are summarised in Table 3.6.1.

Table 3.6.1: Existing Road Realignments

Ballinclay Roundabout:	
North of roundabout – R772	No realignment
East of roundabout – N11	No realignment
West of roundabout – N11	No realignment
Frankfort Junction:	
N11 Arklow / Gorey Bypass	Realignment of the existing N11 dual carriageway from approximate chainage N11:820m to facilitate the M11/N11 Mainline and Frankfurt Junction.
Ballydawmore Junction:	
	No existing roads affected
Scurlocksbush Roundabout:	
North of roundabout – N11	Realignment of existing N11 to facilitate Scurlocksbush Roundabout (0.16 Km)
South of roundabout – N11	Realignment of existing N11 to facilitate Scurlocksbush Roundabout (0.17 Km)
Clavass Junction – North Dumb-bell Roundabout:	
North of roundabout – N11	No realignment
West of roundabout – N80	No realignment
South of roundabout – N11	Realignment of existing N11 to facilitate Clavass Junction (0.05 Km).
Clavass Junction – South Dumb-bell Roundabout:	
North of roundabout – N11	Included in description above
West of roundabout – Old Dublin Road L-2008	Realignment of existing Old Dublin Road to facilitate Clavass Junction (0.1 Km).
South of roundabout – N11	Realignment of existing N11 to facilitate Clavass Junction (0.22 Km).
Milehouse Roundabout:	
West of roundabout - R702	Realignment of existing R702 to facilitate Milehouse Roundabout (0.25 km).
East of roundabout - R702	Realignment of existing R702 to facilitate Milehouse Roundabout (0.50 km).
Templescoby Roundabout:	
West of roundabout – N30	Realignment of existing N30 to facilitate Templescoby Roundabout (0.11 Km).
East of roundabout – N30	Realignment of existing N30 to facilitate Templescoby Roundabout (0.11 Km).

Table 3.6.1: Existing Road Realignments (Cont.)

Local Roads	
L-1027 (Ballygullen)	Realignment to structure M11-S3 (0.06 Km).
L-5092 (Ballyeden)	Realignment to structure M11-S4 (0.23 Km).
L-5093 (Ballymore)	Realignment to structure M11-S5 (0.19 Km).
L-5096 (Rockspring)	Re-routed to Local Road L-5093 (0.84 Km).
L-1023 (Ballycarrigeen Lower)	Realignment to structure M11-S7 (0.44 Km).
L-2011 (Tinnacross)	Realignment to structure M11-S8 (0.26 Km).
L-20211 (Crane)	Realignment to structure M11-S9 (0.26 Km).
Unclassified road between L-2024 (Ballydawmore) and L-2021 (Crane)	Re-routed to Local Road L-2021 (0.58 Km).
L-2024 (Corbally)	Realignment to structure M11-S11 (0.23 Km).
Proposed Side Road	R744 Link Road connecting the Regional Road R744 in Tomnafunshoge to the Ballydawmore Junction (2.7 Km).
R744 (Tomnafusnshoge)	Realignment of R744 in the region of the Tomnafunshoge Roundabout and structure M11-S12 (0.60 Km).
L-2025 (Tomnafunshoge)	Realignment to junction with R744 (0.18Km).
L-6055 (Drumgold)	Realignment to structure M11-S13 (0.55 Km).
L-2040 (Knockrathkyle)	Realignment to structure M11-S14 (0.47 Km).
L-6047 (Knockrathkyle)	Re-routed to Local Road L-2040 (0.26 Km).
L-6048 (Glentiege)	Realignment to structure M11-S15 (0.21 Km).
L-2020 (Ballynabarny)	Realignment to structure N80-S1 (0.12 Km).
L-2015 (Coolnahorna)	Realignment to structure N30-S1 (0.31 Km).
L-2014 (Ballyorril)	Realignment of to structure N30-S2 (0.31 Km).
L-2012 (Killalligan North)	Realignment to structure N30-S3 (0.35 Km).
L-6125 (Bessmount / Monart East)	Realignment to structure N30-S4 (0.24 Km).
L-2030 (Bessmount)	Realignment to structure N30-S5 (0.11 Km).
L-6122 (Templescoby)	Realignment to structure N30-S7 (0.41Km).
L-6121 (Dunsinane)	Re-routed to Local Road L-6122 (0.29Km).
Old N30 (Dunsinane)	Realignment to structure N30-S8 (0.54 Km)

Note: all lengths shown are approximate.

3.7 ACCESS ROADS

Proposed Access Roads will be required to minimise severance of agricultural lands and to provide access to balancing ponds and/or bypass interceptors for maintenance purposes. The major Access Roads included within the preliminary design, as described in this EIS, are described in Table 3.7.1(refer to Figure 3.1 – Proposed Scheme General Layout, in Volume 4 of this EIS).

Table 3.7.1 Major Access Roads

Ref.	Chainage (m) (1)	Approximate Length (m)
M11/N11 Mainline:		
M11-AR-01	1,470	300m
M11-AR-02	1,530	70m
M11-AR-03	2,050	370m
M11-AR-04	2,920	100m
M11-AR-05	3,100	200m
M11-AR-06	3,400	140m
M11-AR-07	4,720	170m
M11-AR-08	4,900	360m
M11-AR-09	5,200	220m
M11-AR-10	9,150	260m
M11-AR-11	10,280	480m
M11-AR-12	10,280	480m
M11-AR-13 (2)	11,230	250m
M11-AR-14	12,550	230m
M11-AR-15	12,560	170m
M11-AR-16	14,120	220m
M11-AR-17	14,500	160m
M11-AR-18	15,970	70m
M11-AR-19	16,290	70m
M11-AR-20	17,060	320m
M11-AR-21	17,360	580m
M11-AR-22	17,800	200m
M11-AR-23	19,160	470m
M11-AR-24	20,180	200m
M11-AR-25	20,900	70m
M11-AR-26	22,250	620m

Table 3.7.1 Major Access Roads (Cont.)

Ref.	Chainage (m) (1)	Approximate Length (m)
M11-AR-27	25,790	140m
M11-AR-28	26,430	160m
M11-AR-29	26,660	450m
N11-AR-30	27,880	120m
N11-AR-31	28,030	110m
N80 Link Road:		
N80-AR-01	0	450m
N80-AR-02	1,200	190m
N80-AR-03	1,500	300m
N80-AR-04	1,680	90m
N80-AR-05	1,700	70m
N80-AR-06	2,080	120m
N80-AR-07	2,830	70m
N80-AR-08	3,700	180m
N80-AR-09	4,050	270m
N30 Mainline:		
N30-AR-01	50	70m
N30-AR-02	350	100m
N30-AR-03	350	70m
N30-AR-04	1,380	90m
N30-AR-05	2,800	170m
N30-AR-06	3,500	400m
N30-AR-07	4,420	110m
N30-AR-08	4,700	170m
N30-AR-09	4,700	100m
N30-AR-10	4,800	190m
N30-AR-11	6,000	90m
N30-AR-12	6,050	50m
N30-AR-13	6,230	80m
N30-AR-14	6,300	50m

Note: (1) Approximate start of Access Road described as a chainage on the adjacent proposed national route for ease of reference.

(2) Also serves as an Emergency Access Link.

(3) All chainages are approximate.

3.8 WATERCOURSE CROSSINGS

The Proposed Scheme includes for structures N80-S1 and N30-S6 to facilitate crossing the River Slaney and the River Urrin respectively. In addition to these, culverts will generally be included where a proposed road passes over a watercourse. The culverts included within the preliminary design, as described and assessed in this EIS, are described in Table 3.5.1.

The culverts may run perpendicular or at a skew angle to a proposed road and will generally extend 3m beyond embankment profiles to provide a continuous access route for maintenance machinery. Some of the watercourses may require to be realigned under the Proposed Scheme. Where required, structures over watercourses and culverts will be increased in size and / or amended in design to incorporate movement of fish and animals without affecting the operational capacity of the structures or culverts (refer to Chapters 9 and 11 of this EIS). The culverts will either comprise a proprietary system, such as precast concrete or corrugated steel units, or will be cast in-situ.

In compliance with the requirements of the Eastern Regional Fisheries Board:-

(i) bottomless culverts will be used at all crossings of the Tinnacross Stream, Corbally Stream and Pullinstown Stream; and

(ii) the culvert facilitating the M11 Mainline crossing of the Ballydwamore Stream, in the region of the Ballydawmore Junction, will comprise 3 sections with intermediate light ports between each section.

The hydraulic effects created by the structures over watercourses and culverts forming part of the Proposed Scheme will be minimised or managed through compliance with the requirements, guidelines and design standards as set out in:-

(i) 'A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945' (OPW, date unknown);

(ii) 'Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes' (NRA, 2006);

(iii) 'Requirements for the Protection of Fisheries Habitats during Construction and Developments Works at River Sites (ERFB, 2006);

(iv) 'Culvert Design Manual – Report 168' (CIRIA, 1997);

(v) United Kingdom Highways Agency Design Manual for Roads and Bridges (UK DMRB) HA 106; and

(vi) UK DMRB HA 107.

The hydrological analysis will be representative of the rainfall and design flood peak flows that can be expected at the location of the proposed watercourse crossings and will include a range of techniques to estimate the most likely design flood peak flow. The design of the watercourse

crossings will be based on a design flood peak flow for a 1 in 100 year event plus a 20% uplift to allow for climate change.

The watercourse crossings included in Table 3.5.1 were identified and sized based on the preliminary design for the Proposed Scheme as described in this EIS. During the preliminary design phase of the Proposed Scheme consent from the Commissioners of Public Works, under Section 50 of the Arterial Drainage Act 1945, was sought for all the watercourse crossings identified and assessed along the Proposed Scheme as described in this EIS. At the time of publication of this EIS, the Section 50 consent applications were under review by the Office of Public Works.

The detailed design of all watercourse crossings will be the responsibility of the Contractor. Prior to the construction of any watercourse crossings the Contractor will be responsible for obtaining consent from the Commissioners of Public Works, under Section 50 of the Arterial Drainage Act 1945, for the detailed design of all watercourse crossings.

3.9 DRAINAGE

The detailed design of the road drainage systems for the national routes will be developed in accordance with the NRA DMRB HD 33, supplemented with best management practice as included within the UK DMRB HD 33. Whilst one the primary aims of the drainage systems described in the NRA DMRB HD 33 and the UK DMRB HD 33 is to remove surface water from the road, they also contribute to pollution and flooding control. The detailed design will comply with the mitigation strategies identified in this Section 3.8 and within Chapters 9 and 11 of this EIS.

The road drainage systems will comprise either:- a sealed drainage system; an open drainage system; or a combination of the two. Sealed drainage systems include systems such as kerbs and gullies and surface water channels, which direct surface water into sealed carrier drains which in turn direct the water to an outfall location. Open drainage systems are ones in which the surface water passes over the edge of the paved area and is either intercepted by a filter drain located at the back of the verge or by an interceptor ditch located at the base of an embankment. The filter drain or interceptor ditch directs the intercepted water to an outfall location.

Also, interceptor ditches or filter drains will be included within the Proposed Scheme where appropriate to provide continuity for existing field ditches intercepted by the Proposed Scheme and to control runoff from adjoining land to maintain the integrity of the road construction. Generally, such ditches and drains will follow the existing ground profile and outfall into existing watercourses.

At outfall locations, the proposed road drainage systems for the national routes will flow via petrol / oil bypass interceptors into balancing ponds before discharging into watercourses. The balancing ponds will be designed so that the maximum rate of outflow into the receiving waters

will be, at most, equivalent to the existing greenfield runoff rate. The design of the balancing pond will be undertaken in accordance with UK DMRB HA 103 and will be based on a 100-year storm event with a duration of 48 hours. The design will also include for a 20% increase in rainfall intensity, to account for climate change in accordance with current best management practice of the UK DMRB HD 33.

The proposed outfall locations, and associated bypass interceptors and balancing ponds, along the national routes identified based on the preliminary design for the Proposed Scheme as described in this EIS, are described in Table 3.8.1 and in Figure 3.5 – Proposed Drainage Outfall Locations, in Volume 4 of this EIS.

Table 3.8.1 National Routes Outfall Locations

Ref.	Chainage (M)	Receiving Waters
M11/N11 Mainline		
M11-OF-01	1,450	Unnamed Watercourse
M11-OF-02	3,320	Bracken River
M11-OF-03	6,300	Bracken River Tributary
M11-OF-04	9,350	Tinnacross Stream
M11-OF-05	10,660	Tinnacross Stream
M11-OF-06	12,670	Tinnacross Stream
M11-OF-07	14,750	Tinnacross Stream
M11-OF-08	16,230	Tinnacross Stream
M11-OF-09	18,370	Ballydawmore Stream
M11-OF-10	20,290	Corbally Stream
M11-OF-11	22,640	Drumgold Stream
M11-OF-12	26,530	Monroe Stream
M11-OF-13	27,090	Monroe Stream Tributary
M11-OF-14	28,020	Scurlocksbush Stream
N80 Link Road		
N80-OF-01	50	River Slaney
N80-OF-02	1,690	Kilcannon Stream
N80-OF-03	2,900	Corbally Stream
N30 Mainline		
N30-OF-01	500	Clavass Stream
N30-OF-02	5,085	Pullinstown Stream
N30-OF-03	6,450	River Urrin
N30-OF-04	8,065	River Boro Tributary

Note: All chainages shown are approximate

Road carriageway runoff from Side Roads affected by the Proposed Scheme will generally be connected into the existing road drainage systems.

3.10 LIGHTING

Traffic route lighting will be provided on the proposed national routes in the region of grade separated and at grade junctions, including the immediate approaches to these junctions, and at the Dublin – Wexford railway structure in Ballygullen.

The standard of lighting that will be provided will be selected by reference to ISEN 13201 (2003) Road Lighting and BS 5489 (2003) Code of Practice for the Design of Road Lighting. The extents of lighting will be determined by reference to NRA DMRB TD22, UK DMRB TD 34 and following consideration of road geometry, junction complexity, road design speed and other relevant factors.

The roundabout lighting will be designed to Class CE2 of ISEN 13201, which will include a road surface luminance of 20 Lux with an overall uniformity of 0.4. All other roads will be designed to Class ME3a of ISEN 13201, which will include a road surface luminance of 1.0 Candelas, with an overall uniformity of 0.4 and a longitudinal uniformity of 0.7.

The lighting will be provided by energy-efficient high pressure sodium lanterns (SONP-T) of up to 250 Watts each, mounted on galvanised steel lighting columns up to a maximum of 12m high above finished road level. All lanterns will be of the fully cut-off, flat glass type to minimise light spill and ensure that light is concentrated on the road surface. The quantity of lighting in the design will be the minimum necessary for road safety. All cables for the lighting installation will be ducted underground.

Within the preliminary design, the traffic route lighting included for on the proposed national routes is as described below.

3.10.1 Ballinclay Roundabout

The existing lighting at Ballinclay Roundabout will be left in place.

3.10.2 Frankfort Junction

It is proposed to light the two roundabouts using 10 metre columns with 250 Watt lanterns around the peripheries of the roundabouts.

The structure linking the roundabouts will be lit using 8 metre bolted columns with 150 Watt lanterns in a single-sided arrangement on the structure, and 10 metre columns with 150 Watt lanterns, also single-sided, on the approaches to the structure.

The diverge ramps will be lit for a distance of 60 metres from the roundabouts, and the merge ramps to 60 metres from the roundabouts, using a single-sided arrangement of 10 metre columns with 150 lanterns.

The dual carriageway link to the existing Ballinclay Roundabout will be lit all the way to the existing lighting using an opposite arrangement of 12 metre columns with 150 Watt lanterns.

3.10.3 Ballydawmore Junction

The two structures, forming part of the two bridge roundabout, and the remainder of the roundabout will be lit using 10 columns with 100 Watt lanterns around the periphery.

The diverge ramps will be lit for a distance of 60 metres from the roundabouts, and the merge ramps to 60 metres from the roundabouts, using a single-sided arrangement of 10 metre columns with 150 Watt lanterns.

The N80 Link Road will be lit to a distance of 240 metres from the two bridge roundabout using an opposite arrangement of 12 metre columns with 150 Watt lanterns.

The R744 Link Road will be lit using a single-sided arrangement of 10 metre columns with 150 Watt lanterns for a distance of 180 metres from the two bridge roundabout.

3.10.4 Tomnafunshoge Roundabout

It is proposed to light the roundabout using 10 metre columns with 250 Watt lanterns around the periphery of the roundabout.

The western approach to the roundabout will be lit for 180m from the roundabout. This will comprise 8 metre bolted columns with 150 Watt lanterns in a single-sided arrangement on the single carriageway structure and 10 metre columns with 150 Watt lanterns, also single-sided, on the approaches to the structure.

The northern approach to the roundabout (R744 Link Road) will be lit using a single-sided arrangement of 10 metre columns with 150 Watt lanterns for a distance of 180 metres from the roundabout.

The eastern approach to the roundabout will be lit for 230m from the roundabout. This approach is made up of a combination of the R744 and the Local Road L-2025, which will be lit using a single-sided arrangement of 10 metre columns with 150 Watt lanterns.

3.10.5 Scurlocksbush Roundabout

The Scurlocksbush Roundabout will be lit using 10 metre columns with 250 Watt lanterns around the periphery of the roundabout.

The northern approach to the Scurlocksbush Roundabout will be lit using a single-sided arrangement of 12 metre columns with 150 Watt lanterns for a distance of 240m.

Both sections of the existing N11, going north and south from Scurlocksbush Roundabout, will be lit to a distance of 240 metres each from the roundabout, using a single-sided arrangement of 10 metre columns with 150 Watt lanterns.

3.10.6 Clavass Junction

The two roundabouts will be lit using 10 metre columns with 250 Watt lanterns around the peripheries of the roundabouts.

The dual-carriageway linking the roundabouts will be lit using an opposite arrangement of 10 metre columns with 150 Watt lanterns.

The N80 Link Road, for a distance of 240 metres, will be lit using an opposite arrangement of 12 metre columns with 150 Watt lanterns.

The existing N80 and the existing N11, going north-west and north from the northern roundabout, as well as the existing N11 and N30 Mainline, going south and south-west from the southern roundabout will be lit to a distance of 240 metres from their respective roundabouts, using a single-sided arrangement of 10 metre columns with 150 Watt lanterns.

The existing L-2008 (Old Dublin Road) will be lit for 90 metres from the south roundabout in a single sided arrangement using 10 metre columns with 150 Watt lanterns.

3.10.7 Milehouse Roundabout

It is proposed to light the roundabout using 10 metre columns with 250 Watt lanterns around the periphery of the roundabout.

Both legs of the N30 Mainline, going east and west, will be lit to a distance of 240 metres from the roundabout using a single-sided arrangement of 10 metre columns and 150 Watt lanterns.

Both legs of the R702, going north-west and south-east, will be lit to a distance of 105 metres from the roundabout, also using a single sided arrangement of 10 metre columns and 150 Watt lanterns.

3.10.8 Templescoby Roundabout

It is proposed to light the roundabout using 10 metre columns with 250 Watt lanterns around the periphery of the roundabout.

Going east on the existing N30, it is proposed to light continuously from the roundabout to a distance of 580m using an opposite arrangement of 12 metre columns with 150 Watt lanterns. It is also proposed to light Local Road L-6106-1 and the Old N30 to a distance of 75 metres from the existing N30, using 10 metre columns and 150 Watt lanterns in a single-sided arrangement.

On the western leg of the existing N30, it is proposed to light for a distance of 240 metres from the roundabout, using a single-sided arrangement of 10 metre columns with 150 Watt lanterns.

Going north from the roundabout on the N30 Mainline, it is proposed to light to a distance of 240 metres from the roundabout, using a single-sided arrangement of 10 metre columns and 150 Watt lanterns.

3.10.9 Road and Rail Underpasses

Structures carrying Side Roads and Access Road under the proposed national routes will not be lit.

Where the Dublin – Wexford railway line passes under the M11 Mainline at chainages M11/N11:3,250m lighting in this structure will comprise a number of soffit-mounted lights providing an average light level of 100 lux.

3.11 CONSTRUCTION ACTIVITIES

3.11.1 Introduction

The likely principal stages of works that will be employed during the construction of the Proposed Scheme are outlined below. The timing of when these works will commence is subject to the satisfactory completion of the statutory land acquisition and EIS procedures, the availability of finance and the satisfactory completion of procurement procedures.

The remaining sub-sections of this construction activities section outline some general impacts and mitigation measures that will be employed during the construction stage. This Section 3.11 should be read in conjunction with Chapters 5 to 15 of this EIS, which also include descriptions of potential significant impacts during construction and proposed mitigating strategies.

Pre Main Construction Works

Generally, the progression of a scheme after confirmation of the land acquisition procedures and EIS has been published by An Bord Pleanála is that notices to treat and notices to enter will be served after which fencing will be erected to delineate the site boundary.

It is currently anticipated that some works may be undertaken prior to the main construction works for the M11 Gorey to Enniscorthy Scheme commencing. Examples of such works that may be undertaken include:-

(i) Archaeological surveys and testing, in order to resolve archaeological issues.;

(ii) Fencing works;

(iii) Tree and hedgerow clearance works; and

(iv) Detailed ground investigation works.

Main Construction Works

Once a contract has been awarded to the successful Contractor, the main site clearance works will begin. These clearance works will require the use of large machinery and vehicles.

The Contractor will identify suitable areas of land at selected locations along the length of the Proposed Scheme for construction compounds. These compound locations will be chosen to accommodate his proposed construction programme and method of constructing the works and will take into account limitations on the locations included within Chapters 5 to 16 of this EIS.

Haul routes may be constructed for the movement of large plant and materials.

Materials brought to site may include concrete and steel structural elements, earthworks materials, road pavement materials, cement, hard core / gravel, pipes, chemicals and oils. The construction of the highways and associated structures will involve earth movements, crossing of utilities plant/services, site drainage and runoff, de-watering operations, working near or within watercourses, working near or within floodplains and the laying of road pavements.

The construction of the highways and associated structures works will require the use of large machinery and vehicles and may include a requirement for blasting.

To aide delivery of the environmental mitigation measures described in this EIS that relate to the construction process the Contractor will develop, implement and maintain an environmental operating plan for the Proposed Scheme during the construction phase, taking into account the guidance included within the *Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan* (NRA, 2007).

3.11.2 Timing of Works

It is proposed that the procurement process for the construction of the M11 Gorey to Enniscorthy Scheme will either be by Design and Build or as part of a Public Private Partnership (PPP) project. Subject to the satisfactory completion of the statutory procedures, the availability of finance and the programming requirements of the successful Contractor it is anticipated that main construction works will begin on site during 2011. The overall construction period for the Proposed Scheme is anticipated to be in the region of 2½ years.

3.11.3 Employment

Employment levels will vary throughout the construction period depending on the operations being undertaken. Employment will include construction workers, administrative staff and professional staff.

3.11.4 Accommodation

Requirements for local accommodation will depend on the Contractor and the level to which local labour is employed.

3.11.5 Working Hours

Site working hours will vary depending on seasons and weather conditions. Hours of operation and noise levels typically deemed acceptable for national road developments are described in Chapter 13 of this EIS.

Normal hours of work are anticipated to be Monday to Friday 07:00 to 19:00 hours and Saturday 08:00 to 16:30 hours. However works outside of these hours, including Sundays, may be necessary in certain circumstances. Night time and Sunday work will require specific permission.

The exception to this is any construction activity required in respect of emergency works. Examples of works that may be necessary outside of the permitted normal hours of work include:- working on existing roads outside of peak periods to avoid causing additional traffic congestion; diversion of statutory utilities; working immediately adjacent to and or over existing roads / railway lines.

3.11.6 Site Acquisition and Management Prior to Development

The site will be acquired after the satisfactory completion of the statutory land acquisition and EIS procedures, subject to the availability of finance. It is not envisaged that any special management of the site is required prior to the start of the pre-construction works.

3.11.7 Site Preparation Works

The site boundary will be fenced. Site access points will be constructed to provide access for construction vehicles from the existing road network. This will involve some works adjacent to existing roads and may require temporary traffic diversions.

3.11.8 Working Space

Provision has been made in the land acquisition extents of the Proposed Scheme for working space along the length of the Proposed Scheme.

For example, land has been included to accommodate temporary, localised diversions adjacent to Side Road realignments. Road structures are predominantly located along the line of the existing Side Roads. Therefore, temporary diversions of Side Roads will be needed during construction, to provide adequate and safe working areas for the Contractor and safe roadways for the public. Temporary diversions may also be necessary in the region of tie-ins to the existing road network.

However, the Contractor may choose to seek temporary road closures from the Local Road Authority (Wexford County Council), which will be assessed and decided upon in accordance with the Local Road Authority's procedures and in accordance with the requirements of the Roads Act 1993 and Roads Regulations 1994. This may result in the temporary closure of some Side Roads during the construction period, which would require the traffic to be temporarily re-routed during the period of the closure.

The planning, design, implementation and maintenance of all temporary diversions, localised and re-routings, will be the responsibility of the Contactor, and will be undertaken in compliance with the requirements of the Local Roads Authority (Wexford County Council) and the Gardaí. The Contractor will employ methods to allow the safe operation of all temporary diversions for both construction operatives and the public.

3.11.9 Bulk Earthworks

Preliminary ground investigations were carried out along the line of the Proposed Scheme during

2006 and 2008 as part of the development of the Proposed Scheme through the informal route selection process, as described in Chapter 10 of this EIS. These ground investigations were undertaken in order to obtain site specific information along the Proposed Scheme, to feed into the preliminary design of the Proposed Scheme.

Preliminary earthworks details and quantities have been developed based on the vertical alignments forming part of the preliminary design, as described in this EIS, and taking into consideration the results of the preliminary site investigations described above. The preliminary design earthworks quantities have been determined based on cut materials generally being incorporated into the works, in compliance with the Specification for Road Works (NRA, March 2000).

The estimated earthworks cut/fill volumes comprise a total gross volume of cut for the preliminary design of approximately 5.28Mm^3 and a total gross volume of fill of approximately 5.52Mm^3, including an estimated 0.24Mm^3 of imported capping.

These preliminary earthworks quantities are considered to be a reasonable indication of the quantities of materials that may arise if the preliminary design were to be built. Ultimately, the detailed design will be undertaken and finalised by the Contractor. The detailed design and the materials that are present during construction will, therefore, determine the actual quantities.

Based on the results of the preliminary site investigations carried out along the line of the Proposed Scheme, excavation in rock may occur at a number of locations along the Proposed Scheme, as described in Chapter 10 of this EIS. The principal methods to excavate rock are blasting or ripping and breaking. Both methods may be used by the Contractor during construction.

The construction of the Proposed Scheme will expose earth surfaces in excavations and embankments, which will increase the potential for soil erosion and sediment transport in surface water run-off during construction. The Contractor will be responsible for constructing and maintaining erosion and sediment control measures during the construction process. Erosion and sediment control measures will be consistent with the guidance contained within *Control of Water Pollution from Linear Construction Projects* (Technical Guide C648 and Site Guide C649, CIRIA, 2006).

3.11.10 River Slaney Structure

The River Slaney / Ballynabarney railway / Local Road L-2020 crossing (Structure Ref. N80-S1) is located at approximate chainage N80:2,800m (refer to Figure 3.4 – Proposed River Slaney Bridge Elevation and Section, in Volume 4 of this EIS). The structure comprises three spans as described in Section 3.5 of this EIS.

Within the preliminary design, as described in this EIS, bored concrete piled foundations are proposed for the sub-structure. Typically, such piled foundations are constructed using a tracked

piling rig which bores through the ground to sound bedrock after which the open bore is filled with concrete. In-situ reinforced concrete piers and abutments will then be constructed on the completed piles.

It is envisaged that the bridge deck will consist of steel plate girders which will be fabricated off site. The plate girders for the side spans will be fabricated to cantilever approximately 10m into the main river/rail span. These will be delivered to site to the west of the River Slaney and to the east of the Dublin- Wexford railway and lifted into place by cranes. The centre portions of each girder above the river will be delivered to the west bank of the river and lifted by crane into place and bolted between the ends of the side span girders. Formwork will be erected to span between the plate girders and the concrete deck slab will be cast to complete the bridge deck.

3.11.11 Concrete Materials

Concrete will be required throughout the construction period, with demand being the greatest during the construction of structures. The construction of the structures and culverts may include the use of pre-cast units, cast in-situ concrete or a combination of the two.

Based on the assumption that all culverts will be pre-cast units, it is estimated that the structures construction may require approximately 14,900m^3 of concrete.

Concrete will be sourced from local suppliers or batched on site.

3.11.12 Road Pavement Materials

Bituminous based and other road pavement materials will be required throughout the construction period. Demand will be greatest during the latter end of construction. It is estimated that some 641,000 tonnes of bituminous based and 156,000m^3 sub-base materials may be required.

Bituminous based and other road pavement materials will be sourced from local suppliers or batched on site.

3.11.13 Construction Traffic

The main materials that may be transported to / from site on public roads are considered to be the concrete to be used in the structures and road pavement and earthworks materials.

There may be haulage of materials from one part of the site to another. For example, earthworks materials gained from the site and that are to be deposited on the site. The Contractor will, in general, transport the majority of such earthworks materials within the extents of the construction site. However, some construction materials, including some earthworks materials, may be transported along the existing road network. Where haul routes along the site cross the existing road network the Contractor will establish crossing points to safely integrate the haul road traffic with the existing traffic flows.

There are a limited number of points where construction traffic can access the site from National and / or Regional roads, with large distances between such access points (over 21Km between the Frankfort and Ballydawmore Junctions). There are also key physical constraints that will delay the establishment of continuous routes within the extents of the site, examples of which are the River Slaney, the River Urrin and the Dublin – Wexford railway. Taking this into account, and looking at the existing road network in the vicinity of the Proposed Scheme, generally the routes the Contractor will be permitted to use during construction include the following National, Regional and Local Roads:-

(i) N11;

(ii) N80;

(iii) N30;

(iv) Old N30;

(v) R744;

(vi) R702; and

(vii) L-1023, from Ferns to The Harrow.

Access along other sections of the existing road network may be required for certain delivery activities. For example, the delivery of concrete for the construction of Side Road structures.

The Contractor will also be responsible for the inspection, repair and maintenance of the existing road network used by construction traffic within the site, and extending for a length of 2 Km from the extents of the site, to ensure that they are safe to use and free of excessive construction debris, dust and mud. Measures such as wheel washing and road-cleaning vehicles will be used. Vehicles removing or delivering loose material, such as stone, will have their loads covered where necessary.

In order to assess the worst case scenario in terms of construction traffic movements for the purposes of this EIS, and taking into account the estimated construction period of 30 months, it has been assumed that the:

(i) Earthworks operations will take approximately 8 months to complete and will generally be undertaken between March and October 2011;

(ii) Structures operations will start around June 2011 and will continue for approximately 18 months till around November 2012; and

(iii) Pavement operations will be undertaken during the last 12 months of the construction period, in general between June 2012 and May 2013.

Based on the programme described above, the maximum daily volume of construction traffic that is estimated may use the surrounding existing road network is 692 vehicle movements per day. Generally, the majority of these traffic movements will be on the national and regional road

network. An estimated maximum of 200 construction vehicle movements per day may use the L-1023 between Ferns and The Harrow.

The construction traffic will be using the existing road network for a limited period of time.

3.12 OPERATION

3.12.1 Traffic

The predicted traffic flows, for the road network affected by the Proposed Scheme, used for the environmental impact assessments in this EIS are described in Chapter 4 of this EIS.

3.12.2 Design Speed, Sight and Stopping Distance

The design speed for the various elements of the Proposed Scheme are as described in Table 3.3.1 of this EIS.

Sight and stopping distances for the Proposed Scheme will be as defined by the NRA DMRB, Volume 6, Road Geometry.

3.12.3 Maintenance

Normal road maintenance procedures will be required for the proposed national routes.

3.12.4 Lights, Signalling and Signage

Street lighting will be provided in the region of all grade separated junctions and at-grade roundabouts along the proposed national routes (refer to Section 3.10 of this EIS).

Appropriate traffic signage along the Proposed Scheme will be provided, which will be compliant with the:

(i) Traffic Signs Manual (Department of the Environment, Heritage and Local Government, 1996);

(ii) Interim Notes for Guidance on the Traffic Signs Manual for use on NRA Funded Road Schemes (NRA, Nov 2004);

(iii) NRA DMRB; and

(iv) Policy on the Provision of Tourist and Leisure Signage on National Roads (NRA, March 2007).

3.12.5 Other Safety Measures

Safety barriers will be provided along the Proposed Scheme in compliance with the NRA DMRB TD 19. This will typically include the provision of a safety barrier system in the central reserves of the M11/N11 Mainline and N80 Link Road, in the verges where sections of the Proposed Scheme are on substantial embankments, on the approaches to and at structural piers and other locations where safety hazards are identified.

3.13 LANDTAKE REQUIREMENTS

The Proposed Scheme will involve a land take of approximately 460 hectares, which is equivalent to approximately 1,137 acres (refer to Figure 3.6 – Landownership, in Volume 4 of this EIS).

Buildings within the land acquisition extents of the Proposed Scheme that will be demolished are described in Table 3.12.1.

Table 3.12.1 Buildings to be Demolished

Townland	Chainage(m)	Description	Location
M11/N11 Mainline			
Ballymore	7,580	Cottage(1)	Under M11 Mainline
Rockspring	8,380	Ruins	Under Access Road
Tomnafunshoge	21,000	Partially constructed house	Under M11 Mainline
N30 Mainline			
Bessmount	6,180	Shed	Under N30 Mainline
	6,205	Motor vehicle repair workshop	Under N30 Mainline
	6,230	Shed	Under N30 Mainline
	6,240	Shed / Boiler House	Under N30 Mainline
	6,250	House	Under N30 Mainline

Note: (1) Considered unfit for human habitation at reasonable cost

(2) All chainages are approximate

3.14 ASSOCIATED DEVELOPMENTS

The Proposed Scheme may stimulate the off site development of new quarries and/or expansion of existing quarries. Such developments would need to fulfil any relevant statutory requirements for planning consent.

The Proposed Scheme may encourage development of garage / service stations and other facilities in the region of the Proposed Scheme. Any such development would require planning consent.

The environmental impacts of the above potential associated developments will be dealt with through the normal planning process.

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4.0 TRAFFIC

4.1 INTRODUCTION

This chapter provides a summary of the predicted traffic flows for the existing road network affected by the Proposed Scheme and for the new roads to be provided by the Proposed Scheme. Predicted flows are provided for a nominal Opening Year of 2013 and Design Year of 2028. Two scenarios are presented in this chapter namely the:

(i) Do-Nothing Scenario, which predicts the traffic flows without the Proposed Scheme in place; and

(ii) Do-Something Scenario, which predicts the future traffic flows with the Proposed Scheme in place.

The assessments of various likely environmental impacts, such as noise, where predicted traffic flows are an important input are presented in other chapters within this EIS.

4.2 TRAFFIC MODEL BACKGROUND AND TRAFFIC SURVEYS

The traffic model used for the Proposed Scheme was initially developed in 2001 as part of the informal route selection process for the Proposed Scheme. A SATURN model of Enniscorthy and the wider road network, within a large study area surrounding the town, was developed using traffic survey data gathered during 1998. SATURN (**S**imulation and **A**ssignment of **T**raffic to **U**rban **R**oad **N**etworks) is a suite of traffic modelling software developed in the UK. It can be used to model traffic networks up to regional and even national levels. The 1998 traffic survey data was factored to reflect traffic growth to 2001 using updated traffic surveys conducted during 2001.

New traffic surveys were carried out in 2006, to replace all older survey data, and incorporated into the SATURN model. In addition, the traffic growth factors used in the model were revised using the document entitled "*Future Traffic Forecasts 2002 – 2040*" (NRA, 2003). This allowed the development of the trip matrices for the Opening Year of 2013 and the Design Year of 2028.

During 2007 the SATURN Model was extended northward as far as the recently completed N11 Gorey – Arklow Bypass. To facilitate this extension further traffic surveys were undertaken at key points on the existing road network between Enniscorthy and Gorey.

With the SATURN model complete, runs were conducted for both the Do-Nothing and Do-Something networks for both the Opening Year and the Design Year.

4.3 POTENTIAL ADDITIONAL TRAFFIC

Two sources of potential additional traffic were identified that are not accounted for within the SATURN model due to its geographical limitations. These sources are:-

(i) Existing trips attracted to the Proposed Scheme from the existing R741 Gorey to Wexford road (refer to location no. 22 in Figure 4.1 included within Volume 4 of this EIS); and

(ii) Additional trips generated as a result of the proposed development strategy for Wexford town, to fulfil its role as a Hub under the National Spatial Strategy.

In order to estimate the potential transfer of trips from the R741 to the M11/N11 Mainline in the future, surveys were conducted during 2007 on the R741, to the south of the N11 Gorey – Arklow Bypass. These surveys allowed the origins and destination of R741 users to be identified. This data, together with estimates of the respective journey times and consideration of the safety characteristics of the two routes, was used to estimate the percentage of R741 traffic that is considered likely to divert onto the M11 N11 Mainline. These flows were then added to the relevant modelled flows on the M11 / N11 Mainline.

The Wexford County Development Plan 2007 – 2012 has taken a population target of 40,000 for Wexford Town in 2020 and included it as part of its settlement strategy. To estimate the possible additional trips generated by the target population growth of Wexford town, new local traffic growth factors were determined and applied to the traffic within the trip matrices that was originating and terminating in the Wexford town area. The flows estimated in this way were then reduced by the level of growth that would have been predicted using the standard NRA growth rates to give the extra over traffic flows associated with the proposed expansion of Wexford town. The residual figures were then added to the relevant modelled flows on the M11 / N11 Mainline and N80 Link Road as appropriate.

4.4 TRAFFIC FORECASTS FOR ENVIRONMENTAL ASSESSMENTS

Two, general growth scenarios were therefore used for predicting future traffic growth in relation to the Proposed Scheme, namely:

(i) NRA growth; and

(ii) NRA plus additional growth.

For the purposes of the assessments within this EIS the NRA plus additional growth have been used as they generally predict higher traffic volumes. When undertaking the cost benefit analysis the NRA growth predictions have been used, having due regard to the relevant NRA guidelines, because these traffic volumes are generally lower.

The forecast flows used for the environmental assessments in this EIS are presented in Tables 4.1 and 4.2, for the Opening Year of 2013 and Design Year of 2028 respectively. The flows given are the predicted Annual Average Daily Traffic (AADT) at the relevant locations. Six key locations on the Proposed Scheme and 16 key locations on the existing road network are presented.

The locations where flows have been modelled are shown in Figure 4.1 included within Volume 4 of this EIS.

Table 4.1: Traffic Flow Projections for the Opening Year (NRA plus Additional Growth)

Ref.	Link Description	Forecast AADT Flows in 2013		
		Do-Nothing	Do-Something	Difference (%)
01	M11 Mainline Frankfort to Ballydawmore	n/a	11,162	n/a
02	M11 Mainline Ballydawmore to Scurlocksbush	n/a	16,834	n/a
03	R744 Link	n/a	1,868	n/a
04	N80 Link Road	n/a	14,627	n/a
05	N30 Mainline Clavass to Milehouse	n/a	5,789	n/a
06	N30 Mainline Milehouse to Templescoby	n/a	4,919	n/a
07	Existing N11 Arklow / Gorey Bypass	15,899	18,516	+16.46%
08	Existing N11 Frankfort to Ballinclay	15,899	7,343	-53.81%
09	Existing N11 Ballinclay to Camolin	15,899	7,343	-53.81%
10	Existing N11 Camolin to Ferns	14,994	6,566	-56.20%
11	Existing N11 Ferns to Scarawalsh	15,574	7,517	-51.73%
12	Existing N11 Scarawalsh to Enniscorthy	20,180	2,958	-85.34%
13	Existing N11 Enniscorthy to Scurlocksbush	20,307	4,652	-77.09%
14	Existing N11 Scurlocksbush to Oilgate	18,567	16,449	+15.71%
15	Existing N80 Scarawalsh	10,996	10,765	+4.80%
16	Existing R702 west of Milehouse	7,088	6,601	-6.80%
17	Existing R702 east of Milehouse	7,088	5,406	-23.73%
18	Existing N30 west of Templescoby	8,468	8,538	-0.82%
19	Existing N30 east of Templescoby	8,468	4,385	-48.22%
20	Existing R744 west of Tomnafunshoge	4,594	3,910	-14.89%
21	Existing R744 east of Tomnafunshoge	4,594	4,664	+1.52%
22	Existing R741 south of N11 Arklow / Gorey Bypass	13,059	10,024	-23.24%

Table 4.2: Traffic Flow Forecasts for the Design Year(NRA plus Additional Growth)

Ref.	Link Description	Forecast AADT Flows in 2028		
		Do-Nothing	Do-Something	Difference (%)
01	M11 Mainline Frankfort to Ballydawmore	n/a	14,081	n/a
02	M11 Mainline Ballydawmore to Scurlocksbush	n/a	21,120	n/a
03	R744 Link	n/a	2,251	n/a
04	N80 Link Road	n/a	18,498	n/a
05	N30 Mainline Scarawalsh to Milehouse	n/a	7,250	n/a
06	N30 Mainline Milehouse to Templescoby	n/a	6,322	n/a
07	Existing N11 Arklow / Gorey Bypass	19,632	23,291	+18.64%
08	Existing N11 Frankfort to Ballinclay	19,632	9,210	-53.09%
09	Existing N11 Ballinclay to Camolin	18,019	9,211	-48.88%
10	Existing N11 Camolin to Ferns	16,685	8,225	-50.70%
11	Existing N11 Ferns to Scarawalsh	17,010	9,408	-44.69%
12	Existing N11 Scarawalsh to Enniscorthy	21,581	3,736	-82.69%
13	Existing N11 Enniscorthy to Scurlocksbush	23,738	5,870	-75.27%
14	Existing N11 Scurlocksbush to Oilgate	23,738	27,080	+14.08%
15	Existing N80 Scarawalsh	13,243	14,415	+8.85%
16	Existing R702 west of Milehouse	8,782	8,921	+1.58%
17	Existing R702 east of Milehouse	8,782	6,902	-21.41%
18	Existing N30 west of Templescoby	10,348	10,707	+3.47%
19	Existing N30 east of Templescoby	10,348	4,385	-57.62%
20	Existing R744 west of Tomnafunshoge	5,278	4,872	-7.69%
21	Existing R744 east of Tomnafunshoge	5,278	5,847	+10.78%
22	Existing R741 south of N11 Arklow / Gorey Bypass	16,101	12,407	-22.94%

5 SOCIO-ECONOMIC IMPACT ASSESSMENT

5.1 INTRODUCTION

This chapter identifies and examines the likely significant socio-economic and community impacts and presents measures to avoid, reduce and where possible remedy the likely significant negative impacts which may arise as a result of the construction and operation of the Proposed Scheme. In assessing and evaluating the likely significant impacts of the Proposed Scheme, the populations in the general vicinity of the Proposed Scheme as well as other road users were considered. This assessment focuses primarily on the environment of County Wexford, Enniscorthy, Camolin, Ferns and their local environs, including Clogh and Boolavogue.

5.2 METHODOLOGY

A desktop study was undertaken by reviewing national strategic transport and planning policy as well as regional and local planning policy including the following:

- The National Development Plan 2007 – 2013;
- National Road Needs Study 1998
- The National Spatial Strategy 2002 – 2020;
- South-East Regional Authority Strategic Planning Guidelines 2004 - 2016;
- Wexford County Development Plan 2007-2013;
- Enniscorthy Town and Environs Development Plan 2008-2014;
-
- Draft Ferns Local Area Plan 2009-2015; and
- Transport 21[1].

All relevant documentation available from work carried out at constraints, route selection and EIA stages was reviewed including:

- N11 Enniscorthy Bypass Constraints Study Report (RHWSP, July 2001);
- N11 Enniscorthy Bypass Route Selection Report (RHWSP, November 2002);

[1] The Transport 21 national road investment is grounded in the National Road Needs Study and in the strategic decision which the Government took in the 2000 to 2006 NDP to build inter-urban motorways linking Dublin and our principal cities. See: http://www.transport21.ie/MEDIA/Speeches/SPEECH_BY_MINISTER_FOR_TRANSPORTAT_THE_ANNUAL_DINNER_OF.html (last accessed, May 2009)

- N11 Clogh to Enniscorthy Constraints Study Report (RHWSP, August 2007)
- N11 Clogh to Enniscorthy Route Selection Report (RHWSP, May 2008)
- N11 Gorey to Enniscorthy Realignment EIS Informal Scoping Report (Scott Cawley, March 2009).

In addition the following sources of information assisted in compiling this section of the EIS.

- Ordnance Survey of Ireland (OSI) Discovery Series maps, 1:50,000, sheets 68 and 69;
- OSI County Wexford maps, 1:10,560 sheets 19, 20, 25 and 26;
- Aerial Photography (flown in 1999 and 2008);
- Geological Survey of Ireland on-line mapping;
- National Census Data, Central Statistics Office (CSO), 2002 and 2006.

Site visits of the area expected to be impacted by the Proposed Scheme were carried out in April and July 2007 and August 2008 and April 2009.

5.2.1 Consultation

In addition to desktop sources of information, telephone consultation was performed, targeting representatives of the Enniscorthy Chamber of Commerce, Enniscorthy Town Council and other relevant community stakeholders. All directly affected farm / landowners were consulted individually as part of the assessments discussed further in Chapters 6 (Agriculture) and 7 (Material Assets – Properties) of this EIS.

5.2.2 Data Deficiencies / Difficulties with Producing the Impact Assessment

Data deficiencies include:

- the most recent CSO data available is from 2006, which is now several years old;
- the current economic downturn has resulted in some of the data and information relied upon for this assessment being out of date; attempts have been made to reflect the current economic position where possible.

These data deficiencies are not considered to have significantly compromised this impact assessment and the data and information available is considered adequate for the purposes of assessing the impact of the Proposed Scheme.

5.3 RECEIVING ENVIRONMENT

5.3.1 Economic Activity - Industry, Business and Tourism

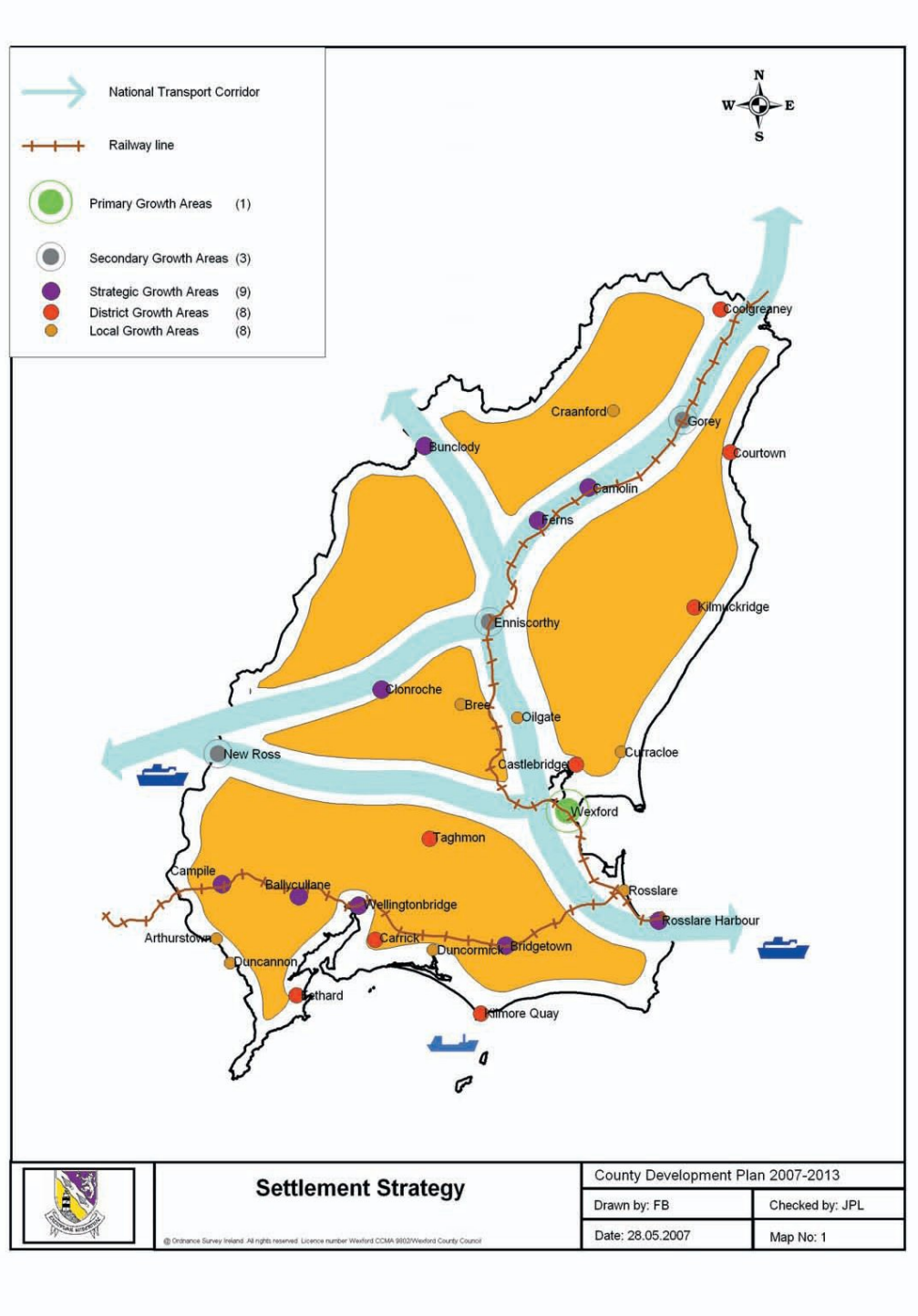
National Policy

At a national policy scale, the National Spatial Strategy (NSS) for Ireland sets out the basis on which all areas of the country will have the opportunity to develop to their potential within a national spatial framework for the period up to 2020.

Key to successful implementation of the NSS in the southeast region is the enhancement of Waterford as a Gateway supported by Wexford and Kilkenny as strategically located medium sized hubs. Collectively they form a nationally strategic growth triangle. A critical mass of population will help support greater economic activity and quality of life. In turn the development of Wexford town as a strategically located medium sized hub will energise smaller towns and rural areas within its influence.

For the southeast region this vision will be realised through combining the strengths of the cities and towns in the region to achieve sufficient critical mass to compete with larger urban centres in other regions. It will require broadening and strengthening the economic base of the region and seeking to achieve greater economic competitiveness and growth, with associated social progress. Improved accessibility through an integrated transport system will facilitate the growth required for this vision.

Wexford town has been defined as a strategically located medium sized hub and its development role has been defined as follows – a strategic urban centre, that supports and is supported by the gateway and reaches out to wider rural areas of the region that the South East Regional Planning Guidelines are targeting for significant levels of growth. Part of the plan for Wexford town as a strategically located medium sized hub is that it is required to develop a critical mass of population. Improved access to the town will encourage this.



Wexford Settlement Strategy taken from Wexford County Development Plan 2007 -2013

The National Spatial Strategy notes:

> *"The critical mass of Waterford as a gateway, supported by Kilkenny and Wexford as hubs will be complemented by development in surrounding and adjacent towns. The extensive network of county towns and other larger towns in the South East provides a key resource, which, combined with the gateway hub approach, provides a strong platform for balanced development throughout the region."*

> *"Towns such as Clonmel and Carrick-on-Suir, in South Tipperary, Dungarvan and Tramore in Waterford, Carlow town, New Ross and Enniscorthy in Wexford provide good bases for population and services which will attract investment and employment activities additional to those that need to be located in or near a gateway."*

> *"Towns representing urban strengthening opportunities... located on important economic and transport corridors or in important locations and with a capacity to grow, must become a focus for the settlement policies of local authorities as incorporated in county development plans."*

The NSS also recognises the potential of Enniscorthy to absorb a measured level of additional development. This would require expansion of existing services, including retail, in the town to cater for the additional population.[2]

The National Road Needs Study (1998) sets out the service level objectives for national roads in Ireland (an average inter-urban speed of at least 80kph) and outlines the investment needs to prevent further deterioration of the road infrastructure. The proposed infrastructure enhancements underpin the National Spatial Strategy growth objectives.

Regional Policy

The Wexford County Development Plan 2007-2013 states that:

> *"The County Council's long term objective is the development of an integrated sustainable transport system involving road, rail, bus, cycling and walking delivered by a range of providers and operators, both public and private."*

> *"In recognition of the fact that traffic has become a major issue for the larger towns in the county, it will be an objective of this Council to seek the highest standards of traffic management in order to promote and sustain the economic viability of the towns and villages in County Wexford."*

> *"It is envisaged that significant investment funds will be made available through the National Development Plan 2007-2012 for national roads development with an emphasis as per the previous plan on the completion of the Trans-European Networks and major inter urban routes. The following schemes* [which include the bypassing of Enniscorthy town] *outline the proposals of the Council in association with the National Roads Authority and central government to improve and construct*

[2] See Enniscorthy Town & Environs Plan 2008-2014 and the associated Retail Strategy. Available at: http://www.wexford.ie/wex/Departments/Planning/DevelopmentPlans/EnniscorthyTownEnvironsPlan2008-2014/Title,6370,en.html (last accessed February 2009)

new National Roads within the lifetime of the plan subject to finance being provided. [The strategic objective of Wexford County Council is] *to facilitate and enable the development of major National Road proposals within the lifetime of the* [County Development] *Plan."*

In the context of the Settlement Strategy set out in the Wexford County Development Plan 2007 2013, Ferns is identified as a one of 9 district growth areas for the County. Ferns and Camolin are regarded as strategic growth areas within the settlement hierarchy which play important roles as service / retail / residential centres. Wexford County Council has set an objective in the County Development Plan 2007 – 2013 to prepare Local Area Plans for Camolin and Ferns (a draft of the Ferns Plan is now available). The NSS recognises that these towns need to be developed in a way that respects their existing character while at the same time strengthening their role as local service centres.

The Draft Ferns Local Area Plan 2009-2015 notes that:

"The Main Street is developed along the N11 National Primary route and the R745 Regional road. There is a strong conflict between its role as part of a local service centre and as an important regional and primary national route."

"The role of Ferns as a service provider and employment location, its strategic location within the county as a whole and its proximity to major towns such as Gorey, Enniscorthy, Wexford and Rosslare Europort, provides a significant opportunity for inward investment and growth for the area."

"Ferns has the potential to be an attractive tourism destination. Ferns Castle is currently open to the public for the summer months and has a coffee shop / information office on site. It is considered that through co-ordination with other relevant bodies, the role of Ferns as a tourism destination could be enhanced."

"The volume of traffic on both N11 and the R745 frequently acts as a barrier between the northern and southern sides of the village and consequently poses a hazard to pedestrians. There is a need to relieve traffic congestion from the N11 and to create a safe and attractive pedestrian environment for the local community. This will be achieved with the delivery of the Enniscorthy / Clogh N11 bypass."

The draft plan for Ferns notes a threat to the development of Ferms as the *"problematic circulation of traffic." and it supports "the provision of the N11 bypass of Ferns Village."*

Rosslare Europort

At regional policy level, Wexford County Council has identified that the continued development of Rosslare Europort is of strategic importance for the development of industry, tourism and commerce in the southeast region as well as the County itself. New Ross port specialises in the handling of both dry and liquid goods. Wexford County Council, where possible, will facilitate the expansion of current port facilities and associated port activities.

Rosslare port is an important port from the perspective of the national economy. In terms of private cars and buses bringing people to the country, Rosslare handles 40 per cent of all sea arrivals, more than Dún Laoghaire and Dublin Port. In freight terms it handles just under a fifth of all Roll-on / Roll-off traffic by volume. Rosslare Europort handles Roll-on / Roll-off freight and passenger traffic primarily to Fishguard and Pembroke but also to the continent. Major car marques are imported through Rosslare. Stena Line, Irish Ferries and Celtic Link are the principal operators using Rosslare. Irish Rail owns Rosslare Europort and the port's future ownership is under active consideration by Government. It can be expected that the some of benefits resulting from the development of the Rosslare port will spill over into the regional economy, in terms of tourism and trade.

Local Policy

The Enniscorthy Town and Environs Plan 2008-2014, states that:

> *"Enniscorthy, at present is bisected by the Euro Route E01 and suffers from the effects of increased traffic flows. When the proposed by-pass is constructed around the town the flow of traffic in the town will substantially reduce. This is particularly true of through-traffic, which has no destination in the town and is currently a major contributor to congestion and the degradation of environmental amenity in the town. With the availability of the by-pass, it is envisaged that internal traffic between zones within the town can be re-routed via the by-pass to minimise the negative environmental impact of traffic on the town. An improvement in the environmental quality of the town is dependent on the reorganisation of the town's system of traffic circulation. Car usage should be reduced through the promotion of other modes of transport, such as cycling, walking and public transport. Policies that address car parking facilities and short trip generation, such as the journey to and from school, can be quite effective in reducing traffic volumes."*
>
> *"…a lack of car parking in the town emerged as a major issue. This has particular relevance for economic development and a growth in the retail and tourism function*

of the town. There are no facilities for coach parking at present, which is proving a major stumbling block to the development of the town as a tourist destination."

"The bypass will create areas with good road access which are outside of the development boundary, and these areas are likely to come under increasing pressure for development. Appropriate land use policies are necessary to protect this area and to ensure that any development is in line with the overall policies for the area."

In summary, the national, regional and local development plans and policies clearly support the delivery of the Proposed Scheme. The expected benefits include continued development of Wexford as a strategically located medium sized hub that supports and is supported by the Waterford gateway and reaches out to wider rural areas of the region. It is expected that this network will provide a platform for balanced development throughout the region. Enniscorthy has been targeted as a town in County Wexford which provides a good basis for populations and services, which will attract investment and employment activities additional to those that need to be located in or near a gateway. This will be complemented by the long-term objective of developing an integrated sustainable transport system. Traffic has become a major issue in Enniscorthy town and environs (including Ferns and Camolin). Reduced traffic congestion in these towns due to a reduction in through-traffic, which has no destination in the towns and is a major contributor to existing congestion, is expected to improve the environmental quality of Enniscorthy, Ferns and Camolin towns and environs. The lack of parking facilities, in particular for coaches, needs to be addressed as part of a broader development strategy, to support the development of Enniscorthy town and environs as a tourist destination.

Tourism

The tourism sector is important to County Wexford and has emerged as one of the primary sectors within the economy. With its considerably unspoilt coastline, countryside, natural and built environment and its reputation as being at the heart of the 'sunny south east', Wexford has traditionally attracted high tourist numbers. As is shown in Table 5.1 below, comparatively, visitor spend continues to be a significant revenue generator in the southeast.

Table 5.1 Visitor and Visitor Spend Figures for 2001, 2003 and 2005

	2001	**2003**	**2005**
Overseas Visitors to Wexford	284,000	203,000	217,000
% of South East Visitors	26%	20%	20.1%
Overseas Tourist Revenue	71 million Euro	61 million Euro	63 million Euro
Average spend per tourist	250	300	290
% of South East Revenue	25.2%	23%	25.1%
Source: Tourism Ireland - website			

Although tourism is an important sector in Wexford; nevertheless, the Wexford County Development Plan 2007-2013 states that:

> *"The County attracts less than 5% of overseas visitors and generates less than 2% of the Country's overseas tourism revenue."*

While there have been significant developments in this sector, greater cohesion between industry operators is required to overcome the significant weaknesses in terms of the tourism product and market focus of the sector. Wexford County Council aims to extend the provision of tourist, leisure, sport and recreational facilities within the County.

According to the Enniscorthy Town Environs Plan 2008-2014:

> *"One of the largest single tourist opportunities in the town is the Castle Museum, which is currently under renovation. The nearest large attraction is the National Heritage Park in Wexford. However the opening of the 1798 Centre, in 1998, has had a positive impact on the number of visitors to the town. The centre provides a special opportunity for the town to 'grow' its tourism product. Other major tourist attractions include Vinegar Hill and St. Aidan's Cathedral. These resources have not been fully exploited to date and offer a unique opportunity for Enniscorthy to enhance its attractiveness to overseas and domestic visitors."*

Concerted action by relevant tourism development and promotion agencies, an efficient road infrastructure and integrated transport policy, adequate car park facilities (in particular for coaches), and other related amenities would complement the development of a regional tourism product. These aspects are included in the development plans for the region. This will be reinforced by the continued development of Rosslare Europort. As the tourism product improves, in parallel, the number of visitors (overseas and domestic) to the area would be expected to increase.

Of particular benefit to Enniscorthy town is the possibility of reinstating the River Slaney as a focal point in the centre of the town and developing the river's amenity use. The River Slaney has significant heritage and recreational use value that could be promoted further when developing the tourism product.

Employment

According the to Enniscorthy Town Environs Plan 2008-2014:

> *"*[Some of] *the main industrial employers in the area* [are] *J. Donohue Ltd., Clearstream and more recently companies such as Dunnes Stores, Datapac, Alcast, Bellefield Designs, Reynaers and Riverside Park Hotel."*

The DKG Group is also a large employer in Enniscorthy.

Enniscorthy provides a strong supporting role to Ferns and Camolin providing employment opportunities within commuting distance. Improved access between Enniscorthy, Ferns and Camolin will bring a significant economic benefit to all of these urban areas.

Between 2002 and 2006, Enniscorthy registered strong growth in the following activities (see Table 5.2 below for details)[3]:

- Agriculture, forestry and fishing growth of 9% (this compares to declines in Wexford and the State, -13% and –8% respectively);
- Manufacturing industries growth of 10% (this compares to weaker growth in Wexford and zero growth in the State, 5.3% and 0% respectively). Construction growth of 46% (this compares to a similar growth pattern in Wexford and the State; 37% and 44% respectively);
- Hotel and restaurants growth of 35% (this compares to similar, albeit weaker growth in Wexford and the State, 23% and 24% respectively); and
- Real estate, renting and business activities growth of 27% (this compares to weaker growth in Wexford and the State, 20% respectively).

Notably between 2002 and 2006, Enniscorthy registered weaker growth in the following activities:

- Transport, storage and communications (although Wexford county contains a number of storage facility based businesses, in the medium term, this could be an area of growth which is linked to the development of Rosslare port);
- Banking and Financial Services;
- Health and Social Work; and
- Other community, social and personal service activities.

[3] With the current economic downturn, most sectors' growth will decline significantly in the short term, due to a decrease in demand for manufactured goods, housing and commercial property development and services.

As illustrated by Table 5.2, manufacturing industry, construction, wholesale and retail, health and social work were the largest industrial groups in Enniscorthy in 2006 and this is broadly proportionate to the industrial groups in County Wexford. With the current economic downturn, it can be expected that there will be slower growth, in particular in the categories of 'construction activity', 'real estate, renting and business activities', 'manufacturing' and 'hotel and restaurants'.

With reference to Table 5.3 below and comparing 'Enniscorthy, Wexford total' to 'Wexford total', Enniscorthy contains:

- a significant proportion (i.e. greater than 50%) of Manual Skilled, Semi-Skilled, Unskilled, and Own Account Workers;
- 81% of 'Farmers' and 87.5% of 'Agricultural Workers' in County Wexford (please note that the actual numbers employed in these two categories is substantially lower than the numbers employed in all the other categories);
- 70% of 'All others gainfully occupied and unknown'.

Using data derived from the Census 2006 (see Table 5.4 below), the unemployment rate (i.e. having lost or given up a previous job and looking for first regular job) for County Wexford was 5.9%. This is higher than the 2006 unemployment rate for the State, which was 5.3% although the figures indicate that trends in employment status in County Wexford are comparable with national trends. The unemployment rate in Ferns at the time of the 2006 Census was approximately 6.3%. This represents a higher level than the State average. The unemployment rate in Camolin (Kilcomb) was approximately 5%. The unemployment rate in Enniscorthy was 9.2%, which is significantly higher than the national and Wexford data. These figures represent a snap shot for 2006. It should be noted here that with the current economic downturn, an increase in the unemployment rate will occur as industries and services contract due to the reduction in demand for related goods and services. The increase in unemployment is likely to affect all employment categories across the region.

Table 5.2 Population aged 15 years and over classified by broad industrial group 2002 and 2006

	Enniscorthy			County Wexford			State		
Industry	**2002**	**2006**	**% +/-**	**2002**	**2006**	**% +/-**	**2002**	**2006**	**% +/-**
Agriculture, forestry and fishing	61	67	9	4751	4216	-13	97,281	89,277	-8
Mining, quarrying and turf production	7	7	0	128	166	22	6,658	7,751	16
Manufacturing industries	432	481	10	6545	6892	5.3	244,203	243,182	0
Electricity, gas and water supply	29	28	3	253	273	7.3	11,363	11,290	-1
Construction	341	640	46	5942	9369	37	149,271	215,184	44
Wholesale and retail trade	595	641	7	6840	8347	18	219,165	257,309	17
Hotels and restaurants	191	293	34	2726	3554	23	81,418	100,731	24
Transport, storage and communications	161	159	1	2178	2580	16	96,855	105,705	9
Banking and financial services	102	105	3	1302	1723	24	70,838	85,413	21
Real estate, renting and business activities	167	228	27	2671	3337	20	151,107	180,973	20
Public administration and defence	147	136	7	2222	2518	12	94,746	101,264	7
Education	200	203	1	2748	3314	17	109,301	127,476	17
Health and social work	354	410	14	3502	5050	31	143,520	191,219	33
Other community, social and personal service activities	153	190	19	1811	2511	27	64,333	80,358	25
Industry not stated	100	107	6	1630	2161	24	101,528	132,910	31
Total at Work	**3040**	**3695**	**60**	**45249**	**56,011**	**19**	**1,641,587**	**1,930,042**	**18**

Source: CSO Census Data 2002 and 2006

Table 5.3 Population by socio-economic group reference

	Camolin (Kilcomb)	Ferns	Enniscorthy, Wexford total	Enniscorthy legal town	Enniscorthy environs	Wexford, Wexford, Total	
							State
Employers and managers	145	151	1067	319	748	2347	650,552
Higher professional	15	29	189	56	133	867	245,170
Lower professional	58	83	704	209	495	1494	451,865
Non-manual	95	147	1610	427	1183	3789	818,573
Manual skilled	118	159	1335	483	852	2362	429,779
Semi-skilled	74	105	1233	448	785	2283	355,441
Unskilled	45	63	764	291	473	1135	159,904
Own account workers	86	101	489	146	343	829	180,500
Farmers	134	44	54	19	35	67	166,864
Agricultural workers	15	23	60	17	43	32	27,407
All others gainfully occupied and unknown	107	305	1656	491	1159	2355	753,793
Total	**892**	**1210**	**9161**	**2912**	**6249**	**17560**	**4,239,848**

Source: CSO (2006) Theme 9 – 2 (a).

Table 5.4 Population aged 15 years and over classified by principal economic status

	Ferns	Camolin (Kilcomb)	Enniscorthy	County Wexford			National Data		
Employment Status			**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
At work	407	340	3,695	33,272	22,739	56,011	1,107,234	822,808	1,930,042
Looking for first regular job	21	4	150	572	445	1,071	16,428	12,944	29,372
Unemployed having lost or given up previous job	37	31	556	2,923	1,831	4,754	90,205	59,879	150,084
Student	76	61	549	3,710	4,604	8,314	164,638	184,958	349,596
Looking after home/family	192	111	1,087	529	11,086	14,615	16,714	370,300	387,014
Retired	124	110	1,017	7,392	5,212	12,604	206,520	171,407	377,927
Unable to work due to permanent sickness or disability	51	33	520	2,688	2,202	4,890	70,562	67,820	138,382
Other	3	1	24	87	219	306	5,826	7,156	12,982
Total aged 15 years and over	**911**	**691**	**7,598**	**51,173**	**48,338**	**99,511**	**1,678,127**	**1,697,272**	**3,375,399**
Unemployment Rate*	6.3%	5%	9.2%	-	-	5.9%	-	-	5.3%

* Unemployment Rates for 2006 were not provided in the Census 2006 data but were instead derived from census figures.

5.3.2 Settlement and Population Distribution and Trends

It is an aim of the National Spatial Strategy (NSS) to a develop critical mass of strategically located urban areas to redress regional imbalance towards Dublin. The NSS suggests that the identified Gateways and Hubs have the greatest needs in relation to expansion of critical mass and population. The NSS suggests that hubs with populations in excess of 10,000 persons would need to grow to a population of 30,000 persons or more in the years to 2020 and beyond. The two hubs in the south east, Kilkenny and Wexford, fall into this category.

The strategic vision for the south east is that by 2020 the region will be recognised as a distinct and cohesive region that is prosperous and competitive, where the benefits of economic success are shared equitably throughout the region and throughout society. By 2006, County Wexford had increased in population by 15,153 persons since 2002, to 131,615 persons, equivalent to a 28.5% share of the region's population.

As can be seen in Table 5.5 below, the main towns in proximity to the Proposed Scheme - Wexford, Enniscorthy, Ferns and Camolin, have all experienced varying levels of population growth in recent years. Most of these towns attracted high levels of new residential development between 2002 and 2006. However, the NSS notes that care must be taken to ensure that the continued expansion of these urban areas is regulated to ensure that community; social and retail developments keep pace with recent rapid phases of mainly residential development.

Table 5.5 Summary of local, regional and national population trends. Taken from the National Census 2002 and 2006

	2002	2006	Actual Change	% change
Enniscorthy Town	3,764	3,241	523	-13.9
Ferns[4]	985	954	-31	-3.1
Camolin	320	390	70	21.9
County Wexford	**116,596**	**131,749**	**15,153**	**13**
Leinster	**2,105,579**	**2,295,123**	**189,544**	**9**
State	**3,594,558**	**3,917,203**	**322,645**	**8.2**

The population of Enniscorthy town decreased by 13.9% since 2002, reflecting the national trend to movement out of the inner urban areas to environs and outskirts of towns.[5] Camolin has seen a significant increase in population and Ferns a slight decrease.

The designation in the NSS of Enniscorthy as a moderate growth town within the south east region necessitates the improvement of links to and from Enniscorthy for all trip purposes by all modes of transport. It is vital that links with Dublin, Waterford and Wexford and surrounding

[4] The Population Projections calculated using the UCD Econometric Population Model 2006, estimate the population of Ferns will be 1338 in 2008, thus reversing the decline of previous years. Also see Draft Ferns Local Area Plan 2009-2015.
[5] See Enniscorthy Town and Environs Plan 2008-2014

areas are maximised not only to attract business development in the town but also to provide for leisure and other trips to and from the surrounding area.

A key component of the settlement strategy for County Wexford for the Development Plan period 2007 - 2013 and beyond is to encourage population growth to locate in existing towns and villages that have the necessary social, community and physical infrastructure. This strategy aims to deliver a range of house types, facilities, infrastructure and amenities and an efficient transport system. The settlement strategy is divided into a number of hierarchical layers that have been chosen to reinforce the policy objectives of the National Spatial Strategy.

Some of the main findings of a Population Density Analysis in the Wexford County Development Plan 2007 – 2013 are as follows:

- County Wexford has a higher population density than the south east region as a whole as well as the State, with an average of 0.55 people per hectare;
- Within the County, the highest population densities are present in the areas surrounding the four main towns of Wexford, Enniscorthy, New Ross and Gorey and in the larger towns of Bunclody, Ferns and Kilmore. Oilgate situated south of Enniscorthy is relatively low in the settlement hierarchy as it is classified as a local growth area. The area around Oilgate has been classified as a strong rural area;
- Population increases have increased population density in rural areas to a larger degree than in urban areas;
- There has been a definite population concentration on the eastern side of the County, particularly in the Gorey and Wexford areas and beginning to emerge in the Enniscorthy area on the Wexford side;
- There is evidence of an overspill effect coming from Dublin to the south east region. The trends in numbers of planning applications received by Wexford County Council point towards a continuing increase in population for the County.

5.3.3 Land Use

The setting within which the Proposed Scheme lies is by and large of a rural nature, although includes the substantial population centres of Enniscorthy, Ferns and Camolin. Others features in the area are the Dublin - Wexford railway which for the most part runs parallel to the existing N11, and three major watercourses (the River Slaney and River Bann which are both designated for wildlife protection as well as the River Urrin). All of these watercourses are important fisheries and are linked to the tourism and recreation product of the area.

The main towns and villages within close proximity to the Proposed Scheme include Enniscorthy, Ferns and Camolin, with smaller settlements in Clogh and Boolavogue. Within the general area

there are a number of institutions related to education, health, sports, recreation, amenity and other community services. These are mainly concentrated within the centres of Enniscorthy, Ferns, Camolin, Clogh and Boolavogue and are indicated on Figure 5.1 in Volume 4 of this EIS. There are additionally a significant number of businesses and institutions with educational, health, sport, recreational, amenity and community interest in Enniscorthy town itself which have not been individually mapped on Figure 5.1 in Volume 4 of this EIS due to their density and number.

5.3.4 Traffic and Transport

Enniscorthy, Ferns and Camolin at present are bisected by the Euroroute 01 and they suffer from the effects of heavy traffic flows including heavy goods vehicles and trips to Rosslare port.[6] The centre of Enniscorthy is currently reaching saturation, despite alternative ways through the town, for example to the west through Carley's Bridge. Comparing traffic flows for 2006 with predicted traffic flows for the Proposed Scheme show this pattern worsening, as more vehicles are trying to travel on the already saturated network.[7]

Table 5.6 below indicates that, in line with the State, Wexford County, Enniscorthy, Wexford, Ferns and Camolin, travel is predominately by private vehicle. Public transport also plays a role, albeit significantly less when compared to private vehicles, in particular for Enniscorthy, Wexford.

Table 5.7 below indicates that a significant proportion (higher than the State) of people in Enniscorthy, Wexford and Wexford County travel to work between 1 and 4 km. This combined with travel using private transport; suggests there is a heavy reliance on private transport for short distance travel, i.e. to and from community amenities, shops etc.

Motor car usage has increased from 53.6% of the population who used this means to get to work in 1996 to 64% that use it in 2002. Wexford County has the highest proportion of working population using a lorry or van as their means of transport to get to work with 10.5% of the working population using this means of transport. Modes of transport to school for 5-12 year olds has changed considerably since 1996 away from bus, bicycle and 'on foot' modes towards motor car use which has increased from 40% to almost 55% for that age group. Wexford County students over 19 years are travelling further distances than other students in the region with over 26% of students travelling over 15 miles to school or college.[8]

[6] The N11, also known as Euroroute 01, forms part of a motorway network, guided by the European Union, which links major commercial seaports at Larne, Belfast, Rosslare and Dublin.
[7] Taken from the N11 Enniscorthy Bypass Route Selection Report, 2002.
[8] http://www.wexfordcdb.ie/Census2002/Travel.pdf (last accessed, 01 December 2008)

Table 5.6 People Travelling to Work by Mode of Transport

Means of Travel	Total people	On foot	Bicycle	Private Vehicle	Public Transport	Work from home	Other means	Not stated
State	1,892,787	205,688	36,306	1,338,946	169,898	105,706	6,445	29,798
%	100%	10.87%	1.92%	70.74%	8.98%	5.58%	0.34%	1.57%
Wexford County	82,754	10,858	520	34,691	7804	-	11,335	819
%	100%	13%	0.6%	41%	9.4%	-	13.7%	1%
Enniscorthy Wexford	5395	1466	34	2993	332		529	41
%		27%	0.6%	55%	6.1%		9.8%	0.76%
Ferns	681	149	2	327	116	-	81	4
%	100%	22%	0.3%	48%	17%	-	11%	0.5%
Camolin (Kilcomb)	546	44	3	337	73	-	95	3
%	100%	8%	0.5%	61%	13%	-	17%	0.5%

Source: Census 2006

Table 5.7 People working by distance travelled to work

Distance Travelled	Total	0 km	1 km	2 to 4 km	5 to 9 km	10 to 14 km	15 to 24 km	25 to 49 km	50+ km	Not stated
Wexford County	82,754	1114	9263	15,180	12,014	7,743	9295	6602	5575	15,968
%		1.3%	11.2%	18.3%	14.5%	9.4%	11.2%	8%	6.7%	19.3%
Enniscorthy Wexford	5395	35	1057	1484	309	185	514	391	305	1115
%		0.6%	19.6%	27.5%	5.7%	3.4%	9.5%	5.9%	5.7%	20.6
Ferns	681	13	68	72	44	86	90	52	39	217
%		1.9%	10%	10.5%	6.4%	12.6%	13.2%	7.6%	5.7%	31.8%
Camolin	546	10	37	70	52	81	94	48	39	115
%		1.8%	6.7%	12.8%	9.5%	14.8%	17.2%	8.8%	7.1%	21%
State	1,892,787	20,293	131,537	291,670	291,506	217,174	239,143	195,568	100,903	404,993
%		1.07%	6.95%	15.41%	15.40%	11.47%	12.63%	10.33%	5.33%	21.40%

Source: Census 2006

5.3.5 Road Safety

Overcapacity on the existing N11 road presents significant opportunities for conflict between pedestrians and cars and a variable alignment with limited visibility and limited opportunities for overtaking – leading to more opportunities for accidents. Between 1996 / 2004, 77 accidents – an average of 8.6 per year – have been recorded for the general area with 50 of these being on the existing N11 national primary route between Clogh and Enniscorthy. These 50 accidents have included: 7 fatalities, 11 serious accidents; and 32 accidents involving minor injuries.

There were also a considerable number of accidents at the existing N11 junction with existing N80, prior to the construction of the new roundabout that opened to traffic in August 2008. This section of road has seen one fatal, four serious and ten minor accidents in the nine-year period between 1996 and 2004.

The Ferns urban area is another hot spot for accidents. Within Ferns there have been a number of minor accidents throughout the town. There has been one fatal accident within the town. There have been four fatalities on the southern approach to Ferns along the N11. Five serious accidents have been recorded along the non-national routes approaching Ferns.

5.3.6 Features of Environmental, Cultural and Heritage Value

County Wexford has a wide variety of environmental assets and resources. The details of these resources are not presented in detail in this chapter as they have been comprehensively covered in specific chapters throughout this EIS. However some of the main features of interest include:

- Areas of landscape and visual sensitivity and interest (refer to Chapter 14 Landscape and Visual Impact Assessment for full details)
- Sites, areas and monuments of archaeological importance (refer to Chapter 15 Archaeological, Architectural and Cultural Heritage Impact Assessment for full details); and
- Historic buildings and structures (refer to Chapter 15 Archaeological, Architectural and Cultural Heritage Impact Assessment for full details).
- A number of sites designated for wildlife importance and conservation which are of national and international conservation significance fall within the area, such as the Slaney River Valley candidate Special Area of Conservation and proposed Natural Heritage Area, as well as and a number of other areas which are not designated but are of ecological interest or sensitivity (refer to Chapter 9 Ecology for full details).

5.3.7 Consultation with Local Stakeholders

Consultation with local stakeholders revealed that the locally perceived positive impacts of the Proposed Scheme would be to:

- rejuvenate the Enniscorthy environs, in particular Enniscorthy town and quay making the area more attractive to live-in and access, providing a “better, safer and more alive” environment; and would alleviate Enniscorthy town and environs from commercial vehicles;
- draw retail customers back into Enniscorthy town (from Wexford), who previously would not enter the town due to traffic congestion; heavy traffic reduces business activity as cars do not tend to stop;

- have little or no negative impacts on community-based initiatives as most are located towards the top of the town and are not directly affected by the Proposed Scheme[9];
- improve safety for school children and elderly;
- provide well needed local employment opportunities for the duration of the construction activities, which is anticipated to be in the region of 2½ years;
- support the growth of the local tourism product by enhancing the access to amenities in Enniscorthy town and environs;
- reduce journey times for local road users;

The consultation exercise revealed that the locally perceived negative impacts of the Proposed Scheme would be to:

- temporarily impact on businesses relying on passing trade from through-traffic until they re-adjust to the new road layout;
- impact on local festivals, such as the Strawberry Festival and the County Show by the reduction in passing trade from through-traffic; this should be addressed by adequate signage on the Proposed Scheme once built as well as promotion in general as part of development of the tourism product;
- impact on local B&Bs by the reduction in passing trade from through-traffic;
- prevent traffic from the Proposed N80 Link Road accessing Enniscorthy town due to the significant capacity related problems along the existing R744 and the proposed convoluted route for accessing the town which will involve travelling in a southerly direction along the Proposed Scheme, then travelling in a north westerly direction along the Proposed N80 Link Road and then back in a southerly direction along the existing N11 national route. The Enniscorthy Chamber of Commerce maintain that those who originally intended to travel to Enniscorthy will be deterred by these access arrangements and will therefore continue along the Proposed Scheme onto Wexford town, which is only a short distance away. It proposes an alternative solution to mitigate these impacts details of which are contained in Appendix 1.2 in Volume 3 of this EIS;

[9] Community-based initiatives (CBI) adopt a holistic approach to health paying equal significance to the physical, mental, social and spiritual well-being of individuals. CBI programmes represent integrated bottom-up socioeconomic development models that rely on full community ownership and intersectoral collaboration. See www.emro.who.int/cbi/ for further information on this definition.

5.4 CHARACTERISTICS OF THE PROPOSED SCHEME

A detailed description of the Proposed Scheme is provided in Chapter 3 and is therefore not repeated here. This includes information on lighting, junctions, structures, drainage and access roads.

It is currently anticipated that main construction works will begin on site during 2011, subject to available finance. The overall construction period for the Proposed Scheme is anticipated to be in the region of 2½ years. Employment levels will vary throughout the construction period depending on the operations being undertaken. Employment will include construction workers, administrative staff and professional staff.

Hours of operation and noise levels typically deemed acceptable for national road developments are described in Chapter 13 (Noise and Vibration) of this EIS. Normal hours of work are anticipated to be Monday to Friday 07:00 to 19:00 hours and Saturday 08:00 to 16:30 hours. However works outside of these hours, including Sundays, may be necessary in certain circumstances. Night time and Sunday work will require specific permission. The exception to this is any construction activity required in respect of emergency works. Examples of works that may be necessary outside of the permitted normal hours of work include:- working on existing roads outside of peak periods to avoid causing additional traffic congestion; diversion of statutory utilities; working immediately adjacent to and or over existing roads / railway lines.

Where existing side roads are intersected by the Proposed Scheme continuity along the existing side roads will be maintained by either providing structures that facilitate the Proposed Scheme or by re-routing side roads to an alternative crossing location,. There will be one exception to this, where it is proposed that Local Road L-6052 in Roperstown will be permanently severed. Turning heads have been included for within the Proposed Scheme and the Local Road L-6052 will be widened at appropriate locations to facilitate the new access arrangements for local residents and businesses on this road.

As detailed in Chapter 3 of this EIS, continuity along all other Side Roads crossed by the Proposed Scheme will be maintained by either providing structures that facilitate the Proposed Scheme (in the majority of cases) or by re-routing Side Roads to an alternative crossing location (in three instances). It is proposed that the following Local Roads will be re-routed:-

(i) L-5096 in Rockspring will be re-routed to Local Road L-5093, to the west of the M11 Mainline. The existing section of Local Road L-5096 located on to the east side of the M11 Mainline will severed. A turning head will be included for within the Proposed Scheme;

(ii) L-6047 in Knockrathkyle will be re-routed to Local Road L-2040; and

(iii) L-6121 in Templescoby will be re-routed to Local Road L-6122.

The permanent realignments, including re-routings, and proposed lengths of Side Roads are further detailed in Chapter 3.

5.5 POTENTIAL IMPACTS OF THE PROPOSED SCHEME

5.5.1 Construction Phase

5.5.1.1 Direct Impacts

The direct construction related impacts include severance and the loss of agricultural lands and other properties. These have already been addressed under Chapter 6 (Agriculture) and Chapter 7 (Material Assets – Properties).

5.5.1.2 Indirect Impacts

There are a range of indirect construction related impacts which would not only have potential to cause environmental impacts but could also be of socio-economic concern. These include noise, dust, water, visual and landscape, ecological, archaeological, architectural and cultural heritage, traffic and waste related impacts and have been addressed separately in Chapters 4 to 17 inclusive. These Chapters address the potential impacts fully and make recommendations for appropriate mitigation where necessary. Some of the more pertinent issues of socio-economic concern are summarised in this section.

The construction phase of the Proposed Scheme will have potential to give rise to inconveniences to adjacent residences, business, landowners and road users. A number of community resources and services are located in close proximity to the Proposed Scheme and in the general area (e.g. schools, churches, petrol station, shops and residential areas). Such inconveniences may include noise, dust, visual intrusion, temporary diversions, disruption in services and traffic congestion / delays. Dust-generating activities and additional emissions from congestion and working vehicles during the construction stage could lead to a temporary reduction in air quality locally. These impacts are fully assessed in Chapters 12 (Air and Climate), Chapter 13 (Noise and Vibration), Chapter 14 (Landscape and Visual) of this EIS with appropriate mitigation measures recommended where necessary.

The construction of the Proposed Scheme will have potential to impact on some lands which are identified as being of special value or sensitivity in terms of their ecology, landscape and / or water quality. Some of these features would also be of socio-economic interest (*e.g.* anglers using the Slaney and other watercourses, or aquaculture operations in Wexford Harbour). Therefore any potential impacts on these, such as a reduction in water quality for example, would potentially have a knock on socio-economic impact. Any potential impacts on any such sensitive features have been fully assessed in Chapters 9 (Ecology), Chapter 10 (Soils and Geology), Chapter 11 (Water Quality, Hydrological and Hydrogeological Impact Assessment), Chapter 14 (Landscape and Visual) and Chapter 15 (Archaeology, Architecture and Cultural Heritage). From these assessments it is evident that no features of socio-economic value or interest will be significantly adversely impacted on.

The M11 / N11 Mainline section of the Proposed Scheme will include the demolition of an uninhabitable cottage in Ballymore at approximate Chainage M11 / N11:7,580; a ruin in Rockspring at approximate Chainage M11 / N11:8,380; and a partially built house in Tomnafunshoge at approximate Chainage M11 / N11:21,000. The N30 Mainline section of the Proposed Scheme will include the demolition of a house, motor repair workshop and a number of sheds at Bessmount at approximate Chainages N30 6,180 to 6,250. Monetary compensatory measures for the loss of land, buildings, severance, disturbance and other injurious affection will be agreed as part of the land acquisition procedures with land owners affected by the land take for the Proposed Scheme. Such compensation measures do not from part of the EIS and are therefore not considered further in this assessment.

There may be small impacts on local population numbers and patterns as some workers may relocate to the area for the purposes of construction related employment. However in the context of the overall existing population of the area any change is considered to be negligible.

In terms of potential positive impacts, the construction phase will give rise to local employment and create business for building suppliers and related industries for the duration of the Proposed Scheme. This may have a small temporary positive impact for local employment lasting for the duration of the construction stage.

In a worst case scenario, if some or all of the proposed mitigation measures are not adequately implemented or fail to work effectively, then slight to severe negative impacts would arise as a result of the construction works. This could have implications directly for people living in the area or indirectly by impacting on resources upon which the local community either relies or enjoys.

5.5.2 Operation Phase

5.5.2.1 Direct Impact

The Proposed Scheme is part of national infrastructure upgrade works identified in the National Development Plan and Transport 21, forms part of a major strategic transport corridor as identified in the National Spatial Strategy and is part of a Euroroute 01. The Proposed Scheme has an important function in assisting meeting the goals of the National Spatial Strategy for more balanced regional development. This major road improvement scheme will provide better movement of vehicles, goods and people through and within the south east region, assisting Wexford as an identified strategic hub to achieve its target critical mass for population and economic activity, and in turn to energise smaller towns and rural areas within its influence.

The Proposed Scheme will provide improved access and connectivity to Rosslare Europort which Wexford County Council has identified as being of strategic importance for the development of industry, tourism and commerce in the south east region as well as the County itself.

Local and regional tourism, which is an important part of the regional economy, will also benefit from the Proposed Scheme which will improve access to destinations in the wider area while still maintaining access to destinations of local interest (e.g. Monart Spa).

Overall the Proposed Scheme will have a significant positive impact on the economy and employment at local, regional and national level. Improved traffic flows and road safety will be of significant benefit to businesses and communities in the local and wider area. The reduction in the volumes of traffic through the congested centres of Camolin, Ferns and Enniscorthy will bring benefits to these local communities in terms of reduced congestion, air and noise pollution in town centres and will result in calmer and safer urban environments. These benefits have been demonstrated through the assessments described in Chapters 4 (Traffic), 12 (Air and Climate) and 13 (Noise and Vibration). These are contained in the Air and Noise chapters of the EIS.

Enniscorthy, Ferns and Camolin at present are bisected by the Euroroute 01 and bypassing them will significantly reduce the frequency of heavy goods vehicles through these towns and it is envisaged that when the Proposed Scheme is opened to traffic, traffic flows in these towns will be substantially reduced. The reduction in through traffic that has no destination in these towns and is currently a major contributor to congestion and the degradation of environmental amenity in the town will be a significant positive impact on quality of life to local residents.

The centre of Enniscorthy is currently reaching saturation point, despite alternative ways through the town, for example to the west through Carley's Bridge. Comparing traffic flows surveyed during 2006 and 2007 with predicted traffic flows for the Proposed Scheme shows this pattern worsening, as more vehicles are trying to travel on the already saturated network. In comparison, modelling has shown that the introduction of the Proposed Scheme significantly alters the pattern of trips around the town and greatly relieves the town centre. The Proposed Scheme will offer a significant reduction in overall travel times around Enniscorthy.

The Proposed Scheme will reduce local commute times for workers travelling between towns and commuter areas. In addition the Proposed Scheme will remove non-local traffic by bypassing the towns of Camolin, Ferns and Enniscorthy, which the existing N11 currently carries.

The routing of the Proposed Scheme outside of the urban centres of Camolin, Ferns and Enniscorthy, including any zoned lands around Enniscorthy[10], will ensure that traffic and associated nuisance, noise and vibration will be directed away from these urban built up areas. At the same time the adequate maintenance of access and in some cases provision of new

[10] Although there are currently no specific land use zonings made for Ferns or Camolin, Wexford County Council has set an objective in the County Development Plan 2007 – 2013 to prepare Local Area Plans for these towns. The first of these draft land use zoning plans for Ferns is available at: http://www.wexford.ie/wex/Departments/Planning/DevelopmentPlans/LocalAreaPlans/DraftFernsLocalAreaPlan2009-2015/Title,8151,en.html

access to local residents along the length of the Proposed Scheme will ensure good local access and minimise severance to local communities. Notably, residents in the area of Bush Road (L6052) have expressed particular concerns regarding the impacts if this road is closed (refer to letter from the Bush Road Retention Association in Appendix 1.2 in Volume 3 of this EIS)

The consultation exercise performed as part of this analysis revealed however, that there is particular concern from the Enniscorthy Chamber of Commerce about the proposed N80 link route (refer to letter in Appendix 1.2 in Volume 3 of this EIS).

The centres of Enniscorthy, Camolin and Ferns currently experience elevated pollution levels from traffic queuing on the existing N11 under congested traffic conditions. The Proposed Scheme will reduce traffic levels along the existing N11, which will lead to an improvement in air quality at these urban locations. The Proposed Scheme will reduce the level of stop-start car usage at these locations and in the overall area, which will help reduce the overall pollutant levels.

The Proposed Scheme will reduce traffic flows through current accident hot spots, and will consequently reduce the number of traffic accidents at these locations, improving traffic safety conditions on this major strategic transport corridor.

The Proposed Scheme will have limited impacts on residential, community or commercial properties with the majority of the directly affected lands being characterised by agricultural holdings. Owners of the farms and properties directly impacted on by the Proposed Scheme have been visited and impacts on these have been assessed in detail in Chapters 6 (Agriculture) and 7 (Material Assets – Properties) of this EIS.

In the worst case scenario, the failure to deliver the Proposed Scheme will jeopardise the ability of Wexford town to fulfil its role as a Hub town and in doing so, to promote economic growth in its hub towns and hinterlands which include the towns of Enniscorthy and Ferns. Wexford may struggle to meets its NSS targets for population and economic activity. This in turn will present significant challenges for the economic and employment performance of the south east region as a whole. In order for Wexford to function as a viable, competitive transport hub, goods entering and leaving must have uncongested access to the rest of the region and the Republic. Furthermore increasing congestion will continue to emit additional pollution, noise and vibration in populated urban centres as the level of service on the existing roads declines.

5.5.2.2 Indirect (Economic) Impacts

Enniscorthy is mainly a market town and the town continues to make strides with new developments in industry and infrastructure.[11] It is a very historic area with a number of historic attractions and excellent fisheries for angling. The tourist office is in the 1798 Rebellion Centre,

[11] See Enniscorthy Chamber of Commerce at http://www.enniscorthychamber.ie/

which was built to commemorate the battle of Vinegar Hill and the battle is re-enacted by audio visual at the Centre. Given the regional importance of Enniscorthy and surrounding towns coupled with the existing regional demand for services from the existing population, it is unlikely that the area will suffer significant negative economic impacts. Those likely to be impacted by the Proposed Scheme and likely to suffer some economic impact would include local businesses (mainly local B&Bs, convenience stores, restaurants and bars) which are served by existing through-traffic on the existing N11 and N30 national routes and which would be bypassed by the Proposed Scheme without having any proposed access points to / from the Proposed Scheme within reasonable proximity.

As noted in section 5.3.1 above, tourism has emerged as one of the primary sectors in the economy of Wexford and surrounding area – with visitor spend a significant revenue generator. Nevertheless, there is significant scope to improve the tourism product and market focus of the sector. Efficient road infrastructure and transport policy (including appropriate signage, lighting, landscaping and tourist information services) will complement the development of the regional tourism product. This will be reinforced by the continued growth of the Rosslare Europort, the development of Wexford as a hub, and the implementation of the local and regional development and local area plans. In the long run this will compensate for any short-term negative economic impact on local businesses which are served by through traffic on the existing N11 national primary route.

In the long run, improved road safety, reduced congestion and air / noise pollution in Enniscorthy, Ferns and Camolin will result in calmer and safer urban environments, improving the quality of life for residents and visitors in these towns. This will improve the environment of the towns for the local residents and visitors that are attracted to the area for heritage, culture and local amenities.

A study by Chase and Gustavson (2004) supports this view in their report prepared for the Department of Transportation and Public Works (Province of Nova Scotia, Canada) *Economics Impacts of Highway Bypass Development of Local Communities*. "They concluded that:

> *"The key findings indicate that the development of a highway bypass results in short-term impacts primarily to drive through traffic-dependent businesses, but little or no significant long-term economic impacts overall. In addition, the magnitude of negative impacts is lessened with a pre-existing strong economic base within the community, or history of being a trade centre for the region, and implementation of appropriate planning and an economic development strategy."*

It was also noted that:

> *"Possible mitigation measures include the development of strategies for appropriate signage, lighting, interchange landscaping, and the provision of tourist information services. In addition, it is clear from the literature that a community's ability to adjust to a change in highway alignment and take economic advantage of the improvements in the transportation infrastructure is dependent, in part, on the effective implementation of a regional economic development strategy or strategic land use plan. It should be noted that patterns of economic development are affected by a complex mix of factors that influence where businesses are located and the nature of the customer base. The location and characteristics of transportation corridors is only one of the many determinants involved."*

Within this literature, Handy *et al.* (2001)[12] in the reviewed case studies, towns were able to use the opportunity to reorganize, and develop into destination-based tourist attractions. Rather than consisting of convenience-based services such as petrol stations and fast-food restaurants, the towns became centres of more specialised activities that have often capitalised on the historic character of the town to become a desired destination for tourists. This suggests that the economic activity can be taken up elsewhere within the community. A similar large-scale study by Wisconsin Department of Transportation, The Economic Impacts of Highway Bypasses on Communities (1998) concluded that:

> *"In most communities, highway bypasses have little adverse impact on overall economic activity. The economies of smaller communities have a greater potential to be adversely impacted by a bypass. Over the long term, average traffic levels on the "old routes" in medium and large bypassed communities are close to or higher than prebypass counts, indicating continued strong economic activity in those communities and the opportunity for retail trade to flourish. Very little retail flight has occurred in bypassed communities, meaning that few businesses have relocated or developed new operations in areas adjacent to the bypass route. Communities view their bypasses as beneficial overall, while at the same time communities and individual businesses understand that the bypasses presented changes that must be addressed proactively."*

In Ireland, the N8 Cashel to Mitchelstown Proposed Road Development - Environmental Impact Statement (May 2005) references a recent example where a before and after questionnaire

[12] Handy, S., S. Kubly, D. Larsen, J. Sralla, S. Vanka, and M. Oden. 2001. Economic Effects of Highway Relief Routes on Small and Medium-size Communities: Case Studies. Research Project 0-1843-3. Conducted for the Texas Department of Transportation in co-operation with the US Department of Transportation by the Center for Transportation Research, University of Texas at Austin, Austin, Texas.

based analysis was performed to assess the impact of a bypass. The study used the questionnaire to survey local businesses and revealed that even those who were initially concerned, in the long run found the bypass beneficial or at least neutral in its impacts.

> *"Between 50 and 76% of all businesses surveyed noted local trade as part of their customer base. Those benefiting most from local trade include retail services, in particular public houses, comparison and convenience shops and, petrol filling stations. Between 39 and 59% of all businesses reported that passing trade formed a part of their customer base. Petrol filling stations, retail services, and comparison/convenience retailing will benefit more than others from opportunistic or passing trade. They may, therefore, be more sensitive to changes in road arrangements than other businesses."*
>
> *"Many businesses commented that in the period after completion of the N8 bypass in 1991 they experienced a loss of trade. However it was the general feeling that trade began to pick up again within twelve months of the bypass opening."*

5.5.3 Cumulative Impacts

A number of planning permissions have been granted within the vicinity of the Proposed Scheme. Those which were already construction at the time of carrying out assessments for the purpose of this EIS have already been assessed, where relevant, in the various Chapters of the EIS and it is not therefore necessary to re-consider them under cumulative impacts.

The only other major scheme which has received permission but has not yet been constructed and is expected could commence construction in the near future, is the Enniscorthy Main Drainage Stage 3 Scheme. This scheme involves the upgrading of an existing wastewater treatment plant (WWTP) and associated sewer network, to treat the effluent from Enniscorthy town and environs. The proposed WWTP will incorporate secondary treatment and tertiary treatment (phosphate and nitrogen removal) to achieve a high removal efficiency of biodegradable organic matter.

An EIS was prepared for the scheme in which it was concluded that all aspects of the scheme, which could impact directly or indirectly on human beings, could be mitigated for. The EIS stated that the scheme is expected to be generally positive in terms of its impacts on human beings in relation to employment and local amenities. It will also facilitate future residential, commercial, industrial, and leisure development in the area. The EIS furthermore considers that the scheme will significantly improve water quality in the receiving waters in the River Slaney and River Urrin. The cumulative operational impacts of the Proposed Scheme in addition to the proposed Enniscorthy Main Drainage Stage 3 Scheme, are therefore expected to be neutral.

The EIS for the Enniscorthy Main Drainage Stage 3 Scheme states an expected construction period of two years. It would be expected that should the Proposed Scheme and the Enniscorthy Main Drainage Stage 3 Scheme be under construction simultaneously, then there would be potential for cumulative construction related impacts on local residents, communities and road users. These would give rise to temporary, short term impacts over this period from traffic congestion, noise, dust and visual intrusion. All of these impacts have been fully mitigated for in the EISs for both scheme and as such the cumulative impacts are not predicted to be significant.

5.5.4 Do Nothing Scenario

Should the Proposed Scheme not progress the various potential construction related negative impacts would not arise. However, the significant positive impacts in terms of improvements in traffic flow and congestion with its knock on benefits for local communities, employment and economic activity would not arise. Similarly additional business for building suppliers and related industries for the duration of the construction stage would not be realised.

In terms of the operation phase of the Proposed Scheme, the Do Nothing Scenario happens to be the same as the worst case scenario as previously described. Beyond simply failing to achieve significant positive impacts, should the Proposed Scheme not progress, the current problems of congestion with increasing traffic flows would worsen. This assessment has found that with predicted traffic flows for the Proposed Scheme the situation would worsen, as more vehicles are trying to travel on the already saturated network. In comparison, modelling work has shown that the Proposed Scheme alters the pattern of trips around the towns of Enniscorthy, Ferns and Camolin and greatly relieves the pressure on these town centres. The Proposed Scheme will offer a significant reduction in overall travel times around Enniscorthy.[13]

5.6 MITIGATION MEASURES

5.6.1 Construction Stage

Local businesses and residents will be informed, in advance by the successful Contractor, of the date of commencement of the main construction works and will be provided with information on the intended construction programme.

Information will also be provided, in advance by the successful Contractor, on any alternative access / traffic management arrangements, disruption in services and the like. Any such proposals will be well managed by the successful Contractor and appropriate measures will be undertaken so as to minimise disruption to the local communities.

There are a limited and defined number of points where construction traffic will access the site from existing national and / or regional roads as described further in Chapter 3. A Traffic Management Plan which will be included within the Environmental Operating Plan, will be

[13] See N11 Clogh to Enniscorthy Route Selection Report (RHWSP, May 2008)

produced and implemented by the successful Contractor prior to construction works commencing. The planning, design, implementation and maintenance of traffic management measures will be the responsibility of the successful Contractor and will be undertaken in compliance with the requirements of the any relevant authorities including the Gardaí.

In order to minimise impacts to adjacent lands, fencing will be erected to clearly delineate the Lands Made Available to the successful Contractor. Works will not extend outside of the lands made available to the successful Contractor without prior written agreement of the Local Planning Authority (Wexford County Council) and / or relevant landowners / occupiers.

Many of the mitigation measures outlined in the various chapters of this EIS also relate to socio-economic impacts and are therefore not repeated here. In order to minimise impacts on environmental resources and features of socio-economic interest, all of the mitigation measures proposed within this EIS, particularly those relating to construction control measures (e.g. control of surface water and dust, maintenance of accesses leading to, from or crossing the Proposed Scheme, maintaining the lands made available and working site free from mud, debris or other hazardous substances etc. during construction operations) will be fully implemented by the successful Contractor. The Schedule of Environmental Commitments outlined in Chapter 18 of this EIS will be written into the main works tendering and contract documentation for full implementation. The successful Contractor will implement an Environmental Operating Plan as per the *Guidelines for the Creation, Implementation and Maintenance of an Environmental Operation Plan* (NRA, 2006), which will contain all mitigation measures contained in this EIS, including all those listed in Chapter 18.

5.6.2 Operation Stage

Impacts on farm holdings and properties have been minimised through careful development of the Proposed Scheme through the planning phases, including close liaison between Wexford County Council, consultants carrying out assessment as part of the EIA and landowners, regarding issues such as farm / property severance, access and potential noise and visual impacts. Design measures which will be implemented to reduce any such impacts as far as practicable have been incorporated into the Proposed Scheme and are detailed in various Chapters throughout this EIS. Additional, specific mitigation measures have also been recommended throughout this EIS where considered appropriate. Examples include noise attenuation measures (refer to Chapter 13 Noise and Vibration) and visual screening measures (refer to Chapter 14 Landscape and Visual).

The estimated traffic volumes likely to be using the Proposed Scheme in the Design Year of 2028 have been taken into account when determining the cross-sectional specifications and geometric parameters for the Proposed Scheme, in order to maximise road safety and efficiency.

5.7 RESIDUAL IMPACTS OF THE PROPOSED SCHEME

5.7.1 Construction Phase

It is inevitable that a major scheme such as this will have some level of environmental impact during its construction. As long as the detailed mitigation measures outlined in throughout the various chapters of this EIS are adequately implemented any such impacts will be minimised as far practicable.

5.7.2 Operation Phase

The Proposed Scheme will improve safety and access on this major strategic transport corridor for the south east region for all road users and will also result in the more efficient movement of vehicles, people and goods in the region. Overall in the long term, the Proposed Scheme is predicted to have a significant positive impact on the local community, employment and enterprise. The Health and Safety Executive (HSE) in their submission as part of the scoping process (refer to Appendix 1.2), noted that:

> *"while the social capital across the neighbourhoods lining the present road should improve because of the increased interaction due to the reduction in traffic it is important that the effects of community severance would be assessed on the rural communities through which the new road passes."*

The Proposed Scheme will alter the routing of traffic, and thus some businesses currently served by existing N11, N80 and N30 through traffic and some which profit indirectly from passing trade, will see a reduction in custom and trade in the towns to be bypassed. This has been mitigated as far as practicable by providing appropriate access from the Proposed Scheme to the town centres, so traders, suppliers and customers will still be able to access these businesses. In most cases it can be assumed that there will be no significant loss of economic activity in the long term.

In line with the design measures suggested in section 5.5.2.2, when the Proposed Scheme opens, appropriate signage, lighting, landscaping, and tourist information services will be provided. Existing NRA policy statements on the *Provision of Tourist and Leisure Signage on National Roads Policy Statement* and *Development Management and Access to National Roads*, provide guidance for these aspects.

Some properties in close proximity to the Proposed Scheme will experience an increase in noise levels or visual intrusion, however these impacts have been mitigated for as described in detail in Chapters 13 (Noise and Vibration) and 14 (Landscape and Visual). Any negative impacts on properties which will be affected by the Proposed Scheme will be mitigated through specific measures as identified throughout this EIS so that impacts are reduced to within industry standard levels. Furthermore, this number will be far exceeded by the numbers of properties,

which will experience a significant positive impact as a result of the re-routing of traffic out of existing urban, populated centres.

Similarly, some properties will experience unavoidable severance and loss of lands and property. Any such impacts have been minimised as far as practicable, through the careful design of the Proposed Scheme. For any unavoidable impacts of this nature landowners will be compensated through the Compulsory Purchase Order process.

Overall any residual impacts, either construction or operation related, which will remain after the implementation of mitigation measures, are far outweighed by the significant positive impacts which the Proposed Scheme will bring to the south east region.

5.8 MONITORING

Specific monitoring measures are outlined in Chapters 4 to 16 of this EIS. In addition to these, the successful Contractor will engage an appropriately qualified individual / organisation to ensure the production and implementation of an Environmental Operating Plan for the Proposed Scheme which will include all of the recommendations set out in the Schedule of Environmental Commitments in Chapter 18 of this EIS and will require regular monitoring of construction works to ensure environmental impacts are minimised.

6 AGRICULTURAL IMPACT ASSSESSMENT

6.1 INTRODUCTION

The Proposed Scheme will directly impact on 109 farms consisting of 71 farms on the M11/N11 Mainline, 9 farms on the N80 Link Road and 29 farms on the N30 Mainline.

6.2 METHODOLOGY

This agricultural impact assessment was undertaken during 2007 and 2008. All of the farms directly impacted by the Proposed Scheme were visited and the potential impacts on them were assessed.

An assessment of the existing agricultural environment was carried out through the completion of detailed farm surveys. The surveys assessed how the Proposed Scheme would impact on the current farming activities carried out on the land directly affected by the Proposed Scheme and what mitigation measures are possible to alleviate negative impacts.

Each of the directly affected landowners was consulted, in order to carry out the following tasks:

- to conduct an appraisal of the farm facilities and layout; and
- to gather data via a questionnaire to enable an assessment of the impact and mitigation measures required as a result of the Proposed Scheme.

Farms were categorised according to the following criteria:

- Total area of farm holding (hectares);
- Farm enterprise type(s);
- Level of overall impact;
- Enterprise type(s) for major / severe impacts;
- Level of land severance;
- Buildings / facilities to be acquired;
- New access facilities requiring provision

On three farms, an additional assessment was conducted by an equestrian specialist, Mr. Michael Sadlier, as to how the Proposed Scheme would impact on equestrian enterprises. The impact on equestrian enterprises arising from these assessments has been incorporated into this chapter.

6.2.1 Impact Predictions

The degree of impact was assessed as being the overall effect of the Proposed Scheme on farm holdings, assuming the construction and operation of the Proposed Scheme, but prior to any

detailed agricultural mitigation. Where mitigation measures relating to severance are possible the degree of impact in most cases has been reduced. The degree to which the Proposed Scheme impacts upon individual farms depends on:

- Landtake;
- The degree of severance;
- The type of farm enterprises carried out;
- Farm size;
- Impact on farm buildings and / or facilities; and
- Impact on shelter.

The assessment of the level of significance of effects of the Proposed Scheme on farms is based on the criteria set out in Table 6.1

Table 6.1 Significance Criteria for Overall Impact on the Farm Holding

EPA Glossary of Impacts	Level of Impact	Criteria
Profound or Significant Impact: Negative only	Severe	Severe impact occurs where the farm enterprise cannot be continued as a result of a proposed scheme. This would occur where landtake and severance was of such a nature to make the holding unworkable and / or where important farm buildings and facilities were removed. Impact of this degree would be rare and is most likely to occur on a dairy or stud farm.
Significant Impact: Negative only	Major	Major impact occurs where the farm enterprise cannot be continued without considerable management or operational changes. There would be significant severance on the affected land parcel(s). The Proposed Scheme may affect farm buildings and / or facilities. Access to the severed portions of land can only be achieved through the use of non-farm roadways to access severed lands. Where the impact is major an enterprise change may be necessitated e.g. from dairy to drystock.
	Moderate	Moderate impact occurs where the farm enterprise can be continued as before but with increased management or operational difficulties. While portions of the land would be severed the enterprise mix would be such that the farming system could continue perhaps with reduced stock numbers or additional labour, contractor or other charges.
	Minor	Minor impact occurs where the farm enterprise suffers inconvenience as a result of a proposed scheme. Severance would not occur or is insignificant and the farm buildings and facilities would be left in place. Typically only a small portion of land would be removed at the boundary of the farm.
Neutral, Imperceptible or Slight Impact	Not Significant	An impact is not significant where the farm enterprise suffers a slight inconvenience such as relocation of access or loss of shelter.

The following definitions were used in carrying out the assessment of the agricultural impacts:

- Field - An area of land, which is surrounded by a permanent boundary (fence, ditch, hedge wall, *etc*.) and is not subdivided by any permanent boundary.
- Land Parcel - An integral undivided area of land comprising one or more fields, which is in single ownership.
- Farm Holding - A single farming enterprise. Some farms will comprise of just one land parcel but others may consist of two or more land parcels.

6.2.1.1 Landtake

Individual Fields

In general the larger the field size the more useful the field. This is particularly because of the ease of use of machinery in larger fields. Reduction in the field size results in increased costs.

Farm Holdings

The landtake is one of the main impacts on a farm holding. The degree of the impact varies with the area of the land taken, the land quality, location and farm type. The greater the landtake and the higher the quality of the affected lands the greater will be the impact.

Landtake on the main land parcel will have a greater impact on a fragmented farm holding than landtake from an outfarm *i.e.* a land parcel removed from the main land parcel. Landtake on a dairy farm on lands used as grazing paddocks adjacent to a milking parlour may have a larger impact than taking land located on a beef farm.

The size of the affected farm holding is also a factor with landtake on a smaller farm generally having a greater impact.

Intensity of Land Use

Farming systems can vary with regard to the intensity of use to which the land is put. In general, the impact will be greater on more intensively farmed lands.

6.2.1.1 Severance

General

Severance is the effect caused when a proposed road divides a farm holding or a field. Severance is important because it affects the future management of the remaining land, which is not taken for the proposed road. It extends the impact of the proposed road outside the footprint of the actual landtake.

Severance of Individual Fields or Land Parcels

Farm holdings are more efficient in single land parcels. Severance of a land parcel occurs when a proposed road alignment splits a field or land parcel into two or more pieces. This results in the

fragmentation of the farm holding into a greater number of management units. Access may involve a considerable distance to the severed area of land. Fragmentation of farm holdings results in greater costs due to increased livestock and grassland management involved in farming more than one unit. For example, movement of livestock between land parcels and increased travel distances for grassland, silage and tillage machinery.

Where farm buildings are located on the land parcel being severed the impact of severing these buildings from the land must be considered. Land isolated from the farm buildings is left without access to facilities previously available. The greater the area of land severed from the farm buildings the greater the impact. The impact of severance on farm buildings is particularly acute in the case of dairy farming where the dairy and milking parlour are severed from the grazing paddocks. The impact is greater because dairy cows require twice-daily access from the grazing area to a milking parlour.

Animal handling facilities such as cattle pens may be present for loading / unloading and treatment of livestock.

In many instances land parcels do not have any farm buildings or animal handling facilities. This may occur when the farm buildings are located on another part of the farm holding. Where it involves short distances it may be the traditional practice to walk livestock along the public road network to the farm buildings.

The significance criteria presented in Table 6.2 are used to rank severance of individual land parcels.

Table 6.2 Significance Criteria Used to Rank Severance of Land Parcels

EPA Glossary of Impacts	Level of Impact	Criteria
Profound or Significant Impact: Negative only	Severe	The Proposed Scheme passes through the land parcel causing severance. It is divided into two units. There is no access to the severed area. The severed area is greater than two thirds of the land parcel. There is a loss of access to farm buildings and / or facilities.
Significant Impact: Negative only	Major	The Proposed Scheme passes through the land parcel causing severance. It is divided into two units and the severed area is greater than one third of the land parcel. There is no access to the severed area or it may be a by way of a considerable distance. Farm buildings and facilities are left on less than half the original area. Remaining areas may be irregularly shaped and less suited to agricultural use.

Table 6.2 Significance Criteria Used to Rank Severance of Land Parcels (Cont.)

EPA Glossary of Impacts	EPA Glossary of Impacts	EPA Glossary of Impacts
	Moderate	The Proposed Scheme passes through the land parcel causing severance. It is divided into two units. Access is available to the two areas. The severed area is less than one third of the land parcel. Where present, the farm buildings and facilities remain on the larger area.
	Minor	The Proposed Scheme passes generally along the external boundary leaving the bulk of the land in one unit. There may be severance of a small area. Farmyard facilities are not affected.
Neutral, Imperceptible or Slight Impact	Not Significant	The Proposed Scheme passes generally along the external field boundary leaving the bulk of the land in one unit. There is no severance caused.

Landtake and severance are two areas that outline the effects of a proposed route on a field or land parcel. However, many farm holdings may be fragmented and may consist of several land parcels. A proposed route may impact on the main land parcel consisting of farm buildings and facilities or on a second land parcel where no facilities are present. Although landtake and severance on both land parcels would be comparable, the overall impact on the farm holding arising from each parcel could differ significantly.

Fragmented farm holdings may also be affected by a proposed route on more than one land parcel. The varying impacts on each land parcel will contribute to the overall impact on the farm holding.

6.2.1.3 The Type of Farm Enterprise

The farm enterprise types that will be most severely affected by a proposed scheme are those of high stocking rates, which are intensively farmed. These would frequently be dairy farms and intensive beef farms. Dairy farming is one of the most profitable farming enterprises in this country. A reduction in the available forage area may result in a reduction in the number of dairy cows that can be maintained on the farm holding. Significant landtake, or severance of the grazing paddocks from the farm buildings, may result in the farmer being forced to change the farm enterprise type to a less profitable enterprise.

Certain farm enterprises may be impacted to a greater extent by a proposed route. Horses are of a more nervous disposition than other stock types. They are prone to stress caused by irregular noise and moving vehicles. Landtake and severance of land parcels may result in fields of an irregular shape (e.g. triangular shaped fields with sharp / narrow corners), which may be unsuitable for grazing with equine stock. Horses risk injury when galloping around such fields.

Drystock enterprises such as beef and sheep are generally less affected by a proposed scheme than dairy farms. Livestock on these farm holdings are not moved from field to field as frequently as on a dairy farm. Although there is a significant impact, the farming practices on these enterprises can be adapted to mitigate the overall impact.

Tillage farms are less severely impacted than dairy or beef farms. Machinery can easily move from one land parcel to another. Fields may be less regularly shaped and more awkward to farm but can still be workable.

6.2.1.4 Impact on Farmyard Buildings and / or Facilities

The removal of farm buildings and / or facilities on the farm will contribute towards the overall impact on the farm. This will depend on the type of farm buildings affected and extent that the facilities are affected.

6.2.1.5 Impact on Shelter

The removal of mature trees and strong hedgerows, which provide shelter to crops and livestock, especially younger stock, will have an impact on a farm holding. It will depend on the extent of the shelter removed and the type of enterprise.

6.2.2 Consultation

The preparation of this assessment involved meeting with and consultation with 108 landowners affected by the Proposed Scheme. The potential impact of the Proposed Scheme on individual farms was discussed with landowners during these meetings and this information was fed into the design process so that appropriate mitigation measures could be incorporated into the scheme design.

6.2.3 Data Deficiencies / Difficulties with Producing the Impact Assessment

There were no major difficulties or data deficiencies encountered in the production of this agricultural assessment. One landowner was unable to be directly contacted, and the assessment was conducted by a roadside survey.

6.3 RECEIVING ENVIRONMENT

In assessing the impact of the Proposed Scheme on agriculture, it is useful to compare the general agricultural activity at a national, county and local level with that of the area immediately affected by the development. This will indicate if there is any significantly unusual agricultural production, taking place along the Proposed Scheme.

6.3.1 Agriculture in County Wexford

County Wexford has a total Utilisable Agricultural Area (U.A.A.) of 184,584 hectares (Central Statistics Office, Census of Agriculture, June 2000). This represents approximately 4.3% of the national agricultural land area. There are 4,613 farms in County Wexford with the average farm size in the County being 40.16 hectares. This is substantially higher than the national average farm size of 31.4 hectares. The average work units employed on the farms in County Wexford are 1.3 units per farm (a work unit is equal to 1,800 hours or more labour input per person per annum).

Grassland based livestock farming is particularly important in County Wexford. The predominant farm enterprise is specialist dairy with a total of 891 farms (19.3% of total farms) involved while mixed grazing livestock has a total of 890 farms (19.3%) in the county. Specialist beef enterprises are carried out on 860 farms (18.6%) and a total of 401 farms (8.7%) are involved in specialist sheep farming. Tillage is also important in County Wexford with specialist tillage carried out on 752 farms (16.3%) and mixed crops and livestock farming on 712 farms (15.4%).

The topography in the vicinity of the Proposed Scheme is gently rolling and elevations are mainly 0-100m above ordnance datum (AOD). The land quality is considered good and the principal soil is a well-drained Acid Brown Earth. Agriculture in this area is intensive in nature due to the relatively high quality of the soil type with all of the main types of farm enterprises to be found.

6.3.2 Agriculture Along the M11 / N11 Mainline

The M11 / N11 Mainline will pass through eight Electoral Divisions (EDs), including Gorey Rural, Ballyoughter, Ballymore, The Harrow, Enniscorthy Rural, Tinnacross, Ballyhuskard, and Edermine.

6.3.2.1 Soil

The soil types along the M11 / N11 Mainline were identified using the Soil Association Map of Ireland from *Soil Associations of Ireland And Their Land Use Potential (*An Foras Taluntais, *1980)*. A soil association is a mapping unit on a soil map, which consists of two or more soils. A soil map is a representation of the distribution of soil types of a given landscape.

The soil types along the M11 / N11 Mainline fall within the following soil associations:

- Soil Association 9: Brown Podzolics 80%, Gleys 15%, Podzols 5%;
- Soil Association 14: Acid Brown Earths 75%, Gleys 15%, Brown Podzolics 10%;
- Soil Association 16: Acid Brown Earths 90%, Gleys 5%, Regozols 3%, Podzols 2%;
- Soil Association 40: Gleys 80%, Grey Brown Podzolics 20%; and

- Soil Association 42: Gleys 90%, Grey Brown Podzolics 10%.

The characteristics of the individual soil associations are outlined in Appendix 6.1.

6.3.2.2 Current Farming Enterprises

Table 6.3 presents the category of farming enterprise in the affected EDs and how they compare with the national percentages for each category.

Table 6.3 Farms Classified by Farm Type along the M11/N11 Mainline and Nationally[1]

Farm / Enterprise Category	No. of Farmers on Proposed N11 /M11 Mainline	% of Farms on Proposed N11 /M11 Mainline	No. of Farmers within Relevant ED'S[2]	% of Total Farmers within Relevant ED'S	National % of Farmers
Specialist Dairy	7	9.9	80	21	18.6
Specialist Beef Production	4	5.6	60	15	51.1
Specialist Sheep Production	1	1.4	20	5	8.6
Mixed Grazing of Livestock	9	12.7	90	23	14.6
Specialist Tillage	6	8.5	80	21	3.3
Mixed crops & Livestock	29	40.8	50	12	2.6
Other*	15	21.1	10	3	1.2
Total	**71**	**100**	**390**	**100%**	**100%**

* For example equine, forestry, leased, fruit / horticulture, pigs, poultry, etc

Table 6.3 indicates that there is a mix of both tillage and grass based livestock enterprises throughout the affected EDs. The level of tillage farms is significantly higher than the national average. Both dairy and mixed grazing of livestock are at a higher level while beef farming is considerably lower than the national average. Sheep farming is also lower than the national average.

There is a lower level of specialist dairy, beef, sheep and mixed livestock enterprises along the M11/N11 Mainline than in the local ED's or nationally. There is a significantly higher level of mixed crops and livestock along the M11/N11 Mainline.

The distribution of farm sizes within the affected EDs in comparison with national averages is presented in Table 6.4.

[1] Central Statistics Offices (CSO) Agricultural Statistics 2000
[2] Figures have been rounded up or down to the nearest ten and data that was suppressed at ED level has been marked as 0 which indicates that the amount of the item in question was actually zero in that ED.

Table 6.4 Farms Classified by Farm Size along the M11/N11 Mainline and Nationally[3]

Farm Size	No. of Farmers on Proposed N11 /M11 Mainline	% of Farms on Proposed N11 /M11 Mainline	No. of Farmers within Relevant ED'S [2]	% of Total Farmers within Relevant ED'S	National % of Farmers
<10 Hectares	1	1.4	50	13	20.1
10 to <20 Hectares	8	11.3	60	15	24.2
20 to <30 Hectares	8	11.3	60	15	17.7
30 to <50 Hectares	17	23.9	110	28	20.9
50 to <100 Hectares	28	39.4	100	26	13.8
≥ 100 Hectares	9	12.7	10	3	3.3
Total	**71**	**100**	**390**	**100%**	**100**

The figures in Table 6.4 show that the average farm size in the affected ED's areas is higher than that nationally. Of all farms, 57% are greater than 30 hectares in size in contrast with the national average of 38% for the same category. The level of farms within the 50-<100 ha is significantly higher at 26% than the national average of 13.8%.

Farm size along the M11/N11 Mainline is higher than farms in the affected ED's and significantly higher than the national farm size.

Table 6.5 illustrates the breakdown of the agricultural land use and the comparison with the national averages.

Table 6.5 Crop Types along the M11/N11 Mainline and the National Area[4]

Crop Types	Area within EDs (ha)	% of Area within ED'S	% of National Area under Crops and Pasture
Total Cereals	4,704	27	7%
Other Crops, Fruit / Horticulture	2,631	15	2%
Total Pasture	6,120	35	51%
Total Hay	913	5	9%
Total Silage	3,020	17	17%
Rough Grazing in use	224	1	14%
Total	**17,612**	**100%**	**100%**

The crop type figures in Table 6.5 reflect the significantly higher level of specialist tillage and mixed livestock and crops within the affected ED's. The combined level of total cereals with other crops, fruit / horticulture is significantly higher at 42% when compared with the national figure of 9%

[3&4] CSO Agricultural Statistics 2000

6.3.3 Agriculture Along the N80 Link Road

The N80 Link Road will pass through the ED of Enniscorthy Rural.

6.3.3.1 Soil

The N80 Link Road falls within the following soil associations:

- Soil Association 16:Acid Brown Earths 90%, Gleys 5%, Regozols 3%, Podzols 2% ;
- Soil Association 40: Gleys 80%, Grey Brown Podzolics 20%;

The characteristics of the individual soil associations are outlined in Appendix 6.1

6.3.3.2 Current Farming Enterprises

Table 6.6 presents the category of farming enterprises in the affected ED and how they compare with the national percentages for each category.

Table 6.6 Farms Classified by Farm Type along the N80 Link Road and Nationally[4]

Farm / Enterprise Category	No. of Farmers on Proposed N80 Link Road	% of Farms on Proposed N80 Link Road	No. of Farmers within Relevant ED'S [5]	% of Total Farmers within Relevant ED'S	National % of Farmers
Specialist Dairy	1	11.1	10	16.7	18.6
Specialist Beef Production	0	0	0	0	51.1
Specialist Sheep Production	1	11.1	0	0	8.6
Mixed Grazing Livestock	1	11.1	10	16.7	14.6
Specialist Tillage	3	33.3	20	33.3	3.3
Mixed crops & Livestock	1	11.1	10	16.7	2.6
Other*	2	22.2	10	16.7	1.2
Total	**9**	**100%**	**60**	**100**	**100%**

* For example equine, forestry, leased, fruit / horticulture, pigs, poultry, etc

Table 6.6 indicates that there is a mix of both tillage and grass based livestock enterprises throughout the affected EDs. The level of specialist tillage farms and mixed crops & livestock is significantly higher than the national average. Dairy farming in the area is slightly lower than the national average and beef and sheep farming are either at a very low level or are absent from the area.

[4] CSO Agricultural Statistics 2000
[5] Figures have been rounded up or down to the nearest ten and data that was suppressed at DED level has been marked as 0 which indicates that the amount of the item in question was actually zero in that DED.

There is a similar level of land use along the N80 Link Road to the affected ED's.

The distribution of farm sizes within the affected ED in comparison with national averages is presented in Table 6.7.

Table 6.7 Farms Classified by Farm Size along the N80 Link Road and Nationally[6]

Farm Size	No. of Farmers on Proposed N80 Link Road	% of Farms on Proposed N80 Link Road	No. of Farmers within the affected ED'S [7]	% of Total Farmers within the affected ED'S	National % of Farmers
<10 Hectares	1	11.1	10	14.3	20.1
10 to <20 Hectares	0	0	10	14.3	24.2
20 to <30 Hectares	1	11.1	10	14.3	17.7
30 to <50 Hectares	1	11.1	20	28.6	20.9
50 to <100 Hectares	6	66.7	20	28.6	13.8
≥ 100 Hectares	0	0	0	0	3.3
Total	**9**	**100%**	**70**	**100%**	**100%**

The figures in Table 6.7 show that the average farm size in this area is higher than that nationally. Of all farms, 57.2% are greater than 30 hectares in size in contrast with the national average of 38% for the same category. The level of farms within the 50-<100 ha is significantly higher at 28.6% than the national average of 13.8%.

Farm size along the N80 Link Road is significantly higher than farms in the affected ED's and the national farm size.

Table 6.8 illustrates the breakdown of the agricultural land use and the comparison with the national averages.

Table 6.8 Crop Types along the N80 Link Road and the National Area[8]

Crop Types	Area within ED's (ha)	% of ED Area in Each Category	% of National Area under Crops and Pasture
Total Cereals	939	39.4	7%
Other Crops, Fruit / Horticulture	144	6.1	2%
Total Pasture	837	35.1	51%
Total Hay	63	2.6	9%
Total Silage	399	16.8	17%
Rough Grazing in use	0	0	14%
Total	**2382**	**100**	**100%**

[6&4] CSO Agricultural Statistics 2000

[7] Figures have been rounded up or down to the nearest ten and data that was suppressed at DED level has been marked as 0 which indicates that the amount of the item in question was actually zero in that DED.

[8] CSO Agricultural Statistics 2000

The crop type figures in Table 6.8 reflect the significantly higher level of specialist tillage and mixed livestock and crops within the affected ED's. The combined level of total cereals with other crops, fruit / horticulture is significantly higher at 45.5% when compared with the national figure of 9%

6.3.4 Agriculture Along the N30 Mainline

The N30 Mainline will pass through four Eds, including Enniscorthy Rural, Marshalstown, Killoughrum and The Leap.

The topography is gently rolling and elevations are mainly 0-100m AOD. The land quality is considered good and the principal soil is a well-drained Acid Brown Earth. Agriculture in this area is intensive in nature due to the relatively high quality of the soil type with all of the main types of farm enterprises to be found.

6.3.4.1 Soil

The N30 Mainline falls within the following soil associations:

- Soil Association 14: Acid Brown Earths 75%, Gleys 15%, Brown Podzolics 10%;
- Soil Association 16: Acid Brown Earths 90%, Gleys 5%, Regozols 3%, Podzols 2% ;
- Soil Association 40: Gleys 80%, Grey Brown Podzolics 20%; and

The characteristics of the individual soil associations are outlined in Appendix 6.1.

6.3.4.2 Current Farming Enterprises

Table 6.9 presents the category of farming enterprise in the affected Eds and how they compare with the national percentages for each category.

Table 6.9 Farms Classified by Farm Type along the N30 Mainline and Nationally[9]

Farm/Enterprise Category	No. of Farmers on Proposed N30 Mainline	% of Farms on Proposed N30 Mainline	No. of Farmers within Relevant ED'S [10]	% of Total Farmers within Relevant ED'S	National % of Farmers
Specialist Dairy	1	3.5	40	19.9	18.6
Specialist Beef Production	0	0	20	10	51.1
Specialist Sheep Production	2	6.9	0	0	8.6

[9] CSO Agricultural Statistics 2000
[10] Figures have been rounded up or down to the nearest ten and data that was suppressed at DED level has been marked as 0 which indicates that the amount of the item in question was actually zero in that DED.

Table 6.9 Farms Classified by Farm Type along the N30 Mainline and Nationally[11] (Cont.)

Farm/Enterprise Category	Farm/Enterprise Category	Farm/Enterprise Category	Farm/Enterprise Category	Farm/Enterprise Category	Farm/Enterprise Category
Mixed Grazing Livestock	2	6.9	40	20.3	14.6
Specialist Tillage	5	17.2	50	24.9	3.3
Mixed crops & Livestock	8	27.6	40	19.9	2.6
Other*	11	37.9	10	5	1.2
Total	**29**	**100%**	**200**	**100**	**100%**

* For example equine, forestry, leased, fruit / horticulture, pigs, poultry, etc

Table 6.9 indicates that there is a mix of both tillage and grass based livestock enterprises throughout the affected ED's. The level of tillage farms and mixed grazing livestock is significantly higher than the national average. Dairy farming in the area is at a similar level while beef farming is considerably lower than the national average. The CSO data indicates that sheep farming is at a very low level or is absent in the affected ED's.

There is a lower level of grassland-based farm enterprises along the N30 Mainline than in the local ED's or nationally. There is a significantly higher level of mixed crops and livestock along the route. There is also a high level of leased farms on the proposed N30 Mainline.

The distribution of farm sizes within the affected ED's in comparison with national averages is presented in Table 6.10.

Table 6.10 Farms Classified by Farm Size along the N30 Mainline and Nationally[12]

Farm Size	No. of Farmers on Proposed N30 Mainline	% of Farms on Proposed N30 Mainline	No. of Farmers within Relevant ED'S [13]	% of Total Farmers within Relevant ED'S	National % of Farmers
<10 Hectares	5	17.2	40	20	20.1
10 to<20 Hectares	2	6.9	20	10	24.2
20 to <30 Hectares	4	13.8	30	15	17.7
30 to <50 Hectares	11	38.0	50	25	20.9
50 to <100 Hectares	5	17.2	60	30	13.8
≥ 100 Hectares	2	6.9	0	0	3.3
Total	**29**	**100%**	**200**	**100%**	**100%**

[11] CSO Agricultural Statistics 2000
[12] CSO Agricultural Statistics 2000
[13] Figures have been rounded up or down to the nearest ten and data that was suppressed at DED level has been marked as 0 which indicates that the amount of the item in question was actually zero in that DED.

The figures in Table 6.10 show that the average farm size in these areas is higher than that nationally. Of all farms, 55% are greater than 30 hectares in size in contrast with the national average of 38% for the same category. The level of farms within the 50 to <100 ha is significantly higher 30% than the national average of 13.8%.

Farm size along the N30 Mainline is similar to farm size in the affected ED's and higher than the national farm size.

Table 6.11 illustrates the breakdown of the agricultural land use and the comparison with the national averages

Table 6.11 Crop Types along the N30 Mainline and the National Area[14]

Crop Types	Area within EDs (ha)	% of ED Area in Each Category	% of National Area under Crops and Pasture
Total Cereals	3,244	40.1%	7%
Other Crops, Fruit/Horticulture	210	2.6%	2%
Total Pasture	2,909	36%	51%
Total Hay	448	5.5%	9%
Total Silage	1,231	15.2%	17%
Rough Grazing in use	48	0.6%	14%
Total	**8,090**	**100**	**100%**

The crop type figures in Table 6.11 reflect the significantly higher level of specialist tillage and mixed livestock and crops within the affected ED's. The combined level of total cereals with other crops, fruit / horticulture is significantly higher at 42.7% when compared with the national figure of 9%

6.3.5 Summary of Agriculture Along the Proposed Scheme

Along the Proposed Scheme there is a mix of both tillage and grass based livestock enterprises throughout the affected ED's. The level of specialist tillage and mixed livestock is significantly higher than the national average. In general, there is a lower level of specialist livestock farm enterprises such as dairy, beef, equine and sheep.

This lower level of grassland based farming enterprises, which are more susceptible to potential impacts than tillage based enterprises, may result in a lower agricultural impact on the Proposed Scheme than a scheme in another area. The higher level in the tillage category reflects the higher quality agricultural land in the area.

[14] CSO Agricultural Statistics 2000

Overall the figures show farm sizes in the affected ED's are greater than the national average and indicate a lower number of affected farms than on a scheme at another location. Along the Proposed Scheme the average farm size is higher than nationally with between 55% and 57% of farms being greater than 30 hectares in size in contrast with the national average of 38% for the same category.

Along the Proposed Scheme the high level of specialist tillage farming is reflected in the level of cereal crops which is significantly higher than the national average. Grassland crops such as pasture and hay are lower than the national average along the M11/N11 Mainline and N30 Mainline with a significantly lower level of rough grazing along the proposed scheme than the national average.

6.4 CHARACTERISTICS OF THE PROPOSED SCHEME

A detailed description of the Proposed Scheme is provided in Chapter 3 of this EIS and detailed plans of the Proposed Scheme are provided in Volume 4 of this EIS. The Proposed Scheme comprises the construction of three new sections of road, which will form part of the National Road network, namely:-

- M11/N11 Mainline – approximately 26 km of dual motorway standard and 1 Km of standard single standard from the existing N11 in Frankfort to the existing N11 in Scurlocksbush;
- N80 Link Road – approximately 4 km of dual carriageway from the existing N11 / N80 junction in Ballynahallin to the proposed N11 mainline at Ballydawmore; and
- N30 Mainline – approximately 8 km of single carriageway from the existing N11 / N80 in Ballynahallin to the existing N30 in Templescoby.

The Proposed Scheme will traverse mainly agricultural land passing through eleven EDs. These EDs are Gorey Rural, Ballyoughter, Ballymore, The Harrow, Enniscorthy Rural, Tinnacross, Edermine, Ballyhuskard, Marshalstown, Killoughrum and The Leap.

The Proposed Scheme will directly impact on 109 farms by either severing them or reducing the area of the farm. The M11/N11 Mainline will impact on 71 farms; the N80 Link Road will impact on 9 farms while the N30 Mainline will impact on 29 farms.

Continuity along existing side roads crossed by the Proposed Scheme is provided where possible, but one local road will need to be permanently severed. Continuity will be maintained either by providing an overbridge over the Proposed Scheme, an underpass under the Proposed Scheme or by re-routing the side road to an alternative crossing location. During construction, temporary diversions of side roads will be required.

A range of watercourses will be traversed by the Proposed Scheme details of which are provided in Chapter 3 of this EIS.

6.5 POTENTIAL IMPACTS OF THE PROPOSED SCHEME

The alignment of the Proposed Scheme is through good quality land which consists of moderate agricultural range and usage. The main enterprises are primarily tillage, dairying and mixed livestock. The impact on agriculture of the Proposed Scheme will be limited to the farms directly traversed by the Proposed Scheme.

6.5.1 Loss of Agricultural Land

Nationally there are approximately 3,936,567 hectares of agricultural land (excluding rough grazing) of which 3,535,443 hectares are in grassland based enterprises and 401,124 hectares are in cereal and non-cereal crop production. Approximately 460 ha of land will be lost to agricultural production as a result of this M11 Gorey to Enniscorthy Scheme. This loss, while significant to individual farmers, is not significant on a county or national level.

6.5.2 Individual Farm Holding Impacts

6.5.2.1 M11 / N11 Mainline

There are 71 farms directly affected by the M11 / N11 Mainline. Table 6.12 below presents summary details of the farm assessments and the anticipated impact of the M11 / N11 Mainline.

Table 6.12 Summary of Individual Farm Assessments on M11 / N11 Mainline (71 farms)

Category	No. of Farms	% of Farms
Farm Size (ha): -		
<10	1	1.4
10 – <20	8	11.3
20 – <30	8	11.3
30 – <50	17	23.9
50 – <100	28	39.4
>=100	9	12.7
Farm Enterprises: -		
Dairy	7	9.9
Equestrian Enterprises	1	1.4
Beef	4	5.6
Sheep	1	1.4
Tillage	6	8.45
Mixed Livestock*	9	12.7
Mixed Tillage & Livestock**	29	40.8
Forestry	1	1.4
Leased	9	12.7
Other***	4	5.6
Level of Overall Impact on Farm		
Not Significant	2	2.8
Minor	13	18.3
Moderate	33	46.5
Major	23	32.4
Severe	0	0
Farm Enterprises with Major Impact (23)		
Dairy Farms	2	2.8
Tillage Farms	2	2.8
Beef	1	1.4
Mixed Tillage & Livestock	9	12.8
Mixed Livestock	5	7.1
Leased	2	2.8
Other	2	2.8
Level of Land Severance: - (75 land parcels)		
Not Significant	32	42.4
Minor	1	1.3
Moderate	20	26
Major	21	28
Severe	1	1.3
Facilities to be acquired [(ii)]	**2**	**2.8**
Access required to severed area [(i) (ii)]	**48**	**64**
Access points to be restored	**10**	**13.3**

* Mixed Livestock includes any combination of cows, cattle, horses or sheep.

** Mixed Tillage & Livestock includes any combination of cows, cattle, horses or sheep and tillage enterprises. It consists of one farm primarily involved in dairying, fifteen primarily involved in beef, two primarily involved in sheep, three primarily involved in equine and seven primarily involved in tillage.

*** Consists of four farms, one involved in forestry, tillage and equine, one involved in forestry and leasing, one involves in dairying and orchards and one in mixed livestock, tillage and forestry.

(i) Access is deemed to be required where it has to be provided to a severed portion of land or a parcel where the access along the entire road frontage is removed. It does not refer to cases where the access point or gates have to be replaced or restored on a land parcel.

(ii) In the case of access required or facilities required, the figure refers to the number of land parcels in each case. It does not relate to the number of farm holdings. In some cases access may be required on more than one land parcel on a holding.

Overall Impact on Individual Farm Holdings

There are no farm holdings along the M11/N11 Mainline on which the agricultural impact would be severe (see Table 6.12). There are 23 farm holdings that will experience a major level of impact, which represents 32% of all farm holdings along the M11/N11 Mainline. Without mitigation measures, these farm enterprises cannot be continued without considerable management or operational changes due to the combination of the landtake, level of severance and the effects on farm buildings and facilities. Often where the potential impact is major an enterprise change may be necessitated e.g. from dairy to drystock.

There are 33 farm holdings, which will experience a moderate impact, representing 47% of all farm holdings along the M11 / N11 Mainline. There are 13 farm holdings that will experience a minor impact representing 18% of farm holdings. There are 2 farm holdings that will not experience a significant level of impact which represents 3% of the overall farm holdings along the M11 / N11 Mainline.

Three farm holdings which were involved in intensive equine enterprises were also assessed by an equine specialist. The specialist concluded that one farm will have a major impact, one farm will have a moderate impact and the third farm will have a minor impact on the equine activities of the farm holdings.

Table 1 in Appendix 6.2 presents details of the individual farm holding assessments and the potential impact of the M11 / N11 Mainline on each farm holding.

Impact on Individual Farm Parcels

Where the M11 / N11 Mainline has affected more than one land parcel on a farm holding the level of land severance on each land parcel is assessed separately. There are 75 individual land parcels directly affected along the M11 / N11 Mainline.

Without mitigation measures being taken into account the levels of land severance on land parcels along the M11/N11 Mainline will be as follows:-

- Severe land severance on 1 land parcel;
- Major land severance on 21 land parcels;
- Moderate land severance on 20 land parcels;
- Minor land severance on one land parcel; and
- Not significant land severance on 32 land parcels.

There will be a loss of farm buildings and animal handling facilities on two farms along the M11 / N11 Mainline.

Table 1 in Appendix 6.2 presents details of the individual farm holding assessments and the anticipated impact of the M11 / N11 Mainline on each farm holding.

6.5.2.2 N80 Link Road

There are 9 farm holdings directly affected by the N80 Link Road. Table 6.13 below presents summary details of the farm assessments and the potential impact of the N80 Link Road.

Table 6.13 Summary of Individual Farm Assessments on N80 Link Road (9 Farms)

Category	No. of Farms	% of Farms
Farm Size (ha): -		
<10	1	11.1
10 – <20	0	0
20 – <30	1	11.1
30 – <50	1	11.1
50 – <100	6	66.7
>=100	0	0
Farm Enterprises: -		
Dairy	1	11.1
Beef	0	0
Sheep	1	11.1
Tillage	3	33.3
Mixed Livestock*	1	11.1
Mixed Tillage & Livestock**	1	11.1
Leased	2	22.2
Other	0	0
Level of Overall Impact on Farm		
Not Significant	0	
Minor	1	11.1
Moderate	5	55.6
Major	3	33.3
Severe	0	0
Farm Enterprise with Major Impact (7 No.)		
Dairy Farms	1	11.1
Tillage Farms	0	0
Sheep	1	11.1
Mixed Tillage & Livestock	0	0
Mixed Livestock	1	11.1
Leased	0	0
Level of Land Severance: - (9 land parcels)		
Not Significant	1	11.1
Minor	0	0
Moderate	4	44.4
Major	4	44.4
Severe	0	0
Facilities to be acquired*** (ii)**	**0**	**0**
Access required to severed area (i) (ii)	**8**	**88.8**
Access points to be restored	**1**	**11.1**

* Mixed Livestock includes any combination of cows, cattle, horses or sheep enterprises. It consists of one farm involved in beef and sheep/

** Mixed Tillage & Livestock includes any combination of cows, cattle, horses or sheep with tillage enterprises.

(i) Access is deemed to be required where it has to be provided to a severed portion of land or a parcel where the access along the entire road frontage is removed. It does not refer to cases where the access point or gates have to be replaced or restored on a land parcel.

(ii) In the case of access required or facilities required, the figure refers to the number of land parcels in each case. It does not relate to the number of farms. In some cases access may be required on more than one land parcel on a holding.

There are no affected farm buildings or animal handling facilities along the N80 Link Road.

Overall Impact on Individual Farms

There are no farm holdings along the N80 Link Road on which the agricultural impact will be severe. There are three farm holdings that will experience a major level of impact, which represents 33% of all farm holdings along the N80 Link Road.

Without mitigation measures, these farm enterprises cannot be continued without considerable management or operational changes due to the combination of the landtake, level of severance and the effects on farm buildings and facilities. Often where the impact is major an enterprise change may be necessitated e.g. from dairy to drystock.

There are five farm holdings that will experience a moderate level of impact representing 55% of all farm holdings on the N80 Link Road. There is one farm holding that will experience a minor impact representing 11.1% of overall farm holdings. .

Table 2 in Appendix 6.2 presents the details of the individual farm holding assessments and the anticipated impact of the N80 Link Road on each farm holding.

Impact on Individual Farm Parcels

Without mitigation measures being taken into account the levels of land severance on land parcels along the N80 Link Road would be as follows:-

- Severe land severance will not occur;
- Major land severance on four land parcels;
- Moderate land severance on four land parcels;
- Minor land severance will not occur on any land parcel;
- Not significant severance on one land parcel.

There would be no farm buildings or facilities removed as a result of the N80 Link Road.

Table 2 in Appendix 6.2 presents details of the individual farm holding assessments and the anticipated impact of the N80 Link Road on each farm holding.

6.5.2.3 N30 Mainline

There are 29 farm holdings directly affected by the N30 Mainline. Table 6.14 below presents summary details of the farm assessments and the potential impact of the N30 Mainline.

Table 6.14 Summary of Individual Farm Assessments on N30 Mainline (29 Farms)

Category	No. of Farms	% of Farms
Farm Size (ha): -		
<10	5	17.2
10 – <20	2	6.9
20 – <30	4	13.8
30 – <50	11	37.9
50 – <100	5	17.2
>=100	2	6.9
Farm Enterprises: -		
Dairy	1	3.4
Equestrian Enterprises	1	3.4
Beef	0	0
Sheep	2	6.9
Tillage	5	17.2
Mixed Livestock*	2	6.9
Mixed Tillage & Livestock**	8	27.6
Leased	8	27.6
Other***	2	6.9
Level of Overall Impact on Farm		
Not Significant	2	6.9
Minor	9	31.0
Moderate	10	34.5
Major	8	27.6
Severe	0	0
Farm Enterprise with Major Impact (8 No.)		
Dairy Farms	1	3.4
Equestrian Enterprises	1	3.4
Tillage Farms	1	3.4
Sheep	0	0
Mixed Tillage & Livestock	3	10.3
Mixed Livestock	0	0
Leased	2	6.9
Level of Land Severance: - (33 land parcels)		
Not Significant	14	42.4
Minor	3	9.1
Moderate	6	18.2
Major	10	30.3
Severe	0	0
Facilities to be acquired*** (ii)**	**0**	**0**
Access required to severed area (i) (ii)	**17**	**51.5**
Access points to be restored	**0**	**0**

* Mixed Livestock includes any combination of cows, cattle, horses or sheep enterprises. It consists of two farms, one involved in dairy, beef and sheep and the other farm involved in beef, sheep and equine.
** Mixed Tillage & Livestock includes any combination of cows, cattle, horses or sheep with tillage enterprises.
*** Consists of two farms, one involved in a mixture of leased and forestry and one involved grass and forestry
(i) Access is deemed to be required where it has to be provided to a severed portion of land or a parcel where the access along the entire road frontage is removed. It does not refer to cases where the access point or gates have to be replaced or restored on a land parcel.
(ii) In the case of access required or facilities required, the figure refers to the number of land parcels in each case. It does not relate to the number of farms. In some cases access may be required on more than one land parcel on a holding.

Overall Impact on Individual Farms

There are no farm holdings along the N30 Mainline on which the agricultural impact will be severe (see Table 6.14). There are eight farm holdings that will experience a major level of impact, which represents 27.6% of all farm holdings along the N30 Mainline.

Without mitigation measures, these farm enterprises cannot be continued without considerable management or operational changes due to the combination of the landtake, level of severance and the effects on farm buildings and facilities. Often where the impact is major an enterprise change may be necessitated e.g. from dairy to drystock.

There are ten farm holdings, which will experience a moderate level of impact representing 34.5% of all farm holdings along the N30 Mainline. There are nine farm holdings that will experience a minor impact representing 31% of overall farm holdings. There are two farm holdings that will not experience a significant level of impact, which represents 6.9% of the overall farm holdings along the N30 Mainline.

Table 3 in Appendix 6.2 presents details of the individual farm holding assessments and the anticipated impact of the N30 Mainline on each farm holding.

Impact on Individual Farm Parcels

Where the N30 Mainline has affected more than one land parcel on a farm holding the level of land severance on each land parcel is assessed separately. There are 33 individual land parcels directly affected along the N30 Mainline.

Without mitigation measures being taken into account the levels of land severance on land parcels along the N30 Mainline would be as follows:-

- Severe land severance will not occur;
- Major land severance on 10 land parcels or 30.3% of all affected land parcels;
- Moderate land severance on six land parcels or 18.2% of all parcels;

- Minor land severance on three land parcels or 9.1% of all land parcels;
- Not significant severance on 14 land parcels or 42.4% of the affected land parcels.

There will be no farm buildings or facilities removed as a result of the N30 Mainline.

Table 3 in Appendix 6.2 presents details of the individual farm holding assessments and the anticipated impact of the N30 Mainline on each farm holding.

6.5.3 Cumulative Impacts

Where the Proposed Scheme has affected a farm holding previously impacted by an adjoining road scheme the cumulative impact of the development on the overall farm holding has been assessed. There are six farm holdings assessed in this chapter which have previously been affected by an adjoining road scheme.

6.5.4 "Do-Nothing" Scenario

In the Do-Nothing Scenario there would be no impact on agriculture.

6.6 MITIGATION MEASURES

Monetary compensatory measures for the loss of land, buildings, severance, disturbance and other injurious affection will be agreed as part of the land acquisition procedures with land owners affected by the land take for the Proposed Scheme. Such compensation measures do not from part of the EIS and are therefore not considered further in this assessment.

6.6.1 Construction Phase

The principal impacts on agricultural activity during the construction phase of the Proposed Scheme will be:

- Construction noise;
- Dust;
- Restricted access to severed land parcels;
- Disturbance of drainage systems; and
- Disturbance of services.

The nature of each specific impact is discussed below.

6.6.1.1 Construction Noise

Construction traffic and operations, such as transport lorries and other ancillary vehicles and earth moving machinery, will generate additional noise emissions in the immediate vicinity of the Proposed Scheme during construction. Noise can be of significance for farm animals (i.e. when

noise becomes excessively loud). In general, animals become accustomed to regular noises and sounds. Intermittent noises can cause fright and distress. Blasting activity, which is sometimes necessary during construction, can be of particular significance. Intermittent noises close to farm buildings, particularly milking parlours, can be of significance.

Mitigation Measures

Precautions will be taken by the Contractor to control noise and vibration as discussed in Chapter 13 Noise and Vibration.

Good communication with farmers will facilitate the organisation of farm enterprises, so that vulnerable livestock are kept as far away as possible from the construction work during critical times. A contact person will be appointed by the successful Contractor during the construction phase to facilitate communications between affected landowners and the successful Contractor. The successful Contractor will put in place a Public Communications Strategy as part of the Environmental Operating Plan which will contain procedures to inform members of the community directly affected by the construction phase on schedules for any activity of a particularly disruptive nature which is likely to impinge on their property (e.g. blasting, demolition, dredging, pile driving) and any mitigating actions that are being taken (e.g. shielding, restriction on work hours, etc) to minimise such disruption.

6.6.1.2 Dust

Dust generated from the exposure of soil to the atmosphere during construction could cause annoyance or nuisance to the farmer and farm animals. The proliferation of dust during construction has a nuisance effect and, if produced in high volumes near milking parlours or on-farm bulk milk storage tanks, may constitute a risk as a source of contamination to the milk.

Livestock are at risk of eye irritations from high levels of wind blown dust particles. This stress may reduce productivity and increase management difficulties, especially on dairy and equestrian farm holdings.

Mitigation

Refer to Chapter 12 Air Quality regarding measures to control and reduce dust generation.

The Contractor put in place a Public Communications Strategy as part of the Environmental Operating Plan which will contain procedures to inform members of the community directly affected by the construction phase on schedules for any activity of a particularly disruptive nature so that sensitive or valuable livestock may be kept as far away as possible from the construction work during critical times.

6.6.1.3 Restricted Access to Severed Land Parcels

Farmers will require access to severed land parcels during the construction period. It is to be expected that there will be increased difficulties in maintaining such access during the construction phase due to the need to allow machinery and equipment continual movement along the construction corridor. This may conflict with a farmer's requirements to move livestock from one part of a farm holding to another in order to utilise all available grazing areas.

Mitigation

The Public Communications Strategy which will form part of the Environmental Operating Plan will ensure that difficulties in relation to access to land parcels can be minimised.

The Contractor will maintain reasonable access to severed land parcels at all times during the construction of the Proposed Scheme until such time as the permanent access arrangements are in place and operational, unless agreed otherwise in writing by the landowner and / or occupier. Temporary fencing may be erected to facilitate the use of affected areas during construction.

6.6.1.4 Disturbance of Drainage Systems

It is to be expected that field drainage systems currently *in situ* will be disturbed during construction. The operation of these systems will be restored as part of the permanent works, but there may be impaired drainage in the period of time between initial disturbance and final reinstatement of such drainage works.

Mitigation

The Contractor will maintain reasonable continuity of all existing ground and surface water drainage systems, such as lands drains, ditches and private outfalls, affected by the Proposed Scheme until the permanent drainage systems for the Proposed Scheme are installed and functioning satisfactorily.

6.6.1.5 Disturbance of Services

Piped watering and power systems on some farms may be severed. Access to either piped water or drinking points on watercourses may be affected. Electric fencing required to help stock-proof non-roadside boundaries may also be affected.

Mitigation

The Contractor will maintain reasonable continuity of all existing services (e.g. electricity supply, mains water supply) affected by the Proposed Scheme until the permanent supply systems for the Proposed Scheme are installed and functioning satisfactorily.

6.6.2 Operation Phase

The preliminary design for the Proposed Scheme as described in this EIS has considered the landowner consultations in relation to provision of local access and access to severed areas. The proposed mitigation measures relating to severance identified in Appendix 6.2 have been included in the Proposed Scheme.

The extent and complexity of the requirement for access provisions vary with each farm holding depending on the nature of the impact and the type of enterprise being carried out. In some cases the provision of simple gateways will suffice, while in other cases new access roads and / or new access structures will be required to provide access to the severed areas.

As regards structures provided for Access Roads, or provided to minimise severance of agricultural lands, those that are to facilitate the passage of agricultural vehicles will generally have a minimum headroom clearance of 4.5m and a minimum width of 4.0m and those that are to facilitate the passage of livestock, but not agricultural vehicles, will generally have a minimum headroom clearance of 3.0m and a minimum width of 3.0m.

The structures included within the preliminary design, as described in this EIS, and assessed in this EIS are described in Table 3.5.1 of Chapter 3 - Description of the Proposed Scheme.

Proposed Access Roads will be required to minimise severance of agricultural lands and to provide access to balancing ponds and/or bypass interceptors for maintenance purposes. The major Access Roads included within the preliminary design, as described in this EIS, are described in Table 3.7.1 of Chapter 3 - Description of the Proposed Scheme.

Where the proposed national routes have affected more than one land parcel on a farm holding the land parcels are separately assessed and parcel specific mitigation relating to access is recommended.

6.6.2.1 M11 / N11 Mainline

From Table 1 in Appendix 6.2, a total of 48 land parcels out of the 75 assessed land parcels require new access provisions to severed areas of land. On 10 land parcels, existing access point(s) have been affected and will need to be reinstated at a suitable location.

Table 1 in Appendix 6.2 summarises the level and nature of the impact the M11 / N11 Mainline will have on each individual farm holding and proposed mitigation measures relating to severance.

6.6.2.2 N80 Link Road

From Table 2, in Appendix 6.2 a total of 8 land parcels, out of the 9 assessed land parcels require new access provisions to severed areas of land. In addition one land parcel the existing access point has been affected and will need to be reinstated at a suitable location.

Table 2 in Appendix 6.2 summarises the level and nature of the impact the N80 Link Road will have on each individual farm holding and proposed mitigation measures relating to severance

6.6.2.3 N30 Mainline

From Table 3, in Appendix 6.2 a total of 17 land parcels, out of the 33 assessed land parcels require new access provisions to severed and affected areas of land.

Table 3 in Appendix 6.2 summarises the level and nature of the impact the N30 Mainline will have on each individual farm holding and proposed mitigation measures relating to severance.

6.7 RESIDUAL IMPACTS OF THE PROPOSED SCHEME

6.7.1 M11 / N11 Mainline

Following recommended mitigation works relating to severance, a residual impact of severe will not occur on any farm on the M11 / N11 Mainline. There will be a major residual impact on twelve farms on the scheme. The level of farms with a major impact has reduced from 32% to 16% of total farms on the M11 / N11 Mainline.

Forty-two farms will have a moderate residual impact resulting in an increase on the M11 / N11 Mainline from 47% to 60% of total farms with this level of impact.

Fourteen farms will receive a minor residual impact resulting in a slight increase on the M11 / N11 Mainline from 18% to 21% of total farms with this level of impact.

Two farms will not have a significant degree of impact on the M11 / N11 Mainline. There is no change in the level of farms with without a significant impact on the M11 / N11 Mainline following recommended mitigation measures.

Table 6.15 shows the details of the individual farm holding assessments and the overall impact residual impact of the M11 / N11 Mainline on each farm holding following recommended mitigation works being carried out.

Table 6.15 Residual Impacts on the Individual Farms of the M11/N11 Mainline

Category	Residual Impact No. Of Farms	Residual Impact % of Farms
Impact on Farm (Of 71)		
Not Significant	2	2.8
Minor	15	21.1
Moderate	42	59.2
Major	12	16.9
Severe	0	0
Of those with Severe/Major Impact:		
Dairy Farms	2	2.8
Equine Enterprises	0	0
Mixed Tillage & Livestock	5	7.1
Mixed Livestock	3	4.3
Leased	1	1.4
Other	1	1.4

6.7.2 N80 Link Road

Following recommended mitigation works relating to severance, a residual impact of severe will not occur on any farm on the N80 Link Road. There will be a major residual impact on one farm on the scheme. The level of farms with a major impact has reduced from approximately 33.3% to 11% of total farms on the N80 Link Road.

Seven farms will have a moderate residual impact resulting in an increase on the N80 Link Road from approximately 56% to 78% of total farms with this level of impact.

One farm will receive a minor residual impact resulting in no change in the level of farms with a minor impact on the N80 Link Road following recommended mitigation measures.

Table 6.16 shows the details of the individual farm holding assessments and a comparison of the overall impact with the anticipated residual impact of the N80 Link Road on each farm holding following recommended mitigation works being carried out.

Table 6.16 Residual Impacts on the Individual Farms on the N80 Link Road

Category	Residual Impact No. Of Farms	Residual Impact % of Farms
Impact on Farm (of 9)		
Not Significant	0	0
Minor	1	11.1
Moderate	7	77.8
Major	1	11.1
Severe	0	0
Of those with Severe/Major Impact:		
Dairy Farms	0	0
Equine Enterprises	0	0

Table 6.16 Residual Impacts on the Individual Farms on the N80 Link Road (Cont.)

Category	Category	Category
Mixed Tillage & Livestock	0	0
Mixed Livestock	0	0
Leased	0	0
Sheep	1	11.1

6.7.3 N30 Mainline

Following recommended mitigation works relating to severance, a residual impact of severe will not occur on any farm on the N30 Mainline. There will be a major residual impact on five farms on the scheme. The level of farms with a major impact has reduced from approximately 28% to 17% of total farms on the N30 Mainline.

Thirteen farms will have a moderate residual impact resulting in an increase on the N30 Mainline from approximately 35% to 45% of total farms with this level of impact.

Nine farms will receive a minor residual impact resulting in no change in the level of farms with a minor impact on the N30 Mainline following recommended mitigation measures.

Two farms will not have a significant degree of impact on the N30 Mainline. There is no change in the level of farms without a significant impact on the N30 Mainline following recommended mitigation measures.

Table 6.17 shows the details of the individual farm holding assessments and a comparison of the overall impact with the anticipated residual impact of the N30 Mainline on each farm holding following recommended mitigation works being carried out.

Table 6.17 Residual Impacts on the Individual Farms on the N30 Mainline

Category	Residual Impact No. Of Farms	Residual Impact % of Farms
Impact on Farm (of 29)		
Not Significant	2	6.9
Minor	9	31.0
Moderate	13	44.8
Major	5	17.2
Severe	0	0
Of those with Severe/Major Impact:		
Dairy Farms	1	3.4
Equestrian Enterprises	1	3.4
Tillage	1	3.4
Beef	0	0
Mixed Tillage & Livestock	2	6.9
Mixed Livestock	0	0

6.8 MONITORING

There is no monitoring required with respect to agricultural impacts.

7 MATERIAL ASSETS IMPACT ASSESSMENT – PROPERTY

7.1 INTRODUCTION

Material assets are generally considered to be the physical resources in the environment, which may be of human or natural origin. This chapter details the impact of the proposed M11 Gorey to Enniscorthy Scheme on non–agricultural properties, referred to hereafter within this chapter as properties. Chapter 8 of this EIS addresses impacts on material assets of an infrastructural nature, such as utilities.

The Proposed Scheme will directly impact on 46 properties, of which 23 properties are located along the M11/N11 Mainline, 1 property along the N80 Link Road and 22 properties along the N30 Mainline. This assessment was undertaken between May 2008 and April 2009. All of the properties directly impacted by the Proposed Scheme were examined and the impacts assessed.

The impact of the Proposed Scheme on non-agricultural properties is addressed under the following headings:

- Residential property;
- Community property; and
- Developments with planning permission which have yet to commence construction.

The study is limited to the assessment of direct impacts on properties (i.e. where there is landtake on a property). Indirect impacts, such as visual, noise and vibration, are dealt with in other sections of this EIS.

The impact of the Proposed Scheme on agricultural properties is dealt with in Chapter 6 of this EIS.

7.2 METHODOLOGY

The assessment is based on a desk study and a roadside survey of the Proposed Scheme. The desk study included an inspection of land registry records, examination of aerial photography and records at Wexford County Council Planning Department.

The assessment of the level of significance of effects of the Proposed Scheme on farms is based on the criteria set out in Table 7.1.

Table 7.1 Criteria for Assessing the Significance of Impact on Properties

EPA Definition of Impacts	Significance Level/Degree of Impact	Definition
Neutral, Imperceptible or Slight Impact	Not Significant	Where a property is impacted upon resulting in minimal change to the environment of the property. This includes properties which are currently occupied by a public right-of-way. It also includes lands in the ownership of the adjacent property which are occupied by existing roads.
Significant Impact:	Minor	Minor impact occurs where part of a property is acquired, resulting in little change to the environment of the property and may cause some inconvenience to the property.
	Moderate	Moderate impact occurs where part of a property is acquired, resulting in a change to the environment of the property and may cause some inconvenience to the property.
	Major	Major impact occurs where a property is acquired, which may result in the demolition of the property.
Profound or Significant Impact:	Severe	Severe impact occurs where a property of national or regional importance is acquired and or / demolished.

The impact of the Proposed Scheme on properties was determined based on the following:

- Acquisition of buildings / facilities
- Size of holding;
- Level of landtake;
- Proximity of the landtake to the residence;
- Loss of access;
- Level of Severance.

7.2.1 Standards and Guidelines

There are currently no standards available for the assessment of material assets. However, *Part 6: Land Use of the DMRB*[1] provides guidance in this regard. The document addresses issues such as private property loss, loss of land used by the community and the assessment thereof, effects on development land, the effects on agricultural land and how to assess it.

[1] The Highways Agency, The Scottish Office Industry Department, The Welsh Office, The Department of the Environment for Northern Ireland, (2000) UK Design Manual for Roads and Bridges (DMRB), Volume 11, Environmental Assessment. The Stationary Office, Norwich

7.2.2 Assumptions and Technical Limitations

This study does not assess the impact of the Proposed Scheme on future development that may occur along the M11/N11 Mainline, N80 Link Road or N30 Mainline unless planning permission had been granted prior to the publication of the preferred routes for the Proposed Scheme.

7.2.3 Data Deficiencies / Difficulties with Producing the Impact Assessment

There were no major difficulties or data deficiencies encountered in the production of this assessment.

7.3 RECEIVING ENVIRONMENT

The existing land use environment along the Proposed Scheme can predominantly be described as agricultural, and this is addressed in Chapter 6 (Agricultural Impact Assessment) of this EIS. In general terms, agriculture is the dominant land use in the area with tillage and livestock farms predominating and a lower number of dairy and equestrian farms.

The study area is well represented by a range of new residential developments. In common with other counties “ribbon” development follows the existing road network.

On the M11/N11 Mainline a number of small cluster developments are present in the townlands of Ballyeden and The Harrow. Ribbon development is common along the entire route particularly in the townlands of Crane and Drumgold.

The N80 Link road is in close proximity the town of Enniscorthy. Housing developments are located in close proximity to the route particularly at the northern section in the townland of Ballynahallin

Developments along the N30 Mainline are characterised by one-off housing and ribbon development such as along the Kiltealy road in the townlands of Milehouse and Askunshin.

7.4 CHARACTERISTICS OF THE PROPOSED SCHEME

A detailed description of the Proposed Scheme is provided in Chapter 3 of this EIS and detailed plans of the scheme are provided in in Volume 4 of this EIS. The Proposed Scheme comprises the construction of three new sections of road, which will form part of the national road network, namely:-

- M11/N11 Mainline;
- N80 Link Road; and
- N30 Mainline.

The Proposed Scheme will traverse mainly agricultural land. . The Proposed Scheme will directly impact on 46 properties.

7.5 POTENTIAL IMPACTS OF THE PROPOSED SCHEME

The Proposed Scheme has been developed through the planning phases to avoid properties, as far as possible in balance with other environmental, engineering and economic considerations. In certain instances, landtake from properties has been unavoidable mainly to accommodate junctions and tie-ins to the existing road network. It is these instances, where it is proposed to acquire land from property owners, these are assessed in this chapter of the EIS.

7.5.1 M11/N11 Mainline

No residential properties will be acquired to accommodate the M11 / N11 Mainline with the exception of one property which is unfit for human habitation at reasonable cost and one partially built house. Both of these properties will be acquired and demolished, are listed in Table 7. 3 and are shown in Figure 7.1 in Volume 4 of this EIS.

The M11/N11 Mainline element of the Proposed Scheme will require landtake from 23 residential properties. The landtake on some properties will also consist of lands currently occupied by public road. These are listed in Tables 7.2 and shown in Figure 7,1 in Volume 4 of this EIS.

7.5.2 N80 Link Road

No residential properties will be acquired to accommodate the N80 link road. The Proposed Scheme will require landtake from one commercial property and the landtake consists of land currently occupied by public road. This property is listed in Table 7.4 and shown in Figure 7.1 in Volume 4 of this EIS.

7.5.3 N30 Mainline

It is proposed that two residential properties will be acquired to accommodate the N30 Mainline. One of these properties comprises a residential property with commercial business attached to it. The commercial property which has separate access from the residential property will also be acquired and demolished. These properties are listed in Table 7.5 and shown in Figure 7.1 in Volume 4 of this EIS.

The N30 Mainline element of the Proposed Scheme will require landtake from 21 residential properties. The land take on some of the properties will also consist of lands currently occupied by public road. These are listed in Tables 7.6 and 7.7 and are shown in Figure 7.1 in Volume 4 of this EIS.

7.5.4 Cumulative Impacts

Where the Proposed Scheme impacts upon a property previously affected by an adjoining scheme, the cumulative impact is the basis of assessment in this chapter. There are no properties which have been impacted upon by an adjoining road scheme.

7.5.5 "Do-Nothing" Scenario

The "Do-Nothing" Scenario (where no construction takes place) will have no impact upon properties.

7.6 MITIGATION MEASURES

Monetary compensatory measures for the loss of land, buildings and other injurious affection will comprises part of the land acquisition procedures with property owners affected by the landtake for the Proposed Scheme. Such compensation measures do not from part of the EIS and are therefore not considered further in this assessment.

Where existing access is affected, this will be reinstated as described in Tables 7.2, 7.3, and 7.5. In some cases it may not be possible to reinstate the original access however an alternative access will be provided.

Where existing services (e.g. electricity supply, water supply) are permanently affected by the Proposed Scheme these will be restored or alternative supplies will be provided.

7.6.1 Construction Phase

The Contractor will maintain reasonable access to all properties at all times during the construction of the Proposed Scheme. This may require temporary alternative access arrangements at some locations.

Information will be made available to affected landowners on the construction programme and its impact on properties.

The NRA code of practice *Guide to Process and Code of Practice for National Road Projects Planning and Acquisition of Property for National Roads* will be adhered to with respect to all land potentially impacted by the construction of the scheme. These measures include the following:

- The local authority will appoint a Project Liaison Officer who will liaise and engage with the affected parties or their representatives on matter relating to the road scheme. The Project Liaison Officer will act as first point of contact should individual encounter difficulties.

- Before any construction is begun in the vicinity of an existing dwelling house / building in use, which may be impacted by the Proposed Scheme, a competent independent expert,

selected by the property and appointed with the consent of the local authority, will prepare a written photographic record of their condition.

- Where excavations interfere with water supplies, sewers, or septic tanks, these services will be restored as a matter of urgency by the local authority or those acting on its behalf, provided the property owner facilitates all necessary access to enable this to be done

- Steps will be undertaken to minimise dust and mud from construction activities. Measures will include, as appropriate, the watering of the road and containment of material with dust or mud potential and are further outlined in Chapter 13 of this EIS.

7.7 RESIDUAL IMPACTS OF THE PROPOSED SCHEME

7.7.1 Operation Phase

Residual impacts cannot be assessed at this stage as mitigation measures in the form of compensation are not part of the EIS.

7.8 MONITORING

Specific monitoring measures are outlined in Chapters 5 to 16 of this EIS. In additional to these, the Contractor will engage an appropriately qualified individual to ensure the production and implementation of an Environmental Operating Plan for the Proposed Scheme which will include all of the recommendations set out in the Schedule of Environmental Commitments in this EIS and will require regular monitoring of construction works to ensure environmental impacts are minimised.

Table 7.2 Properties Affected by the Permanent Acquisition of Part of the Holding (M11/N11 Mainline)

CPO No.	Location	Description of Property	Nature of Impact		Level of Impact	New Access Arrangements
				Description of landtake		
1	Ballyeden	Residential		Portion of Public Road	Not Significant	Replace boundary if necessary
2	Knockrobin	Residential		Portion of Public Road	Not significant	Replace boundary if necessary
3	Knockrobin	Residential		Portion of Public Road	Not Significant	Replace boundary if necessary
4	Corbally	Residential		Portion of Public Road	Not Significant	Replace boundary if necessary
5	Corbally	Residential		Portion of Public Road	Not Significant	Replace boundary if necessary
6	Corbally	Residential		Portion of Public Road	Not Significant	Replace boundary if necessary
7	Tomnafunshoge	Residential		Portion of driveway	Moderate	Restore driveway
8	Tomnafunshoge	Site		Portion of lands and Public road	Minor	Replace boundary if necessary
9	Tomnafunshoge	Residential		Portion of Public Road	Not Significant	Replace entrance and boundary if necessary
10	Tomnafunshoge	Residential		Portion of Public Road	Not Significant	Replace boundary if necessary
11	Tomnafunshoge	Residential		Portion of Public Road & Boundary	Minor	Replace boundary if necessary
12	Tomnafunshoge	Residential		Portion of Public Road	Not Significant	Replace boundary if necessary
14	Drumgold	Residential		Portion of Public Road	Not Significant	Replace boundary if necessary
15	Drumgold	Residential		Portion of Public Road	Not Significant	Replace boundary if necessary
16	Drumgold	Residential		Portion of Public Road	Not Significant	Replace boundary if necessary
17	Drumgold	Residential		Portion of Public Road	Not Significant	Replace boundary if necessary

Table 7.2 Properties Affected by the Permanent Acquisition of Part of the Holding (M11/N11 Mainline) (Cont.)

CPO No.	Location	Description of Property	Nature of Impact		Level of Impact	New Access Arrangements
				Description of landtake		
18	Drumgold	Residential		Portion of Public Road	Not Significant	Replace boundary if necessary
19	Drumgold	Residential		Portion of lands and Public Roads	Minor	Replace boundary and Restore Access
20	Knockrathkyle	Residential		Portion of Garden & Public road, Access point and Boundary	Moderate	Replace boundary and Restore Access
21	Scurlocksbush	Residential		Portion of Public Road	Not Significant	Replace boundary if necessary
22	Scurlocksbush	Residential		Portion of lands and Public Roads	Minor	Replace boundary and Restore Access
23	Scurlocksbush	Residential		Portion of lands and Public Roads	Minor	Replace boundary and Restore Access

Table 7.3 Properties to be Acquired (M11/N11 Mainline)

CPO No.	Location	Description of Property	Nature of Impact		Level of Impact
				Description of landtake	
24	Tomnafunshoge	Partially Built Residence		Partially built residence and a portion of the site	Major

Table 7.4 Commercial Properties Affected by the Permanent Acquisition of Part of the Holding (N80 Link Road)

CPO No.	Location	Description of Property	Nature of Impact		Level of Impact	New Access Arrangements
				Description of landtake		
25	Clavass	Car Garage		Portion of Public Road and boundary	Minor	Reinstate boundary and access if affected

Table 7.5 Properties to be Acquired (N30 Mainline)

CPO No.	Location	Description of Property	Nature of Impact		Level of Impact
				Description of landtake	
26	Bessmount	Residential		Entire Residential Site	Major
27	Bessmount	Residential		Entire Residential Site	Major

Table 7.6 Properties Affected by the Permanent Acquisition of Part of the Holding (N30 Mainline)

CPO No.	Location	Description of Property	Nature of Impact		Level of Impact	New Access Arrangements
				Description of landtake		
28	Ballyorril	Residential		Portion of Public Road	Not Significant	Replace boundary if necessary
29	Milehouse	Garden		Portion of Public Road, Access point	Not Significant	Replace and boundary boundary if necessary
30	Milehouse	Residential		Portion of Garden and Public Road, Access point and Boundary	Moderate	Replace boundary if necessary
31	Milehouse	Residential		Portion of Public Road	Moderate	Access to be Reinstated
32	Milehouse	Residential		Portion of Garden and Public Road, and Boundary	Moderate	Replace boundary
33	Milehouse	Residential		Portion of Public Road	Not Significant	Replace boundary if necessary
34	Milehouse	Garden		Portion of Public Road	Not Significant	Replace boundary if necessary
35	Milehouse	Residential		Portion of Public Road	Not Significant	Replace boundary if necessary
36	Milehouse	Residential		Portion of Public Road	Not Significant	Replace boundary if necessary
37	Milehouse	Residential		Portion of Public Road	Not Significant	Replace boundary if necessary
38	Milehouse	Residential		Portion of Public Road	Not Significant	Replace boundary if necessary
39	Askunshin	Residential		Portion of Garden and Public Road	Moderate	Replace boundary if necessary
40	Bessmount	Residential		Portion of Public Road,	Not Significant	Replace entrance and boundary if necessary

Table 7.6 Properties Affected by the Permanent Acquisition of Part of the Holding (N30 Mainline) (Cont.)

CPO No.	Location	Description of Property	Nature of Impact		Level of Impact	New Access Arrangements
				Description of landtake		
41	Bessmount	Residential		Portion Public Road	Not Significant	Replace boundary if necessary
42	Templescoby	Residential		Portion of Public Road	Not Significant	Replace boundary if necessary
43	Dunsinane	Residential		Portion of Public Road	Not Significant	Replace boundary if necessary
44	Dunsinane	Residential		Portion of Public Road	Not Significant	Replace boundary if necessary
45	Dunsinane	Residential		Portion of Public Road	Not Significant	Replace entrance and boundary if necessary
46	Dunsinane	Residential		Portion of Public Road	Not Significant	Replace entrance and boundary if necessary

Table 7.7 Commercial Properties Affected by the Permanent Acquisition of Part of the Holding (N30 Mainline)

CPO No.	Location	Description of Property	Nature of Impact		Level of Impact
				Description of landtake	
47	Bessmount	Auto Repair Workshop		Portion of land	Major

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8.0 MATERIAL ASSETS IMPACT ASSESSMENT – INFRASTRUCTURE

8.1 INTRODUCTION

This chapter describes the likely effect of the proposed M11 Gorey to Enniscorthy Scheme on the existing railway and major utilities crossed by the Proposed Scheme. The likely effects on the existing road network crossed by the Proposed Scheme are generally described in Chapter 3 of this EIS.

8.2 METHODOLOGY

The existing road and rail networks in the study area were primarily identified from the following mapping and photography:-

(i) Ordnance Survey Ireland (OSi) discovery series mapping at a 1:50,000 scale;

(ii) Ordnance Survey Ireland (OSi) vector mapping at a 1:2,500 scale, the majority dated July 2005 with some areas dated September 2004;

(iii) Ortho rectified digital aerial photography dated September 2004, July 2005, October 2007 or July 2008.

A drive over survey was undertaken along the roads directly impacted by the Proposed Scheme. The details of major utilities in the study area were principally taken from information supplied by the utility companies.

8.2.1 RELEVANT GUIDELINES

The assessment process was undertaken having due regard to the following current guidance documents:

(i) 'Environmental Impact Assessment of National Road Schemes – A Practical Guide' (NRA, 2005);

(ii) 'Guidelines on the information to be contained in Environmental Impact Statements' (Environmental Protection Agency (EPA), 2002);

(iii) 'Advice Notes on Current Practice in the Preparation of Environmental Impact Statements' (EPA, 2003).

8.2.2 CONSULTATION

In undertaking this assessment liaison was undertaken, and where relevant documentation and information was obtained, from the following bodies:

(i) Iarnród Éireann;

(ii) Bord Gáis (Distribution and Transmission);

(iii) Electricity Supply Board (ESB) - Comprising ESBi, Eirgrid and Networks, which for ease of reference are collectively referred to as ESB within this EIS;

(iv) Eircom;

(v) Wexford County Council;

(vi) O_2;

(vii) UPC Ireland (Chorus and NTL);

(viii) Vodafone; and

(ix) Meteor.

8.2.3 DATA DEFICIENCIES / DIFFICULTIES WITH PRODUCING THE IMPACT ASSESSMENT

There were no major difficulties or data deficiencies encountered in the undertaking of this assessment.

8.3 RECEIVING ENVIRONMENT

The sections of the existing rail network and the major utilities that may be effected by the Proposed Scheme are described below (Figure 8.1 – Existing Major Utilities, in Volume 4 of this EIS).

8.3.1 RAILWAYS

The proposed national routes intersect the single track Dublin –Wexford railway in:

(i) Ballygullen, at approximate chainage M11:3,250m, and

(ii) Ballynabarny, at approximate chainage N80:2,800m.

8.3.2 ELECTRICITY

The proposed national route alignments cross the routes of several existing overhead electricity lines and also pass close to some others. The electricity lines that may be effected by the Proposed Scheme range from low voltage lines (less than 38kV) up to 110KV ESB Lines.

The M11 Mainline crosses the:

(i) Crane to Arklow 110kV ESB line route at two locations, at approximate chainages M11:12,000m in Carrigeen and M11:17,130m in Crane; and

(ii) Crane to Wexford 110kV ESB line route at three locations, at approximate chainages M11:17,400m in Crane, M11:19,345m in Ballydawmore and M11:20,890m in Tomnafunshoge.

The N80 Link Road crosses the Crane to Enniscorthy 38kV ESB line route at approximate chainage N80:1,550m in Ballynahallin.

There are a number of low voltage line routes crossing the proposed national routes. The numerous low voltage crossings are considered relatively simple to divert by a competent contractor.

8.3.3 WATERMAINS

The locations where the proposed national routes cross the watermains routes are listed in Table 8.3.1 below.

Table 8.3.1: Watermains Crossed by Proposed Scheme

Chainage (m)	Location of Watermain
M11/N11 Mainline	
26,600	Along Local Road segment L-6048-1
27,700	Along Local Road segment L-6052-01
N80 Link Road	
0	Through Clavass Junction and along the Old Dublin Road
N30 Mainline	
1,360	Along Local Road segment L-2015- 2

Note: All chainages are approximate.

8.3.4 SEWAGE / FOUL PIPES

There is one sewage / foul pipe route crossed by the Proposed Scheme, located to the west of Enniscorthy and crossed by the eastern arm of the Milehouse Roundabout. The sewage / foul pipe route passes along the existing R702 heading towards Enniscorthy.

8.3.5 TELECOMMUNICATIONS

The proposed national routes cross Eircom line routes at several locations. There are 3 No. crossings involving fibre optic cables, which are located on the:

(i) M11 Mainline at approximate chainage M11:28,050m;

(ii) N80 Link Road at approximate chainage N80:2,840 m; and

(iii) N30 Mainline at approximate chainage N30:6,300m.

All the Eircom line route crossings are listed in Table 8.3.2 below.

Table 8.3.2: Eircom Lines Crossed by Proposed Scheme.

Chainage (m)	Location of Eircom Line
M11/N11 Mainline	
3,100	Along Local Road segment L-1027-2 (Overhead)
3,280	Adjacent to Dublin – Wexford Railway (Overhead)
4,880	Along Local Road segment L-5092-1 (Overhead)
7,600	Along Local Road segment L-5093-1 (Overhead)
8,370	Along Local Road segment L-5096-1 (Overhead)
11,490	Along Local Road segment L-1023-3 (Overhead)
14,460	Along Local Road segment L-2011-2 (Overhead)
17,370	Along Local Road segment L-2021-1 (Overhead)
19,700	Along Local Road segment L-2024-2 (Overhead)
21,225	Along R744 (Underground)
22,300	Along Local Road segment L-6055-1 (Overhead)
24,890	Along Local Road segment L-2040-3 (Overhead)
25,030	Along Local Road segment L-6047-2 (Overhead)
28,020	Along Existing N11 (Underground - Fibre Optic)
N80 Link Road	
0	Through Clavass Junction and along the Old Dublin Road (Underground)
1,200	Along Private Road (Underground)
2,840	Along Local Road segment L-2020-2 (Underground - Fibre Optic)
N30 Main Line	
1,390	Along Local Road segment L-2015-2 (Overhead)
3,890	Along Local Road segment L-2012-3 (Overhead)
4,780	Along R702 (Overhead)
4,780	Crossing R702 / Opposite Local Road segment L-6129-2 (Overhead)
6,310	Along Local Road segment L-2030-6 (Underground - Fibre Optic)
6,310	Along Local Road segment L-2030-6 (Overhead)
6,950	Along Local Road segment L-6122-1 (Overhead)
7,825	Along part of Old N30 (Underground)
7,825	Along part of Old N30 (Overhead)

Note: All chainages are approximate.

A Vodafone telephone mast is located in the vicinity of the N11 Mainline in Scurlocksbush at the following approximate grid reference; E299488, N133620.

8.4 POTENTIAL IMPACTS OF THE PROPOSED SCHEME

The likely effects of the Proposed Scheme on the existing rail network and major utilities are described below.

8.4.1 RAILWAYS

The existing, single track Dublin-Wexford railway will be crossed by the M11 Mainline in Ballygullen at approximate chainage M11:3,250m and by the N80 Link Road in Ballynabarney at approximate chainage N80:2,800m. At both locations the Proposed Scheme will pass over the existing railway via proposed road over rail structures.

There will be associated construction and operational impacts at both of these locations. Both such impacts will be minimised via compliance with the requirements of Iarnród Éireann and the Railway Safety Commission, including:

(i) works proposed to be undertaken over the operational railway will only be carried out during possessions arranged with Iarnród Éireann;

(ii) construction works affecting the operational railway will only be undertaken under protection provided by Iarnród Éireann; and

(iii) plant and machinery used during construction and maintenance of the Proposed Scheme will not be allowed to swing over or foul railway property.

8.4.2 ELECTRICITY

As described earlier in this chapter of the EIS, the Proposed Scheme will cross 38kV and 110kV ESB overhead electricity line routes at several locations. The likely impact on these lines is not considered to be significant as diversions will be relatively straight forward for a competent contractor to undertake.

At the time the M11 Gorey to Enniscorthy Scheme was being progressed through part of the informal route selection phases in 2008, ESB were progressing the planning for the refurbishment of the Crane – Wexford 110KV ESB line. Following liaison with ESB, ESB altered their Crane – Wexford refurbishment design so as to take account of the preliminary design horizontal and vertical alignments for the Proposed Scheme, as described in this EIS. As such, the resultant impact of the Proposed Scheme on the proposed Crane – Wexford 110kV line refurbishment will be kept to a minimum.

The Contractor will be required to liaise with ESB to establish safe working practices for undertaking work in the vicinity of 110kV lines and to implement agreed procedures to minimise construction phase impacts on the all ESB plant in the region of the Proposed Scheme.

In general, the operational phase of the Proposed Scheme will not result in significant impacts on the ESB lines described above and the use of standard procedures will ensure that any impact is minor. However, the Contractor will be required to comply with ESB's requirements regarding safety and health during construction operations.

8.4.3 WATERMAINS

It is considered that the principle impact on the existing watermain routes crossed by the Proposed Scheme will be during the construction phase. Any potential impacts will be minimised during construction as standard operating procedures will be adhered to.

8.4.4 TELECOMMUNICATIONS

Several Eircom line routes will be crossed by the Proposed Scheme. It is considered that any likely impacts will occur during the construction phase and will be minor as standard operating procedures will be adhered to.

8.5 MITIGATION MEASURES

8.5.1 RAILWAYS

In compliance with the requirements of Iarnród Éireann, all proposed road over rail structures will allow for the future provision of a second track adjacent to the existing one.

Construction and operational impacts will be minimised via compliance with the requirements of Iarnród Éireann and the Railway Safety Commission.

8.5.2 MAJOR UTILITIES

It is considered that any likely impacts on the major utilities from the Proposed Scheme will occur during construction. Standard operating procedures will be applied during construction to minimise such impacts.

8.6 RESIDUAL IMPACTS OF THE PROPOSED SCHEME

There will be no residual impact on roads or utilities in the study area after the Proposed Scheme has been constructed.

8.7 MONITORING

None identified as being required.

9.0 ECOLOGICAL IMPACT ASSESSMENT

9.1 INTRODUCTION

This chapter of the EIS assesses the potential direct, indirect and cumulative ecological impacts of the Proposed Scheme within both the landtake extents of the Proposed Scheme as well as the general area.

9.2 METHODOLOGY

9.2.1 Relevant legislation and policy context

The assessment of the likely impacts of the proposed development on ecological resources has had regard to the following policy documents and legislation:

9.2.1.1 National and International Policy and Legislation

- Wildlife Act, 1976 and Wildlife Amendment Act, 2000.
- European Communities (EC) Habitats Directive 92/43/EEC.
- EC Birds Directive 79/409/EEC.
- European Communities (Natural Habitats) Regulations 1997 S.I. No. 94/1997, as amended (SI 233/1998 & SI 378/2005).
- Flora (Protection) Order, 1999.
- The Planning and Development Act, 2000
- National Biodiversity Plan, 2002.

9.2.2.1 Relevant Local Policies and Plans

- Wexford County Development Plan 2007-2013.
- Wexford County Development Plan 2007-2013. Strategic Environmental Assessment
- Enniscorthy Town and Environs Development Plan (2008-2014)
- Draft Ferns Local Area Plan 2009-2015

Wexford County Development Plan

The County Development plan outlines objectives needed to achieve the core strategy of the plan. Relevant objectives and policies (from the Natural Heritage Section) are listed below:

Objectives

- Objective NH1: Prohibit development which would damage or threaten the integrity of sites of international or national importance, designated for their habitat/wildlife or

geological/geomorphological importance including the proposed Natural Heritage Areas, candidate Special Areas of Conservation, Special Protection Areas and Statutory Nature Reserves.

Policies

- Policy NH1: The Council shall support the conservation of the abundance and diversity of habitats characteristic of County Wexford and their dependent plant and animal communities and will facilitate and cooperate with national agencies, local and community groups in their protection.
- Policy NH 1: The Council shall encourage the conservation and maintenance of features important to local landscapes including trees, hedgerows, stone walls, woodlands, ponds, streams and wetlands.
- Policy NH 2: The Council shall protect trees and woodlands of particular amenity and nature conservation value and make Tree Preservation Orders where appropriate.
- Policy NH 6: The Council shall resist development proposals which would result in the loss of trees which make a valuable contribution to the character of the landscape, a settlement or its setting.

Enniscorthy Town and Environs Development Plan (2008-2014)

Relevant policies (from the Natural Heritage Section) are listed below:

- Policy NH1: To ensure that the appropriate measures for conservation and enhancement of the natural and built environment are incorporated into all relevant plans and programmes of Enniscorthy Town Council & Wexford County Council.
- Policy NH2: To require potential developers to consult with relevant agencies as early as possible (i.e. prior to lodging a planning application) to ensure that heritage concerns are considered as early as possible in the planning processes and so that the final planning application can be properly informed.
- Policy NH7: To protect riparian zones by maintaining an adequate buffer zone (minimum 5-10m back form the riverbank) along all watercourses, with no infilling or removal of vegetation within these buffer zones.

Draft Ferns Local Area Plan 2009 - 2015

Relevant objectives and policies (from the Natural Heritage Section) are listed below:

- Policy NH1: protect the character, appearance and quality of the habitats and semi-natural features in Ferns Local Area Plan and the Special Area of Conservation* to the east of the Plan area from developments within the Plan area.

- Policy NH2: To protect undeveloped sections of rivers and streams by maintaining an adequate buffer zone (minimum 5-10m back from the riverbank) along all watercourses, with no infilling or removal of vegetation within these buffer zones.
- Policy NH3: To encourage potential developers to consult with relevant agencies as early as possible to ensure that natural heritage concerns are considered early in the planning process thus appropriately informing the final planning application.

*Slaney River cSAC

9.2.2 Relevant guidelines

The baseline ecology surveys, evaluation and impact assessment had regard to the following legislation and guidelines:

General

- *Guidelines for Ecological Impact Assessment* (IEEM, 2006).
- *Advice Notes on Current Practice (in preparation of Environmental Impact Statements)* (EPA, 2003).
- *Guidelines on the information to be contained in Environmental Impact Statements* (EPA, 2002).

Road schemes

- *Environmental Impact Assessment of National Road Schemes – A Practical Guide* (NRA, 2008).
- *Guidelines for assessment of Ecological Impacts of National Road Schemes* (NRA, 2006).
- *National Roads Project Management Guidelines* (NRA, 2000).
- *Design Manual for Roads and Bridges* (Highways Agency, 2001 and amendments).
- *NRA Environmental Assessment and Construction Guidelines* (NRA, 2006).

Survey effort focused on those areas and features of highest ecological sensitivity in accordance with current guidelines and best ecological practice. For instance, particular attention was given to designated conservation areas, habitats listed in Annex I of the European Commission (EC) Habitats Directive, and rare or protected species listed in Annex II and IV of the EC Habitats Directive, Annex I of the EC Birds Directive, the Wildlife Amendment Act (1976) as amended, and the Flora (Protection) Order, 1999.

In addition to rare and protected habitats, non-designated habitats of ecological interest were noted with an assessment of their value provided. Such habitats include for example non-protected woodland habitats and linear features such as hedgerows, treelines and watercourses.

These habitats are often important areas for wildlife and species providing ecological corridors, which are particularly important in areas of intensive agriculture.

9.2.3 Desk study

A desk study was carried out to collect any available information on the local ecological environment.

The following resources assisted in the production of this report:

- Ordnance Survey Ireland maps.
- Aerial photography.
- Data on species that are rare, protected or threatened located within the vicinity (up to 10km) of the proposed alignment, as held by the National Park and Wildlife Service (NPWS) Database and the NBN Gateway.
- Relevant ecological publications, reports and literature.

Previous data and information collected for the Constraints Study and the Route Selection phases of the Proposed Scheme assisted in determining the scope and priorities for the baseline surveys and results have been incorporated into this assessment.

9.2.4 Consultation

The following organisations were consulted. Any correspondence received has been included in Appendix 1.2 in Volume 3 of this EIS.

- Relevant local and regional staff, NPWS*.
- County Council Environment Section, Heritage officer and Biodiversity officer.
- Eastern Region Fisheries Board*.
- The Environmental Protection Agency (EPA) (database of water quality records for the area).
- An Taisce.
- Birdwatch Ireland.
- Bat Conservation Ireland.
- BSBI Vice County recorder (Co Wexford, VC H12).
- Irish Wildlife Trust.

*Two meetings were held with the NPWS and the ERFB on the 28th February 2008 and the 20th November 2008, one of which entailed a site visit to two proposed River Slaney crossing options. The minutes from these meetings are provided in Appendix 9.1 in Volume 3 of this EIS.

Comments and recommendations which arose during these meetings have been taken into consideration in the Preliminary Design of the Proposed Scheme and in this ecological impact assessment.

9.3 FIELD SURVEYS

Survey work spanned all four seasons and covered the optimal survey periods for flora and fauna species. However, as the Badger surveys on the northern section of the M11/ N11 Mainline and N80 Link Road were originally undertaken outside of the optimum period for Badger surveys, additional surveys were undertaken of these areas in April 2009.

9.3.1 Habitat and Flora Surveys

Flora and habitats within the study area were surveyed using methodology outlined in the *Draft Habitat Survey Guidelines* (Heritage Council, April 2005). All habitat types were identified and classified using the *Guide to Habitats in Ireland* (Fossitt, 2000). Within each habitat dominant and abundant plant species, indicator species and/or species of conservation interest were recorded.

Plant nomenclature follows that of the *Checklist of the Flora of Britain & Ireland* (BSBI, 2007), bryophyte nomenclature follows the *Checklist of British and Irish bryophytes* (BBS, 2009).and horticultural plant species nomenclature follows *The Horticultural Society's Encyclopaedia of Garden Plants* (Briskell, 1998).

9.3.2 Fauna Surveys

9.3.2.1 Badgers

Badger surveys were undertaken with regard to the following guidelines:

- *Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes* (National Roads Authority, 2006).
- *Design Manual for Roads and Bridges: Mitigating Against Effects on Badgers* (Highways Agency, 2001).

A corridor of approximately 500m (*i.e.* 250m either side of the centreline of the Proposed Scheme) was surveyed to locate setts and Badger activity. The status and activity of each sett was recorded along with Badger paths, prints, feeding signs and latrines. The above guidelines recommend that surveys are undertaken during November to April, as marking activity is increased during this time and vegetation cover is lower than in summer months. One Badger survey on each section was undertaken at the recommended time of year (Table 9.1).

9.3.2.2 Bats

Bat surveys were undertaken with regard to the following guidelines:

- *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes* (NRA, 2006).
- *Guidelines for the Treatment of Bats during the Construction of National Road Schemes* (NRA, 2005).
- *Bat Mitigation Guidelines for Ireland* (NPWS, 2006).
- *Design Manual for Roads and Bridges*: *Nature Conservation Advice in Relation to Bats* (Highways Agency, 2001).
- *Bat Surveys: Good Practice Guidelines* (UK Bat Conservation Trust, 2007).

Roost inspection and survey

The aim of the bat surveys was to identify any areas important to Bats (including roosts, flight paths, commuting routes and foraging areas). All potential Bat roosts within 1km of the Proposed Scheme were identified during a 'windscreen survey'. These comprised structures and habitats such as Broadleaved Woodland and treelines. The owners of all buildings that were considered to have good potential for Bats were contacted by letter and questionnaire enquiring whether they were aware of Bats in their properties and seeking permission to access properties for internal inspections. Day time internal and external building inspections were carried out for the vast majority of these potential Bat roosts.

During the Habitat survey, habitats such as Broadleaved Woodland that have the potential to support Bat roosts were identified and their potential to support Bat roosts assessed.

Follow up dusk and dawn surveys were undertaken using heterodyne and time expansion detectors (Pettersson D-100, Bat box III & Pettersson D-240x) as well as frequency division detectors (Anabat SD1). Recordings were analysed using sound analysis software (Bat Sound and Analook).

Bat activity survey

Evening surveys of potential foraging habitats were also carried out in the wider area around potential roosts. In addition, point counts and car based surveys, with Anabat detectors and GPS devices, were carried out to map and quantify the commuting and routes and foraging habitats of Bat species within the study area.

9.3.2.3 Otters

Otter surveys were undertaken with regard to the following guidelines:

- *Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes* (NRA, 2006).

Watercourses were surveyed 250 metres either side of the centreline of the Proposed Scheme for signs of Otter. Evidence of Otter activity was noted in the form of spraints, prints, holts and couches (resting areas on river banks). Where holts were encountered they were described and their locations mapped.

9.3.2.4 Freshwater Pearl Mussel

The Freshwater Pearl Mussel survey was undertaken by Moorken (2008) and the full report is located in Appendix 9.2 in Volume 3 of this EIS. This survey followed NPWS guidelines for the survey of this species:

- *Margaritifera margaritifera* "Stage 1 and Stage 2 survey guidelines". Irish Wildlife Manuals No. 12. (NPWS, 2004).

Survey work was undertaken on several separate days, mainly between June and the end of August, with a short period at the end of November. Sections of rivers and streams were surveyed for distances ranging from 50m to 400m depending on the size of the watercourse, at locations in the immediate vicinity of proposed crossing points and at locations downstream.

Different techniques were applied according to the size of the watercourse surveyed. For all watercourses apart from the River Slaney, the survey was carried out by two experienced surveyors using standard perspex-bottomed viewing equipment within safe water depths (1.2 metre maximum). The surveyors worked in parallel, approximately 2-3 metres apart, thus allowing the entire river width to be surveyed. For smaller streams, only one surveyor was in the watercourse at any one time. Most of the survey work on the River Slaney was carried out by snorkel surveying, supplemented by bathyscope surveys in the shallower margins.

9.3.2.5 Aquatic Assessment

Aquatic surveys and assessments were undertaken with regard to the following guidelines:

Q-sampling surveys of all streams crossed by the Proposed Scheme were carried out. Biological water quality rating (or Q-Rating) is a pollution rating Index, which has been developed to measure the response of certain key macroinvertebrate species or groups to pollution. The Q-Rating system has been implemented by the EPA in Ireland as the standard means to assess the quality of any part of a stream based principally on the composition of macroinvertebrate

communities/ faunal groups present and their general sensitivity to organic pollution. The stream or river surveyed is assigned a Q-rating from 5 to 1 (i.e. pristine unpolluted to grossly polluted), as shown in Table 9.1.

Table 9.1 Water Quality Status reflected by Q-Values*

Biotic index	Quality Status	Quality Class
Q4, 4-5, 4	Unpolluted	Class A
Q3-4	Slightly Polluted	Class B
Q3, 2-3	Moderately Polluted	Class C
Q2, 1-2, 1	Seriously Polluted	Class D

*From Toner *et al.* (2005).

The methodology used for this EIS was adapted from EPA and United States Environmental Protection Agency (USEPA) guidance and S.I. 258/1998, as listed below:

- *Water Quality in Ireland 2001–2003. Appendix I: Biological and Physico-Chemical Surveillance and Water Quality Assessment of Rivers* (Toner *et al.*, 2005).
- *Revision of Rapid Bio-assessment Protocols for Use in Wadeable Streams and Rivers* (United States EPA, 2003).
- S.I. No. 258/1998, Local Government (Water Pollution) Act, 1977 (Water Quality Standards for Phosphorous) Regulations, 1998.

Water quality in many of the rivers and streams within the study area is monitored on an ongoing basis by the EPA. In addition to the sampling undertaken as part of the survey work for this EIS, Q-sampling data from the EPA monitoring locations is also presented for relevant watercourses.

9.3.3 Approach to Ecological Evaluation and Impact Assessment

9.3.3.1 Site Evaluation Criteria

The criteria used to assess the ecological value and significance of habitats is shown in Table 9.2, which follows *Guidelines for assessment of Ecological Impacts of National Road Schemes* (Nairn & Fossitt, 2006) and is consistent with the approach recommended in the *Guidelines for Ecological Impact Assessment* (IEEM, 2006).

Table 9.2 Site Ecological Evaluation Scheme*

Rating	Qualifying Criteria
A	**Internationally important** • Sites designated (or qualifying for designation) as SAC* or SPA* under the EC Habitats or Birds Directives. • Undesignated sites containing good examples of Annex I priority habitats under the EC Habitats Directive. • Major Salmon river fisheries. • Major salmonid (Salmon, trout or char) lake fisheries.
B	**Nationally important** • Sites or waters designated or proposed as an NHA* or statutory Nature Reserves. • Undesignated sites containing good examples of Annex I habitats (under EC Habitats Directive). • Undesignated sites containing significant numbers of resident or regularly occurring populations of Annex II species under the EC Habitats Directive or Annex I species under the EC Birds Directive or species protected under the Wildlife (Amendment) Act 2000. • Major trout river fisheries. • Water bodies with major amenity fishery value. • Commercially important coarse fisheries.
C	**High value, locally important** • Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or significant populations of locally rare species. • Small water bodies with known salmonid populations or with good potential salmonid habitat. • Sites containing any resident or regularly occurring populations of Annex II species under the EC Habitats Directive or Annex I species under the EC Birds Directive. • Large water bodies with some coarse fisheries value.
D	**Moderate value, locally important** • Sites containing some semi-natural habitat or locally important for wildlife. • Small water bodies with some coarse fisheries value or some potential salmonid habitat. • Any water body with unpolluted water (Q-value rating 4-5).
E	**Low value, locally important** • Artificial or highly modified habitats with low species diversity and low wildlife value. • Water bodies with no current fisheries value and no significant potential fisheries value.

*After Nairn & Fossitt (2006).

9.3.3.2 Impact Assessment criteria

The impact significance for terrestrial and aquatic habitats has been assessed using the *Guidelines for Ecological Impact Assessment* (IEEM, 2006). Detailed Ecological Impact Assessment was undertaken for all Sensitive Ecological Receptors (defined as those valued at Level C and above in Table 9.2). Based on these guidelines, the criteria used to characterise impacts are outlined in Table 9.3.

Table 9.3 Characterisation of impacts

Parameter	Categories
Type of impact	Positive/ Negative
Magnitude of impact	Size or amount of impact
Extent	Area over which impact occurs (may be the same as magnitude if whole habitat impacted)
Duration	Time over which impact is expected to last. For example, described as Short-term, Medium-term or Long-term in relation to relevant species/ habitat time-scales.
Reversibility	Temporary/ Permanent
Timing and frequency	Timing of impacts in relation to relevant life-stages or seasons
Likelihood of impact occurring	Near-certain: probability >95% Probable: probability 50-95% Unlikely probability 5-50% Extremely unlikely: probability <5%

An impact is considered to be *Ecologically Significant* if it impacts the integrity or conservation status of an Ecologically Sensitive Receptor within a specified geographical area. If impacts are not found to be significant at the highest geographical level at which the Ecological Receptor has been valued, then the impacts may be significant at a lower level. For instance there may be a significant impact at a local level on a species which is valued at an international level. The highest levels of impact significance for each Ecological Receptor 'value' rating are shown in Table 9.4.

Table 9.4 Maximum level of impact significance for Ecologically Sensitive Receptors

Ecological Receptor 'value' rating	Highest significance level
A	Significant Positive/ Negative impact at International level
B	Significant Positive/ Negative impact at National level
C	Significant Positive/ Negative impact at Local level

Flora and fauna species have been evaluated in relation to any legal protection they may be afforded (International or National), their conservation status and local abundance. For instance, a species that is listed on Annex II or IV of the EC Habitats Directive is considered to be of 'International' importance. As above, this does not mean that an impact will necessarily be significant at an International level.

9.3.4 Limitations

The programme for the completion of the EIS resulted in initial Badger surveys for the northern section of the M11/N11 Mainline and the entire length of the N80 Link Road being undertaken outside the optimum period. Badger surveys are best carried out in from November to April when vegetation growth is less dense and setts easier to locate. However this was addressed by a repeat survey of these scheme sections in April 2009. There are therefore no limitations with respect to the Badger survey data.

There were no other major difficulties or data deficiencies encountered in the production of this assessment.

9.4 RECEIVING ENVIRONMENT

The Proposed Scheme is located within the Slaney and Bann river valleys and the topography is of rolling hills and valleys. The Proposed Scheme passes through habitats that are predominantly agricultural grassland and arable farmland, located largely within the catchments of the River Slaney, Bann and Owenavorragh in the case of the M11/N11 Mainline and N80 Link Road sections of the Proposed Scheme, and the River Urrin and Boro in the case of the N30 Mainline section. Tributaries of all of these watercourses, aside form the Boro will traversed by the Proposed Scheme. The two most significant watercourse crossings are the N80 Link Road crossing of the River Slaney and the N30 Mainline crossing of the River Urrin.

9.4.1 Designated Areas

Candidate Special Areas of Conservation (cSAC) are designated under the Habitats Directive (92/43/EEC). The EC (Natural Habitats) Regulations (1997) enable the protection, conservation and, where possible and necessary, the restoration of certain habitats and/ or species (habitats listed on Annex I, and species listed on Annex II, of the Habitats Directive). Designated SACs are compiled within a framework of protected areas known as Natura 2000.

Special Protection Areas (SPAs) are designated under the Birds Directive (79/409/EEC). They are protected for birds listed on Annex I of the Birds Directive, as well as for populations of regularly occurring migratory species. The Directive obliges Ireland to conserve wetlands, especially those of international importance. This Directive seeks to protect any such areas important for birds from potential impacts of proposed developments.

Proposed Natural Heritage Areas (pNHAs) are designations introduced under the Wildlife Act 1976 (as amended). Although many NHA designations are not yet fully in force under this legislation, they are offered protection in the meantime under planning legislation which requires that planning authorities give due regard to their protection in planning policies and decisions.

The Proposed Scheme traverses one cSAC and pNHA, the River Slaney Valley cSAC/ pNHA (Site Code 000781). In addition there are an additional five designated sites within approximately 10km of the Proposed Scheme. A summary of these is listed in Table 9.5 and sites close to the Proposed Scheme are shown on Figure 9.4 in Volume 4 of this EIS.

Table 9.5 Designated Areas within approximately 10km of the Proposed Scheme

Site name and code	Designation	Distance from Proposed Scheme	Designated features (habitats and species)	Legislation
Slaney River valley (000781)	cSAC & pNHA	Proposed Scheme crosses designated site at Ch N80 Link Road 2,800m*	Annex[1] I habitats: Alluvial wet woodland, floating river vegetation, estuaries, tidal mudflats and old oak woodlands. Annex II[1] species: Sea Lamprey *Petromyzon marinus*, River Lamprey *Lampetra fluviatilis*, Brook Lamprey *Lampetra planeri*, Freshwater Pearl Mussel *Margaritifera margaritifera*, Twaite Shad *Alosa fallax*, Atlantic Salmon *Salmo salar* and Otter *Lutra lutra*.	EC Habitats Directive (92/43/EEC) Wildlife (Amendment) Act, 2000
Wexford Slobs and Harbour (004076 & 000712)	SPA & pNHA	1 km from the SPA at closest point (Ch M11/N11 Mainline 27,400).	Regularly supports in excess of 20,000 waterbirds, including internationally important populations of Greenland White-fronted Goose *Anser albifrons flavirostris*, Mute Swan *Cygnus olor*, Light-bellied Brent Goose *Branta bernicla hrota*, Bar-tailed Godwit *Limosa lapponica* and Black-tailed Godwit *Limosa limosa* and is nationally important for a further 25 species of waterbird	Wildlife (Amendment) Act, 2000 The EC Birds Directive (79/409/EEC)
Leskinfere Church (000702)	pNHA	1.1 km north of northern extent of M11/N11 Mainline.	Natterers Bat *Myotis nattereri* roost	Wildlife (Amendment) Act, 2000
Ballynabarney Wood (000746)	pNHA	Approx. 185m south of Ch N80 Link Road 3,000 m	Woodland habitat	Wildlife (Amendment) Act, 2000
Ardamine Wood	pNHA	8.3km east of the start of the M11	Woodland, scrub and heath along coastal cliffs	Wildlife (Amendment) Act, 2000
Ballymoney Strand	pNHA	11km east of the start of the M11	Sea cliffs with rare vegetation and unusual geology	Wildlife (Amendment) Act, 2000
Courtown Dunes & Glen	pNHA	7.4km east of the start of the M11	Mixed Woodland including wooded dunes	Wildlife (Amendment) Act, 2000
Kilgorman River Marsh	pNHA	14km northeast of the start of the M11	Wetland habitats along river banks	Wildlife (Amendment) Act, 2000
Clone Fox Covert (000755)	pNHA	2 km north west of Ch M11/N11 Mainline 15,000	Small section of old Oak woodland with acid-favouring ground flora	Wildlife (Amendment) Act, 2000

[1]Habitats and species listed in Annex I and II of the EC Habitats Directive and Annex I of the EC Birds Directive as being of community interest and whose conservation requires the designation of Special Areas of Conservation and Special Protection Areas.

Table 9.5 Designated Areas within approximately 10km of the Proposed Scheme (Cont.)

Site name and code	Site name and code	Site name and code	Site name and code	Site name and code
Killoughrum Forest (000765)	pNHA	2.2 km west of N30 Mainline Ch 6,000	Oak-birch-holly woodland, Wet woodland, Narrow-leaved Helleborine orchid *Cephalanthera longifolia* (FPO and RDB), Greater Broomrape *Orobanche rapum-genistae* (RDB)	Wildlife (Amendment) Act, 2000

FPO: Plants listed on the Flora (Protection) Order (1999)
RDB: Irish Red Data Book: 1. Vascular Plants. (Curtis & McGough, 1988; updated 2005)

9.4.2 Records of protected, rare and other notable Flora and Fauna species

9.4.2.1 NPWS and NBN Gateway data

A search was undertaken of records of Red Data Book and Protected species held by the NPWS and the NBN Gateway. Relevant records from the 10km x 10km grid squares occupied by the Proposed Scheme, and those within 1km of the Proposed Scheme, (S93, S84, S95, T03, T04, T05, T14, T15) are listed in Table 9.6 for NPWS records and Table 9.7 for NBN Gateway records. It should be noted that the NBN Gateway records do not always give the full grid reference. Where the 10km grid squares only was given it was not possible to calculate the distance of the record from the Proposed Scheme. Records which were on both databases are listed in Table 9.7 only.

Table 9.6 Records of rare and protected species from the NPWS database

Scientific name	Common Name	Habitat association[1]	Location & date[2]	Grid Ref.	Distance from Proposed Scheme	Conservation status
Flora (no fauna records)						
Callitriche truncata	Short-leaved Water-starwort	Aquatic plant of ponds, rivers and canals	Edermine Bridge (1990)	S9734	1 km from M11/N11 Mainline	FPO & RDB R
			Macmine Junction (1990)	S9731	2.5 km from M11/N11 Mainline	
Cephalanthera longifolia	Narrow-leaved Helleborine	Woods and shady places on calcareous soils	Enniscorthy (1993)	S94	(Distance cannot be determined from grid reference)	FPO & RDB V
Clinopodium acinos	Basil Thyme	Bare or rocky ground, arable fields on dry, usually calcareous soils.	Knockmore (1899)	S9030	9 km east of N30 Mainline (Grid Ref S9030)	FPO & RDB V
			Mangan & Ballyhighland (1899)	S8040	10km and 6.3km from the scheme	
			Drumderry gravel pit (1992)	S9058	16km from the scheme	
Erigeron acer	Blue Fleabane	Sandy places.	Drumderry gravel pit (1992)	S9058	16km from scheme	RDB V
Galeopsis angustifolia	Red Hemp-nettle	Arable land, often on peaty soil with root crops and waste places.	Caim	S8040	4.8km east of N30 connector road.	FPO & RDB V
Groenlandia densa	Opposite-leaved Pondweed	Ponds, ditches and streams.	Edermine Bridge (1866)	S975400	1 km from M11/N11 Mainline	FPO & RBB V
			Macmine Junction (1897)	S9831	2.5 km from M11/N11 Mainline	
Lotus subbiflorus	Hairy Bird's-foot-trefoil	Dry grassy places near sea.	Blackwater (1990)	T097330	10km from M11/N11 Mainline	FPO & RDB R
Misopates orontium	Weasel's-snout	Cultivated ground.	Camolin (1975)	T070530	2.3km north-west of M11/N11 Mainline	FPO & RDB V
Stachys officinalis	Betony	Hedgebanks, grassland, heaths, avoiding heavy soils.	Rosdroit (1892)	S9136	3 km from N30 Mainline (Grid Ref. S9136)	FPO & RDB V

Table 9.6 Records of rare and protected species from the NPWS database (Cont.)						
Scientific name	**Scientific name**	**Scientific name**	**Scientific name**	**Scientific name**	**Scientific name**	**Scientific name**
Flora (no fauna records)						
Viola hirta	Hairy Violet	Calcareous pastures and open scrub.	Clohamon (1881)	S9050	11.4km north-west of N11	FPO & RDB V
			Bunclody (1940)	S9054	14km north-west of N11	
Viola lactea	Pale Dog-violet	Dry heaths.	Bunclody (1940)	S9054	14km north-west of N11	FPO & RDB V

[1]Stace, C. (Ed) (1997) New Flora of the British Isles. Cambridge University Press.
[2]Where there are several records for the same location the most recent date is given
FPO: Plants listed on the Flora (Protection) Order (1999)
RDB: Irish Red Data Book: 1. Vascular Plants. (Curtis & McGough, 1988; updated 2005): E = Endangered, V = Vulnerable, R = Rare

Table 9.7 Records of protected species from the NBN database

Scientific name	Common Name	Habitat association[1]	Location & date[2]	Grid Ref.	Distance from Proposed Scheme	Conservation status
Fauna						
Lutra lutra	European Otter	Freshwater and coastal habitats.	Between 1950-1993	S93	n/a	HD - II and IV. WA
			Between 1950-1993	S94	n/a	
			Between 1950-1993	S95	n/a	
			1980	T03	n/a	
			1980	T04	n/a	
			1980	T14	n/a	
			Between 1950-1993	T15	n/a	
Rana temporaria	Common Frog	Widespread habitats such as upland, lowland, woodland, farmland, marsh, bog, coastal and urban.	Enniscorthy (1973)	S93	2.5km	HD - V. WA
			Ballycarney (1973)	S95	3km	
			Tubbergall Ballyhyld (1944)	T062464	6.3km	
			Gorey (1973)	T15	n/a	
			Ballyminane Gorey (1944)	T148595	5.6km	

Table 9.7 Records of protected species from the NBN database

Scientific name	Common Name	Habitat association[1]	Location & date[2]	Grid Ref.	Distance from Proposed Scheme	Conservation status
			Carriganeagh Rock (1989)	T1556	n/a	
Euphydryas aurinia	Marsh Fritillary	Damp, flower-rich grasslands, dunes and wet heath.		S94, S93	n/a	HD - II
Flora						
Centaurea cyanus	Cornflower	Cornfields, casual birdseed-alien or garden escape in waste places.	Bunclody (1946)	S95	14km north-west of N11	RDB E
Cephalanthera longifolia	Narrow-leaved Helleborine	Woods and shady places on calcareous soils.	Killoughrum Forest (1993)	S94	2.7km west of N30 link	FPO, RDB V
Erigeron acer	Blue Fleabane	Sandy places.	Enniscorthy (1886)	S94	2.5km	RDB V
			Bunclody (1991)	S95	14km north-west of N11	
Kickxia elatine	Sharp-leaved Fluellen	Arable fields and field-borders on light, usually calcareous soils.	Ballycarney Nr Ferns (1891)	S94	3km north of N30 link	RDB V
Lamiastrum galeobdolon	Yellow Archangel	Woods, wood borders and hedgerows.	Enniscorthy (1941)	S93	2.5km	RDB R
			Bunclody – Tombrack (1987-1999)	S95	6.5km north of N30 link	
			Carr Hill Wood (1990)	S95	n/a	
			Site name not given (1901)	T03	n/a	
Orchis morio	Green-winged Orchid	Base-rich to neutral short undisturbed grassland.	No site name given (1901)	S94	n/a	RDB V
			Enniscorthy, Nr (1898)	S93	2.5km	
			No site name given (1901)	T03	n/a	

Table 9.7 Records of protected species from the NBN database

Scientific name	Common Name	Habitat association[1]	Location & date[2]	Grid Ref.	Distance from Proposed Scheme	Conservation status
Ornithopus perpusillus	Bird's-foot	Dry bare sandy and gravelly ground.	Ballymum Ballaghkeen (1987-1999)	T03,	n/a	RDB R
			Ballinra (1990)	S95	10km east of Enniscorthy Bypass	
			Slate Quarry Hill (1974)	S95	n/a	
			Ballyprecas (1990)	S95	13km north of N30 Link Road	
			Bunclody – Tombrack (1987-1999)	S95	6.5km north of N30 link	
Orobanche rapum-genistae	Greater Broomrape	Parasite on woody Fabaceae.	Killoughrum Forest (1890)	S94	2.7km west of N30 link	RDB R
			Killoughrum (1917)			
Viola lactea	Pale Dog-violet	Dry heaths.	Bunclody (1940)	S95	14km north-west of N11	FPO, RDB V
			Bree - Enniscorthy South (1999)	S93	2.5km and 4km to Enniscorthy Bypass	

[1]Stace, C. (Ed) (1997) New Flora of the British Isles. Cambridge University Press.
[2]Where there are several records for the same location the most recent date is given
HD II – Species listed on Annex 2 of the EU Habitats Directive
HD IV – Species listed on Annex 4 of the EU Habitats Directive
WA – Species protected under the Wildlife Acts (1976-2000)
FPO: Plants listed on the Flora (Protection) Order (1999)
RDB: Irish Red Data Book: 1. Vascular Plants. (Curtis & McGough, 1988; updated 2005): E = Endangered, V = Vulnerable, R = Rare

Many of these species have been recorded from single sites, several kilometres away from the Proposed Scheme. Given that these species are generally rare, it is not highly likely that they will occur in the study area. Five species are located within 2.5km of the Proposed Scheme:

- *Callitriche truncata* and *Groenlandia densa,* recorded from Edermine Bridge. This site is located approximately 1km from the Proposed Scheme, and is linked by a section of river. These species were not recorded during baseline survey work for the Proposed Scheme.
- *Misopates orontium* recorded on cultivated land near Camolin town, approx. 2.3km from the M11. Cultivated land exists along the alignment; however this species was not recorded during baseline survey work for the Proposed Scheme.
- S*tachys officinalis* occurs in hedgerows up to 3km from the N30. Hedgerows are present within the study area; however this species was not recorded during baseline survey work for the Proposed Scheme.
- Common Frog has been recorded at several locations. Suitable habitat, such wetlands or drainage ditches, are present within the study area and Common Frog is therefore likely to occur within the vicinity of the Proposed Scheme.

9.4.2.2 Bat data

Data from Bat Conservation Ireland for County Wexford shows no known records for Whiskered Bat *Myotis mystacinus* roosts in County Wexford and only one known record for a Natterer's Bat roost (Leskinfere Church pNHA listed above). BCI records from the Car-Based Transect Monitoring Scheme (2003-2006) and the All-Ireland Daubenton's Waterway Survey (2006), recorded Leisler's Bat *Nyctalus leisleri*, Soprano Pipistrelle *Pipistrellus pygmaeus*, Common Pipistrelle *Pipistrellus pipistrellus*, Daubenton's Bat *Myotis daubentonii* and unidentified *Pipistrellus* species and *Myotis* species within the area. Recordings of Daubenton's Bat were made at the Scarawalsh Bridge, approximately 5km south west of Ferns (S9845), and Margerry's Bridge (T1159), approximately 4km north-west of Clogh.

Bat roost survey work was undertaken in relation to the route selection stages for the N11 Enniscorthy Bypass (Kelleher, 2001). Relevant data from this survey is shown in Table 9.8 below and is also shown on Figure 9.1 in Volume 4 of this EIS.

Table 9.8 Bat roost data from Kelleher (2001) survey.

M11/ N11 MAINLINE			
West of 16,400	Murphy's farm, Killabeg	Large colony of Bats (probably Pipistrelle species) in bungalow during the summer. Brown Long-eared *Plecotus auritus* droppings noted.	1092
West of 17,900	Garryvadden, Blackwater	Potential Brown Long-eared roost	391
West of 23,000 across the Slaney River	St Johns Monor	Colony of Brown Long-eared Bats in old building.	2895
East of 26,600	Dicksons Out Farm Riverview	Evidence of Brown Long-eared Bats.	99
West of 23,600 near the Slaney River	Saville House	Signs of Brown Long-eared Bats which may be roosting in the main house.	2370
West of 24,500	Redmond's house, Ballycourcey Beg	Attic showed signs of use by Brown Long-eared Bats. Common Pipistrelle roost within a crack at the rear of an upstairs airing cupboard.	413
West of 23,600 near the Slaney River	Mill Race	Signs of Brown Long-eared Bats with droppings and insect remains present.	2541
N30 MAINLINE			
East of 7,700	Tomduff	Droppings of Pipistrelle species and Brown Long-eared Bats.	2067
East of 8,000	Bloomfield	Common Pipistrelle and Brown Long-eared Bats roosting in attic.	1552

9.4.2.3 Irish Wetland Bird Survey data

There are three Irish Wetland Bird Survey (IWeBS) count areas within the vicinity of the Proposed Scheme at Eldermine Bridge (S975372), Enniscorthy (S980310) and Killurin (Deep) Bridge (S986304). A further IWeBs count area is located 12km south of the Proposed Scheme at Ferrycarrig Bridge (S990245). Of the species that are making use of the River Slaney sites Grey Heron (*Ardea cinerea*), Mallard (*Anas platyrhynchos*), Moorhen (*Gallinula chloropus*), Teal (*Anas crecca*) and Tufted Duck (*Aythya fuligula*) are present in nationally important numbers, while Mute Swan (*Cygnus olor*) is present in both nationally and internationally important numbers.

9.4.2.4 Birdwatch Ireland data

There was one confirmed record of Barn Owl *Tyto alba* at Mackmine Castle (IS 973 323). This is a traditional nesting site.

9.4.3 Terrestrial Ecology

9.4.3.1 Terrestrial Habitats and Flora

A brief description of the main habitats is given below. Habitats which were of particular conservation interest (valued as 'C' – 'High value, locally important', or above), and which potentially could be impacted by the Proposed Scheme, are described in more detail in Table 9.9. The remaining habitats were valued at 'D' 'Moderate value locally important', or below. All habitats are shown on Figure 9.2 in Volume 4 of this EIS. Photos of each habitat type are included in Appendix 9.3 in Volume 3 of this EIS, these are taken from within the study area and do not necessarily show habitats that are located within the landtake of the Proposed Scheme.

Grassland Habitat

Improved Agricultural Grassland (GA1)

Agricultural grassland was the dominant habitat within the study area and varied from intensively managed grassland to rough grassland. These areas were species poor and often dominated by Perennial Rye-grass *Lolium perenne* and White Clover *Trifolium repens.* Rough grassland contained species such as Yorkshire-fog *Holcus lanatus*, Crested Dog's-tail *Cynosurus cristatus*, Annual Meadow-grass *Poa annua*, Cock's-foot *Dactylis glomerata*, Creeping Buttercup *Ranunculus repens*, Silverweed *Potentilla anserina*, Dock species (*Rumex* spp.), Creeping thistle *Cirsium arvense* and Nettle *Urtica dioica*.

Amenity Grassland (GA2)

Amenity grassland was generally dominated by Perennial Rye-grass with a limited range of additional species such as Daisy *Bellis perennis*, Ribwort Plantain *Plantago lanceolata* and Creeping Buttercup.

Wet Grassland (GS4)

Wet grassland areas had abundant Soft-rush *Juncus effusus* with a range of other species related to the amount of water present. Drier areas had abundant Yorkshire-fog, whilst damper areas had additional species such as Meadowsweet *Filipendula ulmaria*, Flag Iris *Iris pseudacorus*, Marsh Thistle *Cirsium palustre* Pointed Spear-moss *Calliergonella cuspidata* and Cuckooflower *Cardamine pratensis.*

Cultivated land

Cultivated land was the next most abundant habitat type and comprised *BCI Arable Crops (BC1), Tilled land (BC3)* and *Horticultural land (BC2).*

Woodland Habitat

(Mixed) Broadleaved Woodland (WD1)

The (Mixed) Broadleaved Woodland habitat within the areas contained canopy species such as Ash *Fraxinus excelsior*, Pedunculate Oak *Quercus robur,* Sessile Oak *Quercus petraea*, Sycamore *Acer pseudoplatanus*, Horse Chestnut *Aesculus hippocastanum*, Beech *Fagus sylvatica* and Hornbeam *Carpinus betulus*. Occasional conifers such as Scots pine *Pinus sylvestris* were occasionally present in small amounts. Ground flora species included Nettle, Cleavers *Galium aparine*, Herb-Robert *Geranium robertianum,* Wood anemone *Anemone nemorosa*, Primrose *Primula vulgaris*, Great Wood-rush *Luzula sylvatica,* Soft Shield-fern *Polystichum setiferum* and occasionally Goldilocks Buttercup *Ranunculus auricomus* and Wood Avens *Geum urbanum.* The understorey included species such as Bramble *Rubus fruticosus* agg., Hawthorn *Crataegus monogyna* and Blackthorn *Prunus spinosa*.

Mixed Broadleaved / Conifer woodland (WD2)

This habitat type was very similar to Mixed Broadleaved Woodland described above, but with higher cover of conifer species such as Scots Pine and Sitka Spruce *Picea sitchensis.* Broadleaved species were dominant to confer species.

Mixed Conifer Woodland (WD3)

This habitat type was dominated by conifer species but with some cover of Broadleaved species as above.

Conifer Plantation (WD4)

Conifer plantations within the area were a combination of commercial forestry (e.g. Sitka Spruce) as well as a few areas of old estate / demesne planting.

Oak-ash-hazel woodland (WN2)

There were small areas of this woodland type. Pedunculate or Sessile Oak and/ or Ash were dominant, with Hazel locally abundant. There was a range of fern species including Soft Shield-fern, Hart's-tongue *Phyllitis scolopendrium*, Scaly Male Fern *Dryopteris affinis*, Lady-fern *Dryopteris filix-femina* Broad Buckler-fern *Dryopteris aemula* and Bracken *Pteridium aquilinum.* Bluebell *Hyacinthoides non-scripta*, Honeysuckle *Lonicera periclymenum* and Bramble were locally common.

Wet willow-alder-ash (WN6)

There were narrow linear areas of Wet woodland in areas of poor drainage or where springs were present. These were dominated by Alder and Ash with ground flora species such as Mint Mentha *sp.*, Opposite-leaved Golden-saxifrage *Chrysosplenium oppositifolium*, Great Horsetail

Equisetum telmateia, Meadowsweet, Hart's-tongue Thyme-moss *Plagiomnium undulatum*, Primrose, Willowherb *Epilobium* spp., Cleavers

Scrub (WS1)

Areas of scrub generally comprised Gorse, Blackthorn, Hawthorn and Elder *Sambucus nigra* with species such as Nettle and Bramble in the understorey.

Hedgerows WL1

The hedgerows along the Proposed Scheme were ranked from 1 to 3 as:

1 = high conservation value (C)

2 = moderate conservation value (D); and

3 = low conservation value (E). .

- Hedgerows (WL1) of High Conservation Value

  Hedgerows of Category 1 High Conservation Value were considered of high conservation value due to their relatively high species diversity, vertical composition, thickness and age. They were generally comprised of Hawthorn, Blackthorn, Elder and Bramble. Mature Ash, Sycamore, Horse Chestnut, Hornbeam and Beech trees were also present in places with associated woodland ground flora species.

- Hedgerows (WL1) of Moderate Conservation Value (Category 2)

  These differed from the Category 1 hedgerows in that they generally contained more gaps, were thinner and less species diverse. In many cases these comprised almost entirely of Hawthorn and Blackthorn. They were generally less than 5m in height with mature trees often absent. Some occasional mature and semi-mature trees such as Ash, Oak and Sycamore were present.

- Hedgerows (WL1) of Low Conservation Value (Category 3)

  These types of hedgerows were often broken lines of Hawthorn or severely pruned hedgerows of Gorse or Bramble.

Treelines (WL2)

Treelines were categorised as single rows of mature trees. Species present included Ash, Oak, Sycamore and Horse Chestnut.

Riverbank vegetation

Many of the watercourses had a mixture of scrub, scattered trees and rough grassland along their banks. This vegetation does not fit any particular habitat category. Species present included Ash, Willow, Alder, Gorse, Bramble, Cock's-foot, False Oat-grass *Arrhenatherum*

elatius, Nettle and Dock species. Invasive species, such as Indian Balsam, were present on some watercourses.

Other habitat types

There were areas of *Recolonising bare ground (ED3)* and *Buildings and Artificial Surfaces (BL3)* scattered throughout the study area.

Habitats of ecological value that may be impacted by the Proposed Scheme

Habitats that are of ecological value and that are likely to be impacted by the Proposed Scheme because they are within or adjacent to landtake are listed in Table 9.9. Habitats of ecological value C and above only are included.

Table 9.9 Habitats of ecological value potentially impacted by the Proposed Scheme

Habitat	Chainage	Site name/ location	Description (flora species etc)	Evaluation
M11/ N11 Mainline				
GS4 Wet grassland	16,800 – 16,900	Crane Tinnacross Wet Grassland and Broadleaved Woodland	A low lying wet area which merges with the adjacent broadleaved woodland. Species composition includes Flag Iris, Hard Rush *Juncus inflexus*, Soft-rush, Marsh Thistle, Ragged Robin *Lychnis flos-cuculi*, Sweet Vernal-grass *Anthoxanthum odoratum* and a number of sedges. Broadleaved woodland described separately below.	C
WD1 Broadleaved Woodland	1,400	Clogh Broadleaved Woodland	Oak dominated Broadleaved woodland.	C
WD1 Broadleaved Woodland	5,300	Medophall Broadleaved Woodland	Mature Pedunculate Oak, Ash and Beech with Willow, Hawthorn and Dog-rose *Rosa canina*. Ground flora species included the ferns Hart's-tongue, Lady-fern and Broad Buckler-fern. The understorey was dense in parts with some areas of standing water in other areas.	C
WD1 Broadleaved Woodland	9,250	Mountgeorge Broadleaved Woodland	Canopy and understorey species include Ash, Holly *Ilex aquifolium*, Willow, Alder, Beech, Blackthorn and Hawthorn.	C

Table 9.9 Habitats of ecological value potentially impacted by the Proposed Scheme

Habitat	Chainage	Site name/ location	Description (flora species etc)	Evaluation
WD1 Broadleaved Woodland	13,400	Myaugh Tinnacross Broadleaved Woodland	A linear strip of Broadleaved woodland along the Tinnacross Stream. Ash and Hawthorn dominant with occasional Blackthorn, Gorse and Bramble and Scot's Pine. Bracken, Honeysuckle in the understorey. Ground flora included Ivy *Hedera helix*, Cock's-foot, Rough Meadow-grass, Wood Avens, Nettle, Hogweed *Heracleum sphondylium*, Lesser Stitchwort *Stellaria holostea* and Wood Dock *Rumex sanguinea*. Riverbank vegetation on the southern side of the river characterised by taller trees (predominantly Ash) with scrubby growth of Hawthorn, Gorse, Nettle, Bramble and grasses. The northern bank supported Alder, Ash, Sallow *Salix cinerea,* Hawthorn and Holly, growing to approx. 8m high in places. Other common bank vegetation species were present.	C
WD1 Broadleaved Woodland	16,800 – 16,900	Crane Tinnacross Wet Grassland and Broadleaved Woodland	Broadleaved woodland on steeply sloping ground. Upper slopes wooded, with scrub/ woodland on the lower slopes. Stands of Flag Iris present in wet, flat areas within the scrub. Dominant tree species were Ash, Hawthorn and Blackthorn growing to approximately 8m high. To the west, trees were taller and dominated by Ash with little evidence of natural regeneration or any understorey due to heavy poaching by cattle. The eastern portion of the woodland characterised by Hawthorn, Blackthorn, Holly, Bramble and Honeysuckle with Bluebell *Hyacinthoides non-scripta,* Common Dog-violet *Viola riviniana*, Lady Fern, and Soft Shield-fern	C

Table 9.9 Habitats of ecological value potentially impacted by the Proposed Scheme

Habitat	Chainage	Site name/ location	Description (flora species etc)	Evaluation
WN2 Oak-Ash-Hazel Woodland	21,700	Tomnafunsh-oge Woodland and Pond	Oak-Ash-Hazel Woodland growing on southern edge of the pond dominated by Pedunculate oak, Beech, Alder, Ash and Hazel. Understorey characterised by regeneration of Hazel, Alder and Beech. Additional species included Holly, Blackthorn, Bramble, Ivy and Honeysuckle. Ground flora species included Lady-fern, Hart's-tongue, Wood dock, Water Horsetail, Winter Heliotrope *Petasites fragrans*, Ground-ivy *Glechoma hederacea*, Lesser Celandine *Ranunculus flammula*, Herb-Robert, Remote Sedge *Carex remota,* Scaly Male-fern *Dryopteris affinis*. Mosses and lichens present included *Brachythecium rutabulum*, *Thuidium tamariscinum*.	C
WN6 Wet Willow-Alder-Ash Woodland	3,130 (approx. 30m east of Proposed Scheme alignment, within CPO)	Ballygullen Wet Woodland	Mixture of Alder, Ash, Goat Willow *Salix caprea* growing to approximately 10m high in waterlogged ground. Ground flora of Creeping Buttercup, Cleavers, Broad-leaved Dock, Common Sorrel, Hogweed, Foxglove *Digitaria purpurea*. Lesser Spearwort *Ranunculus flammula*, Soft Shield-fern, Nettle, Cuckooflower, Yorkshire-fog, Teasel *Dipsacus fullonum* and Great Willowherb *Epilobium hirsutum*. Some areas extremely wet with *Callitriche stagnalis*, Mint, Watercress *Rorippa nasturtium-aquatica*, Fool's-water-cress *Apium nodiflorum,* Marsh Woundwort *Stachys palustris*, Branched Bur-reed *Sparganium erectum* and Greater Tussock-sedge *Carex paniculata*.	C
WN6 Wet Willow-Alder-Ash Woodland	4,150	Ballyoughter Wet Woodland	Small triangular patch of Goat Willow and Sallow growing to less than 10m high with dense Bramble in places. In shaded areas ground flora included Honeysuckle, Remote Sedge, Creeping Buttercup, Ivy, False-brome *Brachypodium sylvaticum*, Soft Shield-fern, Hart's-tongue and Nettle. Wetter areas supported Branched Bur-reed, Mint and Greater Tussock-sedge	C
WN6 Wet Willow-Alder-Ash Woodland	5,550 to 5,750	Medophall Wet Woodland	A mixture of Willow species (*S. fragilis*, *S. cinerea*, *S caprea*) with Ash, Alder and small amounts of Pedunculate Oak and Hawthorn. Dog-rose and Honeysuckle. Rush species and Flag Iris present in the ground flora. Extensive areas of standing water are present.	C

Table 9.9 Habitats of ecological value potentially impacted by the Proposed Scheme

Habitat	Chainage	Site name/ location	Description (flora species etc)	Evaluation
WN6 Wet Willow-Alder-Ash Woodland	21,600	Tomnafunshoge Woodland and Pond	Wet woodland surrounds the pond and is dominated by Sallow, Goat Willow and Alder growing to about 10m with Oak also present. Dense understorey growth and ground flora cover including young Willows, Alder, Elder, Bramble, Lady-fern and Cleavers.	C
WL1 Hedgerows of High Conservation Value	n/a	n/a	High species diversity with species such as Hawthorn, Blackthorn, Elder, Bramble. Mature Ash, Sycamore, Horse Chestnut, Hornbeam and Beech. Associated woodland ground flora species.	C
N80 Link Road				
WN2 Oak-Ash-Hazel Woodland	2,500	Kilcannon Broadleaved Woodland	Narrow linear strip of woodland with Pedunculate oak (some very mature), Beech, Ash, Hazel and Holly growing on a steep slope. Hawthorn, Blackthorn, Eared Willow *Salix aurita*, Honeysuckle and Bramble present in understorey. Ground flora includes Ivy, Bluebell, Primrose, Herb-Robert, Wood Avens, Common Dog-violet, Pignut, Cow Parsley, Ground-ivy, Soft Shield-fern, Hart's-tongue, Male fern *Dryopteris filix-mas* and Winter Heliotrope.	C
Hedgerows (WL1) of High Conservation Value	n/a	n/a	As described for M11/ N11 Mainline	C
N30 Mainline				
WN2 Oak-Ash-Hazel Woodland	6,500	River Urrin Woodland	Growing on a steep slope rising sharply from southern bank of River Urrin. Included Hawthorn, Blackthorn, Ash, Sallow, Goat Willow, Holly, Ivy. Vegetation near water included Hemlock Water-dropwort *Oenanthe crocata*, Common Valerian *Valeriana officinalis* Meadowsweet and other bank vegetation. Ramsons *Allium ursinum* dominant on higher ground.	C
Hedgerows (WL1) of High Conservation Value	n/a	n/a	As described for M11/ N11 Mainline	C

9.4.3.2 Terrestrial Fauna

Badgers

Badgers are protected under the Wildlife Act 1976 (as amended). They are common and widespread in Ireland. Badgers live in family or social groups of related mature and young adults and cubs. Each group has a territory that contains water and food resources to support it throughout the year and a number of underground tunnel systems called setts in which the Badgers live. Not all setts serve the same purpose and they can be categorised according to their use. However, the status of a sett can change over time, particularly if other setts have been disturbed, or land use changes have fragmented or removed feeding opportunities. A summary of the four sett types is given below (DMRB, 2001):

- Main setts usually have a large number of entrances (3-10 on average), large spoil heaps and well used paths to and from the sett and between sett entrances.
- Annexe setts are usually found close to a main sett, usually less than 150m away, and are usually connected to the main sett by one or more obvious, well worn paths. They consist of several holes, but are not necessarily in use all the time, even if the main sett is very active.
- Subsidiary setts are usually found within 50 m of a main sett. These consist of only a few holes, there will often be no obvious path connecting to other setts and they are not continuously active.
- Outlying setts only have one or two holes with little or no spoil heap and no paths to other setts. When not in use by Badgers outlying setts are often taken over by foxes or even rabbits.

The majority of the setts located during the surveys were located within hedgerows, woodland areas and along woodland edges.

A total of 159 setts were located within 250m of the Proposed Scheme. Setts within 50m of the Proposed Scheme are shown in Table 9.10. The full list of setts is shown in Appendix 9.4 in Volume 3 of this EIS and shown on Figure 9.1 in Volume 4 of this EIS. Entrances of the setts were recorded using a three numbering system. The first number refers to the number of active entrances, the second to inactive entrances and the third to damaged or collapsed entrances.

Table 9.10 Badger setts 50m from the Proposed Scheme

Badger Sett Number (BS)	GPS (IS ITM)	Chainage	Distance from Proposed Scheme	Description	Sett type
M11/ N11 Mainline					
112	10778 54704	1,900	0	Two active entrances, possibly rabbit. (2,0,0)	Outlying
3	10828 54556	1,920	0	Single entrance overgrown with brambles. No recent signs of activity. (0,1,0).	Outlying
4	10627 54381	2,230	0	Several entrances within 30m, with many large spoil heaps. Very active, but no signs of bedding. Feeding signs nearby (6,2,1)	Main Sett
9	09867 52416	4,300	0	Possible badger sett. No sign of recent activity (0,1,0)	Possible outlying sett
10	09260 51741	5,250	7	Six entrances. Ground cover dense. No evidence of recent activity (0,6,0)	Outlying
146	08582 50513	6,790	0	Single entrance, Currently occupied by rabbits (1,0,0)	Outlying
147	07760 49685	7,820	0	Inactive sett with at least 5 badger-sized entrances in dense bramble. Some recent signs of activity but only at one entrance, possibly caused by rabbit. Badger hairs in one entrance. (1,5,2)	Subsidiary
134	07626 49519	8,100	0	1 large entrance and spoil heap. Badger hair found at entrance. (1,0,0)	Outlying
136	07180 48917	8,800	32	4 inactive entrances, now partially infilled (0,0,4)	Status undetermined
137	06951 48735	9,100	6	2 entrances with fresh spoil. Located in gorse. Musty smell from sett (2,0,0)	Outlying
13	06887 48649	9,200	0	5 entrances, 1 active. Latrine found nearby (1,4,0)	Subsidiary sett
14	06868 48643	9,200	0	11 entrances. All Inactive, with two large spoil heaps. Feeding signs and prints near sett (0,11,0).	Inactive main sett
15	06945 48604	9,200	0	11 entrances. 6 active and 5 inactive entrances. Large spoil heap with fresh excavated soil, Bedding found on spoil heap. (6, 5, 0)	Main sett

Table 9.10 Badger setts 50m from the Proposed Scheme

Badger Sett Number (BS)	GPS (IS ITM)	Chainage	Distance from Proposed Scheme	Description	Sett type
18	a 06881 48598 b 06908 48600	9,200	0	6 entrances, 1 active. Beside stream (1,5,0). 5 entrances with soil and ivy cover.	Annexe
150	None	9,330	0	Single entrance sett (1,0,0)	Outlying
22	05960 47863	10,400	26	Unlikely sett. One entrance. No spoil heap. No sign of activity (0,1,0). Not found in 2009 re-survey.	Outlying
23	No GPS	11,600	35	Single entrance. No signs of recent activity (0,1,0)	Outlying
151	None	11,430	0	Single entrance large enough to fit a badger, possibly rabbit (1,0,0)	Outlying
153	04278 46681	12,580	4	Single entrance, inactive. Possibly rabbit (0,1,0)	Outlying
154	04092 46800	12,620	47	3 large holes found in hedge-bank, linked by established path to latrine. Currently occupied by rabbits (2,1,0)	Outlying
127	03849 46281	13,150	8	Single entrance with small, but Badger sized, hole and spoil. Badger droppings at bottom of spoil, and feeding signs nearby (1,0,0)	Outlying
24	03626 46173	13,400	0	One entrance. No fresh spoil heap. No signs of recent activity (0,1,0).	Outlying sett
25	03644 46142	13,400	0	Five entrance possible sett. No signs of recent activity. Looks unoccupied (0,5,0)	Inactive main sett
26	03697 46131 (furthest west point).	13,400	0	Large sett complex incorporating up to 30 entrances over 100m. Appears to include one active main, one inactive main and three annexe setts (of 2-3 entrances). All joined by a long path. As all are within 30m of each other they are considered as one large complex. Bedding around several entrances. (20,10,0)	Main sett
29	02415 45320	14,800	15	Possible sett. One entrance with many smaller entrances used by rabbit. No signs of recent activity. Currently occupied by rabbits (0,1,0)	Possible outlying sett

Table 9.10 Badger setts 50m from the Proposed Scheme

Badger Sett Number (BS)	GPS (IS ITM)	Chainage	Distance from Proposed Scheme	Description	Sett type
138	02045 44631	15,650	0	One entrance on raised bank, possibly rabbit (1,0,0)	Outlying
31	01170 43692	16,900	0	Possible sett. Two inactive entrances blocked with leaves and many smaller entrances. No sign of recent activity. Currently occupied by rabbits (2,0,0)	Possible outlying sett
34	01074 42738	17,800	0	Located within the drainage ditch. Entrance within the root of a felled tree. No signs of recent activity (0,1,0). Not found 2009	Outlying
132	01040 42630	17,900	18	At least 7 active entrances found among ruins of old outbuildings – one entrance within the footprint of the building. One very large, fresh spoil heap on roadside. (6,1,0)	Main sett
42	00079 39400	21,900	26	On bank of drainage ditch (1,0,0)	Outlying
49	00325 38035	23,250	32	(3,0,0) Holes quite small, could be rabbit	Outlying
56	00164 36804	24,600	39	(1,1,0)	Annexed sett
57	00190 36747	24,500	0	(4,2,0) In hedgerow behind gorse. Fresh spoil heap. Feeding signs	Main sett
58	00270 36679	24,600	12	(2,0,0) Located on bank near corner of field. Feeding signs	Annexed sett
59	99793 35612	25,800	0	(2,4,0) Large holes, no spoil heap	Outlying sett
63	99726 35273	26,200	46	a (0,2,0) b (0,1,0)	Outlying setts
66	99387 33867	27,600	0	Possible badger. One small hole in bank of hedgerow(0,1,0)	Outlying sett
67	99470 33610	27,800	46	Possible badger/ fox. In earth mound surrounded by grass & scrub in grounds of house. Digging marks in area. Badger trails nearby (0,1,0).	Outlying sett
68	99392 33547	27,900	20	Possible badger in dense hedgerow near corner. Latrine and badger near trails (0,1,0)	Outlying sett

Table 9.10 Badger setts 50m from the Proposed Scheme

Badger Sett Number (BS)	GPS (IS ITM)	Chainage	Distance from Proposed Scheme	Description	Sett type
69	99307 33255	28,000	39	Beside tin hay shed. Latrine at entrance. Fresh spoil heap. Feeding signs, hair snags, (2,1,0)	Outlying sett
70	99307 33255	28,000	17	Possible badger. On bank of ditch four small holes. Trail leading past it, hair snags on fence (0,4,0)	Outlying sett
N80 Link Road					
143	98687 43837	0,700	26	4 entrances, 1 in field and others in woodland. Badger print in one of the entrances (4,0,0)	Outlying
105	No grid ref.	1,100	23	One entrance. No recent activity (0,1,0)	Outlying
110	99393 42290	2,500	46	One entrance, ivy over entrance with tree root blocking entrance. No signs of recent activity. Not found 2009.	Main Sett
N30 Link Road					
71	97601 43720	900	31	(1,0,0) Small hole with a spoil heap	Outlying sett
72	No GPS	920	43	(1,0,0) Small burrow most likely fox	Outlying sett
73	96981 43249	1600	7	(1,0,0) One large active hole on bank between stream and drainage ditch, could be fox den, fox scat found within 5m	Outlying sett
75	96894 43180	1800	0	(0,3,0) Inactive, located on bank between ditch and stream. Badger latrine found nearby	Outlying sett
77	95582 42484	3350	21	(9,0,0) Fresh latrines and bedding.	Main sett
81	94891 42149	4100	3	Probable fox earth in gorse hedge (0,1,0)	Possible outlying sett
82	94821 42062	4250	0	One hole	Outlying sett
84	94781 42017	4350	36	Lots of rabbit droppings	Outlying sett
88	94108 41536	5100	0	Eight entrances with feeding signs (6,3,0)	Main sett
95a	93329 40525	6350	35	On open grass and slope to stream. Very fresh spoil heap (3,1,1)	Subsidiary sett
95b	93301 40545	6350	40	(1,0,0)	Outlying sett

Table 9.10 Badger setts 50m from the Proposed Scheme

Badger Sett Number (BS)	GPS (IS ITM)	Chainage	Distance from Proposed Scheme	Description	Sett type
102	93599 39478	6600	0	At field edge and hedgerow. Possible rabbit re-occupation (2,2,2)	Annexed sett
103	93457 40286	6600	39	In gorse thicket on fence line at top of slope. Feeding signs present, annex (2,4,0)	Annexed sett
104	93618 39475	7400	0	Lots of feeding signs nearby (2,0,0).	Outlying sett

Bats

All Bat species are protected under the EC (Natural Habitats) Regulations (1997) and the Wildlife Act 1976 (as amended).

Bat roosts

Roost sites for Bats can be found within old buildings, trees, cellars, churches, stone masonry bridges, tunnels, mines, cellars and caves. Photographs of potential Bat roosts are shown in Appendix 9.3 in Volume 3 of this EIS. These roosting areas can either be maternity (April to September), hibernation (October to February) or in the case of trees, transition or autumn mating roosts.

The results of the roost inspection survey work are summarised in Table 9.11 and 9.12, with the location of roosts illustrated on Figure 9.1 in Volume 4 of this EIS.

Table 9.11 Confirmed and potential Bat roosts in buildings

Chainage[1]	Name of roost	Species information from roost inspection (and/ or emergent survey)	Distance from Proposed Scheme (m)[2]
M11/N11 Mainline			
South of 830	Leskinfere Church	70 Natterer's Bats	1100
West of 1,500	House adjacent to the old N11	Potential Brown Long-eared Bat recorded emerging from a shed to the south of the main house.	214
West of 4,900	Ballyeden, Camolin	Brown Long-eared Bats in shed	144
East of 6,000	Clonmore, Gorey	Droppings on wall of house	406
East of 7,600	School house	Common Pipistrelle species in School house	103

Table 9.11 Confirmed and potential Bat roosts in buildings

Chainage[1]	Name of roost	Species information from roost inspection (and/ or emergent survey)	Distance from Proposed Scheme (m)[2]
East of 8,200	Rockspring, Ferns	Owners of the house have noted Bats exiting the top right window in the western side of the main house. Bat survey did not detect any emerging Bats.	32
East of 9,400	Mount George	Pipistrelle roost	215
West of 9,900	Cronyhorn	Likely roost with unoccupied house, outhouses and sheds. Bat activity 30 minutes after sunset. Bat foraging in woodland, yard and along lane towards road. No Bats seen coming from buildings.	160
West of 11,400	Ballycarrigeen Lower	Live Bat in shed connected to the main house. Dawn survey recorded Common Pipistrelle Bats entering shed attached to the house in the yard.	265
East of 12,500	Knockavocca, Ferns	Soprano Pipistrelle roost. 90 Bats counted at dusk	832
East of 13,400	Knockavocca, Ferns	Pipistrelle droppings under soffit boards	900
East of 15,700	Ted Nolan, Oulartard	Dawn survey recorded two Pipstrelles flying into a group of trees suggesting that the Bats are roosting within these mature trees. One further Pipistrelle Bat was seen entering a gap between the corrugated upper wall of a barn and the lower stone was.	309
West of 16,400	Summerville House	2 droppings of unidentified species located in grain loft	295
East of 16,700	Oulartard, Ferns	Numerous Pipistrelle droppings on wall. Dusk survey recorded 90 Soprano Pipstrelle Bats emerging on the western side.	324
West of 17,400	Church of Ireland	Brown Long-eared Bat roost. 30 counted at dusk (5%margin error)	419
West of 17,900	Garryvadden, Blackwater	Pipistrelle Roost (<5 counted emerging)	391
East of 20,300	Corbally, Enniscorthy	Potential Brown Long Eared roost (c6 counted emerging at dusk)	315
West of 23,000	Ballycourey house	Brown Long-eared Bat and Pipistrelle roost.	169
West of 23,000	Aughnagalley House	Brown Long-eared Bats found in shed. Survey recorded no Bats entering structures. Probably an occasional roost used by Brown Long-eared Bats.	963
East of 26,600	Dixons Out Farm Riverview	10 *Myotis* sp. counted emerging at dusk	99
N80 Link Road			
East of 1,400	Ballynahallin	Soprano Pipistrelle roost. 19 Bats counted at dusk	536

Table 9.11 Confirmed and potential Bat roosts in buildings

Chainage[1]	Name of roost	Species information from roost inspection (and/ or emergent survey)	Distance from Proposed Scheme (m)[2]
2,500	Linear strip of woodland, near Kilcannon	Potential Leisler's Bat roost in woodland with mature trees. Roost not found. 10-20 counted during emergent survey.	0
North of 3,100	Solsborough gate lodge	Soprano Pipistrelle roost. 37 counted.	500
North of 3,200	Yorkville House	Large roost of Soprano Pipistrelles	209
South of 3,600	Ballynabarny	Whiskered Bat roost	194
N30 Mainline			
East of 1,700	Solsborough, Enniscorthy	Bat found in shed	674
West of 3,400	Ballyorril	Brown Long-eared Bats	87
West of 4,100	Asquinton, Milehouse	Bats located in the garage	86
West of 4,300	Asquinton, Milehouse	64 Common Pipistrelle Bats counted at dusk (55 error margin).	101
East of ,000	Milehouse	Common Pipistrelle roost small number of droppings in upstairs barn.	139

[1]All chainages are approximate
[2]All distances are approximate

Table 9.12 Confirmed and potential Bat roosts in trees and woodlands

Chainage	Description of existing potential roost	Distance from Proposed Scheme (m)[2]
M11/ N11 Mainline		
1,400	Large oak trees in the vicinity may need to be removed for works or be at risk of damage.	Adjacent to alignment to the south.
1,500	Large oak trees	On alignment
1,600 to 1,700	Large Scot's pine trees	On alignment
1,900 to 2,000	Large Scot's pine trees	On alignment
2,100	Large ash trees	On alignment and 30m north of alignment.
3,300	Number of large Ash trees across alignment along the Bracken Stream	On alignment
5,350	Number of large Oak and Ash trees within hedgerow.	On alignment.
5,550	Number of large Oak and Ash trees within hedgerow.	On alignment and immediately adjacent to west of alignment.
5,800 to 6,000	Number of large Oak and Ash trees within hedgerow.	On alignment and immediately adjacent to west of alignment.
6,300	Number of large Oak trees within hedgerow/ Bracken Stream.	On alignment.
8,050	Large trees	On alignment
8,250 to 8,300	Large trees	On alignment
11,550	One mature Ash tree.	On western edge of alignment.
13,400	A number of mature Ash trees.	On alignment.

Table 9.12 Confirmed and potential Bat roosts in trees and woodlands

14,100	One mature Ash tree.	On eastern edge of alignment.
14,200	Cluster of mature Beech trees at bend in track and one mature Ash on stream bank.	On western edge of alignment.
14,225	One mature Ash on northern bank of tributary of Tinnacross (TT-06) and western edge of track.	On alignment
14,450	Mature Oak trees	On western edge of alignment.
24,250	Semi-mature trees	On or immediately adjacent to eastern edge of alignment
24,600	Semi-mature trees	On or immediately adjacent to alignment
27,200	Mature trees	On alignment.
27,500	Mature trees	On or immediately adjacent to eastern and western edge of alignment.
N80 Link Road		
2,500	Mature oak trees	On alignment.
N30 Mainline		
5,100	Semi-mature trees	On or immediately adjacent to northern edge of alignment
6,500 to 6,600	Mature trees	On alignment

Bat activity

Bats predate on insects and habitats such as rivers, wet grassland and woodland are important foraging habitats. Some Bat species may also forage over agricultural grassland and in some cases around street lights.

The results of the Bat activity surveys, around roosts and in the wider area, are shown on Figure 9.1 in Volume 4 of this EIS. Bat activity recorded during the surveys was categorised as either commuting or foraging. Bat commuting activity was recorded for Common Pipistrelle, Soprano Pipistrelle, Leisler's Bat, Natterer's Bat, Daubenton's Bat, Whiskered Bat and Brown Long-eared Bat and unidentified Pipistrelle and *Myotis* species. Bat foraging activity was recorded for Common Pipistrelle, Soprano Pipistrelle and Daubenton's Bat.

Other mammals

Other mammals protected under the Wildlife Act 1976 (as amended) that may potentially occur in the vicinity of the Proposed Scheme include Hedgehog *Erinaceus europaeus*, Pygmy Shrew, *Sorex minutus*, Irish hare *Lepus timidus hibernicus* and Stoat *Mustela erminea.*

Overwintering waterfowl

The walk over site surveys for Badgers in 2007 coincided with the wintering bird season (September to April). These surveys recorded no significant flocks of overwintering waterfowl

species within the study area. However, it is possible that overwintering waterfowl and wader species could possibly be found feeding on agricultural and wet grassland along the Proposed Scheme. Bird species such Mallard *Anas platyrhynchos*, Moorhen *Gallinula chloropus*, Dipper *Cinclus cinclus* and Coot *Fulica atra* would be expected to be inhabiting the streams, ponds and rivers within the study area.

Barn Owl

The Barn Owl is a Red Data Book species and is listed on Annex I of the EC Birds Directive. It is listed on Birdwatch Ireland's red species list as a species of high conservation concern.

An unidentified Owl species was recorded during one of the Bat surveys at Ballynakill (approximately 2.8 km west of chainage M11:9,400m). A sighting of a Barn Owl was also given by a property owner at Ballymurtagh (approximately 1.1km east of the M11/N11 Mainline at Chainage M11/N11:16,400m). A number of properties within the study area provided opportunity for Barn Owls. Some of the property owners in the study area also mentioned sightings of Barn Owls with some reporting that Barn Owls had nested in their property. During the Bat surveys many buildings suitable for Barn Owl were searched, however no evidence was found of their presence in the form of pellets and white washed staining from their droppings. Table 9.13 below lists the properties where owners reported seeing Barn Owls residing in their property; it also lists properties which were deemed to have good potential for nesting Barn Owls. These properties are also illustrated in Figure 9.1 in Volume 4 of this EIS.

Table 9.13 Potential Barn Owl roosts within the study area

Location*	Description	Approximate distance from Proposed Scheme (m)
M11/ N11 Mainline		
Barnadown, Gorey W of Ch:4,800	Barn owl sighting at old mill	613
Rockspring House E of Ch:8,400	The property provides ample opportunity for Barn Owls with large open barns and sheds	204
Oulardtard W of Ch:15,500	The property provides ample opportunity for Barn Owls with large open barns and sheds	156
Oulardtard E of Ch:15,600	Property owner has reported Barn Owls nesting in a barn. No signs of Barn Owls but shed suitable for nesting Barn Owls	249
Ballycourcy House W of Ch:22,900	Property provides ample opportunity for Barn Owls with large open barns and sheds	161
Ballyorril W of Ch:1,400	The property provides ample opportunity for Barn Owls with large open barns and sheds	110
N30 Mainline		
Ballyorril Wof Ch:1,400	The property provides ample opportunity for Barn Owls with large open barns and sheds	120
Milehouse E of Ch:5,000	The property provides ample opportunity for Barn Owls with large open barns and sheds	167

*Note: all chainages are approximate

During the habitat survey, two areas with rough grassland were identified as potential foraging habitat for Barn Owls. The first of these areas was along the banks of the River Slaney and the second was at an old farm which contained grassland that was no longer managed (at approximate Chainage M11/N11:17,800m). This site comprised of two fields of rough grassland with a small area of broadleaved woodland and hedgerows of high value.

Other Birds

During the site visits corvid species such as Jackdaw *Corvus monedula*, Rook *Corvus frugilegus*, Magpie *Pica pica* and Hooded Crow *Corvus corone cornix* were frequently recorded, as well as commonly occurring songbird species such as Blue Tit *Parus caeruleus*, Coal Tit *Parus ater*, Wren *Troglodytes troglodytes*, Robin *Erithaus rubecula*, Song Thrush *Turdus philomelos*, Blackbird *Turdus merula*, Stonechat *Saxicola torquata*, Redwing *Turdus iliacus*, Mistle Thrush *Turdus viscivorus* and Great Tit *Parus major*. These species would be expected to be making use of the farmland, woodland, treeline and hedgerow habitats within the study area for nesting and feeding purposes.

Birds of prey such as Buzzard (*Buteo buteo*), Kestrel (*Falco tinnunculus*) and Sparrow Hawk (*Accipiter nisus*) are likely to also occur within the study area. These species may be using woodland areas and rock outcrops for nesting and areas of woodlands, fields and hedgerows for hunting.

Terrestrial Invertebrates

Cardinal beetle *Pyrochroa serraticornis* (Photograph in Appendix 9.3 in Volume 3 of this EIS.) was recorded on Nettle along the Corbally Stream, near Ballynabarny Bridge (east of Chainage M11/N11 Ch: 20,200). The identification was confirmed by Roy Anderson (author of *Ground Beetles of Northern Ireland: Coleoptera – Carabidae*). This species has only been recorded from five other sites in Ireland. Cardinal eats insects, often at flowers, and the larva is found in the dead wood of oak, elm and beach.

Reptiles

Common Lizard *Zootoca vivipara* are protected under the Wildlife Act 1976 (as amended). Various habitats in the study area had the potential to support Common Lizard.

9.4.4 Aquatic Ecology

The study area contains stretches of a number of rivers, streams and tributaries. Part of the Slaney River Valley cSAC is located within the study area. In addition, the study area contains many tributaries of the Slaney such as the River Urrin, River Boro, Tinnacross Stream and Corbally Stream. The lower stretches of River Boro and the Corbally Stream are within the

Slaney River Valley cSAC and pNHA; and the lower stretch of the Tinnacross Stream and the main length of the River Boro are designated within the Slaney River Valley cSAC.

9.4.4.1 Aquatic Habitats and Flora

Lowland Rivers (FW2)

The Lowland Rivers within the study area included the River Slaney, River Bann, River Urrin, River Boro, Brackan River, Tinnacross Stream, Ballydawmore Stream, Corbally Stream, Drumgold Stream, Monroe Stream, Kilcannon Stream, Pullinstown Stream, Clavass Stream and Hollyfort Stream and their associated tributaries. These are shown on Figure 9.3 in Volume 4 of this EIS.

The River Slaney in the study area was typically 20 to 30 meters in width, with steep to moderately sloped banks with a strong rapid flow. Vegetation present on the banks included Reed Canary-grass *Phalaris arundinacea*, Meadowsweet *Filipendula ulmaria*, Bindweed *Convolvulus arvensis*, Willow *Salix* sp., Ash, Sycamore and Bramble. The non-native invasive species Indian Balsam *Impatiens glandulifera* was present in several locations. Aquatic vegetation was dominated by Pond Water Crowfoot *Ranunculus peltatus* with other Water Crowfoot species and Small/ Lesser Pondweed *Potamogeton berchtoldii/ pusillus.*

The River Urrin, Corbally Stream and the Tinnacross Stream supported similar aquatic vegetation to the River Slaney. The remaining rivers and streams within the study area were smaller with their bankside vegetation typically comprising Bramble, Nettle, Foxglove and Hogweed with Sycamore and Ash.

The ecological assessment of the rivers which the Proposed Scheme traverses, as well as significant streams in the study area, are discussed further below.

Floating river vegetation

Floating river vegetation was present in a range of watercourses and was particularly abundant in the River Slaney, River Urrin and Tinnacross Stream. Water-crowfoot species were dominant, including Pond Water-crowfoot *Ranunculus peltatus* and other Water-crowfoot species. Small/ Lesser Pondweed *Potamogeton pusillus/ berchtoldii* was also present in some areas.

Pond (Eutrophic standing water) (FL8)

A number of seasonal ponds and pools of standing water were located throughout the study area. There was a large pond located at Chainage 21,600 on the M11/ N11 Mainline that is located close to the Proposed Scheme (Tomnafunshoge Woodland and Pond). This pond was surrounded by Wet Willow-Alder-Ash and Oak-Ash-Hazel Woodland. Aquatic vegetation within the pond included Broa-leaved Pondweed *Potamogeton natans*, White Water-lily *Nymphaea alba* and Common Duckweed *Lemna minor.* The fringing vegetation included Meadowsweet, Flag Iris, Water Horsetail *Equisetum fluviatile*, Reed Canary-grass *Phalaris arundinacea,* Yellow

Pimpernel *Lysimachia nemorum*, Purple-loosestrife *Lythrum salicaria* and Skullcap *Scutellaria galericulata.* This was valued as category 'C' High value, locally important.

Q-sampling results for watercourses

EPA data

Q-sampling data from relevant EPA monitoring stations is shown in Table 9.14. Where there is sampling data for several years at a sample point, the most recent data is shown. Sample points are shown on Figure 9.3 in Volume 4 of this EIS.

Table 9.14 EPA Q-sampling data

Watercourse	Sample point	Q-Value	Water quality status	Year sampled
River Slaney	EPA 1	3-4	Slightly polluted	2007
	EPA 2	4	Unpolluted	2007
	EPA 3	4	Unpolluted	2004
	EPA 4	3-4	Slightly polluted	2007
River Bann	EPA 5	4-5	Unpolluted	2007
	EPA 6	4	Unpolluted	2007
Tinnacross Stream	EPA 7	3-4	Slightly polluted	2007
	EPA 8	4	Unpolluted	2004
	EPA 16	4	Unpolluted	2004
	EPA 17	4-5	Unpolluted	2001
Corbally Stream	EPA 9	4	Unpolluted	1991
	EPA 10	4	Unpolluted	2007
	EPA 18	4-5	Unpolluted	2004
River Urrin	EPA 11	4	Unpolluted	2007
	EPA 12	3	Unpolluted	2007
River Boro	EPA 13	4	Unpolluted	2007
	EPA 14	3-4	Unpolluted	2004
River Bracken	EPA 15	4	Unpolluted	2004

Data from the survey undertaken for this EIS, from 2007 and 2008, is shown in Table 9.15

Table 9.15 Survey Q-sampling data 2007-2008

Watercourse	Sample point	Substrate	Channel	Q-Value	Water quality status	Year sampled
River Bracken	QB1	Silt	1.5m wide 0.5m deep	3	Moderately polluted	2008
River Urrin	QA13	Gravel & stone	10m wide 0.4m deep	4	Unpolluted	2007
Ballydawmore Stream	QA2	Sand & silt	4m wide 0.3m deep	3-4	Slightly polluted	2007
	QB11	Silt & stone	2m wide 0.3m deep	3-4	Slightly polluted	2008
Clavass Stream	QA10	Gravel & silt	0.9m wide 0.2m deep	3 -4	Slightly polluted	2007
Corbally Stream	QA3	Gravel & pebble	2m wide 0.1m deep	4	Unpolluted	2007

Table 9.15 Survey Q-sampling data 2007-2008

Watercourse	Sample point	Substrate	Channel	Q-Value	Water quality status	Year sampled
	QA4	Gravel	0.4m wide 0.1m deep	3-4	Slightly polluted	2007
	QA5	Pebble, gravel & cobble	4m wide 0.4m deep	4-5	Unpolluted	2007
Drumgold Stream	QA7	Gravel & pebble	0.4m deep 0.2m wide	4-5	Unpolluted	2007
Hollyfort Stream	QA11	Gravel & pebble	2m wide 0.2m deep	3 -4	Slightly polluted	2007
Kilcannon Stream	QA1	Gravel	0.7m wide 0.01m deep	3-4	Slightly polluted	2007
Pullinstown Stream	QA12	Gravel , stone & pebble	5 m wide 0.3m deep	4	Unpolluted	2007
Tinnacross Stream	QB2	Gravel & pebble	2-3m wide 0.6m deep	4	Unpolluted	2008
	QB4	Gravel & silt	3-4m wide 0.5m deep	3	Moderately polluted	2008
	QB5	Silt	3-4m wide 0.4-0.5m deep	3-4	Slightly polluted	2008
	QB7	Sand, silt, gravel & pebble	3-3.5m wide 0.5m deep	2-3	Moderately polluted	2008
	QB8	Sand, silt, gravel & pebble	3-3.5m wide 0.5m deep	4	Unpolluted	2008
	QB9	Sand, silt, gravel & pebble	3m wide 1m deep	3-4	Slightly polluted	2008
	QB10	Sand, silt, gravel & pebble	3-3.5m wide 0.5m deep	3-4	Slightly polluted	2008
Tributary of Corbally Stream (CT1)	QA6	Silt	0.4m wide 0.1m deep	4	Unpolluted	2007
Tributary of Monroe Stream (MT2)	QA8	Gravel/silt	0.6m wide 0.1m deep	3-4	Slightly polluted	2007
	QA9	Gravel	0.8m wide 0.1m deep	4	Unpolluted	2007
Tributary of Tinnacross Stream (TT06)	QB6	Silt, small rocks & gravel	1.0m wide 0.4-0.6 deep	3	Moderately polluted	2008
Tributary of Tinnacross Stream (TT09)	QB3	Gravel & silt	1.5m wide 0.4m deep	3	Moderately polluted	2008

9.4.4.2 Aquatic Fauna

The information presented here is from a variety of sources including survey data, published data and consultation. Information of relevance from consultation with the ERFB (refer to Appendix

1.2 and Appendix 9.1 in Volume 3 of this EIS) has been incorporated into this assessment and has fed into the planning process for the Proposed Scheme.

Otter *Lutra lutra*

Otters, along with their breeding and resting places, are protected under the Wildlife Act (as amended). Otters are also listed in Annex II and Annex IV of the EC Habitats Directive. Otter will be present in the system all year round. They are not limited to large rivers but may use any source of water within their home range for foraging or exploring, including smaller streams which provide a valuable source of food and secluded areas for cover especially for females when rearing cubs. Streams are also used by dispersing juveniles or adults to travel from one catchment to the next, searching for new areas to colonise

Otters would be expected to occur within the rivers and streams within the study area. Table 9.16 describes the Otter holts that were encountered within the study area with Figure 9.1 in Volume 4 of this EIS illustrating their locations.

Table 9.16 Otter Holts located within 250m of the Proposed Scheme

Otter Holt (OH) Number	GPS REF (IS ITM)	Chainage	Distance from Proposed Scheme	Description
M11/N11 Mainline				
1	99428 33851	27,500	19	Large hole, entrance path leads directly from water. Low flow stream.
3	06984 48543	9,180	87	Fairly inactive entrance, but with path to the river
4	06981 48557	9,180	62	Large active hole under tree. Appears to be a rough path directly to the stream. Some loose straw nearby, may be bedding
5	02121 44740	15,560	36	1 entrance with moderate spoil and tracks to river
6	01161 44271	16,150	0	Open hole in ditch, with tracks to river possible Otter holt
N30 Mainline				
2	97931 44283	0,200	129	In woodland scrub beside stream.

Kingfisher *Alcedo atthis*

Kingfisher is listed on Annex I of the EC Birds Directive.

The streams, ponds and rivers within the study area provide potential foraging and nesting habitat for Kingfisher. No nesting holes were recorded during watercourse surveys.

Fish

Atlantic Salmon Salmo salar

Atlantic Salmon (hereafter referred to as Salmon) are listed on Annex II and V of the EC Habitats Directive and freshwater may be designated as salmonid waters under the EC (Quality of Salmonid Waters) regulations (1988) (S.I. 293/1988).

Salmon require watercourses with no barriers to migration, unpolluted water and suitable spawning sites. Spawning sites require water with a good oxygen flow for embryo development. These species return to the watercourses each year to spawn but also spend time at sea. Juveniles are likely to be present in the watercourses all year round. Spawning takes place during the winter, normally between November-December.

The River Slaney cSAC is considered an important spring Atlantic Salmon *Salmo salar* (and Sea Trout *Salmo trutta*) fishery under the EC (Quality of Salmonid Waters) regulations (1988). Other watercourses that are known to be salmonid that are in the vicinity of the Proposed Scheme are the Tinnacross, Corbally, Bracken, Bann and Pullinstown Stream. Salmon are known to have spawning grounds in the Slaney, Tinnacross and Corbally Streams (pers. comm. ERFB).

River Lamprey Lampetra fluviatilis, Brook Lamprey Lampetra planeri and Sea Lamprey; Petromyzon marinus

Sea and Brook Lamprey are listed on Annex II, and River Lamprey on Annex II and V of the EC Habitats Directive. River Lamprey and Sea Lamprey spend time at sea but return to watercourses each year to spawn in areas of clean gravels. Brook Lamprey spend their entire life-cycle in freshwater. Sea Lamprey migrate upstream to spawn during spring to early summer and spawn from May to June. River Lamprey migrate upstream to spawn during autumn/ spring and spawn from March to April. Downstream migration occurs from summer to early winter in both species. Brook Lamprey spawn at the same time as River Lamprey.

All watercourses in the vicinity of the Proposed Scheme are considered to have the potential to support Lamprey species (pers. comm. ERFB). A survey for Lamprey and Shad species in the River Slaney cSAC (King & Linane, 2004) found that juvenile and Brook Lamprey were widespread in the River Slaney, with spawning observed in the main channel. Juvenile river and Brook Lamprey were also recorded in the River Bann and Sea Lamprey accounted for 1% of the numbers captured. The Bracken River system has Lamprey present (pers. comm. ERFB).

Twaite Shad Alosa fallax and Allis Shad Alosa alosa

Twaite Shad and Aliis Shad are listed on Annex II and V of the EC Habitats Directive. Twaite Shad return to the watercourses each year to spawn but also spend time at sea. Juveniles are likely to be present in the watercourses all year round. Twaite Shad migrate upstream from April

to June, with peak spawning activity occurring in late May (Doherty *et al.*, 2004). Allis Shad also spend time at sea and return to freshwater to spawn in early summer.

There are no known spawning sites for Allis Shad in Ireland (King & LInane, 2004). Spawning activity for Twaite Shad has been recorded from only five large rivers in Ireland; these are all located in the south-east and include the River Slaney (NPWS, 2008). Population levels in these rivers are considered to be low and no spawning has been recorded in the recent years in the River Slaney (NPWS, 2008). Twaite Shad spawn around the top of the tide which is the old bride in Enniscorthy Town while Allis Shad mitigate upstream (pers. comm. ERFB). Allis Shad have been recorded in Colhmon at Bullcody, which is 10 km upstream of the proposed crossing over the River Slaney.

Smelt Osmerus eperlanus

Smelt are not a protected fauna species and are not listed on the EC Habitats Directive. However, they were considered 'Vulnerable' on the (out of date) Red Data List for Vertebrates (ref) and considered of conservation concern by the ERFB. Smelt have been recorded from the River Slaney (pers. comm. ERFB).

Freshwater Pearl Mussel *Margaritifera margaritifera*

Freshwater Pearl Mussel is listed on Annex II and V of the EC Habitats Directive. Freshwater Pearl Mussels are long-lived and have slow reproductive rates, both of which contribute to their sensitivity to disturbance. Their larval stage requires a salmonid fish as a host in order to develop into young mussels (Moorkens, 1999). In Ireland, native Salmon and Trout are used as a host. Freshwater Pearl Mussels are restricted by dense macrophytic or algal growth, siltation of river beds and stocking of non-salmonid fish, which they are unable to use a larval host[6]. Freshwater Pearl Mussels are present in river systems all year round. Larvae release in Ireland occurs between August and September (cited in Moorkens, 1999).

There are records of Freshwater Pearl Mussel within the River Slaney with a small population of mussels recorded in the River Bann between Bann Bridge and the railway bridge (Moorkens, Killen & Kurz; 2004). The baseline survey by Moorken (2008) (Appendix 9.2 in Volume 3 of this EIS) of sections of the River Slaney, the River Urrin, River Urrin and Slaney tributaries west of River Slaney, Slaney tributaries east of River Slaney, Tinnacross Stream and Bracken River and tributaries, found no Freshwater Pearl Mussel in any of these watercourses. Aquatic macrophyte vegetation was found in all sizes of watercourse throughout the survey. Although an Annex I habitat, *Ranunculus* beds are a negative indicator in Margaritifera rivers (Moorkens, 1999). In addition, the silt levels recorded were considered to preclude a viable population.

White-clawed Crayfish *Austropotamobius pallipes*

There are no records of White-clawed Crayfish from the study area.

Amphibians

The permanent and temporary pools would be expected to support protected amphibian species such as Common Frog *Rana temporaria* and Smooth Newt *Triturus vulgaris*

A summary of the ecological value of the watercourses in the vicinity of the Proposed Scheme is shown in Table 9.17. Part of the Corbally Stream and Tinnacross Stream are located within the River Slaney cSAC and are therefore valued at an International level 'A'.

Table 9.17 Ecological evaluation of watercourses

Watercourse	Annex II Aquatic Habitat (Floating river vegetation)	Annex II Riparian Habitat (Riparian/ alluvial woodland)	Annex II Species[1] Annex I species [2]	Additional Fisheries (notes from ERFB)	Q-value[3]	Overall Evaluation
River Bann	Yes		Freshwater Pearl Mussel, Salmon, River, Brook and Sea Lamprey Potential Otter & Kingfisher	Brown and Sea Trout	5	A
River Boro			Potential Otter & Kingfisher Potential Salmon & Lamprey	Trout	4	C
River Bracken			Brook Lamprey, Salmon Potential Otter & Kingfisher	Trout, Eel	4	C
River Slaney	Yes	Yes	Salmon, River Lamprey, Brook Lamprey, Sea Lamprey, Freshwater Pearl Mussel, Twaite Shad, Allis Shad Potential Otter & Kingfisher	Brown and Sea Trout, Eel and Smelt	4	A
River Urrin	Yes		Potential Salmon & Lamprey Potential Otter & Kingfisher	Trout,	4	C
Ballydawmore Stream			Salmon Potential Lamprey Potential Otter & Kingfisher		4	C
Clavass Stream			Salmon Potential Lamprey Potential Otter & Kingfisher	Potential Eel	4	C
Corbally Stream			Salmon* Potential Lamprey Potential Otter & Kingfisher	Brown and Sea Trout Potential Eel	5	A
Drumgold Stream			Salmon Potential Lamprey Potential Otter & Kingfisher		5	C
Hollyfort Stream			Salmon Potential Lamprey Potential Otter & Kingfisher	Potential Eel	4	C
Kilcannon Stream			Potential Otter & Kingfisher	Limited fisheries value	4	D

Table 9.17 Ecological evaluation of watercourses

Watercourse	Annex II Aquatic Habitat (Floating river vegetation)	Annex II Riparian Habitat (Riparian/ alluvial woodland)	Annex II Species[1] Annex I species [2]	Additional Fisheries (notes from ERFB)	Q-value[3]	Overall Evaluation
Monroe Stream			Salmon Potential Lamprey Potential Otter & Kingfisher	Eel	No Q sampling	C
Pullinstown Stream			Salmon* Potential Lamprey Potential Otter & Kingfisher	Trout	4	B
Scurlocksbush Stream			Potential Lamprey Potential Otter & Kingfisher			C
Tinnacross Stream	Yes	Yes	Salmon* Lamprey Potential Otter & Kingfisher	Trout, Eel	5	A
Tributary of Ballydawmore Stream (BT4)			Potential Otter & Kingfisher	Limited fisheries value	No Q sampling	D
Tributary of Ballydawmore Stream (unnamed)			Potential Otter & Kingfisher	Limited fisheries value	No Q sampling	D
Tributary of Ballydawmore Stream (unnamed)			Potential Otter & Kingfisher	Limited fisheries value	No Q sampling	D
Tributary to Bracken River (BRT02)			Potential Salmon, Lamprey Potential Otter & Kingfisher	Eel	No Q sampling	C
Tributary to Bracken River (BRT08)			Potential Otter & Kingfisher	Fishery value not stated	No Q sampling	D
Tributary of Corbally Stream (CT1)			Salmon Potential Otter & Kingfisher	Trout	4	C
Tributary of Corbally Stream (CT2)			Potential Otter & Kingfisher	Limited fisheries value	No Q sampling	D

Table 9.17 Ecological evaluation of watercourses

Watercourse	Annex II Aquatic Habitat (Floating river vegetation)	Annex II Riparian Habitat (Riparian/ alluvial woodland)	Annex II Species[1] Annex I species [2]	Additional Fisheries (notes from ERFB)	Q-value[3]	Overall Evaluation
Tributary of Drumgold Stream (DT3)			Potential Salmon & Lamprey Potential Otter & Kingfisher	Potential Eel	No Q sampling	C
Tributary of Drumgold Stream (DT6)			Potential Salmon & Lamprey Potential Otter & Kingfisher	Potential Eel	No Q sampling	C
Tributary of Hollyfort Stream (HT3)			Potential Salmon & Lamprey Potential Otter & Kingfisher	Potential Eel	No Q sampling	C
Tributary of Monroe Stream (MT1_2)			Potential Otter & Kingfisher	Limited fisheries value	No Q sampling	D
Tributary of Monroe Stream (MT2)			Salmonid Potential Otter & Kingfisher		4	C
Tributary of Monroe Stream (MT2_1)			Potential Salmon & Lamprey Potential Otter & Kingfisher	Potential Eel	No Q sampling	C
Tributary of River Urrin (UT7)			Salmon Potential Otter & Kingfisher		No Q sampling	C
Tributary of River Urrin (UT11)			Potential Salmon & Lamprey Potential Otter & Kingfisher	Potential Eel	No Q sampling	C
Tributary or River Urrin (unnamed)			Potential Otter & Kingfisher	Limited fisheries value	No Q sampling	D
Tributary of Tinnacross Stream (TT06)			Potential Salmon & Lamprey Potential Otter & Kingfisher	Potential Eel	3	C
Tributary of Tinnacross Stream (TT09)			Potential Salmon & Lamprey Potential Otter & Kingfisher	Potential Eel	3	C

*Considered by the ERFB to be an important Salmonid tributary to the River Slaney
[1]EC Habitats Directive
[2]EC Birds Directive
[3]The value shown is the highest quality rating for the watercourse out of all sampling points

9.4.5 Summary of ecological evaluation

All habitats that are of 'Ecological Value' rating of C and above are considered to be 'Ecologically Sensitive Receptors'. These are listed in Table 9.18. In addition, all species that are valued at National and International level are considered to be Ecologically Sensitive Receptors (Table 9.x). Designated sites have only been included where there is potential that they may be impacted by the Proposed Scheme. For habitats, the highest rating is shown.

Table 9.18 Summary of Ecologically Sensitive Receptors

Sensitive receptor	Evaluation
Designated sites	
River Slaney cSAC	International
Wexford Harbour and Slobs SPA	International
Ballynabarney Wood pNHA	National
Terrestrial ecology	
Terrestrial habitats	
Wet grassland	C
Broadleaved woodland	C
Oak-ash-hazel woodland	C
Wet Willow-alder-ash woodland	C
Hedgerow High value	C
Terrestrial fauna	
Badger	National
Bat	International
Other mammals (Hedgehog, Pygmy Shrew, Irish hare & Stoat)	National
Overwintering wildfowl	Local
Barn Owl	International
Cardinal Beetle	National
Common Lizard	National
Aquatic ecology	
Watercourses	
River Bann	A
River Boro	C
River Bracken	C
River Slaney	A
River Urrin	C
Ballydawmore Stream	C
Clavass Stream	C
Corbally Stream	A
Drumgold Stream	C
Hollyfort Stream	C
Monroe Stream	C
Pullinstown Stream	B
Scurlocksbush Stream	C
Tinnacross Stream	A
Tributary to Bracken River (BRT02)	C
Tributary of Corbally Stream (CT1)	C

Table 9.18 Summary of Ecologically Sensitive Receptors

Sensitive receptor	Evaluation
Tributary of Drumgold Stream (DT3)	C
Tributary of Drumgold Stream (DT6)	C
Tributary of Hollyfort Stream (HT3)	C
Tributary of Monroe Stream (MT2)	C
Tributary of Monroe Stream (MT2_1)	C
Tributary of River Urrin (UT7)	C
Tributary of River Urrin (UT11)	C
Tributary of Tinnacross Stream (TT06)	C
Tributary of Tinnacross Stream (TT09)	C
Aquatic fauna	
Fish (Atlantic Salmon, Twaite Shad, River, Sea and Brook Lamprey)	International
Freshwater Pearl Mussel	International
Otter	International
Kingfisher	International
Common Frog	National

9.5 CHARACTERISTICS OF THE PROPOSED SCHEME

A detailed description of the Proposed Scheme is provided in Chapter 3 of this EIS and key points relevant to the ecological impact assessment only are summarised here. The proposed development area is approximately 39 km long, with the M11/N11 Mainline approximately 27 km, the N80 Link Road approximately 4 km and the N30 Mainline approximately 8 km in length. M11/N11 Mainline is standard dual motorway; the N80 Link Road is type 2 dual carriageway and the N30 Mainline is standard single carriageway.

The Proposed Scheme will include a bridge crossing at the River Slaney and one at the River Urrin. In addition to these two bridges, culverts will generally be included where proposed passes over a watercourse. There will be approximately 23 watercourse crossings (culverts) in addition to the above bridges. These will be a mixture of box and bottomless culverts; bottomless culverts are proposed in locations that have been highlighted by the Eastern Region Fisheries Board (ERFB).

A bridge with a main, central span of approximately 70m is the option chosen to cross over the River Slaney. This main span also crosses over the Dublin–Wexford railway, thus providing a clear span over the cSAC and the railway. The total length spanned at this location is approximately 153m. This total span length includes two side spans, each of approximately 42m. One side span is over Local Road L-2020-2. The other side span facilitates uninterrupted flow of flood waters immediately adjacent to the western bank of the river channel. The main span includes a 5m minimum width immediately adjacent to the western bank of the River Slaney that is clear of any structural elements, such as piers. On the western approach to this bridge is an earthworks embankment, which takes the N80 Link Road over an area of the River Slaney

flood plain. A series of flood relief culverts are included within this embankment. . These culverts, together with the bridge side span on the western bank of the river channel, will facilitate the continued migration of flood waters down the River Slaney.

The design flow for the structure together with the adjacent flood relief culverts will be a 100 year flood rate plus a proposed climate change allowance of a 20% increase in peak flow rates. The structure together with the adjacent flood relief culverts will result in minimal changes to the flood regime and will avoid contraction of the overbank flood flow. Consequently the predicted impact upstream of the structure for the design flood condition is small (refer to the hydraulic assessment of the proposed River Slaney bridge crossing included in Appendix 3.1 in Volume 3 of the EIS). Within the preliminary design, as described in the EIS, the flood relief provisions comprise 10 No. flood relief culverts, 4.8m wide by 3.0m high spaced equally at 14.4m centres

At outfall locations, the proposed road drainage systems for the national routes will flow via petrol / oil bypass interceptors into balancing ponds before discharging into watercourses. The balancing ponds will be designed so that the maximum rate of outflow into the receiving waters will be, at most, equivalent to the existing greenfield runoff rate. The design of the balancing pond will be undertaken in accordance with UK DMRB HA 103 and will be based on a 100-year storm event with a duration of 48 hours. The design will also include for a 20% increase in rainfall intensity, to account for climate change in accordance with current best management practice of the UK DMRB HD 33. Balancing ponds will be planted with species such as Common Reed Phragmites australis, Bulrush Typha latifolia, Yellow Iris Iris pseudacorus and Reed Canary-grass Phalaris arundinacea as these wetland species will assist in trapping and removing silt, nutrients and other potential pollutants.

Full details of the development and watercourse crossings are provided in Chapter 3 of the EIS.

9.6 POTENTIAL IMPACTS OF THE PROPOSED SCHEME

As per IEEM guidelines, impacts have been assessed for ‘Ecologically Sensitive Receptors’ only, as listed in the summary of ecological evaluation.

9.6.1 Construction Phase

9.6.6.1 Impacts which apply to the entire scheme

Designated sites

There are two International level designated sites within the vicinity of the Proposed Scheme, the River Slaney cSAC and Wexford Harbour and Slobs SPA. In view of the proximity of the Proposed Scheme to these two sites (the N80 Link Road of Proposed Scheme will cross the River Slaney cSAC), it is necessary that the proposal should have due regard to Regulations 30 and 33 of the Habitats Regulations (1997).

As significant negative impacts, in the absence of mitigation, on the River Slaney cSAC could not be ruled out, information for an 'Appropriate Assessment' has been compiled and is included in Appendix 9.5 in Volume 3 of this EIS. This details the potential impacts to the cSAC resulting from the Proposed Scheme.

Stage One of the 'Appropriate Assessment' screening process had a finding of no significant negative impacts on Wexford Harbour and Slobs SPA. A 'Findings of No Significant Effects' report is provided in Appendix 9.6 in Volume 3 of this EIS, in order to provide transparency of decision-making, and to ensure the application of the 'precautionary principle'.

There is one National level designated site within the vicinity of the Proposed Scheme, Ballnabarney Wood pNHA. This is located along the banks of the River Corbally. There is no landtake of any part of this designated site. Potential negative impacts on this site as a result of construction activities would therefore be related to changes to water quality, siltation and invasive species. These issues are discussed in the aquatic ecology sections below and have also been assessed as part of the River Slaney cSAC 'Appropriate Assessment' as Ballnabarney Wood pNHA is located within this cSAC.

Terrestrial ecology

Terrestrial habitats

The main impact on terrestrial habitats that are considered ecologically sensitive receptors will be direct loss due to landtake by the Proposed Scheme. The loss of any such habitat type has been minimised as far as possible through the planning process which included consideration of these habitat types at Constraints and Route Selection stages, as well as during the development of the Preliminary Design of the Proposed Scheme. Nonetheless it has been unavoidable that some areas of semi-natural habitat of local conservation will be removed by the Proposed Scheme. Where possible, the routing of the Proposed Scheme has been chosen to avoid passing through the centre of any blocks or linear habitat features so as to minimise fragmentation effects. The habitats of ecological value that will be lost due to landtake are detailed below for each section of the scheme.

Badgers

There is potential for negative impacts on Badgers as a result of permanent loss of setts located within the landtake extents of the Proposed Scheme. In addition, during construction works, there may be disturbance and injury to and/or loss of individuals within setts located within 50m of the Proposed Scheme. The setts that may be affected are outlined below for each section of the scheme.

Bats

The main potential impact to Bats during the construction phase is the direct loss of roosts and foraging ground as a result of landtake, including potential injury to and / or loss of individuals during building demolitions and tree felling.

Other mammals

The loss of areas of habitat such as Hedgerows, Treelines, Broad-leaved Woodland and Wet Grassland will have an impact on additional mammal species that use these habitats for breeding and foraging. These include species protected under the Wildlife Act, 1976 (as amended), such as Pygmy Shrew, Hedgehog, Stoat and Hare. In addition, there may be disturbance and injury to and/ or loss of individuals resulting from vegetation clearance work. It is probable that this would have a significant, long-term, negative impact on these species at a Local level.

Overwintering waterfowl

The main sites for waterfowl within the study area are located on the River Slaney and are not in the vicinity of the Proposed Scheme. Therefore there are no predicted impacts from the Proposed Scheme on these populations (see also the section on designated sites, above, and the FONSE report for Wexford Harbour and Slobs SPA, Appendix 9.6 in Volume 3 of this EIS).

Waterfowl may be using land such as wet grassland within the vicinity and/ or landtake of the Proposed Scheme. As no significant populations of any species were found, the loss of these habitats would not comprise a significant negative impact on waterfowl.

Barn Owl

The main potential impact to Barn Owl during the construction phase is the direct loss of nesting locations and foraging ground as a result of landtake, including potential injury to and / or loss of individuals and their nests and eggs during building demolitions. As Barn Owls are of high conservation concern, these impacts would comprise a probable significant negative impact at a National level.

Other birds

If vegetation is cleared during the bird nesting season then there is the potential for disturbance and injury to and/ or loss of individuals, nests and eggs of birds that are nesting in these habitats. These habitats include all areas of Woodland, Treelines, Hedgerow, Grassland and/ or Scrub. It is probable that this would have a probable significant, negative impact on these species at a Local level.

Terrestrial invertebrates

There is no predicted impact on the Cardinal Beetle as the area in which it was recorded is 320m from the Proposed Scheme and is not included in the landtake.

Common Lizard

Clearance of vegetation will lead to a loss of habitat for Common Lizard and may result in injury, disturbance or loss of individuals. There is little accurate information on the current status of the Common Lizard in Ireland, although it is likely to be widespread. Given that Common Lizard is likely to be fairly abundant within the local area, but taking into account the lack of available information, these impacts are predicted to have an unlikely, significant negative impact at a Local level.

Aquatic ecology

The impacts of construction activities on depositing lowland rivers, floating river vegetation, protected fish species, Freshwater Pearl Mussel, Kingfisher and Otter are closely linked and relate to factors such as direct loss of habitat (including spawning and feeding grounds), decreases in water quality and disturbance. These are outlined for each group below. Impacts for the whole scheme are assessed for individual species. However, as impacts for each species are closely linked, impacts for each section of the scheme have been assessed in relation to each watercourse, rather than for individual species. This is also the level at which most mitigation action will be undertaken.

Watercourse impacts are detailed for each section of the Proposed Scheme. The number of culverts and stream diversions impacts on all ecologically sensitive watercourses and their upstream tributaries are shown for each section. This information has been used to determine the likely negative impacts resulting from the construction Proposed Scheme. In determining the magnitude and duration of the impacts, factors such as the ecological evaluation of the watercourse and the life-cycle of ecologically sensitive species have been taken into account. The impact stated is related to the most sensitive species in a particular watercourse.

Lowland rivers

Watercourse crossings will be constructed as part of the Proposed Scheme. Except where clear span bridges are to be constructed, these crossings will comprise box or bottomless culverts and their construction will involve the loss or damage of riparian habitat permanently lost as part of landtake for the Proposed Scheme. In addition, during construction of watercourse crossings, there is the potential for negative impacts on water quality resulting from improper management of silt laden surface water run off and pollution from substances used in construction. Watercourse crossings for each section of the Proposed Scheme are discussed in more detail below.

Some watercourses are to be diverted in addition to culverting; usually this is to reduce the length of the watercourse that requires culverting. This may change the nature of the watercourse substrate at that location and, as above, their may be negative impacts to water

quality due to run-off of substances such as silt during diversion work. This could impact a range of flora and fauna species, the specifics of which are discussed in further detail below.

There is also the potential that fuels and chemicals used during construction of the Proposed Scheme could enter watercourses and negatively impact on water quality. This could impact a range of flora and fauna species, the specifics of which are discussed in further detail below.

Floating river vegetation

Floating river vegetation was present in a number of watercourse crossing locations. The construction of the crossings will lead to the loss of a stretch of this habitat within the watercourse at each location. As this EC Habitats Directive Annex I habitat is locally abundant, loss of floating river vegetation from watercourse crossing points would be a probable, permanent, significant negative impacts at a Local level.

Riparian woodland

Small linear areas of riparian woodland was present at a few watercourse crossing locations. The construction of the crossings will lead to the loss of areas of this habitat on the banks of the watercourse at each location. As this EC Habitats Directive Annex I habitat is locally abundant, loss of small amounts at watercourse crossing points are unlikely to be significant.

Pond

There was one large pond located to the east of the M11/ N11 Mainline at chainage 21,600. Potential impacts to this pond could arise as a result of the construction of an upstream watercourse crossing, leading to silt run-off. However, as this pond was naturally eutrophic and contained a range of species characteristic of moderately enriched, partially shaded water, it is not considered likely that the construction of one watercourse crossing would have a significant negative impact on water quality.

Protected fish species

Fish species such as Atlantic Salmon, River Lamprey, Brook Lamprey, Sea Lamprey, Twaite Shad and Allis Shad could be negatively impacted by changes to water quality and increases in silt levels in watercourses. Fish could be impacted both within watercourses where in-stream works are being undertaken and in downstream watercourses. This would comprise a probable, significant temporary negative impact at a National level.

In addition, some gravel beds used as spawning grounds may be lost as a result of culvert construction. This would comprise a probable, significant long-term negative impact at a Local level.

These impacts are considered as part of the overall impacts to watercourses, outlined in detail for each section of the scheme below.

Freshwater Pearl Mussel

Freshwater Pearl Mussel was not found in any of the watercourses that are to have in-stream works undertaken. However there may be downstream impacts on Freshwater Pearl Mussel as a result of construction activities. Freshwater Pearl Mussel are long-lived and have slow reproductive rates, both of which contribute to their sensitivity to disturbance. They are highly sensitive to eutrophication from nutrient enrichment (which leads to dense macrophyte or algal growth) and siltation of river beds. Due to their sensitivity, impacts to this species would comprise a probable, significant, permanent impact at an International level.

Otter

The potential impacts to Otters from the Proposed Scheme are decreased water quality (which leads to a decline in prey abundance), loss or modification of bankside habitats used for breeding and mortality e.g. from roads and fragmentation. In addition there may be loss of breeding holts due to landtake and disturbance to breeding females during the breeding season. Otters are abundant in the local area and relatively mobile and able to move to new areas. Therefore the above impacts would be expected to comprise probable, significant, short and long-term negative impacts at a Local level.

Kingfisher

Kingfisher nest in holes in the banks of watercourses and therefore if in-stream works were to be undertaken near to a nesting site during the nesting season, then this could result in disturbance or loss of individuals and nests. In addition, negative impacts on water quality may decrease food availability for Kingfisher. As Kingfishers are relatively abundant and able to forage over wide area, the above impacts would comprise a probable, short-term significant negative impact at a Local level.

Common Frog

Where small watercourses, such as drainage ditches, and ponds are within the landtake area there may be impacts to Common Frog. Adults are relatively mobile and should be able to escape disturbance and move to new areas for feeding. However, during the spawning season there may be impacts to larvae and eggs which are not mobile. These impacts would comprise a probable, short-term significant negative impact at the Local level.

9.6.1.2 Impacts specific to the M11/N11 Mainline

<u>Terrestrial ecology</u>

Terrestrial habitats

The areas of habitat that are to be lost due to landtake of the Proposed Scheme are listed in Table 9.19.

Table 9.19 M11/ N11 Mainline: Habitats of ecological value within landtake of the Proposed Scheme

Habitat	Chainage	Site name/ location	Evaluation	Impact
GS4 Wet grassland	16,800 – 16,900	Crane Tinnacross Wet Grassland and Broadleaved Woodland	C	Direct loss of 1095m^2 of a total of 1900m. In addition, indirect impacts due to changes in hydrology are likely to result in an ultimate permanent change in the nature of the habitat that remains.
WD1 Broadleaved Woodland	1,400	Clogh Broadleaved Woodland	C	Direct loss of 400m^2
	5,300	Medophall Broadleaved Woodland	C	Direct loss of 1030m^2 of direct habitat loss out of a total block of 3820m2.Indirect impacts may also arise given the wet influences on this habitat. These may result in an ultimate permanent change in the nature of the habitat that remains.
	9,250	Mountgeorge Broadleaved Woodland	C	Direct loss of 2,737m^2 of 16,365m^2. An additional 1,664m^2 falls outside of the scheme alignment but within the CPO line for the purposes of making lands available for the provision of an artificial setts. This will be protected from damage during construction works.
	13,400	Myaugh Tinnacross Broadleaved Woodland	C	Direct loss of 4,750m^2 from 17,425m^2. An additional 3,329m^2 of habitat is included within the CPO but will not be made available to the successful Contractor and will be protected from construction works.
	16,800 – 16,900	Crane Tinnacross Wet Grassland and Broadleaved Woodland	C	There will be no direct habitat loss from this area, however there is potential for indirect impacts given the proximity of this woodland to the CPO line.
WN2 Oak-Ash-Hazel Woodland	21,700	Tomnafunshoge Woodland and Pond	C	No direct habitat loss but CPO line runs immediately adjacent. No predicted negative impact.
WN6 Wet Willow-Alder-Ash Woodland	3,130 (approx. 30m east of Proposed Scheme alignment, within CPO)	Ballygullen Wet Woodland	C	Entire block of woodland to be removed; approx. 1,640 in total.
	4,150	Ballyoughter Wet Woodland	C	190m^2 of a total area of 1080m^2 will be lost through direct habitat removal. Indirect impacts are

Table 9.19 M11/ N11 Mainline: Habitats of ecological value within landtake of the Proposed Scheme

Habitat	Chainage	Site name/ location	Evaluation	Impact
				likely to effect hydrology of the wet woodland, resulting in an ultimate permanent change in the nature of the habitat.
	5,550 to 5,750	Medophall Wet Woodland	C	No direct habitat loss but CPO line runs immediately adjacent. Indirect impacts are likely to effect hydrology of the wet woodland, resulting in an ultimate permanent change in the nature of the habitat that remains.
	21,600	Tomnafunshoge Woodland and Pond	C	No direct habitat loss but CPO line runs immediately adjacent. No predicted negative impact.
WL1 Hedgerows of High Conservation Value	n/a	n/a	C	Partial removal of 104 hedgerows = 8,642km

Terrestrial fauna

Badgers

There were 41 Badger setts located within 50 metres of the Proposed Scheme (shown on Table 9.20), of which 22 are within the landtake area. Three of the setts within the landtake area are Main setts.

Table 9.20 M11/ N11 Mainline: Badger setts 50m from the Proposed Scheme

Badger Sett Number	Chainage	Distance from Proposed Scheme	Sett type	Impact
112	1,900	0	Outlying	Within landtake. Destruction of sett.
3	1,920	0	Outlying	Within landtake. Destruction of sett.
4	2,230	0	Main Sett	Within landtake. Destruction of sett.
9	4,300	0	Possible outlying sett	Within landtake. Destruction of sett.
10	5,250	7	Outlying	Just outside landtake. Possible disturbance.
146	6,790	0	Outlying	Within landtake. Destruction of sett.
147	7,820	0	Subsidiary	Within landtake. Destruction of sett.
134	8,100	0	Outlying	Within landtake. Destruction of sett.
136	8,800	32	Status undetermined	Outside landtake. Possible disturbance.
137	9,100	6	Outlying	Just outside landtake. Possible disturbance.

Table 9.20 M11/ N11 Mainline: Badger setts 50m from the Proposed Scheme

Badger Sett Number	Chainage	Distance from Proposed Scheme	Sett type	Impact
13	9,200	0	Subsidiary sett	Within landtake. Destruction of sett.
14	9,200	0	Inactive main sett	Within landtake. Destruction of sett.
15	9,200	0	Main sett	Within landtake. Destruction of sett.
18	9,200	0	Annexe	Within landtake. Destruction of sett.
150	9,330	0	Outlying	Within landtake. Destruction of sett.
22	10,400	26	Outlying	Outside landtake. Possible disturbance.
23	11,600	35	Outlying	Outside landtake. Possible disturbance.
151	11,430	0	Outlying	Within landtake. Destruction of sett.
153	12,580	4	Outlying	Just outside landtake. Possible disturbance.
154	12,620	47	Outlying	Outside landtake. Possible disturbance.
127	13,150	8	Outlying	Just outside landtake. Possible disturbance.
24	13,400	0	Outlying sett	Within landtake. Destruction of sett.
25	13,400	0	Inactive main sett	Within landtake. Destruction of sett.
26	13,400	0	Main sett	Partially within landtake. Partial destruction of sett and possible disturbance.
29	14,800	15	Possible outlying sett	Outside landtake. Possible disturbance.
138	15,650	0	Outlying	Within landtake. Destruction of sett.
31	16,900	0	Possible outlying sett	Within landtake. Destruction of sett.
34	17,800	0	Outlying	Within landtake. Destruction of sett.
132	17,900	18	Main sett	Outside landtake. Possible disturbance.
42	21,900	26	Outlying	Outside landtake. Possible disturbance.
49	23,250	32	Outlying	Outside landtake Possible disturbance.
56	24,600	39	Annexed sett	Outside landtake. Possible disturbance.
57	24,500	0	Main sett	Within landtake. Exclude and excavate under licence from NPWS. An artificial sett will be constructed approx 50m N.
58	24,600	12	Annexed sett	Just outside landtake. Possible disturbance.
59	25,800	0	Outlying sett	Within landtake. Exclude and excavate under licence from NPWS.
63	26,200	46	Outlying setts	Outside landtake. Possible disturbance.
66	27,600	0	Outlying sett	Within landtake. Destruction of sett.
67	27,800	46	Outlying sett	Outside landtake. Possible disturbance.

Table 9.20 M11/ N11 Mainline: Badger setts 50m from the Proposed Scheme

Badger Sett Number	Chainage	Distance from Proposed Scheme	Sett type	Impact
68	27,900	20	Outlying sett	Outside landtake. Possible disturbance.
69	28,000	39	Outlying sett	Outside landtake Possible disturbance.
70	28,000	17	Outlying sett	Outside landtake. Possible disturbance.

Bats

Three buildings are to be demolished on this section of the Proposed Scheme (Table 9.21). No buildings to be demolished were found to contain roosts at time of survey. However it is difficult to conclusively rule out Bat use of buildings and therefore the impact has been assessed under the potential scenario that Bats are present in some / all of the buildings.

Table 9.21 M11 / N11 Mainline: Buildings and structures to be demolished

Townland	Chainage (m)	Description	Location
Ballymore	7580	Cottage	Under M11 Mainline
Rockspring	8380	Ruins	Under Access Road
Tomnafunshoge	21000	Partially constructed house	Under M11 Mainline

There were 18 locations where trees and/ or groups of trees that were considered to have the potential to support Bats were either on alignment or nearby. These are shown in Table 9.12. There is potential for disturbance and/ or loss of individuals if these trees were to contain Bat roosts at the time of construction.

Summary of construction impacts on terrestrial ecology

A summary of construction impacts on terrestrial ecology is shown in Table 9.22 below.

Table 9.22 M11 / N11 Mainline: Summary of construction impacts on terrestrial ecology

Ecologically Sensitive Receptor	Ecological Evaluation	Nature of impact	Magnitude/ extent of impact	Overall impact
Wet grassland	C	Loss of habitat due to landtake	1,095m^2	Probable, significant long-term negative impact at a Local level.
Broadleaved Woodland	C	Loss of habitat due to landtake	8,917m^2	Probable, significant long-term negative impact at a Local level.
Oak-ash-hazel woodland	C	Loss of habitat due to landtake	1,640 m^2	Probable, significant long-term negative impact at a Local level.

Table 9.22 M11 / N11 Mainline: Summary of construction impacts on terrestrial ecology

Ecologically Sensitive Receptor	Ecological Evaluation	Nature of impact	Magnitude/ extent of impact	Overall impact
Wet willow-alder-ash woodland	C	Loss of habitat due to landtake	1,830 m^2	Probable, significant long-term negative impact at a Local level.
Hedgerows	C	Loss of habitat due to landtake	8,642 km	Probable, significant long-term negative impact at a Local level.
Badger	National	Disturbance, injury and/ or loss of individuals and loss of setts due to landtake	Potential disturbance to 41setts located within 50m of the proposed scheme. Loss of 22 setts (including 3 Main setts) due to landtake.	Probable, significant short-term negative impact at a Local level.
Bats	International	Potential loss of roosts due to building demolition and felling of mature trees. Potential injury and / or loss of individuals	No buildings to be demolished and only one woodland to be felled were found to contain roosts at time of survey. However it is difficult to conclusively rule out Bat use of buildings/ trees.	(Assessed as if Bats present in buildings and suitable trees). Probable, significant short-term negative impact at a Local level.

Aquatic ecology

The number of culverts and stream diversions and their potential impacts on all ecologically sensitive watercourses (and their upstream tributaries) are shown in Table 9.23.

Table 9.23 M11/ N11 Mainline: Potential construction impacts on watercourses

Watercourse	Evaluation	Annex I[1] or II [2] species present	Water quality status[3] & pollution risk assessment[4]	Culverts	Diversions	Upstream impacts from Proposed Scheme	Impact
River Bracken	C	Brook Lamprey, Salmon Potential Otter & Kingfisher	Unpolluted	1	1	1 culvert on upstream tributary BRT08	Probable short-term significant negative impact at Local level
River Bracken Tributary (BRT02)	C	Potential Salmon, Lamprey Potential Otter & Kingfisher	Not known	1	No	None	Probable short-term significant negative impact at Local level
Tinnacross Stream	A	Salmon* Lamprey Potential Otter & Kingfisher	Unpolluted - probably not at significant risk from pollution	8*	7	3 culverts on upstream tributaries TT09 & TT06	Probable medium-term significant negative impact at a National level.
Tributary of Tinnacross Stream (TT06)	C	Potential Salmon & Lamprey Potential Otter & Kingfisher	Moderately polluted	2	0	None	Probable short-term significant negative impact at Local level
Tributary to Tinnacross Stream (TT09)	C	Potential Salmon & Lamprey Potential Otter & Kingfisher	Moderately polluted	1	1	None	Probable short-term significant negative impact at Local level
Ballydawmore Stream	C	Salmon Potential Lamprey Potential Otter & Kingfisher	Unpolluted	1	1	1 culvert on upstream tributary CT4	Probable short-term significant negative impact at Local level
Corbally Stream	A	Salmon* Potential Lamprey Potential Otter & Kingfisher	Unpolluted - at significant risk from pollution	1*	0	2 culverts on upstream tributaries CT1 & CT2	Probable medium-term significant negative impact at a National level.
Tributary of Corbally Stream (CT1)	C	Salmon Potential Otter & Kingfisher	Unpolluted	1	0	None	Probable short-term significant negative impact at Local level

Table 9.23 M11/ N11 Mainline: Potential construction impacts on watercourses

Watercourse	Evaluation	Annex I[1] or II [2] species present	Water quality status[3] & pollution risk assessment[4]	Culverts	Diversions	Upstream impacts from Proposed Scheme	Impact
Drumgold Stream	C	Salmon Potential Lamprey Potential Otter & Kingfisher	Unpolluted	2	1	2 culverts on upstream tributaries DT3 & DT6	Probable short-term significant negative impact at Local level
Tributary of Drumgold Stream (DT3)	C	Potential Salmon & Lamprey Potential Otter & Kingfisher	Not known	1	1	None	Probable short-term significant negative impact at Local level
Tributary of Drumgold Stream (DT6)	C	Potential Salmon & Lamprey Potential Otter & Kingfisher	Not known	1	0	None	Probable short-term significant negative impact at Local level
Monroe Stream	C	Salmon Potential Lamprey Potential Otter & Kingfisher	Not known	0	0	2 culverts & 1 outfall on upstream tributaries (MT1_2, MT2 & MT2_2)	Probable short-term significant negative impact at Local level
Tributary of Monroe Stream (MT2)	C	Salmonid Potential Otter & Kingfisher	Unpolluted	2	2	None	Probable short-term significant negative impact at Local level
Tributary of Monroe Stream (MT2_1)	C	Potential Salmon & Lamprey Potential Otter & Kingfisher	Not known	1	1	None	Probable short-term significant negative impact at Local level
Scurlocksbush Stream	C	Potential Lamprey Potential Otter & Kingfisher	Not known	0	0	None	No predicted significant impacts

Table 9.23 M11/ N11 Mainline: Potential construction impacts on watercourses

Watercourse	Evaluation	Annex I[1] or II [2] species present	Water quality status[3] & pollution risk assessment[4]	Culverts	Diversions	Upstream impacts from Proposed Scheme	Impact
River Slaney	A	Salmon, River Lamprey, Brook Lamprey, Sea Lamprey, Freshwater Pearl Mussel, Twaite Shad, Allis Shad Potential Otter & Kingfisher	Unpolluted - at significant risk from pollution	0	0	13 Culverts & 8 outfalls on upstream tributaries Bracken, Drumgold, Tinnacross, Corbally, Ballydawnmore (tributaries to these watercourses not included)	Probable medium-term significant negative impact at International level
River Bann	A	Freshwater Pearl Mussel, Salmon, River, Brook and Sea Lamprey Potential Otter & Kingfisher	Unpolluted - at significant risk from pollution	0	0	1 culvert & 1 outfall on upstream tributary BRT02 (approx. 4.3km upstream)	Probable long-term significant negative impact at International level

*Potential loss of small areas of Salmonid spawning gravels and pool habitat at culvert locations
[1]EC Habitats Directive
[2]EC Birds Directive
[3]The water quality status relates to highest quality Q-sampling rating for the watercourse out of all sampling points
[4]SERBD Pollution risk assessment value: refer to Chapter 11 for full details. Data not available for all watercourses.

Otter

There are five Otter holts located within 150m of the M11/ N11 section of the Proposed Scheme. If breeding females and cubs are using these holts at the time of construction then they may suffer disturbance. In addition, one holt is located within the landtake of the Proposed Scheme.

Table 9.24 N80 Link : Otter Holts located within 150m of the Proposed Scheme

Otter Holt (OH) Number	Chainage	Distance from Proposed Scheme
1	27,500	19
3	9,180	87
4	9,180	62
5	15,560	36
6	16,150	0

9.6.1.3 Impacts specific to the N80 Link Road

Terrestrial ecology

Terrestrial habitats

The areas of habitat that are to be lost due to landtake of the Proposed Scheme are listed in Table 9.25.

Table 9.25 N80 Link Road: Habitats of ecological value within landtake of the Proposed Scheme

Habitat	Chainage	Site name/ location	Evaluation	Impact
Oak-ash-hazel woodland	2,500	Kilcannon Broadleaved Woodland	C	2000m^2 out of a block of 33,800m to be removed, causing severance to a linear woodland feature.

Badgers

There were 3 Badger setts located within 50 metres of the Proposed Scheme (shown on Table 9.26), of which none are within the landtake area.

Table 9.26 N80 Link Road: Badger setts 50m from the Proposed Scheme

Badger Sett Number	Chainage	Distance from Proposed Scheme	Sett type	Impact
143	0,700	26	Outlying	Outside landtake. Possible disturbance.
105	1,100	23	Outlying	Outside landtake. Possible disturbance.
110	2,500	46	Main Sett	Outside landtake. Possible disturbance.

Bats

There was a potential Leisler's Bat roost at chainage 2,500 within a linear strip of woodland. This area of woodland is within the landtake of the Proposed Scheme. There was an additional locations where trees that were considered to have the potential to support Bats were either on alignment. This is shown in Table 9.12. There is potential for disturbance and/ or loss of individuals if these trees were to contain Bat roosts at the time of construction.

Summary of construction impacts on terrestrial ecology

A summary of construction impacts on terrestrial ecology is shown in Table 9.27 below.

Table 9.27 N80 Link Road: Summary of construction impacts on terrestrial ecology

Ecologically Sensitive Receptor	Ecological Evaluation	Nature of impact	Magnitude/ extent of impact	Overall impact
Oak-ash-hazel woodland	C	Loss of habitat due to landtake	2,000 m^2	Probable, significant long-term negative impact at a Local level.
Badger	National	Disturbance, injury and/ or loss of individuals and loss of setts due to landtake	Potential disturbance to 3 setts located within 50m of the proposed scheme. No loss of setts due to landtake.	Impacts not significant.
Bats	International	Loss of roosts due to felling of mature trees. Potential injury and / or loss of individuals	Leisler's Bat roost located within Landtake.	Probable, significant short-term negative impact at a Local level.

Aquatic ecology

The number of culverts and stream diversions and their potential impacts on all ecologically sensitive watercourses (and their upstream tributaries) are shown in Table 9.28.

Table 9.28 N80 Link Road: Potential construction impacts on watercourses

Watercourse	Evaluation	Annex I[1] or II [2] species present	Water quality status[3] & pollution risk assessment[4]	Culverts	Diversions	Upstream impacts from Proposed Scheme	Impact
River Slaney	A	Salmon, River Lamprey, Brook Lamprey, Sea Lamprey, Freshwater Pearl Mussel, Twaite Shad, Allis Shad Potential Otter & Kingfisher	Unpolluted - at significant risk from pollution	0 (1 Clear span bridge)	0	1 Culvert on upstream tributary Kilcannon Stream. .	Probable medium-term significant negative impact at International level
Ballydawmore Stream	C	Salmon Potential Lamprey Potential Otter & Kingfisher	Unpolluted	0	0	3 culverts & 1 diversion on upstream tributaries BT04 and 2 unnamed drainage ditches.	Probable short-term significant negative impact at Local level

[1]EC Habitats Directive
[2]EC Birds Directive
[3]The water quality status relates to highest quality Q-sampling rating for the watercourse out of all sampling points
[4]SERBD Pollution risk assessment value: refer to Chapter 11 for full details. Data not available for all watercourses.

Otter

There were no Otter holts located within 250m of the N80 Link Road.

9.6.1.4 Impacts specific to the N30 Mainline

Terrestrial ecology

Terrestrial habitats

The areas of habitat that are to be lost due to landtake of the Proposed Scheme are listed in Table 9.29.

Table 9.29 N30 Mainline: Habitats of ecological value within landtake of the Proposed Scheme

Habitat	Chainage	Site name/ location	Evaluation	Impact
Oak-ash-hazel woodland	6,500	River Urrin Woodland	C	6,750m^2 out of a block of 22,000m^2.

Badgers

There were 14 Badger setts located within 50 metres of the Proposed Scheme (shown on Table 9.30), of which 3 are within the landtake area. One of the setts within the landtake area is a Main sett.

Table 9.30 N30 Mainline: Badger setts 50m from the Proposed Scheme

Badger Sett Number (BS)	Chainage	Distance from Proposed Scheme	Sett type	Mitigation
71	900	31	Outlying sett	Outside landtake. Possible disturbance.
72	920	43	Outlying sett	Outside landtake. Possible disturbance.
73	1600	7	Outlying sett	Just outside landtake. Possible disturbance.
75	1800	0	Outlying sett	Within landtake. Destruction of sett.
77	3350	21	Main sett	Outside landtake. Possible disturbance.
81	4100	3	Outlying sett	Just outside landtake. Possible disturbance.
82	4250	0	Outlying sett	Within landtake. Destruction of sett.
84	4350	36	Outlying sett	Outside landtake. Possible disturbance.
88	5100	0	Main sett	Within landtake. Destruction of sett.
95a	6350	35	Subsidiary sett	Outside landtake. Possible disturbance.

Table 9.30 N30 Mainline: Badger setts 50m from the Proposed Scheme

Badger Sett Number (BS)	Chainage	Distance from Proposed Scheme	Sett type	Mitigation
95b	6350	40	Outlying sett	Outside landtake. Possible disturbance.
102	6600	0	Annexed sett	Within landtake. Destruction of sett.
103	6600	39	Annexed sett	Outside landtake. Possible disturbance.
104	7400	0	Outlying sett	Within landtake. Destruction of sett.

Bats

Five buildings are to be demolished on this section of the Proposed Scheme (Table 9.31). Three buildings are to be demolished on this section of the Proposed Scheme. No buildings to be demolished were found to contain roosts at time of survey. However it is difficult to conclusively rule out Bat use of buildings and therefore the impact has been assessed under the potential scenario that Bats are present in some / all of the buildings.

Table 9.31 N30 Mainline: Buildings and structures to be demolished

Bessmount	6180	Shed	Under N30 Mainline
	6205	Motor vehicle repair workshop	Under N30 Mainline
	6230	Shed	Under N30 Mainline
	6240	Shed / Boiler House	Under N30 Mainline
	6250	House	Under N30 Mainline

There were two locations where trees and/ or groups of trees that were considered to have the potential to support Bats were either on alignment or nearby. These are shown in Table 9.12. There is potential for disturbance and/ or loss of individuals if these trees were to contain Bat roosts at the time of construction.

Summary of construction impacts on terrestrial ecology

A summary of construction impacts on terrestrial ecology is shown in Table 9.32 below.

Table 9.32 N30 Mainline: Summary of construction impacts on terrestrial ecology

Ecologically Sensitive Receptor	Ecological Evaluation	Nature of impact	Magnitude/ extent of impact	Overall impact
Oak-ash-hazel woodland	C	Loss of habitat due to landtake	6,750m^2	Probable, significant long-term negative impact at a Local level.

Table 9.32 N30 Mainline: Summary of construction impacts on terrestrial ecology

Ecologically Sensitive Receptor	Ecological Evaluation	Nature of impact	Magnitude/ extent of impact	Overall impact
Badger	National	Disturbance, injury and/ or loss of individuals and loss of setts due to landtake	Potential disturbance to 14 setts located within 50m of the proposed scheme. Loss of 3 setts (including one Main sett) due to landtake.	Probable, significant short-term negative impact at a Local level.
Bats	International	Loss of roosts due to building demolition and felling of mature trees. Potential injury and / or loss of individuals	No buildings to be demolished/ trees to be felled were found to contain roosts at time of survey. However it is difficult to conclusively rule out Bat use of buildings/ trees.	(Assessed as if Bats present in buildings and suitable trees). Probable, significant short-term negative impact at a Local level.

Aquatic ecology

The number of culverts and stream diversions and their potential impacts on all ecologically sensitive watercourses (and their upstream tributaries) are shown in Table 9.33.

Table 9.33 N30 Mainline: Potential construction impacts on watercourses

Watercourse	Evaluation	Annex I[1] or II [2] species present	Water quality status[3] & pollution risk assessment[4]	Culverts	Diversions	Upstream impacts from Proposed Scheme	Impact
Clavass Stream	C	Salmon Potential Lamprey Potential Otter & Kingfisher	Unpolluted	2	0	None	Probable short-term significant negative impact at Local level
Tributary of Hollyfort Stream (HT3)	C	Potential Salmon & Lamprey Potential Otter & Kingfisher	Unknown	2	2	None	Probable short-term significant negative impact at Local level
Hollyfort Stream	C	Salmon Potential Lamprey Potential Otter & Kingfisher	Unpolluted	1	1	None	Probable short-term significant negative impact at Local level
Pullinstown Stream	B	Salmon* Potential Lamprey Potential Otter & Kingfisher	Unpolluted	1	1	1 culvert on upstream tributary (UT7)	Probable short-term significant negative impact at National level
Tributary of River Urrin (UT7)	C	Salmon Potential Otter & Kingfisher	Unknown	1	0	1 regrade of stream bed on upstream tributary (UT11)	Probable short-term significant negative impact at Local level
River Urrin	C	Potential Salmon & Lamprey Potential Otter & Kingfisher	Unpolluted - probably not at significant risk from pollution	0 (1 clear span bridge)	0	2 culverts & 1 diversion on upstream tributaries (Pullinstown Stream & Hollyfort Stream)	Probable short-term significant negative impact at Local level

[1]EC Habitats Directive
[2]EC Birds Directive
[3]The water quality status relates to highest quality Q-sampling rating for the watercourse out of all sampling points
[4]SERBD Pollution risk assessment value: refer to Chapter 11 for full details. Data not available for all watercourses.

Otter

There is one Otter holt located within 150m of the M11/ N11 section of the Proposed Scheme (Table 9.34). If a breeding female and cubs were to use this holt at the time of construction then they may suffer disturbance. In addition, one holt is located within the landtake of the Proposed Scheme.

Table 9.34 N30 Mainline: Otter Holts located within 150m of the Proposed Scheme

Otter Holt (OH) Number	Chainage	Distance from Proposed Scheme
2	0,200	129

9.6.2 Operation Phase

9.6.2.1 Impacts which apply to the entire scheme

Designated sites

Impacts to the River Slaney cSAC and Wexford Harbour SPA have been discussed in under construction impacts. Refer also to Appendix 9.5 and 9.6 in Volume 3 of this EIS.

Impacts to Ballnabarney Wood pNHA, as discussed under construction impacts, are related to impacts on the River Corbally and associated vegetation as discussed below.

Terrestrial ecology

Terrestrial habitats

Impacts to terrestrial habitats form the Proposed Scheme may arise as a result of pollution from surface water run-off and from dust. The terrestrial habitats of ecological value in the vicinity of the Proposed Scheme are not considered to contain species that are highly sensitive to these impacts and did not support any rare plants species. These impacts are therefore unlikely to be significant.

Badgers

The main potential impacts on Badgers arising during the operation stage are mortality as a result of vehicle collision during road crossing and restriction of movement of species in the area by fragmentation of territories and habitats. Setts may also be abandoned where access to feeding resources has been severely restricted. In areas where there is high Badger activity, or where a Badger territory is likely to be severed, underpasses have been included in the design of the Proposed Scheme if an alternative safe crossing point (such as a culvert with mammal ledge or access underpass) is not proposed in the vicinity. These are listed separately for each section

of the Proposed Scheme. In some locations planting has been specified in the Landscape plan to facilitate Badgers to safe crossing points, including access underpasses.

Bats

Roads may present a barrier to Bat foraging and commuting and lead to direct mortality from collision with vehicles. Design measures that can reduce the impacts of the operation of road schemes on Bats are focused on reducing the effects of fragmentation and vehicle collision. This is achieved by encouraging Bats to cross at 'safe' locations such as underpasses, overpasses and culverts and discouraging them from crossing the road itself. Planting can be used to guide Bats to 'safe' crossing points and avoidance of lighting at the crossing point is essential to encourage Bat passage. The dimensions of underpasses and culverts that Bats will use vary between species. A review of available data was undertaken to design suitable crossing points for each species. This is summarised in Table 9.35 & 9.36.

Table 9.35 Dimensions of underpasses used by Bat species[1]

Species	Use of underpasses	Dimensions required	Notes
Pipistrelle species	Yes	Height 4-6m Width 4-6m	More likely to fly over road but may be used near roost
Natterer's Bat	Yes	Height 4-6m Width 4-6m	Lead in planting essential
Daubenton's Bat	Yes	Height 4-6m Width 4-6m	Lead in planting beneficial
Brown Long-eared Bat	Yes	Height 4-6m Width 4-6m	
Leisler's Bat	No?	Limited information	May not use underpasses
Whiskered Bat	Yes	Height 4-6m Width 4-6m	

[1]Data summarised from range of sources including Kerth & Melber (2009), Bach et al (2004) and data from various sources cited in Bickmore (2003) and Altringham (2008).

Table 9.36 Dimensions of culverts used by Bat species[1]

Species	Use of underpasses	Dimensions required	Notes
Pipistrelle species	Yes	Height 4-5m Width 4-5m	
Natterer's Bat	Yes	Height 1-1.5m Width 2.3m	May use long culverts >30m even when small
Daubenton's Bat	Yes	Height 1-1.5m Width 1.5-2m	Particularly where water present
Brown Long-eared Bat	Yes	Height 2-4m Width 3-4m	
Leisler's Bat	No?	Limited information	May not use underpasses
Whiskered Bat	Yes	Height 4m Width 4m	

[1]Data summarised from range of sources including Kerth & Melber (2009), Bach et al (2004) and data from various sources cited in Bickmore (2003) and Altringham (2008).

The height of culverts and underpasses used by Bats was taken into account in the design stage of the Proposed Scheme and, where possible, the dimensions of underpasses, culverts and specific planting have been included in the design to facilitate Bat passage.

There is potential for negative impacts on Bats from lighting associated with junctions. The main impacts will be where the Proposed Scheme is close to roosts or areas of suitable habitat which were previously unlit. The severity of the impact will depend on the Bat species affected. In general Pipistrelle species and Leisler's Bat would be more tolerant of the Proposed Scheme, than species such as Brown Long-eared Bat, Whiskered Bat and Natterer's Bat, which prefer foraging along unlit woodland edges or Daubenton's Bat, which prefer unlit watercourses (Bat Conservation Trust, 2008). It is recommended that where Bats are crossing roads there be a gap in lighting 10m either side of the crossing point to facilitate Bat crossing (Bat Conservation Trust, 2008).

Other mammals

As for Badgers and Bats above, there may be impacts from collision mortality on small mammals crossing the Proposed Scheme. In addition the Proposed Scheme may act as a barrier to movement. It is probable that this would have a significant, long-term, negative impact on these species at a Local level.

Overwintering waterfowl

The main sites for waterfowl within the study area are located on the River Slaney and are not in the vicinity of the Proposed Scheme. Therefore there are no predicted impacts from the Proposed Scheme on these populations (see also to the section on designated sites, above, and the FONSE report for Wexford Harbour and Slobs SPA, Appendix 9.6 in Volume 3 of this EIS).

Waterfowl may be using land such as wet grassland within the vicinity and/ or landtake of the Proposed Scheme. As no significant populations of any species were found, the loss of these habitats would not comprise a significant negative impact on waterfowl.

Barn Owl

The main potential impact to Barn Owl during the operational phase is direct mortality from vehicle collision. This can occur as a result of Barn Owls flying across roads but may also result from their foraging on road verges, as rough grassland of over 4m wide can support the voles on which they prey (Ramsden, date unknown). However, the design of the Proposed Scheme includes planting of trees or hedgerows in all areas where Barn Owls were considered to potentially forage, to discourage them from flying along the verge. This reduces the likelihood of collision mortality. As Barn Owls are of high conservation concern, any increased mortality arising as a result of the Proposed Scheme would be an unlikely significant negative impact at a National level.

Other birds

Other bird species were not considered to be ecologically sensitive receptors as no populations of conservation significance recorded.

Terrestrial invertebrates

There is no predicted impact on the Cardinal Beetle as the area in which it was recorded is 320m from the Proposed Scheme.

Common Lizard

The main potential impacts on Common Lizard resulting from the operation of the Proposed Scheme are fragmentation of habitat and direct mortality resulting from collisions with vehicles. There is little information on the effects of these impacts on the integrity of Common Lizard populations. Given that Common Lizard is likely to be fairly abundant within the local area, but taking into account the lack of available information, these impacts are predicted to have an unlikely, significant negative impact at a Local level.

Aquatic ecology

Depositing lowland rivers

During the operation phase, inadequate attenuation and treatment of surface water run off prior to discharge to local watercourses could lead to silt loading and/ or pollution and channel scouring from increased rates of water flow. However, attenuation has been included in the design of the scheme in the form of balancing ponds. These will discharge into watercourses after flowing through interceptors (detailed in Chapter 3). As part of the design, the attenuation ponds will be planted with species such as Common Reed, Reed Canary-grass *Phalaris arundinacea*, Yellow Iris *Iris pseudacorus* and Bulrush *Typha latifolia* to further remove and trap silt, nutrients and pollutants. Therefore there are no predicted operational impacts on depositing lowland rivers.

Floating river vegetation

Floating river vegetation is sensitive to decreases in water quality. As outlined above, surface run-off from the scheme will flow into balancing ponds and through interceptors before being discharged into watercourses. Therefore there are no predicted decreases in water quality and hence no predicted operational impacts on floating river vegetation.

Riparian vegetation

The flora of riparian woodland is sensitive to decreases in water quality, particularly nutrient enrichment. As outlined above, surface run-off from the scheme will flow into balancing ponds and through interceptors before being discharged into watercourses. Therefore there are no predicted decreases in water quality and hence no predicted operational impacts on Riparian Woodland.

Protected fish species

The impacts of operation of the Proposed Scheme on protected fish species relate mainly to barriers to movement. Atlantic Salmon, River Lamprey, Brook Lamprey, Sea Lamprey, Twaite Shad and Allis Shad could be negatively impacted by culverts which can act as barriers to movement upstream. Factors such as the length and height of the culvert are important in determining light levels within the culvert and hence the likelihood that fish will travel through them. In addition, the gradient of the culvert is important as it will influence water flow and depth. The ERFB was consulted during the design stage and their recommendations have been taken into account where possible, given engineering constraints. Bottomless culverts are to be used on all crossings of main Salmonid channels (Tinnacross Stream, Corbally Stream and Pullinstown Stream). Where culverts are over 100m in length on any watercourse, or over 60m in length on a main Salmonid channel, the height of the culvert has been increased to 4 metres to increase light penetration within the culvert. An exception to this is the Ballydawmore Stream, where light ports have been installed between the M11 Mainline and associated Ballydawmore Junction Slip Roads.

The gradient and water depth within culverts can also be a barrier to movement. Mitigation measures (baffles) and guidelines on culvert gradients are outlined in the mitigation section. For this reason the impacts have been assessed in this section in the absence this mitigation. Barriers to fish movement would comprise a probable, significant, permanent negative impact at a National level.

Freshwater Pearl Mussel

Freshwater Pearl Mussel are highly sensitive to changes in water quality. They were not present in any of the watercourses that are to have culverts or balancing pond outfalls but may be sensitive to impacts upstream of the River Bann. However as outlined above, surface run-off from the scheme will flow into balancing ponds and through interceptors before being discharged into watercourses. Therefore there are no predicted decreases in water quality and hence no predicted operational impacts on floating river vegetation.

Otter

Long, narrow or low culverts on watercourses that are regularly used by Otters could prevent their passage along these watercourses and lead to habitat fragmentation. Otters are relatively mobile and will cross land; however crossing of the Proposed Scheme could lead to mortality from vehicle collision. As Otters are abundant in the local area, these impacts are likely to affect only a small proportion of the local population and are therefore classed as a probable, significant, long-term negative impact at a Local level.

Kingfisher

Long, narrow or low culverts on watercourses that are regularly used by Kingfisher could prevent their passage along these watercourses and lead to habitat fragmentation. Alternatively they may cross the Proposed Scheme, leading to mortality from vehicle collision. The design measures described above, to increase light penetration within long culverts, will reduce the impact of culverts on Kingfisher. However, there is little available data on Kingfisher use of culverts or their potential as barriers to movement. Where there are several long culverts on a single watercourse, this may act as a barrier to Kingfisher, but the effects will be localised as many culverts will be passable. Therefore this is not predicted to comprise a significant negative impact on Kingfisher.

9.6.2.2 Impacts specific to the M11/N11 Mainline

Terrestrial ecology

Badgers

A list of proposed Badger crossing locations is shown in Table 9.37. In addition there are 30 culverts included on the M11/ N11 Mainline. As culverts are unlikely to be used by Badgers in the absence of measures such as mammal ledges, these have not been included in this section but are discussed under mitigation measures. Although included as part of the Proposed Scheme design, the locations of the Badger underpasses may need to change following the results of the pre-construction Badger surveys.

Table 9.37 M11/ N11 Mainline: Proposed Badger safe crossing locations

Chainage	Description
3,400	Access underpass location; planting to facilitate Badger use
9,340	Access underpass location; planting to facilitate Badger use
13,380	Access underpass location; planting to facilitate Badger use
16,690	Access underpass location; planting to facilitate Badger use
18,200	Badger underpass
19,100	Badger underpass
20,400	Access underpass location; planting to facilitate Badger use
24,350	Badger underpass
25,790	Access underpass location; planting to facilitate Badger use

Bats

There are 15 locations where bat roosts and/ or activity has been recorded within the vicinity of the proposed scheme and where there may therefore be negative impacts on Bats. These are shown in Table 9.38, with details of any structures that may facilitate Bat passage over or under the road at each location. Lighting is not proposed at any of the culverts, underpasses or overbridges in the locations outlined in this table.

Table 9.38 M11/ N11 Mainline: Potential operational impacts on Bats

Chainage	Bat commuting route crossing Proposed Scheme	Bat commuting route near to Proposed Scheme	Bat foraging activity near to Proposed Scheme	Bat roost near to Proposed Scheme	Structure on Proposed Scheme that may facilitate crossing point by Bats	Landscaping	Potential impact of Proposed Scheme
4,900	Pipistrelle species and *Myotis* species	No	No	Brown Long-eared Bat, 100m NW	Ch: 4,880 - Overbridge for Local Road L-5092-1	Hedgerow on lead in to match existing hedgerow.	Negative impact if some Bats do not use overbridge to cross
7,600	Common Pipistrelle	*Myotis* species, 140m E	No	Common Pipistrelle, 180m E	Ch 7,590 - Overbridge for Local Road L-5093-1	Hedgerow on lead in to match existing hedgerow.	Negative impact if some Bats do not use overbridge to cross
8,400	Common Pipistrelle	Natterer's Bat, Common Pipistrelle, Soprano Pipistrelle & *Myotis* species, 360-390m E	No	Potential roost, 260m E	Local road to be severed. No alternative structures suitable for Bat crossing.	n/a	Negative impact from habitat fragmentation and vehicle collision from Bats crossing Proposed Scheme
9,600	No	No	No	Common Pipistrelle, 250m E	None	n/a	No impact predicted as Bats not found to be crossing and no Bat activity in vicinity of road.
10,000	No	No	No	Unidentified , 160m W	None	n/a	No impact predicted as Bats not found to be crossing and no Bat activity in vicinity of road.

Table 9.38 M11/ N11 Mainline: Potential operational impacts on Bats

Chainage	Bat commuting route crossing Proposed Scheme	Bat commuting route near to Proposed Scheme	Bat foraging activity near to Proposed Scheme	Bat roost near to Proposed Scheme	Structure on Proposed Scheme that may facilitate crossing point by Bats	Landscaping	Potential impact of Proposed Scheme
11, 400	No		Common Pipistrelle, 260m SE	Common Pipistrelle, 280m NW	Ch: 11,500 - Overbridge for Local Road L-1023-3	Hedgerow to be planted on S side. Hedgerow to match existing on N side. No planting on slip road as it may lead Bats to cross road rather than use overbridge.	Negative impact if some Bats do not use overbridge to cross.
14,450	Common Pipistrelle	No	No	No	Ch: 14480 - Underpass for local Road L-2011-2. Dimensions will be sufficient for Common Pipistrelle	Hedgerow planting within 0-50m of underpass to be less than 2m to guide Bats to underpass but not encourage them to fly above and cross road. For same reason, no planting above underpass.	Negative impact if some Bats do not use underpass to cross.
15,700	No	No	No	Common Pipistrelle, 230m SE	Ch: 15,520 – Bottomless culvert M11-C-15** (Height 4m x Width 7m x Length 66m).	None	No impact predicted as Bats not found to be crossing and no Bat activity in vicinity of road. However, culvert would be sufficient height for Common Pipistrelle passage.

Table 9.38 M11/ N11 Mainline: Potential operational impacts on Bats

Chainage	Bat commuting route crossing Proposed Scheme	Bat commuting route near to Proposed Scheme	Bat foraging activity near to Proposed Scheme	Bat roost near to Proposed Scheme	Structure on Proposed Scheme that may facilitate crossing point by Bats	Landscaping	Potential impact of Proposed Scheme
16,800	Soprano Pipistrelle & Daubenton's Bat	Soprano Pipistrelle & Common Pipistrelle, 380m SE	No	Soprano Pipistrelle, 190mE	Ch: 16,750 - Bottomless culvert M11-C-17** (Height 4m x Width 7m x Length 93m).	2m high hedgerow planting on approach.	Culvert height increased to 4m to accommodate Bat passage. Negative impact if some Bats do not use culvert or underpass to cross.
					Ch: 16,690 - Access underpass, which will have minimum clear dimensions of 4.0m wide by 4.5m high	2m high hedgerow planting on approach.	
17,400	Soprano Pipistrelle & Common Pipistrelle	Soprano Pipistrelle & Common Pipistrelle, 500m NE	No	Soprano Pipistrelle, 320m E. Brown Long-eared Bat 420m W	Ch: 17370 - Overbridge for Local Road L-2021-1	Hedgerow on lead in to match existing hedgerow.	Negative impact if some Bats do not use overbridge to cross.
17,800	Common Pipistrelle	No	No	Confirmed Common Pipistrelle & potential Brown Long-eared Bat, 450m E	None at this chainage but overbridge 450m to N (Ch: 17370 - Overbridge for Local Road L-2021-1)	2m wide hedgerow planting to W of Proposed Scheme to direct Bats to overbridge	Negative impact if some Bats do not use overbridge to cross.
19,700	Soprano Pipistrelle & Common Pipistrelle	Soprano Pipistrelle & Common Pipistrelle, E	No	No	Ch: 19680 - Overbridge for Local Road L-2024-2	Hedgerow on lead in to match existing hedgerow.	Negative impact if some Bats do not use overbridge to cross.
20,380	Common Pipistrelle	Brown Long-eared Bat, 350m E. Natterer's Bat, 690m NE	Soprano Pipistrelle & Common Pipistrelle, 430m SE	Probable Brown Long-eared Bat, 360m NE	Ch: 16,750 - Bottomless culvert M11-C-20** (Height 4m x Width 7.1m x Length 78m).	None	Culvert height increased to 4m to accommodate Bat passage. Negative impact if

Table 9.38 M11/ N11 Mainline: Potential operational impacts on Bats

Chainage	Bat commuting route crossing Proposed Scheme	Bat commuting route near to Proposed Scheme	Bat foraging activity near to Proposed Scheme	Bat roost near to Proposed Scheme	Structure on Proposed Scheme that may facilitate crossing point by Bats	Landscaping	Potential impact of Proposed Scheme
					Ch: 20,400 - Access underpass, which will have minimum clear dimensions of 4.0m wide by 4.5m high	Hedgerow on lead in to match existing. 2m high planting.	some Bats do not use culvert/ underpass to cross.
22,290	No	No	No	Brown Long-eared Bat & Common Pipistrelle, 170m SW.	Ch: 22,300 - Overbridge for Local Road L-6055-1	Hedgerow on lead in to match existing.	Negative impact if some Bats do not use overbridge to cross.
24,650	No	No	No	Brown Long-eared Bat & Common Pipistrelle, 300m W	24900 - Overbridge for Local Road L-2040-3	None	No impact predicted as Bats not found to be crossing and no Bat activity in vicinity of road.
26,700	No	No	No	*Myotis* sp. and possible Brown Long-eared Bat, 120m E	None (box culvert at this location too small for these Bat species to use)	None	No impact predicted as Bats not found to be crossing and no Bat activity in vicinity of road.

Summary of operational impacts on terrestrial ecology

A summary of operational impacts on terrestrial ecology is shown in Table 9.39 below.

Table 9.39 M11/N11 Mainline: Summary of operational impacts on terrestrial ecology

Ecologically Sensitive Receptor	Ecological Evaluation	Nature of impact	Magnitude/ extent of impact	Overall impact
Badger	National	Habitat fragmentation and mortality through vehicle collision	It is difficult to accurately determine the locations where Badgers are likely to cross the Proposed Scheme. There were 41 setts located within 50m of this section of the Proposed Scheme.	9 'safe' crossing points being provided in areas where Badgers are considered likely to cross the Proposed Scheme. If underpass not available in area where Badgers are crossing or Badgers do not use the underpasses, then this would comprise a probable, significant negative impact at the Local level.
Bats	International	Habitat fragmentation and mortality through vehicle collision	11 locations where Bats crossing/ activity in the vicinity of the Proposed Scheme	Design includes culverts and underpasses, with appropriate planting and lighting, to facilitate Bat safe crossing of the Proposed Scheme at most locations. If some Bats do not use these to cross the road then there will be an unlikely significant negative impact on Bats at the Local level.

Aquatic ecology

Details of culvert number, dimensions, type and location are shown in Table 9.40. The likely impacts resulting from these culverts on the passage of protected fauna species are also shown. The impacts have been assessed in the absence of mitigating measures such as baffles and mammal ledges.

Table 9.40 M11/ N11 Mainline: Potential operational impacts on aquatic fauna species

Watercourse	Evaluation	Annex I[1] or II [2] species present	Culvert & location	Culvert dimensions H x W x L (m)	Culvert type	Impact
River Bracken	C	Brook Lamprey, Salmon Potential Otter & Kingfisher	Ch: 3,500 M11-C-02	3.6 x 3 x 66	Box	If protected fauna species are unable to use the culvert then this would be a probable significant negative impact at a Local level.
River Bracken Tributary (BRT02)	C	Potential Salmon, Lamprey Potential Otter & Kingfisher	Ch: 6,310 M11-C-03 A-C	2.7 x 2.1 x 43 2.7 x 2.1 x 32 2.7 x 2.1 x 8	Box Box Box	If protected fauna species are unable to use the culvert then this would be a probable significant negative impact at a Local level.
Tinnacross Stream	B	Salmon* Lamprey Potential Otter & Kingfisher	Ch: 9,300 M11-C-04**	4*x 5 x 78	Bottomless	The culverts have all been designed to be bottomless and have increased height to increase light to facilitate fish passage. Given the importance of the stream for Salmonids and Lamprey and the number of culverts, if protected fauna species were not able to use the culverts then this would comprise a probable significant negative impact at a National level.
			13,140 M11-C-08**	4* x 6 x 68	Bottomless	
			13,350 M11-C-09**	4 x 6 x 81	Bottomless	
			14,700 M11-C-11**	4* x 7.5 x 73	Bottomless	
			15,520 M11-C-13**	4* x 7 x 73	Bottomless	
			16,130 M11-C-15**	4* x 7 x 66	Bottomless	
			16,750 M11-C-17**	4* (2.4)[1] x 7 x 93	Bottomless	
Tributary of Tinnacross Stream (TT06)	C	Potential Salmon & Lamprey Potential Otter & Kingfisher	14,220 M11-C-10 A-B	2.7 x 2.1 x 74 2.8 x 2.1 x 8	Box Box	If protected fauna species are unable to use the culvert then this would be a probable significant negative impact at a Local level.
Tributary to Tinnacross Stream (TT09)	C	Potential Salmon & Lamprey Potential Otter & Kingfisher	12,230 M11-C-07*	2.7 x 3.6 x 52	Box	If protected fauna species are unable to use the culvert then this would be a probable significant negative impact at a Local level.

Table 9.40 M11/ N11 Mainline: Potential operational impacts on aquatic fauna species

Watercourse	Evaluation	Annex I[1] or II [2] species present	Culvert & location	Culvert dimensions H x W x L (m)	Culvert type	Impact
Ballydawmore Stream	C	Salmon Potential Lamprey Potential Otter & Kingfisher	18,400 M11-C-18	2.2 x 2.4 x 170	Box – to include light ports	If protected fauna species are unable to use the culvert then this would be a probable significant negative impact at a Local level.
Corbally Stream	B	Salmon* Potential Lamprey Potential Otter & Kingfisher	20,380 M11-C-20**	4* x 7.1 x 78	Bottomless	If protected fauna species are unable to use the culvert then this would be a probable significant negative impact at a Local level.
Tributary of Corbally Stream (CT1)	C	Salmon Potential Otter & Kingfisher	21,700 M11-C-21	2.7 x 2.1 x 57	Box	If protected fauna species are unable to use the culvert then this would be a probable significant negative impact at a Local level.
Drumgold Stream	C	Salmon Potential Lamprey Potential Otter & Kingfisher	22,750 M11-C-22	1.8 x 1.5 x 52	Box	If protected fauna species are unable to use the culvert then this would be a probable significant negative impact at a Local level.
Tributary of Drumgold Stream (DT3)	C	Potential Salmon & Lamprey Potential Otter & Kingfisher	24,100 M11-C-24	1.8 x 3.6 x 57	Box	If protected fauna species are unable to use the culvert then this would be a probable significant negative impact at a Local level.
Tributary of Drumgold Stream (DT6)	C	Potential Salmon & Lamprey Potential Otter & Kingfisher	22,750 M11-C-22	1.8 x 1.5 x 52	Box	If protected fauna species are unable to use the culvert then this would be a probable significant negative impact at a Local level.
Tributary of Monroe Stream	C	Salmonid Potential Otter & Kingfisher	26,550 M11-C-26	2.3 x 1.5 x 30	Box	If protected fauna species are unable to use this culvert then

Table 9.40 M11/ N11 Mainline: Potential operational impacts on aquatic fauna species

Watercourse	Evaluation	Annex I[1] or II [2] species present	Culvert & location	Culvert dimensions H x W x L (m)	Culvert type	Impact
(MT2)			26,680 M11-C-27	4* $(2.4)^2$ x 2.4 x 107	Box	this would be a probable significant negative impact at a Local level.
Tributary of Monroe Stream (MT2_1)	C	Potential Salmon & Lamprey Potential Otter & Kingfisher	27,140 M11-C-28	1.8 x 2.1 x 73	Box	If protected fauna species are unable to use the culvert then this would be a probable significant negative impact at a Local level.
River Slaney	A	Salmon, River Lamprey, Brook Lamprey, Sea Lamprey, Freshwater Pearl Mussel, Twaite Shad, Allis Shad Potential Otter & Kingfisher	None (13 culverts on upstream tributaries)	None	None	There are no culverts on this watercourse. However, if protected fauna species are unable to use the culvert then this would be a probable significant negative impact at a National level.
River Bann	A	Freshwater Pearl Mussel, Salmon, River, Brook and Sea Lamprey Potential Otter & Kingfisher	None (1 approx. 4.3km upstream on BRT02)	None	None	There are no culverts on this watercourse. The upstream culvert is 4.3km upstream on a tributary. Given the distance of the culvert, it is predicted that if protected fauna species using the River Bann are not able to use this culvert then this would be an unlikely significant negative impact at a Local level.

*Culvert height increased to 4m (instead of minimum required for accommodate flow) to increase light and facilitate fish passage through long culverts.
[1]Section for accommodation track will be minimum required hydraulic size (2.4 H x 7.0 W).
[2] Section for accommodation track will be minimum required hydraulic size (2.4 H x 2.4 W).

9.6.2.3 Impacts specific to the N80 Link Road

Terrestrial ecology

Badgers

A list of proposed Badger crossing locations is shown in Table 9.41. In addition there are four culverts included on the N80 Link Road. As culverts are unlikely to be used by Badgers in the absence of measures such as mammal ledges, these have not been included in this section but are discussed under mitigation measures. Although included as part of the Proposed Scheme design, the locations of the Badger underpasses may need to change following the results of the pre-construction Badger surveys.

Table 9.41 N80 Link Road: Proposed Badger safe crossing locations

Chainage	Description
1,680	Access underpass location; planting to facilitate Badger use
2,490	Badger underpass
3,900	Access underpass location; planting to facilitate Badger use

Bats

There are 5 locations where bat roosts and/ or activity has been recorded within the vicinity of the proposed scheme and where there may therefore be negative impacts on Bats. These are shown in Table 9.42 with details of any structures that may facilitate Bat passage over or under the road at each location. Lighting is not proposed at any of the culverts, underpasses or overbridges in the locations outlined in this table.

Table 9.42 N80 Link Road: Potential operational impacts on Bats

Chainage	Bat commuting route crossing Proposed Scheme	Bat commuting route near to Proposed Scheme	Bat foraging activity near to Proposed Scheme	Bat roost near to Proposed Scheme	Structure on Proposed Scheme that may facilitate crossing point by Bats	Landscaping	Potential impact of Proposed Scheme
Junction with N30	Daubenton's Bat	Soprano Pipistrelle, Common Pipistrelle & *Myotis* sp., 90m NW. Daubenton's Bat, Leisler's Bat & Natterer's Bat, 210m NE	Daubenton's Bat, 350m N	No	None	No	No impact predicted as Bats using watercourse to north of scheme.
2,500	Leisler's Bat & Soprano Pipistrelle	No	No	Leisler's Bat, 0m	Ch: 2,800 - Underpass for River Slaney, Dublin – Wexford Railway and Local Road L-2020-2. Ch: 2,500 - Badger underpass.	Hedgerow planting 2m high on approach to Badger underpass	Negative impact if some Bats do not use underpass or clear span bridge to E to cross.
2,750	Daubenton's Bat & Soprano Pipistrelle	Soprano Pipistrelle, 500m NE	Daubenton's Bat, 0m & 180m N	Soprano Pipistrelle, 500m NE	Ch: 2,800 - Underpass for River Slaney, Dublin – Wexford Railway and Local Road L-2020-2.	None	None predicted as Bats using existing watercourse and underpass is clear span bridge. Therefore Bats unlikely to cross Proposed Scheme.
3,300	No	Soprano Pipistrelle,140m N	No	No	Ch: 2,800 - Underpass for River Slaney, Dublin – Wexford Railway and Local Road L-2020-2	None	Soprano Pipistrelle found to cross at clear span bridge to W. Minor impact if some Bats do not use this bridge to cross.

Table 9.42 N80 Link Road: Potential operational impacts on Bats

Chainage	Bat commuting route crossing Proposed Scheme	Bat commuting route near to Proposed Scheme	Bat foraging activity near to Proposed Scheme	Bat roost near to Proposed Scheme	Structure on Proposed Scheme that may facilitate crossing point by Bats	Landscaping	Potential impact of Proposed Scheme
3,600	No	No	No	Whiskered Bat. 230m S	None	No	No impact predicted as Bats not found to be crossing and no Bat activity in vicinity of road.

The Clavass junction, at the junction of the proposed N80 link Road and N30 Mainline, will be lit at the two roundabouts and also along the existing N11 and N80, 240m north and north-west from the northern roundabout. Leisler's and Natterer's Bats are currently crossing under the N11, along the River Slaney, 240m north of this roundabout. There is existing lighting from the current roundabout up to 10m south of this bridge. The existing lighting may be sufficient to meet required lighting guidelines; in this case no further lighting would be installed and there would be no predicted impacts on Bats. If, however, increased lighting is required in this location then this may displace Bats from this commuting route. This would comprise a probable significant negative impact at a Local level.

Common Pipistrelle, Soprano Pipistrelle and *Myotis* species are currently using part of the N80 to the north of this junction for commuting. It is likely that this is related to use of the Clavass Stream, which crosses the N80 in this area. Lighting is proposed for this section of the N80 (240m north of the northern roundabout at the Clavass Junction). There is existing lighting in this area of the N80. The existing lighting may be sufficient to meet required lighting guidelines; in this case no further lighting would be installed and there would be no predicted impacts on Bats. If, however, increased lighting is required in this location then this may displace Bats (particularly *Myotis* species) from this commuting route. Alternatively, species such as Common and Soprano Pipstrelle may be attracted to the lighting and this could lead to increased collision mortality. Therefore, increased lighting in this location would comprise a probable significant negative impact at a Local level.

Summary of operational impacts on terrestrial ecology

A summary of operational impacts on terrestrial ecology is shown in Table 9.43 below.

Table 9.43 N80 Link Road: Summary of operational impacts on terrestrial ecology

Ecologically Sensitive Receptor	Ecological Evaluation	Nature of impact	Magnitude/ extent of impact	Overall impact
Badger	National	Habitat fragmentation and mortality through vehicle collision	It is difficult to accurately determine the locations where Badgers are likely to cross the Proposed Scheme. There were 3 setts located within 50m of this section of the Proposed Scheme.	3 'safe' crossing points being provided in areas where Badgers are considered likely to cross the Proposed Scheme. If underpass not available in area where Badgers are crossing or Badgers do not use the underpasses, then this would comprise a probable, significant negative impact at the Local level.

Table 9.43 N80 Link Road: Summary of operational impacts on terrestrial ecology

Ecologically Sensitive Receptor	Ecological Evaluation	Nature of impact	Magnitude/ extent of impact	Overall impact
Bats	International	Habitat fragmentation and mortality through vehicle collision	5 locations where Bats crossing/ activity in the vicinity of the Proposed Scheme	Design includes culverts and underpasses, with appropriate planting and lighting, to facilitate Bat safe crossing of the Proposed Scheme at most locations. If some Bats do not use these to cross the road then there will be an unlikely significant negative impact on Bats at the Local level.

Aquatic ecology

There are no culverts located on any watercourses that are considered to be ecologically sensitive receptors. The main span of the bridge across the River Slaney includes a 5m minimum width immediately adjacent to the western bank of the River Slaney that is clear of any structural elements, such as piers. This will provide a safe crossing point for mammals such as Otters.

9.6.2.4 Impacts specific to the N30 Mainline

Terrestrial ecology

Badgers

A list of proposed Badger crossing locations is shown in Table 9.44. In addition there are nine culverts included on the N30 Mainline section. As culverts are unlikely to be used by Badgers in the absence of measures such as mammal ledges, these have not been included in this section but are discussed under mitigation measures. Although included as part of the Proposed Scheme design, the locations of the Badger underpasses may need to change following the results of the pre-construction Badger surveys.

Table 9.44 N30 Mainline: Proposed Badger safe crossing locations

Chainage	Description
1,600	Badger underpass
3,350	Access underpass location; planting to facilitate Badger use
6,500	Bridge over the River Urrin. Clear span bridge with bankside planting suitable for Badger passage.

Bats

There are 7 locations where bat roosts and/ or activity has been recorded within the vicinity of the proposed scheme and where there may therefore be negative impacts on Bats. These are shown in Table 9.45 with details of any structures that may facilitate Bat passage over or under the road at each location. Lighting is not proposed at any of the culverts, underpasses or overbridges in the locations outlined in this table but is proposed at the Milehouse Roundabout (Chainage 4,000) as outlined in the table. Potential impacts from lighting in the vicinity of the Clavass Junction are as outlined above for the N80 Link Road.

Table 9.45 N30 Mainline: Potential operational impacts on Bats

Chainage	Bat commuting route crossing Proposed Scheme	Bat commuting route near to Proposed Scheme	Bat foraging activity near to Proposed Scheme	Bat roost near to Proposed Scheme	Structure on Proposed Scheme that may facilitate crossing point by Bats	Landscaping	Potential impact of Proposed Scheme
1,400	Common Pipistrelle	No	No	No	Ch: 1390 - Overbridge for Local Road L-2015-2	Existing woodland retained on E side. Planting of cutting on lead in to W.	Negative impact if some Bats do not use overbridge to cross.
2,950	Common Pipistrelle	No	No	No	Ch: 2,950 - Underpass for Local Road L-2014-1	Hedgerow planting within 0-50m of underpass to be less than 2m to guide Bats to underpass but not encourage them to fly above and cross road. For same reason, no planting above underpass.	Negative impact if some Bats do not use underpass to cross.
3,900	No	No	No	(4 roosts) Brown Long-eared Bat, Common Pipistrelle & 2 unknown species, within 350m NE & NW	Ch: 3,890 - Overbridge for Local Road L-2012-3	Hedgerow on lead in to match existing.	Negative impact if some Bats do not use overbridge to cross.
4,800	Daubenton's Bat	No	No	Common Pipistrelle, 280m S	Milehouse roundabout on existing route is to be lit and is therefore unsuitable for Bats to cross. Ch: 5,100 - Bottomless culvert 0N30-C-06** (Height 4m x Width 5.5m x Length 81m).	Planting of at least 2m high from Milehouse roundabout to culvert to direct Bats to culvert location.	Negative impact if some Bats do not use culvert to cross.

Table 9.45 N30 Mainline: Potential operational impacts on Bats

Chainage	Bat commuting route crossing Proposed Scheme	Bat commuting route near to Proposed Scheme	Bat foraging activity near to Proposed Scheme	Bat roost near to Proposed Scheme	Structure on Proposed Scheme that may facilitate crossing point by Bats	Landscaping	Potential impact of Proposed Scheme
6,300	Common Pipistrelle	No	No	No	Ch: 6,310 - Underpass for Local Road L-2030-6	Hedgerow planting of 2m high on lead in.	Negative impact if some Bats do not use overbridge to cross.
7,000	Common Pipistrelle	No	No	No	Ch: 6,940 - Overbridge for Local Road L-6122-1	Hedgerow planting on lead in to match existing.	Negative impact if some Bats do not use overbridge to cross.
7,800	Common Pipistrelle	No	No	No	Ch: 7,820 - Overbridge for Old N30	Hedgerow planting on lead in to match existing.	Negative impact if some Bats do not use overbridge to cross.

Summary of operational impacts on terrestrial ecology

A summary of operational impacts on terrestrial ecology is shown in Table 9.46 below.

Table 9.46 N30 Mainline: Summary of operational impacts on terrestrial ecology

Ecologically Sensitive Receptor	Ecological Evaluation	Nature of impact	Magnitude/ extent of impact	Overall impact
Badger	National	Habitat fragmentation and mortality through vehicle collision	It is difficult to accurately determine the locations where Badgers are likely to cross the Proposed Scheme. There were 14 setts located within 50m of this section of the Proposed Scheme.	3 'safe' crossing points being provided in areas where Badgers are considered likely to cross the Proposed Scheme. If underpass not available in area where Badgers are crossing or Badgers do not use the underpasses, then this would comprise a probable, significant negative impact at the Local level.
Bats	International	Habitat fragmentation and mortality through vehicle collision	7 locations where Bats crossing/ activity in the vicinity of the Proposed Scheme	Design includes culverts and underpasses, with appropriate planting and lighting, to facilitate Bat safe crossing of the Proposed Scheme at most locations. If some Bats do not use these to cross the road then there will be an unlikely significant negative impact on Bats at the Local level.

Aquatic ecology

Details of culvert number, dimensions, type and location are shown in Table 9.47. The likely impacts resulting from these culverts on the passage of protected fauna species are also shown. The impacts have been assessed in the absence of mitigating measures such as baffles and mammal ledges.

The bridge across the River Urrin is a clear span bridge and therefore the banks will provide a safe crossing point for mammals such as Otters.

Table 9.47 N30 Mainline: Potential operational impacts on aquatic fauna species

Watercourse	Evaluation	Annex I[1] or II [2] species present	Culvert & location	Culvert dimensions H x W x L (m)	Culvert type	Impact
Clavass Stream	C	Salmon Potential Lamprey Potential Otter & Kingfisher	Ch: 0,530 N30-C-01	2.1 x 2.8 x 67	Box	If protected fauna species are unable to use the culvert then this would be a probable significant negative impact at a Local level.
			Ch: 1,450 N30-C-02	1.8 x 1.2 x 49	Box	
Tributary of Hollyfort Stream (HT3)	C	Potential Salmon & Lamprey Potential Otter & Kingfisher	Ch: 2,150 N30-C-03	1.5 x 1.8 x 53	Box	If protected fauna species are unable to use the culvert then this would be a probable significant negative impact at a Local level.
			Ch: 2,550 N30-C-04	1.8 x 2.1 x 70	Box	
Hollyfort Stream	C	Salmon Potential Lamprey Potential Otter & Kingfisher	Ch: 3,290 N30-C-05	2.4 x 2.7 x 78	Box	If protected fauna species are unable to use the culvert then this would be a probable significant negative impact at a Local level.
Pullinstown Stream	B	Salmon* Potential Lamprey Potential Otter & Kingfisher	Ch: 5,100 N30-C-06**	4* x 5.5 x 81	Bottomless	If protected fauna species are unable to use the culvert then this would be a probable significant negative impact at a Local level.
Tributary of River Urrin (UT7)	C	Salmon Potential Otter & Kingfisher	Ch: 6,370 N30-C-08	2.7 x 4.8 x 84	Box	If protected fauna species are unable to use the culvert then this would be a probable significant negative impact at a Local level.

*Culvert height increased to 4m (instead of minimum required for accommodate flow) to increase light and facilitate fish passage through long culverts.

9.6.3 Cumulative impacts

A number of planning permissions have been granted within the vicinity of the Proposed Scheme. Those which were already construction at the time of carrying out assessments for the purpose of this EIS have already been assessed, where relevant, in the various Chapters of the EIS and it is not therefore necessary to re-consider them under cumulative impacts.

The only other major scheme which has received permission but has not yet been constructed and is expected could commence construction in the near future, is the Enniscorthy Main Drainage Stage 3 Scheme. This scheme involves the upgrading of an existing waste water treatment plant (WWTP) and associated sewer network, to treat the effluent from Enniscorthy town and environs. The proposed WWTP will incorporate secondary treatment and tertiary treatment (phosphate and nitrogen removal) to achieve a high removal efficiency of biodegradable organic matter.

An EIS was prepared for the scheme in which it was concluded that the scheme will significantly improve water quality in the receiving waters in the River Slaney and River Urrin, and will eliminate a number of existing outfalls to the River Slaney (*e.g.* at Killagoley). The proposed upgrade in the WWTP will result in an overall decrease in nutrient loads to the river and specifically result in a reduction in phosphate loading which will reduce the eutrophic status of the River Slaney downstream of Enniscorthy. This will have a beneficial effect on aquatic life through the reduction of plant and algal growth with corresponding benefits for dissolved oxygen levels. In a “do nothing” scenario, the hydraulic overload would increase resulting in increased volumes of untreated sewage entering the River Slaney as the existing treatment plant will not be able to cater for future loads. The option not to extend the Enniscorthy WWTP would result in deterioration in the water quality of the River Slaney. The cumulative operational impacts of the Proposed Scheme in addition to the proposed Enniscorthy Main Drainage Stage 3 Scheme, are therefore expected to be neutral.

The EIS for the Enniscorthy Main Drainage Stage 3 Scheme states an expected construction period of two years. It would be expected that should the Proposed Scheme and the Enniscorthy Main Drainage Stage 3 Scheme be under construction simultaneously, then there would be potential for cumulative construction related impacts on ecology. These would potentially give rise to temporary and short term construction related negative impacts on water quality. Any such impacts have been fully mitigated for in the EISs for both schemes and as such the cumulative impacts are not predicted to be significant.

The N11 Gorey to Arklow Link was constructed in 2007. This road scheme dual carriageway comprises approximately 22.9 km of National Primary Road and includes a bypass of Gorey Town. Residual ecological impacts from this scheme included the loss of some semi-natural habitat, habitat fragmentation, loss of fauna foraging habitats and loss of Bat roosts. Habitat

creation and planting will mitigate for some habitat loss in the long-term. Provision of mammal passage along and under the route provides a positive significant impact in relation to the previous road. There were no residual impacts on watercourses from construction activities but some habitat was lost at watercourse crossing points. As the Gorey to Arklow Link is built, it forms part of the baseline environment of the Proposed Scheme. The residual impacts from the N11 Gorey to Arklow Link have therefore been taken into account when assessing the significance of impacts from the M11 Gorey to Enniscorthy Scheme. As the residual impacts are significant at a Local level only, there are no predicted significant cumulative impacts. No watercourses that are crossed by the N11 Gorey to Arklow Link are crossed by the Proposed Scheme and therefore no cumulative impacts on sensitive watercourses are predicted.

9.6.4 "Do-nothing" scenario

The baseline status of relevant habitats and species in the absence of the Proposed Scheme are discussed below.

9.6.4.1 Designated sites

The conservation status of the habitats and species in the River Slaney cSAC are discussed in Appendix 9.5 in Volume 3 of this EIS.

9.6.4.2 Terrestrial ecology

Terrestrial habitats

Broadleaved woodland

In the absence of the Proposed Scheme, if current management practices are continued, the conservation status of the Broadleaved Woodland areas is likely to remain unchanged in the medium to long term.

Wet grassland

In the absence of the Proposed Scheme, if current management practices are continued, the conservation status of the wet grassland areas is likely to remain unchanged in the medium to long term.

Terrestrial fauna

Badgers

Badgers are abundant in the local area and in the absence of the Proposed Scheme there are no predicted changes to their baseline population in the medium to long-term.

Bats

The NPWS summary report on the conservation of species listed under the Habitats Directive assesses all of Ireland's bat species to be of good conservation status (NPWS 2008). Therefore

in the absence of the Proposed Scheme there are no predicted changes to their baseline population in the medium to long-term.

Barn Owl

Barn Owl has undergone a documented decline in its geographical range in recent times. They are Red-listed on the Bird of Conservation Concern list in Ireland due to a decline of over 50% in their population during the past 25 years. They are also listed as a Species of European Conservation Concern (SPEC3), having an unfavourable conservation status in Europe. It is likely that their baseline population may therefore decline in the short-term in the absence of management action.

Terrestrial invertebrates

There is no information on the conservation status of the Cardinal Beetle in Ireland. Therefore it is not possible to predict the future status of this species in the absence of the Proposed Scheme.

Common Frog

Common Frog is very abundant, and is found throughout the country. However its conservation status is thought to be poor, due to some habitat loss around urban areas (NPWS 2008). It is likely that given the rural nature of the area in the vicinity of the Proposed Scheme that there is unlikely to be major habitat loss in the local area and that there are no predicted changes to their baseline population in the medium to long-term.

9.6.4.3 Aquatic ecology

Aquatic habitats

Watercourses

Many of the watercourses had good water quality, although a few had moderately polluted water. The Enniscorthy Main Drainage Stage 3 Scheme, described in cumulative impacts, is likely to improve water quality in some of the watercourses. Most of the watercourses are located within farmland and other habitats and not in urban areas; therefore, if land management continues as at present, there are no predicted changes in the condition of watercourses in the medium to long-term.

Riparian woodland

The area of the Annex II habitat 'Alluvial Woodland' in Ireland has declined in recent decades, and it is further threatened by habitat fragmentation, invasive species, drainage and sub-optimal grazing regimes. For these reasons, the habitat is considered to have an overall 'Bad' conservation status in Ireland (NPWS 2008). In the absence of the Proposed Scheme, factors

such as the spread of invasive species and sub-optimal grazing schemes could potentially lead to a decline in the conservation status of this habitat in the long-term.

Floating river vegetation

This habitat has been in decline for decades due to deteriorating water quality (eutrophication), overgrazing, afforestation and invasive species and its conservation status is described as 'bad' (NPWS 2008). However, as this habitat type was abundant in the local area and the water quality of many watercourses was high, it is likely that it would remain in good condition in the absence of the Proposed Scheme.

Aquatic fauna

Otter

This species is considered to have an overall 'Poor' conservation status in Ireland (NPWS 2008). There was a population decline of 24% from 1980-2004, although it is suggested that the decline occurred in the first decade, and that the population has stabilised since that time. Given the generally good condition of the watercourses and riparian habitat within the area, there are no predicted changes to the local Otter population in the medium to long-term.

Kingfisher

A recent public survey of Kingfisher in Ireland (Birdwatch Ireland unpublished) reported that they are widely distributed in Ireland, and that populations appeared to be healthy. They are listed as 'Amber' on the most recent Birds of Conservation Concern in Ireland list of Birdwatch Ireland. Given the generally good condition of the watercourses and riparian habitat within the area, there are no predicted changes to the local Otter population in the medium to long term.

Atlantic Salmon

This species is considered to have an overall 'Bad' conservation status in Ireland. This is due to reduced marine survival (climate change, diseases, parasites and pollution) and poor river quality (sewage, agricultural enrichment, acidification, erosion and siltation. The national population has declined by 75% in recent decades (NPWS 2008). However, given the generally good condition of the watercourses within the area, there are no predicted changes to the Atlantic Salmon population in the medium term.

River Lamprey, Brook Lamprey

These species are considered to have an overall 'Good' conservation status in Ireland (NPWS 2008). Given the generally good condition of the watercourses within the area, there are no predicted changes to their populations in the medium term.

Sea Lamprey

This species is considered to have an overall 'Poor' conservation status in Ireland, due to channel maintenance and in-stream blockages by weirs (NPWS 2008). Given the generally good condition of the watercourses within the area, in the absence of channel modification work, the population of Sea Lamprey is not predicted to significantly change in the medium term.

Twaite Shad

This species is considered to have an overall 'Bad' conservation status in Ireland (NPWS 2008), due to blockage of watercourses (weirs), and enrichment and sedimentation of in-stream gravel beds. Population levels in the River Slaney are low, and no spawning has been recorded there in the recent years. Given the generally good condition of the watercourses within the area, in the absence of channel modification work, the population of Sea Lamprey is predicted to remain as at present in the medium term.

Allis Shad

Relatively little is known of this species, as it has not been definitively confirmed to spawn in any Irish River. However it is present within Irish rivers and the national stronghold of the population appears to be in the south-east. Due to a lack of research, its conservation status is 'unknown' (NPWS 2008). Therefore it is not possible to predict the future status of this species in the absence of the Proposed Scheme.

Freshwater Pearl Mussel

This species is considered to have an overall 'Bad' conservation status in Ireland, and is listed as 'critically endangered' in Ireland under IUCN threat criteria. Results of a population structure and viability assessment indicated that no populations in Ireland can be considered viable due to very low levels of recruitment and recent kills related to suboptimal water quality levels (NPWS, 2008). Given the generally good condition of the watercourses within the area, in the absence of channel modification work, the population of Freshwater Pearl Mussel is predicted to continue to decline or to remain as at present in the medium term.

9.7 MITIGATION MEASURES

9.7.1 Construction phase

9.7.1.1 Mitigation measures which apply to the entire scheme

Designated sites

All relevant mitigation in relation to the River Slaney cSAC is included in the 'Aquatic ecology' section below. Refer also to Appendix 9.5 in Volume 3 of this EIS.

Terrestrial ecology

Terrestrial habitats

During construction work, unnecessary disturbance of habitats outside of the landtake extents for the Proposed Scheme must be avoided. Construction works should be confined to within the landtake extents which should be clearly marked out or fenced. It is possible that the Contractor may identify areas for site compounds or other uses outside of the landtake extents for the Proposed Scheme. In this case it will be the Contractor's responsibility to ensure compliance with environmental legislation. As a general rule the Contractor should not locate any site compounds or other construction related activities, which have not already been covered by this EIS, in the following areas:

- Within or immediately adjacent to a SAC, SPA or NHA.
- Within or immediately adjacent to any areas of woodland.
- Within 10 m of either watercourses, drainage ditches, hedgerows or treelines.
- Within any wetland areas.

A table of ecologically sensitive areas that are outside of the landtake but were surveyed as part of this EIS are listed for each section of the Proposed Scheme. These areas should not be used for construction compounds.

Where semi-natural habitats are outside of but near the landtake extents for the Proposed Scheme they must be fenced off to prevent impacts outside of the direct landtake. These should be put in place before construction works commence. An ecologist should be consulted regarding the nature and placement of fencing at sensitive locations.

Contractors should have regard to the NRA Guidelines '*Guidelines for the protection and preservation of Trees, Hedgerows and Scrub prior to, during and post construction of National Road Schemes*' and guidelines listed in the sections below for Bats, Badgers, Otters and watercourses.

Nesting birds

Best practice recommends that vegetation (e.g. hedgerows, woodland, trees, scrub and grassland) should not be removed between the beginning of March and the end of August, primarily to avoid impacts on nesting birds and breeding small mammals. This timing restriction is provided for in the Wildlife Act 1976 (as amended). However, an exemption from the restriction on the time of year of vegetation clearance is provided for road construction works under the Wildlife (Amendment) Act, 2000. It is recommended that in accordance with best

ecological practice, where feasible, hedgerows, trees, scrub and woodland areas will not be felled between 1st March and 31st August. Where the construction programme does not allow this time restriction to be observed, then these areas must be inspected by a qualified ecologist for the presence of breeding birds or mammals prior to clearance. Where any are found present the appointed ecologist will need to make a recommendation as to whether a licence is required for vegetation removal.

Badgers

Badger mitigation measures will have regard to international good practice and national guidelines:

- *Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes* (National Roads Authority, 2006).
- *Design Manual for Roads and Bridges: Mitigating Against Effects on Badgers* (Highways Agency, 2001).

The Contractor will prepare a method statement, with advice from a suitable qualified ecologist, which will have regard to the above. This will include specific measure in relation as outlined below. All contractors working on site should be made aware of relevant measures. Any works to setts (including sett monitoring), must be carried out under the supervision of qualified and experienced personnel under licence from the NPWS.

- Pre-construction Badger surveys of setts 10-12 months prior to commencement of construction activities. This survey will include setts within a certain distance of the Proposed Scheme; the distance required will depend on the nature of the work being undertaken and the timing of the surveys in relation to the baseline EIS survey work (as outlined in the above NRA guidelines).
- Exclusion and removal[1] of any setts that are within the landtake for the Proposed Scheme to avoid badger mortalities from construction works.
- Provision of artificial setts where a main sett is located within the landtake of the Proposed Scheme and there are no alternative Main setts within the vicinity[2].
- Exclusion[1] of certain setts within 50m of the Proposed Scheme, where it has been identified (during the pre-construction survey) that there may be disturbance during construction.
- Protection (e.g. fencing) of setts and prohibited working areas.
- Clear identification (e.g. signing) of setts and prohibited working areas.

- Distances within which work should not be undertaken near setts for defined types of work (e.g. use of different types of machinery and manual work) and times of year to which these restrictions apply.
- Fencing of relevant areas of Proposed Scheme, as per *Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes'* (NRA, 2006) to prevent Badgers from crossing a road at unsafe locations and to help guide them to underpass locations were they can cross under the road safely.

[1]Setts which are found to be inactive may be blocked and destroyed, regardless of the time of year. Setts which are found to be active may only be evacuated and excavated during the period July to November (inclusive) in order to avoid the badger breeding season, or at other times with the agreement of the NPWS. This timing restriction needs to be factored into the appointed contractor's work schedule.

[2]Land for artificial setts has been included within the CPO line of the Proposed Scheme. Artificial sett provision is detailed for each section of the Proposed Scheme.

The pre-construction surveys will identify any new setts which have become established since the surveys carried out for this EIS were undertaken and will also determine the precise mitigation required for each sett depending on the level of activity and the breeding status of setts at that time. Although provisional recommendations for mitigation at each sett are provided for each section of the Proposed Scheme (below), the pre-construction surveys will verify whether these mitigation measures are adequate to address possible impacts on badgers.

Underpasses will be provided in areas of high Badger activity. These will be constructed according to the *Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes* (NRA, 2006). Planting on approach to these will comprise hedgerow planting, ensuring that this does not obscure the entrance (as outlined in the above guidelines). Underpass locations are outlined for each section of the Proposed Scheme, below.

In relation to watercourse crossings, the following mitigation will be specified in the contractor's method statement. Regard should also be had to the NRA (2005). *Guidelines for the crossing of watercourses during the construction of National Road Schemes.*

- Inclusion of mammal ledges or dry culvert, suitable for Badger passage, in all culverts.
- Inclusion of ramps for access to ledges or dry culverts, where required.
- Measures to guide Badgers to ledges or dry culverts.

Bats

All Bat mitigation measures will have regard to international good practice and national guidelines:

- *Guidelines for the Treatment of Bats during the Construction of National Road Schemes* (NRA, 2005).
- *Bat Mitigation Guidelines for Ireland* (NPWS, 2006).
- *Design Manual for Roads and Bridges*: *Nature Conservation Advice in Relation to Bats* (Highways Agency, 2001).

All Bat species are listed on Annex IV of the EC Habitats Directive. Therefore, in accordance with NPWS guidelines '*Guidance on compliance with Regulation 23 of the Habitats Regulations 1997* (NPWS Circular 2/07), a (draft) derogation licence application has been included with this EIS (Appendix 9.7 in Volume 3 of this EIS). Mitigation measures are also summarised below.

1) Mitigation in respect of the buildings to be demolished

- Pre-construction bat surveys of the structures to be demolished must be carried out to ensure that Bats have not taken up residence in them between the time of the EIS surveys and the commencement of construction works.
- If Bats are not found to be present then the Bat specialist will determine whether it is still necessary to be present during building demolition.
- A derogation licence will be required for the removal or disturbance of any confirmed Bat roosts.
- No Bat roosts were confirmed in buildings to be demolished during the survey work. If Bats are found during pre-construction surveys of these buildings then revision of this derogation licence will be required and an experienced bat specialist will need to prepare a mitigation strategy. Any changes to the proposed mitigation will need to be agreed in advance of demolition works commencing with the NPWS.

2) Mitigation in respect of vegetation clearance within woodlands and hedgerows

- Prior to the commencement of construction works a survey will need to be undertaken by a suitably qualified and experience bat worker to identify any trees which have potential for bat roosts within the landtake of the Proposed Scheme.
- Where trees with potential for bats are situated along the boundary of the landtake, the potential of retaining these trees will need to be discussed with the appointed contractor. Those trees regarded as having potential for bats will need to be clearly marked.

- Trees which have high potential for bat roosts must be surveyed by a bat specialist at night prior to felling. Where Bats are not recorded during this survey, these should be felled the day immediately following the survey. The bat specialist will determine the level of survey work required and whether they are required to be present for the tree felling works.
- Trees which have low potential for bat roosts will not require pre-felling night time surveys, but will require some precautionary measures during felling. The bat specialist will determine the level of survey work required and whether they are required to be present for the tree felling works.
- The precise methodology for felling trees with Bat potential will be determined by the bat specialist. In some cases it will be appropriate to fell trees by gently pushing them over by machine, while in others it would be better to fell them in sections and lower sections to the ground.
- Locations where bat boxes will be installed on trees and in woodland are listed for each section of the Proposed Scheme. The precise number and locations within woodland and on trees will be determined by the bat specialist. This bat worker will also provide instruction to contractors on the proper erection of bat boxes. The pre-construction assessment of trees for bat potential by the bat specialist will identify further suitable locations for bat boxes.
- All trees that are identified by the bat specialist to have potential to support Bats, regardless of whether they are high or low potential and whether or not Bats are found present, must be felled between either late August to early November or late February to mid-April. These are times when bats are capable of flight and are outside of the summer breeding and winter hibernation periods when they would be most vulnerable to disturbance.

Barn Owl

As no Barn Owl nesting sites are to be destroyed there are no specific mitigation measures required in relation to nesting sites.

Aquatic ecology

The ERFB was consulted during the preparation of this EIS and relevant information has fed into the design of the Proposed Scheme. Their full recommendations are outlined in the correspondence and meeting minutes contained in Appendix 9.1 in Volume 3 of this EIS. General mitigation measures for watercourses are outlined below. Where specific measures are required for a particular crossing, these are detailed separately for each section of the Proposed Scheme.

Watercourse protection during construction

The Contractor will have regard to the following guidelines to ensure that watercourses are adequately protected from construction work:

- Construction Industry Research and Information Association CIRIA *C649: Control of water pollution from linear construction projects: Technical guidance* (Murnane *et al.* 2006)
- CIRIA *C649: Control of water pollution from linear construction projects: Site guide* (Murnane *et al.* 2006)
- DMRB HD33/06: *Surface and sub-surface drainage systems for highways.* Design Manual for Roads and Bridges. Volume 4: 2, (2006).

The Contractor will also follow measures outlined in Chapter 11 for the protection of watercourses. The contractor will prepare a method statement, which will have regard to the above, and will include specific measure in relation to the following:

- Storage of fuels, oils, greases and hydraulic fluids.
- Locations for refuelling of machinery and machine servicing.
- Control of run-off from concrete mixing.
- Erosion control in relation to cleared lands.
- Control of silt run-off.
- Control of surface-water run-off.
- Location and size of stockpile areas for sands and gravel.
- Control of sand and gravel run-off.
- Inspection and maintenance of settlement ponds.

Watercourse crossings

In addition to the guidelines listed above, when undertaking watercourse crossings and in-stream works, the Contractor will have regard to the following guidelines to ensure that watercourses are adequately protected from construction work:

- NRA (2005). *Guidelines for the crossing of watercourses during the construction of National Road Schemes.*
- ERFB (2006). *Requirements for the protection of fisheries and habitats during construction and development works at river sites.*

The Contractor will also follow measures outlined in Chapter 11 for the protection of watercourses. The Contractor will prepare a method statement, which will have regard to the

above and the consultation advice from ERFB included in Appendix 9.1 in Volume 3 of this EIS and will include specific measure in relation to the following:

- Timing of works to avoid the Annual Close Season for Salmonids*.
- Methods to control run-off of silt and suspended solids entering watercourses.
- Response measures to potential pollution incidents.
- Maintenance of flow during in-stream works (e.g. via temporary stream diversion) and fish removal if required.
- Methods to stabilise watercourse banks that have been cleared of vegetation.
- Maintenance of machinery to be used in-stream.
- Removal and replacement of stream bed material in diverted watercourses.

* The above NRA guidelines (2005) define the Annual Close Season for Salmonid species as the beginning of October to the end of February, with instream works being permitted from March to September. However they recommend that consultation over the exact timing is discussed with the relevant Regional Fisheries Board. The season is defined in the above ERFB guidelines (2006) as running from the beginning of October to the end of April, with instream works being permitted between May and September.

As described in the impact section, bottomless culverts are to be used on important Salmonid watercourses. In addition, the Contractor will have regard to the above NRA Guidelines: *Guidelines for the crossing of watercourses during the construction of National Road Schemes* in relation to culvert design and installation. Culvert design aspects that must be suitable for fish passage include:

- Culvert slope (and hence flow levels through culvert).
- Level of the culvert bottom (invert) below the level of the natural stream bed.
- Design of pools at entrance and exit to culvert for fish passage.
- Maintenance of minimum water level within culvert.*

*Baffles are to be used to ensure maintenance of required minimum water levels through culverts. As all watercourses have the potential to support Lamprey species (ERFB, pers. comm.) all baffles will be notched to facilitate Lamprey passage.

In addition, mammal ledges, or dry culverts, for mammal passage will be included at all watercourse crossings, as outlined in the above guidelines and in this chapter in relation to Badgers and Otters.

Invasive species

Indian Balsam was recorded at the crossing point of the River Slaney. Invasive plant species were not recorded at any other watercourse crossing location. Indian Balsam and Japanese Knotweed are both present in the area (NPWS, pers. comm.) and as these species can rapidly invade new habitats, particularly on watercourse banks, their presence at watercourse crossings prior to construction works cannot be ruled out. NPWS recommended therefore that pre-construction surveys, by a suitably qualified ecologist, are undertaken for invasive plant species at all watercourse crossing points. Appropriate mitigation will be outlined for crossing points where invasive plant species are found to be present. This will have regard to the 'Invasive species Ireland' Best Practice Guidelines and Management Plans, where these exist for the species concerned.

Planting of riparian habitat

Watercourse banks may require planting for stabilisation and to prevent invasive species such as Indian Balsam from becoming established. Planting of riparian habitats will have regard to the following guidelines:

- NRA (2005). *A guide to landscape treatments for National Road Schemes in Ireland.*

The planting scheme will ensure that the species used are native, reflect the existing plant communities at that location and do not contain invasive species. If translocation of existing plant material is to be used then this must be free of invasive species. A suitable qualified ecologist will be consulted in relation to the planting scheme in these locations.

<u>Otter</u>

Otter mitigation measures will have regard to international good practice and national guidelines:

- *Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes* (NRA, 2006).
- *Design Manual for Roads and Bridges: Nature Conservation Advice in Relation to Otters* (Highways Agency, 2001).

Otter is listed on Annex IV of the EC Habitats Directive. Therefore, in accordance with NPWS guidelines '*Guidance on compliance with Regulation 23 of the Habitats Regulations 1997* (NPWS Circular 2/07), a (draft) derogation licence application has been included with this EIS (Appendix 9.8 in Volume 3 of this EIS). Mitigation measures that the contractor must follow are summarised below; refer to the above NRA and DMRB guidelines for full details:

- Pre-construction Otter surveys of holts within 150m of the Proposed Scheme.
- Exclusion and removal* of any holts that are within the landtake for the Proposed Scheme.

- Exclusion and/ or removal* of holts close to landtake, where there may be temporary disturbance.
- Specification of distances within which work should not be undertaken near holts where breeding females or cubs are present.
- Timing of works to avoid breeding season (requires survey to determine as Otters may breed at any time of year) where holt is not to be excluded.
- Specification of distances within which work should not be undertaken near active, non-breeding holts.
- Protection (e.g. fencing) of holts and prohibited working areas.
- Clear identification (e.g. signing) of holts and prohibited working areas.
- Fencing of relevant areas of Proposed Scheme to prevent Otters from crossing a road at unsafe locations and will help to guide them to underpass locations were they can cross under the road safely.

*Excavation and removal of Otter holts will follow the NRA (2005) *Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes*, as recommended by the *Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes* (NRA, 2006).

In relation to watercourse crossings, the following mitigation will be specified in the contractor's method statement. Regard should also be had to the NRA (2005). *Guidelines for the crossing of watercourses during the construction of National Road Schemes.*

- Inclusion of mammal ledges or dry culvert, suitable for Otter passage, in all culverts.
- Inclusion of ramps for access to ledges or dry culverts, where required.
- Measures to guide Otters to ledges or dry culverts.

Kingfisher

Although Kingfisher breeding banks were recorded at or immediately adjacent to the proposed watercourse crossing points, a pre-construction Kingfisher survey of all watercourse locations will be carried out by a qualified ecologist. This will ensure that no Kingfisher nests have become established at or adjacent to watercourse crossing locations between the time of the EIS surveys and the commencement of construction. Should any nesting holes be located during the pre-construction surveys, the appointed ecologist will need to make a recommendation as to whether a derogation licence is required to allow disturbance to the breeding place of species listed in the EC Habitats and Birds Directives. If derogation licences are required, suitable mitigation strategies will need to be prepared and approved by the NPWS in the consideration of any such derogation licences.

Common Frog

Watercourse crossings of drainage ditches and land drains must avoid damaging Common Frogs and their larvae and eggs, which are not mobile. This does not apply to main watercourses (rivers and streams) which are unlikely to be suitable for Common Frogs as breeding sites. Damage to Common Frogs and their larvae and eggs can be avoided by undertaking works between August to January, outside of the breeding season. If this is not possible then the crossing points will need to be surveyed by a suitable qualified ecologist prior to construction work taking place. Where eggs or larvae are present, a derogation licence and appropriate mitigation strategy will need to be prepared and approved by the NPWS.

9.7.1.2 Mitigation measures specific to the M11/ N11 Mainline

Terrestrial habitats

Location of construction compounds

The location of sensitive habitats, where construction compounds should not be situated, is shown in Table 9.48.

Table 9.48 M11/ N11 Mainline: Sensitive habitats where construction compounds should not be located

Approximate chainage	Habitat type	Approximate chainage	Habitat type
South of 1,100	Scrub	East of 19,000	Scrub
South of 1,150	Scrub	East of 19,200	Scrub
South of 1,200	Scrub	East of 19,550	Scrub
South of 1,500	Woodland	East of 19,700	Scrub
South of 1,600	Scrub	East of 19,900	Scrub
West of 2.600	Scrub	East of 20,200	Woodland
East of 3,100	Woodland	West of 20,400	Woodland
West of 3,900	Woodland	East of 20,200	Woodland
West of 4,300	Scrub	West of 21,700	Woodland
West of 5,300	Woodland	East of 21,600	Woodland
East of 5,300	Wet Grassland	East of 22,300	Woodland
West of 5,600	Immature woodland	East of 22,300	Woodland
West of 5,600	Woodland	West of 22,200	Scrub
East of 5,500	Woodland	West of 22,400	Woodland
West of 6,100	Scrub	West of 22,500	Woodland
West of 7,100	Woodland	West of 22,500	Woodland
West of 7,100	Wet Grassland	West of 23,300	Woodland
East of 7,100	Wet Grassland	West of 22,900	Woodland
West of 7,100	Wet grassland	West of 23,300	Scrub
	Woodland	East of 23,300	Woodland
East of 10,000	Scrub	East of 23,600	Woodland
East of 8,400	Woodland	East of 23,900	Woodland
West of 8,800	Wet Grassland		Scrub
West of 8,800	Woodland	West of 24,300	Woodland
East of 9,300	Woodland	East of 24,300	Woodland
West of 9,500	Wet Grassland	East of 24,500	Woodland
West of 10,000	Woodland	East of 24,600	Woodland

Table 9.48 M11/ N11 Mainline: Sensitive habitats where construction compounds should not be located

Approximate chainage	Habitat type	Approximate chainage	Habitat type
West of 11,100	Wet Grassland	West of 25,700	Woodland
East of 11,200	Scrub	East of 25,600	Woodland
West of 11,300	Scrub	East of 25,800	Woodland
East of 12,900	Woodland	West of 26,100	Woodland
North of 12,600	Scrub		Woodland
North of 13,000	Immature Woodland	East of 26,500	Woodland
North of 13,400	Woodland	East of 26,700	Woodland
East of 13,300	Immature Woodland	West of 26,700	Woodland
North of 14,100	Woodland	West of 26,600	Woodland
West of 14,700	Woodland	East of 27,100	Scrub
West of 14,700	Woodland	East of 27,100	Woodland
East of 14,100	Woodland	East and West of 27,200	Woodland
East of 16,500	Immature Woodland	West of 27,300	Woodland
West of 16,900	Woodland		Woodland
East of 17,600	Immature Woodland	East of 27,400	Woodland
East of 17,900	Woodland	West of 27,500	Woodland
East of 16900	Wet grassland	East of 27,800	Woodland

Compensation planting

In addition to the landscape planting along the scheme, including planting to facilitate mammal crossing and discourage Barn Owl crossing, there will be an area of compensatory woodland habitat created. This is located to the east of the M11/ N11 Mainline from chainage 9.300 to 10,250 and is approximately 32,000km^2 in area. This will comprise native woodland planting, dominated by Oak and Ash with some Hazel and Hawthorn. The planting will be merged with the existing hedgerow along the Tinnacross Stream bank at this location, with occasional Willow and Alder planting.

Terrestrial fauna

Badgers

Mitigation for setts located within 50 metres of the Proposed Scheme is outlined in Table 9.49 below. The three Main setts that are to be destroyed and require artificial sett provision are highlighted in the table. Land that has been included in the CPO line for artificial sett provision is shown in Figure 9.1 in Volume 4 of this EIS

Table 9.49 M11/ N11 Mainline: Badger sett mitigation

Badger Sett Number (BS)	GPS (IS ITM)	Chainage	Distance from Proposed Scheme	Description	Sett type	Mitigation
112	10778 54704	1,900	0	Two active entrances, possibly rabbit. (2,0,0)	Outlying	Within landtake. Exclude and excavate under licence from NPWS.
3	10828 54556	1,920	0	Single entrance overgrown with brambles. No recent signs of activity. (0,1,0).	Outlying	Within landtake. Exclude and excavate under licence from NPWS.
4	10627 54381	2,230	0	Several entrances within 30m, with many large spoil heaps. Very active, but no signs of bedding. Feeding signs nearby (6,2,1)	Main Sett	Within landtake. Exclude and excavate under licence from NPWS. Artificial sett will be constructed 100m to the SW.
9	09867 52416	4,300	0	Possible badger sett. No sign of recent activity (0,1,0)	Possible outlying sett	Within landtake. Exclude and excavate under licence from NPWS.
10	09260 51741	5,250	7	Six entrances. Ground cover dense. No evidence of recent activity (0,6,0)	Outlying	Just outside landtake. Monitor under NPWS licence and take appropriate action if required.
146	08582 50513	6,790	0	Single entrance, Currently occupied by rabbits (1,0,0)	Outlying	Within landtake. Exclude and excavate under licence from NPWS.
147	07760 49685	7,820	0	Inactive sett with at least 5 badger-sized entrances in dense bramble. Some recent signs of activity but only at one entrance, possibly caused by rabbit. Badger hairs in one entrance. (1,5,2)	Subsidiary	Within landtake. Exclude and excavate under licence from NPWS.
134	07626 49519	8,100	0	1 large entrance and spoil heap. Badger hair found at entrance. (1,0,0)	Outlying	Within landtake. Exclude and excavate under licence from NPWS.
136	07180 48917	8,800	32	4 inactive entrances, now partially infilled (0,0,4)	Status undetermined	Outside landtake. Monitor under NPWS licence and take appropriate action if required.

Table 9.49 M11/ N11 Mainline: Badger sett mitigation

Badger Sett Number (BS)	GPS (IS ITM)	Chainage	Distance from Proposed Scheme	Description	Sett type	Mitigation
137	06951 48735	9,100	6	2 entrances with fresh spoil. Located in gorse. Musty smell from sett (2,0,0)	Outlying	Just outside landtake. Monitor under NPWS licence and take appropriate action if required.
13	06887 48649	9,200	0	5 entrances, 1 active. Latrine found nearby (1,4,0)	Subsidiary sett	Within landtake. Exclude and excavate under licence from NPWS.
14	06868 48643	9,200	0	11 entrances. All Inactive, with two large spoil heaps. Feeding signs and prints near sett (0,11,0).	Inactive main sett	Within landtake. Exclude and excavate under licence from NPWS.
15	06945 48604	9,200	0	11 entrances. 6 active and 5 inactive entrances. Large spoil heap with fresh excavated soil, Bedding found on spoil heap. (6, 5, 0)	Main sett	Within landtake. Exclude and excavate under licence from NPWS. Artificial sett will be constructed approx. 50m E.
18	a 06881 48598 b 06908 48600	9,200	0	6 entrances, 1 active. Beside stream (1,5,0). 5 entrances with soil and ivy cover.	Annexe	Within landtake. Exclude and excavate under licence from NPWS.
150	None	9,330	0	Single entrance sett (1,0,0)	Outlying	Within landtake. Exclude and excavate under licence from NPWS.
22	05960 47863	10,400	26	Unlikely sett. One entrance. No spoil heap. No sign of activity (0,1,0). Not found in 2009 re-survey.	Outlying	Outside landtake. Monitor under NPWS licence and take appropriate action if required.
23	No GPS	11,600	35	Single entrance. No signs of recent activity (0,1,0)	Outlying	Outside landtake. Monitor under NPWS licence and take appropriate action if required.
151	None	11,430	0	Single entrance large enough to fit a badger, possibly rabbit (1,0,0)	Outlying	Within landtake. Exclude and excavate under licence from NPWS.

Table 9.49 M11/ N11 Mainline: Badger sett mitigation

Badger Sett Number (BS)	GPS (IS ITM)	Chainage	Distance from Proposed Scheme	Description	Sett type	Mitigation
153	04278 46681	12,580	4	Single entrance, inactive. Possibly rabbit (0,1,0)	Outlying	Just outside landtake. Monitor under NPWS licence and take appropriate action if required.
154	04092 46800	12,620	47	3 large holes found in hedge-bank, linked by established path to latrine. Currently occupied by rabbits (2,1,0)	Outlying	Outside landtake. Monitor under NPWS licence and take appropriate action if required.
127	03849 46281	13,150	8	Single entrance with small, but Badger sized, hole and spoil. Badger droppings at bottom of spoil, and feeding signs nearby (1,0,0)	Outlying	Just outside landtake. Monitor under NPWS licence and take appropriate action if required.
24	03626 46173	13,400	0	One entrance. No fresh spoil heap. No signs of recent activity (0,1,0).	Outlying sett	Within landtake. Exclude and excavate under licence from NPWS.
25	03644 46142	13,400	0	Five entrance possible sett. No signs of recent activity. Looks unoccupied (0,5,0)	Inactive main sett	Within landtake. Exclude and excavate under licence from NPWS.
26	03697 46131 (furthest west point).	13,400	0	Large sett complex incorporating up to 30 entrances over 100m. Appears to include one active main, one inactive main and three annexe setts (of 2-3 entrances). All joined by a long path. It is not clear where each sett ends and next begins, but as all are within 30m of each other they should be considered as one large complex. Lots of bedding around several entrances. (20,10,0)	Main sett	Partially within landtake - probably only inactive entrances would require excavation. Exclude and excavate as required under licence from NPWS. No artificial sett will be provided, as an inactive main (BS128) and smaller setts (BS129, 130) are located within 150m.
29	02415 45320	14,800	15	Possible sett. One entrance with many smaller entrances used by rabbit. No signs of recent activity. Currently occupied by rabbits (0,1,0)	Possible outlying sett	Outside landtake. Monitor under NPWS licence and take appropriate action if required.

Table 9.49 M11/ N11 Mainline: Badger sett mitigation

Badger Sett Number (BS)	GPS (IS ITM)	Chainage	Distance from Proposed Scheme	Description	Sett type	Mitigation
138	02045 44631	15,650	0	One entrance on raised bank, possibly rabbit (1,0,0)	Outlying	Within landtake. Exclude and excavate under licence from NPWS.
31	01170 43692 (nearest GPS reading taken at eastern edge of woodland)	16,900	0	Possible sett. Two inactive entrances blocked with leaves and many smaller entrances. No sign of recent activity. Currently occupied by rabbits (2,0,0)	Possible outlying sett	Within landtake. Exclude and excavate under licence from NPWS.
34	01074 42738	17,800	0	Located within the drainage ditch. Entrance within the root of a felled tree. No signs of recent activity (0,1,0). Not found 2009	Outlying	Within landtake. Exclude and excavate under licence from NPWS.
132	01040 42630	17,900	18	At least 7 active entrances found among ruins of old outbuildings – one entrance within the footprint of the building. One very large, fresh spoil heap on roadside. (6,1,0)	Main sett	Outside landtake. Monitor under NPWS licence and take appropriate action if required. Located near to access track, but this is for landowner access only.
42	00079 39400	21,900	26	On bank of drainage ditch (1,0,0)	Outlying	Outside landtake. Monitor under NPWS licence and take appropriate action if required.
49	00325 38035	23,250	32	(3,0,0) Holes quite small, could be rabbit	Outlying	Outside landtake. Monitor under NPWS licence and take appropriate action if required.
56	00164 36804	24,600	39	(1,1,0)	Annexed sett	Outside landtake. Monitor under NPWS licence and take appropriate action if required.
57	00190 36747	24,500	0	(4,2,0) In hedgerow behind gorse. Fresh spoil heap. Feeding signs	Main sett	Within landtake. Exclude and excavate under licence from NPWS. An artificial sett will be constructed approx 50m N.

Table 9.49 M11/ N11 Mainline: Badger sett mitigation

Badger Sett Number (BS)	GPS (IS ITM)	Chainage	Distance from Proposed Scheme	Description	Sett type	Mitigation
58	00270 36679	24,600	12	(2,0,0) Located on bank near corner of field. Feeding signs	Annexed sett	Just outside landtake. Monitor under NPWS licence and take appropriate action if required.
59	99793 35612	25,800	0	(2,4,0) Large holes, no spoil heap	Outlying sett	Within landtake. Exclude and excavate under licence from NPWS.
63	99726 35273	26,200	46	a (0,2,0) b (0,1,0)	Outlying setts	Outside landtake. Monitor under NPWS licence and take appropriate action if required.
66	99387 33867	27,600	0	Possible badger. One small hole in bank of hedgerow(0,1,0)	Outlying sett	Within landtake. Exclude and excavate under licence from NPWS.
67	99470 33610	27,800	46	Possible badger/ fox. In earth mound surrounded by grass & scrub in grounds of house. Digging marks in area. Badger trails nearby (0,1,0).	Outlying sett	Outside landtake. Monitor under NPWS licence and take appropriate action if required.
68	99392 33547	27,900	20	Possible badger in dense hedgerow near corner. Latrine and badger near trails (0,1,0)	Outlying sett	Outside landtake. Monitor under NPWS licence and take appropriate action if required.
69	99307 33255	28,000	39	Beside tin hay shed. Latrine at entrance. Fresh spoil heap. Feeding signs, hair snags, (2,1,0)	Outlying sett	Outside landtake. Monitor under NPWS licence and take appropriate action if required.
70	99307 33255	28,000	17	Possible badger. On bank of ditch four small holes. Trail leading past it, hair snags on fence (0,4,0)	Outlying sett	Outside landtake. Monitor under NPWS licence and take appropriate action if required.

There are 9 Badger underpasses, as shown in Table 9.37. In addition there are 30 culverts included on the M11/ N11 Mainline. A list of culverts is provided In Chapter 3. All culverts will have mammal ledges for Badger passage.

Bats

Bat boxes will be provided at suitable locations as indicated in Table 9.50 to mitigate for the loss of potential bat tree roosts. The provision of bat boxes will be subject to landowner permission and access and precise locations will need to be determined by the successful Contractor and the appropriately qualified bat ecologist.

Table 9.50 M11/ N11 Mainline: Location of mitigation Bat boxes

Chainage	Description of existing potential roost	Distance from Proposed Scheme (m)[2]	Mitigation
1,400	Large oak trees in the vicinity may need to be removed for works or be at risk of damage.	Adjacent to alignment to the south.	Determine which trees are outside of the Lands Made Available and may be retained and implement tree protection measures if necessary. Provide bat boxes in adjacent broadleaved woodland on south eastern edge of alignment at 1,450.
1,500	Large oak trees	On alignment	Provide bat boxes in broadleaved adjacent woodland on south eastern edge of alignment at 1,450.
1,600 to 1,700	Large Scot's pine trees	On alignment	Provide bat boxes in broadleaved adjacent woodland on south eastern edge of alignment at 1,450.
1,900 to 2,000	Large Scot's pine trees	On alignment	Provide bat boxes in broadleaved adjacent woodland on south eastern edge of alignment at 1,450.
2,100	Large ash trees	On alignment and 30m north of alignment.	Determine which trees are outside of the Lands Made Available and may be retained and implement tree protection measures if necessary. Provide bat boxes on ash trees to be retained in this hedgerow and / or in high value hedges north of M11 / N11 2,300.
3,300	Number of large Ash trees across alignment along the Bracken Stream	On alignment	Provide bat boxes in adjacent trees along railway line, along Brackan stream and / or wet woodland to east of alignment at M11 / N11 Chainage 3,200.
5,350	Number of large Oak and Ash trees within hedgerow.	On alignment.	Provide bat boxes in adjacent broadleaved woodland, high value hedgerow and / or wet woodland, all west of alignment between 5250 and 5,750.

Table 9.50 M11/ N11 Mainline: Location of mitigation Bat boxes

5,550	Number of large Oak and Ash trees within hedgerow.	On alignment and immediately adjacent to west of alignment.	Determine which trees are outside of the Lands Made Available and may be retained and implement tree protection measures if necessary. Provide Bat boxes in adjacent broadleaved woodland, high value hedgerow and / or wet woodland, all west of alignment between 5250 and 5,750.
5,800 to 6,000	Number of large Oak and Ash trees within hedgerow.	On alignment and immediately adjacent to west of alignment.	Determine which trees are outside of the Lands Made Available and may be retained and implement tree protection measures if necessary. Provide Bat boxes in adjacent broadleaved woodland, high value hedgerow and / or wet woodland, all west of alignment between 5250 and 5,750.
6,300	Number of large Oak trees within hedgerow/ Bracken Stream.	On alignment.	Provide bat boxes in suitable trees to be identified in adjacent hedgerows.
8,050	Large trees	On alignment	Provide Bat boxes in suitable trees to be identified in adjacent hedgerows. Consideration should be given to using trees on Local Road - 5096 to the south on the eastern side of the alignment as the proposed re-routing of this local road will result in it carrying less traffic and activity.
8,250 to 8,300	Large trees	On alignment	Provide Bat boxes in suitable trees to be identified in adjacent hedgerows. As with comment above, consideration should be given to using trees on Local Road - 5096 to the south on the eastern side of the alignment.
11,550	One mature Ash tree.	On western edge of alignment.	Provide bat boxes in suitable trees to be identified in adjacent hedgerows.
13,400	A number of mature Ash trees.	On alignment.	Provide Bat boxes in suitable trees in existing adjacent woodland along the Tinnacross Stream.
14,100	One mature Ash tree.	On eastern edge of alignment.	Provide Bat boxes in trees along tributary of the Tinnacross to the east or west and / or in block of broadleaved woodland approx. 300m to the east.
14,200	Cluster of mature Beech trees at bend in track and one mature Ash on stream bank.	On western edge of alignment.	Provide Bat boxes in trees along tributary of the Tinnacross to the east or west and / or in block of broadleaved woodland approx. 300m to the east
14,225	One mature Ash on northern bank of tributary of Tinnacross (TT-06) and western edge of track.	On alignment	As for above.
14,450	Mature Oak trees	On western edge of alignment.	Provide Bat boxes in trees along the Tinnacross to the west.

Aquatic ecology

Watercourse protection during construction

In addition to the watercourse protection measures outlined in the mitigation for the entire scheme, special mitigation measures are required in relation to Culvert M11-C-03 (A-C), which crosses the Bracken Tributary BRT02. This flows into the River Bann, which supports Freshwater Pearl Mussel. Given the sensitivity of this species to increased silt load, measures are required to prevent downstream erosion of the watercourse banks below the culvert. This will reduce the risk of silt entering the River Bann as a result of construction works. An ecologist will be involved in the exact design of the bank erosion protection measures. This will use materials such as logs and tree tops (as detailed in Grady, 2006) to reinforce the banks and encourage vegetation to colonise and stabilise the banks. Materials such as concrete will not be used.

Otters

There are five holts located within 150m of the M11/ N11 section of the Proposed Scheme. These will be surveyed during pre-construction survey work and appropriate mitigation action taken as required. Potential mitigation measures are outlined in Table 9.51.

Table 9.51 M11/ N11 Mainline: Otter Holt mitigation

Otter Holt (OH) Number	Chainage	Distance from Proposed Scheme	Mitigation
1	27,500	19	Monitor and exclude under licence from NPWS if required.
3	9,180	87	Monitor and exclude under licence from NPWS if required.
4	9,180	62	Monitor and exclude under licence from NPWS if required.
5	15,560	36	Monitor and exclude under licence from NPWS if required.
6	16,150	0	Monitor and exclude and excavate under licence from NPWS.

9.7.1.3 Mitigation measures specific to the N80 Link Road

Terrestrial habitats

The location of sensitive habitats, where construction compounds should not be situated, is shown in Table 9.52.

Table 9.52 N80 Link Road: Sensitive habitats where construction compounds should not be located

Approximate chainage	Habitat type	Approximate chainage	Habitat type
North of 3,800	Woodland	North 2,800	Woodland
North of 3,700	Woodland	North of 3,000	Woodland
North of 3,500	Scrub Woodland	North of 1,300	Woodland
South of 3,500	Woodland	North of 2,600	Scrub
South of 3,400	Woodland	North and South of 2,500	Woodland
South of 3,000	Woodland	East of 1,700	Woodland
South of 2,900	Woodland	East of 1,100	Woodland
South of 2,800	Woodland	East of 0,700	Woodland
South of 2,700	Scrub	North of 0,000	Woodland
North and South of 2,750	Species-poor neutral grassland	West of 0,200	Woodland
West and South of 2,800	Scrub		

Badgers

Mitigation for setts located within 50 metres of the Proposed Scheme is outlined in Table 9.53 below. No setts are located within landtake.

Table 9.53 N80 Link Road: Badger sett mitigation

Badger Sett Number (BS)	GPS (IS ITM)	Chainage	Distance from Proposed Scheme	Description	Sett type	Mitigation
143	98687 43837	0700	26	4 entrances, 1 in field and others in woodland. Badger print in one of the entrances (4,0,0)	Outlying sett	Outside landtake. Monitor under NPWS licence and take appropriate action if required.
105	No grid ref.	1100	23	One entrance. No recent activity (0,1,0)	Outlying sett	Outside landtake. Monitor under NPWS licence and take appropriate action if required.
110	99393 42290	2500	46	One entrance, ivy over entrance with tree root blocking entrance. No signs of recent activity. Not found 2009	Outlying sett	Outside landtake. Monitor under NPWS licence and take appropriate action if required.

There are 3 Badger underpasses, as shown in Table 9.41. In addition there are 4 culverts included on the N80 Link Road. A list of culverts is provided In Chapter 3. All culverts will have mammal ledges for Badger passage.

Bats

Bat boxes will be provided at a suitable location as indicated in Table 9.54 to mitigate for the loss of potential bat tree roosts. The provision of bat boxes will be subject to landowner permission and access and precise locations will need to be determined by the successful Contractor and the appropriately qualified bat ecologist.

Table 9.54 N80 Link Road: Location of mitigation Bat boxes

2,500	Mature oak trees	On alignment.	Provide bat boxes in trees in remaining woodland to be retained to east of alignment.

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Aquatic ecology

Watercourse protection during construction

No additional mitigation required. The River Slaney crossing is a clear span bridge and therefore no in-stream works are required.

Otters

There were no holts located within 250m of this section of the Proposed Scheme.

9.7.1.4 Mitigation measures specific to the N30 Mainline

Terrestrial habitats

The location of sensitive habitats, where construction compounds should not be situated, is shown in Table 9.55

Table 9.55 N30 Mainline: Sensitive habitats where construction compounds should not be located

Approximate chainage	Habitat type	Approximate chainage	Habitat type
North and South of 0,600	Woodland	North of 5,100	Scrub
East of 0,500	Woodland	North of 4,600	Woodland
East of 1,100	Scrub	South of 5,000	Woodland
East of 1,200	Woodland	South of 4,950	Woodland
North of 1,500	Wet grassland	West of 6,000	Woodland
South of 1,800	Woodland	East of 6,100	Woodland
West of 1,800	Scrub	East of 6,000	Woodland
West of 1,700	Woodland	West of 6,100	Woodland
West of 2,500	Woodland	East and West of	Woodland

Table 9.55 N30 Mainline: Sensitive habitats where construction compounds should not be located

Approximate chainage	Habitat type	Approximate chainage	Habitat type
		6,400	
North of 2,800	Woodland	West of 6,400	Woodland
South of 3,300	Woodland	East and West of 6,600	Woodland
South of 3,400	Woodland	West of 6,900	Woodland
North of 3,350	Woodland	West of 7,300	Woodland
North of 4,200	Woodland	East/West of 8,000	Woodland
South of 4,300	Scrub	East of 0,000	Woodland
North of 5,100	Woodland	East of 0,000	Scrub

Mitigation for setts located within 50 metres of the Proposed Scheme is outlined below. The Main sett that is to be destroyed and requires an artificial sett provision is highlighted in the table. Land that has been included in the CPO line for artificial sett provision is shown in Figure 9.1.

Table 9.56 N30 Mainline: Badger sett mitigation

Badger Sett Number (BS)	GPS (IS ITM)	Chainage	Distance from Proposed Scheme	Description	Sett type	Mitigation
71	97601 43720	900	31	(1,0,0) Small hole with a spoil heap	Outlying sett	Outside landtake. Monitor under NPWS licence and take appropriate action if required.
72	No GPS	920	43	(1,0,0) Small burrow most likely fox	Outlying sett	Outside landtake. Monitor under NPWS licence and take appropriate action if required.
73	96981 43249	1600	7	(1,0,0) One large active hole on bank between stream and drainage ditch, could be fox den, fox scat found within 5m	Outlying sett	Just outside landtake. Monitor under NPWS licence and take appropriate action if required.
75	96894 43180	1800	0	(0,3,0) Inactive, located on bank between ditch and stream. Badger latrine found nearby	Outlying sett	Within landtake. Exclude and excavate under licence from NPWS.
77	95582 42484	3350	21	(9,0,0) Fresh latrines and bedding.	Main sett	Outside landtake. Monitor under NPWS licence and take appropriate action if required.
81	94891 42149	4100	3	Probable fox earth in gorse hedge (0,1,0)	Outlying sett	Just outside landtake. Monitor under NPWS licence and take appropriate action if required.
82	94821 42062	4250	0	One hole	Outlying sett	Within landtake. Exclude and excavate under licence from NPWS.
84	94781 42017	4350	36	Lots of rabbit droppings	Outlying sett	Outside landtake. Monitor under NPWS licence and take appropriate action if required.
88	94108 41536	5100	0	Eight entrances with feeding signs (6,3,0)	Main sett	Within landtake. Exclude and excavate under licence from NPWS. Artificial sett will be constructed 75m away.
95a	93329 40525	6350	35	On open grass and slope to stream. Very fresh spoil heap (3,1,1)	Subsidiary sett	Outside landtake. Monitor under NPWS licence and take appropriate action if required.

Table 9.56 N30 Mainline: Badger sett mitigation

Badger Sett Number (BS)	GPS (IS ITM)	Chainage	Distance from Proposed Scheme	Description	Sett type	Mitigation
95b	93301 40545	6350	40	(1/0/0)	Outlying sett	Outside landtake. Monitor under NPWS licence and take appropriate action if required.
102	93599 39478	6600	0	At field edge and hedgerow. Possible rabbit re-occupation (2,2,2)	Annexed sett	Within landtake. Exclude and excavate under licence from NPWS.
103	93457 40286	6600	39	In gorse thicket on fence line at top of slope. Feeding signs present, annex (2,4,0)	Annexed sett	Outside landtake. Monitor under NPWS licence and take appropriate action if required.
104	93618 39475	7400	0	Lots of feeding signs nearby (2,0,0).	Outlying sett	Within landtake. Exclude and excavate under licence from NPWS.

There are 3 Badger underpasses, as shown in Table 9.44. In addition there are 9 culverts included on the N30 Mainline. A list of culverts is provided In Chapter 3. All culverts will have mammal ledges for Badger passage.

Bats

Bat boxes will be provided at suitable locations as indicated in Table 9.57 to mitigate for the loss of potential bat tree roosts. The provision of bat boxes will be subject to landowner permission and access and precise locations will need to be determined by the successful Contractor and the appropriately qualified bat ecologist.

Table 9.57 N30 Mainline: Location of mitigation Bat boxes

5,100	Semi-mature trees	On or immediately adjacent to northern edge of alignment	Determine which trees are outside of the Lands Made Available and may be retained and implement tree protection measures if necessary. Provide bat boxes in adjacent broadleaf woodland to be retained to the north of the alignment.
6,500 to 6,600	Mature trees	On alignment	Provide bat boxes in trees in remaining woodland to be retained to east of alignment.

Aquatic ecology

Watercourse protection during construction

No additional mitigation required. The River Urrin crossing is a clear span bridge and therefore no in-stream works are required.

Otters

One holt was located within 150m of the M11/ N11 section of the Proposed Scheme. These will be surveyed during pre-construction survey work and appropriate mitigation action taken as required. Potential mitigation measures are outlined in Table 9.58.

Table 9.58 N30 Mainline: Otter Holt mitigation

Otter Holt (OH) Number	Chainage	Distance from Proposed Scheme	Mitigation
2	0,200	129	Monitor and exclude under licence from NPWS if required.

9.7.2 Operation phase

9.7.2.1 Mitigation measures which apply to the entire scheme

Mitigation measures for the operation phase of the scheme have been included either in the construction impact mitigation section or are included in the design stage.

Construction phase mitigation includes Badger underpasses, mammal ledges on all culverts and culvert features designed to facilitate fish passage. Planting schemes, balancing pond planting, silt interceptors at outfall locations and lighting are included in the design of the Proposed Scheme.

9.8 RESIDUAL IMPACTS OF THE PROPOSED SCHEME

The design of the Proposed Scheme and specified mitigation measures will reduce impacts to terrestrial and aquatic ecology from the construction and operation of the Proposed Scheme. However it is difficult to remove all impacts from this type of scheme. Details of residual impacts are shown below. All probable significant negative residual impacts are at a Local level.

9.8.1 Construction Phase

Residual impacts from the construction phase of the Proposed Scheme are shown in Table 9.56. Impacts which were not considered to be ecologically significant have not been included.

9.8.2 Operation Phase

Residual impacts from the construction phase of the Proposed Scheme are shown in Table 9.56. Impacts which were not considered to be ecologically significant have not been included.

Table 9.59 Residual impacts

Sensitive receptor	Evaluation	Impact description	Impact level	Mitigation measure	Residual impact
Impacts during construction					
Entire Scheme					
Wet grassland	C	Loss of habitat	Probable, significant long-term negative impact at a Local level.	None	Probable, significant long-term negative impact at a Local level.
Broadleaved woodland	C	Loss of habitat	Probable, significant long-term negative impact at a Local level.	Landscape planting of woodland along Proposed Scheme	Probable, significant long-term negative impact at a Local level.
Oak-ash-hazel woodland	C	Loss of habitat	Probable, significant long-term negative impact at a Local level.	Landscape planting of woodland along Proposed Scheme	Probable, significant long-term negative impact at a Local level.
Wet Willow-alder-ash woodland	C	Loss of habitat	Probable, significant long-term negative impact at a Local level.	None	Probable, significant long-term negative impact at a Local level.
Hedgerow High value	C	Loss of habitat	Probable, significant long-term negative impact at a Local level.	Landscape planting of hedgerows along Proposed Scheme	Unlikley, significant long-term negative impact at a Local level.
Badgers	National	Destruction of setts, disturbance and/ or injury	Probable significant, short-term negative impact at the Local level.	Best practice guidelines during construction	No significant negative impact
Bats	International	Destruction of roosts, and/ or injury	Probable significant, short-term negative impact at the Local level.	Best practice guidelines during construction	No significant negative impact
Other mammals	National	Loss of habitat	Probable significant, long-term, negative impact on these species at a Local level	None	Probable significant, long-term, negative impact on these species at a Local level
Barn Owl	National	Loss of foraging habitat.	Probable significant negative impact at a Local level.	None	Probable significant negative impact at a Local level.

Table 9.59 Residual impacts

Sensitive receptor	Evaluation	Impact description	Impact level	Mitigation measure	Residual impact
Other birds	Local	Disturbance of individuals, nests and eggs	Probable significant, negative impact on these species at a Local level.	Timing of vegetation clearance to avoid nesting season or checking of vegetation for nests before clearance	No significant negative impact
Common Lizard	Local	Habitat loss and/ or injury	Unlikely, significant negative impact at a Local level.	None	Unlikely, significant negative impact at a Local level.
Watercourses	Local to International	Changes to water quality and siltation	Assessed in relation to habitats and fauna	n/a	n/a
Protected fish species	International	Changes to water quality and silt levels resulting from watercourse crossing construction	Probable, significant temporary negative impact at a National level.	Best practice guidelines during watercourse crossing construction.	No significant negative impact
Freshwater Pearl Mussel	International	Changes to water quality and siltation resulting from watercourse crossing construction	Probable, significant, permanent impact at an International level	Additional mitigation measures for tributary of River Bann.	No significant negative impact
Otter	International	Loss of habitat, disturbance of breeding females and cubs, changes to water quality	Probable, significant, short and long-term negative impacts at a Local level.	Best practice guidelines during watercourse crossing construction.	No significant negative impact
Kingfisher	International	Disturbance of individuals and nests during watercourse crossing construction	Probable, short-term significant negative impact at a Local level.	Timing of watercourse crossing work to avoid nesting season or checking of vegetation for nests before clearance	No significant negative impact
Common Frog	National	Disturbance and/ or injury of larvae and eggs during watercourse crossing construction	Probable, short-term significant negative impact at the Local level.	Timing of watercourse crossing work to breeding season or checking for larvae and eggs before clearance	No significant negative impact

Table 9.59 Residual impacts

Sensitive receptor	Evaluation	Impact description	Impact level	Mitigation measure	Residual impact
M11/N11 Mainline					
Wet grassland	C	Loss of 1,095m^2 of habitat due to landtake	Probable, significant long-term negative impact at a Local level.	None	Probable, significant long-term negative impact at a Local level.
Broadleaved woodland	C	8,917m^2 of	Probable, significant long-term negative impact at a Local level.	Landscape planting of woodland along Proposed Scheme	Probable, significant long-term negative impact at a Local level.
Oak-ash-hazel woodland	C	Loss of 1,640 m^2 of habitat due to landtake	Probable, significant long-term negative impact at a Local level.	Landscape planting of woodland along Proposed Scheme	Probable, significant long-term negative impact at a Local level.
Wet Willow-alder-ash woodland	C	Loss of 1,830 m^2 of habitat due to landtake	Probable, significant long-term negative impact at a Local level.	None	Probable, significant long-term negative impact at a Local level.
Hedgerow High value	C	Loss of 8,642 km of habitat due to landtake	Probable, significant long-term negative impact at a Local level.	Landscape planting of hedgerows along Proposed Scheme	Unlikely, significant long-term negative impact at a Local level.
Badgers	National	Potential disturbance to 41setts. Loss of 22 setts (including 3 Main setts).	Probable, significant short-term negative impact at a Local level.	Best practice guidelines during construction	No significant negative impact
Bats	International	No buildings to be demolished/ trees to be felled were found to contain roosts at time of survey. However it is difficult to conclusively rule out Bat use of buildings/ trees.	(Assessed as if Bats present in buildings and suitable trees). Probable, significant short-term negative impact at a Local level.	Best practice guidelines during construction	No significant negative impact
Watercourses	A (SAC)	Changes to water quality and silt levels due to construction of culverts and stream diversions in 2 watercourses	Probable medium-term significant negative impact at a National level.	Best practice guidelines during watercourse crossing construction.	No significant negative impact

Table 9.59 Residual impacts

Sensitive receptor	Evaluation	Impact description	Impact level	Mitigation measure	Residual impact
	A	Changes to water quality and silt levels due to construction of culverts and stream diversions in 2 watercourses	Probable medium-term significant negative impact at an international.	Best practice guidelines during watercourse crossing construction.	No significant negative impact
	C	Changes to water quality and silt levels due to construction of culverts and stream diversions in 13 watercourses	Probable short-term significant negative impact at Local level	Best practice guidelines during watercourse crossing construction.	No significant negative impact
Otter	International	Loss of one holt, potential disturbance to breeding females and cubs at 5 holts		Best practice guidelines during watercourse crossing construction.	No significant negative impact
N80 Link Road					
Oak-ash-hazel woodland	C	Loss of 2000 m^2 of habitat due to landtake	Probable, significant long-term negative impact at a Local level.	None	Probable, significant long-term negative impact at a Local level.
Bats	International	Loss of Leisler's Bat roost in woodland and other potential Bat roosts	Probable, significant short-term negative impact at a Local level.	Best practice guidelines during construction	No significant negative impact
Watercourses	A (SAC)	Changes to water quality and silt levels due to construction of culverts and stream diversions in 1 watercourses	Probable medium-term significant negative impact at a National level.	Best practice guidelines during watercourse crossing construction.	No significant negative impact
	C	Changes to water quality and silt levels due to construction of culverts and stream diversions in 1 watercourses	Probable short-term significant negative impact at Local level	Best practice guidelines during watercourse crossing construction.	No significant negative impact
N30 Mainline					
Oak-ash-hazel woodland	C	Loss of 6,750m^2 of habitat due to landtake	Probable, significant long-term negative impact at a Local level.	None	Probable, significant long-term negative impact at a Local level.

Table 9.59 Residual impacts

Sensitive receptor	Evaluation	Impact description	Impact level	Mitigation measure	Residual impact
Badgers	National	Potential disturbance to 14setts. Loss of 3 setts (including 1 Main setts).	Probable, significant short-term negative impact at a Local level.	Best practice guidelines during construction	No significant negative impact
Bats	International	No buildings to be demolished/ trees to be felled were found to contain roosts at time of survey. However it is difficult to conclusively rule out Bat use of buildings/ trees.	(Assessed as if Bats present in buildings and suitable trees). Probable, significant short-term negative impact at a Local level.	Best practice guidelines during construction	No significant negative impact
Watercourses	B	Changes to water quality and silt levels due to construction of culverts and stream diversions in 1 watercourse	Probable medium-term significant negative impact at a National level.	Best practice guidelines during watercourse crossing construction.	No significant negative impact
	C	Changes to water quality and silt levels due to construction of culverts and stream diversions in 6 watercourses	Probable short-term significant negative impact at Local level	Best practice guidelines during watercourse crossing construction.	No significant negative impact
Otter	International	Potential disturbance to breeding females and cubs at 1 holt	Unlikely short-term significant negative impact at Local level	Best practice guidelines during watercourse crossing construction.	No significant negative impact
Impacts during operation					
Entire Scheme					
Badgers	National	Collision mortality and habitat fragmentation	Probable, significant long-term negative impact at a Local level.	Mammal ledges in all culverts to provide additional 'safe' crossing points. Fencing to prevent Badger's crossing the Proposed Scheme in these locations.	No significant impact.
Bats	International	Collision mortality and habitat fragmentation	Probable, significant long-term negative impact at a Local level.	None	Unlikely significant negative impact on Bats at the Local level.

Table 9.59 Residual impacts

Sensitive receptor	Evaluation	Impact description	Impact level	Mitigation measure	Residual impact
Other mammals	National	Collision mortality and habitat fragmentation	Probable, significant long-term negative impact at a Local level.	Mammal ledges in all culverts to provide additional 'safe' crossing points. Fencing to prevent Badger's crossing the Proposed Scheme in these locations.	No significant impact.
Barn Owl	National	Collision mortality and habitat fragmentation. Design includes planting to discourage Barn Owls from flying on road verge.	Unlikely significant negative impact at a National level	None	Unlikely significant negative impact at a level
Common Lizard	Local	Collision mortality and habitat fragmentation	Unlikely, significant negative impact at a Local level	None	Unlikely significant negative impact at a Local level
Protected fish species	International	Barriers to migration	Probable significant negative impact at a National level	Best practice guidelines in construction of culvert to include features to facilitate fish passage.	No significant impact.
Otter	International	Collision mortality and habitat fragmentation	Probable, significant long-term negative impact at a Local level.	Mammal ledges in all culverts to provide additional 'safe' crossing points.	No significant impact.
M11/N11 Mainline					
Badgers	National	Collision mortality and habitat fragmentation. There were 41 setts located within 50m of this section of the Proposed Scheme. 9 'safe' crossing points being provided in areas where Badgers are considered likely to cross the Proposed Scheme.	If underpass not available in area where Badgers are crossing or Badgers do not use the underpasses, then this would comprise a probable, significant negative impact at the Local level.	Mammal ledges in all culverts to provide additional 'safe' crossing points. Fencing to prevent Badger's crossing the Proposed Scheme in these locations.	No significant impact.

Table 9.59 Residual impacts

Sensitive receptor	Evaluation	Impact description	Impact level	Mitigation measure	Residual impact
Bats	International	Collision mortality and habitat fragmentation. 11 locations where bat roosts and/ or activity has been recorded within the vicinity of the proposed scheme. Design includes culverts and underpasses, with appropriate planting and lighting, to facilitate Bat safe crossing of the Proposed Scheme at most locations.	If some Bats do not use these to cross the road then there will be an unlikely significant negative impact on Bats at the Local level.	None	Unlikely significant negative impact on Bats at the Local level.
Protected aquatic fauna species	International	Barriers to migration. However, culverts designed to facilitate fish passage by providing bottomless culverts in sensitive location and increased height in long culverts	If protected fauna species are unable to use the culverts then this would be a probable significant negative impact at a Local level.	Mammal ledges in all culverts to provide 'safe' crossing points. Best practice guidelines in construction of culvert to include features to facilitate fish passage.	No significant impact.
N80 Link Road					
Badgers	National	Collision mortality and habitat fragmentation. 3 setts located within 50m of this section of the Proposed Scheme. 3 'safe' crossing points being provided in areas where Badgers are considered likely to cross the Proposed Scheme.	If underpass not available in area where Badgers are crossing or Badgers do not use the underpasses, then this would comprise a probable, significant negative impact at the Local level.	Mammal ledges in all culverts to provide additional 'safe' crossing points. Fencing to prevent Badger's crossing the Proposed Scheme in these locations.	No significant impact.

Table 9.59 Residual impacts

Sensitive receptor	Evaluation	Impact description	Impact level	Mitigation measure	Residual impact
Bats	International	Collision mortality and habitat fragmentation. 5 locations where bat roosts and/ or activity has been recorded within the vicinity of the proposed scheme	11 locations where Design includes culverts and underpasses, with appropriate planting and lighting, to facilitate Bat safe crossing of the Proposed Scheme at most locations. If some Bats do not use these to cross the road then there will be a probable significant negative impact on Bats at the Local level.	None	Unlikely significant negative impact on Bats at the Local level.
Otter	International	Collision mortality and habitat fragmentation. Clear span bridge across River Slaney will allow safe Otter passage.	If Otter are unable to use the culvert in other locations then this would be a probable significant negative impact at a Local level.	Mammal ledges in all culverts to provide 'safe' crossing points.	No significant impact.
N30 Mainline					
Badgers	National	Collision mortality and habitat fragmentation. 14 setts located within 50m of this section of the Proposed Scheme. 3 'safe' crossing points being provided in areas where Badgers are considered likely to cross the Proposed Scheme.	If underpass not available in area where Badgers are crossing or Badgers do not use the underpasses, then this would comprise a probable, significant negative impact at the Local level.	Mammal ledges in all culverts to provide additional 'safe' crossing points. Fencing to prevent Badger's crossing the Proposed Scheme in these locations.	No significant impact.

Table 9.59 Residual impacts

Sensitive receptor	Evaluation	Impact description	Impact level	Mitigation measure	Residual impact
Bats	International	Collision mortality and habitat fragmentation. 7 locations where Bats crossing/ activity in the vicinity of the Proposed Scheme. Design includes culverts and underpasses, with appropriate planting and lighting, to facilitate Bat safe crossing of the Proposed Scheme at most locations.	If some Bats do not use these to cross the road then there will be a probable significant negative impact on Bats at the Local level.	None	Unlikely significant negative impact on Bats at the Local level.
Protected aquatic fauna species	International	Barriers to migration. However, culverts designed to facilitate fish passage by providing bottomless culverts in sensitive location and increased height in long culverts	If protected fauna species are unable to use the culverts then this would be a probable significant negative impact at a Local level.	Mammal ledges in all culverts to provide 'safe' crossing points. Best practice guidelines in construction of culvert to include features to facilitate fish passage.	No significant impact.

9.9 MONITORING

The derogation licences for Bats and Otters (and Kingfisher if necessary) and the badger licence are likely to include requirements for short and long term scientific monitoring programmes. Once these licences have been received the licensee will be responsible for implementing these short and long term monitoring requirements and for the associated reporting requirements to the NPWS.

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10 SOILS AND GEOLOGY IMPACT ASSESSMENT

10.1 INTRODUCTION

This chapter of the EIS presents available information on the soils and geology of the area along, and in the immediate vicinity of, the proposed M11 Gorey to Enniscorthy Scheme. It identifies how the existing soil and geological environment will be altered in both the short and long-term by the construction and operation of the Proposed Scheme. Where potentially significant environmental impacts on soil and geology are identified, it also outlines, insofar as practicable, how such impacts may be mitigated.

10.2 METHODOLOGY

10.2.1 Receiving Environment

The baseline study of the existing soil and geological environment along the Proposed Scheme was prepared using regional geological maps published by the Geological Survey of Ireland (GSI), soil and subsoil mapping produced by Teagasc and site-specific information obtained along the Proposed Scheme routes by a number of recent ground investigation contracts specifically:-

- N11 / N30 Enniscorthy Bypass Preliminary Ground Investigation (Oct to Dec 2006);
- N11 Clogh - Enniscorthy Preliminary Ground Investigation (Phase 1) (Apr to Jun 2008);
- N11 Clogh - Enniscorthy Preliminary Ground Investigation (Phase 2) (Oct to Dec 2008 and March to April 2009).

In-situ exposures of soil deposits or rock formations were also inspected where they occur along or in the immediate vicinity of the Proposed Scheme.

Historical Ordnance Survey maps were reviewed in order to establish former land use patterns along the Proposed Scheme. A walkover survey along the Proposed Scheme and a review of aerial photography was also undertaken in order to identify present day land-use. The principal objective in undertaking these tasks was to attempt to identify sites with potential soil contamination and/or inadequate foundation support for the Proposed Scheme.

Relevant stakeholders (identified in Section 10.2.3 below) were contacted in order to obtain relevant published information.

10.2.2 Impact Assessment

In undertaking the impact assessment of the proposed M11 Gorey to Enniscorthy Scheme on soils and geology, all relevant aspects of the Proposed Scheme which require construction on, in or under soil and / or rock are identified and described in accordance with criteria provided in the *Guidelines on Information to be Contained in Environmental Impact Statements,* (Environmental

Protection Agency, 2002) and guidance provided in the publication *Geology in Environmental Impact Statements – A Guide*, (Institute of Geologists of Ireland, 2002)

Having regard to information obtained from desk-based studies, ground investigations and observations made in the course of field (walkover) surveys, all potentially sensitive attributes (features) of the soil and geology environment along the Proposed Scheme are identified and their importance evaluated on a 5-point scale, ranging from low to extremely high importance. The importance of soil and geology attributes is typically assessed on the basis of their quality (or degree of contamination risk), extent (scale) and rarity.

Thereafter the magnitude of the potential environmental impacts on the various soil and geology attributes is rated on a 4-point scale ranging from negligible to large. The magnitude of potential impacts is typically assessed on the basis of their predicted nature, scale and duration.

The rating of potential environmental impacts on soil and geological environments are based on the matrix in Table 10.1 below, which takes account both of the importance of the attribute and the magnitude of the potential environmental impact(s) of the Proposed Scheme upon it.

Table 10.1 Rating of Significant Environmental Impacts at EIA Stage

		Magnitude of Impact			
		Negligible	**Small**	**Moderate**	**Large**
Importance of Attribute	**Extremely High**	Imperceptible	Significant	Profound	Profound
	Very High	Imperceptible	Significant / Moderate	Profound / Significant	Profound
	High	Imperceptible	Moderate / Slight	Significant / Moderate	Severe / Significant
	Medium	Imperceptible	Slight	Moderate	Significant
	Low	Imperceptible	Imperceptible	Slight	Slight / Moderate

Where practicable, measures to mitigate or eliminate the potential environmental impact are identified and described. The residual impact, which is the final impact which arises after proposed mitigation measures have been fully established, is then assessed and discussed.

10.2.3 Consultations

In undertaking this study, documentation and information was obtained from the following bodies:-

- Quarternary Section, Geological Survey of Ireland, Haddington Road, Dublin 4
- Bedrock Geology Section, Geological Survey of Ireland, Haddington Road, Dublin 4
- Ordnance Survey Ireland, Phoenix Park, Dublin
- Environment Section, Wexford County Council, County Hall, Spawell Road, Wexford

- Teagasc Dublin Advisory Office, Kinsealy Centre, Malahide Road, Dublin 17
- Environmental Protection Agency, Johnstown Castle, Co. Wexford.

10.2.4 Difficulties Encountered in Compilation

No significant difficulties were encountered in the compilation of this Chapter of the Environmental Impact Statement.

10.2.5 Definitions

Environmental and agricultural scientists generally understand the word 'soil' to refer to the fertile, organic rich layer which occurs on the surface of the Earth and the underlying layers which interact with it in terms of nutrient, ion, water and heat exchange. Using this definition, the depth of the soil layer is typically 0.3 m to 1.0 m thick. Geologists and engineers, on the other hand, generally understand the word 'soil' to refer to all unconsolidated (non-lithified) organic and inorganic deposits which occur above bedrock.

For the purposes of this EIS, the term 'soil' refers to the unconsolidated, organic rich material closest to the Earth's surface ('*topsoil*'),while the term 'subsoil' is used to refer to all other unconsolidated (non-lithified) materials which occur above bedrock.

A glossary of geological terms used is provided in Appendix 10.1.

10.3 RECEIVING ENVIRONMENT

10.3.1 Soils

Soil is the top layer of the earth's crust. It is formed by mineral particles, organic matter, water, air and living organisms. It is an extremely complex, variable and living medium and its characteristics are a function of parent subsoil or bedrock materials, climate, relief and the actions of living organisms over time.

Soil can take thousands of years to evolve and is essentially a non-renewable resource. Soil performs many vital functions. It supports food and other biomass production (forestry, biofuels *etc.*) by providing anchorage for vegetation and storing water and nutrients long enough for plants to absorb them. Soil also stores, filters and transforms others substances including carbon and nitrogen. It also has a role supporting habitats and serves as a platform for human activity, landscape and archaeology.

Soil mapping produced by Teagasc (2007) indicates that the entire length of the Proposed Scheme (with the exception of road crossings) runs over largely undisturbed soil and that there are no areas of disturbed ground where soils may have been placed, covered and/or sealed. The Teagasc mapping, reproduced in Figure 10.1 in Volume 4 of this EIS, indicates that soils along the Proposed Scheme are typically derived from mainly non-calcareous (non-limestone) parent materials (rock / subsoil). Although these soils are indicated to be relatively deep over

much of the Proposed Scheme, they do have variable drainage characteristics and alternate between well drained (AminDW) and poorly drained (AminPD).

At the northern end of the M11 / N11 Mainline however, between approximate chainages M11:3,450m and M11:5,800m, mapping indicates that the underlying soil is derived from calcareous parent materials and is relatively deep (BminPD). This soil, known locally as Macamore Clay, is poorly drained and derived from the underlying lime rich glacio-marine clay which was lifted from the sea floor by an ice sheet and deposited on land at the time of the last glaciation.

Deep well drained soils (AminDW) account for approximately 45% of the soils which occur along the Proposed Scheme. Where they occur, these soils are likely to be classified as Brown Earths. Brown Earths are soils which once supported a thick cover of deciduous forest. They often form on glacial subsoil deposits and are generally free draining, weathered, slightly leached and only slightly horizonated (layered). In general, well drained soils tend to be good, productive soils and are suitable for a wider range of agricultural uses than other soil types and, as a result, are more highly valued. Well drained soils also have higher rainfall infiltration and / or groundwater recharge rates than other soils. As such, they give rise to less surface water run-off during rainfall events and naturally attenuate flows to drains and watercourses, thereby reducing flood risks within the river catchments and sub-catchments in which they occur.

Deep poorly drained soils (AminPD and BminPD) account for approximately 40% of the soils along the Proposed Scheme. Where they occur, these soils are typically classified as surface water and / or groundwater gleys. These soils have high clay content and are characteristically affected by periodic or permanent saturation by water (in the absence of artificial drainage). In general, these soils tend to be less productive and can support only a limited range of agricultural uses, typically pasture and forestry. Although Macamore Clays have a high clay content and are poorly drained, given that they are naturally rich in lime, they tend to be somewhat more fertile and typically support silage production and cattle grazing over the drier summer months. Poorly drained soils have low rainfall infiltration and / or groundwater recharge rates. As such, they generally give rise to higher surface water run-off during rainfall events and increased flows to drains and watercourses, which in turn increases flood risks within the river catchments and sub-catchments in which they occur.

The Teagasc soils map reproduced in Figure 10.1 in Volume 4 of this EIS indicates that soils in a number of areas along the Proposed Scheme are shallow and well drained (AminSW). These soils, which account for approximately 10% of the soils along the Proposed Scheme, can often be of limited agricultural use and fertility. They are typically classified as Lithosols (in areas where subsoils are absent or rock occurs close to the surface) or Regosols (in areas adjacent to watercourses). Along the Proposed Scheme, these soils principally occur:

- around the tie-in with the existing N11 Arklow / Gorey Bypass (approximate chainage M11 / N11:1,000m to 2,300m);
- around Tomnafunshoge (approximate chainage M11:20,500 to 21,350);
- south of the county road overbridge in Drumgold (approximate chainage M11:22,250m to M11:22,550m);
- around Knockrathkyle (approximate chainage M11:24,450m to 24,650m);
- at the southern end of the M11 / N11 Mainline, around Glenteige (approximate chainage M11:26,300m to 26,600m);
- locally around Ballynahallin along the N80 Link Road;
- locally in Moyne Middle along the N30 Mainline, (approximate chainage N30:2,250 to N30:2,450m);
- locally around the hill in Killalligan North on the N30 Mainline (approximate chainage N30:2,950m);
- locally along the county road east of Monart Bridge along the east bank of the Hollyfort Stream (approximate chainage N30:4,800m and N30:5,000m respectively); and
- on the rising ground south of the N30 Mainline crossing of the River Urrin (approximate chainage N30:6,500m to N30:6,600m).

The Teagasc soil map reproduced in Figure 10.1 in Volume 4 of this EIS also indicates that mineral alluvial soils occur across approximately 5% of the Proposed Scheme, typically where the Proposed Scheme crosses or runs parallel to existing watercourses, most notably

- around the railway crossing in Ballygullen (approximate chainage M11:3,200m to 3,400m);
- along the M11 Mainline between Solsborough and Corbetstown where the Proposed Scheme criss-crosses the Tinnacross Stream and/or its tributaries numerous times (approximate chainages M11:9,300m; 9,600m to 10,850m; 11,200m to 11,420m; 12,400m; 13,100m; 13,360m; 14,240m; 14,680m to 14,800m; 14,900m to 15,200m; 15,450m to 15560m; 16,100m; 16,720m and 16,830m)
- at the crossing of the Ballydawmore Stream (approximate change M11:18,400)
- at the crossing of the Corbally Stream (approximate chainage M11:20,310m to 20,400m)
- at the crossing, and along the banks, of the Drumgold Stream and its tributaries (approximate chainages M11:22,800m; 23,250m to 23,500m; 24,100m);
- the River Slaney crossing (approximate chainage N80:2,500m to 2,800m)

- at the Clavass Stream (approximate chainage N30:550m)
- along a tributary of the Hollyfort Stream (approximate chainage N30:1,500m to 2,650m);
- at the Hollyfort Stream (approximate chaiange N30:3,300m)
- at the Pullinstown Stream (approximate chainage N30: 5,000m to 5,150m)
- the River Urrin crossing (approximate chainage N30: 6,340m to 6,560m).

Given that they occur at low points along surface watercourses, alluvial soils have a high water table, are poorly drained, are often saturated and prone to periodic flooding. Although such soils can often be quite fertile, they are only suitable for a limited range of agricultural uses.

10.3.2 Geomorphology

Geomorphology is the study of landforms which comprise the earth's surface, the processes which have modified and shaped it in the past and which continue to modify it and shape it at the present time. The principal geomorphological processes are erosion and deposition, the principal agents of which are ice, wind and water.

The geomorphological map of Ireland published in the Royal Irish Academy Atlas of Ireland (1979) indicates that most of the landforms and subsoils across Ireland are of glacial origin. Although most of these subsoils were deposited during the most recent glaciation (known as the Midlandian Glaciation), some, particularly in areas of south-western and south–eastern Ireland were deposited earlier, during the previous, penultimate glaciation (known as the Munsterian glaciation).

The maximum extent (advance) of the most recent (Midlandian) glaciation, occurred approximately 20,000 years ago. The associated ice sheets had largely retreated off the island of Ireland and / or melted some time between 10,000 and 12,000 years ago. The available geomporphological mapping published by the Royal Irish Academy indicates that along the Proposed Scheme, the Midlandian ice sheet only extended inland from the Irish Sea:-

- over the northern section of the M11 / N11 Mainline, north of Knockrobin Lower (approximate chainage M11 /N11:4,700m);
- over the southern section of the M11 / N11 Mainline, south of Tomnafunshoge (approximate chainage M11 / N11:19,300m).

In all other areas along the Proposed Scheme, the available geomorphological mapping indicates that the subsoils were deposited at the time of the penultimate (Munsterian) glaciation, approximately 70,000 years ago. The approximate extent of Midlandian and Munsterian subsoils in the vicinity of the Proposed Scheme is shown in Figure 10.2 in Volume 4 of this EIS.

In areas where the Proposed Scheme runs close to the maximum inland advance of the Midlandian ice sheet, most notably around Ballydawmore, Corbally and Tomnafunshoge, the

underlying soil profile is likely to be complex, reflecting the variety of deposition processes which occur at the margins of ice sheets. Some glacial outwash deposits in particular may have been deposited over areas, in front of, or on the margins of, the Midlandian ice sheet.

These soils are also likely to have experienced intense permafrost conditions at the time of the Midlandian glaciation and may have been altered by them. They may host a number of periglacial landforms such as *pingos*, *ice wedge polygons* etc.

10.3.3 Regional Quaternary Geology (Subsoils)

The Quaternary Period is the final stage of the geological time scale. This period includes the start of the Ice Age (approximately 1.8 million years ago), known as the Pleistocene Epoch right through to the postglacial period, known as the Holocene Epoch, which began 10,000 years ago. The Pleistocene Epoch in Ireland began when there was a significant cooling of the Earth's climate, and was characterized by alternating extended periods of very cold conditions, during which time much of the country was covered by an ice sheet. These colder periods were interspaced with warmer periods, known as interglacials, which lasted for several thousands of years at a time.

The two main types of quaternary subsoil in Ireland are glacial till, deposited at the base or margins of the ice sheets (lodgement till), and sand and gravels, whose deposition is generally associated with the melting of ice sheets at the end of an ice age (glacio-fluvial sand and gravel). Most of the quaternary subsoils in Ireland were laid down during one or other of the two most recent glaciations.

Subsoils deposited since the end of the last glaciation are typically referred to as 'recent deposits'. The most widespread recent deposit in Ireland is peat, which occurs both as upland blanket peat and lowland raised bog. Other recent deposits include silt and clay rich alluvium, typically deposited by and along rivers.

The recent (2004) subsoil mapping produced by Teagasc, the National Agriculture and Food Development Agency, indicates that a variety of subsoils occur along the M11 Gorey to Enniscorthy Scheme, principally:-

- alluvium;
- glacial till derived from Lower Palaeozoic Sandstone and Shale;
- sand and gravel derived from Lower Palaeozoic Sandstone and Shale; and
- Irish Sea Basin Till derived from Carboniferous Limestone Clasts.

The extent and distribution of these subsoils along the Proposed Scheme is shown in Figure 10.3 in Volume 4 of this EIS and was confirmed by the recent ground investigation contracts. A brief discussion on the various subsoils which occur along the Proposed Scheme is presented below:

10.3.3.1 Made Ground

Made Ground is defined as material, including soil, which has been deposited on land and / or altered by anthropogenic (human) activity. Although the available subsoil mapping indicates that the Proposed Scheme does not run across any Made Ground, some evidence of Made Ground was identified by recent ground investigations, most notably at a former landfill site at Corbally, approximately 400m to 500m west of the M11 / N11 Mainline. Some evidence of landfilling and stockpiling of imported soils was encountered along the M11 / N11 Mainline immediately south of the R744 in Tomnafunshoge. Excavation of these materials in the course of the ground investigation indicated that soils were inert and free from contamination. Some small localised infilled depressions were also identified along the M11 / N11 Mainline at chainages M11 / N11:13,300m and M11 / N11:20,750m and along the N80 Link Road at chainage N80:2,150m.

10.3.3.2 Alluvium

Along the Proposed Scheme, post-glacial, alluvial (river deposited) soils are indicated to occur principally along or immediately adjacent to surface watercourses. The most significant alluvial deposit across the Proposed Scheme is that which occurs along the valley of the River Slaney, principally on the western side of the proposed river crossing, along the N80 Link Road. Significant alluvium deposits are repeatedly encountered along the M11 / N11 Mainline between Solsborough and Corbetstown as the proposed scheme runs along the valley of the Tinnacross Stream and criss-crosses both it and its tributaries several times. Smaller deposits occur around the railway crossing in Ballygullen at the northern end of the M11 / N11 Mainline, at the crossing of the Corbally Stream and along the banks of the Drumgold Stream. Along the N30 Mainline, significant alluvium deposits occur along the banks of the River Urrin and also at crossings of the Pullinstown Stream and the Hollyfort Stream (and its tributary).

10.3.3.3 Glacial Till

Glacial till is a generic term which applies to glacially derived and / or transported soil which is deposited beneath or on the margins of a glacier or ice sheet. The Teagasc subsoil map indicates that glacial till is the predominant subsoil type which occurs along the Proposed Scheme and that it is principally derived from Lower Palaeozoic Sandstone and Shale. The Teagasc mapping does not make any distinction between the glacial till deposited during the last glaciation and the one which preceeded it.

Little specific research has been undertaken or published on the glacial subsoils of County Wexford. However, given the complexity of the depositional environment around the ice margin, possibly associated with several phases of ice advance and retreat, the glacial till would be expected to include mixing of fluvio-glacial and / or glacio-marine deposits. Evidence of this complexity was revealed by the recent ground investigations, most notably around Ballydawmore, Corbally and Tomnafunshoge.

10.3.3.4 Sand and Gravel

The Teagasc subsoil map indicates that sand and gravel deposits occur locally at several locations along the Proposed Scheme, principally around the L2024-2 overbridge at Corbally, immediately north of the Tomnafunshoge Roundabout, immediately south of the L-6605 overbridge at Drumgold and north of the L-6048 overbridge at Glenteige. Along the N80 Link Road, mapping indicates that sand and gravel occurs along the floor of the River Slaney valley, while along the N30 Mainline, it indicates that sand and gravel occurs adjacent to a minor tributary of the River Slaney, approximately 400m south of the Clavass Junction.

Where they occur at the southern end of the M11 / N11 Mainline, these deposits are interpreted to be glacial outwash deposits, deposited by meltwater at or near the margins of an ice sheet. The presence of sand and gravels at these locations is consistent with the inferred maximum extent of the Midlandian ice sheet indicated on Figure 10.3 in Volume 4 of this EIS.

The sand and gravel deposits along the banks of the River Slaney are interpreted to be of glacio-fluvial origin, deposited by glacial meltwater at the end of the last glaciation as the ice sheets retreated and formed outwash kame and terrace landforms.

10.3.3.5 Irish Sea Basin Till

Teagasc subsoil mapping indicates that a pocket of clayey till occurs around the northern section of the M11 / N11 Mainline, between approximate chainages M11 / N11:3,450m and M11 / N11:5,800m. This till was formerly at the bottom of the sea bed and was lifted and deposited on land by an ice sheet during the last glaciation. This subsoil is predominantly clayey, with little gravel content and few, if any, cobbles or boulders. It is relatively impermeable and has poor drainage characteristics. This subsoil is the parent material for the poorly drained soil known locally as ‘Macamore Clay’.

10.3.3.6 Subsoil Depth

The subsoil mapping produced by Teagasc indicates that subsoil is thin or absent at or close to ground level locally in a number of areas along the Proposed Scheme. The areas where subsoil mapping indicates subsoil cover to be thin typically corresponds to areas where Lithosol or Regosol soils are identified on Teagasc soil mapping, including most notably :

- at the northern end of the M11 / N11 Mainline, at the tie-in with the existing N11 Arklow / Gorey Bypass;
- locally along the eastern bank of the Tinnacross Stream on the M11 / N11 Mainline;
- around Knockrathkyle on the M11 / N11 Mainline;
- locally on higher ground in Killalligan North; on the N30 Mainline

- along the local road east of Monart Bridge and the eastern bank of the Hollyfort Stream (around the N30 Mainline) and
- on higher ground south of the River Urrin Crossing on the M11/N11 Mainline.

In addition to the above, recent ground investigations confirmed that subsoil is also locally thin or absent at the following locations:

- at the site of the L-2015 Ballyorril Overbridge along the N30 Mainline (approximate chainage N30:1,400m); and
- in Bessmount along the N30 Mainline (approximate chainage N30:5,450m to 5,600m).

10.3.4 Regional Solid Geology (Bedrock)

10.3.4.1 Lithology

The recent 1: 100,000 scale bedrock geology map of the area (Sheet No. 19, Carlow-Wexford) published by the Geological Survey of Ireland in 1995 identifies a number of distinct bedrock formations beneath the Proposed Scheme, principally the Lower Ordovician age Ballyhoge Formation and the Upper Ordovician age Campile Formation. These rock formations are identified in increasing age order in Table 10.2. Their areal extent along the Proposed Scheme is indicated on the bedrock geology map reproduced in Figure 10.4 in Volume 4 of this EIS.

Table 10.2 Bedrock Geology

Name	Geological Stage	Description
Campile Formation	Later Ordovician	Rhyolitic volcanic rocks ; grey and brown slates
Oaklands Formation	Early Ordovician	Green, red-purple, buff, slate and siltstone
Ballyhoge Formation	Early Ordovician	Dark grey slates with siltstone laminae

Much of the M11 / N11 Mainline and the entire length of the N80 Link Road is underlain by the Campile Formation. Along the M11 / N11 Mainline, the Campile formation extends from the northern tie-in at the Frankfort Junction to Cooladine (approximate chainage M11 / N11:22,800m), south-east of Enniscorthy. This rock formation is generally of later (or Upper) Ordovician age and typically comprises slate into which rhyolites and volcanics have been intruded. The grey brown slates that occur within the Campile Formation are fine-grained, low-grade metamorphic rocks that are characterised by well developed cleavages (along which it may split easily). Rhyolite, a fine-grained volcanic rock, is the most prevalent of the igneous intrusive rocks. Many other minor igneous intrusions occur within the formation, principally felsic volcanics which contain an abundance of feldspar and quartz, intermediate volcanics, granites and dolerites. The volcanic rocks within the Campile Formation are described as being ‘hard, very resistant’ (Geological Survey of Ireland 1994).

From Cooladine to its southern end in Scurlocksbush (approximate chainage M11 / N11:28,020m), the M11 / N11 Mainline is underlain by the early (or Lower) Ordovician age Ballyhoge formation, which typically comprises dark blue-grey slates and slaty mudstones with pale siltstone laminae. The geological map also indicates that there are granitic intrusions into the Ballyhoge formation. Although none are identified along the M11 / N11 Mainline, it is conceivable that some unmapped intrusions could occur locally within it.

The northern section of the N30 Mainline and a short section at its extreme southern end are underlain by the Campile formation. The intervening section is underlain by the Oaklands Formation, which typically comprises early Ordovician age green, red-purple, buff, slate and siltstone. Along this section, the N30 Mainline generally runs parallel to the geological contact / fault between the Campile and Oaklands Formations

In general, bedrock encountered in rotary drillholes in the course of the recent ground investigation was consistent with the available geological mapping, with moderately weak to strong mudstone (Ballyhoge Formation) typically encountered along the southern section of the M11 / N11 Mainline and strong to extremely strong igneous and low grade metapmorphic rocks of the Campile Formation along the northern section of the M11 / N11 Mainline and the N80 Link Road.

Along the N30 Mainline, the igneous and low grade metapmorphic rocks of the Campile Formation (including rhyolite, amphibolite, mudstone, slate and siltstone) were encountered along the northern section, while fine grained sedimentary and metamorphic rocks of the Oaklands Formation (including mudstone, siltstone, slate and shale) were recorded along the southern section.

The approximate extent of the rock formations underlying the Proposed Scheme is inferred from the modern 1:100,000 scale GSI regional bedrock geology map and is indicated in Tables 10.3a, 10.3b and 10.3c respectively below:

Table 10.3a Inferred Extent of Bedrock Formations along M11 / N11 Mainline

Chainage (approx) m		Bedrock Geology
Start	Finish	
0	22,800	Campile Formation
22,800	28,020	Ballyhoge Formation

Table 10.3b Inferred Extent of Bedrock Formations along N80 Link Road

Chainage (approx) m		Bedrock Geology
Start	Finish	
0	4,090	Campile Formation

Table 10.3c Inferred Extent of Bedrock Formations along N30 Mainline

Chainage (approx) m		Bedrock Geology
Start	Finish	
0	3,500	Campile Formation
3,500	7,700	Oaklands Formation
7,700	8,060	Campile Formation

10.3.4.2 Karst Features

The Proposed Scheme is underlain by volcanics, slates, mudstones and siltstones of early to later Ordovician age. These rocks are insoluble and are not prone to dissolution by water or rainfall. As such, there are no karst solution features (caves, turloughs, sinkholes etc.) along the Proposed Scheme. No karst features are recorded in the vicinity of the Proposed Scheme on the Karst Database published by the Geological Survey of Ireland.

10.3.4.3 Rock Structure

The bedrock geology underlying the Proposed Scheme generally comprises grey and brown slates of Early Ordovician age at the southern ends of the M11 / N11 Mainline and N30 Mainline which have been intruded by volcanics of Late Ordovician age over much of the remainder of the Proposed Scheme.

For much of its length the M11 / N11 Mainline overlies and runs in largely the same direction as a north-east to south-west trending structural syncline. Over the northern section of the M11/N11 Mainline, it is noticeable that the River Bann also follows the line of this syncline. A major fault, the Courtown-Tramore Fault (GSI, 1994) occurs at the contact of the Campile and Ballyhoge Formations.

10.3.4.4 Rock Weathering

Variations in the extent and depth of rock weathering were identified by recent ground investigations across the Proposed Scheme.

Along the M11 / N11 Mainline, weathering of the Campile Formation was found to be variable in both depth and extent. Weathering is most pronounced in shales and slates, particularly around rockhead level, and they are typically highly to moderately weathered. Weathering is less pronounced in igneous rocks (dykes, sills etc.) and they are typically moderately to slightly weathered. Some igneous rock around the northern end of the Proposed Scheme (at the tie-in to the N11 Gorey Bypass) are described as slightly weathered to fresh.

Further south along the M11 / N11 Mainline, highly weathered bedrock, typically comprising non-intact or highly fractured mudstone / siltstone with clay and silt infill was identified at the top of the Ballyhoge formation at depths of between 1.5 m and 10.5 m.

Along the N30 Mainline, weathered rock at the top of the Oaklands and Campile Formations typically occurs as silty and / or sandy gravel, cobbles and boulders at depths of between 0.3m and 2.2 m.

10.3.5 Geological Heritage

Geological heritage encompasses the earth science component of nature conservation. This includes both bedrock and unconsolidated (soil) deposits close to the surface and processes (past and present) that shaped the land surface. The identification of geological heritage is achieved by finding sites or areas that best demonstrate particular types of geology, processes or phenomena that rank as noteworthy. A site selection process is currently being undertaken by the Geological Survey of Ireland GSI), through the Irish Geological Heritage (IGH) Programme.

The IGH Programme operates a two-tier site designation. The primary national site designation for geological heritage (and nature conservation in general) is Natural Heritage Area (NHA). Designation of national sites is the responsibility of the National Parks and Wildlife Service (NPWS), working in partnership with the IGH programme. The second tier designation is that of County Geological Site (CGS). While a County Geological Site is not statutorily protected, the designation is intended to provide recognition for the site and some protection through incorporation into the County Development Plan.

No site along the M11 / N11 Gorey to Enniscorthy Scheme is currently designated (or proposed for future designation) as a Natural Heritage Area (NHA) or as a County Geological Site (CGS). According to the Geological Survey of Ireland, two sites in the vicinity of the Proposed Scheme are currently proposed for designation as NHA or CGS sites on geological or geomorphological grounds. These sites are:

- Greenville farmyard (Grid Ref. E 296300 N 141400) – comprising fossils of Mid Caradoc Avalonian deep water fauna, the site has been proposed under the IGH2 Theme (Precambrian to Devonian Palaeontology Theme) for classification as an NHA site; and
- Kiltrea, Co. Wexford (Grid Ref. E 291930 N 140445) – comprising fossils or early Arenig age, the site has been proposed under IGH2 Theme (Precambrian to Devonian Palaeontology) for designation as a CGS site. Part of this site is a quarry.

The locations of these sites in relation to the Proposed Scheme are shown on the Bedrock Geology map in Figure 10.4 in Volume 4 of this EIS. The proposed NHA at Greenville Farm, to the north of Enniscorthy town, is located approximately 1.5 km to the east / southeast of the N30 Mainline and at least 2.5 km to the west of the M11 / N11 Mainline. The proposed CGS site at Kiltrea is located approximately 0.5 km to the west of the N30 Mainline.

The current Wexford County Development Plan (2007-2013) does not identify any sites of geological and geomorphological interest in the County which are to be proposed or considered as possible County Geological Sites.

The entire Slaney River is designated as a candidate Special Area of Conservation (cSAC) and a proposed Natural Heritage Area (pNHA) and parts of the river are designated as a Special Protection Area (SPA). While the site is designated primarily for the quality of its natural habitat, the underlying alluvial soil forms an intrinsic part of the habitat and supports its flora and fauna. The same could also be asserted in respect of other designated ecological sites in the immediate vicinity of the Proposed Scheme.

10.3.6 Historical and Present Day Land Use

Historical Ordnance Survey 6 inch (1:10,560 scale) maps from 1829 to 1841 and later 25 inch (1:2500) scale maps from 1897 to 1913 were reviewed together with present day mapping and aerial photography for evidence of former and / or existing land-use along the Proposed Scheme. This review did not identify any former or present day industrial or commercial activities along the Proposed Scheme which could give rise to potential soil contamination.

Historical and present day mapping both indicate that land-use along and in the immediate vicinity of the Proposed Scheme has historically been, and remains, predominantly agriculture based, with interspersed isolated residential development. Enquiries to Wexford County Council and recent ground investigations revealed that a landfill site was previously operated by the County Council in Tomnafunshoge townland, approximately 400m to 500m west of the M11 Mainline (approximate chainage M11 / N11:19,800m). Details of former quarries, former and present day waste sites and industrial activities in the vicinity of the Proposed Scheme are provided in Appendix 10.2. The locations of these sites are also shown on the subsoils map in Figure 10.3 in Volume 4 of this EIS.

10.3.7 Economic Geology

The term ‘economic geology’ refers to commercial activities involving soil and bedrock. The activities involved principally comprise aggregate extraction (sand and gravel pits and quarries) and mining. A number of sources were examined for information on such commercial activities within the study area, including:

- Directory of Active Quarries, Pits and Mines in Ireland (3rd Edition, published by the Geological Survey of Ireland, 2003);
- Wexford Co. Co. Planning Department (Application for Registration of Quarries under Section 261, Planning and Development Act 2000);
- State Mining and Prospecting Facilities (published twice annually by the Department of Communications, Marine and Natural Resources);

- Concrete Products Directory (Irish Concrete Federation);
- Aerial Photographs (GSI, 1973, 1:30,000); and
- Aerial Photographs provided by Wexford County Council

These sources indicate that the only major active extractive industry along or in the immediate vicinity of the Proposed Scheme is the quarry operated by Roadstone Provinces Ltd. in Brownswood south of Enniscorthy (approximately 2 km west of the Proposed Scheme).

Recent aerial photography supplied by Wexford County Council indicates that there are currently no established extraction operations along the Proposed Scheme. A planning search by the Planning Section, Wexford County Council, also indicates that no planning permissions have been granted for extraction operations along or in the immediate vicinity of the Proposed Scheme since 27 April 2000.

There is a small active quarry located at the base of Ballydonigan Hill, approximately 1 km east of the M11 / N11 Mainline. Wexford County Council records indicate that an application to register a quarry in Ballydonigan was submitted by Mr. Patrick Breen under Section 261 of the Planning and Development Act of 2000.

There appears to be a disused quarry in Ballysimon approximately 500m south-west of Monagear village and 2 km east of the Ballydawmore Junction. The quarry appears to have been worked until relatively recently. There is no record of it having been registered under Section 261 of the Planning and Development Act of 2000. Planning permission for retention of the existing quarry was refused by Wexford County Council in August 2008 (Ref. No. 20081590).

There would also appear to be another small quarry located in Ballyhast, approximately 1 km north of the Frankfort Junction, although no record of its planning status is held by Wexford County Council. The locations of each of the quarries discussed above are indicated on the subsoil map in Figure 10.3 in Volume 4 of this EIS.

A review of the 'State Mining and Prospecting Facilities' (Department of Communications, Energy and Natural Resources) indicates that the Government has issued prospecting licences for the Courtown-Tramore Fault syncline between Enniscorthy and Gorey. These licences are held by Boliden Tara Mines in six contiguous blocks (Nos. 1194 and 1196 - 1200). Active mineral exploration (drilling) was observed in close proximity to the Proposed Scheme in Knockrobin townland (approximate chainage M11 / N11:7,000 m) during recent ground investigation works. As of April 2009 however, no economically viable mineral finds have been reported.

10.3.8 Geohazards

There are no known geohazards along or in the immediate vicinity of the Proposed Scheme. No peat occurs on either flat or sloping ground along the Proposed Scheme and the risk of peat

slides is therefore non-existent. The National Landslide Database for Ireland (Landslides Working Group, 2006) was consulted and indicated no recorded landslides in the area.

10.4 CHARACTERISTICS OF THE PROPOSED SCHEME

The Proposed Scheme comprises the construction of three new sections of road, which will form part of the National Road network, namely:-

- M11/N11 Mainline;
- N80 Link Road; and
- N30 Mainline.

Preliminary earthworks details and quantities have been developed based on the vertical alignments forming part of the preliminary design, as described in this EIS, taking into consideration the results of preliminary site investigations. The estimated bulk earthworks volumes comprise a total gross cut volume of approximately 5.28Mm^3 and a total gross fill volume of approximately 5.52Mm^3, with an estimated import requirement for 0.24Mm^3 of capping.

The preliminary site investigations indicate that excavation in rock will occur at several locations along the Proposed Scheme, principally at

- Frankfort, approximate chainage M11 / N11: 1,550m to 2,250m
- Ballymore / Rockspring, approximate chainage M11:7,840m to 8,630m
- Crane / Ballydawmore, approximate chainage M11:17,100m to 18,200m
- Ballycourcy More, approximate chainage M11:24,400m to 25,000m
- Ballynahallin, approximate chainage N80:1,800m to 2,450m
- Solsborough / Ballynabarney, approximate chainage N80:3,300m to 3,500m
- Coolnahorna, approximate chainage N30:650m to 1,450m
- Killalligan, approximate chainage N30:3,430m to 4,000m
- Bessmount, approximate chainage N30:5,255m to 5,735m
- Templescoby, approximate chainage N30:6,570m to 7,050m
- Dunsinane, approximate chainage N30:7,235m to 7,900m

The principal methods to excavate rock are blasting, breaking (using hydraulic hammers) or ripping. It is likely that the appointed Contractor will use a combination of all three excavation methods during construction.

The construction of the road scheme will generate significant local demand for aggregates and related construction materials, including 470,000m^3 of capping stone, 156,000m^3 of pavement sub-base, 641,000 tonnes of bituminous based road pavement materials and 14,900m^3 of concrete. While some materials will be sourced within the Proposed Scheme and processed on-site, the remainder will be sourced from established local suppliers.

10.5 POTENTIAL IMPACTS OF THE PROPOSED SCHEME

10.5.1 Soils

As previously noted, the Proposed Scheme generally traverses open agricultural land. The most significant direct impact of the construction and operation of the Proposed Scheme on soils and geology is the potential loss of approximately large areas of existing agricultural land and the underlying soil. Any loss of the productive soil resource will be permanent and irreversible.

Approximately 45% of the soils that will be lost along the Proposed Scheme are classified as well-drained and are suitable for a wide range of agricultural uses, including tillage. The total area of well drained soil to be lost to the Proposed Scheme accounts for approximately 0.1% of the cumulative area of these soils in County Wexford (approximately 144,000 hectares). Although the loss of these generally productive soils could be locally significant along the Proposed Scheme, in the context of the wider county and the State as a whole, the loss is relatively insignificant.

The remaining 55% of the soils along the Proposed Scheme are shallow and / or poorly drained and are consequently of more limited agricultural use. The total area of poorly drained soil to be lost to the Proposed Scheme (184 hectares) accounts for approximately 0.2% of the cumulative area of these soils in County Wexford (approximately 97,000 hectares). Although the loss of these soils may be of some limited local significance along the Proposed Scheme, in the context of the wider county and the State as a whole, the loss is relatively insignificant.

Although the impact of a permanent and irreversible loss of the productive soils along the Proposed Scheme is large, given that it effects a limited proportion of soils which are ubiquitous on a regional scale and therefore of relatively low importance, the overall impact is classified as a potentially slight negative impact.

10.5.2 Contaminated Land

Although small pockets of Made Ground were encountered at several locations along the Proposed Scheme, most notably south of the R744 Tomnafunshoge Roundabout, much of it appears to comprise inert construction and demolition waste, principally soil.

No evidence of historical activities which could potentially have contributed to soil contamination was identified along or in the immediate vicinity of the Proposed Scheme.

Although the key risk associated with Made Ground is its uncertain origin and potential for contamination, there is no evidence to suggest that any Made Ground along the Proposed Scheme is contaminated. The Proposed Scheme will have no impact on the former Local Authority municipal landfill site at Tomnafunshogue, approximately 400m to 500m west of the Proposed Scheme around chainage M11:19,800m.

On the basis of the available evidence, the potential impact of the excavation, transport, handling and / or re-use of any inert soil waste likely to be encountered along the Proposed Scheme is classified as imperceptible.

10.5.3 Geological Heritage

The GSI advises that no site along or in the immediate vicinity of the Proposed Scheme is of sufficient geological or geomorphological importance on a national scale to merit consideration for designation (or future designation) as an Natural Heritage Area (NHA). The Geological Survey of Ireland also advises that no site along or in the immediate vicinity of the Proposed Scheme is of sufficient importance on a local scale to merit designation as a County Geological Site.

The impact of national road construction on geological heritage sites is different to that for many other natural or cultural heritage sites, in that impacts are just as likely to be positive as negative. Although the Proposed Scheme does not traverse or run close to any designated geological or geomorphological sites, it will necessitate development of large scale excavations into the underlying subsoil and bedrock in many areas, creating new exposures which can facilitate deeper insight and understanding of the origin and nature of the underlying geological strata.

Exposures of subsoil will only be temporary and will generally be covered by a layer of topsoil prior to seeding with grass and / or planting. If sufficiently shallow, cutting side slopes developed in bedrock may also be topsoiled, seeded and / or planted. Where rock slopes steeper than 1v:1.5h (approximately 34°) are excavated along the Proposed Scheme, they may be too steep to support vegetation and would most likely therefore remain exposed on a permanent basis. This long-term exposure of the bedrock will provide an opportunity for earth scientists to enhance their existing knowledge of the local geological heritage resource. Of particular note is that some of the geological formations to be exposed in rock cuttings are the same as those which host the prospective geological heritage sites at Greenville Farm and Kiltrea. As such, from a geological heritage perspective, the Proposed Scheme will have a potentially slight, positive impact.

10.5.4 Economic Geology

No sand and gravel pits or quarries are located along or in the immediate vicinity of the Proposed Scheme. As such, the Proposed Scheme will not have any significant direct impact on established extractive industry or on proven / existing geological resources.

The construction of the Proposed Scheme will generate a requirement for a large volume of construction materials, principally aggregates for pavement sub-base and capping, bituminous based road pavement materials and drainage stone. Although every effort will be made to maximise the volume of excavated rock re-used as capping, it is likely that the bulk of construction materials will be sourced from local quarries.

Indirectly therefore, the Proposed Scheme is likely to lead to a reduction in the volume of proven aggregate resources locally at existing pits and quarries. Over the short term construction stage, the temporary increase in demand for aggregates from established local quarries means that the magnitude of this impact is likely to be small to moderate. It is likely however that, over the longer term, the magnitude of this impact is more likely to be small as additional aggregate resource is proven and new pits and quarries replace established ones.

The proven aggregate resource is deemed to be of medium importance, given the relative abundance of potential aggregate resource in County Wexford and the increased emphasis being placed on development and use of secondary aggregates (*i.e.* recycled concrete and road pavement) for construction purposes. The overall impact of a reduction in the volume of proven aggregate resources is therefore classified as a potentially slight to moderate, negative impact over the short-term construction phase and as a slight negative impact over the longer term operational phase.

10.5.5 Geohazards

No pre-existing or former landslide sites or potentially unstable slopes have been identified along or in the immediate vicinity of the Proposed Scheme. The Proposed Scheme will not give rise to any potential landslide risk.

10.5.6 Construction Phase Impacts

The key impact associated with the construction phase of the M11 Gorey to Enniscorthy Scheme is the excavation, handling, storage, processing and transport of earthworks materials. An estimate of the earthworks cut / fill volumes, based on the preliminary design for the Proposed Scheme, is included in Chapter 3 (Description of Proposed Scheme) of this EIS. This estimate indicates that the total gross volume of cut for the Proposed Scheme is approximately 5.28Mm^3, while the total gross volume of fill is approximately 5.52Mm^3. These quantities are a reasonable indication of the quantities and types of material that may arise were the preliminary design to be built. Ultimately however, the detailed design will be finalised by the appointed Contractor and it will be this design and the materials encountered during its construction that will determine actual earthworks quantities.

There are a number of potentially negative environmental impacts that can arise in handling earthworks materials. These impacts can arise directly as a result of on-site excavation and embankment construction activities or indirectly, due to placement of excess unsuitable materials at off-site locations.

10.5.6.1 Soil Erosion and Degradation

Where soils and / or subsoils are disturbed, excavated and / or stored for re-use during construction, they are prone to erosion by surface water run-off. In addition, *in-situ* subsoils may

be compacted by earthmoving machinery, reducing their ability to store water and this in turn will lead to increased run-off and soil erosion.

In the absence of any active management of surface water run-off during the construction phase of the Proposed Scheme, there would be significant potential for soil erosion and discharge of sediment laden surface water run-off to local streams and watercourses. The impact of soil erosion on soils along and in the immediate vicinity of the Proposed Scheme and at potential soil deposition sites along rivers further downstream is likely to be moderate in scale.

Compaction, stockpiling and repeated handling of soil during construction has the potential to degrade soil by destroying its structure and fertility. The transfer of soil across large distances may also give rise to a lack of soil compatability. These impacts are assessed as being small to moderate in scale.

As soils underlying the Proposed Scheme are ubiquitous on a local and regional scale, they are of relatively low environmental and / or ecological value. Applying the impact rating matrix in Table 10.1 for a moderate impact on soils of low importance indicates that soil erosion and degradation along the Proposed Scheme during the construction phase can be classified as a potentially slight, negative impact.

10.5.6.2 Subsoil Disposal / Recovery

For much of its length, the Proposed Scheme is underlain by Glacial Till and / or near-surface Bedrock. The only exception to this arises where soft, compressible alluvial deposits occur locally along the banks of watercourses and rivers, most notably around the River Slaney and River Urrin crossings, the Tinnacross Stream and its tributaries and the Ballydawmore, Corbally, Drumgold, Clavass, Pullinstown and Hollyfort streams.

The available ground investigation data indicates that the glacial till and bedrock will generally provide a competent foundation for the Proposed Scheme. It is likely that soft, compressible alluvial deposits which occur locally around watercourses may have to be locally excavated and replaced beneath an engineered embankment or foundation supports. Localised pockets of water softened glacial till or uncompacted Made Ground will also require excavation and replacement, where encountered.

The excavated alluvial subsoils are unlikely to be suitable for re-use as structural fill (for embankment construction). Some glacially derived subsoils (approximately 15%) will not be suitable for re-use as structural fill and it is likely that marginal glacial subsoils will require drying and/or processing in order to render them suitable for re-use as structural fill.

Overall, it is estimated that approximately 460,000 tonnes of subsoil excavated along the Proposed Scheme will be unsuitable for re-use as structural fill. Within the preliminary design earthworks quantities it has been assumed that all of this material will incorporated into the

Proposed Scheme as visual screening bunds, balancing ponds and / or in areas of landscape / ecological planting. It is currently envisaged that little or no excess or unsuitable materials will require removal to off-site soil disposal or recovery facilities.

The volume of subsoil requiring excavation and off-site disposal / recovery is therefore expected to be small in the context of the total volume of such materials generated and disposed of / recovered in County Wexford on an annual basis. As both Glacial Till and alluvium are inert and present a low level of environmental risk for disposal or recovery activities, applying the impact rating matrix in Table 10.1 for a small impact on subsoils of low risk / importance indicates that the overall impact of subsoil disposal / recovery along the Proposed Scheme on the soil and geology environment can be classified as potentially slight and negative.

10.5.6.3 Soil Contamination

In the absence of proper management and / or mitigation measures, the storage and handling of fuels and lubricants for plant and machinery and of non-hazardous or hazardous liquid and solid wastes during the construction phase of the Proposed Scheme will increase the potential risk of localised soil contamination arising as a result of an accident, spill or leak.

10.5.6.4 Aquifer Protection

The loss of soil cover at a number of locations along the Proposed Scheme, most notably in cut sections will result in a reduced thickness of soil cover above the Regionally Important Aquifer and a short-term increase in aquifer vulnerability. The increased aquifer vulnerability will be most pronounced in cut sections within the Campile Formation at the following locations:

- around the northern tie-in to the N11 Gorey Bypass at Frankfort;
- around Ballyeden and Medophall;
- through Knockrobin, Ballymore and Rockspring;
- around Ballycarrigeen and Carrigeen;
- around Crane, Toom and Ballydawmore
- around the Tomnafunshoge Roundabout;
- through Drumgold and Cooladine;
- along the N80 Link Road; and
- around Coolnahorna and Killalligan North on the N30 Mainline.

The vulnerability of the aquifer will be greater during the construction phase, particularly prior to installation of roadside drainage and the construction of the road pavement. This impact is assessed separately in Chapter 11 of this EIS (Hydrological and Hydrogeological Impact Assessment).

10.5.7 Operational Phase Impacts

The loss of the soil resource, the compaction of the underlying subsoil and the sealing of the ground surface along the road carriageways will all contribute to a long-term increase in the volume and rate of surface water run-off along the Proposed Scheme, most notably in areas where the existing soil is well drained. In the absence of any positive drainage control measures, this could lead to

- an increase in soil erosion;
- an increase in sediment discharged to local watercourses and deposited downstream;
- an increase in peak flows along local watercourses and in rivers further downstream;
- increased ponding of surface water in any closed depressions created adjacent to the Proposed Scheme.

10.5.7.1 Soil Erosion

During the operational phase, the potential for increased soil erosion along and in the immediate vicinity of the Proposed Scheme and at potential soil deposition sites further downstream along rivers is deemed to be moderate. As soils underlying the Proposed Scheme are ubiquitous on a regional scale, they are of relatively low environmental and / or ecological value. Applying the impact rating matrix in Table 10.1 for a moderate impact on soils of low importance indicates that soil erosion along the Proposed Scheme during the operational phase can be classified as a potentially slight, negative impact.

The downstream effects of soil erosion, particularly a potential increase in suspended solids on local rivers and streams are assessed separately in Chapter 11 of this EIS (Hydrological and Hydrogeological Impact Assessment).

10.5.7.2 Attenuation of Overground Flow

One of the valued functions of soil and / or subsoil is to absorb rainfall and naturally attenuate overground flow to drains and surface watercourses, thereby reducing flood risks within the river catchments and sub-catchments in which they occur. The effectiveness with which soil performs this function varies and depends on a number of variables including soil moisture content and permeability. Well-drained soils have higher rainfall infiltration and / or groundwater recharge rates than poorly-drained soils, and as such are more effective in attenuating flows to drains and watercourses,

The permanent and irreversible loss of existing soil cover along the road carriageways and its potential compaction along road verges will reduce the amount of precipitation absorbed by the ground and could potentially lead to an increase in surface water run-off and flooding risk. These impacts are assessed and discussed in more detail in Chapter 11 of this EIS (Hydrological and Hydrogeological impact Assessment).

10.5.7.3 Aquifer Protection

The permanent and irreversible loss of soil cover at a number of locations along the Proposed Scheme will result in reduced thickness of soil cover above the Regionally Important Aquifer and a long term increase in aquifer vulnerability. These impacts are assessed and discussed in more detail in Chapter 11 of this EIS (Hydrological and Hydrogeological impact Assessment).

A worst case scenario for the soil and geological environment would only arise if all of the potential construction and operational phase impacts identified above were to arise on a widespread scale across the Proposed Scheme Were they to arise, the overall impact would vary from a moderate negative impact at a local scale, to a slight negative impact on a regional scale. In reality, none of the impacts identified above would be expected to arise, as mitigation measures will be developed and incorporated into the Proposed Scheme. The appointed Contractor will be contractually obligated to implement such measures in the design and construction of the Proposed Scheme.

10.5.8 Cumulative Impacts

At the present time, none of the lands to be acquired for the Proposed Scheme are zoned for future development, or likely to be zoned for such in the foreseeable future. There is also no other proposal for major infrastructure works within, along or across the study area. Although a number of private 'one-off' residential properties are currently under construction in the vicinity of the Proposed Scheme, or have been granted planning permission in recent years, the development footprint and the scale of the construction works is very small relative to that for the Proposed Scheme. As such, there is unlikely to be any significant cumulative impact arising on the existing soil and geological environment.

10.5.9 "Do-Nothing" Scenario

In the event that the Proposed Scheme did not proceed, it is unlikely that any existing soils would be lost or degraded, as none of the lands to be acquired are zoned for future development, or likely to be zoned for such in the foreseeable future.

The likelihood of contamination arising along the acquired lands as a result of the storage and handling fuel, chemical or waste associated with established land-use activities would be almost negligible.

10.6 MITIGATION MEASURES

In order to reduce the impacts of the Proposed Scheme on the soil and geological environment, a number of mitigation measures will be incorporated into the design of the Proposed Scheme as outlined below.

10.6.1 Soils

The construction and operation of the Proposed Scheme will result in the permanent loss of soil cover along the road carriageway and in the vicinity of associated road structures. In order to minimise the extent of soil loss arising from the Proposed Scheme, soil will be excavated and stockpiled along the Proposed Scheme, pending re-use and re-establishment, insofar as practicable, along embankment and cutting side slopes, on verges adjacent to the road carriageway, on screening mounds and at landscaping areas. The overall effect of this will be to reduce the loss of soil cover within the Proposed Scheme from a potential 335 hectares to 99 hectares (or 30% of the overall landtake requirement). Any excess soil, not required for the permanent works, will be re-used for site reclamation and / or restoration works at sites in the local area, ideally contiguous to the Proposed Scheme.

10.6.2 Geological Heritage

The exposure of new geological surfaces, especially in bedrock, and the high visibility afforded to these exposures along a stretch of national road will facilitate greater understanding and appreciation of local geological heritage and earth science.

Insofar as practicable, and where provided for by landscape design proposals, excavations developed in rock cuttings along the Proposed Scheme will be scaled and trimmed and left exposed for future inspection and earth science study (ie. they will not be obscured by topsoil cover and / or new planting).

In order to expand the understanding of Ireland's geological heritage, the successful Contractor will be required as part of the main works construction contract to record geological data revealed in roadside cuttings during construction using the GSI's Temporary Exposures Form.

10.6.3 Economic Geology

In order to conserve existing local reserves of sand and gravel and bedrock for future extraction and aggregate production, embankment and road construction materials along the Proposed Scheme will be sourced, insofar as practicable, from within the confines of the landtake for the Proposed Scheme.

Where possible, all excavated bedrock will be processed and used for pavement construction purposes and failing this, for embankment construction purposes. It is anticipated that sufficient quantities of acceptable subsoil material can be sourced across the Proposed Scheme to facilitate construction of embankments and there is unlikely to be any requirement to import embankment construction materials from local pits and quarries.

The re-use of soft, wet or marginal subsoils excavated along the Proposed Scheme can be maximised by processing it in one of several possible ways. These include spreading it in thin layers and allowing it to dry naturally, excavating drainage channels prior to bulk excavation (if

groundwater level is close to ground level) or stockpiling wet soils with interbedded layers of dry soil (if available). Maximising the re-use of subsoil materials in this way reduces the requirement to import primary aggregates from local quarries.

10.6.4 Construction Stage Impacts

10.6.4.1 Soil Erosion and Degradation

In order to control the potential erosion of *in-situ* and excavated soils and subsoils during the construction phase of any civil engineering project, it is necessary to establish and implement an active construction phase surface water management system. As well as minimising soil erosion, a surface water management system will also minimise the volume of suspended solids (silt / clay sized particles) transported by surface water run-off and discharged into local watercourses.

In order to minimise soil erosion and the potential discharge of sediment to local watercourses, the following measures will be implemented during the construction phase of the Proposed Scheme (refer also to Chapter 11 of this EIS (Hydrological and Hydrogeological Impact Assessment)):

- leaving vegetation and soil in place for as long as possible prior to excavation and minimising excavation and stockpiling of soil during wet weather periods;
- shaping of soil stockpiles so as to shed water
- interception and channelling of surface water run-off over exposed soil surfaces to sumps and to silt traps or settlement lagoons thereafter;
- construction of silt traps, settlement lagoons / ponds or wetlands (either temporary or permanent) at sensitive outfalls at an early stage in the construction programme;
- construction of cut-off ditches to divert surface water run-off from entering excavations; and
- placing of granular materials over bare soil, particularly in the vicinity of watercourses, to prevent erosion of fines and/or rutting by site traffic.

Further discussion on management of surface water run-off during the road construction phase is provided in Chapter 11 of this EIS (Hydrological and Hydrogeological Impact Assessment). Guidance is also provided in the NRA publication *Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*.

In order to minimise the potential degradation of soil as a result of construction activities, the following measures will be implemented during the construction phase of the Proposed Scheme

- insofar as practicable, compaction of soil will be avoided and soil stockpiles will be restricted to less than 2m height
- repeated handling of soils will be avoided and ideally all soil stockpiles will remain undisturbed pending re-use and re-establishment of soil along the Proposed Scheme

10.6.4.2 Offsite Disposal or Recovery of Excess Soil or Subsoil

It is expected, on the basis of the preliminary design, that the amount of unsuitable mineral subsoil requiring transfer off-site to existing waste disposal or recovery facilities during the construction phase will be minimal. Efforts will be made to process unsuitable or marginal subsoils and/or re-use them within the landtake boundary for the Proposed Scheme. Potential opportunities for re-use of marginal subsoils include construction of visual screening bunds and filling in areas of landscape / ecological planting.

The construction contract will require any excess soil or unsuitable subsoil not used in construction of the Proposed Scheme to be disposed of and/or recovered in accordance with the requirements of the Waste Management Acts and Regulations 1996-2008 and the NRA *Guidelines on Waste Management for National Road Schemes* (2008).

In this respect, consideration will be given to using any excess material, not required for the permanent works, for agricultural, ecological or landscape improvement works in areas contiguous to the Proposed Scheme, in accordance with local planning controls and required licences or permits.

Alternatively, excess material may be hauled to a nearby quarry facility for backfilling purposes or processed and stored, pending re-use on future public works and / or private development projects in the area.

10.6.4.3 Soil Contamination

In order to reduce the risk of soil contamination arising as a result of spills or leakages during the construction phase, a number of measures will be implemented to control the storage and handling of fuels, lubricants and waste. These measures include, but are not limited to, the following (refer to Chapter 11 of this EIS (Hydrological and Hydrogeological impact Assessment):

(i) storing fuels, soils, chemicals, liquid and solid wastes on impermeable surfaces;

(ii) undertaking refuelling of plant, equipment and vehicles on impermeable or hardstanding surfaces. Where this is not possible, refuelling may take place using mobile, double skinned bowsers. No refuelling will be permitted in soil or rock cuttings.

(iii) ensuring all tanks and drums are bunded in accordance with established best practice guidelines;

(iv) provision of spill kits at refuelling areas and high risk / sensitive sites;

(v) development and implementation of a Construction Waste Management Plan to ensure correct handling and disposal of construction waste streams (most notably wet concrete and asphalt) in accordance with the Waste Management Acts and Regulations 1996 to 2008. This plan will form part of the Environmental Control Plan prepared for construction of the Proposed Scheme.

10.6.5 Operational Stage Impacts

In order to reduce the potential for soil erosion across and along the Proposed Scheme, vegetation will be re-established on all bare or exposed soil surfaces. Details of the preliminary Landscape Masterplan are provided in Chapter 14 of this EIS (Landscape Impact Assessment).

In order to further minimise the potential long-term increase in the volume and rate of surface water run-off along the Proposed Scheme, arising from the loss of soil cover and the sealing of the ground, positive drainage control measures in the form of balancing ponds will be installed at all proposed national route carriageway runoff outfall locations.

Balancing ponds will form an integral part of the Proposed Scheme to ensure that there is no increase in the rate of surface water run-off within local river catchments or maximum (peak) flows in local watercourses. This in turn will ensure that the erosive power of peak flows in existing watercourses will not increase as a consequence of the Proposed Scheme. Details of the proposed drainage scheme are provided in Chapter 3 and (Description of the Scheme) and Chapter 11 (Hydrological and Hydrogeological Impact Assessment) of this EIS.

10.7 RESIDUAL IMPACTS OF THE PROPOSED SCHEME

10.7.1 Construction Phase

Assuming active management of surface water run-off and the handling of fuels, lubricants and wastes during the construction phase of the Proposed Scheme are in accordance with established best practice, the potential for soil erosion and soil contamination will be minimised and the overall environmental impact on soils will be small. Re-applying the impact rating matrix in Table 10.1 for a small impact on soils of low importance indicates that the residual impact of soil erosion and soil contamination across and along the Proposed Scheme during the construction phase can be re-classified as imperceptible.

10.7.2 Operation Phase

Assuming positive drainage control measures are established during the operational phase of the Proposed Scheme and that vegetation cover is re-established, there should be no further long-term impacts on soils and geology, once it becomes operational. Re-applying the impact rating matrix in Table 10.1 for a small impact on soils of low importance indicates that the residual

impact of soil erosion across and along the Proposed Scheme during the operational phase can be re-classified as imperceptible.

The only conceivable residual impact that could arise would be if drainage systems were poorly designed and / or malfunctioned at some stage during the operational life of the scheme, when increased flooding could lead to possible erosion of soil and/or subsoil.

10.8 MONITORING

No long-term monitoring of soil degradation or soil quality is required or proposed as part of the Proposed Scheme.

10.9 REFERENCES

Environmental Protection Agency (2002) *Guidelines on the Information to be Contained in Environmental Impact Statements*

Geological Survey of Ireland (1995) *Geology of Carlow-Wexford* (1:100,000 scale, Sheet No . 19)

Geological Survey of Ireland (2001) *Directory of Active Quarries, Pits and Mines*, Third Edition

Government Publications Office (2000) *Planning and Development Act* (No. 30 of 2000)

Institute of Geologists of Ireland (2002) *Geology in Environmental Impact statements – A Guide*

Irish Concrete Federation (2005) *Concrete Products Directory*, ICF, Dublin

Teagasc (2007) *Soil Map of Ireland*

Teagasc (2004) *Subsoil Map of Ireland*

11 WATER QUALITY, HYDROLOGICAL AND HYDROGEOLOGICAL IMPACT ASSESSMENT

11.1 INTRODUCTION

This assessment covers the baseline environment with regards to surface waters, drainage (hydrology) and groundwater (hydrogeology) along and in the vicinity of the Proposed Scheme. This chapter of the EIS also assesses the sensitivity of the water environment to potential impacts that may be encountered during the construction and operational phases of the Proposed Scheme. Appropriate mitigation measures are recommended where required

11.2 METHODOLOGY

The methodology used in the preparation of this chapter of the EIS is included in Appendix 11.1.

11.2.1 Consultation

Consultation with the Eastern Regional Fisheries Board and the South Eastern River Basin District was carried out, and is described in Chapter 9 (Ecology) of this EIS.

11.2.2 Legislative Context

The Water Framework Directive is considered the main piece of legislation applicable to this chapter of the EIS. In addition, the relevant policies included in the Wexford County Development Plan (2007 – 2013) are outlined in this chapter of the EIS. Further information is provided in Appendix 11.2.

11.2.3 Data Deficiencies / Difficulties with Producing the Impact Assessment

There were no major difficulties or data deficiencies encountered in the production of this assessment.

11.3 RECEIVING ENVIRONMENT

11.3.1 Surface Water Quality

11.3.1.1 Description of Surface Water Environment

M11/N11Mainline

This section of the proposed scheme extends from Clogh to the intersection of the N11 with the N80 link Road. The M11/N11Mainline is within the catchment area of the River Slaney and River Bann, which dominate the hydrological environment along this section of the Proposed Scheme. These rivers would be considered the main receiving surface water bodies for surface runoff within the M11/N11Mainline corridor.

The main tributaries that drain directly to the River Slaney in the vicinity of the M11/N11Mainline are: the River Bann, the Tinnacross Stream, the Ballydawnmore Stream, the Corbally Stream, the Drumgold Stream, the Monroe Stream and the Scurlocksbrush Stream. All these streams join the River Slaney directly and from the east with the exception of the River Bann, which flows from a northerly direction. Further detail on the hydrological environment along this section of the route is provided in Appendix 11.3. The hydrological environment for this section of the Proposed Scheme is provided in Figure 11.1 in Volume 4 of this EIS.

N80 Link Road

The N80 Link Road is within the catchment area of the River Slaney, which dominates the hydrological environment in the vicinity of the N80 link road. The Slaney River would be considered the main receiving surface water body for surface runoff within the N80 Link Road corridor.

There are a number of tributaries of the River Slaney that are located in close proximity to the N80 Link Road. One of these is the Ballydawmore Stream, which is described above under the M11/N11Mainline route. The N80 Link Road crosses this stream just before the Ballydawmore Junction on the M11/N11Mainline.

The second tributary of the River Slaney in close proximity to the N80 Link Road, which is crossed south of Ballynahallin and north of Kilcannon, is the Kilcannon Stream. This stream rises approximately 2 km west of the River Slaney and flows in an easterly direction directly into the Slaney.

N30 Mainline

As with the M11/N11Mainline, the N30 Mainline is within the catchment of the River Slaney, which dominates the hydrological environment in the area. A number of minor tributaries drain directly into the River Slaney. The main tributary that drains directly to the Slaney is the Clavass Stream. See Figure 11.2 in Volume 4 of this EIS.

The River Urrin rises on the southern slopes of Black Rock Mountain and flows in a south-easterly direction towards Enniscorthy Town. The River Slaney / River Urrin confluence is approximately 0.5 km south west of Enniscorthy Town, and 3km to the west of the N30 Mainline. The River Urrin has a number of tributaries, which drain the lands predominantly to the north of the river. The main tributary of the River Urrin is the Hollyfort Stream, a branch of which drains to the River Urrin, and a branch of which drains into the River Slaney. The Pullinstown Stream is also a tributary of the River Urrin.

The River Boro rises in the Blackstairs Mountains to the northwest of Enniscorthy and its confluence with the River Slaney is approximately 3 km south of the town and 2 km to the west of the M11/N11Mainline. Each of these rivers has minor tributaries which drain the surrounding area. However, it shall be noted that the River Boro drains an area to the west of the River

Slaney and although the N30 Mainline will not cross this river, drainage from the road will be directed to one of its tributaries.

11.3.1.2 Surface Water Quality

M11/N11Mainline

Water quality in many of the rivers and streams within the study area is monitored on an ongoing basis by the EPA. Details on the EPA water quality monitoring stations that are located within the area of the M11/N11Mainline are provided in Table 11.1. Figure 11.1 in Volume 4 of this EIS provides the location of the EPA water quality monitoring stations within the study area.

Table 11.1 EPA Water Quality Monitoring Stations within the Study Site

Station Number	River Code	Situated On	Location	Hydrometric Area
600	12B01	River Bann	Milshoge Bridge	Slaney and Wexford Harbour
300	12C08	Camolin Stream	Bay Bridge	Slaney and Wexford Harbour
900	12C04	Corbally Stream	White's Bridge	Slaney and Wexford Harbour
600	12C04	Corbally Stream	Cooladine Bridge	Slaney and Wexford Harbour
1,000	12B01	River Bann	Bann Bridge	Slaney and Wexford Harbour
2,220	12S02	River Slaney	Just West of Solsborough Bridge	Slaney and Wexford Harbour
600	12T01	Tinnacross Stream	Bridge upstream of Solsborough Bridge	Slaney and Wexford Harbour
500	12T01	Tinnacross Stream	Tinnacross Bridge	Slaney and Wexford Harbour
400	12T01	Tinnacross Stream	Carrigeen Bridge	Slaney and Wexford Harbour
900	12B01	River Bann	Doran's Bridge	Slaney and Wexford Harbour
100	11B04	Brackan River	Toberanieran Bridge	Owenavorragh

As described in further detail in Chapter 9 (Ecology) of this EIS, biological Q Values are used to express the biological water quality by the EPA, based on changes in the macro invertebrate communities of riffle areas brought about by organic pollution, with Q1 indicating seriously polluted water body, and Q5 indicating unpolluted water of high quality. EPA biological data (from 1971 to 2005) for the surface water bodies within the M11/N11Mainline area are provided in Table 11.2. It should be noted that further Q sampling has been carried out for a number of watercourse and details are provided in Chapter 9 (Ecology).

In terms of the water quality, a summary of the condition of each of the monitored rivers and streams along the M11/N11Mainline, which were assessed in the EPA Water Quality Reports (EPA, 2004, 2005), are outlined below:

The EPA biological data indicates that the water quality in the River Bann, River Slaney, Camolin Stream, Corbally Stream, Tinnacross Stream and Brackan River is generally of good quality. In general, the water quality in these surface water bodies ranged from unpolluted to slightly polluted during the most recent sampling events in 2004 / 2005. According to the biological Q values for 2004, the water quality in the Camolin Stream at Bay Bridge would be classified as moderately polluted. This may be attributed to the fact that the Bay Bridge water quality monitoring station is situated downstream of an urban area (Camolin).

Table 11.3 presents EPA physiochemical data (the most recent data from 2001 to 2003) for the surface water bodies within the study area. The comparison of the most recent EPA physiochemical water quality data (from 2001 to 2003) with the relevant criteria provided in Table 11.3 indicates that it is, overall, of good quality at the monitoring stations at Milshoge Bridge, Bann Bridge and Toberanieran Bridge. No exceedances of the minimum or average values were registered when compared against the relevant criteria.

Table 11.2 Biological Q Values for EPA Water Quality Monitoring Stations Within the N11 Mainline Area

Year	Milshoge Bridge	Bay Bridge	Bann Bridge	Dorans Bridge	West of Solsborough Bridge	Solsborough Upstream Bridge	Tinnacross Bridge	Carigeen Bridge	Brackan River	Cooladine Bridge	White's Bridge
	River Bann	Camolin Stream	River Bann		River Slaney	Tinnacross Stream			Owenavorragh River	Corbally Stream	
2005									4		
2004	4	3	3 to 4	4	4	4		4		4-5	3 to 4
2001	3	4	3 to 4	3 to 4	4	4	4 to 5	3 to 4	4	3-4	4
1998	3	4 to 5	4 to 5	3 to 4	4	4	3 to 4	3	4	4-5	4
1995	3 to 4	4 to 5	4	3 to 4	3 to 4	4	4	3 to 4	4	4	4
1993									3		
1991	4	3	3 to 4	3		4	4	3 to 4			3
1989	4 to 5		4 to 5	4 to 5					4 to 5		
1987	4	4	4	4		4	4	4		4-5	3 to 4
1985									2		
1983	4		4	4							
1981									3 to 4		

Table 11.3 EPA Physiochemical Water Quality Monitoring Results 2001 to 2003

Parameter	Unit	Criteria	Criteria	Station No. 0600 Milshoge Bridge			Station No. 1000 – Bann Bridge			Station No. 0100 - Toberaniera		
				Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Ortho-Phosphate	mg P 1-1	0.03[1]	Good status ≤0.035 (mean)[3]	0.01	0.02	**0.07**	0.01	0.03	**0.08**	0.02	0.03	**0.16**
Oxidised Nitrogen	mg N 1-1	50[1]		4.3	5.5	6.8	4.6	5.9	6.7	3.4	5.2	6.8
PH		5.5-8.5[1]and 6.0-9.0[2]	Soft Water pH 4.5 to 9.0 Hard Water pH 6.0 to 9.0[3]	7.1	7.4	7.8	7.2	7.5	7.7	7.3	7.6	8.3
Temperature	°C	25[1]	<1.5˚C rise in ambient temperature downstream of a point of discharge[3]	5.9	9.3	16.4	5.8	9.6	16.6	8.1	11.5	16.3
Total Ammonia	mg N 1-1	0.2[1]	≤1[3]	0	0.01	0.06	0.01	0.02	0.04	0.02	0.04	**0.29**
B.O.D	mg O21-1	5.0[1]	Good Status ≤1.5 (mean)[3]	0.4	0.8	1.5	0.4	0.7	1.7	0.4	1	**8.7**

Table 11.3 EPA Physiochemical Water Quality Monitoring Results 2001 to 2003

Parameter	Unit	Criteria	Criteria	Station No. 0600 Milshoge Bridge			Station No. 1000 – Bann Bridge			Station No. 0100 - Toberaniera		
				Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum
Chloride	mg Cl 1-1	250		16	19	21	17	20	31	20	26	53
Colour	Hazen	20		5	18	**30**	5	20	**30**	10	20	**70**

Note 1 Limits from the *European Communities Quality of Surface Water Intended for the Abstraction of Drinking Water Regulations (S.I 293 of 1989)* for A1 Waters

Note 2 Limits from the *European Communities (Quality of Salmonid Waters Regulations) (S.I. 293 of 1988)*

Note 3 - Draft *European Communities Environmental Objectives (Surface Waters) Regulations 2008*

Historically, water quality was found to be moderately polluted during some of the previous monitoring events at Milshoge Bridge, Bay Bridge, Doran's Bridge, upstream of the River Slaney confluence and Brackan River. The former three EPA monitoring stations are situated in the vicinity of an urban area (Camolin and Ferns). The slight previous deterioration of surface water quality, where encountered in the past, may be due to potentially contaminated runoff from urban areas such as car parks, agricultural runoff, sewage discharge to the surface water bodies and diffuse pollution from septic tanks.

The Corbally Stream was in mostly satisfactory biological condition when last surveyed in 2004 (EPA, 2004), which was an improvement since 2001. However, according to the EPA, Station 0900 (White's Bridge) still remained in need of improvement at this time.

It shall be noted that currently no EPA biological monitoring is carried out for the streams along the remainder of the southern section of the N11.

The EPA Water Quality Report (EPA, 2005) showed that minor improvements in the water quality had occurred in the lower reaches of the River Bann for the 2004 sampling period and that the river was assessed as mostly satisfactory.

The River Slaney, in the lower reaches of its course, which is the section of the river that flows close to the Proposed Scheme, was assessed as mostly satisfactory and the EPA (2005) reported that the biological condition of the river has improved considerably in the vicinity of Enniscorthy.

The River Slaney becomes the Slaney Estuary just downstream of Enniscorthy Town and is divided into the Upper Slaney Estuary and the Lower Slaney Estuary. The EPA water quality database shows that the Lower Slaney Estuary is currently classed as Potentially Eutrophic and the Upper Slaney Estuary is classed as Intermediate i.e. between Unpolluted and Potentially Eutrophic. The most recent data available for the Slaney Estuary is from the 2005 – Water Quality in Ireland Assessment, which indicated that the Upper Slaney Estuary showed improvement between the monitoring periods 1995 – 1999 and 2000 – 2003, where the status changed from Eutrophic to Intermediate status. The Lower Slaney water quality improved from Eutrophic status to Potentially Eutrophic. This improvement was marked by a decrease in chlorophyll levels.

Table 11.4 AWN Water Quality Analysis

	Parameters	River/Stream Name	Total Suspended Solids	Oils Fats & Greases	Conductivity @ 25C	pH
	Units		**mg/l**	**mg/l**	**µS/cm**	**pH Unit**
Sample Ref.	WHITE'S BRIDGE	Corbally Stream	18	<1	212	7.25
	CORBALLY BRIDGE	Corbally Stream	15	<1	207	7.09
	AUGHNAGULLORY BRIDGE	Drumgold Stream	<10	<1	259	7.27
	GLEBE TOWNLAND	MT 2 (Monroe Stream Trib.)	<10	<1	327	7.66
	BALLYDANIEL BRIDGE	River Bann	<10	<1	169	6.99
	TOBERANIERAN BRIDGE	Brackan River	<10	<1	245	6.90
	BALLYCARNEY	River Slaney	<10	<1	226	7.47
	DORAN	River Bann	21	<1	169	7.06
	NEWBRIDGE WOOD	Tributary of River Bann	18	<1	163	6.98
	CARRIGEEN	Tinnacross Stream	<10	<1	202	6.96
	BANN BRIDGE	River Bann	25	<1	180	7.23
	MILSHOGE BRIDGE	River Bann	**31**	<1	164	6.94
Surface Water Regs[1]	A1 Waters		50	N/A	1000	5.5 - 8.5
	A 2 Waters		50	N/A	1000	5.5 - 9.0
	A 3 Waters		50	N/A	1000	5.5 - 9.0
Draft EC Surface Water Regs[2]			N/A	N/A	N/A	Soft Water pH 4.5 to 9.0 Hard Water

Table 11.4 AWN Water Quality Analysis

	Parameters	River/Stream Name	Total Suspended Solids	Oils Fats & Greases	Conductivity @ 25C	pH
	Units		**mg/l**	**mg/l**	**µS/cm**	**pH Unit**
						pH 6.0 to 9.0 [2]
Salmonid Regulations[3]			25	N/A	N/A	6-9

Note 1 Limits from the *European Communities Quality of Surface Water Intended for the Abstraction of Drinking Water Regulations (S.I. 293 of 1989)*
Note 2 - Draft *European Communities Environmental Objectives (Surface Waters) Regulations 2008*

Note 3 Limits from the *European Communities (Quality of Salmonid Waters Regulations) (S.I. 293 of 1988)*

Surface water sampling and analysis was carried out for some of the major streams and tributaries on the M11/N11Mainline, for which limited published water quality data was available. The results of the surface water monitoring are shown in Table 11.4 and the sampling locations are provided on Figure 11.2 in Volume 4 of this EIS. The comparison of the analytical results against the relevant surface water quality criteria (see Table 11.4) indicates that the water quality is good (with regard to the selected parameters) in the section of the study area. No exceedances of the relevant criteria were registered with the exception of a slight exceedance of the criteria of 25 mg/l for suspended solids in the River Bann at Milshoge Bridge (measured concentration of 31 mg/l).

The River Slaney is a designated river under the *European Communities (Quality of Salmonid Waters) Regulations of 1978* and according to the Eastern Regional Fisheries Board is an important spring Salmon and sea trout fishery. The entire main channel of the River Slaney, including the downstream Slaney Estuary, is a candidate Special Area for Conservation under the European Habitats Directive.

N80 Link Road

The Slaney River, the Kilcannon Stream and the Ballydawmore Stream are the watercourses in the vicinity of the N80 Link Road. No EPA biological monitoring is carried out on either of the streams, nor is physiochemical data available for these streams. The EPA data for the monitoring location on the River Slaney that is also close to the northern section of the M11/N11Mainline is discussed under the M11/N11Mainline section above.

N30 Mainline

A summary of the condition of each of the monitored rivers and streams along the N30 Mainline, which were assessed in the EPA Water Quality Report (2005) are outlined below.

The River Urrin was reported to be satisfactory over most of its course, with indications of some ecological upset at John's Bridge (0500) in Enniscorthy. EPA biological data is shown in Table 11.5 and 11.6.

The River Boro showed improvement along the river with the exception of the lower reaches i.e. in the vicinity of Kilcarbry Bridge (0600) and was assessed as satisfactory. The EPA (2005) reported that this may have been due to flooding in the area prior to the 2004 survey.

Table 11.5 EPA Water Quality Monitoring Stations within the N30 Mainline Area

Station Number	River Code	Situated On	Location	Hydrometric Area
360	12U01	River Urrin	Verona Bridge	Slaney and Wexford Harbour
500	12U01	River Urrin	John's Bridge	Slaney and Wexford Harbour
400	12/B02	River Boro	Br NW of Wilton Castle	Slaney and Wexford Harbour
600	12/B02	River Boro	Kilcarbry Bridge	Slaney and Wexford Harbour

Table 11.6 Biological Q Values for EPA Water Quality Monitoring Stations Within the N30 Mainline Area

Year	Verona Bridge	John's Bridge	Br NW of Wilton Castle	Kilcarbry Bridge
	River Urrin		**River Boro**	
2004		3-4	4	3-4
2001	4-5	3-4	3-4	4
1998	4-5	3-4	3-4	3
1995	3-4	4-5	4	4
1991	5	4	4	4
1989	3	-	4	4
1987	-	-	4	4
1984	-	-	4	4
1980	-	-	4	4

Surface water sampling and analysis was carried out on the N30 Mainline for some of the major streams and tributaries, for which limited published water quality data was available. The results of the surface water monitoring are shown in Table 11.7 and the sampling locations are described in Table 11.8. Figure 11.2 in Volume 4 of this EIS provides the location of the sampling points.

Table 11.7 AWN Water Quality Analysis

	Parameters	River/Stream Name	Total	Oils Fats & Greases	Conductivity @ 25C	pH
			Suspended Solids			
	Units		**mg/l**	**mg/l**	**µS/cm**	**pH Unit**
Sample Ref.	3815-S01 N30	Clavass Stream	<10	<1	0.229	7.34
	3815-S02 N30	Hollyfort Stream	<10	<1	0.183	7.07
	3815-S03 N31	UT 6 (River Urrin Trib.)	<10	<1	0.22	7.2
Surface Water Regs[1]	A1 Waters		50	N/A	1000	5.5 - 8.5
	A 2 Waters		50	N/A	1000	5.5 - 9.0
	A 3 Waters		50	N/A	1000	5.5 - 9.0
Draft EC Surface Water Regs[2]			N/A	N/A	N/A	Soft Water pH 4.5 to 9.0
						Hard Water pH 6.0 to 9.0 [2]
Salmonid Regulations [3]			25	N/A	N/A	06-Sep

Note 1 – Surface Water Regulations 1989 (A1 Waters)

Note 2 – Draft European Communities Environmental Objectives (Surface Waters) Regulations 2008

Note 3 – Salmonid Waters Regulations [1988]

Table 11.8 AWN Water Quality Sampling Locations

AWN Reference	Watercourse Name/Ref	Location
3815-S01 N30	Clavass Stream	Off N80, near Scarawalsh
3815-S02 N30	Hollyfort Stream	Killalligan North
3815-S03 N30	UT 6 (River Urrin Trib.)	Bessmont

11.3.1.3 Water Framework Directive Requirements

The Water Framework Directive (WFD) requires 'good water status' for all European waters by 2015, to be achieved through a system of river basin management planning and extensive monitoring. In 2004 a characterisation and analysis of all RBDs in Ireland was undertaken as required by Article 5 of the WFD. In this characterisation study the impacts of a range of pressures were assessed including diffuse and point pollution, water abstraction and morphological pressures (e.g. water regulation structures). The purpose of this exercise was to identify water bodies at risk of failing to meet the objectives of the WFD by 2015. Measures to address and alleviate these pressures are to be included in a formal programme of measures to be submitted to the European Commission by 2009. These measures are included in the Draft SERBD Management Plan, issued in December 2008, which need to be adopted by the end of 2009.

Reference to the Draft River Basin Management Plan (December 2008) for the South Eastern River Basin District (SERBD) indicates that:

- That surface water bodies along the Proposed Scheme have generally moderate water quality (ecological status); and

  Most major water courses along the Proposed Scheme will need to be restored (in terms of the objectives of SERBD). The River Slaney will need to be protected.

<u>M11/N11Mainline</u>

The River Slaney, and its tributaries, form part of the South Eastern River Basin District (SERBD), which is one of the River Basin Districts formed as part of the implementation of the EU Water Framework Directive (2000/60/EC). The SERBD covers an area of approximately 14,000 km^2 (including coastal and transitional waters). A characterisation report was produced for the SERBD as part of the Water Framework Requirements. Each main river and tributary was assessed in terms of a number of risk parameters, including diffuse pollution, morphological risk, point source pollution and the overall pollution risk. The results for the risk assessment for the River Slaney and its tributaries in the vicinity of the M11/N11Mainline and the explanation of the risk test results are shown in Tables 11.9 and 11.10, as extracted from the SERBD *Management System - Initial Characterisation Report* (EG Pettit & Co, July 2003).

Table 11.9 SERBD Risk Test Results – M11/N11Mainline				
Watercourse	**Overall Risk**	**Diffuse Pollution**	**Morphological Risk**	**Point Source**
River Slaney	1a	1b	2a	1a
River Bann	1a	1a	1b	1a
Corbally Stream	1a	1a	1b	2b
Tinnacross Stream	2a	1a	2a	2b

Table 11.10 Explanation of SERBD Risk Test Results	
Risk Rating	**Significance**
1a	At significant risk
1b	Probably at significant risk
2a	Probably not at significant risk
2b	Not at significant risk

N80 Link Road

The water quality for the River Slaney has been addressed under the M11/N11Mainline in terms of water quality and in relation to the SERBD. The two tributaries that are in close proximity to the N80 Link Road are the Kilcannon Stream and the Ballydawnmore Stream. There is no published EPA or SERBD water quality data for either stream.

N30 Mainline

The SERBD risk assessment from the characterisation study is shown in Table 11.11 and the risk rating in Table 11.12.

Table 11.11 SERBD Risk Test Results – N30 Mainline				
Watercourse	**Overall Risk**	**Diffuse Pollution**	**Morphological Risk**	**Point Source**
River Slaney	1a	1b	2a	1a
River Urrin Lower	2a	1a	2a	1b
Askunskin Stream	1a	1a	1b	2b
Lyre Stream	1a	1a	1b	2b
River Boro	1a	1a	2b	2b

Table 11.12 Explanation of SERBD Risk Test Results	
Risk Rating	**Significance**
1a	At significant risk
1b	Probably at significant risk
2a	Probably not at significant risk
2b	Not at significant risk

11.3.2 Surface Water Drainage & Flooding

Specific flood risks associated with watercourse crossings are detailed in Chapter 3 and appendices to Chapter 3. However baseline flood data for the overall Proposed Scheme has been collated and presented in this section.

Historically, Enniscorthy Town has been subject to periodic localised flooding. A feasibility study on flooding in Enniscorthy and proposed flood relief measures was carried out by the OPW, at the request of Wexford County Council and Enniscorthy Town Council. The feasibility report, which was produced in June 2004, showed that the main extent of flooding occurs at the town itself, and that flooding is due to a combination of joint fluvial/tidal events (OPW, 2004).

The Enniscorthy Drainage Scheme was proposed by the OPW in February 2009. The proposed drainage scheme states that the OPW, as Commissioners of Public Works in Ireland, believe that the execution of drainage works is expedient in respect of a part of the River Slaney at Enniscorthy, County Wexford for the purpose of preventing or substantially reducing the periodical localised flooding of lands in the area of that watercourse (OPW, 2009).

<u>M11/N11Mainline</u>

At present, the majority of the M11/N11Mainline crosses agricultural land. The existing surface water drainage systems consist of field drainage, which eventually enter the River Bann, River Slaney or Owenavorragh River via minor streams, rivers and tributaries.

Surface water drainage from Enniscorthy Town generally enters the River Slaney.

(i) AWN referred to the OPW National Flood Hazard Map. Flood hazards, i.e. areas where the OPW have recorded flood events. Flood events were not identified along this section of the route. The nearest recorded flood event was at the confluence of the River Slaney and Bann River.

N80 Link Road

At present, the majority of the N80 Link Road crosses agricultural land. The existing surface water drainage systems consist of field drainage, which eventually enter the River Slaney directly or via minor streams/ tributaries such as the Kilcannon Stream, Ballydawmore Stream and Corbally Stream.

There were no flood hazard records identified from the OPW Flood Hazard map that intersect, or were close to the line of the proposed N80 Link Road.

N30 Mainline

At present, the majority of the N30 Mainline crosses agricultural land. The existing surface water drainage systems consist of field drainage, which eventually enter the River Slaney directly via minor streams, rivers and tributaries or indirectly via the River Urrin and its tributaries, including the Hollyfort Stream and Pullinstown Stream.

Flood hazards identified from the OPW Flood Hazard map that intersect or were close to the line of the Proposed Scheme, were:

(i) Urrin River - in the vicinity of Verona Bridge to the west of Enniscorthy Town.

11.3.3 Hydrogeology (Groundwater)

11.3.3.1 Aquifer Classification

M11/N11Mainline

Groundwater can be defined as water that is stored in, or moves through, pores and cracks in sub-soils. Aquifers are rocks or deposits that contain sufficient void spaces and which are permeable enough, to allow water to flow through them in significant quantities. The potential of rock to store and transport water is governed by permeability of which there are two types, intergranular and fissure permeability.

Intergranular permeability is found in sediments, sands, gravels and clays and fissure permeability is found in bedrock, where water moves through (and is stored in) cracks, fissures, planes and solution openings. Based on information obtained from the GSI groundwater database, the aquifer underlying the study area is a bedrock aquifer and therefore the primary characteristic of this aquifer is defined by fissure permeability as opposed to intergranular permeability which would apply in the case of quaternary aquifer.

Details on the bedrock geology encountered along the proposed scheme are provided in Chapter 10 (Soils and Geology) of this EIS. Reference to the GSI National Draft Bedrock Aquifer Map indicates that the M11/N11Mainline is underlain by a Regionally Important Aquifer (Rf) within fissured bedrock (see Figure 11.3 in Volume 4 of this EIS). According to the GSI National Draft

Generalised Bedrock Map, the Regionally Important Aquifer is fissured bedrock comprising Ordovician Volcanics with some intrusions of granites and other igneous rocks.

The bedrock aquifer (see Figure 11.3 in Volume 4 of this EIS) underlying the southern part of the M11/N11Mainline has been classified by the GSI as a Poor Aquifer (Pl), which is generally unproductive except for local zones. The Poor Aquifer is underlain by Ordovician metasediments.

No sand or gravel aquifers have been mapped for the study area based on information obtained from the GSI groundwater database. In addition, no groundwater source protection zones, which are zones defined by the GSI within which development is limited in order to protect groundwater from potential pollution, are identified by the GSI along the M11/N11Mainline or in the immediate vicinity.

Reference to the Draft River Basin Management Plan for the South Eastern River Basin District (December 2008) indicates that

- Groundwater has generally a good status along this section of the Proposed Scheme; and
- Groundwater would need to be protected (in terms of the objectives of the SERBD).

N80 Link Road

Details on the bedrock geology encountered along this section of the Proposed Scheme are provided in Chapter 10 (Soils and Geology) of this EIS. Reference to the GSI National Draft Bedrock Aquifer Map (see Figure 11.3 in Volume 4) indicates that the N80 Link Road is underlain by a Regionally Important Aquifer (Rf). According to the GSI National Draft Generalised Bedrock Map, the Regionally Important Aquifer is fissured bedrock comprising Ordovician Volcanics with some intrusions of granites and other igneous rocks.

No sand or gravel aquifers have been mapped for the N80 Link Road based on information obtained from the GSI groundwater database. In addition, no groundwater source protection zones, which are zones defined by the GSI within which development is limited in order to protect groundwater from potential pollution, are identified by the GSI along the N80 Link Road or in the immediate vicinity.

Reference to the Draft River Basin Management Plan for the South Eastern River Basin District (December 2008) indicates that

- Groundwater has generally a good status along this section of the Proposed Scheme; and
- Groundwater would need to be protected (in terms of the objectives of the SERBD).

N30 Mainline

The major bedrock aquifer (see Figure 11.3 in Volume 4) underlying the N30 Mainline has been classified by the GSI as a Regionally Important Aquifer (Rf) (refer Figure 11.4 in Volume 4 of this EIS). The aquifer is fissured bedrock and is comprised of the grey and brown slate with are no sand or gravel aquifers recorded by the GSI in the area. No groundwater source protection zones are identified by the GSI along the N30 Mainline or in the immediate vicinity.

Reference to the Draft River Basin Management Plan for the South Eastern River Basin District (December 2008) indicates that

- Groundwater has generally a good status along this section of the Proposed Scheme; and
- Groundwater would need to be protected (in terms of the objectives of the SERBD).

11.3.3.2 Aquifer Vulnerability

The GSI, EPA, and the Department of Environment, Heritage and Local Government (DoEHLG) have developed a programme of Groundwater Protection Schemes, with the aim of maintaining the quantity and quality of groundwater in Ireland, and in some cases improving groundwater quality, by applying a risk assessment approach to groundwater protection and sustainable development.

As part of this protection scheme, the GSI have mapped the vulnerability of the country's aquifers.

M11/N11Mainline

Reference to the GSI South-Eastern Interim Aquifer Vulnerability Map indicates that the aquifer vulnerability along the M11/N11Mainline, in particular the area in the vicinity of the River Bann and its confluence with the River Slaney, is largely classified as extreme (due to the presence of rock near the surface). Reference to the GSI South-Eastern Interim Vulnerability data indicates that the aquifer vulnerability across the remainder of the M11/N11Mainline is mainly classified as High to Low because only an interim study has taken place and this section of the study area has not been sufficiently classified.

Figure 11.4 in Volume 4 of this EIS shows the classification of aquifer vulnerability within the area of the M11/N11Mainline.

N80 Link Road

Reference to the GSI South-Eastern Interim Aquifer Vulnerability Map indicates that the aquifer vulnerability in the vicinity of the N80 Link Road is largely classified as High to Low because only an interim study has taken place and this section of the study area has not been sufficiently

classified. There are small areas of Extreme vulnerability, due to bedrock recorded close to the surface.

N30 Mainline

For the N30 Mainline, the vulnerability of the aquifer beneath a significant section of the N30 Mainline is classified as High to Low. However, up to 40% of the aquifer is classified as Extreme (mainly due to the presence of rock near the surface). See Figure 11.4 in Volume 4 of this EIS which shows the classification of aquifer vulnerability and Figure 11.4 in Volume 4 of this EIS, which shows the overall groundwater status in the vicinity of the proposed national route.

11.3.3.3 Hydrogeological Regime

The direction of groundwater is likely to be influenced by the topography of the surrounding area. Groundwater within the study area is likely to be hydraulically connected to the River Bann and River Slaney or their tributaries. Groundwater in the vicinity of Clogh (northern section of M11/N11 Mainline) may also be hydraulically connected to the Owenavorragh River.

GSI Well Card Index data, which is a record of wells drilled in Ireland, was requested and reviewed. While much useful information can be obtained from this Index, it shall be noted that it is by no means exhaustive, as it relies on individual drillers submitting details of wells drilled in each area.

Due to the large number of GSI recorded wells along the Proposed Scheme, the findings will be discussed under headings as follows:

- M11/N11Mainline North - the section of the M11/N11Mainline that extends from the Frankfort Junction to the Ballydawmore Junction;
- M11/N11Mainline South - the section of the M11/N11Mainline that extends from the Ballydawmore Junction to the Scurlocksbush Roundabout;
- N30 Mainline;
- N80 Link Road.

Table 11.13 GSI Well Card Data

M11/N11 MAINLINE NORTH							
Depth to Bedrock (m BGL)	**Depth of Well (m BGL)**	**GSI Well ID**	**Townland**	**Usage**	**Yield (m^3/day)**	**Yield Class**	**Water Strike (m BGL)**
CAMOLIN							
12	91.4	2915SEW021	BALLOUGHTER	P	65	Moderate	12
11.6	30.5	2915SEW035	BALLYDANIEL	B	32.7	Poor	16.8
5.5	51.8	2915SEW036	CLONHENRET	B	39.3	Poor	15.2
3.4	22.9	2915SEW042	CLOLOGE	B	43.6	Moderate	10.7
8.5	50.3	2915SEW038	CAMOLIN	B	103.6	Good	8.5
CLOGH							
5	61	2915SEW009	CHURCHTOWN	O	109	Good	
7.5	91.4	2915SEW016	TOBERANIERAN	P	670	Excellent	11.5
13.5	91.4	2915SEW024	MOUNTFOREST	P	340	Good	9
8	91.4	2915SEW025	CLONMORE	P	125	Good	9
5	61	2915SEW033	CHURCHTOWN	P	130	Good	
5	67.1	2915SEW034	CLOGH	P	260	Good	12.5
FERNS							
4.3	38.1	2913NWW022	EFFERNOGE	B	54.6	Moderate	16.8
1.2	32	2913NWW024	CLONE	B	32.7	Poor	19.8
BANN RIVER AND RIVER SLANEY CONFLUENCE							
9.1	41.2	2913NWW033	CRANE	B	130.9	Good	21.3
4.9	40	2913NWW083	MOYNE LOWER	No Data	No Data	No Data	4.9
4.9	40	2913NWW084	MOYNE LOWER	No Data	No Data	No Data	14

BGL = Below ground level, B = Agricultural and domestic use, P = Potable water supply, I = Industry, O = Other.

11.3.3.3.1 M11/N11Mainline North

Clogh

Table 11.13 indicates that the depth to bedrock within the vicinity of Clogh ranges from 5 m BGL (at Clogh and Churchtown) to 13.5 m BGL at Mountforest.

The yield from the wells within a 3 km radius from Clogh ranges from good (109 m3/day) at Churchtown to excellent (670 m3/day) at Toberanieran. Most of the wells in the area around Clogh are used for public water supply. This is likely to be attributed to the good yields of groundwater in this area. Mitigation measures shall be implemented during the construction and operational phases of the Proposed Scheme in order to protect the underlying groundwater source, which is an important water supply in the surrounding area.

According to the GSI well card data, water strikes were encountered at depths ranging from 9 m BGL at Clonmore and Mountforest to 12.5 m BGL at Clogh. However, no information is available on the water bearing stratum within the wells in question. It shall be noted that the water strikes encountered only provide an indication of the likely depth of the water table because insufficient time (48 hours) is likely to have been allowed for the water level to reach equilibrium during drilling. However, water strike information may be used for indicative purposes.

Camolin

Table 11.13 indicates that the depth to bedrock within a 3 km radius (approximately) from Camolin ranges from 3.4 m BGL at Clologe to 12m BGL at Balloughter.

The groundwater yield from the wells in the area ranges from good (103.6 m3/day) at Camolin to poor (32.7 m3/day) at Ballintrim and Ballydaniel.

Most of the wells in the area around Camolin would be used for the supply of water for agricultural use or domestic use. In addition, the GSI well card data indicates that a groundwater well is used for public water supply at Balloughter.

Water strikes were encountered at depths ranging from 8.5 m BGL to 16.3 m BGL within the vicinity of Camolin. However, no information is available on the water bearing stratum. The limitations of the use of water strikes as previously mentioned also apply.

Ferns

Table 11.13 indicates that the depth to bedrock within the vicinity of Ferns ranges from 1.2 m BGL at Clone to 4.3 m BGL at Effernoge.

The yield from the wells within a 3 km radius (approximately) from Ferns ranges from poor (32.7 m3/day) at Clone to moderate (54.6 m3/day) at Effernoge. Most of the wells in the area around Ferns are used for agricultural or domestic purposes.

Water strikes were encountered at depths ranging from 16.8m BGL at Effernoge to 19.8 m BGL at Clone. However, no information is available on the water bearing stratum. The limitations of the use of water strikes as previously mentioned also apply.

North of Enniscorthy

Table 11.13 indicates that the depth to bedrock within the vicinity of the southern part of the M11/N11 and the N80 Link Road, which are located north of Enniscorthy, ranges from 0.6 m BGL to 7.9 m BGL.

The GSI records only provide groundwater yield information for one well in the vicinity of Enniscorthy. The well in Blackstoops has a good groundwater yield at 109.1 m3/day. The groundwater well is used for domestic or agricultural water supplies, according to the GSI records.

Water strikes were encountered at depths ranging from 3 m BGL to 18 m in the vicinity of the town of Enniscorthy. However, no information is available on the water bearing stratum. The limitations associated with the use of water strikes as previously discussed also apply.

Groundwater Level Monitoring Data

A ground investigation was carried out along the M11/N11 Mainline North between October 2008 and December 2008. A large number of the boreholes were dry during cable percussion drilling. Waterstrike information, where indicated in the borehole logs for cable percussion boreholes along this section of the Proposed Scheme, is summarised as follows:

- Frankfort – waterstrike at 2.3m BGL;
- Ballinclay – waterstrike at 2.7m BGL;
- Balloughter – waterstrikes encountered between 3.4m BGL to 5.6m BGL in wells along this section of the Proposed Scheme;
- Ballyeden – waterstrike at 3m BGL;
- Knockrobin – waterstrike at 1.5m BGL to 5.1m BGL;
- North of Rockspring – waterstrike at 4.1m BGL to 7.1m BGL;
- Rockspring – waterstrike at 4.9m BGL;
- Mountgeorge – waterstrike at 1.9m BGL to 5.5m BGL;
- Ballycarrigeen Lower – waterstrike at 3.7m BGL to 6.1m BGL;
- Knockavocka – waterstrike at 0.6m BGL;
- Myaugh – waterstrike at 2.9m BGL to 3.4m BGL;
- Tinnacross – waterstrike at 1.3m BGL to 5.9m BGL;

- Crane – waterstrike at 1.3 to 6.5m BGL;
- Toom – artesian to 2.9m BGL.

The waterstrike information indicates that the groundwater strikes are variable along the M11/N11 Mainline North. Groundwater strikes were encountered within the upper 1.3m to 7.1m approximately and were noted to be artesian along the southern most part of the M11/N11 Mainline North (in the townland of Toom).

As part of the ground investigation, groundwater levels were obtained for a number of wells located along the M11/N11 Mainline North between November 2008 and March 2009. The table in Appendix 11.5 provides the groundwater levels readings. A summary of the results is as follows:

- Frankfort: The results indicate that the groundwater levels along the northern section of the Proposed Scheme at Frankfort are highly variable, which may be due to temporal climatic conditions. Some of the wells appear to have a rapid response to climatic conditions and range from being dry to having groundwater within 1m approximately of the surface. Groundwater levels in Frankfort range from 0.75m BGL to 9.42m BGL. Therefore, it is likely that groundwater will be encountered in the cut along this section of the route;
- Ballinclay and Balloughter: Groundwater levels in the townlands of Ballinclay and Balloughter do not appear to have varied to a great extent between November 2008 and March 2009. However, groundwater levels are present close to the ground surface and range from 0.12m BGL to 4.61m BGL at Ballinclay and 0.01m BGL (south of Balloughter) to 2.94m BGL at Balloughter. The ground level along these sections of the Proposed Scheme will be raised and thus dewatering is not expected;
- Knockrobin: Groundwater levels at Knockrobin were encountered at depths ranging from 2.03m BGL to 5.77m BGL and do not appear to be considerably variable. Groundwater is likely to be encountered within the cut along this section of the Proposed Scheme;
- Rockspring: Groundwater at Rockspring has been encountered within 0.07m BGL, which indicates artesian groundwater conditions. Groundwater is likely to be encountered within the cut at this location;
- Mountgeorge/Ballycarrigeen: Groundwater was encountered within 1.5m approximately of the ground surface at Mountgeorge and 2m of the ground surface at Ballycarrigeen Lower and was not considered particularly variable during the monitoring period. Deep cuts are not proposed along these sections of the Proposed Scheme and thus only minimum amounts of groundwater (if any) will be encountered;

- Carrigeen: Groundwater was encountered within 0.65m of the surface at Carrigeen and groundwater is likely to be encountered during excavations for the Proposed Scheme at this location;
- Myaugh: Groundwater was encountered at depths ranging from 0.82m BGL to 7.62m BGL at Myaugh and is likely to be encountered in the excavations along this section of the Proposed Scheme;
- Tinnacross: Groundwater at Tinnacross ranges from 1m to 2m approximately BGL. Deep excavations are not proposed along this section of the Proposed Scheme and thus only minimal amounts of groundwater (if any) are likely to be encountered;
- Crane: Groundwater is likely to be encountered within the cuts at Crane because it ranges in depth from 0.89m BGL to 4.2m BGL;
- Toom: Groundwater at Toom is located within 0.09m BGL and appears to be artesian. Therefore, groundwater is likely to be encountered during construction works at this location.

Groundwater Pump Test Data

A hydrogeological characterisation study was completed at Rockspring in April 2009. It is proposed that a cut will extend for a distance of approximately 2 km through the townland of Rockspring. Available information indicates that the cut (maximum of 12.2m) will extend approximately 10m into the water table at Rockspring where a number of springs are located.

The findings of the study indicate that the aquifer at Rockspring is confined and it is recharged by fractures associated with nearby fault and fracture zones.

The study included a 72 hour pump test in order to determine the volumes of groundwater that will be generated by dewatering operations in order to keep the cut dry and to determine the extent of the cone of depression from the drawdown of the aquifer.

it is estimated that the proposed road cutting would generate between 0.18 and 0.67 l/second for every 100 m of road cutting. Groundwater drainage requirements of less than 8 l/second (and possibly <3 l/second) are anticipated for the rock cutting Therefore, the associated drainage system will need to be of sufficient capacity to accommodate these flows.

The study concludes that the cone of depression will extend 300m from the proposed excavation (based on a drawdown of 12m at the pump test well).

Three spring catchments will be impacted by the road cutting at Rockspring, both by reduction of catchment area and interception of subsurface flows by the cutting. The groundwater flows diverted from the springs are relatively minor

11.3.3.3.2 M11/N11Mainline South

From the GSI well card data presented in Table 11.14, it can be seen that abstractions of up to 2400 m^3/day are obtained from the bedrock aquifer. Yield class ranges from poor to excellent.

Table 11.14 GSI Well Card Data

Map Ref.	O.S. Grid Ref.		Townland	Usage	Yield	Yield Class	Water Strike
	Easting	Northing			m^3/day		m
2	29932	13912	Drumgold	B	273	Good	6.7
3	29852	13622	Brownswood	B	55	Moderate	No Data
7	30008	14034	Tomnafunshoge	B	109	Good	18.3
9	30064	13968	Tomnafunshoge	B	55	Moderate	24.4
10	29714	13351	Ballybuckley	B	44	Moderate	30.5
11	30015	14028	Tomnafunshoge	B	109	Good	18.2
12	29977	14027	Tomnafunshoge	B	26	Poor	No Data
13	30077	14022	Tomnafunshoge	B	24	Poor	No Data
16	29765	13445	Kilgibbon	P	2400	Excellent	No Data

B = Agricultural and domestic use, P = Potable water supply, I = Industry, O = Other.

Ground investigations along the M11/N11Mainline South were carried out in 2006 and 2008.

During the 2006 investigations for the southern section of the M11/N11Mainline, groundwater strikes were encountered in 8 no. of the 27 cable percussion boreholes drilled. Groundwater ingress ranged from between 0.9 – 11.5 m below ground level. The depth of groundwater strikes appeared to be controlled by topography, with deeper strikes recorded in areas of higher ground, and shallower strikes recorded in areas of lower ground.

During the rotary core drilling, groundwater strikes were recorded in 2 no. of the 10. no. boreholes for the M11/N11Mainline South and groundwater ingress ranged from 1.2 m to 2.8 m BGL. However, it shall be noted that rotary coring was generally carried out in areas of higher ground and it is likely that groundwater strikes were only identified at a few locations because of this.

During the further ground investigations carried out in 2008 the trial pit excavations for the M11/N11Mainline South showed groundwater ingress in a number of the trial pits, from 1.4 m BGL to 4.4 m BGL. Water ingress was mostly at slow seepage to a trickle.

Groundwater level monitoring was also conducted. Table 11.15 shows the groundwater monitoring data for the period October 2006 and February 2007. Table 11.16 shows the groundwater monitoring data from 2008.

Table 11.15 Recorded Groundwater Levels - Preliminary Ground Investigations 2006

Borehole/Drillhole Reference from Site Investigation Contractor.	Ground Level	Groundwater Level	
		Oct. - Dec. '06	Jan - Feb '07
	M AOD	m BGL	m BGL
RC303	36.06	8.25 - 10.12	9.95
BH305	37	0.00 - 0.14	0.1 - 0.17
RC313	29.35	0.45 - 0.51	0.53 - 0.67
BH321	46.66	2.19 - 3.00	1.45 - 3.86
RC340	55.37	1.79 - 1.92	1.8 - 2.21
BH349	53.75	4.15 - 5.97	4.11 - 6.5
RC362	86.41	10.17	9.2 - 11.53
RC367	84.82	6.12	6.3 - 7.74
BH387	45.45	2.79 - 3.87	3.9
BH397	51.01	1.52 - 1.83	1.8 - 2.04

Table 11.16 Recorded Groundwater Levels - Preliminary Ground Investigations 2008

Borehole/DrillholeReference from Site Investigation Contractor.	Groundwater Level			
	9-19th May	23-30th May	23rd -24th July	25th Sept.
	m BGL		m BGL	m BGL
BH603	3	3.3-3.4	Dry	2
BH609R	Damp/dry at 8.5		Dry	8
BH612	Damp/dry at 9.0		Dry	7
RC625	Damp/dry at 7.0		Dry	6.6
BH635	3.5	2.4-2.5	2.3	2.5
RC641	Not installed	4.2-4.5	4.2	3.6
BH647R	6.0	6.1-6.3	4.7	3.8
BH652R	Not installed	1.3-1.7	0.6	0.5
BH661	0.1	-	0.9	-
BH655	>2.0 (artesian)	standpipe sealed		
BH676	-	-	2.24	-
BH678R (Piezometer)	-	-	3.8	-
BH678R	-	-	4.04	3.95
BH684	-	-	3.32	-
BH698A	-	-	1.22	1.32
RC700	-	-	2.93	2.9

During the 2006 investigations, there was substantial variation in groundwater levels noted along the M11/N11Mainline south with measured levels varying from ground level to 10.17 m BGL. Seasonal variation was also noted, with variations of up to 1.2 m in measured water levels between May and August 2006. Groundwater installations were predominantly installed in proposed cut sections or at proposed bridge crossing (of side roads), which are generally areas of higher ground. Groundwater levels were found to be widely variable, showing levels within 2 m of the existing ground level or at depths greater than 4 m. The variable levels may be due to perched groundwater in some locations. Artesian groundwater (water capable of rising to the surface by internal hydrostatic pressure) was recorded at BH655, This well was sealed and no further measurements were taken.

11.3.3.3.30 Link Road

Confluence of Bann River and River Slaney

The confluence of the Slaney and the River Bann is close to both the M11/N11Mainline and to the N80 Link Road and the relevant GSI well card data has already been identified in Table 11.13. This indicates that the depth to bedrock within the vicinity of the confluence of the Bann River and the River Slaney is 9.1 m BGL at Crane.

Table 11.17 shows the GSI wells recorded in the vicinity of the N80 Link Road.

Table 11.17 GSI Well Card Data N80 Link Road

Map Ref.	O.S. Grid Ref.		Townland	Usage	Yield	Yield Class	Water Strike
	Easting	Northing			m^3/day		m
5	29352	14536	Ballydawmore	B	55	Moderate	25.9
6	29384	14533	Ballydawmore	B	33	Poor	19.8
8	30125	14270	Crane	B	131	Good	21.3
14	29900	14345	Ballynahallin	B	59	Moderate	4.3
15	30056	14279	Solsborough	B	72	Moderate	

B = Agricultural and domestic use, P = Potable water supply, I = Industry, O = Other.

The maximum yield from the well recorded by the GSI at this part of the Proposed Scheme is good at 130.9 m^3/day. The GSI recorded groundwater wells in the area are specified as being used for agricultural or domestic purposes. It must be ensured that the groundwater source, which is used as a domestic and agricultural water supply, is not deteriorated (in terms of its

quality and quantity) to an unacceptable extent due to the construction and operation of the Proposed Scheme.

A water strike was encountered at a depth of 21.3 m BGL at Crane. However, no information is available on the water bearing stratum. The limitations associated with the use of water strikes as previously discussed also apply.

The groundwater yields from the other recorded wells in the area range from poor to moderate, indicating that yields in the area are not significant.

11.3.3.3.4 N30 Mainline

The only GSI records in the vicinity of the N30 Mainline that show useful groundwater yield data are shown in Table 11.18.

Table 11.18 GSI Well Card Data N30 Mainline

Map Ref.	O.S. Grid Ref.		Townland	Usage	Yield	Yield Class	Water Strike
	Easting	Northing			m^3/day		m
1	29400	14077	Bessmount	B	109	Good	
4	29460	14298	Askunshin	B	44	Moderate	21.3

B = Agricultural and domestic use, P = Potable water supply, I = Industry, O = Other.

Recorded yields range from moderate to good, with the maximum yield being 109 m^3/day.

Ground investigations along the N30 Mainline were carried out in 2006. Groundwater strikes were encountered in 13 no. of the 28 cable percussion boreholes drilled along the N30 Mainline. Groundwater ingress ranged from between 0.0 – 6.2 m BGL. Groundwater strikes were not generally encountered in higher ground areas due to thick overburden in these areas.

During the rotary core drilling, groundwater strikes were recorded in 4 of the 19 no. boreholes. Groundwater ingress ranged from 2.0 m to 8.7 m BGL. However, again it shall be noted that rotary coring was generally carried out in areas of higher ground and it is likely that groundwater strikes were only identified at a few locations because of this.

Trial pit excavations showed ingress of groundwater in 35 of 76 trial pits and ranged from 0.8 m BGL to 3.9 m BGL.

During the site investigations carried out along the N30 Mainline as part of the Preliminary Ground Investigations in 2006, groundwater level monitoring was conducted. Table 11.19 shows the groundwater monitoring data for the period October 2006 and February 2007.

Table 11.19 Recorded Groundwater Levels for the N30 Mainline - Preliminary Ground Investigations 2006

Borehole/Drillhole Reference by Site Investigation Contractor	Ground Level	Groundwater Level	
		Oct. - Dec. '06	Jan - Feb '07
	mAOD	m BGL	m BGL
RC418	30.93	1.76	Dry - 2.8
RC425	39.41	4.17	3.6 - 5.7
RC441	39.13	2	1.66 - 2.24
RC448	59.33	7.62	Dry - 8.95
RC453	62.17	7.01	7.08 - 7.10
RC473	41.4	2.02	2.56 - 2.75
RC484	22.51	0.87	Dry - 2.03
RC551	53.57	Dry to 15m	Dry to 15m
RC500	60.15	5.13	3.9 - 7.25
RC505	61.63	5.39	5.4 - 6.15
RC511	55.56	1.97	Dry to 2.36

Groundwater levels were found to be widely variable, showing levels within 1 m of the existing ground level to greater than 15 m depth for the N30 Mainline.

11.3.4 Water Supply

According to information available from Wexford County Council, public water supply schemes are in place in Ferns and Camolin as discussed in more detail in Chapter 8 (Material Assets – Infrastructure) of this EIS. The well card data supplied by the GSI indicates that a number of wells in the vicinity of Clogh are used for public water supply, which is likely to be attributable to the good water yields from wells in this area (see Table 11.13). With the exception of one groundwater well at Balloughter (used for public water supply) the remaining wells within the study area, which are registered on the GSI well card database, are mainly used for domestic or agricultural water supply.

The review of minutes for meetings held with landowners along the Proposed Scheme indicates that water supply within the area is either by means of private wells or public water supply schemes.

It shall be noted that the well use is not recorded, in general, by the GSI in the area around Enniscorthy (with the exception of one well in Blackstoops, which is used for agricultural / domestic purposes).

This suggests that most of the water supply for the residences within the study area that are located outside of the towns / villages is from their own bored wells as opposed to public water supply. Water supply within the towns and the immediately surrounding area is predominantly from public water supply schemes.

Mitigation measures are recommended in this chapter of the EIS in order to ensure that the construction and operational phases of the Proposed Scheme do not adversely impact on water supplies in the surrounding area.

11.4 CHARACTERISTICS OF THE PROPOSED SCHEME

A detailed description of the proposed scheme is provided in Chapter 3 of this EIS and elements of relevance to this chapter of the EIS are briefly summarised in Appendix 11.4.

11.5 POTENTIAL IMPACTS OF THE PROPOSED SCHEME

11.5.1 Construction Phase

Surface water pollution is possible due to sediment release from excavated areas and the storage of stockpiles of construction materials, such as topsoil and earthworks materials, during the construction phase of the Proposed Scheme. In addition, there is the potential for sediment release in surface runoff in localised areas where piling is required for the construction of structure foundations, for example at overbridges. The release of silt laden surface water runoff may occur if stockpiles of construction materials, such as imported earthworks / pavement materials or excavated subsoil/spoil, are located too close to water courses and from construction work being carried out next to and within watercourses. A number of stream and river crossings will be constructed as part of the Proposed Scheme; details are provided in Chapter 3 of this EIS. There is the potential for the generation of silt laden water during construction work for the diversion of streams along the Proposed Scheme. This form of pollution may also occur by pumping untreated groundwater or surface water, which has collected in excavations, to watercourses.

There will be temporary construction compounds built at selected locations along the Proposed Scheme during the construction phase. Surface water runoff from these compounds may contain increased silt levels (from unsealed areas or storage areas) or be polluted from construction activities, examples of which include hydrocarbon spills or leaks, leakage from chemical/waste storage areas and / or the release of foul effluent. Temporary construction compounds will not be located in an area where the groundwater vulnerability has been classed as “Extreme”.

Due to the use of machinery, equipment and vehicles on site, there is the potential for fuel spills or leaks, particularly during storage and dispensing operations, to enter the surface watercourses or underlying groundwater if allowed to infiltrate into the ground. Accidental spillage of lubricants,

paints and solvents, leakage from chemical storage areas and inappropriate disposal of construction waste materials may also occur on site and impact surface water and groundwater quality.

Precast structures (such as culverts for example) may be used during the construction of the Proposed Scheme. However, concrete pouring is also likely to be required in some areas. There is the potential for the release of concrete to nearby surface water bodies, which would be expected to have an adverse impact on water quality, during concrete pouring operations or the washing of vehicles or equipment. The diversion of streams has the potential to adversely impact on water quality due to the generation of silt laden water and the potential for the release of hydrocarbons due to leaks or spills from vehicles and machinery used working within or near to watercourses. In addition, there is the potential for adverse impacts on aquatic flora and fauna habitats within streams, which is discussed further in Chapter 9 (Ecology) of this EIS. As previously mentioned, the River Slaney is a designated river under the *European Communities (Quality of Salmonid Waters) Regulations of 1978* and is a candidate Special Area for Conservation under the *European Communities Habitats Directive*. Therefore, this water body would be considered particularly susceptible to adverse impacts on upstream water quality. It must be ensured that the mitigation measures recommended in this chapter of the EIS and within Chapter 9 are implemented during the diversion of streams in order to ensure that the potential for adverse impacts on the water quality remains low.

There is the potential for the construction phase of the Proposed Scheme to adversely impact on the underlying aquifers. This may include deterioration of the groundwater quality, slight alteration of groundwater flows around underground structures such as piles and a temporary reduction in groundwater yields in down-gradient wells if significant or prolonged dewatering occurs.

The loss of subsoil cover at a number of locations along the Proposed Scheme, most notably in cut sections will result in a reduced thickness of subsoil cover above the Regionally Important Aquifer and increased aquifer vulnerability. The vulnerability of the aquifer will be greater during the construction phase. There will be heavy machinery on site, with the possibility of emissions such as fuel, oils or lubricants.

11.5.2 Operation Phase

The operational phase of the Proposed Scheme will involve vehicles using the Proposed Scheme on a daily basis.

Surface water runoff from the Proposed Scheme may contain hydrocarbons arising from leaks or spills from vehicles, silt and tyre residues. There is a potential impact from the mobilisation of pollutants from the road surface, such as sediment, hydrocarbons and metals, which may enter the surface water or groundwater via the groundmass. However, a 5-year monitoring programme

of routine road runoff from rural trunk roads and motorways was carried out on behalf of the UK Environment Agency and the Highways Agency (Highways Agency, 2002), which showed that no discernible impact from the contaminants identified was observed on the surface waters at the sites where biological monitoring was carried out.

Carriageway water runoff from the Proposed Scheme will be directed to a filter drain, interceptor ditch or carrier pipe, which will flow via bypass interceptors into balancing ponds before discharging into watercourses. The purpose of the bypass interceptors is to minimise the release of hydrocarbons into the receiving watercourses. The balancing ponds will enable the attenuation of surface water to Greenfield discharge rates prior to discharge to approved nearby watercourses, which will either be located within the catchment area for the River Bann, River Slaney, Owenavorragh River, River Boro or River Urrin. The balancing ponds may be dry during times of little or no rainfall. Measures outlined in the mitigation section will minimise the risk of surface water pollution from contaminated materials or discharges during normal conditions.

An emergency protocol will be designed and implemented by the contractor for the management of chemical spills, clean up materials and firewater arising from traffic accidents (if they occur) on the Proposed Scheme. Untreated hazardous materials will not be released into the surface water or allowed to infiltrate into the underlying aquifer.

Due to the fact that existing Greenfield areas will be replaced by the sealed surface for the Proposed Scheme, the surface water runoff rate will increase somewhat due to a reduced infiltration into the subsoil and underlying aquifer. The surface runoff rates for the Proposed Scheme will be attenuated to existing Greenfield runoff rates using the balancing ponds.

The potential impact on the groundwater environment is expected to be minimal during the operational phase of the Proposed Scheme.

The permanent loss of subsoil cover will occur at a number of locations along the Proposed Scheme, most notably in cut sections developed in or above the Campile Formation at the following locations:

- immediately south of the Ballydawmore Junction;
- around the Tomnafunshoge Junction;
- through Drumgold and Cooladine;
- along the N80 Link Road; and
- along the N30 Mainline through Clavass and Killalligan North.

This will result in a reduced thickness of subsoil cover above the Regionally Important Aquifer and will increase aquifer vulnerability. This will result in a decrease in protection of the Regional Aquifer with an easier pathway to the aquifer from possible emissions at ground level.

There is the potential for reduced recharge to the underlying bedrock aquifers due to the replacement of Greenfield areas with the sealed road surface and the slight localised alteration of the direction of groundwater flow by structures such as piles for bridges. However, these potential impacts are expected to be minimal (due to the limited width of the Proposed Scheme) and would be localised around piled areas. Mitigation measures, which are provided in Section 11.6 of this chapter of the EIS, will be implemented to ensure that the risk of discharge of any potentially polluting materials to the surface water and groundwater environments is minimised.

Historically, flooding has been an issue in Enniscorthy Town, with periodic flooding events recorded at, and around, the town. There is a potential impact that any new development can exacerbate flooding issues, upstream or downstream, due to alteration of drainage schemes, restriction or alteration of flow of surface water courses, building on floodplains and therefore loss of floodplain storage, and increased surface water runoff to surface water courses from hard standing areas. In addition, flooding events have been recorded by the OPW at Verona Bridge on the River Urrin.

In relation to the potential impact of restriction or alteration of flow in surface water courses, this issue is dealt with in Chapter 3, where a detailed hydrological study has been carried out to assess this potential impact. From hydrological studies carried out, it has been assessed that the design of the River Slaney and River Urrin crossings will not impact on the hydrological regime of these surface water bodies, including during flood conditions. Ongoing liaison with the OPW in relation to the design of the river crossings was carried out.

The design of the Proposed Scheme is based on controlling the surface water run-off from the proposed scheme to Greenfield run-off rates. The N80 Link Road will involve building an embankment on the existing River Slaney floodplain. As detailed in Chapter 3, included within this embankment will be a series of flood relief culverts, evenly spaced over the remaining width of the flood plain. These culverts, together with the design of the bridge, will facilitate the continued migration of flood waters across the full width of the River Slaney flood plain.

The design flow for the structure together with the adjacent flood relief culverts will be a 100 year flood rate plus a proposed climate change allowance of a 20% increase in peak flow rates. The structure together with the adjacent flood relief culverts will result in minimal changes to the flood regime and will avoid contraction of the overbank flood flow. Consequently the predicted impact upstream of the structure for the design flood condition is small.

For the River Urrin crossing the same design criteria as those for the River Slaney were adopted, detailed above.

The Proposed Scheme has been designed to maintain surface water runoff rates at Greenfield rates. At outfall locations, the proposed road drainage systems for the national routes will flow into balancing ponds before discharging into watercourses. The design of the balancing pond will

be based on a 100-year storm event with a duration of 48 hours. The design will also include for a 20% increase in rainfall intensity, to account for climate change in accordance with current best management practice of the UK DMRB HD 33/06.

11.6 Cumulative Impacts

A number of planning permissions have been granted within the vicinity of the Proposed Scheme. The only other major scheme which has received permission is the Enniscorthy Main Drainage Stage 3 Scheme. Construction for this project had not commenced at the time of writing. This scheme involves the upgrading of an existing waste water treatment plant (WWTP) and associated sewer network, to treat the effluent from Enniscorthy town and environs.

Due to its nature, Enniscorthy Main Drainage Stage 3 Scheme will significantly improve water quality (and decrease the concentration of nutrient loads) in the receiving waters in the River Slaney and River Urrin,

The cumulative operational impacts of the Proposed Scheme in addition to the proposed Enniscorthy Main Drainage Stage 3 Scheme, are therefore expected to be neutral.

11.7 "DO-NOTHING" SCENARIO

If the Proposed Scheme were not to proceed, there would be no potential risk of deterioration in surface or ground water quality arising from the proposed works.

11.8 MITIGATION MEASURES

In order to minimise the potential impacts from the Proposed Scheme, the following mitigation measures will be implemented. These measures will minimise the risk of contamination of groundwater and surface water occurring during normal, and/or emergency conditions during the construction and operational phases.

The Department of the Marine and Natural Resources (1997) published guidelines, which were designed to ensure the impact of construction work on the water environment is minimised. The UK Department of the Environment (EA) has also published guidance on the approach to minimise impacts of construction and operation of developments on the water environment. The contractor will follow current guidance from the UK EA and the Department of the Marine and Natural Resources during the construction phase.

In addition, mitigation measures for culverts, balancing ponds and watercourse crossings will be designed based on guidance from the UK Design Manual for Roads and Bridges, the Eastern Regional Fisheries Board publication R*equirements for the Protection of Fisheries Habitats during Construction and Development Works at River Sites* and the NRA Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes (NRA, 2006).

11.8.1 Construction Phase

Stockpiling of construction materials, such as earthworks/pavement materials and fuels, will not occur within 10 m of the nearest watercourse, in order to minimise the risk Groundwater and surface water pollution will be minimised by the implementation of good construction practices as contained in the publication by the Construction Industry Research and Information Association (CIRIA) *Control of Water Pollution from Construction-sites, Guidance from Consultants and Contractors (Master et al. 2001).* An emergency response protocol for the management of pollution incidents that may occur during the construction phase will be established as part of the Environmental Operating Plan for the Proposed Scheme by the Contractor and regularly updated. Based on the guidance documents referred to in this chapter of the EIS this protocol will include: containment measures; a list of appropriate clean-up materials and equipment; details on staff responsibilities and trained personnel; and contact details for pollution clean-up companies and relevant Local Authorities.

Discharge to the River Slaney, River Bann, Owenavorragh River, River Boro or River Urrin, their tributaries or any other river / stream / watercourse along the Proposed Scheme or from the temporary construction compounds during the construction phase will be controlled. It is expected that welfare facilities at the construction compounds will comprise port-a-loos and the release of foul effluent from the compounds into nearby watercourses will not occur.

Temporary construction compounds will not be situated in areas where the vulnerability of the underlying aquifer/groundwater body has been classified as 'Extreme' and will not be located close to surface water bodies. Temporary construction compounds will not be located close to road cuttings where it is likely that groundwater will be encountered. Procedures to minimise the risk of pollution to surface water and groundwater will be put in place prior to the commencement of construction work at any particular section of the Proposed Scheme.

In order to minimise any impact on surface water and groundwater from material spillages, all oils, solvents and paints used during construction will be stored within suitably designed bunded areas at the temporary construction compounds, in accordance with *Guidance Note for the Control of Pollution (Oil Storage) (England) Regulation 2001* by the Department of Environment, Food and Rural Affairs (DEFRA) in the UK. Oil and fuel storage tanks will be stored on designated areas of hardstanding, and these areas will be bunded to a volume of 110% of the capacity of the largest tank / container within the bunded area(s) (plus an allowance of 30 mm for rainwater ingress). Filling and draw-off points will be located entirely within the bunded area(s). Drainage from the bunded area(s) will be diverted for collection and safe disposal off-site in accordance with current waste management legislation.

Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles / equipment, will take place in designated areas of hardstanding within the temporary construction compounds, away from surface water gullies or drains. The vehicles will not be left unattended

during refuelling. Spill kits and hydrocarbon adsorbent packs will be stored in these areas and operators will be fully trained in the use of this equipment. An adequate supply of spill kits and hydrocarbon adsorbent packs will also be stored along the construction areas for the Proposed Scheme. All relevant personnel will be fully trained in the use of this equipment.

Should it not be possible for machinery or vehicles to return to the temporary compounds for refuelling or maintenance purposes, refuelling or maintenance may take place outside the temporary compounds. In this event, fuel will be transported in a mobile, double skinned tank and a spill tray will be used when refuelling is carried out in this manner. Spill kits will be available during such refuelling operations. In areas where cutting into subsoil and bedrock is required no refuelling on site will be undertaken in order to limit the exposure of the aquifers to potential contamination.

Wet concrete and cement will be carefully controlled so as to minimise the risk of any material entering the water, particularly from shuttered structures or the washing of equipment. The use of quick setting mixes will be used. Concrete pouring will be prevented during periods of heavy rainfall. An emergency response protocol will be implemented by the Contractor in the event of concrete spillages during pouring operations and the document detailing this protocol will form part of the Environmental Operational Plan for the construction phase of the Proposed Scheme.

Also, controlling measures which limit the use and movement of potentially contaminating materials such as fuels and hydrocarbons will be identified, implemented and enforced by the Contractor. All associated hazardous waste residuals will also be stored within suitably designed bunded storage areas at the compounds prior to removal by an appropriate EPA or a Wexford County Council approved waste management contractor for off-site treatment / recycling / disposal.

All other waste material will be stored appropriately, removed and disposed of by contractors licensed under the *Waste Management Act of 1996* and the *Waste Management (Collection Permit) Regulations of 2007.*

of solids entering the water. Stockpiles of soil, including topsoil and earthworks material that will be kept on site for long periods will need to be graded and seeded to promote stability of the soil. Placing of granular materials over bare soil, particularly in the vicinity of watercourses will aid in preventing erosion of fines and/or rutting by site traffic, which could lead to increased sediment release into nearby watercourses. The disturbance of soils during the construction of the River Slaney Bridge will need to be minimised and carefully managed in order to minimise the release of sediment into this water body during construction work.

Silt traps or geotextile membrane barriers and / or appropriately designed settlement lagoons will be put in place to prevent sediment from stockpile and excavated areas entering nearby watercourses. The guidance outlined in the NRA Guidelines for the Crossing of Watercourses

(NRA, 2006) will be followed by the contractor during construction. Geotextile membrane barriers, where used, will be erected between the construction works and water courses. This membrane barrier will be a minimum of 0.5 m in height above ground and will be staked at 2 m intervals and the trailing edge of the barrier will be buried with soil on the landward side of the barrier, to provide a seal with the ground surface. It is also important that the discharge of surface runoff from the Proposed Scheme during the construction phase is properly attenuated. The lagoons will not be located close to areas of significant cut, as the thickness of subsoil will be reduced in these areas. This will ensure that the underlying aquifer in each case is not put at increased risk of polluting emissions entering the aquifer.

In addition, construction of cut-off ditches to divert surface water run-off from entering excavations will be utilised, again reducing the risk of infiltration of contaminants into the subsoil and potentially the groundwater.

The contractor will liaise with the Eastern Regional Fisheries Board and National Parks and Wildlife Service regarding the precise methodology for works to water courses in advance of construction works commencing. Guidance from these bodies and mitigation measures included in this chapter as well as Chapter 9 (Ecology) of this EIS will be followed.

De-watering may be required along some sections of the Proposed Scheme, in particular in areas situated next to surface water bodies or where groundwater is encountered during excavation or piling operations. Excessive and or prolonged dewatering operations have the potential to cause a reduction in groundwater yields in water supply wells in the surrounding area. The importance and sensitivity of water supply wells in the vicinity of the Proposed Scheme is understood. Appropriate mitigation measures will be implemented in order to ensure that the quality and quantity of water supply wells in the area are not compromised. Pump tests (72 hour) will be carried out at sections of the Proposed Scheme where significant or prolonged dewatering of groundwater in excavations is required. The pump tests will determine the required pump out rate and the cone of depression (or zone of influence) from the area being dewatered. Based on the findings of the pump test, dewatering operations will be properly controlled and managed in order to not adversely affect nearby water supply wells. In the event that groundwater levels are reduced temporarily in nearby wells to the extent that the water supply is interrupted, the dewatering operations will cease until the problem is investigation. Where existing water supplies (including private water supply wells) are permanently affected by the Proposed Scheme, these will be restored or alternative supplies will be provided (see Chapter 3 Material Assets in this EIS). Pre-construction groundwater quality monitoring will be carried out at a select number of wells along the Proposed Scheme.

Water, which is generated by dewatering operations (to remove surface water or groundwater from excavations), will be treated by means of a suitable silt trap prior to discharge to a holding tank/attenuation pond. It is proposed that a permanent drainage system will be used to manage groundwater encountered at the cut at Rockspring. Once the water is deemed to be of satisfactory quality with respect to suspended solids and hydrocarbons, it will be discharged at a controlled rate to the surface watercourses subject to agreement with Wexford County Council. This will also apply to any silty surface water runoff that may be generated within the temporary construction compounds. The temporary compounds may also require hydrocarbon interceptors should a risk of fuel or oil spills/leaks, be suspected or recorded.

In the event that the water generated by dewatering operations is found to be contaminated, it will be treated to a standard specified under a Trade Effluent Discharge License by Wexford County Council or removed off-site for appropriate treatment and/or disposal.

Surface water drainage systems along the Proposed Scheme will be regularly maintained and inspected (as per the methodology outlined in the Environmental Operational Plan) by the Contractor to ensure that they are working correctly.

Requirements specific to drainage design features are as follows:

1. Culverts
    - The installation of the culverts will only be carried out where absolutely necessary;
    - Their length will be limited where feasible;
    - The culverts will be: at least the same width; and have a similar gradient as the existing watercourse dimensions;
    - Bottomless culverts (as opposed to box culverts) will be installed where feasible, and as a minimum at the locations required by the Eastern Regional Fisheries Board and where identified in Chapter 3 of this EIS;
    - The culverts will be adequately maintained;
    - Culverts will not adversely alter the existing flow rates in watercourses, which could contribute to downstream flooding (if too high) or limit water levels downstream (if too low);
2. Watercourse Diversions
    - The dimensions of the new, diverted section of the watercourse will be similar to that of the existing watercourse. This will minimise the alteration of flow rates within the watercourse and thus minimising any contribution to flooding events.

3. Balancing Ponds

    - It is important that they do not alter the underlying groundwater quality through the release of contaminants (for example hydrocarbons or metals from runoff from the road). Based on the information available, the balancing ponds will be of suitable construction in order to avoid releases towards groundwater sources. In addition, it is important that the ponds do not alter the direction of groundwater flow. Given the relatively shallow depth (maximum depth of 2 m BGL) of the ponds included within the preliminary design as described in this EIS, the potential for this to occur is low.

The implementation of the above mitigation measures will minimise the potential for accidental inputs to and subsequent contamination of surface water and groundwater during normal and or emergency conditions during the construction phase. It should be noted that the implementation of the mitigation measures outlined above will be especially important in areas where construction work is taking place either within or next to water courses (for example the culverting of watercourses, the diversion of watercourses and the construction of bridges over watercourses).

In relation to flooding, it is not expected that the proposed Enniscorthy Drainage Scheme will be affected by the construction of the Proposed Scheme; however liaison with the OPW will be carried out prior to the construction of the Proposed Scheme as required.

11.8.2 Operational Phase

11.8.2.1 Surface Water Discharge

At outfall locations, the proposed road drainage systems for the Proposed Scheme will flow via petrol/oil bypass interceptors into balancing ponds before discharging into watercourses at the locations outlined in Chapter 3 of this EIS and at Greenfield rates of flow. The hydrocarbon interceptors will minimise the risk that any spills or leaks from vehicles using the Proposed Scheme will enter the existing watercourses. Suitable plant species will be established in the balancing pond in order to help remove contaminants (metals), if present in the surface water runoff from the proposed scheme. In addition, the plants would trap and suspended solids present in surface water runoff. The balancing ponds will be appropriately maintained in order to ensure that they operate properly.

The design of the balancing ponds will be undertaken in accordance with the UK DMRB HA 103/06 and will be based on a 100-year storm event with a duration of 48 hours. The design will also include for a 20% increase in rainfall intensity, to account for climate change in accordance with current best management practice of the UK DMRB HD 33/06. This will allow for the controlled release of water into the watercourses in the vicinity of the balancing ponds and mitigate the impact of increased surface water runoff from the Proposed Scheme.

A regular inspection and maintenance / desludging programme will be implemented by the maintaining authority whereby any oil / solids / debris trapped within the hydrocarbon bypass interceptors will be removed and disposed appropriately by a suitably licensed EPA approved waste disposal contractor. If the balancing ponds become silted up over time as a result of silt contained in surface water runoff, they may require dredging/cleaning out.

In the event of a major oil or chemical spillage from vehicles using the Proposed Scheme, it is vital that the emergency protocol, prepared by the maintaining authority or equivalent as part of the Environmental Operating Plan is implemented. Reference will be made to the *Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan* by the NRA.

Due to the reduced thickness of subsoils that will result in cut sections along the Proposed Scheme, groundwater will be more susceptible to emissions from vehicles, such as hydrocarbon leaks or spills. The detailed drainage system design for the surface water runoff will be designed to capture the surface water runoff and direct it through petrol/oil interceptors prior to discharge to balancing ponds. The detailed design of these ponds is the responsibility of the Contractor and will be based on a number of criteria, including the vertical and horizontal alignments of the Proposed Scheme in relation to the thickness of the underlying subsoil and depth to bedrock.

Based on the nature of the Proposed Scheme, foul effluent will not be generated during the operational phase.

11.8.2.2 Groundwater

The potential impact of the operation of the Proposed Scheme on the groundwater environment is expected to be minimal. In the case of a minor spill or leak of contaminants from vehicles using the Proposed Scheme, the groundwater environment will be protected by the overlying substrata. In the event of a major oil or chemical spillage from vehicles using the Proposed Scheme, it is vital that an emergency response protocol will be prepared as part of the Environmental Operational Plan by the maintaining authority or equivalent.

Groundwater will be encountered at the cut at Rockspring and it is proposed that a permanent drainage system will be used to manage groundwater generated by dewatering operations at this location. The drawdown of the aquifer by pumping operations at Rockspring, which are required in order to keep this part of the Proposed Scheme free from groundwater ingress, is estimated to extend approximately 300m from the cut. This indicates that water supply wells located within a distance of 300m from the cut may be impacted by dewatering operations at Rockspring to some extent.

11.8.2.3 Flooding

Overall, the drainage for the Proposed Scheme has been designed so as not to significantly alter the prevailing drainage situation. As mentioned in Section 11.8.2.1, surface water runoff for the

Proposed Scheme will be controlled to Greenfield rates. Balancing ponds will be used to attenuate surface water runoff and will be based on a 100-year storm event with a duration of 48 hours. The design will also include for a 20% increase in rainfall intensity, to account for climate change. Chapter 3 provides more details on drainage design.

The drainage design for the Proposed Scheme will mitigate the potential impacts of flooding. The restriction of the surface water runoff rate to Greenfield rates will prevent surface water entering the existing watercourses at a higher rate and therefore potentially increasing the flood risk either upstream or downstream. No balancing ponds will be located in the River Slaney or River Urrin floodplains.

Water course crossings have been designed in order to mitigate the effects of building in the River Slaney floodplain and to prevent the restriction of flow of in the river during normal and flood conditions.

11.9 RESIDUAL IMPACTS OF THE PROPOSED SCHEME

11.9.1 Construction Phase

The residual impact on the surface water environment will be slightly negative during the construction phase of the Proposed Scheme. For the groundwater environment, there will be no residual impact, provided the mitigation measures are implemented.

11.9.2 Operation Phase

Provided that the mitigation measures outlined above are implemented, no significant residual impacts are expected during the operational phase of the Proposed Scheme.

Surface water runoff will increase due to the increased impermeable area that has been created. Surface water drainage systems along the Proposed Scheme will need to be regularly maintained and inspected by the maintaining authority to ensure that they are working correctly.

List of References

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12 AIR AND CLIMATE IMPACT ASSESSMENT

12.1 INTRODUCTION

This chapter assesses the likely impacts on air quality and climate resulting from the Proposed Scheme. The assessment was carried out using the National Roads Authority document *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* (NRA 2006).

12.1.1 Ambient Air Quality Standards

In order to reduce the risk to health from poor air quality, national and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or "Air Quality Standards" are health- or environmental-based levels for which additional factors may be considered. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set (see Appendix 12.1 in Volume 3 of this EIS).

Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. The applicable standards in Ireland include the Air Quality Standards Regulations 2002, which incorporate EU Directives 1999/30/EC and 2000/69/EC, which have set limit values for the pollutants SO_2, NO_2, PM_{10}, benzene and CO (see Appendix 12.1 in Volume 3 of this EIS). The most recent EU Council Directive on ambient air quality was published on the 11/06/08. Council Directive 2008/50/EC combines the previous Air Quality Framework Directive (96/62/EC) and its subsequent daughter directives (including 1999/30/EC and 2000/69/EC). A new ambient limit value for $PM_{2.5}$ is also included (see Appendix 12.1 in Volume 3 of this EIS).

12.1.2 Climate Agreements

Ireland ratified the United Nations Framework Convention on Climate Change (UNFCCC) in April 1994 and the Kyoto Protocol in principle in 1997 and formally in May 2002 (FCCC 1997, 1999). For the purposes of the EU burden sharing agreement under Article 4 of the Kyoto Protocol, in June 1998, Ireland agreed to limit the net growth of the six GHGs under the Kyoto Protocol to 13% above the 1990 level over the period 2008 to 2012 (EPA 2008b, ERM 1998). The UNFCCC is continuing detailed negotiations in relation to GHGs reductions and in relation to technical issues such as Emissions Trading and burden sharing. The most recent Conference of the Parties (COP14) to the agreement was convened in Poznán, Poland in December 2008.

12.1.3 Gothenburg Protocol

In 1999, Ireland signed the Gothenburg Protocol to the 1979 UN Convention on Long Range Transboundary Air Pollution. The objective of the Protocol is to control and reduce emissions of Sulphur Dioxide (SO_2), Nitrogen Oxides (NO_X), Volatile Organic Compounds (VOCs) and

Ammonia (NH_3). To achieve the targets Ireland will, by 2010, have to meet national emission ceilings of 42 kilotonnes (kt) for SO_2 (67% below 2001 levels), 65kt for NO_X (52% reduction), 55kt for VOCs (37% reduction) and 116kt for NH_3 (6% reduction). EU Directive 2001/81/EC, the National Emissions Ceiling Directive, prescribes the same emission limits. Emissions of SO_2 and NH_3 from the road traffic sector are insignificant accounting for less than 1.5% of total emissions in Ireland in 2001. Road traffic emissions of Nitrogen Oxides (NO_X) and Volatile Organic Compounds (VOCs) are important accounting for 37% and 38% respectively of total emissions of these pollutants in Ireland in 2001 (DOE 2003). A National Programme for the progressive reduction of emissions of the four transboundary pollutants is in place since April 2005 (DEHLG 2004). A review of the National Programme in 2007 (DEHLG 2007a) showed that Ireland was on target to comply with the emissions ceilings for SO_2, VOCs and NH_3 by 2010, but that the ceiling for NO_x presents a difficulty even with the implementation of additional measures.

12.2 METHODOLOGY

12.2.1 Local Air Quality Assessment

The air quality assessment has been carried out following procedures described in the publications by the EPA (EPA 2002, 2003) and using the methodology outlined in the guidance documents published by the UK DEFRA (UK DEFRA 2001, 2007, 2009a, 2009b; UK DETR 1998). The assessment of air quality was carried out using a phased approach as recommended by the UK DEFRA (UK DEFRA 2009a). The phased approach recommends that the complexity of an air quality assessment be consistent with the risk of failing to achieve the air quality standards. In the current assessment, an initial scoping of possible key pollutants was carried out and the likely location of air pollution “hot-spots” identified. An examination of recent EPA and Local Authority data in Ireland (EPA 2008a, 2009), has indicated that SO_2 and smoke and CO are unlikely to be exceeded at locations such as the current one and thus these pollutants do not require detailed monitoring or assessment to be carried out. However, the analysis did indicate potential problems in regards to nitrogen dioxide (NO_2) and PM_{10} at busy junctions in urban centres (EPA 2008a, 2009). Benzene, although previously reported at quite high levels in urban centres (EPA 2009), has recently been measured at several city centre locations to be well below the EU limit value (EPA 2008a, 2009). Historically, CO levels in urban areas were a cause for concern. However, CO concentrations have decreased significantly over the past number of years and are now measured to be well below the limits even in urban centres (EPA 2008a, 2009).

The current assessment thus focused firstly on identifying the existing baseline levels of NO_2, PM_{10}, $PM_{2.5}$, benzene and CO and in the region of the Proposed Scheme, both currently (by carrying out a baseline survey and by analysis of suitable EPA monitoring data), and when the Proposed Scheme is opened (through modelling). Thereafter, the impact of the Proposed

Scheme on air quality at the neighbouring sensitive receptors was determined relative to "do nothing" levels for the opening and design years (2013 and 2028). The assessment methodology involved air dispersion modelling using the UK DMRB Screening Model (UK DEFRA 2007) (Version 1.03c, July 2007) and following guidance issued by the NRA (NRA 2006), UK DEFRA (UK DEFRA 2007, 2009a) and the EPA (EPA 2002, 2003). The inputs to the air dispersion model consist of information on road layouts, receptor locations, annual average daily traffic movements (AADT), annual average traffic speeds and background concentrations. Using this input data the model predicts ambient ground level concentrations at the worst-case sensitive receptor using generic meteorological data. This worst-case concentration is then added to the existing background concentration to give the worst-case predicted ambient concentration. The worst-case ambient concentration is then compared with the relevant ambient air quality standard to assess the compliance of the Proposed Scheme with these ambient air quality standards.

Although no relative impact, as a percentage of the limit value, is enshrined in EU or Irish Legislation, the NRA guidelines (NRA 2006) detail a methodology for determining air quality impact significance criteria for road schemes. The degree of impact is determined based on both the absolute and relative impact of the Proposed Scheme. The NRA significance criteria have been adopted for the Proposed Scheme and are detailed in Tables 12.1 - 12.2. The significance criteria are based on PM_{10} and NO_2 as these pollutants are most likely to exceed the limit values. However the criteria have also been applied to the predicted 8-hour CO, annual benzene and annual $PM_{2.5}$ concentrations for the purposes of this assessment.

Table 12.1 Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations

Magnitude of Change	**Annual Mean NO_2 / PM_{10}**	**Days PM10 > 50 µg/m^3**
Very Large	Increase / decrease >25%	Increase / decrease >25 days
Large	Increase / decrease 15-25%	Increase / decrease 15-25 days
Moderate	Increase / decrease 10-15%	Increase / decrease 10-15 days
Small	Increase / decrease 5-10%	Increase / decrease 5-10 days
Very Small	Increase / decrease 1-5%	Increase / decrease 1-5 days
Extremely Small	Increase / decrease <1%	Increase / decrease <1 days

Source: Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes - National Roads Authority (2006)

Table 12.2 Air Quality Impact Significance Criteria

Absolute Concentration in Relation to Standard[Note 1]	Change in Concentration					
	Extremely Small	**Very Small**	**Small**	**Moderate**	**Large**	**Very Large**
Decrease with Scheme						
Above Standard with Scheme	slight beneficial	slight beneficial	substantial beneficial	substantial beneficial	very substantial beneficial	very substantial beneficial
Above Standard in Do-min, Below with Scheme	slight beneficial	moderate beneficial	substantial beneficial	substantial beneficial	very substantial beneficial	very substantial beneficial
Below Standard in Do-min, but not Well Below	negligible	slight beneficial	slight beneficial	moderate beneficial	moderate beneficial	substantial beneficial
Well Below Standard in Do-min	negligible	negligible	slight beneficial	slight beneficial	slight beneficial	moderate beneficial
Increase with Scheme						
Above Standard in Do-min	slight adverse	slight adverse	substantial adverse	substantial adverse	very substantial adverse	very substantial adverse
Below Standard in Do-min, Above with Scheme	slight adverse	moderate adverse	substantial adverse	substantial adverse	very substantial adverse	very substantial adverse
Below Standard with Scheme, but not Well Below	negligible	slight adverse	slight adverse	moderate adverse	moderate adverse	substantial adverse
Well Below Standard with Scheme	negligible	negligible	slight adverse	slight adverse	slight adverse	moderate adverse

Note 1 Well Below Standard = <75% of limit value.

Source: Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes - National Roads Authority (2006)

12.2.2 Regional Impact Assessment (Including Climate)

The impact of the Proposed Scheme at a national / international level has been determined using the procedures given by the NRA (NRA 2006) and the methodology provided in Annex 2 in the UK DMRB (UK DEFRA 2007). The assessment focused on determining the resulting change in emissions of CO, particulates (PM_{10}), volatile organic compounds (VOCs), nitrogen oxides (NO_x) and carbon dioxide (CO_2). The Annex provides a method for the prediction of the regional impact of emissions of these pollutants from road schemes. The inputs to the air dispersion model consist of information on road link lengths, AADT movements and annual average traffic speeds.

12.2.3 Consultation

Consultation with statutory and voluntary bodies was not required for the assessment.

12.2.4 Data Deficiencies / Difficulties with Producing the Impact Assessment

There were no major difficulties or data deficiencies encountered in the production of this assessment.

12.3 RECEIVING ENVIRONMENT

12.3.1 Meteorological Data

A key factor in assessing temporal and spatial variations in air quality is 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) (WHO 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 PM_{10}, 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 ($PM_{2.5}$ - PM_{10}) will actually increase at higher wind speeds. Thus, measured levels of PM_{10} will be a non-linear function of wind speed.

The nearest representative weather station collating detailed weather records is Rosslare meteorological station, which is located approximately 35 - 25 km south of the Proposed Scheme. For data collated during five representative years (2001-2005), the predominant wind ranges from southerly to westerly in direction with an average wind speed of approximately 4-6 m/s (see ,Figure 12.1 in Volume 4 of this EIS).

12.3.2 Trends In Air Quality

Air quality is variable and subject to both significant spatial and temporal variation. In relation to spatial variations in air quality, concentrations generally fall significantly with distance from major road sources (UK DEFRA 2007). Thus, residential exposure in urban and suburban areas is determined by the location of sensitive receptors relative to major roads sources in the area. Temporally, air quality can vary significantly by orders of magnitude due to changes in traffic volumes, meteorological conditions and wind direction.

12.3.3 Baseline Air Quality Monitoring

Baseline monitoring studies were carried out for close to the N11/M11 Mainline, N80 Link Road and N30 Mainline. The survey was indicative only and cannot be used to gauge compliance with either the short-term or annual limit values for the reasons outlined above. The survey does however allow an indicative assessment of the influence of local road sources relative to the prevailing background level of these pollutants in the area. The monitoring methodology and results are described below.

N11/M11 Mainline

NO_2

NO_2 monitoring, using nitrogen dioxide passive diffusion tubes, was conducted over a three month period at 12 locations close to the N11/M11 Mainline, at one location in Camolin and at one location in Ferns (see, Figure 12.2 in Volume 4 of this EIS & Table 12.3). The results allow an indicative comparison with the annual average limit value and an assessment of the spatial variation of NO_2 away from existing road sources. The spatial variation is particularly important for NO_2, as a complex relationship exists between NO, NO_2 and O_3 leading to a non-linear variation of NO_2 concentrations with distance.

Studies in the UK have shown that diffusion tube monitoring results generally have a positive or negative bias when compared to continuous analysers. This bias is laboratory specific and is dependent on the specific analysis procedures at each laboratory. A diffusion tube bias of 0.90 was obtained for the Bureau Veritas Glasgow laboratory (which analysed the diffusion tubes) from the UK Air Quality Review and Assessment website (UWE 2008). This bias was applied to the diffusion tube monitoring results.

The passive diffusion tube survey was designed to assess rural and roadside levels close to the N11/M11 Mainline and also roadside levels in Camolin and Ferns (see Table 12.3). The monitoring results show that three month average rural background concentrations along the proposed route ranged from 1 to 10 µg/m^3 with the majority of results below 5 µg/m^3. Average levels at the existing N11 roadside locations at Camolin (15 µg/m^3) and Ferns (26 µg/m^3) are, as expected, higher than the rural background level.

Average NO_2 concentrations measured over the three month period were all well below the EU standard. Average levels ranged from 2 - 65% of the annual limit value. Average rural levels reached at most 25% of the limit value. Ferns had the highest NO_2 concentrations with the three month average reaching 65% of the limit value.

Table 12.3 Results Of NO_2 Diffusion Tube Monitoring Carried Out Near The N11/M11 Mainline (June - September 2007 & 2008).

Location Type	Location	NO_2 (µg/m^3)[Note 1]			
		25/06/08 - 24/07/08	**24/07/08 - 27/08/08**	**27/08/08 - 29/09/08**	**Average**
Rural	AM1 - Clogh	2	4	7	4
Rural	AM2 - Ballycullen	3	4	8	5
Roadside	AM3 - Camolin Church	16	15	15	15
Rural	AM4 - Ballyedan	1	2	4	2
Rural	AM5 - Rockspring	<1	2	4	2
Rural	AM6 - Mountgeorge	<1	Note 3	Note 3	<1
Rural	AM7 - The Harrow	7	9	14	10
Rural	AM8 - Tinacross Bridge	1	4	5	3
Rural	AM9 - Crane	4	13	7	8
Roadside	AM10 - Ferns	38	36	5	26
Location Type	**Location**	**13/06/07 - 13/07/07**	**13/07/07 - 16/08/07**	**16/08/07 - 13/09/07**	**Average**
Roadside	AM11 - Drumgold (R744)	10	7	6	8
Rural	AM12 - Drumgold	5	5	7	6
Rural	AM13 - Ballycourcy More	5	3	5	4
Roadside	AM14 - Scurlockbush (N11)	18	15	17	17
			Limit Value		*40*[Note 2]

Note 1 Diffusion tube bias factor of 0.90 applied to laboratory results.
Note 2 EU Council Directive 2008/50/EC & S.I. 271 of 2002 (as an annual average).

Benzene

Benzene was monitored, using passive diffusion tubes over a one-month period at seven locations near the N11/M11 Mainline (see Figure 12.2 in Volume 4 of this EIS & Table 12.4). Passive sampling of benzene involves the molecular diffusion of benzene molecules through a stainless steel tube and their subsequent adsorption onto a stainless steel gauze coated with Chromasorb 106. Following sampling, the tubes were analysed using Gas Chromatography, at a UKAS accredited laboratory.

The passive diffusion tube survey was designed to assess roadside and rural levels along the route of the proposed road and also roadside levels in Camolin and Ferns. Average benzene concentrations over the one month monitoring period ranged from <0.2 - 0.3 µg/m^3 at the rural monitoring locations, while levels measured at roadside locations at Camolin and in Ferns ranged from 0.4 - 0.5 µg/m^3. Thus the average concentrations measured reached at most 10% of the EU limit value.

Table 12.4 Results Of Benzene Diffusion Tube Monitoring Carried Out Near The N11/M11 Mainline (June - September 2007 & 2008).

Location Type	**Location**	**Benzene (µg/m^3)**
		25/06/08 - 24/07/08
Rural	AM1 - Clogh	<0.2
Roadside	AM3 - Camolin Church	0.4
Rural	AM5 - Rockspring	0.3
Rural	AM7 - The Harrow	<0.2
Roadside	AM10 - Ferns	0.5
Location Type	**Location**	**13/06/07 - 13/07/07**
Roadside	AM11 - Drumgold (R744)	0.3
Roadside	AM14 - Scurlockbush (N11)	0.2
	Limit Value	*5*[Note 1]

Note 1 EU Council Directive 2008/50/EC & S.I. 271 of 2002 (as an annual average).

PM_{10} / $PM_{2.5}$

The PM_{10} & $PM_{2.5}$ monitoring program was carried out by means of a Turnkey Instruments® Osiris Environmental Dust Monitor in the townlands of Rockspring and Crefoge. The locations were positioned to allow an assessment of rural background levels in the region of the N11/M11 Mainline. The Osiris instrument is a light scattering device capable of continuous measurement of TSP, PM_{10}, $PM_{2.5}$ and PM_1. The air sample was continuously drawn into the instrument by a pump through a heated inlet at a flow rate of 600 ml/min. The incoming air passed through a laser beam in a photometer. The light scattered by the individual particles of dust was measured by the photometer and this information used to measure the size and concentration of the dust particles. A two-year inter-comparison study between PM_{10} monitoring methods in Camden, London has shown that the Osiris instrument gives similar results to the TEOM analyser (Tod et al. 2002), which is widely used in the UK PM_{10} monitoring network (UK DEFRA 2005).

Rockspring PM_{10} / $PM_{2.5}$ Results

Daily concentrations of PM_{10} and $PM_{2.5}$ measured at the rural location in Rockspring (see Figure 12.2 - Location AP1 in Volume 4 of this EIS,) are shown in Tables 12.5 - 12.6.

The average PM_{10} concentration measured over the one month period was 15 µg/m^3, which is 38% of the EU annual limit value of 40 µg/m^3. The results also show that the 24-hour average levels of PM_{10} did not exceed the 24-hour EU limit value of 50 µg/m^3 over the monitoring period. The 24-hour limit value is expressed as a 90.4th%ile, which means 35 exceedances are permitted per year. The 90.4th%ile of 24-hour average PM_{10} levels measured was 21 µg/m^3, which is 42% of the limit value.

Daily levels of $PM_{2.5}$ measured over the one-month period averaged 4.3 µg/m^3, reaching only 17% of the annual limit value of 25 µg/m^3, which will come into force in 2010.

Table 12.5 Results of PM_{10} and $PM_{2.5}$ Monitoring Carried Out at a Rural Location in the Townland of Rockspring (August - September 2008).

Date	PM_{10} Conc. (µg/m^3)	$PM_{2.5}$ Conc. (µg/m^3)	Date	PM_{10} Conc. (µg/m^3)	$PM_{2.5}$ Conc. (µg/m^3)
28-Aug	7	1	13-Sep	16	5
29-Aug	6	2	14-Sep	23	4
30-Aug	12	4	15-Sep	12	2
31-Aug	11	3	16-Sep	12	4
01-Sep	21	5	17-Sep	13	4
02-Sep	19	4	18-Sep	10	3
03-Sep	17	4	19-Sep	13	4
04-Sep	14	4	20-Sep	9	3
05-Sep	19	5	21-Sep	14	4
06-Sep	10	3	22-Sep	13	5
07-Sep	10	3	23-Sep	17	6
08-Sep	11	4	24-Sep	15	5
09-Sep	18	5	25-Sep	18	6
10-Sep	28	7	26-Sep	20	6
11-Sep	28	9	27-Sep	13	4
12-Sep	13	4			
Limit Values	*50*[Note 1]*, 40*[Note 2]	*25*[Note 2]	*Limit Values*	*50*[Note 1]*, 40*[Note 2]	*25*[Note 2]

Note 1 EU Council Directive 2008/50/EC - *24-hour limit value not to be exceeded >35 times per year*.
Note 2 EU Council Directive 2008/50/EC - a*nnual limit value*.

Table 12.6 Summary Of PM_{10} and $PM_{2.5}$ Monitoring Results in the Townland of Rockspring (August - September 2008)

PM_{10} / $PM_{2.5}$ Monitoring Results Summary		
PM_{10} Results	Total No. Days Sampling	31
	No. Days > 50 µg/m^3	0
	90.4th%ile of 24-hour Averages	21 *µg/m^3*
	PM_{10} Average	15 *µg/m^3*
	Limit Value	*50 µg/m^3 Note 1, 40 µg/m^3 Note 2*
$PM_{2.5}$ Results	Total No. Days Sampling	31
	$PM_{2.5}$ / PM_{10} Ratio	0.29
	$PM_{2.5}$ Average	4.3 *µg/m^3*
	Limit Value	*25 µg/m^3 Note 2*

Note 1 EU Council Directive 2008/50/EC - *24-hour limit value not to be exceeded >35 times per year*.

Note 2 EU Council Directive 2008/50/EC - a*nnual limit value*.

Crefoge PM_{10} / $PM_{2.5}$ Results

Daily concentrations of PM_{10} and $PM_{2.5}$ measured at the rural location in Crefoge (see Figure 12.2 - Location AP2 in Volume 4 of this EIS) are shown in Tables 12.7 - 12.8.

The average PM_{10} concentration measured over the one month period was 18 µg/m^3, which is 45% of the EU annual limit value of 40 µg/m^3. The results also show that the 24-hour average levels of PM_{10} did not exceed the 24-hour EU limit value of 50 µg/m^3 over the monitoring period. The 24-hour limit value is expressed as a 90.4th%ile, which means 35 exceedances are permitted per year. The 90.4th%ile of 24-hour average PM_{10} levels measured was 24 µg/m^3, which is 48% of the limit value.

Daily levels of $PM_{2.5}$ measured over the one-month period averaged 5.6 µg/m^3, reaching only 22% of the annual target value of 25 µg/m^3, which will come into force in 2010.

Table 12.7 Results of PM_{10} and $PM_{2.5}$ Monitoring Carried Out at a Rural Location in the Townland of Crefoge (September - October 2007)

Date	PM_{10} Conc. ($\mu g/m^3$)	$PM_{2.5}$ Conc. ($\mu g/m^3$)	Date	PM_{10} Conc. ($\mu g/m^3$)	$PM_{2.5}$ Conc. ($\mu g/m^3$)
14/09/07	22	6.7	30/09/07	20	6.6
15/09/07	21	7.5	01/10/07	19	6.0
16/09/07	19	5.6	02/10/07	15	5.5
17/09/07	14	4.7	03/10/07	13	4.2
18/09/07	13	4.0	04/10/07	10	2.7
19/09/07	19	7.2	05/10/07	16	3.9
20/09/07	26	7.0	06/10/07	18	4.4
21/09/07	10	2.1	07/10/07	16	4.4
22/09/07	12	3.6	08/10/07	24	6.4
23/09/07	32	9.7	09/10/07	30	8.7
24/09/07	16	6.4	10/10/07	21	6.7
25/09/07	18	6.3	11/10/07	19	5.8
26/09/07	14	5.0	12/10/07	14	4.6
27/09/07	12	4.2	13/10/07	14	4.2
28/09/07	18	5.9	14/10/07	21	8.9
29/09/07	15	5.3			
Limit Values	*50[Note 1], 40[Note 2]*	*25[Note 2]*	*Limit Values*	*50[Note 1], 40[Note 2]*	*25[Note 2]*

Note 1 EU Council Directive 2008/50/EC - *24-hour limit value not to be exceeded >35 times per year*.

Note 2 EU Council Directive 2008/50/EC - a*nnual limit value*.

Table 12.8 Summary Of PM_{10} and $PM_{2.5}$ Monitoring Results in the Townland of Crefoge (September - October 2007)

PM_{10} / $PM_{2.5}$ Monitoring Results Summary		
PM_{10} Results	Total No. Days Sampling	31
	No. Days > 50 $\mu g/m^3$	0
	90.4th%ile of 24-hour Averages	24 *$\mu g/m^3$*
	PM_{10} Average	18 *$\mu g/m^3$*
	Limit Value	*50 $\mu g/m^3$ [Note 1], 40 $\mu g/m^3$ [Note 2]*
$PM_{2.5}$ Results	Total No. Days Sampling	31
	$PM_{2.5}$ / PM_{10} Ratio	0.32
	$PM_{2.5}$ Average	5.6 *$\mu g/m^3$*
	Limit Value	*25 $\mu g/m^3$ [Note 2]*

Note 1 EU Council Directive 2008/50/EC - *24-hour limit value not to be exceeded >35 times per year*.

Note 2 EU Council Directive 2008/50/EC - a*nnual limit value*.

N80 Link Road

NO_2

NO_2 monitoring was conducted over a three month period at two locations close to the N80 Link Road (see Figure 12.2 in Volume 4 of this EIS & Table 12.9). The monitoring methodology was the same as that for the N11/M11 Mainline.

The passive diffusion tube survey was designed to assess rural and roadside levels close to the N80 Link Road. The monitoring results show that the three month average rural background concentration at Solsborough was 6 µg/m^3, while the existing N11 roadside concentration at Clavass was 34 µg/m^3. Thus, average rural and roadside levels were below the limit value, reaching 15% and 85% of the limit respectively.

Table 12.9 Results Of NO_2 Diffusion Tube Monitoring Carried Out Near The N80 Link Road (June - September 2007)

Location Type	Location	NO_2 (µg/m^3)[Note 1]			
		13/06/07 - 13/07/07	13/07/07 - 16/08/07	16/08/07 - 13/09/07	Average
Roadside	AM15 - Clavass (N11)	37	26	38	34
Rural	AM16 - Solsborough	8	5	6	6
Limit Value					*40*[Note 2]

Note 1 Diffusion tube bias factor of 0.90 applied to laboratory results.
Note 2 EU Council Directive 2008/50/EC & S.I. 271 of 2002 (as an annual average).

Benzene

Benzene was monitored over a one-month period at one location near the N80 Link Road (see Figure 12.2 in Volume 4 of this EIS & Table 12.10). The monitoring methodology was the same as that for the N11/M11 Mainline.

The passive diffusion tube survey was designed to assess roadside levels close to the N80 Link Road. The average benzene concentration over the one month monitoring period was <0.2 µg/m^3, thus reaching only 4% of the EU limit value.

Table 12.10 Results Of Benzene Diffusion Tube Monitoring Carried Out Near The N80 Link Road (June - September 2007)

Location Type	Location	Benzene (µg/m^3)
		13/06/07 - 13/07/07
Roadside	AM15 - Clavass (N11)	<0.2
Limit Value		*5*[Note 1]

Note 1 EU Council Directive 2008/50/EC & S.I. 271 of 2002 (as an annual average).

N30 Mainline

NO_2

NO_2 monitoring was conducted over a three month period at four locations close to the N30 Mainline and one location in Enniscorthy town centre (see Figure 12.2 in Volume 4 of this EIS & Table 12.11). The monitoring methodology was the same as that for the N11/M11 Mainline.

The passive diffusion tube survey was designed to assess rural and roadside levels close to the N30 Mainline and also roadside levels in Enniscorthy. The monitoring results show that three month average rural background concentration was 4 µg/m^3, which is 10% of the limit value. The average concentration measured at the R702 and N30 roadside locations ranged from was 6 - 8 µg/m^3, thus reaching at most 20% of the limit value. The average concentration measured at the existing N11 roadside location at Clavass was 34 µg/m^3, which represents 85% of the limit vlaue. As expected, the average level measured at the roadside location in Enniscorthy (32 µg/m^3) was higher than those close to the N30 Mainline, reaching 80% of the limit value.

Table 12.11 Results Of NO_2 Diffusion Tube Monitoring Carried Out Near The N30 Mainline (June - September 2007)

Location Type	Location	NO_2 (µg/m^3)[Note 1]			
		13/06/07 - 13/07/07	13/07/07 - 16/08/07	16/08/07 - 13/09/07	Average
Roadside	AM15 - Clavass (N11)	37	26	38	34
Rural	AM17 - Ballyorril	6	3	4	4
Roadside	AM18 - R702 Askunshin	4	3	10	6
Roadside	AM19 - Templescoby (N30)	10	5	9	8
Roadside	AM20 - Enniscorthy	30	23	42	32
Limit Value					*40*[Note 2]

Note 1 Diffusion tube bias factor of 0.90 applied to laboratory results.
Note 2 EU Council Directive 2008/50/EC & S.I. 271 of 2002 (as an annual average).

Benzene

Benzene was monitored, using passive diffusion tubes over a one-month period at two locations near the N30 Mainline and one location in Enniscorthy town centre (see Figure 12.2 in Volume 4 of this EIS & Table 12.12). The monitoring methodology was the same as that for the N11/M11 Mainline.

The average benzene concentration over the one month monitoring period at the N11 and N30 roadside locations was <0.2 µg/m^3, thus reaching only 4% of the EU limit value. Levels measured in Enniscorthy town centre (0.6 µg/m^3) reached 1.2% of the limit value.

Table 12.12 Results Of Benzene Diffusion Tube Monitoring Carried Out Near The N80 Link Road (June - September 2007)

Location Type	Location	Benzene (µg/m^3)
		13/06/07 - 13/07/07
Roadside	AM15 - Clavass (N11)	<0.2
Roadside	AM19 - Templescoby (N30)	<0.2
Roadside	AM20 - Enniscorthy	0.6
Limit Value		*5*[Note 1]

Note 1 EU Council Directive 2008/50/EC & S.I. 271 of 2002 (as an annual average).

12.3.4 EPA Monitoring Data and Background Concentrations

A review of representative EPA monitoring data in Ireland and details of the background concentrations used in the assessment are detailed in Appendix 12.2 in Volume 3 of this EIS.

12.4 CHARACTERISTICS OF THE PROPOSED SCHEME

Road traffic is expected to be the dominant source of emissions resulting from the Proposed Scheme and thus is the focus of the current assessment. Road traffic would also be expected to be the dominant source of greenhouse gas emissions resulting from the Proposed Scheme.

12.5 POTENTIAL IMPACTS OF THE PROPOSED SCHEME

12.5.1 Construction Phase - Air Quality & Climate

The greatest potential impact on air quality during the construction phase of the Proposed Scheme is from construction dust emissions and the potential for nuisance dust.

Due to the size and nature of the construction activities, CO_2 and N_2O emissions during construction will have a negligible impact on climate.

12.5.2 Operation Phase - Local Air Quality

Detailed traffic flow information was obtained from the traffic consultant for the project and has been used to model pollutant levels under various traffic scenarios and under sufficient spatial resolution to assess whether any significant air quality impact on sensitive receptors may occur. The traffic data corresponded to the design years of 2013 and 2028. The traffic data used represented capacity figures for the "do nothing" (i.e. without the Proposed Scheme in place) and "do something" (i.e. with the Proposed Scheme in place) scenarios.

Cumulative effects have been assessed, as recommended in the EU Directive on EIA (Council Directive 97/11/EC) and using the methodology of the UK DEFRA (UK DEFRA 2009a, UK DETR 1998). Firstly, background concentrations (UK DEFRA 2009a) have been included in the modelling study, for both "do nothing" and "do something" scenarios. These background concentrations are year-specific and account for non-localised sources of the pollutants of concern (UK DEFRA 2009a). Appropriate background levels were selected based on the available monitoring data provided by the EPA and Local Authorities (EPA 2008a, 2009) (see Appendix 12.2 in Volume 3 of this EIS).

Once appropriate background concentrations were established, the existing situation, including background levels, was assessed in the absence of the Proposed Scheme for the opening and design years. The assessment methodology involved air dispersion modelling using the UK DMRB Screening Model (Version 1.03c) (UK DEFRA 2007) and following guidance issued by the UK DEFRA (UK DETR 1998; UK DEFRA 2007, 2009a, 2009b). Ambient concentrations of CO, benzene, NO_2, PM_{10} and $PM_{2.5}$ for 2013 and 2028 were predicted at the nearest sensitive receptors to the Proposed Scheme. "Do nothing" and "do something" modelling was carried out at the building façade of the worst-case receptors for both 2013 and 2028. This assessment allows the significance of the Proposed Scheme, with respect to both relative and absolute impact, to be determined both temporally and spatially.

N11/M11 Mainline

Receptor Locations

Twenty-two locations were modelled close to the N11/M11 Mainline. In addition, receptors in Camolin, Ferns and Enniscorthy were modelled. The receptors modelled represent the worst-case locations along the N11/M11 Mainline and were chosen due to their close proximity to the Proposed Scheme, the existing N11 and the R744. Details of the assessment locations are provided in Table 12.13.

Annual average traffic speeds are required as an input to the DMRB screening model (UK DEFRA 2007). The N11/M11 Mainline was modelled at a speed of 120 kph, the R744 was modelled at a speed of 80 kph, and roads in the centre of Camolin, Ferns and Enniscorthy were modelled at a speed of 30 kph.

Table 12.13 DMRB Screening Air Quality Assessment, Proposed N11/M11 Mainline. Details of Assessment Locations.

Receptor	Location / Townland	Chainage	OS Co-ordinates
1	Clogh	Ch1980	E310425 N154905
2	Ballyeden	Ch4950	E309400 N152065
3	Ballymore	Ch7880	E308135 N149835
4	Knockrobin Upper	Ch7590	E307895 N149885
5	Rockspring	Ch8300	E307615 N149240
6	Cronyhorn	Ch9540	E306540 N148605
7	Ballycarrigeen Lower	Ch10850	E305685 N147630
8	Ballycarrigeen Lower	Ch11400	E305310 N147220
9	Carrigeen	Ch11600	E304970 N147285
10	Tomsallagh	Ch15450	E301935 N144885
11	Crane	Ch17400	E301135 N143170
12	Toom	Ch17900	E301045 N142715
13	Ballydawmore	Ch19180	E301420 N141585
14	Corbally	Ch19690	E301260 N141070
15	Tomnafunshoge	Ch20620	E300490 N139935
16	Tomnafunshoge	Ch21100	E300490 N139935
17	Drumgold	Ch22310	E300010 N138915
18	Ballcourcy More	Ch22850	E299935 N138343
19	Ballcourcy More	Ch25160	E300085 N136135
20	Riverview	Ch26700	E299600 N134695
21	Skurlocksbush	n/a	E299200 N133495
22	Skurlocksbush	n/a	E299400 N133175
38	Ferns Centre	n/a	E301755 N149875
39	Camolin Centre	n/a	E306385 N152585
40	Enniscorthy Bridge	n/a	E297440 N139935

Modelling Results and Impact Assessment

CO and Benzene

The results of the modelled impact of the N11/M11 Mainline for CO and benzene in the opening and design years are shown in Tables 12.14 - 12.15. Predicted pollutant concentrations in the region of the N11/M11 Mainline are below the ambient standards at all locations. Levels of both pollutants range from 11 - 16% of the respective limit values in 2013.

Future trends indicate similarly low levels of CO and benzene. Levels of both pollutants are below the relevant limit values, ranging from 12 - 17% of their respective limits in 2028.

The impact of the Proposed Scheme can be assessed relative to "do nothing" levels in 2013 and 2028 (see Tables 12.14 - 12.15). Relative to baseline levels, some small increases and decreases in pollutant levels at the worst-case receptors are predicted as a result of the proposed road. With regard to impacts at individual receptors, none of the 22 receptors assessed will experience an increase or decrease in concentrations of greater than 5% of the limit value in either 2013 or 2028.

The greatest impact on CO and benzene concentrations in either 2013 or 2028 will be an increase of 3.0% of their respective limit values. Furthermore, the greatest improvement in CO and benzene concentrations will be a decrease of 0.5% of their respective limit values.

The modelling results for Camolin, Ferns and Enniscorthy show that CO and benzene levels are predicted to decrease by up to 5% of the limit value.

Thus, using the assessment criteria for NO_2 and PM_{10} outlined in Tables 12.1 and 12.2, and applying these criteria to CO and benzene, the impact of the Proposed Scheme in terms of CO and benzene is negligible.

Table 12.14 DMRB Screening Air Quality Assessment, Proposed N11/M11 Mainline. Details of Assessment Locations. Predicted Maximum 8-Hour CO Concentrations.

Receptor	Location	Maximum 8-Hour CO Concentrations (mg/m^3)			
		Do Nothing		*Do Something*	
		2013	*2028*	*2013*	*2028*
1	Clogh	1.3	1.3	1.2	1.3
2	Ballyeden	1.2	1.3	1.2	1.3
3	Ballymore	1.2	1.3	1.2	1.3
4	Knockrobin Upper	1.2	1.3	1.3	1.4
5	Rockspring	1.2	1.3	1.2	1.3
6	Cronyhorn	1.2	1.3	1.2	1.3
7	Ballycarrigeen Lower	1.2	1.3	1.2	1.3
8	Ballycarrigeen Lower	1.2	1.3	1.2	1.3
9	Carrigeen	1.2	1.3	1.2	1.3
10	Tomsallagh	1.2	1.3	1.2	1.3
11	Crane	1.2	1.3	1.2	1.3
12	Toom	1.2	1.3	1.2	1.3
13	Ballydawmore	1.2	1.3	1.2	1.3
14	Corbally	1.2	1.3	1.3	1.3
15	Tomnafunshoge	1.2	1.3	1.3	1.3
16	Tomnafunshoge	1.2	1.3	1.3	1.4
17	Drumgold	1.2	1.3	1.3	1.3
18	Ballcourcy More	1.2	1.3	1.2	1.3
19	Ballcourcy More	1.2	1.3	1.2	1.3
20	Riverview	1.2	1.3	1.3	1.3
21	Skurlocksbush	1.4	1.4	1.6	1.7
22	Skurlocksbush	1.3	1.4	1.3	1.4
38	Ferns Centre	3.1	3.3	2.9	3.1
39	Camolin Centre	2.9	3.0	2.6	2.8
40	Enniscorthy Bridge	3.2	3.4	2.7	2.9
Ambient Limit Value[Note 1]		10 mg/m^3	10 mg/m^3	10 mg/m^3	10 mg/m^3

Note 1 Maximum 8-hour CO Limit Value: S.I. No. 271 of 2002 & EU Directive 2008/50/EC

Table 12.15 DMRB Screening Air Quality Assessment, Proposed N11/M11 Mainline. Details of Assessment Locations. Predicted Annual Average Benzene Concentrations.

Receptor	Location	Annual Average Benzene Concentrations (µg/m^3)			
		Do Nothing		*Do Something*	
		2013	*2028*	*2013*	*2028*
1	Clogh	0.57	0.60	0.56	0.59
2	Ballyeden	0.55	0.58	0.55	0.58
3	Ballymore	0.55	0.58	0.55	0.58
4	Knockrobin Upper	0.55	0.58	0.57	0.60
5	Rockspring	0.55	0.58	0.56	0.59
6	Cronyhorn	0.55	0.58	0.56	0.59
7	Ballycarrigeen Lower	0.55	0.58	0.55	0.58
8	Ballycarrigeen Lower	0.55	0.58	0.56	0.59
9	Carrigeen	0.55	0.58	0.55	0.58
10	Tomsallagh	0.55	0.58	0.55	0.58
11	Crane	0.55	0.58	0.55	0.58
12	Toom	0.55	0.58	0.55	0.58
13	Ballydawmore	0.55	0.58	0.55	0.58
14	Corbally	0.55	0.58	0.56	0.60
15	Tomnafunshoge	0.55	0.58	0.56	0.60
16	Tomnafunshoge	0.56	0.59	0.57	0.61
17	Drumgold	0.55	0.58	0.56	0.60
18	Ballcourcy More	0.55	0.58	0.55	0.58
19	Ballcourcy More	0.55	0.58	0.55	0.58
20	Riverview	0.55	0.58	0.56	0.59
21	Skurlocksbush	0.59	0.62	0.64	0.69
22	Skurlocksbush	0.57	0.61	0.57	0.61
38	Ferns Centre	0.70	0.75	0.65	0.71
39	Camolin Centre	0.65	0.70	0.60	0.64
40	Enniscorthy Bridge	0.75	0.81	0.62	0.67
Ambient Limit Value[Note 1]		5 µg/m^3	5 µg/m^3	5 µg/m^3	5 µg/m^3

Note 1 Annual Average Benzene Limit Value: S.I. No. 271 of 2002 & EU Directive 2008/50/EC

PM_{10}

The results of the modelled impact of the Proposed Scheme for PM_{10} in the opening and design years are shown in Tables 12.16 - 12.17. Predicted annual average concentrations in the region of the N11/M11 Mainline are below the ambient standards at all worst-case receptors, ranging from 34 - 38% of the limit value in 2013. In addition, no exceedances of the 24-hour PM_{10} concentration are predicted.

Future trends with the Proposed Scheme in place indicate similarly low levels of PM_{10}. Annual average PM_{10} concentrations range from 33 - 37% of the limit in 2028. Furthermore, the results show that the 24-hour limit value will not be exceeded in 2028.

The impact of the Proposed Scheme can be assessed relative to “do nothing” levels in 2013 and 2028 (see Tables 12.16 - 12.17). Relative to baseline levels, some small increases and decreases in PM_{10} levels at the worst-case receptors are predicted as a result of the proposed road. With regard to impacts at individual receptors, none of the 22 receptors assessed will experience an increase or decrease in concentrations of over 5% of the limit value in either 2013 or 2028.

The greatest impact on PM_{10} concentrations in the region of the proposed road in either 2013 or 2028 will be an increase of 3.1% of the annual limit value. Furthermore, the greatest improvement in PM_{10} concentrations will be a decrease of 1.3% of the annual limit value.

The modelling results also show that PM_{10} concentrations in Camolin, Ferns and Enniscorthy are predicted to decrease by up to 5% of the limit value.

Thus, using the assessment criteria outlined in Tables 12.1 and 12.2, the impact of the Proposed Scheme with regard to PM_{10} is negligible.

Table 12.16 DMRB Screening Air Quality Assessment, Proposed N11/M11 Mainline. Details of Assessment Locations. Predicted Annual Average PM_{10} Concentrations.

Receptor	Location	Annual Average PM_{10} Concentrations ($\mu g/m^3$)			
		Do Nothing		*Do Something*	
		2013	*2028*	*2013*	*2028*
1	Clogh	14.3	13.9	13.7	13.4
2	Ballyeden	13.5	13.1	13.6	13.2
3	Ballymore	13.5	13.1	13.6	13.2
4	Knockrobin Upper	13.5	13.1	14.5	14.3
5	Rockspring	13.5	13.1	13.8	13.5
6	Cronyhorn	13.5	13.1	13.9	13.5
7	Ballycarrigeen Lower	13.5	13.1	13.6	13.2
8	Ballycarrigeen Lower	13.5	13.1	13.8	13.5
9	Carrigeen	13.5	13.1	13.6	13.2
10	Tomsallagh	13.5	13.1	13.6	13.2
11	Crane	13.5	13.1	13.7	13.4
12	Toom	13.5	13.1	13.5	13.2
13	Ballydawmore	13.5	13.1	13.6	13.2
14	Corbally	13.5	13.1	14.2	13.8
15	Tomnafunshoge	13.5	13.1	14.4	14.0
16	Tomnafunshoge	13.7	13.3	14.0	13.6
17	Drumgold	13.5	13.1	14.4	14.0
18	Ballcourcy More	13.5	13.1	13.6	13.2
19	Ballcourcy More	13.5	13.1	13.7	13.3
20	Riverview	13.5	13.1	14.2	13.8
21	Skurlocksbush	14.8	14.4	15.1	14.6
22	Skurlocksbush	14.3	13.9	14.4	14.0
38	Ferns Centre	21.9	21.3	20.7	20.3
39	Camolin Centre	21.4	20.7	19.9	19.5
40	Enniscorthy Bridge	22.4	21.6	20.2	19.9
Ambient Limit Value[Note 1]		40 $\mu g/m^3$	40 $\mu g/m^3$	40 $\mu g/m^3$	40 $\mu g/m^3$

Note 1 Annual Average PM_{10} Limit Value: S.I. No. 271 of 2002 & EU Directive 2008/50/EC

Table 12.17 DMRB Screening Air Quality Assessment, Proposed N11/M11 Mainline. Details of Assessment Locations. Predicted Number of Daily Exceedences of the PM_{10} 24-Hour Limit Value.

Receptor	Location	24 Hour PM_{10}: No. Days >50 µg/m^3			
		Do Nothing		*Do Something*	
		2013	*2028*	*2013*	*2028*
1	Clogh	0	0	0	0
2	Ballyeden	0	0	0	0
3	Ballymore	0	0	0	0
4	Knockrobin Upper	0	0	0	0
5	Rockspring	0	0	0	0
6	Cronyhorn	0	0	0	0
7	Ballycarrigeen Lower	0	0	0	0
8	Ballycarrigeen Lower	0	0	0	0
9	Carrigeen	0	0	0	0
10	Tomsallagh	0	0	0	0
11	Crane	0	0	0	0
12	Toom	0	0	0	0
13	Ballydawmore	0	0	0	0
14	Corbally	0	0	0	0
15	Tomnafunshoge	0	0	0	0
16	Tomnafunshoge	0	0	0	0
17	Drumgold	0	0	0	0
18	Ballcourcy More	0	0	0	0
19	Ballcourcy More	0	0	0	0
20	Riverview	0	0	0	0
21	Skurlocksbush	0	0	0	0
22	Skurlocksbush	0	0	0	0
38	Ferns Centre	6	5	4	4
39	Camolin Centre	5	4	3	3
40	Enniscorthy Bridge	7	6	4	3
Ambient Limit Value[Note 1]		35 days	35 days	35 days	35 days

Note 1 24-hour PM_{10} Limit Value: S.I. No. 271 of 2002 & EU Directive 2008/50/EC

$PM_{2.5}$

The results of the modelled impact of the Proposed Scheme for $PM_{2.5}$ in the opening and design years are shown in Table 12.18. Predicted annual average concentrations in the region of the N11/M11 Mainline are below the ambient standards at all worst-case receptors, ranging from 33 - 39% of the limit value in 2013.

Future trends with the Proposed Scheme in place indicate similarly low levels of $PM_{2.5}$. Annual average $PM_{2.5}$ concentrations range from 32 - 38% of the limit in 2028.

The impact of the Proposed Scheme can be assessed relative to “do nothing” levels in 2013 and 2028 (see Table 12.18). Relative to baseline levels, some small increases and decreases in

$PM_{2.5}$ levels at the worst-case receptors are predicted as a result of the proposed road. With regard to impacts at individual receptors, none of the 22 receptors assessed will experience an increase or decrease in concentrations of over 5% of the limit value in either 2013 or 2028.

The greatest impact on $PM_{2.5}$ concentrations in the region of the proposed road in either 2013 or 2028 will be an increase of 5.0% of the annual limit value. Furthermore, the greatest improvement in $PM_{2.5}$ concentrations will be a decrease of 2.1% of the annual limit value.

The modelling results also show that $PM_{2.5}$ concentrations in Camolin, Ferns and Enniscorthy are predicted to decrease by up to 9% of the limit value.

Thus, using the assessment criteria outlined in Tables 12.1 and 12.2, the impact of the Proposed Scheme with regard to $PM_{2.5}$ is negligible.

Table 12.18 DMRB Screening Air Quality Assessment, Proposed N11/M11 Mainline. Details of Assessment Locations. Predicted Annual Average $PM_{2.5}$ Concentrations.

Receptor	Location	Annual Average $PM_{2.5}$ Concentrations ($\mu g/m^3$)			
		Do Nothing		*Do Something*	
		2013	*2028*	*2013*	*2028*
1	Clogh	8.9	8.6	8.3	8.1
2	Ballyeden	8.1	7.8	8.2	8.0
3	Ballymore	8.1	7.8	8.2	7.9
4	Knockrobin Upper	8.1	7.8	9.1	9.1
5	Rockspring	8.1	7.8	8.4	8.2
6	Cronyhorn	8.1	7.8	8.5	8.3
7	Ballycarrigeen Lower	8.1	7.8	8.2	7.9
8	Ballycarrigeen Lower	8.1	7.8	8.4	8.2
9	Carrigeen	8.1	7.8	8.2	8.0
10	Tomsallagh	8.1	7.8	8.2	7.9
11	Crane	8.1	7.8	8.3	8.1
12	Toom	8.1	7.8	8.2	7.9
13	Ballydawmore	8.1	7.8	8.2	8.0
14	Corbally	8.1	7.8	8.8	8.6
15	Tomnafunshoge	8.1	7.8	9.0	8.8
16	Tomnafunshoge	8.3	8.1	8.6	8.4
17	Drumgold	8.1	7.8	9.0	8.7
18	Ballcourcy More	8.1	7.8	8.2	7.9
19	Ballcourcy More	8.1	7.8	8.3	8.0
20	Riverview	8.1	7.8	8.8	8.6
21	Skurlocksbush	9.4	9.1	9.7	9.4
22	Skurlocksbush	8.9	8.7	9.0	8.8
38	Ferns Centre	14.2	13.8	13.0	12.9
39	Camolin Centre	13.7	13.2	12.3	12.1
40	Enniscorthy Bridge	14.7	14.2	12.6	12.4
Ambient Limit Value[Note 1]		25 $\mu g/m^3$	25 $\mu g/m^3$	25 $\mu g/m^3$	25 $\mu g/m^3$

Note 1 Annual Average $PM_{2.5}$ Limit Value: EU Directive 2008/50/EC

NO_2

The result of the assessment of the impact of the Proposed Scheme for NO_2 in the opening and design years are shown in Tables 12.19 - 12.20. The annual average concentration is within the limit value at all worst-case receptors. Future trends, with the Proposed Scheme in place, indicate reduced annual levels of NO_2. Levels of NO_2 range from 27 - 39% of the annual limit value in 2013 and 2028.

Maximum one-hour NO_2 levels with the Proposed Scheme in place will be significantly below the limit value, with levels at the worst-case receptor reaching 37% of the limit value in 2013 and 37% of the limit in 2028.

The impact of the Proposed Scheme on maximum one-hour NO_2 levels can be assessed relative to “do nothing” levels in 2013 and 2028 (see Tables 12.19 - 12.20). Relative to baseline levels, some increases and decreases in pollutant levels are predicted as a result of the proposed road. Of the 22 worst-case receptors assessed, three receptors (Receptors 4, 15 & 17) will experience increased levels of over 5% of the limit. The remaining 19 receptors will experience an increase or decrease in levels of less than 5% of the limit value.

The greatest impact on NO_2 concentrations in the region of the proposed road in either 2013 or 2028 will be an increase of 6.5% of the annual or maximum 1-hour limit value. Furthermore, the greatest improvement in NO_2 concentrations will be a decrease of 3.8% of the annual or maximum 1-hour limit value.

The modelling results also show that NO_2 concentrations in Camolin, Ferns and Enniscorthy are predicted to decrease by up to 12% of the limit value.

Thus, using the assessment criteria outlined in Tables 12.1 - 12.2, the impact of the Proposed Scheme in terms of NO_2 is slight adverse at three receptors (Receptor 4, 15 & 17) and negligible at the remaining 18 receptors assessed.

Table 12.19 DMRB Screening Air Quality Assessment, Proposed N11/M11 Mainline. Details of Assessment Locations. Predicted Annual Average NO_2 Concentrations.

Receptor	Location	Annual Average NO_2 Concentrations ($\mu g/m^3$)			
		Do Nothing		*Do Something*	
		2013	*2028*	*2013*	*2028*
1	Clogh	13.3	12.8	11.8	11.5
2	Ballyeden	10.8	10.5	11.1	10.8
3	Ballymore	10.8	10.5	11.0	10.7
4	Knockrobin Upper	10.8	10.5	13.3	13.1
5	Rockspring	10.8	10.5	11.6	11.4
6	Cronyhorn	10.8	10.5	11.7	11.5
7	Ballycarrigeen Lower	10.8	10.5	11.0	10.7
8	Ballycarrigeen Lower	10.8	10.5	11.6	11.4
9	Carrigeen	10.8	10.5	11.0	10.7
10	Tomsallagh	10.8	10.5	11.0	10.7
11	Crane	10.8	10.5	11.4	11.1
12	Toom	10.8	10.5	11.0	10.7
13	Ballydawmore	10.8	10.5	11.2	10.9
14	Corbally	10.8	10.5	12.7	12.2
15	Tomnafunshoge	10.8	10.5	13.0	12.5
16	Tomnafunshoge	11.4	11.2	12.1	11.7
17	Drumgold	10.8	10.5	13.0	12.5
18	Ballcourcy More	10.8	10.5	11.1	10.7
19	Ballcourcy More	10.8	10.5	11.3	11.0
20	Riverview	10.8	10.5	12.7	12.2
21	Skurlocksbush	14.5	13.7	15.4	14.9
22	Skurlocksbush	13.3	12.7	13.7	13.2
38	Ferns Centre	23.1	22.1	20.1	19.6
39	Camolin Centre	22.4	21.2	18.6	18.0
40	Enniscorthy Bridge	24.1	22.8	19.2	18.8
Ambient Limit Value[Note 1]		40 $\mu g/m^3$	40 $\mu g/m^3$	40 $\mu g/m^3$	40 $\mu g/m^3$

Note 1 Annual Average NO_2 Limit Value: S.I. No. 271 of 2002 & EU Directive 2008/50/EC

Table 12.20 DMRB Screening Air Quality Assessment, Proposed N11/M11 Mainline. Details of Assessment Locations. Predicted Maximum 1-Hour NO_2 Concentrations.

Receptor	Location	Maximum 1-Hour NO_2 Concentrations ($\mu g/m^3$)			
		Do Nothing		*Do Something*	
		2013	*2028*	*2013*	*2028*
1	Clogh	66.5	64.0	59.0	57.7
2	Ballyeden	54.0	52.5	55.4	54.0
3	Ballymore	54.0	52.5	55.0	53.5
4	Knockrobin Upper	54.0	52.5	66.4	65.5
5	Rockspring	54.0	52.5	58.1	56.9
6	Cronyhorn	54.0	52.5	58.7	57.4
7	Ballycarrigeen Lower	54.0	52.5	55.1	53.7
8	Ballycarrigeen Lower	54.0	52.5	58.1	56.9
9	Carrigeen	54.0	52.5	55.1	53.7
10	Tomsallagh	54.0	52.5	55.0	53.5
11	Crane	54.0	52.5	56.9	55.6
12	Toom	54.0	52.5	54.9	53.4
13	Ballydawmore	54.0	52.5	55.9	54.3
14	Corbally	54.0	52.5	63.4	61.2
15	Tomnafunshoge	54.0	52.5	65.0	62.6
16	Tomnafunshoge	57.2	55.8	60.4	58.7
17	Drumgold	54.0	52.5	64.9	62.5
18	Ballcourcy More	54.0	52.5	55.3	53.7
19	Ballcourcy More	54.0	52.5	56.5	54.8
20	Riverview	54.0	52.5	63.3	61.1
21	Skurlocksbush	72.6	68.6	77.2	74.3
22	Skurlocksbush	66.7	63.5	68.6	65.8
38	Ferns Centre	116	111	100	98.2
39	Camolin Centre	112	106	92.8	90.1
40	Enniscorthy Bridge	120	114	95.9	94.2
Ambient Limit Value[Note 1]		200 $\mu g/m^3$	200 $\mu g/m^3$	200 $\mu g/m^3$	200 $\mu g/m^3$

Note 1 Maximum 1-Hour NO_2 Limit Value: S.I. No. 271 of 2002 & EU Directive 2008/50/EC

N80 Link Road

Receptor Locations

Four locations were modelled close to the N80 Link Road. The receptors modelled represent the worst-case locations along the N80 Link Road and were chosen due to their close proximity to the Proposed Scheme and the existing N11. Details of the assessment locations are provided in Table 12.21.

Annual average traffic speeds are required as an input to the DMRB screening model (UK DEFRA 2007). The N11/M11 Mainline was modelled at a speed of 100 kph, the N30 Mainline, N80 Link Road and existing N11 were modelled at a speed of 30 kph.

Table 12.21 DMRB Screening Air Quality Assessment, Proposed N80 Link Road. Details of Assessment Locations.

Receptor	Location / Townland	Chainage	OS Co-ordinates
23	Kilcannon	Ch2300	E299110 N142325
24	Ballynahallin	Ch700	E298505 N143805
25	Clavass	Ch500	E298385 N143975
26	Clavass	Ch0	E298285 N144615

Modelling Results and Impact Assessment

CO and Benzene

The results of the modelled impact of the N80 Link Road for CO and benzene in the opening and design years are shown in Tables 12.22 - 12.23. Predicted pollutant concentrations are below the ambient standards at all locations assessed. Levels of both pollutants range from 11 - 16% of the respective limit values in 2013.

Future trends indicate similarly low levels of CO and benzene. Levels of both pollutants are below the relevant limit values, ranging from 12 - 18% of their respective limits in 2028.

The impact of the Proposed Scheme can be assessed relative to “do nothing” levels in 2013 and 2028 (see Tables 12.22 - 12.23). Relative to baseline levels, some small increases and decreases in pollutant levels at the worst-case receptors are predicted as a result of the proposed road. With regard to impacts at individual receptors, none of the four receptors assessed will experience an increase or decrease in concentrations of greater than 5% of the limit value in either 2013 or 2028.

The greatest impact on CO and benzene concentrations in either 2013 or 2028 will be an increase of 0.5% of their respective limit values. Furthermore, the greatest improvement in CO and benzene concentrations will be a decrease of 0.1% of their respective limit values.

Thus, using the assessment criteria for NO_2 and PM_{10} outlined in Tables 12.1 and 12.2, and applying these criteria to CO and benzene, the impact of the Proposed Scheme in terms of CO and benzene is negligible.

Table 12.22 DMRB Screening Air Quality Assessment, Proposed N80 Link Road. Details of Assessment Locations. Predicted Maximum 8-Hour CO Concentrations.

Receptor	Location	Maximum 8-Hour CO Concentrations (mg/m^3)			
		Do Nothing		*Do Something*	
		2013	***2028***	***2013***	***2028***
23	Kilcannon	1.2	1.3	1.2	1.3
24	Ballynahallin	1.2	1.3	1.2	1.3
25	Clavass	1.2	1.3	1.2	1.3
26	Clavass	1.6	1.7	1.6	1.8
Ambient Limit Value[Note 1]		10 mg/m^3	10 mg/m^3	10 mg/m^3	10 mg/m^3

Note 1 Maximum 8-hour CO Limit Value: S.I. No. 271 of 2002 & EU Directive 2008/50/EC

Table 12.23 DMRB Screening Air Quality Assessment, Proposed N80 Link Road. Details of Assessment Locations. Predicted Annual Average Benzene Concentrations.

Receptor	Location	Annual Average Benzene Concentrations (µg/m^3)			
		Do Nothing		*Do Something*	
		2013	***2028***	***2013***	***2028***
23	Kilcannon	0.55	0.58	0.55	0.58
24	Ballynahallin	0.55	0.58	0.55	0.58
25	Clavass	0.55	0.58	0.55	0.58
26	Clavass	0.63	0.66	0.63	0.68
Ambient Limit Value[Note 1]		5 µg/m^3	5 µg/m^3	5 µg/m^3	5 µg/m^3

Note 1 Annual Average Benzene Limit Value: S.I. No. 271 of 2002 & EU Directive 2008/50/EC

PM_{10}

The results of the modelled impact of the Proposed Scheme for PM_{10} in the opening and design years are shown in Tables 12.24 - 12.25. Predicted annual average concentrations are below the ambient standards at all worst-case receptors, ranging from 34 - 39% of the limit value in 2013. In addition, no exceedances of the 24-hour PM_{10} concentration are predicted.

Future trends with the Proposed Scheme in place indicate similarly low levels of PM_{10}. Annual average PM_{10} concentrations range from 33 - 37% of the limit in 2028. Furthermore, the results show that the 24-hour limit value will not be exceeded in 2028.

The impact of the Proposed Scheme can be assessed relative to "do nothing" levels in 2013 and 2028 (see Tables 12.24 - 12.25). Relative to baseline levels, some small increases and decreases in PM_{10} levels at the worst-case receptors are predicted as a result of the proposed road. With regard to impacts at individual receptors, none of the four receptors assessed will experience an increase or decrease in concentrations of over 5% of the limit value in either 2013 or 2028.

The greatest impact on PM_{10} concentrations in the region of the proposed road in either 2013 or 2028 will be an increase of 0.4% of the annual limit value. Furthermore, the greatest improvement in PM_{10} concentrations will be a decrease of 0.1% of the annual limit value.

Thus, using the assessment criteria outlined in Tables 12.1 and 12.2, the impact of the Proposed Scheme with regard to PM_{10} is negligible.

Table 12.24 DMRB Screening Air Quality Assessment, Proposed N80 Link Road. Details of Assessment Locations. Predicted Annual Average PM_{10} Concentrations.

Receptor	Location	Annual Average PM_{10} Concentrations ($\mu g/m^3$)			
		Do Nothing		*Do Something*	
		2013	*2028*	*2013*	*2028*
23	Kilcannon	13.5	13.1	13.6	13.2
24	Ballynahallin	13.5	13.1	13.7	13.3
25	Clavass	13.6	13.2	13.6	13.2
26	Clavass	15.5	14.8	15.5	14.9
Ambient Limit Value[Note 1]		40 $\mu g/m^3$	40 $\mu g/m^3$	40 $\mu g/m^3$	40 $\mu g/m^3$

Note 1 Annual Average PM_{10} Limit Value: S.I. No. 271 of 2002 & EU Directive 2008/50/EC

Table 12.25 DMRB Screening Air Quality Assessment, Proposed N80 Link Road. Details of Assessment Locations. Predicted Number of Daily Exceedences of the PM_{10} 24-Hour Limit Value.

Receptor	Location	24 Hour PM_{10}: No. Days >50 µg/m^3			
		Do Nothing		*Do Something*	
		2013	*2028*	*2013*	*2028*
23	Kilcannon	0	0	0	0
24	Ballynahallin	0	0	0	0
25	Clavass	0	0	0	0
26	Clavass	0	0	0	0
Ambient Limit Value[Note 1]		35 days	35 days	35 days	35 days

Note 1 24-hour PM_{10} Limit Value: S.I. No. 271 of 2002 & EU Directive 2008/50/EC

$PM_{2.5}$

The results of the modelled impact of the Proposed Scheme for $PM_{2.5}$ in the opening and design years are shown in Tables 12.26. Predicted annual average concentrations are below the ambient standards at all worst-case receptors, ranging from 33 - 40% of the limit value in 2013.

Future trends with the Proposed Scheme in place indicate similarly low levels of $PM_{2.5}$. Annual average $PM_{2.5}$ concentrations range from 32 - 39% of the limit in 2028.

The impact of the Proposed Scheme can be assessed relative to "do nothing" levels in 2013 and 2028 (see Table 12.26). Relative to baseline levels, some small increases and decreases in $PM_{2.5}$ levels at the worst-case receptors are predicted as a result of the proposed road. With regard to impacts at individual receptors, none of the four receptors assessed will experience an increase or decrease in concentrations of over 5% of the limit value in either 2013 or 2028.

The greatest impact on $PM_{2.5}$ concentrations in the region of the proposed road in either 2013 or 2028 will be an increase of 0.7% of the annual limit value. Furthermore, the greatest improvement in PM_{10} concentrations will be a decrease of 0.1% of the annual limit value.

Thus, using the assessment criteria outlined in Tables 12.1 and 12.2, the impact of the Proposed Scheme with regard to $PM_{2.5}$ is negligible.

Table 12.26 DMRB Screening Air Quality Assessment, Proposed N80 Link Road. Details of Assessment Locations. Predicted Annual Average $PM_{2.5}$ Concentrations.

Receptor	Location	Annual Average $PM_{2.5}$ Concentrations ($\mu g/m^3$)			
		Do Nothing		*Do Something*	
		2013	*2028*	*2013*	*2028*
23	Kilcannon	8.1	7.9	8.2	7.9
24	Ballynahallin	8.1	7.9	8.3	8.0
25	Clavass	8.2	8.0	8.2	8.0
26	Clavass	10.1	9.6	10.1	9.7
Ambient Limit Value[Note 1]		25 $\mu g/m^3$	25 $\mu g/m^3$	25 $\mu g/m^3$	25 $\mu g/m^3$

Note 1 Annual Average $PM_{2.5}$ Limit Value: EU Directive 2008/50/EC

NO_2

The result of the assessment of the impact of the Proposed Scheme for NO_2 in the opening and design years are shown in Tables 12.27 - 12.28. The annual average concentration is within the limit value at all worst-case receptors. Future trends, with the Proposed Scheme in place, indicate reduced annual levels of NO_2. Levels of NO_2 range from 27 - 42% of the annual limit value in 2013 and 2028.

Maximum one-hour NO_2 levels with the Proposed Scheme in place will be significantly below the limit value, with levels at the worst-case receptor reaching 42% of the limit value in 2013 and 40% of the limit in 2028.

The impact of the Proposed Scheme on maximum one-hour NO_2 levels can be assessed relative to "do nothing" levels in 2013 and 2028 (see Tables 12.27 - 12.28). Relative to baseline levels, some increases and decreases in pollutant levels are predicted as a result of the proposed road. Of the four worst-case receptors assessed, none will experience increased levels of over 5% of the limit value.

The greatest impact on NO_2 concentrations in the region of the proposed road in either 2013 or 2028 will be an increase of 1.6% of the annual or maximum 1-hour limit value. Furthermore, the greatest improvement in NO_2 concentrations will be a decrease of 0.3% of the annual or maximum 1-hour limit value.

Thus, using the assessment criteria outlined in Tables 12.1 and 12.2, the impact of the Proposed Scheme in terms of NO_2 is negligible.

Table 12.27 DMRB Screening Air Quality Assessment, Proposed N80 Link Road. Details of Assessment Locations. Predicted Annual Average NO_2 Concentrations.

Receptor	Location	Annual Average NO_2 Concentrations ($\mu g/m^3$)			
		Do Nothing		*Do Something*	
		2013	*2028*	*2013*	*2028*
23	Kilcannon	10.8	10.5	11.1	10.8
24	Ballynahallin	10.8	10.5	11.5	11.1
25	Clavass	11.2	10.9	11.2	10.8
26	Clavass	16.8	15.7	16.7	16.0
Ambient Limit Value[Note 1]		40 $\mu g/m^3$	40 $\mu g/m^3$	40 $\mu g/m^3$	40 $\mu g/m^3$

Note 1 Annual Average NO_2 Limit Value: S.I. No. 271 of 2002 & EU Directive 2008/50/EC

Table 12.28 DMRB Screening Air Quality Assessment, Proposed N80 Link Road. Details of Assessment Locations. Predicted Maximum 1-Hour NO_2 Concentrations.

Receptor	Location	Maximum 1-Hour NO_2 Concentrations ($\mu g/m^3$)			
		Do Nothing		*Do Something*	
		2013	*2028*	*2013*	*2028*
23	Kilcannon	54.0	52.5	55.5	53.9
24	Ballynahallin	54.0	52.5	57.3	55.5
25	Clavass	56.1	54.3	55.8	54.2
26	Clavass	83.9	78.7	83.3	80.2
Ambient Limit Value[Note 1]		200 $\mu g/m^3$	200 $\mu g/m^3$	200 $\mu g/m^3$	200 $\mu g/m^3$

Note 1 Maximum 1-Hour NO_2 Limit Value: S.I. No. 271 of 2002 & EU Directive 2008/50/EC

Air Quality 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. The NRA guidelines (NRA 2006) require assessment at designated sites such as Natural Heritage Areas (NHA), Special Areas of Conservation (SAC), Special Protection Areas (SPA), National Parks, Nature Reserves, Refuges for Fauna, Refuges for Flora, Wildfowl Sanctuaries, Ramsar Sites, Biogenetic Reserves and UNESCO Biosphere Reserves.

The NRA guidelines (NRA 2006) state that as the potential impact of a scheme is limited to a local level, detailed consideration need only be given to roads where there is a significant change to traffic flows (>5%) and the designated site lies within 200m of the road centre line.

The impact of NO_x (i.e. NO and NO_2) emissions resulting from the N80 Link Road at the Slaney River SAC was assessed. Dispersion modelling and prediction was carried out at typical traffic speeds. Ambient NO_x concentrations predicted along a transect from the road

centreline to 200m within the Slaney River SAC are given in Table 12.29. The road contribution to dry deposition along the transect is also given and was calculated using the methodology of the NRA (NRA 2006).

The predicted annual average NO_x level at the Slaney River SAC is below the limit value of 30 µg/m^3 for both the "do nothing" and "do something" scenarios in 2013 and 2028. Levels with the proposed Proposed Scheme in place reach at most 78% and 71% of the limit in 2013 and 2028 respectively. The impact of the proposed N80 Link Road leads to an increase in NO_x concentrations of >2 µg/m^3 within the Slaney River SAC at distances of up to 100 m from the proposed road.

The road contribution to the NO_2 dry deposition rate along the 200m transect within the Slaney River SAC is also detailed in Table 12.29. The maximum NO_2 dry deposition rate is 0.33 Kg(N)/ha/yr in either 2013 or 2028. This reaches only 7% of the critical load for inland and surface water habitats of 5-10 Kg(N)/ha/yr (NRA 2006).

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Table 12.29 Air Quality Assessment of Ecosystems, Proposed N80 Link Road. Assessment of Impact Along Transect From the Centreline of the Proposed N80 Link Road through Slaney River Valley SAC.

Dist. To Road (m)	2013 NO_x Conc. (µg/m^3)			2028 NO_x Conc. (µg/m^3)			NO_2 Dry Deposition Rate Impact (Kg(N) /ha/yr)	
Do Something	Do Nothing	Do Something	Impact	Do Nothing	Do Something	Impact	2013	2028
35	12.9	23.3	10.4	12.0	21.4	9.4	0.33	0.30
40	12.9	22.1	9.2	12.0	20.3	8.3	0.29	0.27
50	12.9	20.1	7.2	12.0	18.5	6.5	0.23	0.22
60	12.9	18.6	5.7	12.0	17.1	5.1	0.19	0.17
70	12.9	17.4	4.5	12.0	16.1	4.1	0.15	0.14
80	12.9	16.4	3.5	12.0	15.2	3.2	0.12	0.11
90	12.9	15.7	2.8	12.0	14.5	2.5	0.09	0.09
100	12.9	15.0	2.1	12.0	14.0	2.0	0.07	0.07
110	12.9	14.6	1.7	12.0	13.5	1.5	0.06	0.05
120	12.9	14.2	1.3	12.0	13.2	1.2	0.05	0.04
130	12.9	13.9	1.0	12.0	12.9	0.9	0.04	0.03
140	12.9	13.7	0.8	12.0	12.8	0.8	0.03	0.03
150	12.9	13.6	0.7	12.0	12.6	0.6	0.02	0.02
160	12.9	13.5	0.6	12.0	12.6	0.6	0.02	0.02
170	12.9	13.5	0.6	12.0	12.5	0.5	0.02	0.02
180	12.9	13.4	0.5	12.0	12.5	0.5	0.02	0.02
190	12.9	13.3	0.4	12.0	12.4	0.4	0.01	0.01
200	12.9	13.2	0.3	12.0	12.3	0.3	0.01	0.01
Standards	30 µg/m^3	30 µg/m^3	-	30 µg/m^3	30 µg/m^3	-	5 - 10 Kg(N)/ha/yr	

N30 Mainline

Receptor Locations

Twelve locations were modelled close to the N30 Mainline. The receptors modelled represent the worst-case locations along the N30 Mainline and were chosen due to their close proximity to the Proposed Scheme, the existing N11 and the R702. Details of the assessment locations are provided in Table 12.30.

Annual average traffic speeds are required as an input to the DMRB screening model (UK DEFRA 2007). The N30 Mainline was modelled at a speed of 100 kph (except at the approach to the R702 which was modelled at 20 kph), and the R702 was modelled at a speed of 80 kph ("do nothing") and 20 kph ("do something").

Table 12.30 DMRB Screening Air Quality Assessment, Proposed N30 Mainline. Details of Assessment Locations.

Receptor	Location / Townland	Chainage	OS Co-ordinates
26	Clavass	Ch0	E298285 N144615
27	Coolnahorna	Ch1330	E297155 N143610
28	Ballyorrril	Ch2460	E296290 N142890
29	Ballyorril	Ch2890	E296005 N142700
30	Ballyorril	Ch3110	E295855 N142355
31	Killalligan North	Ch3500	E295435 N142520
32	Askunshin	Ch3500	E295435 N142520
33	Milehouse	Ch4810	E294230 N141785
34	Milehouse	Ch4800	E294435 N141675
35	Bessmount	Ch6250	E293549 N140610
36	Dunsinane	Ch6250	E293500 N139740
37	Templescoby	Ch7890	E293390 N139015

Modelling Results and Impact Assessment

CO and Benzene

The results of the modelled impact of the N80 Link Road for CO and benzene in the opening and design years are shown in Tables 12.31 - 12.32. Predicted pollutant concentrations are below the ambient standards at all locations assessed. Levels of both pollutants range from 11 - 16% of the respective limit values in 2013.

Future trends indicate similarly low levels of CO and benzene. Levels of both pollutants are below the relevant limit values, ranging from 12 - 18% of their respective limits in 2028.

The impact of the Proposed Scheme can be assessed relative to "do nothing" levels in 2013 and 2028 (see Tables 12.31 - 12.32). Relative to baseline levels, some small increases and decreases in pollutant levels at the worst-case receptors are predicted as a result of the proposed road. With regard to impacts at individual receptors, none of the 12 receptors assessed will experience an increase or decrease in concentrations of greater than 5% of the limit value in either 2013 or 2028.

The greatest impact on CO and benzene concentrations in either 2013 or 2028 will be an increase of 2.0% of their respective limit values. Furthermore, the greatest improvement in CO and benzene concentrations will be a decrease of 0.2% of their respective limit values.

Thus, using the assessment criteria for NO_2 and PM_{10} outlined in Tables 12.1 and 12.2, and applying these criteria to CO and benzene, the impact of the Proposed Scheme in terms of CO and benzene is negligible.

Table 12.31 DMRB Screening Air Quality Assessment, Proposed N30 Mainline. Details of Assessment Locations. Predicted Maximum 8-Hour CO Concentrations.

Receptor	Location	Maximum 8-Hour CO Concentrations (mg/m^3)			
		Do Nothing		*Do Something*	
		2013	***2028***	***2013***	***2028***
26	Clavass	1.6	1.7	1.6	1.8
27	Coolnahorna	1.2	1.3	1.2	1.3
28	Ballyorrril	1.2	1.3	1.2	1.3
29	Ballyorril	1.2	1.3	1.2	1.3
30	Ballyorril	1.2	1.3	1.2	1.3
31	Killalligan North	1.2	1.3	1.2	1.3
32	Askunshin	1.2	1.3	1.2	1.3
33	Milehouse	1.3	1.4	1.5	1.6
34	Milehouse	1.3	1.3	1.3	1.4
35	Bessmount	1.2	1.3	1.2	1.3
36	Dunsinane	1.2	1.3	1.2	1.3
37	Templescoby	1.2	1.3	1.2	1.3
Ambient Limit Value[Note 1]		10 mg/m^3	10 mg/m^3	10 mg/m^3	10 mg/m^3

Note 1 Maximum 8-hour CO Limit Value: S.I. No. 271 of 2002 & EU Directive 2008/50/EC

Table 12.32 DMRB Screening Air Quality Assessment, Proposed N30 Mainline. Details of Assessment Locations. Predicted Annual Average Benzene Concentrations.

Receptor	Location	Annual Average Benzene Concentrations (µg/m^3)			
		Do Nothing		*Do Something*	
		2013	*2028*	*2013*	*2028*
26	Clavass	0.63	0.66	0.63	0.68
27	Coolnahorna	0.55	0.58	0.55	0.58
28	Ballyorrril	0.55	0.58	0.55	0.58
29	Ballyorril	0.55	0.58	0.55	0.58
30	Ballyorril	0.55	0.58	0.55	0.58
31	Killalligan North	0.55	0.58	0.55	0.58
32	Askunshin	0.55	0.58	0.55	0.59
33	Milehouse	0.57	0.60	0.60	0.64
34	Milehouse	0.56	0.60	0.58	0.61
35	Bessmount	0.55	0.58	0.56	0.59
36	Dunsinane	0.55	0.58	0.55	0.58
37	Templescoby	0.55	0.58	0.55	0.58
Ambient Limit Value[Note 1]		5 µg/m^3	5 µg/m^3	5 µg/m^3	5 µg/m^3

Note 1 Annual Average Benzene Limit Value: S.I. No. 271 of 2002 & EU Directive 2008/50/EC

PM_{10}

The results of the modelled impact of the Proposed Scheme for PM_{10} in the opening and design years are shown in Tables 12.33 - 12.34. Predicted annual average concentrations are below the ambient standards at all worst-case receptors, ranging from 34 - 39% of the limit value in 2013. In addition, no exceedances of the 24-hour PM_{10} concentration are predicted.

Future trends with the Proposed Scheme in place indicate similarly low levels of PM_{10}. Annual average PM_{10} concentrations range from 33 - 37% of the limit in 2028. Furthermore, the results show that the 24-hour limit value will not be exceeded in 2028.

The impact of the Proposed Scheme can be assessed relative to “do nothing” levels in 2013 and 2028 (see Tables 12.33 - 12.34). Relative to baseline levels, some small increases and decreases in PM_{10} levels at the worst-case receptors are predicted as a result of the proposed road. With regard to impacts at individual receptors, none of the 12 receptors assessed will experience an increase or decrease in concentrations of over 5% of the limit value in either 2013 or 2028.

The greatest impact on PM_{10} concentrations in the region of the proposed road in either 2013 or 2028 will be an increase of 1.1% of the annual limit value. Furthermore, the greatest improvement in PM_{10} concentrations will be a decrease of <0.1% of the annual limit value.

Thus, using the assessment criteria outlined in Tables 12.1 and 12.2, the impact of the Proposed Scheme with regard to PM_{10} is negligible.

Table 12.33 DMRB Screening Air Quality Assessment, Proposed N30 Mainline. Details of Assessment Locations. Predicted Annual Average PM_{10} Concentrations.

Receptor	Location	Annual Average PM_{10} Concentrations ($\mu g/m^3$)			
		Do Nothing		*Do Something*	
		2013	*2028*	*2013*	*2028*
26	Clavass	15.5	14.8	15.5	14.9
27	Coolnahorna	13.5	13.1	13.5	13.1
28	Ballyorrril	13.5	13.1	13.5	13.1
29	Ballyorril	13.5	13.1	13.5	13.1
30	Ballyorril	13.5	13.1	13.5	13.1
31	Killalligan North	13.5	13.1	13.5	13.1
32	Askunshin	13.5	13.1	13.7	13.3
33	Milehouse	13.9	13.6	14.3	14.0
34	Milehouse	13.8	13.4	13.9	13.5
35	Bessmount	13.5	13.1	13.8	13.4
36	Dunsinane	13.5	13.1	13.6	13.2
37	Templescoby	13.5	13.1	13.5	13.1
Ambient Limit Value[Note 1]		40 $\mu g/m^3$	40 $\mu g/m^3$	40 $\mu g/m^3$	40 $\mu g/m^3$

Note 1 Annual Average PM_{10} Limit Value: S.I. No. 271 of 2002 & EU Directive 2008/50/EC

Table 12.34 DMRB Screening Air Quality Assessment, Proposed N30 Mainline. Details of Assessment Locations. Predicted Number of Daily Exceedences of the PM_{10} 24-Hour Limit Value.

Receptor	Location	24 Hour PM_{10}: No. Days >50 $\mu g/m^3$			
		Do Nothing		*Do Something*	
		2013	*2028*	*2013*	*2028*
23	Clavass	0	0	0	0
24	Coolnahorna	0	0	0	0
25	Ballyorrril	0	0	0	0
26	Ballyorril	0	0	0	0
27	Ballyorril	0	0	0	0
28	Killalligan North	0	0	0	0
29	Askunshin	0	0	0	0
30	Milehouse	0	0	0	0
31	Milehouse	0	0	0	0
32	Bessmount	0	0	0	0
33	Dunsinane	0	0	0	0
34	Templescoby	0	0	0	0
Ambient Limit Value[Note 1]		35 days	35 days	35 days	35 days

Note 1 24-hour PM_{10} Limit Value: S.I. No. 271 of 2002 & EU Directive 2008/50/EC

$PM_{2.5}$

The results of the modelled impact of the Proposed Scheme for $PM_{2.5}$ in the opening and design years are shown in Tables 12.35. Predicted annual average concentrations are below the ambient standards at all worst-case receptors, ranging from 32 - 40% of the limit value in 2013.

Future trends with the Proposed Scheme in place indicate similarly low levels of $PM_{2.5}$. Annual average $PM_{2.5}$ concentrations range from 32 - 39% of the limit in 2028.

The impact of the Proposed Scheme can be assessed relative to "do nothing" levels in 2013 and 2028 (see Table 12.35). Relative to baseline levels, some small increases and decreases in $PM_{2.5}$ levels at the worst-case receptors are predicted as a result of the proposed road. With regard to impacts at individual receptors, none of the 12 receptors assessed will experience an increase or decrease in concentrations of over 5% of the limit value in either 2013 or 2028.

The greatest impact on $PM_{2.5}$ concentrations in the region of the proposed road in either 2013 or 2028 will be an increase of 1.7% of the annual limit value. Furthermore, the greatest improvement in PM_{10} concentrations will be a decrease of 0.1% of the annual limit value.

Thus, using the assessment criteria outlined in Tables 12.1 and 12.2, the impact of the Proposed Scheme with regard to $PM_{2.5}$ is negligible.

Table 12.35 DMRB Screening Air Quality Assessment, Proposed N30 Mainline. Details of Assessment Locations. Predicted Annual Average $PM_{2.5}$ Concentrations.

Receptor	Location	Annual Average $PM_{2.5}$ Concentrations ($\mu g/m^3$)			
		Do Nothing		*Do Something*	
		2013	*2028*	*2013*	*2028*
26	Clavass	10.1	9.6	10.1	9.7
27	Coolnahorna	8.1	7.9	8.1	7.9
28	Ballyorrril	8.1	7.9	8.1	7.9
29	Ballyorril	8.1	7.9	8.1	7.9
30	Ballyorril	8.1	7.9	8.1	7.9
31	Killalligan North	8.1	7.9	8.1	7.9
32	Askunshin	8.1	7.9	8.3	8.1
33	Milehouse	8.5	8.3	8.9	8.8
34	Milehouse	8.4	8.2	8.5	8.3
35	Bessmount	8.1	7.9	8.4	8.2
36	Dunsinane	8.1	7.9	8.2	8.0
37	Templescoby	8.1	7.9	8.1	7.9
Ambient Limit Value[Note 1]		25 $\mu g/m^3$	25 $\mu g/m^3$	25 $\mu g/m^3$	25 $\mu g/m^3$

Note 1 Annual Average $PM_{2.5}$ Limit Value: EU Directive 2008/50/EC

NO_2

The result of the assessment of the impact of the Proposed Scheme for NO_2 in the opening and design years are shown in Tables 12.36 - 12.37. The annual average concentration is within the limit value at all worst-case receptors. Future trends, with the Proposed Scheme in place, indicate reduced annual levels of NO_2. Levels of NO_2 range from 26 - 42% of the annual limit value in 2013 and 2028.

Maximum one-hour NO_2 levels with the Proposed Scheme in place will be significantly below the limit value, with levels at the worst-case receptor reaching 42% of the limit value in 2013 and 40% of the limit in 2028.

The impact of the Proposed Scheme on maximum one-hour NO_2 levels can be assessed relative to "do nothing" levels in 2013 and 2028 (see Tables 12.36 - 12.37). Relative to baseline levels, some increases and decreases in pollutant levels are predicted as a result of the proposed road. Of the 12 worst-case receptors assessed, none will experience increased levels of over 5% of the limit value.

The greatest impact on NO_2 concentrations in the region of the proposed road in either 2013 or 2028 will be an increase of 2.5% of the annual or maximum 1-hour limit value. Furthermore, the greatest improvement in NO_2 concentrations will be a decrease of 0.3% of the annual or maximum 1-hour limit value.

Thus, using the assessment criteria outlined in Tables 12.1 and 12.2, the impact of the Proposed Scheme in terms of NO_2 is negligible.

Table 12.36 DMRB Screening Air Quality Assessment, Proposed N30 Mainline. Details of Assessment Locations. Predicted Annual Average NO_2 Concentrations.

Receptor	Location	Annual Average NO_2 Concentrations ($\mu g/m^3$)			
		Do Nothing		*Do Something*	
		2013	*2028*	*2013*	*2028*
26	Clavass	16.8	15.7	16.7	16.0
27	Coolnahorna	10.8	10.5	10.9	10.6
28	Ballyorrril	10.8	10.5	11.0	10.7
29	Ballyorril	10.8	10.5	10.9	10.6
30	Ballyorril	10.8	10.5	10.9	10.6
31	Killalligan North	10.8	10.5	11.0	10.7
32	Askunshin	10.8	10.5	11.3	11.1
33	Milehouse	12.1	11.9	13.0	12.9
34	Milehouse	11.7	11.5	12.0	11.7
35	Bessmount	10.8	10.5	11.7	11.5
36	Dunsinane	10.8	10.5	11.2	10.9
37	Templescoby	10.8	10.5	10.9	10.6
Ambient Limit Value[Note 1]		40 $\mu g/m^3$	40 $\mu g/m^3$	40 $\mu g/m^3$	40 $\mu g/m^3$

Note 1 Annual Average NO_2 Limit Value: S.I. No. 271 of 2002 & EU Directive 2008/50/EC

Table 12.37 DMRB Screening Air Quality Assessment, Proposed N30 Mainline. Details of Assessment Locations. Predicted Maximum 1-Hour NO_2 Concentrations.

Receptor	Location	Maximum 1-Hour NO_2 Concentrations ($\mu g/m^3$)			
		Do Nothing		*Do Something*	
		2013	*2028*	*2013*	*2028*
26	Clavass	83.9	78.7	83.3	80.2
27	Coolnahorna	54.0	52.5	54.6	53.1
28	Ballyorrril	54.0	52.5	54.8	53.3
29	Ballyorril	54.0	52.5	54.4	53.0
30	Ballyorril	54.0	52.5	54.5	53.0
31	Killalligan North	54.0	52.5	54.8	53.3
32	Askunshin	54.0	52.5	56.7	55.4
33	Milehouse	60.4	59.6	64.9	64.4
34	Milehouse	58.6	57.6	59.9	58.6
35	Bessmount	54.0	52.5	58.6	57.4
36	Dunsinane	54.0	52.5	55.9	54.6
37	Templescoby	54.0	52.5	54.4	52.9
Ambient Limit Value[Note 1]		200 $\mu g/m^3$	200 $\mu g/m^3$	200 $\mu g/m^3$	200 $\mu g/m^3$

Note 1 Maximum 1-Hour NO_2 Limit Value: S.I. No. 271 of 2002 & EU Directive 2008/50/EC

12.5.3 Operation Phase - Regional Air Quality

The regional impact of the proposed M11 Gorey to Enniscorthy Scheme on emissions of NO_x and VOCs has been assessed using the procedures of the NRA (NRA 2006) and the UK DEFRA (UK DEFRA 2007) using the DMRB screening model (V1.03c, July 2007). The results (see Table 12.38) indicate that the impact of the proposed M11 Gorey to Enniscorthy Scheme on Ireland's obligations under the Gothenburg Protocol is negligible. For the assessment year 2013, the predicted impact of the proposed road is to increase NO_x levels by 0.072% of the NO_x emissions ceiling and increase VOC levels by 0.004% of the VOC emissions ceiling to be complied with in 2010. For the assessment year 2028, the predicted impact of the proposed road is to increase NO_x levels by 0.093% of the NO_x emissions ceiling and increase VOC levels by 0.009% of the VOC emissions ceiling to be complied with in 2010.

12.5.4 Operation Phase - Climate

The impact of the proposed M11 Gorey to Enniscorthy Scheme on emissions of CO_2 were also assessed using the DMRB screening model (see Table 12.38). The results show that the impact of the proposed road will be to increase CO_2 emissions by 0.025% and 0.040% of Ireland's Kyoto target in 2013 and 2028 respectively. Thus, the impact of the Proposed Scheme on national greenhouse gas emissions will be insignificant in terms of Ireland’s obligations under the Kyoto Protocol (FCCC 1997, DEHLG 2007b).

12.5.5 Cumulative Impacts

Cumulative impacts of traffic resulting from schemes outside the study area are included in the dispersion modelling assessments of the M11/N11 Mainline, N80 Link Road and N30 Mainline (as detailed in the sections above).

Table 12.38 Regional Air Quality Assessment. Proposed Gorey to Enniscorthy Scheme.

Year	Scenario	CO (kg/annum)	VOC (kg/annum)	NO_X (kg/annum)	PM_{10} (kg/annum)	CO_2 (tonnes/annum)
2013	Do Nothing	194,909	26,312	163,711	5,182	66,262
	Do Something	214,519	28,541	210,459	7,664	81,609
2028	Do Nothing	220,713	29,717	158,774	5,471	74,179
	Do Something	259,947	34,498	219,040	8,852	98,230
Increment in 2013		19,610 kg	2,229 kg	46,748 kg	2,482 kg	15,347 tonnes
Increment in 2028		39,234 kg	4,781 kg	60,256 kg	3,381 kg	24,051 tonnes
Emission Ceiling			55 kt[Note 1]	65 kt[Note 1]		60,740 kt[Note 2]
Impact in 2013			0.004%	0.072%		0.025%
Impact in 2028			0.009%	0.093%		0.040%

Note 1 kt = kilo tonnes. National Emission Ceiling (EU Directive 2001/81/EC)

Note 2 kt = kilo tonnes. Ireland's Target Under The Kyoto Protocol

12.5.6 "Do-Nothing" Scenario - Local Air Quality

N11/M11 Mainline

CO and Benzene

The results of the "do nothing" modelling assessment for CO and benzene in the opening and design years are shown in Tables 12.14 - 12.15. Concentrations are well within the limit values at all worst-case receptors. Levels of both pollutants range from 11 - 14% of the respective limit values in 2013 and 2028.

The modelling results for Camolin, Ferns and Enniscorthy show that CO and benzene levels are predicted to reach up to 34% of their respective limit values in 2013 and 2028.

PM_{10}

The results of the "do nothing" modelling assessment for PM_{10} in the opening and design years are shown in Tables 12.16 - 12.17. Predicted annual average concentrations in the region of the N11/M11 Mainline are below the ambient standards at all worst-case receptors, ranging from 34 - 37% of the annual limit value in 2013 and 2028. In addition, no exceedances of the 24-hour PM_{10} concentration are predicted.

The modelling results for Camolin, Ferns and Enniscorthy show that PM_{10} levels are predicted to reach up to 56% of the annual limit value in 2013 and 2028.

$PM_{2.5}$

The results of the "do nothing" modelling assessment for $PM_{2.5}$ in the opening and design years are shown in Tables 12.18. Predicted annual average concentrations in the region of the N11/M11 Mainline are below the ambient standards at all worst-case receptors, ranging from 31 - 38% of the annual limit value in 2013 and 2028.

The modelling results for Camolin, Ferns and Enniscorthy show that $PM_{2.5}$ levels are predicted to reach up to 59% of the annual limit value in 2013 and 2028.

NO_2

The results of the "do nothing" assessment of annual average and maximum 1-hour NO_2 concentrations in the opening and design years are shown in Tables 12.19 - 12.20. Predicted levels are within the limit values at all worst-case receptors, ranging from 26 - 36% of the annual limit value in 2013 and 2028.

The modelling results for Camolin, Ferns and Enniscorthy show that NO_2 levels are predicted to reach up to 60% of the annual limit value in 2013 and 2028.

N80 Link Road

CO and Benzene

The results of the "do nothing" modelling assessment for CO and benzene in the opening and design years are shown in Tables 12.22 - 12.23. Concentrations are well within the limit values at all worst-case receptors. Levels of both pollutants range from 12 - 17% of the respective limit values in 2013 and 2028.

PM_{10}

The results of the "do nothing" modelling assessment for PM_{10} in the opening and design years are shown in Tables 12.24 - 12.25. Predicted annual average concentrations are below the ambient standards at all worst-case receptors, ranging from 33 - 39% of the annual limit value in 2013 and 2028. In addition, no exceedances of the 24-hour PM_{10} concentration are predicted.

$PM_{2.5}$

The results of the "do nothing" modelling assessment for $PM_{2.5}$ in the opening and design years are shown in Tables 12.26. Predicted annual average concentrations are below the ambient standards at all worst-case receptors, ranging from 31 - 40% of the annual limit value in 2013 and 2028.

NO_2

The results of the "do nothing" assessment of annual average and maximum 1-hour NO_2 concentrations in the opening and design years are shown in Tables 12.27 - 12.28. Predicted levels are within the limit values at all worst-case receptors, ranging from 26 - 42% of the annual limit value in 2013 and 2028.

N30 Mainline

CO and Benzene

The results of the "do nothing" modelling assessment for CO and benzene in the opening and design years are shown in Tables 12.31 - 12.32. Concentrations are well within the limit values at all worst-case receptors. Levels of both pollutants range from 12 - 17% of the respective limit values in 2013 and 2028.

PM_{10}

The results of the "do nothing" modelling assessment for PM_{10} in the opening and design years are shown in Tables 12.33 - 12.34. Predicted annual average concentrations are below the ambient standards at all worst-case receptors, ranging from 33 - 39% of the annual limit value in 2013 and 2028. In addition, no exceedances of the 24-hour PM_{10} concentration are predicted.

$PM_{2.5}$

The results of the "do nothing" modelling assessment for $PM_{2.5}$ in the opening and design years are shown in Tables 12.35. Predicted annual average concentrations are below the ambient standards at all worst-case receptors, ranging from 31 - 40% of the annual limit value in 2013 and 2028.

NO_2

The results of the "do nothing" assessment of annual average and maximum 1-hour NO_2 concentrations in the opening and design years are shown in Tables 12.36 - 12.37. Predicted levels are within the limit values at all worst-case receptors, ranging from 26 - 42% of the annual limit value in 2013 and 2028.

12.5.7 "Do-Nothing" Scenario - Regional Air Quality

Predicted "do nothing" emissions of NO_x and VOCs in the region of the M11 Gorey to Enniscorthy Scheme are provided in Table 12.38. NO_x and VOC emissions in the region of the Proposed Scheme represent at most 0.25% and 0.05% respectively of their national emissions ceilings in 2013 and 2028.

12.5.8 "Do-Nothing" Scenario - Climate

Predicted "do nothing" emissions of CO_2 in the region of the M11 Gorey to Enniscorthy Scheme are provided in Table 12.38. CO_2 emissions represent at most 0.12% of Ireland's limits under the Kyoto Protocol (FCCC 1997, DEHLG 2007b).

12.5.9 Worst Case Scenario

The worst-case scenario corresponds to the situation where the mitigation measures fail or are not implemented. Should dust mitigation measures not be implemented during the construction phase, significant dust nuisance is likely in areas close to the construction site. Furthermore, there is also the potential for exceedances of the PM_{10} and $PM_{2.5}$ air quality standards during the construction period. The results of the air disperionsion modelling assessment show that no mitigation measures are required during the operational phase and therefore the worst-case scenario is not applicable.

12.6 MITIGATION MEASURES

12.6.1 Construction Phase

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

In order to minimise dust emissions during construction, a series of mitigation measures have been prepared and will be included in the EOP for implementation during the construction phase of the project. These measures are as follows:

- Site roads will be regularly cleaned and maintained as appropriate. Hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads will be restricted to essential site traffic only. Any road that has the potential to give rise to fugitive dust will be regularly watered during dry and/or windy conditions.

- Vehicles using site roads will have their speeds restricted to 20 kph where there is a potential for dust nuisance at nearby properties. Vehicles delivering material with dust potential to an off-site location will be enclosed or covered with tarpaulin at all times to restrict the escape of dust.

- Where practicable, vehicles exiting the site shall make use of a wheel wash facility prior to entering onto public roads. This will ensure that mud and other wastes are not tracked onto public roads. Public roads outside the site will be regularly inspected for cleanliness, and cleaned as necessary. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.

- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.

- The dust minimisation procedures put in place will be monitored and assessed by the contractor. In the event of dust nuisance occurring outside the site boundary, the effectiveness of existing measures will be reviewed and further mitigation will be implemented to rectify the problem.

Provided the dust minimisation measures outlined above are adhered to, the air quality impacts during the construction phase will be not be significant.

12.6.2 Operational Phase - Air Quality

Mitigation measures in relation to traffic-derived pollutants have focused generally on improvements in both engine technology and fuel quality. EU legislation, based on the EU sponsored Auto-Oil programmes, has imposed stringent emission standards for key pollutants (REGULATION (EC) No 715/2007) for passenger cars to be complied with in 2009 (Euro V) and 2014 (Euro VI). With regard to heavy duty vehicles, EU Directive 2005/78/EC defines the emission standard currently in force, Euro IV, as well as the next stage (Euro V) which will enter into force in October 2009. In addition, it defines a non-binding standard called Enhanced Environmentally-friendly Vehicle (EEV). In relation to fuel quality, SI No. 407 of 1999 and SI No. 72 of 2000 have introduced significant reductions in both sulphur and benzene content of fuels.

In relation to design and operational aspects of road schemes, emissions of pollutants from road traffic can be controlled most effectively by either diverting traffic away from heavily congested areas or ensuring free flowing traffic through good traffic management plans and the use of automatic traffic control systems (UK DEFRA 2009b). The Proposed Scheme will divert traffic from Enniscorthy. The air dispersion modelling assessment has shown that this will result in reduced pollutant concentrations in the town.

Improvements in air quality are likely over the next few years as a result of the on-going comprehensive vehicle inspection and maintenance program, fiscal measures to encourage the use of alternatively fuelled vehicles and the introduction of cleaner fuels.

12.6.3 Operational Phase - Climate

CO_2 emissions for the average new car fleet will be reduced to 120 g/km by 2012 through EU legislation on improvements in vehicle motor technology and by an increased use of biofuels. This measure will reduce CO_2 emissions from new cars by an average of 25% in the period from 1995 to 2008/2009 whilst 15% of the necessary effort towards the overall climate change target of the EU will be met by this measure alone (DEHLG 2000).

Additional measures included in the National Climate Change Strategy (DEHLG 2006, 2007b) include: (1) VRT and Motor Tax rebalancing to favour the purchases more fuel-efficient vehicles with lower CO_2 emissions; (2) continuing the Mineral Oils Tax Relief (MOTR) II Scheme and introduction of a biofuels obligation scheme; (3) implementation of a national efficient driving awareness campaign, to promote smooth and safe driving at lower engine revolutions; and (4) enhancing the existing mandatory vehicle labelling system to provide more information on CO_2 emission levels and on fuel economy.

12.7 RESIDUAL IMPACTS OF THE PROPOSED SCHEME

The results of the air dispersion modelling study show that the residual impacts of the Proposed Scheme on air quality and climate will be insignificant.

12.8 MONITORING

No monitoring is required.

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13 NOISE IMPACT ASSESSMENT

13.1 INTRODUCTION

An assessment into the likely noise and vibration impact associated with both construction and operational phases of the Proposed Scheme has been undertaken. The first stage of this assessment was to measure the existing noise levels. Noise surveys along the corridors of the proposed national routes were out in accordance with guidance given in the National Road Authority document *Guidelines for the Treatment of Noise and Vibration in National Road Schemes (2004)*.

13.2 METHODOLOGY

The first stage is to assess and quantify the noise environment in the vicinity of sensitive receptors that may be affected by the Proposed Scheme. In the case of a proposed road development, the selected noise-sensitive locations are those in closest proximity to the proposed road.

13.2.1 Unattended Measurements

Unmanned continuous measurements were performed over a 24-hour period at ten locations. All survey locations are shown in Figure 13.1 in Volume 4 of this EIS. Along with each unattended measurement location, five additional locations were identified in the vicinity of each unattended survey location for attended measurements. Following the joining of the Clough to Enniscorthy scheme to the Enniscorthy Bypass scheme, there were additional three attended measurement locations chosen in the vicinity of the interface between the two schemes, thus to total number of survey locations is 63. $L_{A10(18hour)}$ values are derived from the results of the continuous monitoring by taking the arithmetic average of the eighteen hourly sample values between 06:00hrs and 24:00hrs. L_{den} values are derived directly from the measured data.

13.2.2 Attended Measurements

The attended surveys were conducted in accordance with the shortened measurement procedure as laid down in the NRA guidance document.

When surveying traffic noise, the acoustical parameters of interest are $L_{A10(1hour)}$ and $L_{A10(18hour)}$, expressed in terms of decibels (dB) relative to 2×10^{-5}Pa. The value of $L_{A10(1hour)}$ is the noise level exceeded for just 10% of the time over the period of one hour. $L_{A10(18hour)}$ is the arithmetic average of the values of $L_{A10(1hour)}$ for each of the one hour periods between 06:00 and 24:00hrs.

The shortened measurement procedure involves a method whereby $L_{A10(18hour)}$ values are obtained through a combination of measurement and calculation as follows:

- noise level measurements are undertaken at the chosen location over three consecutive hours between 10:00 and 17:00hrs;

- the duration of the sample period during each hour is selected to encompass sufficient traffic flows to ensure reliable results;

- the $L_{A10(18hour)}$ for the location is derived by subtracting 1dB from the arithmetic average of the three hourly sample values, i.e. $L_{A10(18hour)} = ((\sum L_{A10(1hour)}) \div 3) - 1$ dB.

13.2.3 Assessment of Noise Impact

In order to assess the noise impact of any proposed road development, the following methodology is normally adopted.

The first stage is to assess and quantify the noise environment in the vicinity of sensitive receptors that may be affected by the Proposed Scheme. In the case of a proposed road scheme, the selected noise-sensitive locations are likely to be those in closest proximity to the scheme. Both the construction and operational phases of the scheme should be reviewed when selecting appropriate measurement locations.

Where possible, the noise levels resulting from both the construction and operational phases are then calculated using established prediction techniques. The noise levels associated with the operational phase of the proposed scheme are predicted in accordance with guidance set out in Calculation of Road Traffic Noise (CRTN), giving results in the form L_{den} values in accordance with the procedures detailed in the NRA guidance.

The predicted values are then assessed against the three conditions set out in the following section in order to assess the need for mitigation measures.

13.2.4 Design Goal for Specifying Mitigation Measures

For new roads in Ireland, it is standard practice to adopt the traffic noise design goal contained within the NRA document (National Roads Authority, 2004. *Guidelines for the Treatment of Noise and Vibration in National Road Schemes*). This document specifies that the Authority (i.e. NRA) considers it appropriate to set the design goal for Ireland as follows:

- day-evening-night 60dB L_{den} (free field residential façade criterion)

Noise mitigation measures are deemed necessary whenever all of the following three conditions are satisfied:

(a) the combined expected maximum traffic noise level, i.e. the relevant noise level, from the proposed road scheme together with other traffic in the vicinity is greater than the design goal, and;

(b) the relevant noise level is at least 1dB more than the expected traffic noise level without the proposed road scheme in place, and;

(c) the contribution to the increase in the relevant noise level from the proposed road scheme is at least 1dB.

These conditions will ensure that mitigation measures arising out of this process are based upon the degree of impact of the scheme under consideration.

This Design Goal is applicable to new road schemes only. In EIS terms, this means that they are to be applied to existing receptors in respect of both the year of opening and the design year, typically 15 years after projected year of opening (i.e. 2013). In this case the design year of 2028 has been assessed.

It is stated that the Authority acknowledges that it may not always be sustainable to achieve this design goal. In such circumstances, nevertheless, a structured approach should be taken in order to ameliorate as far as practicable road traffic noise through the consideration of measures such as alignment changes, barrier type (e.g. earth mounds) or low noise road surfaces.

13.2.5 Consultation

Consultation with landowners is detailed in Chapters 6 and 7 of this EIS.

13.2.6 Data Deficiencies / Difficulties with Producing the Impact Assessment

There were no major difficulties or data deficiencies encountered in the production of this assessment.

13.3 RECEIVING ENVIRONMENT

The noise environment in the vicinity of the M11 Gorey to Enniscorthy Scheme has been characterised by a set of traffic noise surveys. The existing noise levels are typical of a semi-rural area. Noise levels near the existing main routes are dominated by traffic on these roads. Noise levels at a distance from these roads were governed by birdsong, occasional local vehicle movements and farm activities.

13.3.1 Instrumentation

Noise level measurements were conducted in accordance with the Shortened Measurement Procedure. The shortened measurements were performed using Brüel & Kjær Type 2260 and

2250 Sound Level Meters. The continuous measurements were performed using Brüel & Kjær Type 3592 Environmental Kits and a Brüel & Kjær Type 2238 Sound Level Meters. Before and after the survey the measurement apparatus was check calibrated using a Brüel & Kjær Type 4231 Sound Level Calibrator.

13.3.2 Procedure

Shortened measurements were conducted at survey locations on a cyclical basis. Sample periods were 15 minutes. The results were noted onto a Survey Record Sheet immediately following each sample, and were also saved to the instrument memory for later analysis where appropriate. Survey personnel noted all primary noise sources contributing to noise build-up.

For 24-hour monitoring, sample periods were 1 hour long. The results were saved to the instrument memory for later analysis.

13.3.3 Results

The survey results are presented in terms of the following three parameters.

L_{Aeq} is the A-weighted equivalent continuous steady sound level during the sample period and effectively represents an average value.

L_{A90} is the A-weighted sound level that is exceeded for 90% of the sample period; generally used to quantify background noise.

L_{A10} is the A-weighted sound level that is exceeded for 10% of the sample period; this parameter gives an indication of the upper limit of fluctuating noise such as that from road traffic.

The results for all sixty-three locations, along with the derived $L_{A10(18hour)}$ and L_{den} values, are presented in the Tables 13.1 to 13.11 in Appendix 13.1 in Volume 3 of this EIS and are summarised below.

13.3.4 M11/N11 Mainline

The location reference and a description of each survey position are given in Table 13.11, and shown in Figures 13.1a to 13.1m in Volume 4 of this EIS.

Survey locations

Table 13.12 presents details of the survey locations in this section.

Table 13.12 Details of Survey Locations, M11/N11 Mainline Section

Location	Description of Survey Location	Grid Reference	
		E	N
NS01	Frankfort	310,976	155,070
NS02	Frankfort	310,059	154,361
NS03	Ballygulleen	310,182	153,701
NS04	Ballyoughter (North)	310,614	153,280
NS05	Ballyoughter (South)	310,430	152,628
NS06	Ballyeden	309,336	152,151
NS07	Knockrobin	308,294	151,109
NS08	Ballymore	309,325	150,568
NS09	Ballymore Schoolhouse	308,114	149,851
NS10	Ballymore	307,884	149,894
NS11	Rockspring	307,408	149,207
NS12	Mountgeorge	306,880	148,314
NS13	Whistling Bridge, Ballyhaddock	306,347	148,779
NS14	Ballycarrigeen Lower	305,884	147,386
NS15	Ballycarrigeen Lower	305,002	147,315
NS16	Knockavocka	304,798	146,255
NS17	Glen Village	303,497	147,052
NS18	Myaugh	303,560	145,846
NS19	Tinnacross Bridge	302,739	145,728
NS20	Tinnacross	302,782	145,180
NS21	Tinnacross	301,793	144,864
NS22	Oulartard	302,287	144,369
NS23	Oulartard	301,233	144,241
NS24	Oulartard	301,743	143,732
NS25	Crane	301,197	143,211
NS26	Ballydawmore	301,410	141,833
NS27	Corbally	301,230	141,065
NS28	Corbally	301,720	140,704
NS29	Corbally	300,469	140,593
NS30	Tomnafunshoge	300,660	139,802
NS31	Cooladine	299,993	138,892
NS32	Ballycourcy House	299,837	138,331
NS33	Ballycourcy Beg	301,118	137,427
NS34	Brownswood	299,701	136,372
NS35	Knockrathkyle	300,255	136,152
NS36	Glenteige	299,329	134,732
NS37	Riverview	299,715	134,552
NS38	Garrynisk	299,205	133,779
NS39	Scurlocksbush	299,609	133,392

Survey Periods

Attended measurement survey periods were as follows:

- NS01 to NS06 on 23 July 2008, 10:00hrs to 17:05hrs;
- NS07, NS08 and NS10 to NS13 on 5 November 2008, 10:00hrs to 17:00hrs;
- NS09 and NS14 to NS18 on 21 November 2008, 10:00hrs to 17:00hrs;
- NS19 to NS24 on 21 November 2008, 10:00hrs to 17:00hrs;
- NS25 to NS30 on 11 June 2008, 10:00hrs to 17:00hrs;
- NS31 to NS33 on 11 October 2007, 10:00hrs to 17:00hrs;
- NS34 to NS39 on 18 October 2007, 10:00hrs to 16:30hrs.

Unattended 24-hour monitoring was conducted at the following locations:

- NS03 between 16:00hrs on 22 July and 16:00hrs on 23 July 2008.
- NS07 between 16:00hrs on 4 November and 16:00hrs on 5 November 2008;
- NS09 between 16:00hrs on 20 November and 16:00hrs on 21 November 2008;
- NS22 between 16:00hrs on 20 November and 16:00hrs on 21 November 2008;
- NS29 between 16:00hrs on 10 June and 16:00hrs on 11 June 2008;
- NS37 between 16:00hrs on 17 October and 16:00hrs on 18 October 2007;

Noise Survey Results

Location NS01

Noise levels at this location were dominated by distant traffic on the existing N11 and birdsong. Noise levels were in the range 47 to 49dB L_{Aeq} and 50 to 51dB L_{A10}. The derived L_{den} at this location was 53dB.

Location NS02

Noise levels at this location were dominated by distant traffic on the existing N11 and birdsong. Noise levels were in the range 38 to 39dB L_{Aeq} and 40 to 41dB L_{A10}. The derived L_{den} at this location was 43dB.

Location NS03

Noise levels at this location were dominated by isolated vehicle movements on the local road and birdsong. Noise levels were in the range 42 to 47dB L_{Aeq} and 43 to 48dB L_{A10}. The derived L_{den} at this location was 49dB.

Unattended measurements were also carried out at this location. Daytime noise level were in the range 43 to 53dB L_{Aeq}, evening noise levels were in the range 42 to 48dB L_{Aeq} and night-time noise levels were in the range 20 to 44dB L_{Aeq}. The measured $L_{A10,18hr}$ value was 46dB and the measured L_{den} value was 48dB.

Location NS04

Noise levels at this location were dominated by light traffic on the nearby local road, birdsong and agricultural machinery in a nearby field. Noise levels were in the range 38 to 46dB L_{Aeq} and 40 to 47dB L_{A10}. The derived L_{den} at this location was 47dB.

Location NS05

Noise levels at this location were dominated birdsong and distant agricultural machinery. Noise levels were in the range 35 to 40dB L_{Aeq} and 39 to 43dB L_{A10}. The derived L_{den} at this location was 43dB.

Location NS06

Noise levels at this location were dominated by isolated vehicle movements on the local road and birdsong. Noise levels were in the range 35 to 43dB L_{Aeq} and 37 to 45 dB L_{A10}. The derived L_{den} at this location was 45dB.

Location NS07

Noise levels at this location were dominated by birdsong. Traffic was just audible in the distance. Noise levels were in the range 39 to 48dB L_{Aeq} and 39 to 42dB L_{A10}. The derived L_{den} at this location was 44dB.

Unattended measurements were also carried out at this location. Daytime noise level were in the range 27 to 38dB L_{Aeq}, evening noise levels were in the range 21 to 26dB L_{Aeq} and night-time noise levels were in the range 21 to 26dB L_{Aeq}. The measured $L_{A10,18hr}$ value was 28dB and the measured L_{den} value was 31dB.

Location NS08

Noise levels at this location were dominated by birdsong. Traffic was just audible in the distance. Noise levels were in the range 37 to 52dB L_{Aeq} and 38 to 46dB L_{A10}. The derived L_{den} at this location was 45dB.

Location NS09

Noise levels at this location were dominated by birdsong and a degree of wind-generated noise in nearby foliage. Isolated traffic movements along the local road were also audible. Noise levels were in the range 46 to 50dB L_{Aeq} and 46 to 52dB L_{A10}. The derived L_{den} at this location was 52dB.

Unattended measurements were also carried out at this location. Daytime noise level were in the range 44 to 48dB L_{Aeq}, evening noise levels were in the range 39 to 43dB L_{Aeq} and night-time noise levels were in the range 40 to 50dB L_{Aeq}. The measured $L_{A10,18hr}$ value was 47dB and the measured L_{den} value was 52dB.

Location NS10

Noise levels at this location were dominated by birdsong and isolated traffic movements along the local road. Construction activity and raised voices were audible in the distance. Noise levels were in the range 60 to 64dB L_{Aeq} and 50 to 56dB L_{A10}. The derived L_{den} at this location was 55dB.

Location NS11

Noise levels at this location were dominated by birdsong and isolated traffic movements along the local road. Distant farm activity was also audible. Noise levels were in the range 47 to 57dB L_{Aeq} and 34 to 41dB L_{A10}. The derived L_{den} at this location was 43dB.

Location NS12

Noise levels at this location were dominated by nearby farm activity and birdsong. Noise levels were in the range 41 to 48dB L_{Aeq} and 40 to 50dB L_{A10}. The derived L_{den} at this location was 48dB.

Location NS13

Noise levels at this location were dominated by birdsong and distant traffic audible at low level. Noise levels were in the range 43 to 52dB L_{Aeq} and 42 to 58dB L_{A10}. The derived L_{den} at this location was 48dB.

Location NS14

Noise levels at this location were dominated by birdsong and a degree of wind-generated noise in nearby foliage. Isolated traffic movements along the local road were also audible. Noise levels were in the range 48 to 54dB L_{Aeq} and 43 to 53dB L_{A10}. The derived L_{den} at this location was 51dB.

Location NS15

Noise levels at this location were dominated by birdsong and a degree of wind-generated noise in nearby foliage. Isolated traffic movements along the local road were also audible. Noise levels were in the range 48 to 54dB L_{Aeq} and 43 to 53dB L_{A10}. The derived L_{den} at this location was 53dB.

Location NS16

Noise levels at this location were dominated by birdsong and a degree of wind-generated noise in nearby foliage. Isolated traffic movements along the local road were also audible. Noise levels were in the range 52 to 54dB L_{Aeq} and 52 to 53dB L_{A10}. The derived L_{den} at this location was 55dB.

Location NS17

Noise levels at this location were dominated by birdsong, farm activity and a degree of wind-generated noise in nearby foliage. Isolated traffic movements along the local road were also audible. Noise levels were in the range 47 to 52dB L_{Aeq} and 50 to 52dB L_{A10}. The derived L_{den} at this location was 54dB.

Location NS18

Noise levels at this location were dominated by birdsong and a degree of wind-generated noise in nearby foliage. Noise levels were in the range 47 to 53dB L_{Aeq} and 50 to 54dB L_{A10}. The derived L_{den} at this location was 53dB.

Location NS19

Noise levels at this location were dominated by occasional local traffic and a degree of wind-generated noise in nearby foliage. Noise levels were in the range 47 to 51dB L_{Aeq} and of the order of 49dB L_{A10}. The derived L_{den} at this location was 51dB.

Location NS20

Noise levels at this location were dominated by occasional local traffic and a degree of wind-generated noise in nearby foliage. Noise levels were in the range 50 to 58dB L_{Aeq} and 47 to 56dB L_{A10}. The derived L_{den} at this location was 55dB.

Location NS21

Noise levels at this location were dominated by construction activity and a degree of wind-generated noise in nearby foliage. Noise levels were in the range 47 to 53dB L_{Aeq} and 49 to 56dB L_{A10}. The derived L_{den} at this location was 55dB.

Location NS22

Noise levels at this location were dominated by distant road traffic and a degree of wind-generated noise in nearby foliage. Noise levels were in the range 45 to 56dB L_{Aeq} and 48 to 51dB L_{A10}. The derived L_{den} at this location was 52dB.

Unattended measurements were also carried out at this location. Daytime noise level were in the range 42 to 45dB L_{Aeq}, evening noise levels were in the range 36 to 38dB L_{Aeq} and night-time noise levels were in the range 40 to 51dB L_{Aeq}. The measured $L_{A10,18hr}$ value was 48dB and the measured L_{den} value was 55dB.

Location NS23

Noise levels at this location were dominated by wind-generated noise in nearby foliage. Noise levels were in the range 49 to 50dB L_{Aeq} and 52 to 53dB L_{A10}. The derived L_{den} at this location was 54dB.

Location NS24

Noise levels at this location were dominated by wind-generated noise in nearby foliage. Noise levels were in the range 48 to 52dB L_{Aeq} and 48 to 54dB L_{A10}. The derived L_{den} at this location was 52dB.

Location NS25

Noise levels at this location were dominated by local and distant traffic, along with birdsong. Noise levels were in the range 58 to 62dB L_{Aeq} and 58 to 51dB L_{A10}. The derived L_{den} at this location was 61dB.

Location NS26

Noise levels at this location were dominated by birdsong and isolated local traffic movements. Noise levels were in the range 41 to 46dB L_{Aeq} and 44 to 46dB L_{A10}. The derived L_{den} at this location was 47dB.

Location NS27

Noise levels at this location were dominated by isolated local traffic movements and birdsong. Noise levels were in the range 59 to 62dB L_{Aeq} and 48 to 52dB L_{A10}. The derived L_{den} at this location was 53dB.

Location NS28

Noise levels at this location were dominated by distant traffic movements, distant construction activity and birdsong. Noise levels were in the range 37 to 49dB L_{Aeq} and 39 to 51dB L_{A10}. The derived L_{den} at this location was 43dB.

Location NS29

Noise levels at this location were dominated by distant traffic movements isolated local traffic movements and birdsong. A chainsaw was heard during the first measurement period. Noise levels were in the range 48 to 51dB L_{Aeq} and 51 to 54dB L_{A10}. The derived L_{den} at this location was 54dB.

Unattended measurements were also carried out at this location. Daytime noise level were in the range 44 to 53dB L_{Aeq}, evening noise levels were in the range 40 to 49dB L_{Aeq} and night-time noise levels were in the range 30 to 52dB L_{Aeq}. The measured $L_{A10,18hr}$ value was 49dB and the measured L_{den} value was 53dB.

Location NS30

Noise levels at this location were dominated by isolated local traffic movements, birdsong and buzzing from a nearby electricity pylon. Noise levels were in the range 64 to 67dB L_{Aeq} and 63 to 68dB L_{A10}. The derived L_{den} at this location was 65dB.

Location NS31

Noise levels at this location were dominated by birdsong and machinery in the distance. A dog barking in the grounds of the nearby house was also audible in the first measurement period, and a hedge trimmer in use was occasionally audible during the second period. Noise levels were in the range 44 to 48dB L_{Aeq} and 41 to 48dB L_{A10}. The derived L_{den} at this location was 47dB.

Location NS32

Noise levels at this location were dominated by birdsong and wind-generated noise in the nearby trees. Traffic in the far distance was audible at times. Noise levels were of the order of 40dB L_{Aeq} and 42dB L_{A10}. The derived L_{den} at this location was 45dB.

Location NS33

Noise levels at this location were governed by birdsong and wind-generated noise. Noise levels were in the range 34 to 37dB L_{Aeq} and 36 to 39dB L_{A10}. The derived L_{den} at this location was 42dB.

Location NS34

Noise levels at this location were governed by distant traffic, birdsong and occasional local traffic movements. A lawnmower was audible during the third measurement period. Noise levels were in the range 52 to 64dB L_{Aeq} and 45 to 61dB L_{A10}. The derived L_{den} at this location was 55dB.

Location NS35

Noise levels at this location were dominated by occasional vehicles on the local and distant traffic. Construction noise nearby was also audible during the second measurement period. A lawnmower was audible in the distance in the third period. Noise levels were in the range 46 to 54dB L_{Aeq} and 43 to 55dB L_{A10}. The derived L_{den} at this location was 50dB.

Location NS36

Noise levels at this location were governed by birdsong, distant traffic on the existing N11 and water in a nearby stream. One local car movement was observed during the first measurement period. Noise levels were in the range 62 to 68dB L_{Aeq} and 53 to 58dB L_{A10}. The derived L_{den} at this location was 56dB.

Location NS37

Noise levels at this location were governed by distant traffic on the existing N11, distant construction activity and birdsong. Noise levels were in the range 40 to 48dB L_{Aeq} and 42 to 49dB L_{A10}. The derived L_{den} at this location was 48dB.

Unattended measurements were also carried out at this location. Daytime noise level were in the range 47 to 58dB L_{Aeq}, evening noise levels were in the range 46 to 49dB L_{Aeq} and night-time noise levels were in the range 42 to 49dB L_{Aeq}. The measured $L_{A10,18hr}$ value was 51dB and the measured L_{den} value was 54dB.

Location NS38

Noise levels at this location were dominated by traffic on the existing N11, infrequent local traffic and birdsong. Noise levels were in the range 50 to 53dB L_{Aeq} and 43 to 47dB L_{A10}. The derived L_{den} at this location was 49dB.

Location NS39

Noise levels at this location were dominated by traffic on the existing N11, occasional local traffic and birdsong. Noise levels were in the range 43 to 49dB L_{Aeq} and 44 to 45dB L_{A10}. The derived L_{den} at this location was 48dB.

13.3.5 N80 Link Road

Survey Locations

Table 13.13 presents details of the survey locations in this section.

Table 13.13 Details of Survey Locations, N80 Link Road Section

Location	Description of Survey Location	Grid Reference	
		E	N
NS40	Ballynahallin	298,446	143,984
NS41	Ballynahallin	299,218	143,449
NS42	Kilcannon	299,070	142,360
NS43	Solsborough	299,915	142,503
NS44	White's Bridge	299,559	141,774
NS45	Ballynabarny	300,262	141,923

Survey Periods

Attended measurement survey periods were as follows:

- NS40 to NS45 on 11 June 2008, 10:00hrs to 17:00hrs;

Unattended 24-hour monitoring was conducted at the following locations:

- NS41 between 16:00hrs on 10 June 2008 and 16:00hrs on 11 June 2008;

Noise Survey Results

Location NS40

Noise levels at this location were dominated by traffic on the existing N11, occasional local traffic and birdsong. Noise levels were in the range 66 to 68dB L_{Aeq} and 67 to 71dB L_{A10}. The derived L_{den} at this location was 68dB.

Location NS41

During the first measurement period, noise levels at this location were dominated by lorry movements in a nearby yard. During the remaining measurement periods, the dominant source was traffic in the distance. Noise levels were in the range 37 to 59dB L_{Aeq} and 39 to 55dB L_{A10}. The derived L_{den} at this location was 48dB.

Location NS42

Noise levels at this location were dominated by distant traffic and birdsong. Noise levels were in the range 41 to 51dB L_{Aeq} and 37 to 46dB L_{A10}. The derived L_{den} at this location was 45dB.

Unattended measurements were also carried out at this location. Daytime noise level were in the range 42 to 45dB L_{Aeq}, evening noise levels were in the range 43 to 52dB L_{Aeq} and night-time noise levels were in the range 37 to 54dB L_{Aeq}. The measured $L_{A10,18hr}$ value was 47dB and the measured L_{den} value was 54dB.

Location NS43

Noise levels at this location were dominated by local and distant traffic, and birdsong. Noise levels were in the range 57 to 64dB L_{Aeq} and 55 to 68dB L_{A10}. The derived L_{den} at this location was 62dB.

Location NS44

Noise levels at this location were dominated by local and distant traffic, and birdsong. Noise levels were in the range 64 to 67dB L_{Aeq} and 63 to 64dB L_{A10}. The derived L_{den} at this location was 63dB.

Location NS45

Noise levels at this location were dominated by local and distant traffic, and birdsong. Noise levels were in the range 44 to 48dB L_{Aeq} and 45 to 49dB L_{A10}. The derived L_{den} at this location was 49dB.

13.3.6 N30 Mainline

Table 13.14 presents details of the survey locations in this section.

Table 13.14 Details of Survey Locations, N30 Mainline Road Section

Location	Description of Survey Location	Grid Reference	
		E	N
NS46	Ballynahallin	298,312	144,643
NS47	Ballynahallin	298,044	144,817
NS48	Coolnahorna	297,485	144,075
NS49	Ballyorril	296,990	143,474
NS50	Moyne Lower	297,256	143,096
NS51	Ballyorril	296,015	142,707
NS52	Killalligan	295,757	142,223
NS53	Killalligan	295,135	142,100
NS54	Askunshin	294,837	142,287
NS55	Milehouse	294,442	141,696
NS56	Milehouse	294,175	141,808
NS57	Milehouse	293,851	141,631
NS58	Urrinfort House	293,213	140,813
NS59	Urrinfort	293,812	140,525
NS60	Dunsinane	293,445	139,771
NS61	Dunsinane	293,731	139,811
NS62	Templescoby	293,405	139,041
NS63	Jamestown	293,973	139,035

Survey Periods

Attended measurement survey periods were as follows:

- NS46 to NS51 on 19 July 2007, 10:00hrs to 16:30hrs;
- NS52 to NS57 on 19 July 2007, 10:00hrs to 16:00hrs;
- NS58 to NS63 on 4 October 2007, 10:00hrs to 16:15hrs, and

Unattended 24-hour monitoring was conducted at the following locations:

- NS49 between 16:00hrs on 18 July and 16:00hrs on 19 July 2007;
- NS54 between 16:00hrs on 18 July and 16:00hrs on 19 July 2007;
- NS61 between 16:00hrs on 3 October and 16:00hrs on 4 October 2007.

Noise Survey Results

Location NS46

Noise levels at this location were dominated by traffic on the N80, which was observed to have a significant HGV content. Traffic on the N11 was audible during lulls in the N80 traffic. Noise levels were in the range 71 to 72dB L_{Aeq} and 76 to 77dB L_{A10}. The derived L_{den} at this location was 74dB.

Location NS47

Noise levels at this location were dominated by traffic on the N80 and the N11 and occasional vehicles on the local road. Noise levels were in the range 55 to 61dB L_{Aeq} and 58 to 60dB L_{A10}. The derived L_{den} at this location was 60dB.

Location NS48

Noise levels at this location were dominated by distant traffic , birdsong and a degree of wind-generated noise. Noise levels were in the range 49 to 52dB L_{Aeq} and 51 to 53dB L_{A10}. The derived L_{den} at this location was 54dB.

Location NS49

Noise levels at this location were governed by distant road traffic, a degree of wind-generated noise and birdsong. Noise levels were of the order of 42dB L_{Aeq} and 44dB L_{A10}. The derived L_{den} at this location was 47dB.

Unattended measurements were also carried out at this location. Daytime noise level were in the range 43 to 54dB L_{Aeq}, evening noise levels were in the range 41 to 45dB L_{Aeq} and night-time noise levels were in the range 33 to 52dB L_{Aeq}. The measured $L_{A10,18hr}$ value was 49dB and the measured L_{den} value was 53dB.

Location NS50

Noise levels at this location were dominated by distant road traffic and occasional local vehicle movements. Noise levels were in the range 51 to 56dB L_{Aeq} and 46 to 48dB L_{A10}. The derived L_{den} at this location was 49dB.

Location NS51

Noise levels at this location were dominated by occasional local vehicle movements, distant road traffic, a degree of wind generated noise and occasional noise from livestock nearby. Noise

levels were in the range 52 to 54dB L_{Aeq} and 47 to 49dB L_{A10}. The derived L_{den} at this location was 50dB.

Location NS52

Noise levels at this location were dominated by occasional traffic on the local road, birdsong, distant livestock and a 'banger' in a distant field. Noise levels were in the range 56 to 62dB L_{Aeq} and 48 to 55dB L_{A10}. The derived L_{den} at this location was 54dB.

Location NS53

Noise levels at this location were dominated by occasional vehicles on the local road and birdsong. Noise levels were in the range 65 to 66dB L_{Aeq} and 61 to 66dB L_{A10}. The derived L_{den} at this location was 63dB.

Location NS54

Noise levels at this location were dominated by farm machinery operating nearby. Construction noise and birdsong were also audible. The level of activity had reduced significantly during the third measurement period. Noise levels were in the range 60 to 66dB L_{Aeq} and 46 to 72dB L_{A10}. The derived L_{den} at this location was 62dB.

Unattended measurements were also carried out at this location. Daytime noise level were in the range 43 to 63dB L_{Aeq}, evening noise levels were in the range 38 to 46dB L_{Aeq} and night-time noise levels were in the range 23 to 48dB L_{Aeq}. The measured $L_{A10,18hr}$ value was 49dB and the measured L_{den} value was 55dB.

Location NS55

Noise levels at this location were dominated by infrequent local vehicle movements on the R702. Noise levels were in the range 66 to 67dB L_{Aeq} and 68 to 69dB L_{A10}. The derived L_{den} at this location was 68dB.

Location NS56

Noise levels at this location were dominated by intermittent local traffic on the nearby R702 road. Noise levels were in the range 69 to 71dB L_{Aeq} and 69 to 72dB L_{A10}. The derived L_{den} at this location was 69dB.

Location NS57

Noise levels at this location were dominated by infrequent local traffic movements and birdsong. Noise levels were in the range 53 to 59dB L_{Aeq} and in the range 56 to 61dB L_{A10}. The derived L_{den} at this location was 59dB.

Location NS58

Noise levels at this location were dominated by traffic on the local road, birdsong and nearby sheep. Noise levels were of the order of 67dB L_{Aeq} and 64 to 66dB L_{A10}. The derived L_{den} at this location was 65dB.

Location NS59

Noise levels at this location were dominated by occasional vehicles on the local road and birdsong. Noise levels were in the range 62 to 65dB L_{Aeq} and 59 to 62dB L_{A10}. The derived L_{den} at this location was 61dB.

Location NS60

Noise levels at this location were dominated by occasional traffic on the nearby local road, a tractor in an adjacent field and birdsong. Noise levels were in the range 62 to 63dB L_{Aeq} and 57 to 62dB L_{A10}. The derived L_{den} at this location was 60dB.

Location NS61

Noise levels at this location were distant traffic and a dog occasionally barking. Noise levels were in the range 41 to 50dB L_{Aeq} and 39 to 44dB L_{A10}. The derived L_{den} at this location was 45dB.

Unattended measurements were also carried out at this location. Daytime noise level were in the range 35 to 43dB L_{Aeq}, evening noise levels were in the range 32 to 47dB L_{Aeq} and night-time noise levels were in the range 20 to 40dB L_{Aeq}. The measured $L_{A10,18hr}$ value was 39dB and the measured L_{den} value was 42dB.

Location NS62

Noise levels at this location were dominated by infrequent local traffic movements and birdsong. Noise levels were in the range 53 to 57dB L_{Aeq} and in the range 54 to 60dB L_{A10}. The derived L_{den} at this location was 57dB.

Location NS63

Noise levels at this location were dominated by traffic on the N30. Noise levels were in the range 56 to 59dB L_{Aeq} and in the range 58 to 61dB L_{A10}. The derived L_{den} at this location was 60dB.

13.4 POTENTIAL IMPACTS OF THE PROPOSED SCHEME

13.4.1 Construction Phase

Standards and Guidelines

As per NRA guidance noise levels associated with construction may be calculated in accordance with methodology set out in BS5228 (British Standards Institution, 2009. BS 5228:1997 *Code of Practice for noise and vibration control on construction and open sites – Part 1: Noise*. London: BSI. This standard sets out sound power levels for plant items normally encountered on construction sites, which in turn enables the prediction of noise levels at selected locations. However, it is often not possible to conduct detailed prediction calculations for the construction phase of a project in support of the EIS. This is due to the fact that the programme for construction works has not been established in detail. Under such circumstances, best practice involves the consideration of appropriate mitigation measures.

The NRA guidance document specifies noise levels that it typically deems acceptable in terms of construction noise. These limits are set out in Table 13.15. Note that these values are indicative only; it may be appropriate to apply more stringent limits in areas where pre-existing noise levels are low.

Table 13.15 Maximum Permissible Noise Levels at the Façade of Nearby Dwellings During Construction

Days & Times	$L_{Aeq\ (1hr)}$ dB	L_{Amax} dB(A)
Monday to Friday 07:00 to 19:00hrs	70	80
Monday to Friday 19:00 to 22:00hrs	60	65
Saturday 08:00 to 16:30hrs	65	75
Sundays and Bank Holidays 08:00 to 16:30hrs	60	65

Assessment of Construction Noise

A variety of items of plant will be in use, such as excavators, lifting equipment, dumper trucks, compressors and generators. It is also possible that rock breaking may be required on occasions and there will be vehicular movements to and from the site that will make use of existing roads.

Due to the nature of the activities undertaken on a large construction site, there is potential for generation of significant levels of noise. The flow of vehicular traffic to and from a construction site is also a potential source of relatively high noise levels.

Due to the fact that the construction programme has been established in outline form only, it is not possible to calculate the actual magnitude of noise emissions to the local environment. However, the following paragraphs present calculations of indicative noise levels for typical noise sources associated with road construction.

BS5228 *Noise and vibration control on construction and open sites, Part 1, Code of practice for basic information and procedures for noise and vibration control* sets out typical noise levels for items of construction plant. Table 13.16 lists the sound power levels of the plant used for calculation of the expected noise level at various distances from the roadway, which are shown in Table 13.17.

Table 13.16 Typical construction plant noise levels

Plant Item	Sound Power Level, dB re 10^{-12} W	Reference
Dozer	108	Pt. 1, Table C2: 10
Dump Truck	102	Pt. 1, Table C2: 32
Asphalt Spreader	103	Pt. 1, Table C5: 33
Road Roller	103	Pt. 1, Table C8: 25
Wheeled Crane	98	Pt. 1, Table C4: 43
Drop Hammer for piling	108	Pt. 1, Table C12: 13

Table 13.17 Indicative noise levels from construction plant items at various distances from the road

Plant Item	Distance from road, meters				
	25	50	100	150	200
Dozer	72	66	60	56	54
Dump Truck	66	60	54	50	48
Asphalt Spreader	67	61	55	51	49
Road Roller	67	61	55	51	49
Wheeled Crane	62	56	50	46	44
Drop hammer for piling	72	66	60	56	54

The noise levels presented for 50m distance from the plant and upwards are within the limit values shown in Table 13.15 for weekday daytime periods. The noise levels at 25m distance from the plant are in excess of the limit values for some plant items. Section 13.5.1 describes typical measures to minimise the potential for noise disturbance to the surrounding area.

Blasting

Certain areas will require removal significant amounts of rock. Blasting for the purposes of rock excavation will be required during the construction of sections of the proposed road within areas of deep cut.

The impact to noise and vibration during this phase can be significantly reduced through clear communication processes and proven mitigation measures such as careful attention to blast design. A precondition survey will be conducted at all properties within 50m of the Proposed Scheme in areas where blasting is proposed. Monitoring will take place during all blasts at the nearest property to its activity to ensure noise and vibration limits specified in the EIS will be adhered to. The contractor will be required to take all practical steps to minimise the impact during this activity which will include:

- a public notification policy will be undertaken before any blasting starts, explaining what is being done and for what duration;
- appropriate charging and stemming;
- in order to minimize the potential for startling people, nearby residents will be informed of timing of blast;
- restriction of hours when blasting can be conducted;
- on-going circulars informing people of the progress of works;
- trial blasts in less sensitive areas to assist in blast designs;
- the use of independent monitoring by external bodies for verification of the results.

Ripping will be limited typically to the removal of material close to the rock head in areas where a cutting is proposed. Noise and vibration levels during this activity will be limited to the limits set out in the EIS. The contractor will be required to take all steps necessary to reduce noise and vibration impacts in accordance with BS5228.

Rock crushing may be required at designated areas along the route to process excavated rock. Noise and vibration levels during this activity will be restricted to the limits set out in the EIS. The impact from such activities can be reduced through location of machinery at the base of cuttings to make use of screening afforded by slopes.

13.4.2 Operation Phase

Noise Model

A computer-based prediction model has been prepared in order to quantify the traffic noise level associated with the operational phase of the Proposed Scheme. This section discusses the methodology behind the noise modelling process and presents the results of the modelling exercise.

Brüel & Kjær Type 7810 *Predictor*

Proprietary noise calculation software was used for the purposes of this impact assessment. The selected software, Brüel & Kjær Type 7810 *Predictor*, calculates traffic noise levels in accordance with CRTN and NRA guidance.

Brüel & Kjær Type 7810 *Predictor* is a proprietary noise calculation package for computing noise levels in the vicinity of noise sources. *Predictor* predicts noise levels in different ways depending on the selected prediction standard. In general, however, the resultant noise level is calculated taking into account a range of factors affecting the propagation of sound, including:

- the magnitude of the noise source in terms of sound power or traffic flow and average velocity;
- the distance between the source and receiver;
- the presence of obstacles such as screens or barriers in the propagation path;
- the presence of reflecting surfaces, and
- the hardness of the ground between the source and receiver.

Prediction of traffic noise

Noise emissions during the operational phase of the project have been modelled using *Predictor* in accordance with CRTN and with application of the relevant conversion factors as detailed in the NRA Guidance. The CRTN method of predicting noise from a road scheme consists of the following five elements:

- divide the proposed road into segments so that the variation of noise within this segment is small;
- calculate the basic noise level at a reference distance of 10 metres from the nearside carriageway edge for each segment;

- assess for each segment the noise level at the reception point taking into account distance attenuation and screening of the source line;
- correct the noise level at the reception point to take account of site layout features including reflections from buildings and facades, and the size of source segment, and;
- combine the contributions from all segments to give the predicted noise level at the receiver location for the whole proposed road.

Note that all calculations are performed to one decimal place. For the purposes of comparison with the design goals of 60dB L_{den}, the relevant noise level is to be rounded to the nearest whole number in accordance with guidance given in the NRA document.

Input to the Noise Model

The noise model was prepared using the following data:

- preliminary design road alignments, topographical data and Ordnance Survey mapping supplied by Ryan Hanley WSP;
- forecast traffic flow data supplied by Ryan Hanley WSP, and;
- traffic speeds as supplied by Ryan Hanley WSP.

For illustrative purposes only, the extent of the noise model with the Proposed Scheme in place is shown schematically in Figure 13.2 in Volume 4 of this EIS. This figure is a 3D representation of the developed model.

Output of the Noise Model

Predictor calculates noise levels for a set of receiver locations specified by the user. The results include an overall level in dB L_{den}.

Calibration

The purpose of noise model calibration is to ensure that the software is correctly interpreting the input data and providing results that are valid for the scenario under consideration. The CRTN prediction methodology has itself been previously validated.

Given the nature of the scale of the Proposed Scheme in question it was decided that the most appropriate mechanism for calibration would be to compare the output of the *Predictor* model with the output of another CRTN package, i.e. the National Physical Laboratory's (NPL) on-line utility.

The input data for a number of critical receptors was retrieved from the *Predictor* model and input to the NPL utility. The results from the two models were compared in order to ensure that the variance was no greater than ±3dB(A) at any of the assessment locations.

The results of the calibration are presented in Table 13.18. The differences between the results from the two systems is -2 to +2 dB(A), which confirms that the model is correctly interpreting the input data.

Table 13.18 Comparison of Predicted Values for $L_{A10(1hour)}$ at Assessment Locations

Receiver Location Reference	NPL L_{A10} dB	*Predictor* L_{A10} dB	Difference dB
R036	67	66	-1
R107	66	67	+1
R199	63	62	+1

Choice of Receiver Locations

Free-field traffic noise levels have been predicted at a number of properties in the vicinity of proposed and existing roads. Two hundred and thirty receivers have been considered in total. Some properties have more than one associated receiver, as different sides of the properties face different roads.

The coordinates of all locations are provided in Tables 13.19, 13.20, 13.21. These receiver locations are detailed in Figure 13.3 in Volume 4 of this EIS.

M11/N11 Mainline

The following table gives details of receivers in this section of the Proposed Scheme.

Table 13.19 Details of Receiver Locations

Receiver Location Reference	Height (m)	Grid Reference	
		E	N
R001	4	310,989	155,075
R002	4	310,764	154,903
R003	4	310,493	155,007
R004	4	310,446	154,926
R005a	4	310,257	154,820
R005b	4	310,442	154,730
R006	4	310,152	154,302
R007a	4	310,171	153,710
R007b	4	310,114	153,663
R008	4	310,838	153,796
R009	4	310,568	153,295
R010	4	310,015	153,521
R011	4	309,910	153,469

Table 13.19 Details of Receiver Locations

Receiver Location Reference	Height (m)	Grid Reference	
		E	N
R012	4	309,892	153,452
R013	4	309,860	153,451
R014	4	309,845	153,440
R015	4	310,358	152,799
R016a	4	309,915	151,937
R016b	4	309,796	151,936
R016c	4	309,704	151,925
R017	4	309,411	152,064
R018	4	309,573	151,530
R019	4	308,971	152,087
R020	4	308,964	150,936
R021	4	308,360	151,099
R022	4	308,651	150,246
R023	4	308,131	149,840
R024	1.6	307,900	149,882
R025	4	307,830	149,919
R026	4	308,097	149,731
R027	4	307,609	149,242
R028	4	307,372	149,234
R029	4	307,696	149,107
R030	4	307,196	149,096
R031	4	306,967	148,993
R032	4	306,626	148,948
R033	4	307,283	148,560
R034	4	306,302	148,744
R035	4	306,756	148,320
R036a	4	306,189	148,371
R036b	4	306,544	148,595
R036c	4	306,400	147,863
R037	4	305,682	147,635
R038	4	305,593	147,545
R039	4	305,095	147,486
R040	4	304,972	147,270
R041a	4	305,340	147,022
R041b	4	305,310	147,219
R042	4	304,744	146,270
R043	4	303,527	146,950
R044	4	303,591	145,863
R045	4	303,161	146,035
R046	4	302,761	145,730
R047	4	302,649	145,095
R048	4	301,940	144,878
R049	4	302,190	144,418
R050	4	301,236	144,274
R051	4	302,172	144,106
R052	4	301,903	143,980
R053	4	301,876	143,965
R054	4	301,820	143,911
R055	4	301,786	143,859
R056	4	301,788	143,830

Table 13.19 Details of Receiver Locations

Receiver Location Reference	Height (m)	Grid Reference	
		E	N
R057	4	301,735	143,772
R058	4	301,711	143,740
R059	4	301,691	143,676
R060	4	301,682	143,629
R061	4	301,653	143,624
R062	4	301,151	143,851
R063	4	301,430	143,416
R064a	4	301,258	143,310
R064b	4	301,232	143,307
R065	4	300,915	143,467
R066	4	300,874	143,335
R067	4	301,126	143,169
R068	4	300,704	143,201
R069	4	301,044	142,719
R070	4	300,423	142,761
R071	4	301,385	141,849
R072	4	301,412	141,587
R073	4	301,500	141,230
R074	4	301,437	141,667
R075	4	301,497	141,194
R076	4	301,266	141,073
R077a	4	301,509	141,070
R077b	4	301,544	141,115
R078	4	301,448	140,989
R079	4	301,578	140,673
R080a	4	301,367	140,452
R080b	4	300,724	140,658
R080c	4	300,686	140,656
R080d	4	300,662	140,646
R081a	4	300,600	140,570
R081b	4	300,693	140,425
R082	4	300,550	140,555
R083	4	300,464	140,571
R084	4	300,392	140,508
R085	4	300,322	140,447
R086	4	300,252	140,367
R087	4	300,195	140,326
R088	4	300,711	140,114
R089	4	300,479	139,936
R090	4	300,543	139,944
R091	4	300,661	139,802
R092a	4	300,002	138,918
R092b	4	300,002	138,910
R093	4	300,638	139,651
R094	4	299,799	138,939
R095	4	300,021	138,902
R096	4	300,039	138,889
R097	4	300,108	138,862
R098	4	300,135	138,848
R099	4	300,160	138,832

Table 13.19 Details of Receiver Locations

Receiver Location Reference	Height (m)	Grid Reference	
		E	N
R100	4	300,179	138,773
R101	4	300,329	138,438
R102	4	299,942	138,349
R103	4	299,830	137,602
R104	4	300,563	137,322
R105a	4	300,665	136,876
R105b	4	300,220	136,500
R106	4	299,750	136,769
R107	4	299,928	136,412
R108	4	300,194	136,212
R109	4	300,081	136,144
R110	4	299,662	136,137
R111	4	299,257	135,353
R112	4	300,223	135,377
R113	4	299,823	134,922
R114	4	300,074	134,982
R115	4	299,591	134,697
R116	4	299,324	134,745
R117	4	299,697	134,579
R118	4	299,049	134,511
R119	4	299,107	134,131
R120	4	299,153	134,226
R121	4	299,034	133,951
R122a	4	299,177	133,778
R122b	4	299,180	133,785
R123a	4	299,445	133,660
R123b	4	299,450	133,630
R124	4	299,470	133,694
R125a	4	299,235	133,544
R125b	4	299,205	133,493
R126a	4	299,400	133,181
R126b	4	299,393	133,173
R127	4	299,535	133,414

N80 Link Road

The following table gives details of receivers in this section of the Proposed Scheme.

Table 13.20 Details of Receiver Locations

Receiver Location Reference	Height (m)	Grid Reference	
		E	N
R128a	4	300,254	141,888
R128b	4	300,170	141,900
R128c	4	300,126	141,947
R129	4	299,933	142,194
R130	4	299,470	141,779
R131	4	299,118	142,331

Table 13.20 Details of Receiver Locations

Receiver Location Reference	Height (m)	Grid Reference	
		E	N
R132	4	299,301	142,430
R133	4	298,662	142,656
R134	4	299,229	143,438
R135	4	298,452	143,652
R136	4	298,448	143,693
R137	4	298,455	143,722
R138	4	298,455	143,739
R139	4	298,458	143,764
R140	4	298,465	143,787
R141	4	298,511	143,807
R142	4	298,461	143,902
R143	4	298,455	143,923
R144	4	298,461	143,948
R145	4	298,466	143,967
R146	4	298,959	144,302
R147	4	298,357	144,663
R148a	4	298,396	144,299
R148b	4	298,383	144,303

N30 Mainline

The following table gives details of receivers in this section of the Proposed Scheme.

Table 13.21 Details of Receiver Locations

Receiver Location Reference	Height (m)	Grid Reference	
		E	N
R149	4	298,094	143,852
R150	4	297,964	143,675
R151	4	297,454	144,048
R152	4	297,156	143,599
R153	4	296,975	143,508
R154	4	297,243	143,235
R155	4	297,236	143,113
R156	4	297,246	143,063
R157	4	297,249	143,045
R158	4	296,270	142,880
R159	4	297,051	142,564
R160	4	296,081	142,893
R161	4	296,072	142,874
R162	4	296,048	142,847
R163	4	296,044	142,826
R164	4	296,009	142,699
R165	4	295,857	142,361
R166	4	295,777	142,276
R167a	4	295,727	142,215
R167b	4	295,707	142,204

Table 13.21 Details of Receiver Locations

Receiver Location Reference	Height (m)	Grid Reference	
		E	N
R167c	4	295,686	142,176
R168	4	295,441	142,515
R169	4	295,150	142,091
R170	4	295,041	142,134
R171	4	294,839	142,274
R172	4	294,694	142,170
R173	4	294,654	142,100
R174	4	294,277	141,833
R175	4	294,262	141,827
R176a	4	294,423	141,684
R176b	4	294,444	141,679
R177a	4	294,234	141,787
R177b	4	294,167	141,798
R178	4	294,712	141,550
R179	4	294,995	141,484
R180	4	293,989	141,898
R181	4	293,987	141,835
R182	4	293,962	141,872
R183	4	293,941	141,861
R184	4	293,914	141,850
R185	4	293,883	141,855
R186	4	293,842	141,881
R187a	4	294,355	141,460
R187b	4	293,888	141,623
R188a	4	293,543	140,610
R188b	4	293,747	140,629
R188c	4	293,811	140,562
R189	4	293,395	140,606
R190	4	293,202	140,798
R191	4	293,727	139,947
R192	4	293,820	139,783
R193	4	293,383	139,976
R194a	4	293,514	139,743
R194b	4	293,714	139,592
R195	4	293,902	139,237
R196	4	293,740	139,050
R197	4	293,395	139,020
R198	4	293,397	139,008
R199	4	294,161	138,912
R200	4	293,895	138,846

Traffic Noise Predictions for 2013 and 2028

Four scenarios have been considered as follows:

- Year 2013 – Do Minimum (i.e. Proposed Scheme does not take place);
- Year 2013 – Do Something (i.e. incorporates Proposed Scheme);

- Year 2028 – Do Minimum;
- Year 2028 – Do Something.

The results of the traffic noise predictions based on the preliminary design, as described in this EIS, are presented in the following sections.

Note that in the tables in this chapter presenting predicted traffic noise levels, the Do Minimum columns have no value shown for certain locations. This means that the traffic noise from the N11 is very low at these locations due to the large distances from the existing N11. Typically at these locations noise levels will be dominated by local sources and or very occasional local traffic movements on local roads.

M11/N11 Mainline

Table 13.22 Predicted noise levels at receiver locations, with and without the Proposed Scheme

Receiver Location Reference	Opening Year 2013		Mitigation Required?	Design Year 2028		Mitigation Required?
	Predicted Noise Level			Predicted Noise Level		
	Do Minimum	Do Something		Do Minimum	Do Something	
	L_{den}	L_{den}		L_{den}	L_{den}	
R001	57	58	No	58	59	No
R002	61	61	No	62	62	No
R003	53	52	No	54	53	No
R004	55	54	No	56	55	No
R005a	58	56	No	59	57	No
R005b	62	59	No	63	60	No
R006	47	54	No	48	55	No
R007a	44	58	No	44	59	No
R007b	46	57	No	47	58	No
R008	43	54	No	44	55	No
R009	43	56	No	44	57	No
R010	40	56	No	41	57	No
R011	40	55	No	41	55	No
R012	39	53	No	40	54	No
R013	40	53	No	40	54	No
R014	39	53	No	39	53	No
R015	43	57	No	44	57	No
R016a	–	52	No	–	53	No
R016b	40	55	No	41	56	No
R016c	40	56	No	40	57	No
R017	40	55	No	40	56	No
R018	–	52	No	–	53	No
R019	32	47	No	33	47	No
R020	–	56	No	–	57	No
R021	–	53	No	–	54	No
R022	–	52	No	–	53	No
R023	–	54	No	–	55	No

Table 13.22 Predicted noise levels at receiver locations, with and without the Proposed Scheme

Receiver Location Reference	Opening Year 2013		Mitigation Required?	Design Year 2028		Mitigation Required?
	Predicted Noise Level			Predicted Noise Level		
	Do Minimum	Do Something		Do Minimum	Do Something	
	L_{den}	L_{den}		L_{den}	L_{den}	
R024	–	63	Yes	–	64	Yes
R025	–	55	No	–	56	No
R026	–	52	No	–	53	No
R027	–	58	No	–	59	No
R028	–	54	No	–	55	No
R029	–	55	No	–	56	No
R030	–	57	No	–	58	No
R031	–	57	No	–	58	No
R032	–	55	No	–	56	No
R033	–	56	No	–	57	No
R034	–	55	No	–	56	No
R035	–	57	No	–	58	No
R036a	–	59	No	–	60	No
R036b	–	59	No	–	60	No
R036c	–	53	No	–	54	No
R037	–	59	No	–	59	No
R038	–	58	No	–	59	No
R039	–	56	No	–	56	No
R040	–	55	No	–	56	No
R041a	–	52	No	–	53	No
R041b	–	58	No	–	59	No
R042	–	50	No	–	51	No
R043	–	52	No	–	53	No
R044	–	56	No	–	56	No
R045	–	56	No	–	57	No
R046	–	58	No	–	59	No
R047	–	58	No	–	59	No
R048	–	59	No	–	60	No
R049	–	56	No	–	57	No
R050	–	55	No	–	56	No
R051	–	53	No	–	54	No
R052	–	55	No	–	56	No
R053	–	55	No	–	56	No
R054	–	55	No	–	56	No
R055	–	55	No	–	56	No
R056	–	54	No	–	55	No
R057	–	55	No	–	56	No
R058	–	55	No	–	56	No
R059	–	55	No	–	56	No
R060	–	55	No	–	55	No
R061	–	55	No	–	56	No
R062	–	59	No	–	60	No
R063	–	56	No	–	57	No
R064a	–	57	No	–	58	No
R064b	–	58	No	–	58	No

Table 13.22 Predicted noise levels at receiver locations, with and without the Proposed Scheme

Receiver Location Reference	Opening Year 2013		Mitigation Required?	Design Year 2028		Mitigation Required?
	Predicted Noise Level			Predicted Noise Level		
	Do Minimum	Do Something		Do Minimum	Do Something	
	L_{den}	L_{den}		L_{den}	L_{den}	
R065	–	55	No	–	56	No
R066	–	55	No	–	56	No
R067	–	56	No	–	57	No
R068	–	53	No	–	54	No
R069	–	55	No	–	55	No
R070	34	53	No	34	54	No
R071	32	58	No	33	59	No
R072	33	59	No	34	60	No
R073	35	61	Yes	36	62	Yes
R074	33	58	No	33	59	No
R075	35	61	Yes	36	62	Yes
R076	31	62	Yes	31	63	Yes
R077a	35	60	No	35	61	Yes
R077b	35	57	No	35	58	No
R078	36	63	Yes	37	64	Yes
R079	38	57	No	38	58	No
R080a	34	56	No	35	57	No
R080b	34	57	No	34	58	No
R080c	34	56	No	34	57	No
R080d	34	56	No	34	57	No
R081a	35	54	No	36	55	No
R081b	37	60	No	38	61	Yes
R082	36	53	No	36	54	No
R083	36	52	No	36	53	No
R084	38	52	No	39	53	No
R085	41	53	No	41	54	No
R086	42	53	No	42	54	No
R087	44	54	No	44	54	No
R088	39	57	No	39	58	No
R089	57	60	No	57	61	Yes
R090	46	55	No	46	56	No
R091	67	68	Yes	68	69	Yes
R092a	38	61	Yes	38	62	Yes
R092b	32	61	Yes	33	62	Yes
R093	48	54	No	49	55	No
R094	36	56	No	37	57	No
R095	31	59	No	32	60	No
R096	32	58	No	32	59	No
R097	31	56	No	32	56	No
R098	31	55	No	32	56	No
R099	31	55	No	32	56	No
R100	37	54	No	38	55	No
R101	29	56	No	30	57	No
R102	33	59	No	34	60	No
R103	32	53	No	32	54	No

Table 13.22 Predicted noise levels at receiver locations, with and without the Proposed Scheme

Receiver Location Reference	Opening Year 2013		Mitigation Required?	Design Year 2028		Mitigation Required?
	Predicted Noise Level			Predicted Noise Level		
	Do Minimum	Do Something		Do Minimum	Do Something	
	L_{den}	L_{den}		L_{den}	L_{den}	
R104	28	59	No	29	60	No
R105a	–	52	No	–	53	No
R105b	–	57	No	–	58	No
R106	–	51	No	–	52	No
R107	–	59	No	–	60	No
R108	–	57	No	–	58	No
R109	–	61	Yes	–	62	Yes
R110	38	58	No	39	59	No
R111	41	56	No	42	57	No
R112	39	52	No	39	53	No
R113	39	58	No	40	59	No
R114	38	53	No	39	54	No
R115	42	66	Yes	43	67	Yes
R116	45	59	No	46	60	No
R117	44	59	No	44	60	No
R118	47	54	No	48	55	No
R119	46	56	No	47	57	No
R120	46	57	No	47	58	No
R121	55	55	No	56	56	No
R122a	53	56	No	54	58	No
R122b	50	58	No	51	59	No
R123a	53	61	Yes	54	62	Yes
R123b	54	60	No	55	61	Yes
R124	53	60	No	54	61	Yes
R125a	57	66	Yes	58	67	Yes
R125b	63	67	Yes	63	68	Yes
R126a	61	61	No	62	62	No
R126b	66	67	Yes	67	68	Yes
R127	52	54	No	52	55	No

Year 2013

The combined expected maximum traffic noise level from the Proposed Scheme together with other traffic in the vicinity (i.e. Do Something scenario) is greater than 60dB L_{den} at sixteen locations: R002, R024, R073, R075, R076, R078, R091, R092a, R092b, R109, R115, R123a, R125, R125b, R126a and R126b.

The noise level at two of these locations is dominated by contributions from the existing road network, or experiences a drop in noise level due to the traffic flow transferred onto the Proposed Scheme: R002 and R126a. Mitigation measures are not required at these locations.

At the remaining fourteen locations, i.e., R024, R073, R075, R076, R078, R091, R092a, R092b,

R109, R115, R123a, R125a, R125b and R126b, the Do Something noise level is higher than the Do Minimum level, and in excess of the Design Goal. Consideration is given to mitigation measures for these locations in the following section.

Year 2028

The combined expected maximum traffic noise level from the Proposed Scheme together with other traffic in the vicinity (i.e. Do Something scenario) is greater than 60dB L_{den} at twenty-one locations: R002, R024, R073, R075, R076, R077a, R078, R081b, R089, R091, R092a R092b, R109, R115, R123a, R123b, R124, R125a, R125b, R126a and R126a.

The noise level at two of these locations is dominated by contributions from the existing road network, or experiences a drop in noise level due to the traffic flow transferred onto the Proposed Scheme: R002 and R126a. Mitigation measures are not required at these locations.

At the remaining nineteen locations, i.e. R024, R073, R075, R076, R077a, R078, R081b, R089, R091, R092a, R092b, R109, R115, R123a R123b, R124, R125a R125b, and R126b, the Do Something noise level is higher than the Do Minimum level, and in excess of the Design Goal. Consideration is given to mitigation measures for these locations in the following section.

N80 Link Road

Table 13.23 Predicted noise levels at receiver locations, with and without the Proposed Scheme

Receiver Location Reference	Opening Year 2013		Mitigation Required?	Design Year 2028		Mitigation Required?
	Predicted Noise Level			Predicted Noise Level		
	Do Minimum	Do Something		Do Minimum	Do Something	
	L_{den}	L_{den}		L_{den}	L_{den}	
R128a	32	57	No	32	57	No
R128b	35	58	No	36	58	No
R128c	35	60	No	36	60	No
R129	33	56	No	34	57	No
R130	32	56	No	32	57	No
R131	36	56	No	37	57	No
R132	37	59	No	38	60	No
R133	38	51	No	39	52	No
R134	42	50	No	43	51	No
R135	45	53	No	46	54	No
R136	47	53	No	47	54	No
R137	47	52	No	48	53	No
R138	47	54	No	48	55	No
R139	48	53	No	48	54	No
R140	47	53	No	48	54	No
R141	50	57	No	51	58	No
R142	49	56	No	50	57	No

Table 13.23 Predicted noise levels at receiver locations, with and without the Proposed Scheme

Receiver Location Reference	Opening Year 2013		Mitigation Required?	Design Year 2028		Mitigation Required?
	Predicted Noise Level			Predicted Noise Level		
	Do Minimum	Do Something		Do Minimum	Do Something	
	L_{den}	L_{den}		L_{den}	L_{den}	
R143	49	56	No	49	57	No
R144	49	58	No	49	59	No
R145	49	59	No	50	60	No
R146	48	51	No	49	52	No
R147	61	60	No	62	60	No
R148a	55	58	No	55	59	No
R148b	66	61	No	66	62	No

Year 2013

The combined expected maximum traffic noise level from the Proposed Scheme together with other traffic in the vicinity (i.e. Do Something scenario) is greater than 60dB L_{den} at one location: R148a.

The noise level at this location is dominated by contributions from the existing road network, and experiences a drop in noise level due to the traffic flow transferred onto the Proposed Scheme. Mitigation measures are not required at this location.

Year 2028

The combined expected maximum traffic noise level from the Proposed Scheme together with other traffic in the vicinity (i.e. Do Something scenario) is greater than 60dB L_{den} at one location: R148a.

The noise level at this location is dominated by contributions from the existing road network, and experiences a drop in noise level due to the traffic flow transferred onto the Proposed Scheme. Mitigation measures are not required at this location.

N30 Mainline

Table 13.24 Predicted noise levels at receiver locations, with and without the Proposed Scheme

Receiver Location Reference	Opening Year 2013		Mitigation Required?	Design Year 2028		Mitigation Required?
	Predicted Noise Level			Predicted Noise Level		
	Do Minimum	Do Something		Do Minimum	Do Something	
	L_{den}	L_{den}		L_{den}	L_{den}	
R149	49	51	No	50	52	No
R150	46	50	No	47	51	No
R151	50	52	No	50	53	No

Table 13.24 Predicted noise levels at receiver locations, with and without the Proposed Scheme

Receiver Location Reference	Opening Year 2013		Mitigation Required?	Design Year 2028		Mitigation Required?
	Predicted Noise Level			Predicted Noise Level		
	Do Minimum	Do Something		Do Minimum	Do Something	
	L_{den}	L_{den}		L_{den}	L_{den}	
R152	45	55	No	46	56	No
R153	45	55	No	45	55	No
R154	45	52	No	46	53	No
R155	45	51	No	46	52	No
R156	36	48	No	37	49	No
R157	36	48	No	36	49	No
R158	39	56	No	39	57	No
R159	40	46	No	41	47	No
R160	38	51	No	39	52	No
R161	38	52	No	38	52	No
R162	38	52	No	38	53	No
R163	38	52	No	38	53	No
R164	37	56	No	38	57	No
R165	33	54	No	34	55	No
R166	32	52	No	33	53	No
R167a	34	51	No	35	52	No
R167b	34	51	No	35	52	No
R167c	34	49	No	35	50	No
R168	35	54	No	35	55	No
R169	37	47	No	38	48	No
R170	39	49	No	40	50	No
R171	38	51	No	38	52	No
R172	40	51	No	41	52	No
R173	42	53	No	43	54	No
R174	57	59	No	58	59	No
R175	62	63	Yes	63	64	Yes
R176a	59	58	No	60	59	No
R176b	62	57	No	63	58	No
R177a	67	66	No	68	67	No
R177b	63	63	No	64	64	No
R178	67	66	No	68	67	No
R179	64	63	No	65	64	No
R180	60	60	No	61	61	No
R181	64	64	No	65	65	No
R182	71	71	No	72	72	No
R183	68	68	No	69	69	No
R184	62	62	No	63	63	No
R185	61	61	No	62	62	No
R186	63	63	No	64	64	No
R187a	46	52	No	46	53	No
R187b	48	52	No	49	53	No
R188a	33	62	Yes	34	63	Yes
R188b	35	50	No	36	51	No
R188c	34	49	No	35	50	No
R189	34	56	No	35	57	No

Table 13.24 Predicted noise levels at receiver locations, with and without the Proposed Scheme

Receiver Location Reference	Opening Year 2013		Mitigation Required?	Design Year 2028		Mitigation Required?
	Predicted Noise Level			Predicted Noise Level		
	Do Minimum	Do Something		Do Minimum	Do Something	
	L_{den}	L_{den}		L_{den}	L_{den}	
R190	36	49	No	37	50	No
R191	38	47	No	39	48	No
R192	40	48	No	41	49	No
R193	38	48	No	39	49	No
R194a	40	56	No	41	58	No
R194b	43	53	No	43	54	No
R195	47	48	No	47	48	No
R196	52	52	No	52	53	No
R197	48	51	No	49	52	No
R198	52	54	No	53	55	No
R199	64	61	No	65	62	No
R200	59	56	No	60	57	No

Year 2013

The combined expected maximum traffic noise level from the Proposed Scheme together with other traffic in the vicinity (i.e. Do Something scenario) is greater than 60dB L_{den} at thirteen locations: R175, R177a, R177b, R178, R179, R181, R182, R183, R184, R185, R186, R188a and R199.

The noise level at eleven of these locations is dominated by contributions from the existing road network, or experiences a drop in noise level due to the traffic flow transferred onto the Proposed Scheme: R177a, R177a, R178, R179, R181, R182, R183, R184, R185, R186 and R199. Mitigation measures are not required at these locations.
At the remaining two locations, i.e., R175 and R188a, the Do Something noise level is higher than the Do Minimum level, and in excess of the Design Goal.

Year 2028

The combined expected maximum traffic noise level from the Proposed Scheme together with other traffic in the vicinity (i.e. Do Something scenario) is greater than 60dB L_{den} at fourteen locations: R175, R177a, R177b, R178, R179, R180, R181, R182, R183, R184, R185, R186, R188a and R199.

The noise level at twelve of these locations is dominated by contributions from the existing road network, or experiences a drop in noise level due to the traffic flow transferred onto the Proposed Scheme: R177a, R177b, R178, R179, R180, R181, R182, R183, R184, R185, R186 and R199. Mitigation measures are not required at these locations.

At the remaining two locations, i.e., R175 and R188a, the Do Something noise level is higher than the Do Minimum level, and in excess of the Design Goal.

13.4.3 Cumulative Impacts

The calculations for the Do Something scenario include the existing roads with significant traffic flow values reflecting the presence of the Proposed Scheme. Therefore, the cumulative impact of the existing environment and the Proposed Scheme is built in to the Do Something scenario.

13.4.4 "Do-Nothing" Scenario

In the scenario, the noise environment at the noise sensitive locations would be as specified in the Do Nothing scenario in Table 13.21, 13.22, and 13.23.

13.4.5 Worst Case Scenario

In this instance, the worst-case scenario corresponds to the situation where the mitigation measures fail or are not implemented. This noise levels would be as specified for the Do Something scenario, without the mitigation measures in place. Twenty-one out of two hundred and thirty locations would therefore have noise levels in excess of the design goal.

13.5 MITIGATION MEASURES

13.5.1 Construction Phase

The contract documents will clearly specify that the Contractor will be obliged to take specific noise abatement measures and comply with the recommendations of BS 5228: Part 1 and the European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001. These measures will ensure that:

- No plant used on site will be permitted to cause an ongoing public nuisance due to noise.
- The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract.
- Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers.
- Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use.

- Any plant, such as generators or pumps, that is required to operate before 07:00hrs or after 19:00hrs will be surrounded by an acoustic enclosure or portable screen.

- During the course of the construction programme, supervision of the works will include ensuring compliance with the limits detailed in Table 13.15 using methods outlined in BS 5228 “Noise and Vibration Control on Construction and open sites”, Annex E. It should be noted that BS 5228 does not detail any specific noise limits in relation to construction noise.

Table 13.25 presents predicted construction noise levels assuming that the exhaust on the dozer has been attenuated, and that the piling equipment has been fitted with a dampened bit and an acoustic shroud.

Table 13.25 Noise levels from construction plant items at various distances from the road, assuming basic mitigation

Plant Item	Distance from road, meters				
	25	**50**	**100**	**150**	**200**
Dozer	67	61	55	51	49
Dump Truck	66	60	54	50	48
Asphalt Spreader	67	61	55	51	49
Road Roller	67	61	55	51	49
Wheeled Crane	62	56	50	46	44
Drop hammer for piling	62	56	50	46	44

These values demonstrate that is possible for the Contractor to comply with the adopted noise level limits in Table 13.15.

The contractor undertaking blasting works will be required to ensure that all nearby structures and ground features are investigated prior to the blasting through either geophysical surveys or rotary core holes. The most suitable method for rock extraction will be chosen based on the localised ground conditions. The measures outlined in section 13.4.1 will serve to minimise disruption caused by blasting.

13.5.2 Operational Phase

In order to mitigate noise traffic noise levels sufficiently, reference is made to the design goal and the three criteria for mitigation described in section 13.2.4. Based on the Proposed Scheme design as assessed here, the proposed mitigation measures consist of a set of barriers as described in the following sections. Barriers shall conform to the requirements of *Series 300 – National Roads Authority Specification for Contract Works*. In a number of cases, a section of low-noise surface is also called for. Based on Paragraph 16.2 in CRTN, a low-noise surface has a reduction in noise level of 3.5dB(A) when compared to hot-rolled asphalt. Predicted noise levels with the mitigation measures in place are presented in Table 13.26.

M11/N11 Mainline

Location R024

The proposed mitigation measure for Location R024 consists of a 3.5 metre high barrier on the west side of the Proposed Scheme, from Ch 07 + 440 to Ch 07 + 570 and from Ch 07 + 598 to 07 + 635. The locations of these barriers are shown in Figure 13.4a in Volume 4 of this EIS.

With this mitigation measure in place, the predicted result for the year 2028 Do Something scenario is 60dB L_{den}. Condition (a) of the criteria for mitigation is no longer satisfied, and therefore the mitigated noise level satisfies the adopted criteria.

Locations R075 and R077a

The proposed mitigation measure for these locations consists of a 2.5 metre high barrier on the east side of the Proposed Scheme, from Ch 19 + 354 to Ch 19 + 670, plus a low-noise road surface from Ch 18 + 940 to Ch 20 + 400. The location of the barrier is shown in Figure 13.4c in Volume 4 of this EIS.

With this mitigation measure in place, the predicted result for the year 2028 Do Something scenario is 58dB L_{den} at R075 and 57dB L_{den} at R077a. Condition (a) of the criteria for mitigation is no longer satisfied, and therefore the mitigated noise levels satisfy the adopted criteria.

Location R076

The proposed mitigation measure for Location R076 consists of a 3.0 metre high barrier on the west side of the Proposed Scheme, from Ch 19 + 460 to Ch 19 + 675 and from Ch 19 + 700 to Ch 19 + 830 plus a low-noise road surface from Ch 18 + 940 to Ch 20 + 410. The locations of these barriers are shown in Figure 13.4c in Volume 4 of this EIS.

With this mitigation measure in place, the predicted result for the year 2028 Do Something scenario is 58dB L_{den}. Condition (a) of the criteria for mitigation is no longer satisfied, and therefore the mitigated noise level satisfies the adopted criteria.

Location R078

The proposed mitigation measure for Location R078 consists of a 3.5 metre high barrier on the east side of the Proposed Scheme, from Ch 18 + 685 to Ch 19 + 840 plus a low-noise road surface from Ch 18 + 940 to Ch 20 + 410. The location of this barrier is shown in Figure 13.4c in Volume 4 of this EIS.

With this mitigation measure in place, the predicted result for the year 2028 Do Something scenario is 60dB L_{den}. Condition (a) of the criteria for mitigation is no longer satisfied, and therefore the mitigated noise level satisfies the adopted criteria.

Location R081b

The proposed mitigation measure for Location R081b consists of a 3.0 metre high barrier on the west side of the Proposed Scheme, from Ch 20 + 370 to Ch 20 + 610. The location of this barrier is shown in Figure 13.4d in Volume 4 of this EIS.

With this mitigation measure in place, the predicted result for the year 2028 Do Something scenario is 60dB L_{den}. Condition (a) of the criteria for mitigation is no longer satisfied, and therefore the mitigated noise level satisfies the adopted criteria.

Location R089

The proposed mitigation measure for Location R089 consists of a 2.0 metre high barrier on the east side of the Proposed Scheme, from Ch 21 + 005 to Ch 21 + 080. The location of this barrier is shown in Figure 13.4d in Volume 4 of this EIS.

With this mitigation measure in place, the predicted result for the year 2028 Do Something scenario is 60dB L_{den}. Condition (a) of the criteria for mitigation oals is no longer satisfied, and therefore the mitigated noise level satisfies the adopted criteria.

Locations R092a and R092b

The proposed mitigation measure for these locations consists of a 2.5 metre high barrier on the east side of the Proposed Scheme, from Ch 22 + 160 to Ch 22 + 310 and from Ch 22 + 335 to 22 + 460. The locations of these barriers are shown in Figure 13.4e in Volume 4 of this EIS.

With this mitigation measure in place, the predicted result for the year 2028 Do Something scenario is 60dB L_{den} at both locations. Condition (a) of the criteria for mitigation is no longer satisfied, and therefore the mitigated noise levels satisfy the adopted criteria.

Location R109

The proposed mitigation measure for Location R109 consists of a 2.5 metre high barrier on the east side of the Proposed Scheme, from Ch 25 + 140 to Ch 25 + 370. The location of this barrier is shown in Figure 13.4f in Volume 4 of this EIS.

With this mitigation measure in place, the predicted result for the year 2028 Do Something scenario is 60dB L_{den}. Condition (a) of the criteria for mitigation is no longer satisfied, and therefore the mitigated noise level satisfies the adopted criteria.

Location R115

The proposed mitigation measure for Location R115 consists of a 3.5 metre high barrier on the east side of the Proposed Scheme, from Ch 26 + 480 to Ch 26 + 850. The location of this barrier is shown in Figure 13.4g in Volume 4 of this EIS.

With this mitigation measure in place, the predicted result for the year 2028 Do Something scenario is 60dB L_{den}. Condition (a) of the criteria for mitigation is no longer satisfied, and therefore the mitigated noise level satisfies the adopted criteria.

Location R123a and R123b

The proposed mitigation measure for these locations consists of a 3.5 metre high barrier on the east side of the Proposed Scheme, from Ch 27 + 710 to Ch 27 + 825 plus a low-noise road surface from Ch 27 + 685 to the roundabout on the existing N11. The location of the barrier is shown in Figure 13.4h in Volume 4 of this EIS.

With this mitigation measure in place, the predicted result for the year 2028 Do Something scenario is 60dB L_{den} at R123a and 59dB L_{den} at R123b. Condition (a) of the criteria for mitigation are no longer satisfied, and therefore the mitigated noise levels satisfy the adopted criteria.

Locations R125a and R125b

The proposed mitigation measure for Location R125a and R125b consists of a 3.0 metre high barrier on the west side of the Proposed Scheme, from Ch 27 + 840 to the roundabout on the existing N11, plus a low-noise road surface from Ch 27 + 685 to the roundabout on the existing N11. The location of this barrier is shown in Figure 13.4h in Volume 4 of this EIS.

With this mitigation measure in place, the predicted result for the year 2028 Do Something scenario is 59dB L_{den} at R123a and 63dB L_{den} at R123b. Conditions (a) and (b) of the criteria for

mitigation are no longer satisfied, and therefore the mitigated noise levels satisfy the adopted criteria.

Location R126b

The proposed mitigation measure for Location R126b consists of a 2.0 metre high barrier from the southern end of the tie in on the existing N11 to point 130m to the north. The location of this barrier is shown in Figure 13.4h in Volume 4 of this EIS.

With this mitigation measure in place, the predicted result for the year 2028 Do Something scenario is 67dB L_{den}. Condition (b) of the criteria for mitigation is no longer satisfied, and therefore the mitigated noise levels satisfy the adopted criteria.

In summary, noise levels with the mitigation measures in place are presented in Table 13.26 below.

Table 13.26 Predicted noise levels at receiver locations, with the mitigation measures in place

Receiver Location Reference	Opening Year 2013		Mitigation Required?	Design Year 2028		Mitigation Required?
	Predicted Noise Level			Predicted Noise Level		
	Do Minimum	Do Something		Do Minimum	Do Something	
	L_{den}	L_{den}		L_{den}	L_{den}	
R001	57	58	No	58	59	No
R002	61	61	No	62	62	No
R003	53	52	No	54	53	No
R004	55	54	No	56	55	No
R005a	58	56	No	59	57	No
R005b	62	59	No	63	60	No
R006	47	54	No	48	55	No
R007a	44	58	No	44	59	No
R007b	46	57	No	47	58	No
R008	43	54	No	44	55	No
R009	43	56	No	44	57	No
R010	40	56	No	41	57	No
R011	40	55	No	41	55	No
R012	39	53	No	40	54	No
R013	40	53	No	40	54	No
R014	39	53	No	39	53	No
R015	43	57	No	44	57	No
R016a	–	52	No	–	53	No
R016b	40	55	No	41	56	No
R016c	40	56	No	40	57	No
R017	40	55	No	40	56	No
R018	–	52	No	–	53	No
R019	32	47	No	33	47	No
R020	–	56	No	–	57	No
R021	–	53	No	–	54	No
R022	–	52	No	–	53	No

Table 13.26 Predicted noise levels at receiver locations, with the mitigation measures in place

Receiver Location Reference	Opening Year 2013		Mitigation Required?	Design Year 2028		Mitigation Required?
	Predicted Noise Level			Predicted Noise Level		
	Do Minimum	Do Something		Do Minimum	Do Something	
	L_{den}	L_{den}		L_{den}	L_{den}	
R023	–	54	No	–	55	No
R024	–	59	No	–	60	No
R025	–	55	No	–	55	No
R026	–	52	No	–	53	No
R027	–	58	No	–	59	No
R028	–	54	No	–	55	No
R029	–	55	No	–	56	No
R030	–	57	No	–	58	No
R031	–	57	No	–	58	No
R032	–	55	No	–	56	No
R033	–	56	No	–	57	No
R034	–	55	No	–	56	No
R035	–	57	No	–	58	No
R036a	–	59	No	–	60	No
R036b	–	59	No	–	60	No
R036c	–	53	No	–	54	No
R037	–	59	No	–	59	No
R038	–	58	No	–	59	No
R039	–	56	No	–	56	No
R040	–	55	No	–	56	No
R041a	–	52	No	–	53	No
R041b	–	58	No	–	59	No
R042	–	50	No	–	51	No
R043	–	52	No	–	53	No
R044	–	56	No	–	56	No
R045	–	56	No	–	57	No
R046	–	58	No	–	59	No
R047	–	58	No	–	59	No
R048	–	59	No	–	60	No
R049	–	56	No	–	57	No
R050	–	55	No	–	56	No
R051	–	53	No	–	54	No
R052	–	55	No	–	56	No
R053	–	55	No	–	56	No
R054	–	55	No	–	56	No
R055	–	55	No	–	56	No
R056	–	54	No	–	55	No
R057	–	55	No	–	56	No
R058	–	55	No	–	56	No
R059	–	55	No	–	56	No
R060	–	55	No	–	55	No
R061	–	55	No	–	56	No
R062	–	59	No	–	60	No
R063	–	56	No	–	57	No
R064a	–	57	No	–	58	No

Table 13.26 Predicted noise levels at receiver locations, with the mitigation measures in place

Receiver Location Reference	Opening Year 2013		Mitigation Required?	Design Year 2028		Mitigation Required?
	Predicted Noise Level			Predicted Noise Level		
	Do Minimum	Do Something		Do Minimum	Do Something	
	L_{den}	L_{den}		L_{den}	L_{den}	
R064b	–	58	No	–	58	No
R065	–	55	No	–	56	No
R066	–	55	No	–	56	No
R067	–	56	No	–	57	No
R068	–	53	No	–	54	No
R069	–	54	No	–	55	No
R070	34	53	No	34	54	No
R071	32	58	No	33	59	No
R072	33	57	No	34	58	No
R073	35	57	No	36	58	No
R074	33	57	No	33	58	No
R075	35	57	No	36	58	No
R076	31	57	No	31	58	No
R077a	35	56	No	35	57	No
R077b	35	54	No	35	55	No
R078	36	59	No	37	60	No
R079	38	55	No	38	56	No
R080a	34	55	No	35	56	No
R080b	34	54	No	34	55	No
R080c	34	53	No	34	54	No
R080d	34	53	No	34	54	No
R081a	35	51	No	36	52	No
R081b	37	59	No	38	60	No
R082	36	51	No	36	52	No
R083	36	50	No	36	51	No
R084	38	50	No	39	51	No
R085	41	52	No	41	53	No
R086	42	52	No	42	53	No
R087	44	53	No	44	54	No
R088	39	56	No	39	57	No
R089	57	59	No	57	60	No
R090	46	55	No	46	56	No
R091	67	67	No	68	68	No
R092a	38	59	No	38	60	No
R092b	32	60	No	33	60	No
R093	48	54	No	49	55	No
R094	36	56	No	37	57	No
R095	31	58	No	32	58	No
R096	32	57	No	32	58	No
R097	31	55	No	32	56	No
R098	31	55	No	32	56	No
R099	31	55	No	32	56	No
R100	37	54	No	38	55	No
R101	29	56	No	30	57	No
R102	33	59	No	34	60	No

Table 13.26 Predicted noise levels at receiver locations, with the mitigation measures in place

Receiver Location Reference	Opening Year 2013		Mitigation Required?	Design Year 2028		Mitigation Required?
	Predicted Noise Level			Predicted Noise Level		
	Do Minimum	Do Something		Do Minimum	Do Something	
	L_{den}	L_{den}		L_{den}	L_{den}	
R103	32	53	No	32	54	No
R104	28	59	No	29	60	No
R105a	–	52	No	–	53	No
R105b	–	57	No	–	58	No
R106	–	52	No	–	52	No
R107	–	59	No	–	60	No
R108	–	56	No	–	57	No
R109	–	59	No	–	60	No
R110	38	59	No	39	60	No
R111	41	56	No	42	57	No
R112	39	51	No	39	52	No
R113	39	56	No	40	57	No
R114	38	52	No	39	53	No
R115	42	60	No	43	60	No
R116	45	60	No	46	61	No
R117	44	58	No	44	59	No
R118	47	54	No	48	55	No
R119	46	56	No	47	57	No
R120	46	57	No	47	58	No
R121	55	55	No	56	56	No
R122a	53	54	No	54	55	No
R122b	50	56	No	51	57	No
R123a	53	59	No	54	60	No
R123b	54	58	No	55	59	No
R124	53	58	No	54	59	No
R125a	57	58	No	58	59	No
R125b	63	62	No	63	63	No
R126a	61	61	No	62	62	No
R126b	66	66	No	67	67	No
R127	52	53	No	52	54	No

N80 Link Road

No mitigation measure applies to this section of the Proposed Scheme in respect of noise.

N30 Link Road

Location R175

The proposed mitigation measure for Location R175 consists of a 2.0 metre high barrier on the north side of the local road re-alignment for the scheme. The location of this barrier is shown in Figure 13.4i in Volume 4 of this EIS.

With this mitigation measure in place, the predicted result for the year 2028 Do Something scenario is 61dB L_{den}. Condition (b) of the criteria for mitigation is no longer satisfied, and therefore the mitigated noise level satisfies the adopted criteria.

Location R188a

The proposed mitigation measure for Location R188 consists of a 2.0 metre high barrier on the east side of the Proposed Scheme, from Ch 06 + 150 to Ch 06 + 340. The location of this barrier is shown in Figure 13.4j in Volume 4 of this EIS.

With this mitigation measure in place, the predicted result for the year 2028 Do Something scenario is 58dB L_{den}. Condition (a) of the criteria for mitigation is no longer satisfied, and therefore the mitigated noise level satisfies the adopted criteria.

Table 13.27 Predicted noise levels at receiver locations, with the mitigation measures in place

Receiver Location Reference	Opening Year 2013		Mitigation Required?	Design Year 2028		Mitigation Required?
	Predicted Noise Level			Predicted Noise Level		
	Do Minimum	Do Something		Do Minimum	Do Something	
	L_{den}	L_{den}		L_{den}	L_{den}	
R149	49	51	No	50	52	No
R150	46	50	No	47	51	No
R151	50	52	No	50	53	No
R152	45	55	No	46	56	No
R153	45	55	No	45	55	No
R154	45	52	No	46	53	No
R155	45	51	No	46	52	No
R156	36	48	No	37	49	No
R157	36	48	No	36	49	No
R158	39	56	No	39	57	No
R159	40	46	No	41	47	No
R160	38	51	No	39	52	No
R161	38	52	No	38	52	No
R162	38	52	No	38	53	No
R163	38	52	No	38	53	No
R164	37	56	No	38	57	No
R165	33	54	No	34	55	No
R166	32	52	No	33	53	No
R167a	34	51	No	35	52	No
R167b	34	51	No	35	52	No
R167c	34	49	No	35	50	No
R168	35	54	No	35	55	No
R169	37	47	No	38	48	No
R170	39	49	No	40	50	No
R171	38	51	No	38	52	No
R172	40	51	No	41	52	No
R173	42	53	No	43	54	No

Table 13.27 Predicted noise levels at receiver locations, with the mitigation measures in place

Receiver Location Reference	Opening Year 2013		Mitigation Required?	Design Year 2028		Mitigation Required?
	Predicted Noise Level			Predicted Noise Level		
	Do Minimum	Do Something		Do Minimum	Do Something	
	L_{den}	L_{den}		L_{den}	L_{den}	
R174	57	57	No	58	58	No
R175	62	60	No	63	61	No
R176a	59	58	No	60	59	No
R176b	62	57	No	63	58	No
R177a	67	67	No	68	68	No
R177b	63	64	No	64	64	No
R178	67	66	No	68	67	No
R179	64	63	No	65	64	No
R180	60	60	No	61	61	No
R181	64	64	No	65	65	No
R182	71	71	No	72	72	No
R183	68	68	No	69	69	No
R184	62	62	No	63	63	No
R185	61	61	No	62	62	No
R186	63	63	No	64	64	No
R187a	46	52	No	46	53	No
R187b	48	52	No	49	53	No
R188a	33	57	No	34	58	No
R188b	35	49	No	36	51	No
R188c	34	48	No	35	49	No
R189	34	56	No	35	57	No
R190	36	49	No	37	50	No
R191	38	47	No	39	48	No
R192	40	48	No	41	49	No
R193	38	48	No	39	49	No
R194a	40	56	No	41	58	No
R194b	43	53	No	43	54	No
R195	47	48	No	47	48	No
R196	52	52	No	52	53	No
R197	48	51	No	49	52	No
R198	52	54	No	53	55	No
R199	64	61	No	65	62	No
R200	59	56	No	60	57	No

13.6 RESIDUAL IMPACTS OF THE PROPOSED SCHEME

13.6.1 Construction Phase

During the construction phase of the Proposed Scheme there will be some small impact on nearby residential properties due to noise emissions from site traffic and other activities. The application of binding noise limits and hours of operation, along with implementation of appropriate noise control measures, will ensure that noise impact is kept to a minimum.

13.6.2 Operation Phase

There are a number of locations highlighted in this chapter where the Proposed Scheme meets all of the three conditions that must be satisfied before noise mitigation measures are deemed necessary. In these instances, mitigation measures have been specified. Once mitigation measures have been assessed all locations comply with the adopted criterion.

It may be concluded that the Proposed Scheme complies with the appropriate guidance in relation to noise, hence the associated impact is considered acceptable.

13.7 MONITORING

No monitoring is required.

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14 LANDSCAPE AND VISUAL IMPACT ASSESSMENT

14.1 INTRODUCTION

For the purpose of this assessment of the landscape and visual impact of the M11 Gorey to Enniscorthy Scheme, Landscape impact may be defined as changes in the physical landscape, which may give rise to changes in its character and how it is experienced. Visual impact comprises the change in the composition of available views from dwellings and public areas resulting from the Proposed Scheme.

14.2 METHODOLOGY

Landscape and visual impact assessments were carried out based on methods described in the following publications:-

- Environmental Protection Agency (EPA) publications: *Guidelines on the Information to be Contained in an Environmental Impact Statement* (March 2002) and the accompanying *Advice Notes on Current Practice* (September 2003);
- *Guidelines for Landscape and Visual Impact Assessment* (2002), published by the Landscape Institute (UK) and the Institute of Environmental Management & Assessment (UK);
- Highways Agency (UK) *Design Manual for Roads and Bridges* (as amended 2005);
- Department for Transport (UK) *The Landscape Sub-Objective (Transport Analysis Guidance) TAG Unit 3.3.7 (December 2004)*;
- National Roads Authority *A Guide to Landscape Treatments for National Road Schemes in Ireland (2005);*

This assessment takes into account the mitigation and enhancement proposals recommended for inclusion within the Proposed Scheme. The study area used for the landscape and visual impact assessment is based on the estimated visual envelope of the Proposed Scheme- that is to say. the area from which any part of the Proposed Scheme is likely to be visible. As a guide the visual envelope is often within 500m of a proposed road corridor however local variation in topography and vegetation cover can increase or reduce the visibility of the proposals beyond or below the 500m distance.

14.2.1 Landscape Character and Impact Assessment

The assessment of the impact on landscape considers the effect of the Proposed Scheme on attributes of landscape character as defined in Transport Analysis Guidance UK (TAG) work sheets (Highways Agency UK, 2004), outlined in Table 1 within Appendix 14.1 in Volume 3 of this EIS These attributes are defined as:

Pattern - the expression of the relationship between topography and form, elevation and degree of enclosure and scale;

Tranquillity - the remoteness and sense of isolation, or lack of it, within the landscape;

Cultural - how landscape elements of an historic or traditional nature contribute to character;

Landcover – how the way in which the land is farmed or managed contributes to character.

TAG Unit 3.3.7 Worksheet 1 sets out the structure for considering these aspects. Completed worksheets for this assessment are presented in Tables 2 to 9 within Appendix 14.1 in Volume 3 of this EIS. For each of the above attributes, the value is described in the table in terms of the scale at which it matters, its rarity, importance and substitutability. The impact on the attribute is then summarised and any recommendations for further mitigation set out.

The landscape character assessments used as the baseline of this impact assessment are taken from:-The Wexford County Development Plan 2007-2013, Landscape Character Assessment. This county level assessment is used as the baseline to describe the character of the general study area. Landscape Management objectives are described for each character area at a county level. The degree to which the proposals comply with these strategies has been taken into consideration when assessing the impact on landscape. Further mitigation is recommended to support landscape management strategies in these guidelines.

The assessment of landscape impact is based on the division of character areas derived from the county landscape character assessment. For each character area, the impact is assessed in terms of the effect on key features, taking into consideration the capacity of the landscape to accommodate the type of change generated by the Proposed Scheme. The landscape character areas and study area are indicated on Landscape Character Areas Figure 14.1 in Volume 4 of this EIS.

14.2.1.1 Landscape quality

The baseline description of landscape character in this chapter of the EIS concludes with an assessment of existing landscape quality based upon the guidelines given in the Highways Agency (UK) *Design Manual for Roads and Bridges*. The assessment judges the existing landscape against the criteria set out in Table 14.1. Assessment of quality, like landscape character descriptions, are based on subjective judgement. However, in determining the quality of the existing landscape, the following aspects have been considered:- the condition of the key features identified in the landscape character descriptions; and the value as set out in the TAG Worksheets (see Appendix 14.1 in Volume 3 of this EIS).

Table 14.1 Criteria for Assessing Landscape Quality

Landscape Value	Criteria
Grade 1 Highest quality landscape	Includes the most aesthetically attractive and often remote landscape. Areas of particular natural beauty received as special in a regional or national context. Nationally designated land such as National Parks may be present.
Grade 2 Very attractive landscape	Areas including historic and designed landscape. Diverse, semi-natural or farmed landscape with unusual features. Normally abundant woodland cover together with a high distribution of trees, hedgerows and shrubs. Streams and other naturalised unpolluted water corridors may be present. Local landscape designations may apply, including Architectural Conservation Areas and some historical or cultural sites may be present.
Grade 3 Good quality landscape	Countryside with some variety in farmland cover. Settlements and villages with pockets of open space and public recreation areas. There is reasonable distribution of semi-natural vegetation, trees and shrubs cover and the overall view of the area is pleasant. Local nature reserves and listed monuments may be present.
Grade 4 Ordinary quality landscape	Typical open agricultural land where attractive features are offset by detractors. Some strategic planning is evident but development is primarily functional including housing estates, business parks of urban fringe land uses. Not particularly aesthetically attractive, but with more value than a poor quality landscape. Land may have local landscape designation.
Grade 5 Poor quality landscape	Includes detractors such as power lines, industrial, derelict or inappropriate built forms with no aesthetic value or evidence of strategic planning. There is a lack of mature vegetation cover and no landscape designations apply. Intensively farmed landscape, which has lost most of its natural features.
Parkland	Historic or remnant parkland.

14.2.1.2 Significance Criteria

The effect of the Proposed Scheme on the individual character areas is considered in the context of local landscape quality to derive an overall impact score for the Proposed Scheme in accordance with the TAG criteria; these are set out in Table 1 (see Appendix 14.1 in Volume 3 of this EIS). The seven point scale used to judge is Slight, Moderate or Large Beneficial or Adverse plus Neutral as set out in TAG.

14.2.2 Visual impact assessment method

The visual impact assessment was carried out in two phases. The southern section of the M11/N11 Mainline and the N80 Link Road were assessed in August 2008 when all deciduous vegetation was in leaf, which contributes to screening during the summer months. This limited the ability of the worst case to be considered. The northern section of the M11/ Mainline and the

N30 Mainline were assessed in November 2008 when deciduous vegetation was at various stages of loosing its leaves. This enabled a better prediction of maximum intervisibility between visual receptors and the Proposed Scheme. In both instances, on site assessment was cross checked and verified with the aide of aerial photography, survey information and topographical mapping. The impact of the Proposed Scheme was examined for both Opening Year (pre-establishment of mitigation planting 2013) and Design Year (post-establishment of mitigation planting 2028) for the following receptors:-

- Dwellings and public buildings (the assessment of views from buildings includes the immediate curtilage and garden);
- Commercial premises;
- Archaeological sites and protected structures.

The following aspects of the Proposed Scheme were considered in the assessment of visual impact:-

- the relationship of the Proposed Scheme with the existing geographical location and arrangement and scale;
- lighting;
- overbridges;
- traffic on the Proposed Scheme (height of 4m above the road represents the tops of HGVs);
- loss of trees, other vegetation and buildings, where these stand between the observer and the Proposed Scheme;
- earth mounding and re-graded landform;
- environmental barriers;
- proposed balancing ponds;
- proposed planting (at Opening Year 2013 and Design Year 2028).

The site survey was undertaken by walking as close as possible to the centrelines of the proposed national routes and noting visible buildings and gardens within views of the Proposed Scheme and taking into account the features listed above.

Features acting as significant visual barriers between receptors and the Proposed Scheme were recorded and illustrated on plans. These features include;

- tree belts;
- woodland;
- hedgerows;

- intervening buildings or structures;
- cuttings and embankments.

For each receptor identified in both the Opening Year (pre-establishment of mitigation planting) 2013 and Design Year (post-establishment of mitigation planting) scenarios, the impact score 2028 was recorded in the Visual Impact Schedule set out at Tables 1 and 2 (see Appendix 14.2 in Volume 3 of this EIS). The UK DMRB Volume 11 Section 3 categorises the visual changes according to the following scale:

Table 14.2 Criteria for Assessing Visual Impact

Substantial Adverse Or Beneficial Impact	Where the posed scheme would cause a significant deterioration or improvement in the existing view.
Moderate Adverse Or Beneficial Impact	Where the proposed scheme would cause a noticeable deterioration or improvement in the existing view.
Slight Adverse Or Beneficial Impact	Where the proposed scheme would cause a barely perceptible deterioration or improvement in the existing view.
No Change Or Neutral	No discernible deterioration or improvement in the existing view.

Where properties were identified as having views of the Proposed Scheme, the degree of visual impact determined was influenced by three main factors:- the effect of distance; the provision of screen planting and the vertical alignment.

In some instances, where properties would have views toward the Proposed Scheme, these factors reduce the effect sufficiently for a neutral impact to be recorded. Neutral impacts were also applied where the change in view would comprise evenly balanced positive and negative effects.

Consideration was also given to the effect of lighting on view, and comments on the proposed lighting to be included within the Proposed Scheme, as identified during the preliminary design phase, is included in the narrative at scheme description including mitigation section.

An overall visual impact score was determined for the Proposed Scheme by considering the balance of impacts on all receptors in both Opening and Design Years.

14.2.3 Consultation

No consultation outside the design team was undertaken.

14.2.4 Data Deficiencies / Difficulties with Producing the Impact Assessment

There were no major difficulties or data deficiencies encountered in the production of this assessment.

14.3 RECEIVING ENVIRONMENT

14.3.1 Landscape Planning Context

The Proposed Scheme falls within Wexford County Council administrative area. The following paragraphs summarise landscape planning policy relevant to the Proposed Scheme.

Wexford County Development Plan 2007 -2013

Policy L1, *'proposed developments should reflect the guidance contained in the Landscape Character Assessment and seek to minimise the visual impact.*'

Policy NH 1, *'The Council shall encourage the conservation and maintenance of features important to local landscapes including trees, hedgerows, stone walls, woodlands, ponds, stream and wetlands.'*

Policy NH 6, *'The Council shall resist development proposals which would result in the loss of trees which make a valuable contribution to the character of landscape.'*

14.3.2 Landscape Character Baseline

The information gathered concerning existing landscape character assessments is set out in Section 14.3.5 below. Character Areas have been described at a county scale by Wexford County Council within the Wexford Landscape Character Assessment. Elements contributing to landscape character are described in Section 14.3.3 below and are illustrated at photographs 1 to 12 that follow the descriptive text in this chapter of the EIS.

14.3.3 Summary of Landscape Character

M11/N11 Mainline

The M11/N11 Mainline connects to the existing N11 in Clogh in the north, continues southwards to a commences at the proposed grade separated Frankfort Junction and then bears southwest climbing through elevated land on the lower slopes of Carrigroe Hill. From the elevated land along the base of Carrigroe Hill there are long distant views out over the wider lowland landscape below and long distant views east to the Blackstairs Mountains. West of Carrigroe Hill the M11 Mainline continues sidelong as it descends through sloping land. Southwest of Carrigroe Hill the M11 Mainline continues along the bottom of a local valley to Crane and then continues further southwest to the proposed grade separated Ballydawmore Junction. From Ballydawmore the M11 Mainline passes through the gently sloping to undulating landscape, the combination of

woodland and sloping valley topography contain views. The M11 Mainline emerges from the undulating landscape at Tomnafunshoge, where there is the proposed grade separated Tomnafunshoge Junction, from where it passes generally flat land towards Cooladine. South of Cooladine the landform rises towards Knockrathkyle from where it then slopes and sweeps across wide open arable fields to Glentiege. The combination of large scale open arable fields and elevation gives the landscape a vast open feeling accentuated by long distant views to higher ground to the south and east of County Wexford and to Vinegar Hill. South of Glentige the M11/N11 Mainline passes though strongly undulating lowland to where it reconnects with the existing N11 at the proposed at grade Scurlocksbush Roundabout.

N80 Link Road

The N80 Link Road commences at the proposed at grade Clavass Junction and then travels on higher ground through Ballynahallin. The N80 Link Road crosses the River Slaney and Wexford to Dublin railway at Ballynabarney and then ascends gently on the eastern valley side of the River Slaney towards the proposed grade separated Ballydawmore Junction.

N30 Mainline

The N30 Mainline commences at the proposed at grade Clavass Junction, passes though sloping lowland north of Enniscorthy and then travels through more strongly undulating lowland to the west of Enniscorthy. West of the N30 Mainline the land rises towards the Blackstairs Mountains. There are long distance views back towards the Slaney Valley, Enniscorthy town and Vinegar Hill to the east.

General to the Proposed Scheme

The agricultural fields within the entire study area are generally medium to large in scale and occasionally small, and are enclosed by hedgerows which are either low or in places overgrown and punctuated with numerous mature trees. These hedgerows in combination with belts and blocks of large areas of woodland give localised sense of enclosure within the landscape. Other significant features within the landscape include; the existing N11, the Dublin to Wexford railway line, electricity pylons and numerous one-off housing and (often large) farm outbuildings within the rural areas. Outside of the existing N11 corridor and Enniscorthy, Camolin and Ferns, the majority of the landscape within the study area is tranquil and is perceived as peaceful.

Land use is predominately agriculture, both arable and pastoral. Commercial use is present at Enniscorthy and within settlements at Camolin, Ferns and along the existing N11 corridor (refer to Chapter 5 Socio-Economic of this EIS for details. Nature conservation interest includes riparian habitat along the River Slaney, field ponds, areas of woodland, pasture and hedgerows (refer to Chapter 9 Ecology of this EIS for details. Elements of historic character include numerous historic buildings and structures within the environs of Enniscorthy and the 1798 battlefield at and around Vinegar Hill (refer to Chapter 15 Archaeology, Cultural and Architectural

Heritage of this EIS for details. A dramatic backdrop to the study area is provided by the Backstairs Mountains to the west, by Carrigroe Hill and Oulart Hill to the east and Vinegar Hill. Long distance views to these features from within the study area lend a sense of wide scale to the landscape.

Photograph 1: *View from existing N11 Clogh roundabout looking southwest towards Carrigroe Hill.*

Photograph 2: *View looking west over Proposed Scheme M11/N11 Mainline corridor from higher ground at the base of Carrigroe Hill, note the long distant views to Blackstairs mountains in the distance.*

Photograph 3: *View looking east to Carrigroe Hill from Kilcaysan. Proposed M11/N11 Mainline route will cross in the centre of this view.*

Photograph 4: *View across a locally enclosed valley landscape from Ballydonigann, P Scheme M11/N11 Mainline route travels along the bottom of this local valley.*

Photograph 5: *Pasture and woodland close to the River Slaney.*

Photograph 6: *Undulating pasture close to the existing Ballinanbarny Bridge and within the River Slaney Valley.*

Photograph 7: *Large arable field and mixed woodland at Cooladine.*

Photograph 8: *View looking north to Vinegar Hill from arable field at Knockrathkyle.*

Photograph 9: *Vast and open scale landscape south of Knockrathkyle, note the long distance views to higher lands in background of view.*

Photograph 10: *View to north west from just south of existing N11/N80 junction. Houses visible on local road that runs along western side of the valley with higher ground and typical large fields at Coolnahorna visible on skyline.*

Photograph 11*: Pasture and arable fields on sloping land at Coolnahorna. The commercial warehouse building in middle background of this view is adjacent to the existing N11 north of Enniscorthy.*

Photograph 12: *View looking south east from Killalligan towards Enniscorthy and Vinegar Hill.*

Photograph 13: *Undulating pasture and arable land at Bessmount.*

14.3.4 Landscape Quality Assessment

The study area contains predominately positive landscape elements. Those elements contributing to character include the undulating topography, the backdrop of surrounding high ground to the west, east and south, agricultural lands, field boundaries, blocks and lines of woodland, hedgerow trees, rivers and streams and the perception of tranquilly. Areas of residential and commercial ribbon development on the outskirts of Enniscorthy and along sections of local roads are the only significant detractors from the visual quality of this landscape. Evidence of quarrying also detracts from landscape quality but these activities are screened by vegetation. The lands within the study area are largely taken up by agricultural grassland, tilled land and arable land that are not identified as having high ecological value, but that contribute to the overall countryside character.

Overall the combination of features suggests a **Grade 2- very attractive landscape** that would be moderate to very sensitive to development. The very sensitive areas would include; the River Slaney Valley, areas of woodland and mature trees (as tree rows or within hedgerows), open areas on elevated ground, minor rivers and stream valleys and Vinegar Hill. The undulating topography, existing mature trees and hedgerows which can foreshorten views within the study area gives it capacity to absorb the Proposed Scheme subject to appropriate design and mitigation (as discussed in Section 14.5 of this Chapter of the EIS).

14.3.5 Wexford County Landscape Character Areas

The Wexford County Development Plan 2007-2013, Landscape Character Assessment divides the County into character areas on the basis of distinctive landscape character, and identifies policy objectives for the landscape management of these character areas. The Proposed Scheme is located within two character areas; Policy Area 1 – Uplands and Policy Area 2 – Lowlands. The Lowland Area (as it relates to the Proposed Scheme) is further divided into Policy Area 2 – Lowlands and Policy Area 2 - Slaney Valley. The key characteristics and policy objectives of the above areas relevant to the Proposed Scheme are summarised below.

14.3.5.1 Uplands Character Area

The part of the Uplands character area within the study area is at the transition between lowland and upland areas and therefore has many characteristics similar to lowland. The following part of the description for Uplands within the landscape character assessment is applicable.

> *"Transitional upland areas are those located between lowland and upland areas. They contain relatively large fields with low hedges and scattered smaller trees. The land is mostly used for stock rearing or some mixed agricultural use. Coniferous forestry, some deciduous forestry and some transitional woodland on steep slopes can be found within these areas. The*

transition between the two character areas may be mostly classified normal to robust, although sensitive at specific locations."

The above characteristics are well represented within the relevant part of the study area with the following exceptions:

Land use is a combination of pasture and arable. The elevation of the area above sea level varies from approximately 21.0m AOD to 62.0m AOD which is characteristic of lowland and explains that it is a transitional area adjacent to lowlands. The topography is generally undulating, further to the west of the study area the ground starts to rise steeply towards the Backstairs Mountains. There are large blocks of woodland associated with rivers and streams. There are long distance views back towards Vinegar Hill; fields are medium to large in scale.

The Wexford County Development Plan 2007 Character Assessment includes the following Policy Objectives of relevance to the proposals;

- Encourage development that will not have a disproportionate visual impact (due to excessive bulk, scale or inappropriate siting) and will not significantly interfere or detract from scenic upland vistas, when viewed from areas of the public realm.

14.3.5.2 Lowlands Character Area

The lowlands character area within the study area is divided into two sub-areas, Policy Area 2 - Slaney Valley and Policy Area 2 - Lowlands (see below). The Wexford County Development Plan 2007-2013, Landscape Character Assessment describes the area and sub-areas as follows;

"*The Lowlands Character Area contains predominately fertile lands with high levels of population and intensive land management (agriculture). The slope and topography in the area occurs in a shallow/ gradual transition. Agricultural lands tend to be characterised by extensive views across large fields as a result of the generally low trimmed hedges. This character unit may be generally classified as robust to normal; however sensitive areas or landscape factors can be found at specific locations*."

<u>Sub-Areas</u>

Slaney Valley

The Slaney River is one of two (the other being the Barrow River) highly scenic major river corridors that transect the lowlands of the County.

"…*the Slaney is the most exceptional on account of its extent, its centrality to the county and its unspoilt character. This is another area where vigilance will be required when evaluating planning applications*."

The area of Slaney Valley landscape within the study area agrees with the above description in that it is highly scenic due to a combination of farmland, woodland, pasture and rolling topography. The area is also tranquil and appears predominantly natural with a dominant rural countryside character. The visual envelope of the Slaney Valley extends outside of its character area in that the ridgeline of the eastern and western sides of this wider valley are within the Policy Area 6 Character Area. These ridgelines define the visual limit of the valley when viewed from the valley floor and contribute to the high scenic character.

Policy Area 2:

The description quoted above in regard to the Lowlands Character Area in general applies to Policy Area 2. The characteristics as described occur within the parts of Policy Area 2 within the study area. Although the landscape is intensively farmed, undulating topography, field boundaries and mature trees and woodland give the landscape an attractive appearance. Furthermore, the landscape of this area distanced from urban settlements is in good condition, is tranquil and appears generally unspoilt.

The Wexford County Development Plan 2007 Character Assessment includes the following Policy Objectives for lowland areas of relevance to the Proposed Scheme;

- Recognise that these areas are made up of a variety of working landscapes and contain the vast proportion of the County's population within principle towns and on rural holdings. These also incorporate all of the major national primary and regional roads, and railways;
- Continue to permit development that can utilise existing infrastructure, whilst taking account of absorption opportunities provided by the landscape and prevailing vegetation;
- Encourage development that will not unduly result in detrimental impacts on the landscape at a local or micro level as viewed from areas of the public realm;
- Consider development on steeps slopes, ensuring that it will not have a disproportionate or dominating visual impact on the surrounding environment as seen from areas of the public realm;
- Continue to facilitate appropriate development in a progressive manner that respects the scale, character and sensitivities of the landscape;
- Recognise that in this low lying open environment, tall and bulky development sometimes can have a disproportionate impact against the landscape particularly when viewed from the predominately low lying areas of the public realm;
- Encourage development that will not have a disproportionate effect on the existing character of the landscape in terms of location, design and visual prominence.

14.3.6 Division of Landscape Character within the Study Area

The assessment of landscape impacts of the Proposed Scheme are based on the appropriate sections of the Wexford County Landscape Character Assessment as listed in Section 14.3.5 above (refer to Figure 14.1 in Volume 4 of this EIS). For the purposes of this EIS, Policy Area 2 has been sub-divided into six areas described in relation to the Proposed Scheme as follows:

- Policy Area 2A corresponds to the part of the area that includes the M11 Mainline corridor from Clogh to Rockspring;
- Policy Area 2B corresponds to the part of the area that includes the M11 Mainline corridor from Rockspring through to Crane;
- Policy Area 2C corresponds to the part of the area that includes the N80 Link Road corridor to the east of the River Slaney to the junction at Ballydawmore (the remaining part of the N80 Link Road is within the Slaney River Character Area) and the M11 Mainline from Crane south through to Tomnafunshogue;
- Policy Area 2D includes the M11 Mainline corridor from Tomnafunshogue to Glenteige;
- Policy Area 2E includes the M11/N11 Mainline corridor from Glenteige to Scurlocksbush;
- Policy Area 2F corresponds to the part of the character area which includes the N30 Mainline corridor from the junction at Clavass as far as Ballyorril and the southern 5 kilometres of the N30 Mainline (the remaining part of the N30 Mainline is within the Uplands Character Area).

The baseline characteristics of each area is described under the relevant Character Area above, the TAG worksheets at Tables 2-9, (see Appendix 14.1 in Volume 3 of this EIS) and summarised in Sections 14.3.6.1 - 14.3.6.8 below:

14.3.6.1 Policy Area 2A

- Broadly sloping to undulating lowland;
- Medium to large scale mixed agricultural land;
- Good quality hedgerows enclose fields in semi-regular grid pattern;
- Blocks and lines of woodland, and tree lines within hedgerows;
- Views to west of Blackstairs Mountains and east to Carrigroe Hill.

14.3.6.2 Policy Area 2B

- Locally enclosed valley;
- Medium to large scale mixed agricultural land, primarily pasture;
- Good quality hedgerows enclose fields in semi-regular grid pattern;

- Blocks and lines of woodland, and tree lines within hedgerows;
- Meandering local streams;
- Valley gives enclosure, views out mostly restricted within this valley.

14.3.6.3 Policy Area 2C

- Gently sloping valley side to east of River Slaney, undulating at local rivers and streams;
- Medium to large scale mixed agricultural land;
- Good quality hedgerows enclose fields in semi-regular grid pattern;
- Abundant blocks and lines of woodland, and tree lines within hedgerows;
- Meandering local streams and rivers and occasional field ponds;
- Views to west of wooded Slaney Valley and to Vinegar Hill.

14.3.6.4 Policy Area 2D

- Flat to broadly sloping lowland above the Slaney Valley;
- Medium, large to vast scale mixed agricultural land, primarily arable;
- Good quality hedgerows enclose fields in semi-regular grid pattern;
- Blocks and lines of woodland, and tree lines within hedgerows;
- Vast long distance views over south and east of County Wexford and to Vinegar Hill to the North.

14.3.6.5 Policy Area 2E

- Gently sloping lowland to more undulating at local stream valleys;
- Medium, large to scale mixed agricultural land, primarily pasture;
- Good quality hedgerows enclose fields in semi-regular grid pattern;
- Blocks and lines of woodland, and tree lines within hedgerows;
- Topography and vegetation gives enclosure, views out to surrounding higher ground.

14.3.6.6 Policy Area 2F

- Sloping valley side to west of River Slaney;
- Small to medium scale mixed agricultural land, primarily pasture;
- Good quality hedgerows enclose fields in semi-regular grid pattern;
- Some blocks of woodland, and tree lines within hedgerows;
- Views out to existing N11 corridor and over surrounding countryside.

14.3.6.7 Policy Area 2 - Lowlands - Slaney Valley

- Gently sloping valley side of River Slaney;
- Medium to large scale mixed agricultural land;
- Good quality hedgerows enclose fields in semi-regular grid pattern;
- Abundant blocks and lines of woodland, and tree lines within hedgerows;
- River valley gives enclosure, views out mostly restricted within this valley.

14.3.6.8 Policy Area 1 - Uplands

- Undulating and rolling upland;
- Small to large scale mixed agricultural land;
- Good quality hedgerows enclose fields in semi-regular grid pattern;
- Abundant blocks and lines of woodland, and tree lines within hedgerows;
- Meandering local streams and rivers. River Urirn corridor enclosed character due to heavy woodland and locally steep topography.
- Long distance views from higher contours to the wider landscape. Views over Enniscorthy and Vinegar Hill.

14.4 CHARACTERISTICS OF THE PROPOSED SCHEME

A detailed description of the Proposed Scheme is provided in Chapter 3 of this EIS and is briefly summarised here. The scheme comprises the construction of three new sections of road, which will form part of the National Road network, namely:-

- M11/N11 Mainline – approximately 26 km of dual motorway standard and 1 Km of standard single carriageway standard from the existing N11 at Frankfort to the existing N11 in Scurlocksbush in the south.
- N80 Link Road – approximately 4km of dual carriageway from the existing N11/N80 junction in Ballynahallin in the west to the proposed M11 Mainline at Ballydawmore in the east.
- N30 Mainline – approximately 8 km of single carriageway from the existing N11/N80 in Ballynahallin in the north to the existing N30 in Templescoby in the south.

The integration of the Proposed Scheme within the existing road network includes the retention of the existing Ballinclay Roundabout, as well as the introduction of number of new junctions and realignments to existing local roads (primarily where the Proposed Scheme crosses existing roads) as described in Chapter 3 of this EIS.

Continuity is provided as much as possible where the Proposed Scheme crosses existing side roads but some roads will need to be either permanently severed or experience temporary

diversions during construction. Continuity is maintained either by providing an overbridge over the Proposed Scheme, an underpass under the Proposed Scheme or by re-routing a side road to an alternative crossing location.

A range of watercourses will be traversed by the Proposed Scheme a list of which is provided in Chapter 3 of this EIS. The design of watercourse crossings has been in accordance with the *Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes* (NRA, July 2008), the UK *DMRB HA 107/04 Design of Culvert and Outfall Details* (Highways Agency, Nov. 2004) and in consultation with the National Parks and Wildlife Service and the Eastern Regional Fisheries Board.

The River Slaney will be crossed by a structure with a main span of approximately 70m. This main span also crosses over the Dublin – Wexford railway, thus providing a clear span over both the river and the railway. The total length spanned is approximately 153m. This total span length includes two side spans, one over Local Road L-2020 and the other facilitating uninterrupted flow of flood waters immediately adjacent to the western bank of the river channel. The span arrangement avoids the River Slaney and its banks. On the western approach to this bridge is an earthworks embankment, which takes the N80 Link Road over an area of the River Slaney flood plain. Included within this embankment are a series of flood relief culverts.

It is currently anticipated that main construction works will begin on site during 2011, subject to available finance. The overall construction period for the Proposed Scheme is anticipated to be in the region of 2½ years with the nominal scheme opening year being 2013.

14.5 POTENTIAL IMPACTS OF THE PROPOSED SCHEME

14.5.1 Scheme Description including Mitigation

The Proposed Scheme is described in detail in Chapter 3 (Description of Proposed Scheme) of this EIS, and the engineering layout is illustrated in Figures contained in Volume 4 of this EIS. The aspects of the Proposed Scheme considered pertinent to this landscape assessment, in terms of its physical appearance, are summarised below and the Landscape Masterplan is illustrated in Figure 14.2 in Volume 4 of this EIS.

The Landscape Masterplan has been prepared for the Proposed Scheme as part of the mitigation of visual impacts. The landscape proposals forming the masterplan include planting to provide screening in specific locations and also to help integrate the Proposed Scheme into the existing landform and patterns in the local landscape.

The proposed planting concept within the masterplan includes the application of three main plant mix types:- hedgerows; dense shrub/woodland planting; and a species rich grassland mix. Proposed hedges are located where existing hedgerows are currently prevalent in the landscape and/or where a row of screening planting is required. In general, a 2.5 metre width of space is allocated to allow for robust and diverse hedgerow planting. Shrub/woodland planting is

proposed to provide screening, in particular where a dense band of trees is required to screen lighting such as at new junctions and to help integrate the Proposed Scheme into existing vegetation patterns. The shrub/woodland planting is also proposed, often in conjunction with species rich grassland, to provide driver interest along long stretches of road cutting.

Generally, areas of significant cut and fill are to be graded to a suitable grade as to marry into the local landforms. This grading will help as part of the mitigations to reduce the overall impact of the proposed scheme by helping to amalgamate into the existing landscape. Where feasible lands will be suitably graded and seeded to allow them to be returned to existing agricultural usage. Planting of the embankments and cuttings help soften the visual impact of the earthworks for both drivers and as seen in views from the wider landscape Areas of cut found to be too steep for planting will be faced to reflect the natural strata creating a profile with a natural appearance which will provide visual and geological interests.

In addition, the landscape treatment is intended to provide driver interest through enclosing and opening out views to the surrounding landscape.

Proposed planting also takes account of ecological mitigation requirements and cultural heritage protection as detailed in those relevant Chapters of the EIS. These include areas of low planting to allow for bat migration across areas of the landscape, planting of underpass to allow for badger movement. Continuation of this comprehensive approach to landscape mitigation is essential.

The Contractor will be responsible for developing the Landscape Masterplan into the final landscaping proposals, which will form the Landscape Masterplan for the Proposed Scheme, during the detailed design and implementation phases of the Proposed Scheme. The Landscape Masterplan for the Proposed Scheme will be developed in accordance with the concepts contained within the preliminary masterplan as described in this EIS. The final landscaping proposals will be detailed in close consultation with an ecologist to ensure planting will achieve anticipated screening, maximum benefits to landscape character and mitigation of impacts on ecological values.

Ecological impacts are discussed in detail at Chapter 9 of this EIS. Areas where badger crossing facilities are required are to be planted to provide appropriate cover for the badgers to move through. Similarly planting around culverts and underpasses has been designed to encourage safe passage of bats across the Proposed Scheme. In areas where it has been identified that barn owls may be foraging, verge planting has been designed to discourage barn owls from foraging in order to minimise collision mortality. Watercourses, in the region of new culverts and/or watercourse diversions, are to be re-planted to return each area to as close to original condition as possible, integrating the new section back into the old alignments. Common Reed *Phragmites australis*, Reed Canary-grass *Phalaris arundinacea*, Yellow Iris *Iris pseudacorus* and

Bulrush *Typha latifolia* have been proposed at balancing bonds for the purpose of treating surface water run off prior to discharge to local watercourses. Where Side Roads are intercepted by the proposed national routes provision has been included, where appropriate, for replanting vegetation to match existing roadside treatment such as hedgerows and tree lines in recognition of the importance of this roadside vegetation as habitat for species moving through the rural landscape. Proposed planting along the M11/N11 Mainline, N80 Link Road and N30 Mainline enables severed field boundary vegetation to be re-connected with new connections made possible for wildlife, such as bats, to move through the landscape.

Noise related impacts are discussed in Chapter 13 of this EIS. There are no bunds proposed in response to noise impacts, instead, noise barriers are proposed as the most effective method of appropriate noise reduction. Of these proposed barriers, 7no. out of 11no. are 3.5m high with the remainder being between 2.0m and 2.5m high. It is recognised that the noise barriers have potential in themselves to create a visual impact, therefore landscaping is proposed to soften views to the barriers where they are visible from private property, where feasible.

Balancing ponds are proposed intermittently along the length of the Proposed Scheme, as part of the road drainage systems for the proposed national routes. These balancing ponds may be dry during times of little or no rainfall. The ponds will be constructed to appear naturalistic in the landscape with shallow slopes to surrounding bunds and planting to help integrate the new landforms into the existing landscape character.

Lighting is proposed at the major junctions along the M11/N11 Mainline, the N80 Link Road and the N30 Mainline. The entire length of the Proposed Scheme will not be lit. Where feasible, shrub/woodland mix planting is proposed in dense bands or thickets in and around the major junctions to enable maturing trees to reduce the degree of light spill into the wider landscape. The lighting will be provided by fully cut-off, high pressure sodium lanterns, to minimise light spill and the impacts of lighting visible at night. The minimum height of lighting columns feasible in each situation will be used, and the maximum height of such columns will be 12m above finished road level. The quantity of lighting included within the Proposed Scheme will be the minimum necessary for road safety.

Proposed overbridges and underpasses, which accommodate the existing Side Road network, are to be planted to screen cuttings and embankments and help integrate earthworks and structures into the existing landscape. Ecological mitigation will also be provided through re-establishing planting along Side Roads.

The Design Phase Landscape Mitigation includes:

- Embankment and cuttings will be graded back to gradual slopes, planted to reduce visibility and integrate the Proposed Scheme to existing landscape pattern and character.

Where possible lands along the embankment may be returned to agricultural use so that they re-establish the existing landscape character and pattern.

- Suitable topsoil will be required to accommodate landscaping proposals.
- Planting proposed in conjunction with noise barriers to screen visual impact of barriers. Barriers and planting combined will reduce visibility and noise to reduce impact on perception of tranquillity.
- Planting proposed to match existing around cultural heritage sites to help retain landscape setting of the sites in accordance with archaeologists' recommendations. For example along the M11/N11 Mainline in the vicinity of Ballyeden house.
- Provision of shrub/woodland planting and hedges planted along cuttings and embankments to re-establish field boundary vegetation patterns that provide a significant contribution to landscape character,
- Provision for planting along disturbed or realigned Side Roads to match existing conditions to re-establish existing vegetation patterns, rural road character and ecological value. Planting will also provide and/or re-establish screening to Side Roads from adjacent houses.
- Detailed landscape plans, including plant species selection, will be prepared by the Contractor, in consultation with an ecologist, during the detailed design and implementation phase of the Proposed Scheme to achieve maximum benefit for landscape character, screening and ecological mitigation together. This detailed landscaping will comply with the planting as outlined on the Landscape Masterplan for the Proposed Scheme.
- Prior to construction of the Proposed Scheme protection of existing vegetation that is to be retained within and adjacent to the land acquisition extents will be put in place in accordance with recommendations outlined in Chapter 9 (Ecology) of this EIS.
- Appropriate planting at major junctions which will balance the need to reduce visibility of the road/traffic and lighting at night with ecological mitigation (for example, tall trees may reduce risk of collision mortality for barn owl, or absence of any planting may deter bats coming into proximity with junctions hence reducing risk of collision mortality – refer to details in Ecology Chapter 9 of this EIS).
- Where small parcels of land are severed from a wider field pattern, these small areas will be planted in woodland planting to match existing woodland planting in the area, to enhance ecological value, provide screening potential and to retain and enhance existing landscape character and pattern.

- Provision of hedgerows along the Proposed Scheme to restore severed field patterns and landscape character and to also help mitigate disruption to wildlife (commuting routes, habitat and food source).
- Provision of varied landscape treatment along the proposed national routes to provide interest to drivers and minimise fatigue.
- Provision of planting to balancing ponds to help mitigate against any potential pollutants while also beneficial for ecological and varied visual interests.
- Type of permanent fencing to be used along the boundary length of proposed scheme to be agreed with landscape architect prior to works undertaken by contractor to minimise such fencing resulting in a negative visual impact.

The Construction Phase Mitigation includes:

- All storage of works materials, machinery, refuelling should be keep safely within an agreed compound area to ensure minimum impact on existing planting and landscape.
- Location of compounds should not be positioned on elevated sites where they will be highly visible or in areas of sensitive landscape, particularly the Slane Valley LCA (Figure 14.2), from N80 CH 0+000 to CH 3+000 and lands to western side of Proposed Scurlocksbush Roundabout at M11 CH 28+060, so to reduce their impact on the landscape.
- Construction compounds should be sited outside of the canopy spread of existing trees with works to be agreed with arborist and landscape architect. Compound area will be suitably returned to its previous land use or as planting proposed in landscape masterplan this will help reduce the landscape and visual impact.
- Trees and hedgerows to be retained along the boundary edges of all proposed carriageways and works areas and temporary access roads should be protected against construction works in accordance with BS5837 (2005) Trees and development. An independent arborist will be appointed to supervise protection measures for all existing trees during construction.
- All topsoil to be removed should be carefully removed and stored in accordance with BS3882:2007 so that it can be retained for use in the proposed landscape planting.
- Removal of existing field hedgerows, boundary planting and walls should be removed as part of the phased program of works and not all at once. This staggered approach will help reduce the overall landscape and visual impact of the scheme.

14.5.1.1 Landscape Planning Impacts

Section 14.3.1.of this chapter of the EIS outlines Policy most relevant to landscape impacts of the Proposed Scheme. The Wexford County Landscape Character Assessment document was

used in developing baseline landscape character assessment in relation to the landscape through which the Proposed Scheme passes. Proposed mitigation measures (in particular proposed landscaping) seek to minimise visual impact as required by Policy L1 of the Wexford County Development Plan 2007-2013 and help integrate the Proposed Scheme into existing landscape pattern and character.

Policy NH1 of the Wexford County Development Plan requires '*The Council shall encourage the conservation and maintenance of features important to local landscapes including trees, hedgerows, stone walls, woodlands, ponds, stream and wetlands'.* While it is recognised that the linear nature of a road proposal through a rural landscape will require the removal of a quantum of vegetation, natural landscape features are to be maintained wherever possible and any disturbance is to be well mitigated through new planting to help integrate the proposed roads back into the existing vegetation patterns and landscape character. Proposed landscaping includes re-establishment of roadside vegetation along disrupted Side Roads and watercourses with the intention of matching new planting to existing. In addition, where areas of existing woodland and hedgerow are removed planting is proposed to replace any significant losses (such as at the River Urrin) with new planting. It is also proposed to re-connect severed field boundaries.

The final relevant Policy in regard to Landscape impact is Policy 6 which states '*The Council shall resist development proposals which would result in the loss of trees which make a valuable contribution to the character to the landscape'.* The Proposed Scheme runs primarily through rural farmland that includes hedgerows of varied form and quality and stands of woodland. In the Rockspring house area the local road realignment was specifically designed to provide for retention of the large mature trees that have historic associations with the house and demesne. Likewise, at the River Urrin crossing, significant areas of new woodland planting are proposed to soften both the visual and ecological impact of the proposed crossing embankments. It is recognised that the field boundary and road side vegetation makes a contribution to the character of the landscape at a macro scale and as such the proposed planting concept seeks to provide for new planting that will, in time, repair or visually knit back together any severed hedgerows and tree rows.

14.5.1.2 Landscape Impact

The landscape impacts of the Proposed Scheme on the eight character areas described above are summarised below with detailed assessment set out in the TAG Worksheets, Tables 2-9 in Appendix 14.1 in Volume 3 of this EIS.

<u>Policy Area 2A</u>

Overall Impact: There will be a moderate adverse effect as a result of the proximity of the Proposed Scheme to Carriogroe Hill, elevation of the M11/N11 Mainline here and the sweeping

descent of the M11/N11 Mainline across this landscape character area and on fill along a valley floor. The Frankfort Junction connecting to the existing N11 is a large junction in an elevated location.

Policy Area 2B

Overall Impact: Moderate adverse effects due primarily to the length of embankments along valley floor. The M11/N11 Mainline constructed on embankment along valley floor and will dominate the local landscape setting of the Tinnacross Bridge (a cultural heritage setting).

Policy Area 2C

Overall Impact: Neutral to slight adverse effect on landscape character due to pockets of woodland and roadside trees and vegetation which encloses landscape and can be mimicked along embankments and at major junctions on the M11/N11 Mainline to integrate into existing landscape character in the long term. Generally large field sizes therefore less removal of field boundary vegetation. Few Side Road crossings.

Policy Area 2D

Overall Impact: Neutral to slight adverse impact on landscape character. Openness of landscape results in loss of tranquillity however, in a similar way to previous Policy Area 2 landscape, proposed landscape treatment can help integrate the Proposed Scheme into existing landscape pattern and character.

Policy Area 2E

Overall Impact: Neutral to slight adverse effects on landscape character. Proposed landscape treatment will help integrate the Proposed Scheme into the slightly undulating character of this part of Character Area 2. Extensive planting at major junctions will reduce impact of built infrastructure on natural landscape character.

Policy Area 2F

Overall Impact: Neutral to slight adverse effects on landscape character. The tranquillity of the area is currently degraded by proximity to existing N11 alignment to east. Large field sizes reduce the need for removal and fragmentation of field boundary vegetation with new roadside planting able to mitigate against vegetation severance and help blend Proposed Scheme into vegetation patterns and character of surrounding landscape. The N30 Mainline alignment will avoid disruption to local landscape feature (Hore's Rock) passing through low ground to the north of the feature.

Slaney Valley

Overall Impact: There will be moderate adverse effect on landscape character due primarily to the large embankment and bridge structure proposed at the River Slaney. While the scenic and

rural character of the area is degraded in closer proximity to the existing N11 junction, the areas around the river corridor have a more natural, quiet and established quality that will be disrupted through the proposed River Slaney crossing.

Uplands

Overall Impact: There will be a moderate to slight adverse impact on landscape character. Significant areas of the N30 Mainline through the uplands Character Area are in cut providing for opportunities to use vegetation in screening the impacts of the proposed national route and integrate it into the landscape. The undulating nature of the area coupled with significant field boundary and Side Road tree lines enables the visual impact of the N30 Mainline through this area to remain localised.

Overall Landscape Impact.

Localised adverse effects are primarily associated with areas of lengthy and high embankment that will appear at odds with existing topography. The tranquillity of areas not currently affected by the existing N11 and busy Side Roads will also be degraded by the Proposed Scheme. The River Slaney crossing will have a moderate impact due to the scale of the proposed approach embankments and the bridge, however ecological values will be well protected through use of a single span structure. Removal of trees and hedgerows will be well mitigated through extensive, varied planting along the entire length of the Proposed Scheme with particular emphasis on mimicking existing vegetation patterns.

The linear nature of a road enables new roadside landscape planting to play a significant role in mitigating the impact of the Proposed Scheme. Woodland/shrub planting and hedgerow planting along the proposed national routes will help integrate the Proposed Scheme into the existing strong linear patterns of the field boundary and Side Road hedgerows and vegetation patterns. Proposed landscape treatment will also (in the medium to long term) soften the impact of cut and embankment slopes in areas of more gently rolling or flat landscape.

The impact on landscape character across the study area as a whole is considered on balance to be slight to moderately adverse.

If the Proposed Scheme be abandoned only partially built and /or landscaping proposals not implemented for any reason there would likely be a significantly greater impact on the landscape associated with the Proposed Scheme.

14.5.2 Visual Impact (Opening Year and Design Year)

The Visual Impact for the Proposed Scheme is illustrated together with reference numbers of key receptors in Volume 3 of the EIS (Appendix 14.2 - Table 1 and 2) with the associated mapping at Volume 4 of the EIS (Figures 14.2). These impacts are summarised in Table 14.3 below. The main contributors to visual impact arising from the Proposed Scheme are earthworks and new

carriageways and traffic itself, with localised effects due to junction layout, lighting and signs. Planting carried out as part of the Proposed Scheme would also be increasingly effective in reducing visual impact as it matures.

Table 14.3 Summary of Visual Impact on Dwellings and Commercial Buildings.

Impact	**Winter Opening Year 2013**	**Summer Design Year 2028**
Substantial beneficial change		
Moderate beneficial change		
Slight beneficial change		
No overall change/neutral	352	515
Slight adverse change	157	68
Moderate adverse change	74	13
Substantial adverse change	14	1
Total	597	597

14.5.2.1 Archaeological Sites/ Protected Structures

Chapter 15 (Archaeological, Architectural and Cultural Heritage) of the EIS provides a complete assessment of impact on Archaeological Sites and Protected Structures. There are a total of three protected structures within the receiving environment of the Proposed Scheme. Chapter 15 states that '*none of the structures will be directly impacted on by the scheme'.*

The recommendations in Chapter 15 of this EIS, in regard to establishing natural screening where practical to help preserve the setting of site of Cultural Heritage value, have been incorporated into the Landscape Masterplan.

Chapter 15 of this EIS identified a total of 13 demesnes and notes '*The Proposed Scheme will impact directly on five of these areas; Ballinclay, Mountgeorge, Rockspring, Summerville and Monart. However, field inspection and a review of the NIAH garden survey has shown that many of the main original demesne features have disappeared and the once ornamental landscapes have been subsumed back into the landscape. Where the proposed national routes do impact on the former demesne area, there will be no severance of demesne features or buildings (for example gate lodge from the main house.'*

The landscape proposals along the Proposed Scheme provide for planting that will compliment the existing landscape structure. Mitigation of visual impact associated with vegetation removal, in particular where mature trees or hedgerows associated with historic landscape patterns are removed, includes replacement planting along the proposed national routes where feasible.

14.5.2.2 Overall Visual Impact -

Table 14.3 provides a summary of the overall visual impact. At opening year it is predicted that there is a range of visual impact with most visual receptors having no views to the Proposed Scheme. There are, however a relatively high number of slight adverse impacts where the Proposed Scheme will cause a barely perceptible deterioration in the existing view. These impacts are generally where views to the Proposed Scheme include a narrow field of view, views from secondary elevations, views filtered by existing vegetation, limited by topography or where the road surface and associated traffic will be out of view within a minimum of 4m depth cutting. A combination of these factors is often common in the slightly impacted views. Moderate adverse effects were also recorded at opening year with a small number of substantial visual impacts where the Proposed Scheme will cause a significant deterioration in the existing view.

Visual impact at design year is predicted to be significantly reduced, primarily as a result of maturing vegetation planted as part of the construction process specifically to mitigate landscape and visual impact (refer to Figure 14.2 in Volume 4 of this EiS). The Proposed Scheme will, after 15 years, become screened in most areas by maturing planting, reducing the slight, moderate and substantial impacts of opening year. Visual impacts will be reduced in some instances to none while in others the planting will soften visual impact to bring the impact down but not completely eliminating the deterioration in view.

Substantial visual impact at design year will occur only at visual receptor N11_133 (located at approximate chainage M11/N11: 14,380m and 250m west of the mainline). This is as a result of the proximity of the M11/N11 Mainline to the dwelling and the construction of the road on substantial embankment (approximately 8 metres high) along the valley floor. Visual receptor N11-133 (located at approximate chainage M11/N11: 14,380m and 250m west of the mainline) appears to be oriented south with views directly to the M11/N11 Mainline. While planting of the embankment will soften the impact of the earthworks and screen traffic, the works will result in a significant disruption to the existing view across the Tinnacross Stream to gently sloping, open fields.

There will need to be a level of common sense and flexibility in species choice, plant density and exact location of trees so as to achieve the best results in regard to screening with landscaping. The linear nature of the Proposed Scheme enables planting along the road corridor to not only screen individual views but also often appear in keeping with linear roadside and hedgerow vegetation in views of the wider landscape. Detailed landscape design proposals will be required as an integral part of the ongoing detailing of the Proposed Scheme.

The overall visual impact of the Proposed Scheme is, on balance, considered slightly negative to neutral. While there will be a number of individual properties with ongoing visual impact, this must be balanced with the much greater number with slight or no visual impact.

If for whatever reason the Proposed Scheme should be abandoned, only partially built and /or landscaping proposals not implemented for any reason the visual impact would likely be a significantly greater impact associated with the Proposed Scheme.

14.5.3 Cumulative Impacts

The M11 mainline Proposed Scheme at Clogh connects up with the Proposed N11 Arklow to Gorey Bypass Scheme. The combination of these two Proposed roads is likely to cause adverse impacts on the landscape character, quality of the area and views. Due to the scale and linear nature of the Proposed N11 Arklow to Gorey Bypass Scheme and the close proximity of it to the Proposed M11 mainline. The combined impacts between the two schemes will likely be higher in the vicinity of where they intercept at Frankfort Junction. However the proximity of existing infrastructure N11 Carriageway and Wexford to Dublin Railway to the proposed roads may slightly reduce its overall impact at this particular location. Given the linear nature of the two schemes the degree and type of impact will greatly vary across the wider area, rather than just at one location. It will be influenced by various factors including the road design, particularly where extensive lengths of the road are in cut, fill or grade and levels of traffic. Also localised variations in topography, vegetation coverage, location of receptors may help to reduce or emphasis the impact of these two road at a given location.

There is potential for a slight positive cumulative impact in regard to an increase in woodland and hedgerow planting that the Proposed Schemes will contribute to the wider landscape stock. Planting of Shrub/woodland vegetation and hedgerow type plant mixes will visually complement existing vegetation and diversify habitat and food source where there is currently only pasture or crops. As the proposed planting in both schemes matures it will provide further screening of views towards the Proposed Schemes as well as high visual interest for the users.

Other cumulative impacts include potential areas of development for example one off housing, which have been granted planning, or the possibility of applications being granted in near future but as yet have not been constructed. These may be constructed prior to the road completion (2013) or before the design year (2028). These developments could result in an adverse impact on the local landscape character and/or combined with the road. The Proposed Scheme M11, N80 and N30 mainlines may potentially visually impact on the setting of new housing within its visual envelope, not already accounted for in this report. However the degree of impact will vary depending on several factors including the siting and orientation of the development, the extent of growth of the proposed landscape and existing field boundary vegetation at the time of construction, whether the road is in cut or fill. Any impact will likely be further reduced to slight or none as the proposed planting matures.

14.5.4 "Do-Nothing" Scenario

Should the Proposed Scheme not be constructed there will be no change to the local landscape character along the route of the Proposed Scheme. Views from private property and road corridors in the area would remain unchanged. The landscape character of an area is not a static quality and is likely to change (potentially in both positive and negative ways) as rural living and farming practices change and evolve.

14.6 MITIGATION MEASURES

Proposed mitigation measures are discussed and listed in detail at Section 14.5.1 above. As they comprise the planting proposals which are an integral part of the Proposed Scheme design, they are taken into consideration in the assessment of potential impacts.

14.7 RESIDUAL IMPACTS OF THE PROPOSED SCHEME

14.7.1 Construction Phase

During construction there are likely to be impacts associated with machinery, temporary storage of equipment, site offices, vehicles and people on site. These impacts will be somewhat transient depending on work stages. The nature of construction impacts is that they are temporary and cease once the project is complete. Therefore, other than ordinary maintenance and repair there is unlikely to be any residual impacts on landscape and visual impact associated with the construction phase.

14.7.2 Operation Phase

As a result of extensive landscaping proposals along the Proposed Scheme residual landscape and visual impacts will be limited to impacts on the outlook from a limited number of houses as discussed above at Section14.5.3.3. There will be a change in landscape character in areas along the Proposed Scheme as discussed above at Section 14.5.1.2.

14.8 MONITORING

Landscaping proposals will need to be monitored in the short, medium and long term to ensure the outcomes, in particular in regard to visual impacts, come to fruition. Planting will need to be monitored to ensure it establishes well. Replacement planting will need to be provided for where failures occur. The period of establishment maintenance contract and contract monitoring will be a minimum of 5 years post practical completion to ensure adequate establishment of planting.

References

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- (Highways Agency UK, as amended 2005).
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- National Roads Authority, 2005. A Guide to Landscape Treatments for National Road Schemes in Ireland. NRA, Dublin.

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15 ARCHAEOLOGICAL, ARCHITECTURAL AND CULTURAL HERITAGE IMPACT ASSESSMENT

15.1 METHODOLOGY

This study determines, as far as reasonably possible from existing records and walk over survey, the nature of the archaeological, architectural and cultural heritage resource within the path of the Proposed Schemes. Desk based research is defined as a collation of existing written, graphic, photographic and electronic information in order to identify the likely character, extent, quality and worth of the known or potential archaeological resource in a local, regional, national or international context as appropriate. (Institute of Field Archaeologists 2001a: 2).

The purpose of the study is to assess the significance of the receiving archaeological, architectural and cultural heritage environment and the impact of the proposed schemes on this environment. Ameliorative measures have been proposed where necessary and feasible in order to safe guard any monuments, features or finds of antiquity that are identified during the course of the study as likely to sustain significant impacts (NRA Guidelines for the Assessment of Archaeological Heritage Impacts 2005, 34). The study has been carried out in accordance with the Code of Practice that was agreed between the NRA and the Minister for Arts, Heritage, Gealtacht and the Irelands (now the Department of Environment, Heritage and Local Government). Please see Appendix 15.6 and 15.7 for protective guidelines and legislation that were taken into account during the assessment of the archaeological and architectural heritage of the Proposed Schemes.

The study involved detailed interrogation of the existing archaeological and historical records pertaining to the landscape surrounding the Proposed Scheme. This included information from the Record of Monuments and Places of County Wexford, the County Development Plan, the topographical files of the National Museum of Ireland, cartographic and documentary records. Consultations were also carried out with statutory bodies such as the National Monuments Section of the Department of Environment, Heritage and Local Government, along with non-state organisations such as the Trinity University Map Library, Dublin.

Aerial photographic coverage of the receiving environment, held by the Geological Survey of Ireland was examined along with more recent aerial photographs provided by Wexford County Council. Field inspections along the proposed national routes were carried out during June 2007 and in May, July and November 2008. These inspections were undertaken in an attempt to assess any known archaeological and cultural heritage sites and identify previously unrecorded archaeological and cultural heritage features or sites within the receiving environment.

An impact assessment and a mitigation strategy have been prepared for the Proposed Scheme. The impact assessment is undertaken to outline potential adverse impacts that the Proposed

Scheme may have on the cultural heritage resource, while the mitigation strategy is designed to avoid, reduce or offset such adverse impacts.

15.1.1 Definitions

In order to assess, distil and present the findings of this study, the following definitions apply:

- '**Cultural Heritage'** where used generically, is an over-arching term applied to describe any combination of archaeological, architectural and cultural heritage features, where:–
- the term '**archaeological heritage'** is applied to objects, monuments, buildings or landscapes of an (assumed) age typically older than AD 1700 (and recorded as archaeological sites within the Record of Monuments and Places);
- the term '**architectural heritage'** is applied to structures, buildings, their contents and settings of an (assumed) age typically younger than AD 1700;
- the term '**cultural heritage'**, where used specifically, is applied to other (often less tangible) aspects of the landscape such as historical events, folklore memories and cultural associations. This designation can also accompany are archaeological or architectural designation.

For the purposes of this EIS the terms 'architectural heritage' and 'built heritage' have the same intended meaning and are used interchangeably.

For the purposes of this EIS the surrounding landscape is referred to as the receiving environment of the Proposed Scheme. This consists of a corridor of 300m, measured 150m from the edge of the footprint of the Proposed Schemes, and consists of an in depth analysis of the archaeological, architectural and cultural heritage resource present within this area. For purposes of context all recorded archaeological sites (Recorded Monument and Place/Sites and Monuments Record RMP/SMR) and architectural sites (National Inventory of Architectural Heritage/Record of Protected Structures NIAH/RPS) within 500m of the Proposed Scheme (measured 250m from the edge of the footprint of the Proposed Schemes) will also be included within this EIS.

It should further be noted that all measurements referenced within this chapter are taken from the designated edge of the sites to the edge of the Proposed Scheme landtake extents, unless otherwise stated.

15.1.2 Survey Work

Research has been undertaken in two phases. The first phase comprised a paper survey of all available archaeological, historical and cartographic sources. The second phase involved a field inspection of the Proposed Scheme.

15.1.2.1 Paper Survey

This is a document search. The following sources were examined and a list of sites and areas of archaeological potential compiled:

- Record of Monuments and Places for County Wexford;
- Sites and Monuments Record for County Wexford;
- Monuments in State Care Database;
- Preservation Orders;
- Register of Historic Monuments;
- National Monuments Database of Licences 2005-2008;
- Archaeological Inventory of County Wexford;
- Topographical files of the National Museum of Ireland;
- Cartographic and written sources pertaining to the receiving environment;
- Place Names relating to the receiving environment;
- Folklore files pertaining to the receiving environment;
- Aerial photographs of the Geological Survey of Ireland, 1973-77, 1:30,000;
- Aerial photographs of Ordnance Survey Ireland;
- County Wexford Development Plan (2007-2013);
- Enniscorthy Town and Environs Development Plan (2008-2014);
- National Inventory of Architectural Heritage: Draft Architectural Survey, County Wexford;
- National Inventory of Architectural Heritage: Garden Survey; County Wexford;
- Excavations Bulletin, 1970-2005

Record of Monuments and Places (RMP) is a list of archaeological sites known to the National Monuments Service, which are afforded legal protection under Section 12 of the 1994 National Monuments Act. The Record of Monuments & Places includes mapping based on OS 6" Sheets, which indicate the location of each recorded site. The RMP list is based on the Sites and Monuments Record files (see below) housed in the National Monuments Services offices.

Sites and Monuments Record (SMR) holds documentary and cartographic evidence as well as the results of field inspections of all known archaeological sites and monuments. Some information is also held about archaeological sites and monuments whose precise location is not known e.g. only a site type and townland are recorded. These are known to the National

Monuments Section as 'un-located sites' and cannot be afforded legal protection due to lack of location information. As a result these are omitted from the Record of Monuments and Places. SMR sites are constantly updated and also listed on the recently launched website created by the DoEHLG – www.archaeology.ie.

National Monuments in State Care Database is a list of all the National Monuments in State guardianship or ownership. Each is assigned a National Monument number whether in guardianship or ownership and has a brief description of the remains of each Monument.

The Minister for the Department of Environment, Heritage and Local Government (DoEHLG) may acquire national monuments by agreement or by compulsory order. The state or local authority may assume guardianship of any national monument (other than dwellings). The owners of national monuments (other than dwellings) may also appoint the Minister or the local authority as guardian of that monument if the state or local authority agrees. Once the site is in ownership or guardianship of the state, it may not be interfered with without the written consent of the Minister.

Preservation Orders List contains information on Preservation Orders and/or Temporary Preservation Orders, which have been assigned to a site or sites. Sites deemed to be in danger of injury or destruction can be allocated Preservation Orders under the 1930 Act. Preservation Orders make any interference with the site illegal. Temporary Preservation Orders can be attached under the 1954 Act. These perform the same function as a Preservation Order but have a time limit of six months, after which the situation must be reviewed. Work may only be undertaken on or in the vicinity of sites under Preservation Orders with the written consent, and at the discretion, of the Minister.

Register of Historic Monuments was established under Section 5 of the 1987 National Monuments Act, which requires the Minister to establish and maintain such a record. Historic monuments and archaeological areas present on the register are afforded statutory protection under the 1987 Act. The register also includes sites under Preservation Orders and Temporary Preservation Orders. All registered monuments are included in the Record of Monuments and Places.

Database of current archaeological investigation licences is a list held by the National Monument Section of the DoEHLG that provides details of licences issued that have yet to appear within the Excavations Bulletin (2006-2009).

Archaeological Inventory of County Wexford was consulted to obtain up-to-date field descriptions of previously recorded RMP sites that have been discovered within County Wexford.

Topographical files of the National Museum of Ireland is the national archive of all known finds recorded by the National Museum. This archive relates primarily to artefacts but also includes references to monuments and unique records of previous excavations. The find spots of artefacts are important sources of information on the discovery of sites of archaeological

significance.

Cartographic sources are important in tracing land use development within the development area as well as providing important topographical information on sites and areas of archaeological potential. Cartographic analysis of all relevant historical maps has been made to identify any topographical anomalies that no longer remain within the landscape.

Ordnance Survey. Map Editions 1841, 1903, 1926, Co. Wexford

Petty, W 1655-6 Down Survey Map of the Baronies of Gorey and Scarawalsh

Documentary sources were consulted to gain background information on the historical and archaeological landscape containing the Proposed Schemes.

Place Names are an important part in understanding both the archaeology and history of an area. Place names can be used for generations and in some cases have been found to have their root deep in the historical past.

Folklore Files are housed in the Department of Irish Folklore in University College Dublin. They have proven useful in providing additional historical background information relating to particular historical events associated with the receiving environment and study area. The files were reviewed as part this is assessment, but no information pertaining to the receiving environments could be found.

Aerial photographic coverage is an important source of information regarding the precise location of sites and their extent. It also provides initial information on the terrain and its likely potential for archaeology.

Development Plans contain a catalogue of all the protected sites and structures within the County. Enniscorthy Town Development Plan was also reviewed in order to obtain information on further sites not included within the county plan. These plans also provide policies, aims and objectives held by the County Councils with regards to archaeological and built heritage.

The **National Inventory of Architectural Heritage** (NIAH) is a government based organisation tasked with making a nationwide record of significant local, regional, national and international structures, which in turn provides County Councils with a guide as to what structures to list within the Record of Protected Structures. The architectural survey for County Wexford has been completed but is yet to be published. However, draft information from the NIAH was obtained for this assessment. The NIAH have also carried out a nationwide desk based survey of historic gardens, including demesnes that surround large houses. This has also been completed for County Wexford and was examined in relation to the surviving demesnes within the receiving environment of the Proposed Scheme.

Excavations Bulletin is a summary publication that has been produced every year since 1970. This summarises every archaeological excavation that has taken place in Ireland during that year up until 2005 and since 1987 has been edited by Isabel Bennett. This information is vital when

examining the archaeological content of any area, which may not have been recorded under the SMR and RMP files. This information is also available online at www.excavations.ie.

15.1.2.2 Field Inspection

Field inspection is necessary to determine the extent and nature of archaeological remains, and can also lead to the identification of previously unrecorded or suspected sites and portable finds through topographical observation and local information. Field inspection of the Proposed Schemes was carried out during June 2007 and May, July and Nov 2008. Inspections during June 2007 were carried out by The Archaeology Company, who inspected the southern section of the proposed M11/N11 Mainline (chainage 17,600 to 28,000) along with the proposed N80 Link Road and proposed N30 Mainline. Inspections during 2008 were carried out by Irish Archaeological Consultancy Ltd of the northern section of the M11/N11 Mainline (chainage 0 to 17,600). A total of 285 fields were surveyed, and each was given a unique number.

The archaeological field walking inspection entailed:

- Walking the corridors of the Proposed Schemes, following the centre-line of the development but deviating from this line to ensure that the entire route corridor was investigated;
- Noting and recording the terrain type;
- Noting and recording land usage, which involved giving each field a unique number;
- Noting, recording and photographing the presence of features of archaeological, architectural or cultural heritage significance, and using GPS in order to confirm their position;
- Verifying the extent and condition of recorded sites;
- Visually investigating any suspect landscape anomalies to determine the possibility of their being anthropogenic in origin.

15.1.3 Impact Definition: Archaeological Heritage

The quality and type of an impact can vary to include the following (as per NRA Guidelines for the Assessment of Archaeological Heritage Impacts 2005, 25 & 54) :

Negative Impact: A change that will detract from or permanently remove an archaeological monument from the landscape.

Neutral Impact: A change that does not affect the archaeological heritage.

Positive Impact: A change that improves or enhances the setting of an archaeological monument.

Direct Impact: Where an archaeological feature or site is physically located within the footprint of a potential route and entails the removal of part, or all of the monument or feature.

Indirect Impact: Where a feature or site of archaeological heritage merit or its setting is located in close proximity to the footprint of a potential route alignment.

No Predicted Impact: Where the potential route does not adversely or positively affect an archaeological heritage site.

Definitions are as outlined in the NRA's Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes (NRA, 2005, 54).

Type of Impact	Definitions relating to sites of an archaeological nature
Profound (Direct Impact)	Applies where mitigation would be unlikely to remove adverse effects. Reserved for adverse, negative effects only. These effects arise when an archaeological site is completely and irreversibly destroyed by a proposed development.
Significant (Direct Impact)	An impact which, by its magnitude, duration or intensity, alters an important aspect of the environment. An impact like this would be where part of a site would be permanently impacted upon, leading to a loss of character, integrity and data about the archaeological feature/site.
Moderate (Indirect Impact)	A moderate direct impact arises where a change to the site is proposed, which although noticeable, is not such that the archaeological integrity of the site is compromised and which is reversible. This arises where an archaeological feature can be incorporated into modern day development without damage and that all procedures used to facilitate this are reversible.
Slight (Indirect Impact)	An impact which causes changes to the character of the environment which are not significant or profound and do not directly impact or affect an archaeological feature or monument.
Imperceptible (Indirect Impact)	An impact capable of measurement but without noticeable consequences.

15.1.4 Impact Definition: Built Heritage

Importance of the Built Heritage feature (in terms of local, regional, national and international) will be dependant on the eminence afforded to the architectural heritage feature or structure.

The magnitude of the impact (low, medium, high, very high) is derived from a consideration of the nature of the impact. The nature and magnitude of the impacts affecting architectural or built heritage can take various forms (as per below NRA Guidelines for the Assessment of Architectural Heritage Impacts 2005, 21) :

Direct Impact: Where a feature or site of architectural heritage merit is physically located in whole or in part within the footprint of a route alignment.

Indirect Impact: Where a feature or site of architectural heritage merit or its setting is located in close proximity to the footprint of a route alignment.

No Predicted Impact: Where the potential route option does not adversely or positively affect an architectural heritage site.

Definitions as outlined in the NRA's Guidelines for the Assessment of Architectural Heritage Impacts of National Road Schemes (NRA, 2005, 33).

Type of Impact	Definitions relating to sites of an architectural nature
Profound Negative (Direct Impact)	An impact that obliterates the architectural heritage of a structure or feature of national or international importance. These effects arise where an architectural structure or feature is completely and irreversibly destroyed by the proposed development. Mitigation is unlikely to remove adverse impacts.
Significant Negative (Direct Impact)	An impact that, by its magnitude, duration or intensity alters the character and/or setting of the architectural heritage. These effects arise where an aspect or aspects of the architectural heritage is/are permanently impacted upon leading to a loss of character and integrity in the architectural structure or feature. Appropriate mitigation is unlikely to reduce the impact.
Moderate Negative (Indirect Impact)	An impact that results in a change to the architectural heritage which, although noticeable, is not such that it alters the integrity of the heritage. The change is likely to be consistent with existing and emerging trends. Impacts are probably reversible and may be of a relatively short duration. Appropriate mitigation is very likely to reduce the impact.
Slight Negative (Indirect Impact)	An impact that causes some minor changes to the character of architectural heritage of local or regional importance without affecting its integrity or sensitivities. Although noticeable, the effects do not directly impact on the architectural structure or feature. Impacts are reversible and of relatively short duration. Appropriate mitigation will reduce the impact.
Imperceptible Negative (Indirect Impact)	An impact on architectural heritage of local importance that is capable of measurement but without noticeable consequences.
Significant Positive Impact	A beneficial effect that permanently enhances or restore the character and/or setting of the architectural heritage in a clearly noticeable manner.
Moderate Positive Impact	A beneficial effect that results in partial or temporary enhancement of the character and/or setting of the architectural heritage and which is noticeable and consistent with emerging trends.
Slight Positive Impact	A beneficial effect that causes some minor or temporary enhancement of the character of architectural heritage of local or regional importance which, although positive, is unlikely to be readily noticeable.
Imperceptible Positive Impact	A beneficial impact effect on architectural heritage of local importance that is capable of measurement but without noticeable consequences.

Schedule of Significance (NRA Guidelines for the Assessment of Architectural Heritage Impacts 2005, 32).

Magnitude of Negative Impact	*Record Only/Local Importance*	*Regional Importance*	*National Importance*	*International Importance*
Very High	Significant	Significant	Profound	Profound
High	Moderate	Significant	Significant	Profound
Medium	Slight	Moderate	Significant	Significant
Low	Imperceptible	Slight	Moderate	Significant
Neutral – A change that does not affect the quality of the environment				
Magnitude of Positive Impact	*Record Only/Local Importance*	*Regional Importance*	*National Importance*	*International Importance*
Low	Imperceptible	Slight	Moderate	Significant
Medium	Slight	Moderate	Significant	Significant
High	Moderate	Significant	Significant	Significant

The below *Importance definitions* are taken from the *National Inventory of Architectural Heritage Handbook (June 2006).*

Please not that although structures listed within the draft NIAH architectural survey for County Wexford are not protected within the RPS, their identification within the NIAH means that they may be included in the future.

International Importance

Structures or sites of sufficient architectural heritage importance to be considered in an international context. Examples include St Fin Barre's Cathedral, Cork. These are exceptional structures that can be compared to and contrasted with the finest architectural heritage in other countries.

National Importance

Structures or sites that make a significant contribution to the architectural heritage of Ireland. These are structures and sites that are considered to be of great architectural heritage significance in an Irish context. Examples include Ardnacrusha Power Station, County Clare; the Ford Factory, Cork; Carroll's Factory, Dundalk; Lismore Castle, County Waterford; Sligo Courthouse, Sligo; and Emo Court, County Laois.

Regional Importance

Structures or sites that make a significant contribution to the architectural heritage within their region or area. They also stand in comparison with similar structures or sites in other regions or areas within Ireland. Examples would include many Georgian terraces; Nenagh Courthouse, County Tipperary; or the Bailey Lighthouse, Howth. Increasingly, structures that need to be protected include structures or sites that make a significant contribution to the architectural heritage within their own locality. Examples of these would include modest terraces and timber shop fronts.

Local Importance

These are structures or sites of some vintage that make a contribution to the architectural heritage but may not merit being placed in the RPS separately. Such structures may have lost much of their original fabric.

Record Only

These are structures or sites that are not deemed to have sufficient presence or inherent architectural or other importance at the time of recording to warrant a higher rating. It is acknowledged, however, that they might be considered further at a future time.

Please see Appendix 15.4 and 15.7 in Volume 3 of this EIS for the definitions of categories of special interest and the assignment of these categories to the Built Heritage sites.

15.1.5 Consultation

Following the initial research a number of statutory and voluntary bodies were consulted to gain further insight into the cultural background of the background environment, receiving environment and study area, as follows:

- Department of Environment, Heritage and Local Government – the Heritage Service, National Monuments and Historic Properties Section: Record of Monuments and Places; Sites and Monuments Record; Monuments in State Care Database; Preservation Orders and the Register of Historic Monuments;
- Department of Environment, Heritage and Local Government – the Architectural Advisory Service
- National Museum of Ireland, Irish Antiquities Division: topographical files of Ireland;
- Wexford County Council: Planning Section;
- Trinity College Dublin, Map Library: Ordnance Survey Maps, Barony Maps

- Geological Survey of Ireland, Dublin: Aerial photographs;
- University College Dublin, Folklore Commission;
- The Heritage Council;
- An Taisce;
- Failte Ireland;
- The Arts Council

15.1.6 Data Deficiencies / Difficulties with Producing the Impact Assessment

There were no major difficulties or data deficiencies encountered in the production of this assessment.

15.2 RECEIVING ENVIRONMENT

15.2.1 Archaeology

County Wexford is located in the southeast of Ireland, and forms part of the eastern and south eastern coastline. The name Wexford is derived from the Viking *Weissford* or 'the Land of mud flats'. The Irish version *Loch Garman* is purportedly derived from a legend telling of a vast expanse of harbour created by an enchantress in which drowned Garman Garbh.

M11/N11 Mainline

The M11/N11 Mainline travels roughly north east to south west from Clogh village to the eastern limits of Enniscorthy parallel to the existing N11 route and the River Bann. At Enniscorthy the M11/N11 Mainline continues in a southerly direction and terminates where it re-joins the existing N11 in Scurlocksbush.

The main Dublin - Wexford railway line runs parallel to the M11/N11 Mainline, which will also provide traffic relief for the towns of Camolin, Ferns and Enniscorthy. The M11/N11 Mainline will travel through and in close proximity to 10 parishes and 49 townlands. A total of 6 Archaeological Heritage (AH) sites have been identified within the receiving environment of the M11/N11 Mainline, whereas 36 Areas of Archaeological Potential (AAP) and 17 Sites of Archaeological Potential have also been identified.

N80 Link Road

The N80 Link Road will travel from the existing N11 in Clavass to the north of Enniscorthy east to join the M11/N11 Mainline in Ballydawmore.

A total of 8 Archaeological Heritage (AH) sites have been identified within the receiving environment of the N80 Link Road, whereas 4 Areas of Archaeological Potential (AAP) and 7 Sites of Archaeological Potential have also been identified.

N30 Mainline

The N30 Mainline will travel from the existing N11 in Clavass to the north of Enniscorthy, in a southwest direction around Enniscorthy town. It terminates where it joins the existing N30 in Templescoby.

The N30 Mainline will provide further traffic relief for the town of Enniscorthy as New Ross will be directly accessible from the north of the town. The N30 Mainline will travel through and in close proximity to 4 parishes and 14 townlands. A total of 5 Archaeological Heritage (AH) sites have been identified within the receiving environment of the N30 Mainline, whereas 14 Areas of Archaeological Potential (AAP) and 15 Sites of Archaeological Potential have also been identified.

The receiving environment of the M11/N11 Mainline includes the following parishes and townlands:

M11/N11 Mainline

Parish	**Townland**
Liskinfere	Frankfort, Clogh, Ballinclay, Ballygullen, Toberanierin Upper
Toome	Ballyoughter, Ballyeden, Tullabeg, Medophall, Knockrobin Lower, Knockrobin Upper,
Kilbride	Ballymore, Rockspring, Quarry, Cronyhorn
Ferns	Effernoge
Kilcormick	Mountgeorge, Carrigeen, Ballycarrigeen Lower, Knockavocka, Myaugh
Clone	Tinnacross, Toom, Tomsallagh, Oulartard, Crane, Garryphelim, Ballydawmore, Killabeg, Solsborough
Templeshannon	Ballynabarney, Corbally, Tomnafunshoge, Drumgold
Edermine	Ballybanoge, Craaneroe, Garrynisk, Glenteige, Monroe, Riverview, Roperstown, Scurlocksbush
Ballyhuskard	Ballycourcy Beg, Ballycourcy More, Cooladine, Knockrathkyle

The receiving environment of the N80 Link Road includes the following parishes and townlands:

N80 Link Road

Parish	**Townland**
St. Mary's, Enniscorthy	Kilcannon, Ballynahallin
Templeshannon	Ballynabarney, Clonhasten,
Clone	Ballydawmore, Toom

The receiving environment of the N30 Mainline includes the following parishes and townlands:

N30 Mainline

Parish	**Townland**
St. Mary's, Enniscorthy	Clavass, Moyne Middle
Monart	Askunshin, Ballybrannis, Ballyorril, Bessmount, Coolnahorna, Killalligan North, Killalligan South, Milehouse, Monart East
Templescoby	Clohass, Dunsinane, Templescoby

15.2.1.1 M11/N11 Mainline

Please note that all measurements between the identified sites and the Proposed Schemes are made from the designated constraint area to the edge of the proposed footprint of the Proposed Scheme unless specified otherwise.

Archaeological Heritage

AH No.:	**Townland:**	**Classification:**	**Chainage:**	**RMP No.:**	**Dist. from route**
AH 1	Balloughter	Enclosure	4,010	WX016-043	>200m
AH 2	Myaugh	Moated site	13,780	WX020-068	>200m
AH 3	Oulartard	*Fulacht fiadh*	16,370	WX020-063	>50m
AH 12	Tomnafunshoge	Moated site	21,475	WX020-035	>50m
AH 13	Ballycourcymore	Moated site	23,400	WX026-007	>100m
AH 14	Ballycourcymore	Rectilinear enclosure	24,250	WX026-057	<50m

Areas of Archaeological Potential

AAP No.:	Townland:	Classification:	Chainage:	Dist. from route
AAP 1	Frankfort/Ballinclay	Townland boundary	2,300	0m
AAP 2	Ballinclay/Ballygullen	Townland boundary	2,550	0m
AAP 3	Ballygullen	Large drumlin	2,730	0m
AAP 4	Ballygullen/Balloughter	River Bracken and townland boundary	3,325	0m
AAP 5	Balloughter/Tullabeg	Townland boundary	4,150	0m
AAP 6	Tullabeg/Ballyeden	Townland boundary	4,370	0m
AAP 7	Ballyeden/Medophall	Townland boundary	5,220	0m
AAP 8	Medophall/Knockrobin Lower	Townland boundary	5,840	0m
AAP 9	Knockrobin Lower/ Knockrobin Upper	Townland boundary (site of)	6,650	0m
AAP 10	Knockrobin Upper/ Ballymore	Townland boundary	6,870-7,460	0m
AAP 11	Ballymore/Rockspring	Townland boundary	7,600	0m
AAP 12	Crane/Toom	Townland boundary	17,600	0m
AAP 13	Rockspring/Quarry	Townland boundary and stream	8,710	0m
AAP 14	Quarry/Mountgeorge	Townland boundary and stream	9,170-9,940	0m
AAP 15	Mountgeorge/ Ballycarrigeen Lower	Townland boundary	10,000	0m
AAP 16	Ballycarrigeen Lower	Riverine environment	10,090-10,700	0m
AAP 17	Ballycarrigeen Lower/ Carrigeen	Townland boundary	11,480	0m
AAP 18	Carrigeen/Knockavocka	Townland boundary and stream	12,350	0m
AAP 19	Knockavocka/Effernoge/ Myaugh	Two townland boundaries and two streams	12,560-13,430	0m
AAP 20	Myaugh/Tinnacross	Townland boundary and stream	14,230	0m
AAP 21	Tinnacross/Tomsallagh/ Oulartard	Two townland boundaries and two streams	14,650-15,650	0m
AAP 22	Oulartard/Tomsallagh/ Crane	Two townland boundaries and two streams	15,860-16,840	0m
AAP 27	Toom/Ballydawmore	Townland boundary and stream	18,300-18,700	0m
AAP 28	Ballydawmore/ Ballydawmore	Townland boundary and stream	19,180	0m
AAP 29	Ballydawmore/Corbally	Townland boundary and stream	19,550	0m

AAP No.:	Townland:	Classification:	Chainage:	Dist. from route
AAP 30	Corbally/Tomnafunshoge	Townland boundary and stream	20,400	0m
AAP 31	Tomnafunshoge/Drumgold	Townland boundary and stream	21,660-21,800	0m
AAP 32	Drumgold/Cooladine	Townland boundary and stream	22,710-23,000	0m
AAP 33	Cooladine/ Ballycourcymore	Townland boundary and two streams	23,210-24,130	0m
AAP 34	Knockrathkyle/ Ballybanoge/Monroe	Two townland boundaries and one stream	24,980-25,330	0m
AAP 35	Monroe	Marginal ground	25,400-26,050	0m
AAP 36	Monroe/Craanroe/ Glenteige	Three townland boundaries and two streams	26,070-26,350	0m
AAP 37	Glenteige/Riverview	Townland boundary and stream	26,550-26,700	0m
AAP 38	Riverview	Stream	26,850	0m
AAP 39	Riverview/Roperstown	Townland boundary and stream	27,150	0m
AAP 40	Roperstown/Garrynisk/ Scurlocksbush	Townland boundary	27,180-28,000	0m

Sites of Archaeological Potential

SAP No.:	Townland:	Classification:	Chainage:	Dist. from route
SAP 1	Ballyeden	Possible enclosure	4,400	>200m
SAP 2	Knockrobin Upper	Possible rectilinear enclosure	7,070	<50m
SAP 3	Knockrobin Upper	Two mounds	7,220	<50m
SAP 4	Mountgeorge	Holy Well	9,900	<50m
SAP 5	Ballycarrigeen Lower	Possible *fulacht fiadh*	10,230	0m
SAP 6	Tinnacross	Site of school house	14,460	0m
SAP 7	Oulartard	Site of weir/head of mill race	15,550	0m
SAP 8	Oulartard	Site of mill and mill race	15,950-16,050	0m
SAP 15	Ballydawmore	Former PM settlement	19,200	<50m
SAP 16	Tomnafunshoge	Surface anomaly	20,750	0m
SAP 17	Tomnafunshoge	Former track	20,980	0m
SAP 18	Cooladine	Surface anomaly	22,800	0m
SAP 19	Ballycourcymore	Former PM settlement	24,300	<50m

SAP No.:	Townland:	Classification:	Chainage:	Dist. from route
SAP 20	Ballycourcymore/ Knockrathkyle	Former PM settlement and townland boundary	24,850	0m
SAP 21	Riverview	Struck flint find spot	27,060	0m
SAP 22	Roperstown	Surface anomaly	27,560	0m
SAP 23	Garrynisk	Former PM settlement	27,720	0m

15.2.1.2 N80 Link Road

Archaeological Heritage

AH No.:	Townland:	Classification:	RMP No.:	Chainage:	Dist. from route
AH 4	Clavass	Ring ditch	WX020-066	600	>100m
AH 5	Ballynahallin	Ring ditch	WX020-011	1,210	<50m
AH 6	Kilcannon	Enclosure site	WX020-010	1,860	>100m
AH 7	Kilcannon	Holy well	WX020-020 (De-listed)	2,500	>50m
AH 8	Kilcannon	Church	WX020-021	2,500	>100m
AH 9	Kilcannon	Pit alignment	WX020-019	2,360	<50m
AH 10	Ballynabarny	Enclosure	WX020-025	3,160	>50m
AH 11	Ballynabarny	Rectilinear enclosure	WX020-026	3,965	>100m

Areas of Archaeological Potential

AAP No.:	Townland:	Classification:	Chainage:	Dist. from route
AAP 23	Ballynahallin	Riverine environment	0-1150	0m
AAP 24	Ballynahallin/Kilcannon	Townland boundary and stream	1,690	0m
AAP 25	Kilcannon/Ballynabarny	River Crossing	2,690-2,825	0m
AAP 26	Ballynabarny/Toom	Townland boundary and stream	3,620-4,010	0m

Sites of Archaeological Potential

SAP No.:	Townland:	Classification:		Dist. from route
SAP 9	Ballynahallin	Surface anomaly	400	0m
SAP 10	Ballynahallin	Surface anomaly	540	0m
SAP 11	Ballynahallin	Linear anomaly	875	0m

SAP No.:	Townland:	Classification:		Dist. from route
SAP 12	Kilcannon	Former PM settlement	1,715	0m
SAP 13	Kilcannon	Former PM settlement	2,275	<50m
SAP 14	Ballynabarny	Former PM settlement	3,490	0m
SAP 39	Kilcannon	Possible enclosure	2,100	0m

15.2.1.3 N30 Mainline

Archaeological Heritage

AH No.:	Townland:	Classification:	RMP No.:	Chainage:	Dist. from route
AH 15	Clavass	Moated site	WX020-008	400	>100m
AH 16	Clavass	Enclosure	WX020-065	540	>50m
AH 17	Coolnahorna	Redundant record	WX020-007 (De-listed)	815	>50m
AH 18	Coolnahorna	Ring ditch	WX020-069	940	>100m
AH 19	Ballybrannis	Redundant record	WX019-023 (De-listed)	6,125	>200m

Areas of Archaeological Potential

AAP No.:	Townland:	Classification:	Chainage:	Dist. from route
AAP 23	Clavass	Riverine environment	0-600	0m
AAP 41	Clavass/Coolnahorna	Townland boundary and stream	520	0m
AAP 42	Coolnahorna/Ballyorril	Townland boundary	1,400	0m
AAP 43	Ballyorril	Riverine environment and townland boundary	1,700-1,640	0m
AAP 44	Ballyorril/Moyne Middle	Two townland boundaries and two streams	2,050-2,600	0m
AAP 45	Ballyorril/Killalligan North	Townland boundary and stream	3,220-3,340	0m
AAP 46	Killalligan North/ Askunshin	Townland boundary	3,900	0m
AAP 47	Askunshin/Milehouse	Townland boundary	4,550-4,800	0m
AAP 48	Milehouse	Elevated ground	4,800-4,950	0m
AAP 49	Milehouse/Monart East	Townland boundary and stream	5,050-5,180	0m
AAP 50	Monart East/Bessmount	Townland boundary	5,170-5,900	0m

AAP No.:	Townland:	Classification:	Chainage:	Dist. from route
AAP 51	Bessmount/Templescoby	River Urrin crossing	6,300-6,600	0m
AAP 53	Templescoby/Dunsiane	Townland boundary	7,000	0m
AAP 54	Dunsinane/Templescoby	Townland boundary	7,850	0m

Table 15.15 Sites of Archaeological Potential

SAP No.:	Townland:	Classification:	Chainage:	Dist. from route
SAP 24	Coolnahorna	Surface anomaly	1,350	0m
SAP 25	Ballyorril	Surface anomaly	2,050	0m
SAP 26	Moyne Middle	Spring	2,300	0m
SAP 27	Ballyorril	Surface anomaly	2,550	0m
SAP 28	Ballyorril	Surface anomaly	2,650	0m
SAP 29	Ballyorril	Surface anomaly	2,670	0m
SAP 30	Ballyorril	Surface anomaly	2,750	0m
SAP 31	Askunshin	Former PM settlement	4,400	<50m
SAP 32	Milehouse	Mill race	4,900-5,070	0m
SAP 33	Bessmount	Former PM settlement	5,350	0m
SAP 34	Bessmount	Former PM settlement	5,400	<50m
SAP 35	Bessmount	Mill race	6,400	0m
SAP 36	Templescoby	Surface anomaly	6,600	<50m
SAP 37	Templescoby	Former PM settlement	6,980	0m
SAP 38	Bessmount	Former PM settlement	6,240	0m

15.2.1.4 Prehistoric Period

Mesolithic Period (c.7000-4000BC)

The Mesolithic Period is the earliest time for which there is clear evidence of prehistoric activity in Ireland. During this period people hunted, foraged and gathered food and appear to have had a mobile lifestyle. The most common evidence indicative of Mesolithic activity at a site comprises scatters of worked flint material; a by-product from the production of flint implements (Stout & Stout 1997). The earliest human occupants of County Wexford appeared to live along the eastern coast, subsiding off a plentiful marine resource. The flint tools discovered on Wexford's coast, from Carnsore Point to Kilmichael point, are dated from approximately 5000 BC. No known sites from this period have been identified within the receiving environment of the Proposed Scheme, which is not usual as very little evidence for Mesolithic activity has been discovered away from the coast in County Wexford (Stout 1987:4). However, as evidence for

Mesolithic populations is also often found close to the riverine as well as the coastal resource, the presence of the River Slaney and River Urrin within the receiving environment means that the potential exists for the discovery of further archaeology in the area that relates to this period.

Neolithic Period (c.4000 – 2500BC)

During the Neolithic period communities became less mobile and their economy became based on the rearing of stock and cereal cultivation. This transition was accompanied by major social change. Agriculture demanded an altering of the physical landscape, forests were rapidly cleared and field boundaries constructed. In Wexford, land clearance is recorded from around 4000BC although it is difficult to gauge the scale at which this was taking place and any resultant population growth (Stout 1987:4).

There was a greater concern for territory, which saw the construction of large communal ritual monuments called megalithic tombs, which are characteristic of the period. There are no known sites of this type within the receiving environment of the Proposed Scheme, with the majority of megalithic tombs found in the southern part of the County or within the uplands in the very north of the County. However, a variety of stone implements dating from the Neolithic have been found throughout County Wexford, although few of these have a provenance within the receiving environment. Sherds of Neolithic pottery were found accompanying human remains in a cist at Norrismount (National Museum of Ireland Ref.: 1949:60-62) whilst a stone lamp (NMI Ref.: 1961:2) was also found nearby. Although the exact locations of these finds are unknown, Norrismount is located c. 1km northwest of the Proposed Scheme in the region of M11/N11 Mainline chainage 6,300m. Archaeological excavations undertaken as part of the N11 Gorey Bypass revealed some evidence for Neolithic activity at Moneylawn Lower, c.3km northeast of the northern most point of the M11/N11 Mainline. A small stone axehead found at Moneylawn Lower ((Ministerial Direction Ref.: A003/046 Liam McKinstry); whereas a series of pits containing flint debris and pottery sherds from approximately six Early Neolithic Carinated bowls were also discovered at a site in the same townland (Ministerial Direction Ref.: A003/015 Liam McKinstry).

The majority of Neolithic evidence is distributed around the estuary of the River Slaney, although the presence of this river within the receiving environment may have attracted unknown Neolithic settlement into the receiving environment of the Proposed Schemes.

Bronze Age (c.2500-600BC)

The Bronze Age was marked by the widespread use of metal for the first time in Ireland. There have also been a numerous amount of gold objects found in County Wexford, of which four exceptionally large gold disks were found in the vicinity of Enniscorthy in the 18th century (Furlong 2003:4). However due to the early nature of their discovery a precise location is not

known for their find spots. Further finds in the form of a twisted gold torc are known from the region surrounding Gorey.

As with the transition from Mesolithic to Neolithic the transition into the Early Bronze Age was accompanied by changes in society. Megalithic tombs were no longer constructed and the burial of the individual became typical. Cremated or inhumed bodies were often placed in a cist, which is a stone-lined grave, usually built of slabs set upright to form a box-like construction and capped by a large slab or several smaller lintels (Buckley and Sweetman 1991, 63). In excess of 37 cists have been discovered in County Wexford, with their general distribution showing a bias towards the eastern half of the County (Stout 1987:11). The cists were then frequently covered by cairns or barrows (mounds of earth and/or stone). Circular cairns and barrows were not restricted to use with cist burials and can contain burials dating to as late as the end of the Iron Age (c. 5th century AD). The term ring-ditch is often applied to barrows with a flat centre.

According to the Archaeological Inventory of Wexford, barrows and tumuli are all located in the eastern part of the County, particularly north of Enniscorthy (Moore 1996). In 1999 excavations outside of the receiving environment revealed a small ring-ditch in Ferns Lower in the north west corner of a reed bed following bulldozing of the field (Licence Ref: 99E0450). The burial monument contained the cremated remains of five individuals, three of which were accompanied by grave goods. The cremated remains appear to have been burnt elsewhere and then transferred to the ring-ditch as indicated by the charred remains of wood beneath the burials.

A further six Bronze Age burial Urns and cremated human remains were collected from a flat cemetery again just outside of the receiving environment in Scarawalsh (NMI Ref.: 1963: 47-58). Three possible ring-ditch sites (AH 4, AH 5, AH 18) have been recorded within the receiving environment of the Proposed Scheme. These have been identified through aerial photographs as crop marks and do not possess any surface expression. The closest site is AH 5, located c. 33m to the east of the N80 Link Road (approximate chainage N80:1,200m) within Ballynahallin. These three sites are all located within close proximity to each other and the River Slaney, which is situated to the northeast. It is possible that they were placed within the landscape in reference to the River and possibly the flat cemetery located within Scarawalsh, c. 1.4km to the northeast. Therefore the northern end of the proposed N80 Link Road and the N30 Mainline has been designated as an Area of Archaeological Potential (AAP 23).

Evidence for settlement during the Bronze Age is relatively sparse. However a site thought to reveal of glimpse of domestic life at this time is the *fulacht fiadh*. A common site, they are normally interpreted as temporary cooking sites, possibly used on a seasonal basis. These sites survive as low mounds of charcoal-enriched soil mixed with an abundance of heat-shattered stones. They are usually horseshoe shaped and located in low-lying areas near a water source and are often found in clusters. Even when levelled by an activity such as ploughing, they are

identifiable as burnt spreads in the landscape. Radiocarbon dates for this monument type have generally placed them in the Bronze Age (Brindley and Lanting 1990: 55).

One *fulacht fiadh* is known within the receiving environment of the Proposed Schemes located at Oulartard (AH 3), 64m from the M11/N11 Mainline. A further possible *fulacht fiadh* site has been identified in Ballycarrigeen Lower within the footprint of the M11/N11 Mainline (SAP 5). Numerous *fulachta fiadh* (one third of all sites) were discovered and excavated as part of the recent construction of the N11 Gorey Bypass to the north of the receiving environment of the M11/N11 Mainline, indicating the potential for future detection within the proximity of the Proposed Schemes, particularly in water logged or riverine landscapes of which a proliferation have been identified within the receiving environment.

Another familiar feature of the rural landscape, which may have its roots grounded in the Bronze Age, is the standing stone. These monuments are very difficult to date, with each example having the potential to belong to a number of different periods. It is likely that those with a long north east / south west axis date to the Bronze Age having close affinity in orientation to similarly dated stone rows and pairs. They appear to have been erected for a variety of reasons. Certain stones mark prehistoric burials whilst others may have had a commemorative or ritual role, or served as boundary markers or positions posts along ancient route ways (Moore 1996). Whilst they were once particularly numerous in the north of Wexford County there are no recorded sites within the receiving environment of the Proposed Scheme. However, one stone is located at Solsborough just outside of the receiving environment of the M11/N11 Mainline and the N80 Link Road. This displays evidence of decoration in the form of identifiable Bronze Age decorations. The majority of recorded standing stones are located along the valley of the River Slaney from Enniscorthy to Wexford harbour.

In around 2150 BC the "Bell-Beaker" culture, named for the bell-shaped vessels that the population left behind, began to appear in Ireland. The culture is known as one of more technologically advanced people, who made and used metal and finely polished stone tools. The recent increase in development-led excavations has resulted in the discovery of many new Irish Beaker-related funerary and ritual sites. Two sites were excavated at Frankfort in 2005 as part of the archaeological assessment associated with the recently constructed N11 Gorey Bypass. Site 1 (Ministerial Direction Ref.: A003/055), located close to the tie in with the M11/N11 Mainline, was comprised of a number of possible postholes, amorphous pits and a small kiln. One particular pit was revealed to be full of Beaker pottery sherds (190 in total) and was interpreted as a type of fire pit (Devine 2005:2). Site 2 (Ministerial Direction Ref.: A003/056) comprised of a series of 50 furrows, three pits and over thirty fire spots (Lehane 2005:2). These features may possibly have a prehistoric date although no diagnostic artefacts were found during excavation to verify this. In Moneylawn Lower, c. 3km northeast of the northern point of the M11/N11 Mainline,

54 sherds of Beaker Ware representing at least 6 vessels were also discovered within an oval pit. ((Ministerial Direction Ref.: A003/015 Liam McKinstry).

Iron Age Period (c. 500BC – c. AD500)

Compared to the rest of Irish prehistory, there is very little evidence in Ireland, as a whole, representing the Iron Age. As in Europe, there are two phases of the Iron Age in Ireland; the Hallstatt and the La Tène. The Hallstatt period generally dates from 700BC onwards and spread rapidly from Austria, across Europe, and then into Ireland. The later Iron Age or La Tène also originated in Europe during the middle of the 5th Century BC. For several centuries the La Tène Celts were the dominant people in Europe, until they were finally overcome by the Roman Empire.

County Wexford was first mapped by Ptolemy around the year 150 AD through information extracted from various accounts of sailors and traders of the time. The detail of its position on the eastern coast shows Carnsore Point as being a particularly dangerous landmark for travellers. According to Ptolemy the tribe most dominant in County Wexford were the Brigantes (*Uí Bairrche*) who once occupied much of south Leinster. However, they were eventually confined to a portion of Laois and Bargy in South Wexford. Their conquerors were the *Uí Cheinnselaig*, a branch of the *Laigin*, who gave their name to Leinster (Culleton 1999:16). The evidence for Iron Age activity in Wexford in still inadequate and there are no known Iron Age sites within the receiving environment of the Proposed Scheme. However, some of the enclosure sites and possibly some of the 600 ringforts identified within the County and the receiving environment have the potential to date to this period or even earlier in prehistory.

15.2.1.5 Early Medieval Period

The Early Medieval period is depicted in the surviving sources as entirely rural characterised by the basic territorial unit known as *túath.* Byrne (1973) estimates that there were probably at least one hundred and fifty kings in Ireland at any given time during this period, each ruling over his own *túath.* The Annals of the Four Masters refer to a monastic foundation, dedicated to St. Ibar or *Iubhar*, which was situated most probably on an island in Wexford harbour. It was mentioned in AD 499-501 when *Iubhar* died, in 819 when the settlement was sacked by Vikings, in 884 on the death of *Diarmait*, abbot of *Beg Eire* and again in 964 on the death of another abbot *Crundmael* (Furlong 2003, 11). These references occurring over a period of four centuries suggest a settlement of some size and importance, prosperous enough to have been targeted by Viking raiders.

From the 6th century onwards the landscape was dominated by scattered rural monasteries, which were often surrounded by a large circular or oval enclosure, as is the case with the ecclesiastical remains at Ferns which are located just outside of the receiving environment of the

M11/N11 Mainline. The old monastery was founded by the King of Leinster for *St. Meadhog* in the 6th century which was plundered by the Vikings in 930 and other later additions. The remains at Ferns, which include later medieval additions, are classed as National Monuments.

During the 7th and 8th centuries, control of the area now known as Wexford was consolidated by the *Uí Chennselaig* clan, based at Ferns, and the possession of Ferns came to mean the possession of power. From c. AD769 the abbey there was elevated to the rank of royal monastery, replacing St. Mullin's, County Carlow as the principal religious base in south Leinster. However, a new power was to arrive in the Country, and from AD795 onwards, Viking raids are recorded in the County Wexford. Even the county name itself derives from the Viking name for "the land of the flats" – *Waesfjords*. Ferns town, the focus of religious and political power was raided in AD834, and again in AD930, when the old monastery founded in the 6th century by the King of Leinster and dedicated to St. *Meadhog*, was plundered. It was only when Brian Boru, once a little thought of king of Munster, challenged and defeated a powerful Leinster and Norse alliance in 1014 that the rule of the Vikings was broken.

During this sometimes violent period, roughly circular defensive enclosures known as ringforts were constructed to protect farmsteads. Although most of the ringforts that have been excavated are shown to date to this period, some have earlier origins and may have been originally constructed during the Iron Age, or even earlier. The ringfort or rath is considered to be the most common indicator of settlement during the Early Medieval Period (c. 400-1160 AD). The most recent study of the ringfort (Stout 1997) has suggested that there are a total of 45,119 potential ringforts or enclosure sites throughout Ireland. They are typically enclosed by an earthen bank and exterior ditch, and range from 25m to 50m in diameter. The smaller sized and single banked type (univallate) were more likely to be home to the lower ranks of society while larger examples with more than one bank (bivallate / trivallate) housed the more powerful kings and lords.

There are approximately 600 'earthworks' or 'enclosures' in the County with 4 such sites recorded within the receiving environment of the Proposed Schemes. The closest of the sites to the routes are AH 10 located in Ballynabarny and AH 16 located in Clavass. The function and date of these enclosures is unclear without further investigation. Often they may in fact represent ringforts, which have either been damaged to a point where they cannot be positively recognised, or which are smaller or more irregular in plan than the accepted range for a ringfort. An early-Christian date is generally likely, though not a certainty. It is also possible that the sites represent the remains of earlier prehistoric settlement. The majority of the examples from the receiving environment have been identified through successive surveys of aerial photography, which have revealed crop-marks in the land that make a site visible from the air, but hard to identify at ground level.

In general, the organisation of the Irish church was primarily monastic. It was not until the beginning of the 12th century that it was gradually reorganised into dioceses, and abbots were replaced by bishops. The evidence for early Christian sites within the receiving environment is supported by a number of examples. AH 8 consists of the remains of a small church within Kilcannon. The name of the townland itself refers to the religious nature of the area, with 'Kil' deriving from the Irish word *Cil*, meaning church. The church is located c. 131m northeast of the N80 Link Road, approximate chainage N80:2,500m, and is found in association with AH 7, a holy well (now de-listed as an RMP site). Part of an early circular enclosure is visible at the site, which is likely to indicate an early foundation for the site, along with the presence of the holy well.

The veneration of holy wells is one of the oldest traditions in Irish Christianity and most likely has its origins in earlier pagan ritual activities. These wells can manifest themselves in a variety of forms ranging from natural springs to rain collecting rock depressions and often have Early Christian origins. In County Wexford alone 113 potential holy wells are listed in the Archaeological Inventory for County Wexford (1996, 230), whereas there are only 10 listed within the RMP/SMR records.

Field inspection along the M11/N11 Mainline of the Proposed Scheme identified a previously unrecorded holy well, which tradition states is linked with a St. Maunyeen (no reference could be found to this particular name or any derivative). St. Maunyeen was a junior to St. Patrick and was sent to Ferns to investigate happenings, when he was chased from the town by King Dunlang. He eventually came to the townland of Mountgeorge where he slept having placed his thorn walking stick into the ground. In the morning he awoke to find that the stick had turned into a great thorn tree and a spring with healing powers flowed at his feet (information from newspaper cutting provided by landowner Joan Gahan). A spring was identified at Mountgeorge as SAP 4, immediately adjacent to the M11/N11 Mainline at approximate chainage M11/N11: 9,650m. The spring itself was surrounded by a roughly constructed low stone wall, and overlooked by a mature ash tree. Several pieces of white quartz have been deposited close to the spring and on the wall. A small basin carved into a stone was also apparent, which has been built into the base of the wall. This stone represents a bullaun stone, which are often found in association with early medieval religious sites. It is possible that these stones featured as an element of pagan worship, which was carried forward as a Christian ritual during the early medieval period. The Archaeological Inventory of Wexford lists a total of 23 recorded bullaun stones within the county (1996, 227).

15.2.1.6 Medieval Period

The first of the Irish Anglo-Norman landings and invasions took place in County Wexford, at the invitation of the former king of Leinster, Dermot MacMurrough Kavanagh. The Anglo-Normans, joined by 500 *Uí Chennselaig* men, took the Viking town of Wexford. Through a policy of military

force and integration, the Anglo-Normans colonised much of the Country. Marriages between Norman leaders and the women of Ireland's great families aided this integration. The Norman feudal culture, techniques, language and legal systems were to have a profound effect in the County after 230 years of Norse influence.

The many monastic settlements that flourished during the medieval period were supplemented during the 13th century by the continental monastic orders. These were introduced and patronised by the Anglo-Normans. The Franciscans were present in Wexford in the 1240's and the Augustinian Friars were established in Ferns by the middle of the 12th century and in New Ross by the late 13th century. In Enniscorthy a charter of AD1223-43 confirms a grant of de Prendergast involving the House of St John and the appointment of the prior (Furlong 2003, 49). Enniscorthy town itself became a defensive point, with a major stone castle being built on the west side between 1245 and 1274. The town developed over the following centuries but suffered greatly from an attack by the Kavanagh clan in 1548. The town however recovered due to its development as a trading centre and the growth of its timber industry, supplying much of the oak for English navy ships from forests to the north and west of the town (Barrett 1885; Colfer 2002; Whelan 2000).

In 1152 Dermot MacMurrough Kavanagh founded an Abbey in Ferns, but it was burned down two years later. He rebuilt it in 1160 and handed it over to the Augustinians. Portions of this church still survive and can be recognised by the characteristic tower at the west end of the church, which is square at the bottom and becomes round higher up. Dermot was also thought to have died within this Abbey in 1172, and his grave is supposedly marked by a fragment of a shaft of cross, which is highly decorated. The present Church of Ireland church incorporates parts of a Cathedral which was probably built by John St. John, the first Anglo-Norman bishop of the diocese (1223-43), and which was burned in 1577. To the east of this structure is another 13th century building, which may have acted as the monks' choir.

During this period moated sites (defended farmsteads) begin to appear regularly in the landscape of County Wexford. These sites are characterised by a water-filled moat and are often situated in low-lying or poorly drained inaccessible land. The displaced material from the moat was laid in the interior to create a raised platform which was further defended by a palisade. Like the ringfort of the early medieval period the moated enclosure represented the small farming class of the Anglo-Norman settlement of the County. Around 130 extant and levelled examples exist in County Wexford, with four such sites located within the receiving environment of the Proposed Scheme (AH 2, 12, 13, 15). The closest site to the Proposed Scheme is AH 12 located 177m from the M11/N11 Mainline in Tomnafunshogue.

A medieval farmstead was recently excavated as part of the archaeological investigations associated with the N11 Gorey Bypass in Moneycross Upper, c. 500m north east of the start of

the M11/N11 Mainline (Ministerial Direction Ref.: A003/057). The remains consisted of a long rectangular house structure with associated field ditches and a U-shaped enclosure. It was thought during excavation that it bore similarities to houses of the Anglo-Norman type, a theory that was defended by certain finds, such as medieval pottery, an iron arrowhead and a bone awl (Schweitzer 2005:2).

Excavations 2.6km southwest of the southern point of the N30 Mainline, also revealed a previously unrecorded medieval moated site at Coolamurry as part of the N30 Enniscorthy to Clonroche Road Scheme. A possible drawbridge was identified along with a cobbled path and separate living/livestock areas. Finds from the site included local medieval pottery, a copper coin and copper alloy dividers (Licence Ref.: 04E0326).

15.2.1.7 Post Medieval Period

Although English landowners may have been losing their grip on Irish land during the medieval period, during the time of Henry VIII and Elizabeth I, lands were regained and secured. The Elizabethan implementation of the 'Surrender and Regrant' policy allowed the monarch to continue colonising Ireland at a time when the treasury funds were too low to afford a war. The policy was to induce native leaders to put their lands under the protection and ultimate ownership of the crown. The implication was that if they did not, it would be taken away from them anyway. Under the Irish custom the clan itself owned the land, not any individual and this included the chief. He administered it during his lifetime but could not will any part of it on his death at which time it reverted to the charge of the *tanaiste* or appointed successor for the clan, who would not necessarily be his son and heir.

The inducement was that on re-granting the chieftain would personally own the land and could will it in any way he desired. The aim was to break up the clan system and to put the lands and the owners within the control of the crown. The snag however was that the crown could take the land back at any time if they so wished and in practice over the coming years frequently exercised this right. Confiscated lands were granted to 'undertakers', which were suitable English people of the new faith who would undertake to purchase available land at a very low price on agreement that he would sub-let it only to English Protestants and would otherwise comply with the wishes of the authorities. The plantation of northern Wexford took place over a number of phases between 1612 and 1618. However, due to some violent protests from the dispossessed it was decided in 1613 to construct a corporate town in the southern part of the plantation in order to improve security. Thus Enniscorthy was established as a town and grew quickly to become a major centre of commerce (Goff 1987:139). By 1640, the majority of the land contained within the receiving environment of the Proposed Scheme was owned by a planter named Sir Henry Wallop, who possessed just over 5,000 acres (*ibid*. 147).

This was followed in the second half of the 17th century by the Cromwellian, Restoration and Williamite land settlements. Before 1641, the confiscation was aimed primarily against the Irish, but after that date all Catholic proprietors, comprising mainly Irish and Old English, found their lands subject to forfeiture, unless they could prove 'constant good affection' to the English parliament (Goff 1987:122). Between 1641 and 1878 estates became progressively smaller and more fragmented.

The rebellion of 1798 was the most violent and tragic event in Irish history between the Jacobite wars and the Great Famine. After years of mutterings and sporadic outbreaks of violence, by people such as Theobald Wolfe Tone, who wanted a united Ireland, a major rebellion started in County Wexford on the 28th May 1798. It began at Carnew when 36 prisoners were summarily executed. After his church and some houses in the village were burned down, Father John Murphy of Boolavogue led several thousand men and women armed with pikes and scythes into resistance and won an important victory on the Hill of Oulart, c. 6.75km east of the M11/N11 Mainline. They made their way to Ferns, burnt the bishop's palace and then went on to overwhelm Enniscorthy where they established their base on Vinegar Hill, c. 1.5km west of the M11/N11 Mainline, before taking Wexford Town. The insurrection eventually fell apart and the leaders and many other participants were rounded up and executed by the authorities. The cultural heritage section of this chapter deals with this event in more detail (Section 15.5).

15.2.1.8 A Summary of Previous Archaeological Fieldwork undertaken within the Receiving Environment

A review of the Excavations Bulletin (1970-2005) and the licence database held by the National Monuments Section of the Depart of Environment, Heritage and Local Government (2006-2009) has revealed that whilst no previous archaeological fieldwork has been carried out within the corridors of the proposed national routes, a number of excavations have been carried out within the receiving environment. These are summarised below:

<u>M11/N11 Mainline</u>

Frankfort, 2005, Site 2, Ministerial Direction Ref.: A003/056

A site comprising of a series of fifty furrows, three pits and over thirty fire spots. Located to the immediate northeast of the tie in between the existing N11 Gorey Bypass and the M11/N11 Mainline. No diagnostic artefacts were found during excavation but the site is though to be prehistoric in date.

Frankfort, 2005, Site 1, *Ministerial Direction Ref.: A003/055*,

A site located in close proximity to the tie in with the M11/N11 Mainline, was excavated that comprised of a number of possible postholes, amorphous pits and a small kiln. One particular pit

was revealed to be full of Beaker pottery sherds (190 in total) and was interpreted as a type of fire pit.

Ballygullen, 2006. Licence Ref.: 06E0991

Monitoring of topsoil stripping was undertaken at a development site located just within the receiving environment, to the west of the M11/N11 Mainline. Nothing of archaeological significance was discovered.

N80 Link Road

No archaeological investigations have been carried out within the receiving environment of the N80 Link Road.

N30 Mainline

Bulletin Ref.: 2005:1676 Templescoby *NGR 292787 138375*

Licence Ref.: 04E0322ext, located c.830m southwest of the southern point of the N30 Mainline. A series of substantial timbers were recovered from construction work for the N30 Enniscorthy–Clonroche Road Scheme. Eight archaeological timbers were recovered, three of which were believed to form the main structural elements of a horizontal mill, the most diagnostic timber being similar to those used to support the wooden flume, either within the millpond or at the mill itself. Subsequent to this discovery, a program of licensed monitoring took place, and two additional timbers were discovered during the reshaping of a drainage ditch. These timbers were thought to correspond with those from a possible tailrace for the mill structure. Felling dates of AD771±9 years and AD745AD±9 have been obtained through dendrochronological analysis, which places the mill within the early medieval period.

Site 10, Templescoby, *NGR 293659, 138837*

Licence Ref.: 04E0320, located c. 120m E of N30 Mainline chainage 8,000. This site was excavated as part of the N30 Enniscorthy – Clonroche Road Scheme. It consisted of a post medieval farm complex with an associated agricultural landscape. A possible outbuilding was identified on site along with areas of burning and pos medieval pottery. However, the site is not present on any of the OS map editions and as a result is likely to have dated to the 18th century at the latest.

15.2.1.9 Cartographic Analysis

The study of maps is important when tracing land use development within the study area as well as providing important topographical information on sites and areas of archaeological potential. Cartographic analysis of all relevant maps has been made to identify any topographical anomalies that no longer remain within the landscape. The Ordnance Survey six inch map

editions and Barony maps were obtained from the Trinity Map Library in Dublin. This section of the chapter includes a description of any built heritage or cultural heritage features marked within the mapping.

Down Survey Maps of the Baronies of Gorey, Scarawalsh and Bantry, 1655-56

These particular maps were compiled during the 17th century in order to give a representation of landownership within Ireland, and as such do not possess a large amount of detail. A small section of the northern point of the M11/N11 Mainline is located within the Barony of Gorey. No detail of buildings or topographical features are marked within the approximate vicinity of the M11/N11 Mainline on this map.

The majority of the M11/N11 Mainline, the N80 Link Road and the N30 Mainline are located within the Barony of Scarawalsh. A small section of the southern portion of the N30 Mainline is located within the Barony of Bantry.

A large portion of the land within the Barony of Scarawalsh is marked as being under Protestant ownership and as such contains little detail. Very few of the townland names that are used are recognisable when compared to the 19th century townlands. Enniscorthy is named a 'Iniscorthy', and Monart is named as 'Moynart'. The River Slaney and the River Urrin are both marked and named, along with some smaller waterways. However, no roads are marked within the mapping, and the closest buildings marked to the approximate position of the Proposed Schemes is the house at Monart and a building at 'Toomenemaghtory' to the east of Enniscorthy. It is not clear as to which townland this name refers.

M11/N11 Mainline

First Edition Ordnance Survey Map, 1841, scale 1:10560.

The M11/N11 Mainline begins in the townland of Clogh (OS sheet 11) and passes through a wooded area with a slightly curved boundary to the south. It then travels southwest through Frankfort and cuts the southeastern corner of Ballinclay Demesne (D 1). The demesne is shaded to indicate its extent, with the house (BH 1) shown along with outbuildings, and a garden. A burial ground is marked in the northern section of the demesne c. 450m northwest of the mainline.

Continuing south southeast the M11/N11 Mainline crosses a tertiary road at approximate chainage N11:2,950m at which point a churning mill is marked c. 150m to the west in the townland of Ballygullen. It then crosses the Bracken River (AAP 4), which flows east-west into the River Bann, at approximate chainage N11:3,300m. At chainage N11:4,900 The M11/N11 Mainline continues through Medophall c. 600 to the southeast of Medophall Demesne and c. 600m northwest Ballymore demesne. The surrounding landscape is characterised by open fields and the occasional farmstead. Several large probable gravel pits are also illustrated in the surrounding landscape. In Ballyeden, a complex of buildings are marked at the location of BH 3,

and further south in Medophall a further farmstead is marked c. 170m northwest of the M11/N11 Mainline. The route then passes into Knockrobin Lower, where a substantial farm complex is marked c. 150m to the southeast and three buildings are marked at BH 5, c. 270m to the northwest. To the immediate northwest of BH 5 is a plot of land characterised by a group of buildings accessed via a long drive, with a possible orchard.

At Ballymore the M11/N11 Mainline crosses a tertiary road at approximate chainage N11:7,600m. Here a small building is marked within the footprint of the M11/N11 Mainline (BH 7). Several similar sized buildings are marked as fronting onto the road further to the northwest, and approximately nine buildings are marked adjacent to the road to the southeast of the route. The M11/N11 Mainline then enters Rockspring, where it passes to the immediate southeast of a group of buildings (approximate chainage N11:8,350m), and cuts through the northwest corner of Rockspring demesne (D 2). The house at Rockspring (BH 11) is marked with outbuildings to the east forming a courtyard behind the house. The walled garden may be present, but a small rectangular structure appears to occupy the current location of the turreted garden house/folly (BH 12).

The M11/N11 Mainline then curves southwest to pass through Quarry and c. 200m northwest of a farmstead. It then runs through the north western part of the Mountgeorge Demesne (D 3) which is bounded to the northeast and northwest by a water course (AAP 14, 15). The house and landscaped gardens are located c. 200m to the southeast of the M11/N11 Mainline. There is no obvious trace of the holy well located within Mountgeorge (SAP 4) although a very small dot is present within the area of the well, but is marked as being further west than its actual position. The M11/N11 Mainline then passes into Ballycarrigeen Lower and passes to the northwest of two farmsteads (BH 13, 14). At approximate chainage N11:11,150m the M11/N11 Mainline crosses a small track (BH 15) that serves BH 14, which consists of a small farmstead. At approximate chainage N11:11,500m the M11/N11 Mainline crosses a tertiary road to the southeast of two further farms (BH 16, 17). Approximately 400m to the southeast the village of The Harrow is marked (CH 2), which contains only a small number of buildings.

The M11/N11 Mainline then travels through open landscape within Carrigeen, Knockavocka and Myaugh. Here the M11/N11 Mainline crosses water courses at AAP 18 and 19 before passing to the southeast of a small farm (BH 18). Just before the route passes BH 18, it passes c. 25m to the northwest of a further small dot (similar to the one noted close to SAP 4). This may indicate the presence of a well, or part of the cartographic process of marking heights and contours.

As the M11/N11 Mainline enters Tinnacross at approximate chainage N11:14,450m a school house is marked within the path of the M11/N11 Mainline (SAP 6). Tinnacross Bridge is marked c. 140m to the north (BH 19). The M11/N11 Mainline continues southwest roughly following a small water course (AAP 21, 22). At approximate chainage N11:16,400m the M11/N11 Mainline

cuts through the southern section of un-shaded demesne (D 4) associated with Summerville House (BH 20). Although the house is marked along with outbuildings, it is not labeled and the demesne is not shaded. However, the presence of the trees indicates an ornamental function. The M11/N11 Mainline then passes c. 100m to the southeast of a farmstead (BH 21), which is surrounded by some ornamental gardens. Crane Bridge (BH 22) is also marked c. 300m to the northwest of the M11/N11 Mainline at this location.

In Crane the M11/N11 Mainline crosses a tertiary road at approximate chainage N11:17, 400m, and passes between 50m and 300m to the east of Solsborough Demesne. The house with accompanying ha-ha is clearly marked along with outbuildings and the walled garden. To the immediate south of the complex is a square enclosure that may represent a former moated site. As the route passes to the east of Solsborough demesne, it crosses two further small tertiary roads in Toom and to the immediate west of a farmstead (BH 24).To the immediate southeast of the demesne is the proposed Ballydawmore Junction.

The M11/N11 Mainline continues south from the Ballydawmore Junction and at approximate chainage N11:19,200m it passes to the immediate northeast of a group of small buildings (SAP 15). At approximate chainage N11:19,700m the M11/N11 Mainline crosses a tertiary road and passes c. 300m to the southeast of a small shaded demesne, which although contains a house and buildings, is not labelled. To the immediate south of this demesne is Ballynabarny Bridge (BH 30). Within the townland of Ballynabarny and Ballydawmore a large number of quarry pits are marked. At approximate chainage N11:21,000m the M11/N11 Mainline then crosses another small road (SAP 17) within Tomnafunshoge. The current R744 had not been constructed at this time and as a result the proposed Tomnafunshoge junction is located within an open field. It then passes c. 175m to the northwest of a square moated site (AH 12). At approximate chainage N11:22,250m the M11/N11 Mainline crosses a tertiary road and to the east of a farm complex with small orchard. It then continues south to the immediate east of the demesne surrounding Ballycourcy House (BH 32). This house is marked as being surrounded by substantial planting and an ornamental lake located between the house and M11/N11 Mainline. To the immediate east of the M11/N11 Mainline there is what appears to be a smaller, un-shaded demesne marked, although the house is not labeled. Further east again (c. 250m) Cooladine House is marked, although the demesne is not shaded. Several large quarry pits are marked as present within this area.

The M11/N11 Mainline continues in a southerly direction past a number of small farms, including BH 30 in Monroe, before crossing a tertiary road at approximate chainage N11:24,900m. At this location six buildings are marked on the southern side of the tertiary road whereas three are marked on the northern side (SAP 20), within the path of the M11/N11 Mainline. A small settlement is marked as Darby's Gap (CH 6) c. 150m west of the M11/N11 Mainline. The

M11/N11 Mainline then travels through a relatively unoccupied landscape until approximate chainage N11:26,600m, where small and medium sized farms are located close to the M11/N11 Mainline. Over the next 1.4km of the M11/N11 Mainline there are twelve settlements marked within 300m. At approximate chainage N11:27,700m the M11/N11 Mainline cuts through the side of the one of the settlements (SAP 23).

Second Edition Ordnance Survey Map, 1903, scale 1:10560.

The second edition mapping of the receiving environment reveals that a number a general changes have been carried out within the landscape. The railway that runs from Dublin down to Wexford has been constructed and is labeled as the Dublin, Wicklow and Wexford Railway. The M11/N11 Mainline crosses this feature (still in use) at approximate chainage N11:3,250m and the N80 Link Road crosses at approximate chainage N80:2,800m. A number of additional tertiary roads have been constructed, including the R447 within the townland of Tomnafunshoge and many of the small farmsteads within the landscape have been removed. The demesnes surrounding the country houses have either been reduced in size or are no longer shaded. This does not mean that they no longer exist, but are more likely to possess an agricultural rather than ornamental role.

Ballinclay House (BH 1) is still present, although the demesne (D 1) that is shaded is much smaller and located c. 250m from the M11/N11 Mainline. In Ballygullen, the mill that was located to the west of the M11/N11 Mainline is no longer present, although the area is marked with buildings. A new small road now exists at approximate chainage N11:3,100m, which crosses the Dublin – Wexford railway via a bridge (BH 2).

In Medophall, the demesne for Medop Hall is no longer shaded, although demesne characteristics remain. To the southeast part of Ballymore House demesne is shaded, but not to the same degree as the first edition. As the M11/N11 Mainline enters Rockspring the small building BH 7 is still marked within the path of the M11/N11 Mainline. A Smithy is marked c. 100m east of the M11/N11 Mainline at approximate chainage N11:7,350m. The buildings marked adjacent to Rockspring demesne (D 2) are fewer in number, although some are still present (BH 9). A well is also labelled to the immediate north of the demesne (CH 1). The house at Rockspring is still present and the walled garden is now definitely marked although the turret building is not shown.

At Mountgeorge, the demesne (D 3) is no longer shaded, although the house and outbuildings are still present. The M11/N11 Mainline continues in a southwest direction through relatively unoccupied landscape. Once it reaches Tinnacross, the school building is still marked within path of the M11/N11 Mainline. As the M11/N11 Mainline passes into Oulartard, it crosses a water course (AAP 21). Here, at approximate chainage N11:15,550m, a weir is marked along

with the head of a mill race (SAP 7), which leaves the small river to run in a westerly direction before turning south. At approximate chainage N11:16,000m the M11/N11 Mainline crosses the millrace again, just before it reaches a Corn Mill marked on the eastern bank of the stream (SAP 8). The buildings associated with the mill are located c. 75m to the southeast of the M11/N11 Mainline as it crosses the stream again at approximate chainage N11:16,150m.

The M11/N11 Mainline then enters the un-shaded demesne (D 4) associated with Summerville House (BH 20), which is now labelled on this map. It then carries on in a southerly direction to pass to the east of Solsborough demesne. This demesne is marked by a smaller shaded area than on the first edition, although all buildings are present. In Ballydawmore the M11/N11 Mainline meets with the junction of the N80 link road.

As the M11/N11 Mainline continues in a south east and then south west direction it passes through a relatively unoccupied landscape. The small road that was crossed at approximate chainage N11:21,000m (SAP 17) is no longer marked, although a new road (R447) has been constructed to the south, which the M11/N11 Mainline crosses at approximate chainage N11:21,250m. From Drumgold, the M11/N11 Mainline passes into Cooladine, and to the immediate east of Ballycourcy House. The demesne is no longer shaded although the house is still present. The ornamental lake is no longer marked. There is no indication of a demesne landscape surrounding the house to the east of the M11/N11 Mainline as there was on the first edition map.

At approximate chainage N11:24,900m the M11/N11 Mainline passes to the east of Darby's Gap (CH 6), which now only possesses two buildings. The buildings that were located within the footprint of the M11/N11 Mainline at this chainage either side of the road (SAP 20) are no longer marked on this edition. The final portion of the M11/N11 Mainline, which did possess a significant amount of farmsteads on the previous edition, has lost some of its farms. Those that remain are smaller in size.

Third Edition Ordnance Survey Map, 1926, scale 1:10560.

By the time of this map edition it should be noted that the demesnes that surround the larger country houses were not shaded in the manner of the first and second edition maps. There are no major changes to note within the cartography of the receiving environment of all the routes, but where changes have taken place these are noted below.

At approximate chainage N11:7,500m Ballymore School House (BH 6) is now labelled as such for the first time.

At Rockspring, the well (CH 1) located to the immediate north of the demesne is now marked as being located within its own wooded enclosure.

At Tinnacross the school house (SAP 6) is no longer marked.

The weir, mill race and Corn Mill (SAP 7, 8) are all still marked within Oulartard.

Solsborough House is marked as being 'in ruins', although the outbuildings are intact.

N80 Link Road

First Edition Ordnance Survey Map, 1841, scale 1:10560.

The N80 Link Road begins in Ballynahallin and travels through the townland in a south southeast direction close to the River Slaney. It passes c. 350m to the southwest of Ballynahallin House, which is not marked within a demesne, although the route crosses the access track. It then enters Kilcannon and a small structure is marked to the south of the townland boundary (SAP 12) and passes through an open landscape before crossing the River Slaney at approximate chainage N80:2,750m. At approximate chainage N80: 2,100 a small circular feature is marked within the path of the proposed route, which may represent a small enclosure, or a quarry pit (there are a number marked in the vicinity within this mapping). The route then passes a cluster of buildings (SAP 13), serviced by a trackway (BH 25) that the route crosses at chainage N80: 2,085.

At approximate chainage N80: 2,500m the site of a church (AH 8) is marked c. 200m northeast of the N80 Link Road. This church site is accessed via means of the trackway (BH 25), which is shown as passing the church and crossing the River Slaney to emerge on the opposite bank, although no fording point is labeled on the river. Once the N80 Link road has crossed the River Slaney at chainage N80: 2,750 it travels east-west to the south of Solsborough demesne and the small demesne accompanying Yorke Ville House (BH 26). At approximate chainage N80:3,500m the N80 Link Road passes through the location of three buildings likely to represent a post medieval farmstead (SAP 14). This farm may be connected to an un-named house (later Ballynabarney House) marked to the south of the settlement. The route then passes to the immediate south of a small stream, before crossing it at approximate chainage N80: 3,700m (AAP 26/27). It then reaches the proposed Ballydawmore Junction. A number of quarry pits are marked within the surrounding landscape, as well as several ponds. One circular pond is marked to the immediate north of the proposed route at chainage N80: 4,025.

Second Edition Ordnance Survey Map, 1903, scale 1:10560.

There are no major changes to note within the landscape that the N80 Link Road travels through. However, a house named as Riversdale is now located 400m northeast of the N80 Link Road at approximate chainage N80:400. The church site in Kilcannon (AH 8) is also still marked, along with Yorke Ville House on the eastern bank of the River Slaney. However, there is no shaded demesne surrounding this house. At approximate chainage N80:3,350 a house (BH 4) and small

un-shaded demesne are located c. 100m to the south of the N80 Link Road, although the house is not labeled (this is Ballynabarney House). After crossing a stream at AAP 26/27 the N80 Link Road reaches the Ballydawmore Junction.

Third Edition Ordnance Survey Map, 1926, scale 1:10560.

There are no major changes to note within the cartography of this map that relate to the receiving environment of the N80 Link.

N30 Mainline

First Edition Ordnance Survey Map, 1841, scale 1:10560.

The N30 Mainline commences in Clavass. It travels in a southwest direction through the townland c. 250m to the north of a farmstead where 'site of castle' is marked in italics (AH 15). It then continues on through Coolnahorna, where it crosses a small track apparently associated with a substantial settlement c.175m to the northwest. It continues through Ballyorril and Moyne Middle, which is marked as open landscape with relatively few settlements. In Ballyorril the N30 Mainline passes c. 150m to the southeast of BH 35, which is marked as containing ten buildings. At chainage N30: 2,450m the N30 Mainline passes c. 100m to the southeast of BH 36, a small farmstead. In Killalligan North the N30 Mainline passes c. 70m to the south of a farmstead (BH 41). Here the N30 Mainline appears to cut through an associated orchard. Approximately 800m to the southwest the N30 Mainline partially cuts through a small settlement (SAP 31), consisting of four buildings. This too appears to be accompanied by an orchard, as do the properties to the north and west.

In Askunshin the N30 Mainline runs almost parallel with a small road on a northeast – southwest alignment. Here a number of settlements are marked, including BH 40 and BH 42. The route then enters the townland of Milehouse and passes c. 150m to the northwest of BH 45 a large farmstead. At approximate chainage N30:5,000m, the N30 Mainline crosses a mill race, which runs in a roughly north-south direction (SAP 32). This feature passes two buildings, which may represent a small unmarked mill, c. 250m to the north of the N30 Mainline (adjacent to Monart Bridge BH 44). The race has a length of over 900m prior to meeting those building. The race carries on in a southerly direction after being crossed by the N30 Mainline, where it starts to form townland boundaries. This may indicate a substantial age for the feature. It eventually terminates at a mill and foundry complex located to the immediate south of Enniscorthy Town, adjacent to the River Slaney and the mouth of the River Urrin.

At approximate chainage N30:5,350m the N30 Mainline passes over the site of a rectangular structure marked on this map (SAP 33). It then runs in a southwest direction to curve around the western edge of Monart House demesne (D 5). It does however, cut a small portion of these

demesne lands at the western most corner. Monart House is located c. 750m to the east of the N30 Mainline. The route then passes through a cluster of three buildings that front onto a road (SAP 38). At approximate chainage N30:6,300m the N30 Mainline crosses the tertiary road before crossing another mill race at approximate chainage N30:6,370m (SAP 35). This race is marked as having a total length of 2km and runs in a west-east direction adjacent to the River Urrin. It appears to service an unlabeled mill located c. 450m east of the N30 Mainline. At approximate chainage N30:6,500m the N30 Mainline crosses the River Urrin (AAP 51), which also forms the southern boundary to Monart House demesne (D 5). Approximately 125m to the west of the N30 Mainline at approximate chainage N30:6,200m, Urrinfort House is marked (BH 47) within a small un-shaded demesne. To the northwest of this is Broomlands House, which is also located within a small un-shaded demesne.

At approximate chainage N30:6,950m and N30:7,000m the N30 Mainline crosses two tertiary roads. In between the roads five buildings are marked (SAP 37). Approximately 200m to the east of this point is the edge of Verona House demesne with the house located c. 900m away The main entrance and gate lodge (BH 48) to Dunsinane House is also marked c. 200m east of the Mainline at this point. At approximate chainage N30:7,850m the N30 Mainline crosses another tertiary road with the demesne lands of Dunsinane House (BH 49) located c. 100m to the east. The house is clearly marked along with ornamental gardens and out buildings. The N30 Mainline terminates c. 200m west of a small un-shaded demesne that accompanies Clohass House (BH 50), although the building is not named as such on this map. Just prior to terminating the route crosses a small tertiary road, which is also a townland boundary (AAP 54), with a farmstead marked c. 150m to the west.

Second Edition Ordnance Survey Map, 1903, scale 1:10560.

There are no major changes to note within this map. Those that have taken place are listed below.

At chainage N30:3,500 the mainline crosses an access track leading to BH 41, which was not present on the first edition OS map.

At approximate chainage N30:5,000m the mill race is still present, although it is only named as such to the north of the N30 Mainline. A Woollen Mill is now marked adjacent to Monart Bridge (BH 44), although this is likely to be a replacement or extension of the mill that occupied this site previously but was un-named.

The shaded demesne (D 5) surrounding Monart House is now much smaller in size. Monart House itself is outside of the receiving environment. The building that was located at approximate chainage N30:5,350m is no longer present (SAP 33). However, a group of buildings are now

marked to the immediate southeast of the N30 Mainline at approximate chainage N30:5,400m (SAP 34).

The mill race at approximate chainage N30:6,370m is still marked as such and serves the previously un-named Corn Mill,, which has been extended and is located c. 450m to the east of the N30 Mainline.

At approximate chainage N30:6,950m only one building is now marked between the two small tertiary roads (SAP 37). The demesne surrounding Dunsinane House is also much reduced in size.

Third Edition Ordnance Survey Map, 1926, scale 1:10560.

There are no major changes to note within the cartography of this map that relate to the receiving environment of the N30 Mainline.

15.2.1.10 Development Plan

County Wexford Development Plan (2007-2013)

The County Development Plan makes the following statement (Section 9, pg 3):

> *The* archaeological *heritage of County Wexford includes structures, constructions, groups of buildings, developed sites, all recorded monuments as well as their contexts, and moveable objects, situated both on land and underwater.*
>
> Archaeological *remains are a crucial part of County Wexford's heritage and are of great cultural and scientific importance. They are evidence of past development and of human interaction with the landscape, helping to interpret today's landscape. These finite nonrenewable resources must be protected and maintained and the planning process is an essential mechanism for ensuring this protection. The Council will play its role in seeking to protect archaeological remains in situ wherever this is feasible. The importance and value of the wider historic landscape and environment, including battlefields is also recognised.*

The Council recognises the statutory protection afforded to all RMP/SMR sites under the National Monuments Act (Amendment) 2004. It aims to secure the protection of all archaeological sites recorded within the RMP by means of preservation in-situ or at a minimum preservation by record. The Council also considers that any previously unrecorded archaeological sites are to be designated as archaeological heritage.

There are no National Monuments or monuments covered by Preservation Orders located within the receiving environment of the Proposed Scheme. None of the proposed national routes will directly impact upon a recorded archaeological site. Further details regarding the objectives and policies of Wexford County Council are listed in Appendix 15.6 in Volume 3 of this EIS.

Enniscorthy Town and Environs Development Plan (2008-2014)

The receiving environment of the Proposed Scheme is outside of the area covered by the boundary that designates Enniscorthy Town and Environs. However, its immediate vicinity to the Proposed Scheme makes its review pertinent to this assessment. As with the County plan, the town plan recognises the statutory protection afforded to RMP/SMR sites, and lists additional areas of archaeological potential such as the battle site at Vinegar Hill, located c 1.5km west of the M11/N11 Mainline. None of the sites listed within the plan will be directly impacted on by the Proposed Scheme.

15.2.1.11 Aerial Photographs

A number of aerial photographic resources were examined in order to ascertain the presence of any previously unrecorded archaeological sites located within the receiving environment of the Proposed Scheme. Vertical aerial photographs dating to the 1970s (1:30,000) were examined at the Geological Survey of Ireland. A stereoscope was used in order to view the photographs in 3D. The receiving environment of the Proposed Schemes was carefully examined, and one site was identified in close proximity to the M11/N11 Mainline within Knockrobin Upper (SAP 2). This site consists of a possible rectilinear enclosure, although there was not evidence of it noted on the ground during field inspection.

Ordnance survey aerial photographs held by Wexford County Council were also examined, which date to c. 2005. Once again the receiving environments of the Proposed Scheme were examined, but no previously unrecorded sites of archaeological potential were identified.

Aerial photographs present on the National Monuments Section website (www.archaeology.ie) were also reviewed, but again, no previously unrecorded sites of archaeological potential were identified within the receiving environments of the proposed routes.

15.2.1.12 Stray Finds

M11/N11 Mainline

Museum No:	I.A. 302/52
Townland:	Carrigeen
Parish:	Kilcormick
Barony:	Gorey

Find:	Inscribed Stone
Find place:	Field
Description:	Measures 3' by 2' 6", decoration/ incised circular patterns, on reverse XVI incised – possibly modern product
Reference:	NMI Topographical File

Two finds are provenanced to just 'near Enniscorthy' and consists of a gold neck ring (NMI Ref.: W186) and possibly two reels of gold (NMI Ref.: 1963:2).

No stray finds are recorded within the receiving environment of the N80 Link or N30 Mainline.

A number of finds are listed as being un-provenanced within County Wexford. It is impossible to know if any of these were uncovered within the receiving environment of the Proposed Schemes. The finds were purchased from a dealer in Liffey Street, Dublin, who apparently had a strong market for bronze artefacts. The pieces consist of four socketed bronze axe heads (NMI Ref.:1933:4819, 1959:126, 128-9), four bronze axe heads (NMI Ref.:1968:292, 1959:61, 1959:62, 1980:57), a medieval bronze buckle (NMI Ref.:1959:212), a bronze ibex-headed pin (NMI Ref.:1959:214), a bronze ring pin (NMI Ref.:1959:216), a bronze dress fastener (NMI Ref.:1984 IA/64/79), an iron spur (NMI Ref.:WK 89) and an ogham stone (NMI Ref.:1939).

The stray finds dating from the Bronze Age, Iron Age, Early Christian, Medieval and Post-medieval periods show that there is continuous evidence of human activity in County Wexford since the Bronze Age. As of yet there has been little evidence of Mesolithic and Neolithic activity within the Enniscorthy area, but of course this is a reflection of the survival and visibility of such remains and does not exclude the potential for remains from this period being present along the path of the Proposed Schemes.

15.2.1.13 Field Inspection

Field inspection of the Proposed Schemes was carried out during June 2007 and May, July and Nov 2008. Inspections during June 2007 were carried out by The Archaeology Company, who inspected the southern section of the proposed M11/N11 Mainline (chainage 17,600 to 28,000) along with the proposed N80 Link Road and proposed N30 Mainline. Inspections during 2008 were carried out by Irish Archaeological Consultancy Ltd of the northern section of the M11/N11 Mainline (chainage 0 to 17,600). A total of 285 fields were surveyed, and each was given a unique number.

<u>M11/N11 Mainline</u>

The field inspection, which was undertaken in conjunction with the desk study, resulted in the identification of a total of 37 Areas of Archaeological Potential and 17 Sites of Archaeological Potential, along the proposed route. A total of 191 fields were investigated along the path of the

M11/N11 Mainline. The AAP sites consist of townland boundaries, stream and river crossings, riverine environments and areas of marshy, marginal ground. The SAP sites consist of features that form a particular site type such as a potential *fulacht fiadh*. Field inspection identified a total of two potential enclosures, two possible mounds, the site of a mill race and weir, a possible *fulacht fiadh*, three surface anomalies and the site of five former post medieval structures or farms. The most significant discovery was made in Mountgeorge townland, where as previously unrecorded holy well and bullaun stone were identified (SAP 4). Descriptions of all AH, AAP and SAP sites within the receiving environment of the M11/N11 Mainline, along with plate and figure references can be found in appendices 15.1, 15.2 and 15.3 of this report.

N80 Link

The field inspection, which was undertaken in conjunction with the desk study, resulted in the identification of a total of 4 Areas of Archaeological Potential and 7 Sites of Archaeological Potential, along the proposed route. A total of 24 fields were investigated along the path of the N80 Link. The AAP sites consist of townland boundaries, a crossing of the River Slaney and riverine environments. The SAP sites consist of potential features including two surface anomalies, one linear anomaly and three former post medieval settlement sites. Potentially the most significant discovery was made in Kilcannon townland (from the first edition OS map), where a possible enclosure was identified (SAP 39). Descriptions of all AH, AAP and SAP sites within the receiving environment of the N80 Link Road, along with plate and figure references can be found in appendices 15.1, 15.2 and 15.3 of this report.

N30 Mainline

The field inspection, which was undertaken in conjunction with the desk study, resulted in the identification of a total of 14 Areas of Archaeological Potential and 15 Sites of Archaeological Potential, along the proposed route. A total of 70 fields were investigated along the path of the N30 Mainline. The AAP sites consist of townland boundaries, a crossing of the River Urrin, stream crossings and riverine environments. The SAP sites consist of potential features including seven surface anomalies, five former post medieval settlement sites and one spring. Two mill race crossings will also be made by the route, one of which still functions as a stream. Descriptions of all AH, AAP and SAP sites within the receiving environment of the N30 Mainline, along with plate and figure references can be found in appendices 15.1, 15.2 and 15.3 of this report.

15.2.1.14 Conclusions on Archaeology

M11/N11 Mainline

The Proposed M11/N11 Mainline Scheme is located within a rich archaeological environment. A total of 6 Archaeological Heritage sites have been identified within the receiving environment of the Proposed Scheme. The closest of these sites to the proposed M11/N11 Mainline is AH 14 (a rectilinear enclosure). However, this site will not be directly impacted on by the Proposed Scheme. The most predominant site type recorded within the receiving environment is the moated site. There are a total of 3 moated sites, with a further two enclosures, one of which is rectilinear in nature, and one *fulachta fiadh*.

A study of the historic cartographic resource and aerial photographs of the receiving environment of the M11/N11 Mainline was made along with relevant documentary research. This was then coupled with a field inspection of the M11/N11 Mainline. As a result a total of 36 Areas of Archaeological Potential were identified within the receiving environment of the M11/N11 Mainline. Many of the AAP designations cover more than one site type, for example a stream and a townland boundary may be the same feature in the landscape. As a result, a total of 38 townland boundaries have been identified, along with 26 stream or river crossings. Townland boundaries have the potential to represent more ancient patterns of land division and as a result are an important part of the potential archaeological heritage within the receiving environment. Rivers and streams have often been a focus for habitation throughout the prehistoric and historic periods. They also have the potential to preserve organic archaeological remains such as wood, leather and pollen, which do not usually survive within the terrestrial archaeological record. One large drumlin was also identified as possessing potential for archaeological settlement (AAP 3), as well as an area of marginal ground (AAP 35). The M11/N11 Mainline will also travel through one riverine environment (AAP 16). All listed AAP sites will be impacted directly by the M11/N11 Mainline.

The desktop assessment and field inspection also identified a total of 17 Sites of Archaeological Potential. Of these a total of 4 designations represent the former location of settlement as depicted within the historic cartographic resource and are likely to represent post medieval occupation (SAP 15, 19, 20, 23). The site of Tinnacross school house (SAP 6) was also identified from the historic maps. A total of 3 surface anomalies were also identified, which may represent individual archaeological remains (SAP 16, 18, 22). In addition to these a possible enclosure was identified along with a possible rectilinear enclosure (SAP 1, 2). Two mounds in close proximity to one another were also noted during field inspection, which may possess archaeological significance (SAP 3). The historical mapping also enabled the identification of a former mill site, mill race and weir (SAP 7, 8), as well as a former trackway (SAP 17). The most significant previously unrecorded site consists of a holy well with a possible bullaun stone, which

was identified within Mountgeorge (SAP 4). Although not located within the path of the M11/N11 Mainline, it will be directly adjacent to the land take extents. All SAP sites are located within 50m of the M11/N11 Mainline.

N80 Link

The N80 Link road represents a shorter section of road development, although there are more recorded sites located within its receiving environment than the M11/N11 Mainline and N30 Mainline. A total of 8 AH sites were identified within the receiving environment of this route, the closest of which is AH 5 (ring ditch). However, the N80 Link will not directly impact on this site. A further 3 enclosure sites were also identified (one of which is listed as a rectangular enclosure), along with another ring ditch, a holy well, a church site and a pit alignment. The holy well (BH 7) is also marked within the RMP mapping as being de-listed.

A study of the historic cartographic resource and aerial photographs of the receiving environment of the N80 Link was made along with relevant documentary research. This was then coupled with a field inspection of the N80 Link. As a result a total of 4 Areas of Archaeological Potential were identified within the receiving environment of the M11/N11 Mainline. Within these 4 areas a total of 2 townland boundaries have been identified (AAP 24, 26), along with 3 stream or river crossings (AAP 23, 24, 25) and one riverine environment (AAP 23). The riverine environment area of potential has been designated as a large area due to the proximity of the river and the presence of a number of ring ditch sites. These particular sites may have been purposefully placed in reference to the river, or the large Bronze Age cemetery that was discovered at Scarawalsh c. 1.4km to the north east. The northern section of the proposed N30 Mainline is also partially located within AAP 23.

The desktop assessment and field inspection also identified a total of 7 Sites of Archaeological Potential. Of these a total of 3 designations represent the former location of settlement as depicted within the historic cartographic resource and are likely to represent post medieval occupation (SAP 12, 13, 14). A total of 3 surface anomalies were also identified, which may represent individual archaeological remains (SAP 9, 10, 11). A possible enclosure site was also identified during analysis of the first edition OS map, in the townland of Kilcannon SAP 39). However, it should be noted that this feature may represent small scale quarrying within the area, as a number of former quarries are marked in this area within the receiving environment of the route.

N30 Mainline

The N30 Mainline travels to the west of Enniscorthy town and is shorter in length than the M11/N11 Mainline. A total of 5 Archeological Heritage sites have been identified within the

receiving environment, the closest of which is AH 16 (an enclosure). None of the sites will be directly impacted on by the N30 Mainline. The recorded sites consist of one enclosure site, a moated site, a ring ditch and 2 redundant records.

A study of the historic cartographic resource and aerial photographs of the receiving environment of the N30 Mainline was made along with relevant documentary research. This was then coupled with a field inspection of the N30 Mainline. As a result a total of 14 Areas of Archaeological Potential were identified within the receiving environment of the N30 Mainline. Many of the AAP designations cover more than one site type, and as a result a total of 12 townland boundaries have been identified, along with 6 stream or river crossings. One area of elevated ground was also noted as possessing potential for archaeological settlement (AAP 48). The N30 Mainline will also travel through two riverine environments (AAP 23, 43). All listed AAP sites will be directly impacted by the N30 Mainline.

The desktop assessment and field inspection also identified a total of 15 Sites of Archaeological Potential. Of these a total of 5 of these designations represent the former location of settlement as depicted within the historic cartographic resource and are likely to represent post medieval occupation (SAP 31, 33, 34, 37, 38). A total of 7 surface anomalies were also identified, which may represent individual archaeological remains (SAP 24, 25, 27, 28, 29, 30, 36). In addition to this 2 mill races were identified (SAP 32, 35), along with the site of a spring (SAP 26). All SAP sites are located within 50m of the N30 Mainline.

15.2.2 Architecture

The receiving environments of the Proposed Scheme are all located within a predominantly rural landscape. The landscape is characterised by arable farming, as Wexford is the most cultivated county in Ireland. As a result, much of the built heritage resource exists as small farm holdings, which have survived from the end of the 18th and 19th centuries. There are also a large number of country houses and demesnes within the landscape, especially surrounding the town of Enniscorthy. Many of the houses no longer survive, and the demesnes have been subsumed back into the landscape. Some of the smaller houses represent the residences of what would have been wealthy farmers. In these cases a small demesne is often created around a property, although its main function is agricultural rather than ornamental.

15.2.2.1 M11/N11 Mainline

A total of 29 Built Heritage sites were identified within the receiving environment of the proposed M11/N11 Mainline. Of these the predominant site type consists of farm complexes (10), country houses (4) and bridges (4). Of these structures 2 are listed as Protected Structures, and 10 are listed within the Draft Architectural Heritage Survey for County Wexford.

Sites are described in detail in Appendix 15.4 in Volume 3 of this EIS.

Please note that all measurements between the identified sites and the Proposed Schemes are made from the designated constraint area to the edge of the proposed footprint of the routes unless specified otherwise.

Built Heritage

BH No.:	Townland:	Classification:	RPS/NIAH No.:	Chainage:	Dist. from route
BH 1	Ballinclay	Ballinclay House	15701117	2,470	>200m
BH 2	Ballygullen	Railway bridge	-	3,100	<50m
BH 3	Ballyeden	House	15701608	4,950	<50m
BH 5	Knockrobin	Farm and house	-	6,450	>200m
BH 6	Ballymore	Former school house	WCC0509 15701607	7,500	>100m
BH 7	Ballymore	Vernacular cottage (derelict)	-	7,580	0m
BH 8	Ballymore	Cottage	-	7,600	<50m
BH 9	Rockspring	Vernacular cottage (in ruins)	-	8,370	0m
BH 10	Rockspring	Entrance to Rockspring House	-	8,350	>100m
BH 11	Rockspring	Rockspring House and complex	15701605	8,400	>100m
BH 12	Rockspring	Garden folly	WCC0708 15801601	8,340	>100m
BH 13	Ballycarrigeen Lower	Vernacular house and farmyard	-	10,900	>100m
BH 14	Ballycarrigeen Lower	Vernacular house and farmyard (derelict)	-	11,000	>50m
BH 15	Ballycarrigeen Lower	Hollow trackway	-	11,160	0m
BH 16	Ballycarrigeen Lower	Farm complex	-	11,400	>100m
BH 17	Carrigeen	Farm complex	-	11,650	>50m
BH 18	Myuagh	Farm complex (in ruins)	-	13,800	>100m
BH 19	Tinnacross	Bridge	15702035	14,450	<50m
BH 20	Tomsallagh	Summerville House	15702030	16,450	>200m
BH 21	Crane	Farm complex (in ruins)	-	16,800	>50m
BH 22	Crane	Bridge	15702031	17,000	>200m
BH 23	Crane	Vernacular house	-	17,200	>100m
BH 24	Toom	Farm complex (in ruins)	-	17,850	<50m
BH 29	Ballydawmore	Farm complex	-	19,030	>100m

BH No.:	Townland:	Classification:	RPS/NIAH No.:	Chainage:	Dist. from route
BH 30	Ballynabarny	Bridge	15702026	20,500	>200m
BH 31	Tomnafunshoge	Post box	-	21,100	0m
BH 32	Ballycourcymore	Ballycourcy House	15702639	22,850	>100m
BH 33	Monroe	Farm complex	-	25,180	>50m
BH 51	Cronyhorn	Vernacular house	15801602	9,900	>50m
D 1	Ballinclay	Former demesne lands of Ballinclay House	-	2,300-2,550	0m
D 2	Rockspring	Former demesne lands of Rockspring House	-	8,375-8,500	0m
D 3	Mountgeorge	Former demesne lands of Mountgeorge House	-	9,300-10,000	0m
D 4	Tomsallagh	Former demesne of Summerville House	-	16,275-16,680	0m

15.2.2.2 N80 Link Road

A total of 5 Built Heritage sites were identified within the receiving environment of the proposed N80 Link. Of these the predominant site type consists of country houses (2), with one bridge, one track and one farm. Of these structures 2 are listed within the Draft Architectural Heritage Survey for County Wexford.

Built Heritage

BH No.:	Townland:	Classification:	RPS/NIAH No.:	Chainage:	Dist. from route
BH 4	Ballynabarny	Farm and house	15702023	3,420	>100m
BH 25	Kilcannon	Trackway	-	2,085	0m
BH 26	Ballynabarny	Yorke Ville House	15702022	3,200	>100m
BH 27	Ballynabarny	Bridge	-	2,900	>100m
BH 28	Clonhasten	Whitefield House	-	2,835	>200m

15.2.2.3 N30 Mainline

A total of 17 Built Heritage sites were identified within the receiving environment of the proposed N30 Mainline. Of these the predominant site type consists of country houses (4) and farm complexes (6). None of the buildings are listed as a Protected Structure, but 5 are listed within the Draft Architectural Heritage Survey for County Wexford.

Built Heritage

BH No.:	Townland:	Classification:	RPS/NIAH No.:	Chainage:	Dist. from route
BH 34	Coolnahorna	House & Post box	15702003/04	0	>200m
BH 35	Ballyorril	Small country house	-	1,555	>100m
BH 36	Ballyorril	Farm complex	-	2,480	>50m
BH 37	Ballyorril	Cottage	-	2,525	>100m
BH 38	Ballyorril	Cottage	-	2,870	>50m
BH 39	Ballyorril	Farm complex	-	3,100	>50m
BH 40	Askunshin	Farm complex (derelict)	-	3,975	>200m
BH 41	Killalligan North	Vernacular house and farm (derelict)	-	3,450	<50m
BH 42	Askunshin	Farm complex	-	4,270	<50m
BH 43	Askunshin	Cottage	-	4,350	<50m
BH 44	Askunshin	Bridge	15701928	5,000	<50m
BH 45	Milehouse	Farm complex	-	5,015	>100m
BH 46	Bessmount	House	-	6,330	>100m
BH 47	Ballybrannis	Urrinfort House	15701915	6,100	>200m
BH 48	Dunsinane	Former entrance to Dunsinane House	-	7,180	>200m
BH 49	Dunsinane	Dunsinane House	15702540	7,600	>200m
BH 50	Clohass	Clohass House	15702539	8,000	>200m
D 1	Bessmount	Former demesne of Monart House	-	5,140-6,500	0m

15.2.2.4 Architectural Background

The receiving environments of the Proposed Scheme are characterised by a rural landscape scattered with small farms and residential dwellings of various ages. Many of the small buildings marked on the early OS map editions no longer survive within the landscape, or have been replaced with modern buildings. In many cases, small farms have completely disappeared.

Vernacular Architecture is defined in James Steven Curl's Encyclopedia of Architectural Terms as 'a term used to describe the local regional traditional building forms and types using indigenous materials, and without grand architectural pretensions', i.e. the homes and workplaces of the ordinary people built by local people using local materials. This is in contrast to formal architecture, such as the grand estate houses of the gentry, churches and public buildings, which were often designed by architects or engineers. The majority of vernacular buildings are domestic dwellings. Examples of other structures that may fall into this category

include shops, outbuildings, mills, limekilns, farmsteads, forges, gates and gate piers. Typically the single storied thatched cottage would be considered to represent the real vernacular style in Ireland. Local material is used to construct the house; stone or mud for the walls, cereal straw or rushes for thatch. While there are plenty of well preserved examples of this type in County Wexford, only several un-thatched versions exist within the receiving environments of the Proposed Schemes (BH 7, 9, 14). Of these, BH 7 survives in a very derelict state (and will be demolished as part of the proposed M11/N11 Mainline), whereas BH 9 is completely ruined and BH 14 is in the process of being renovated and forms part of the farmyard associated with a later two storey farm house.

Where cottages do exist, albeit in a denuded state, they do represent important survivals as so many more have been lost. This is particularly well represented within the first and second edition OS maps of the 19th century as many buildings have been removed or in many cases, replaced by modern bungalows or disappeared all together. A distinction between the regional styles in the country can be seen within vernacular cottages, with the eastern region cottages possessing a centrally located hearth, lobby entrance and hipped roof. The walls were made of stone or mud and there is no tradition that animals and humans occupied the same space, as is the case with the western regional style (Aalen 1997: 152). The derelict cottage BH 7 appears to reflect the eastern regional style, with an almost central chimney stack. However, the internal layout could not be gauged due to access not being available as the cottage appears unsafe to enter. However, it was possible to discern through the render that the base of the building (c. 0.8m in height) was constructed from stone whereas the remainder appears to have been constructed from mud.

During the late 18th and 19th centuries, strong farmers along with more successful traders started to develop more substantial two storied houses, which are clearly elaborations on basic vernacular patterns. Some of these retained thatched, hip-ended roofs (BH 51, although the original thatch has been covered with corrugated iron) whereas other adopted gabled, slated roofs (Aalen 1997:156). There are a number of two storied houses, some in varying states of preservation within the receiving environment of the Proposed Schemes (BH 5, 13, 14, 16, 17, 33, 39, 42, 51). Most of these structures still occupy working or former farmyards.

More successful farmers and merchants started to adopt elements of formal architecture into their properties mostly during the 19th century. This resulted in modest buildings that although often possessed large windows, a semi-circular fanlight above the door and centrally placed chimney stacks on a hipped and slated roof, still possessed vernacular characteristics (ibid. 160). The receiving environment also contains a number of these houses (BH 3, 20, 21, 23, 35), some of which, such as BH 20, do not appear to have possessed an official ornamental demesne but

possess characteristics, such as tree plantations, that can be associated with a demesne landscape.

The Great Famine of 1845-48 had catastrophic effects on the rural population in many areas, and many landed estates struggled to cope with the effects of widespread starvation and death amongst smaller tenants and labourers as well as with the attendant decline in rents and the landlord's former moral and political authority (Whelan 1997, 91). By the 1850's, the rapid decrease in population due to death and emigration had facilitated a move towards the joining together (consolidation) of small holdings and a more professional approach to estate and land management.

The country house was often only a small part of the overall estate of a large landowner, and provided a base to manage sometimes vast areas of land that could be located nationwide. Several buildings within the receiving environments of the Proposed Scheme have been designated as Recorded Protected Structures (RPS) or listed within the Draft NIAH architectural survey. These are associated with the demesnes and estates of the 18th and 19th centuries, although Craig (2006:48) states that Wexford possesses a relative poverty of the modest country house, which he attributes to the destruction brought by the 1798 rebellion. However, one of the largest of these estates is Solsborough demesne, located to the north northeast of Enniscorthy town and just outside of the receiving environment of the M11/N11 Mainline and N80 Link Road. The main house no longer survives, although many of the ornamental elements of the demesne landscape remain, including the semi-circular ha-ha, gate lodges, outbuildings and a substantial walled garden. The house itself consisted of a detached three-bay, two-storey (over basement) structure, which may have incorporated the fabric of an earlier structure, which was extant in 1688 (Draft NIAH Survey Ref.: 15702016).

Within the receiving environment of the N30 Mainline, the proposed route cuts through the western most edge of the demesne associated with Monart House (D 5), which itself is located outside of the receiving environment of the N30 Mainline. However, this structure is listed as Protected and is designated as possessing National importance within the Draft NIAH survey. The house, which was constructed between 1733 and 1740, consists of a five-bay, three-storey (over part raised basement) structure, which was not completed until the 1840s. Its owner at the time was Nathaniel Cookman, a financier to the British Crown, and it was intended to be the centerpiece of an extensive landholding granted by George I (Draft NIAH Survey Ref.: 15701930).

Although not constructed on such a large scale, the smaller demesnes located within the receiving environment are also a significant component of the Wexford landscape. Possibly one of the best preserved is Rockspring House and demesne (BH 10, 11, 12, D 2). This house is not listed as a protected structure, although the thatched garden house/folly within its grounds is.

The house and its outbuildings are listed within the Draft NIAH survey. The house is likely to date to at least the mid 18th century, as record of it is first made in 1768. However, the current owners whose family have owned the house since the beginning of the 19th century, state that it could be as early as 1670. Prior to its reconstruction, the house is thought to have possessed three-storeys but it was substantially damaged during the rebellion of 1798. This may have been due to the fact that the Commander of the Camolin Yeoman, Lieutenant Thomas Bookey is (according to the current owners) said to have leased Rockspring House as a residence. After the rebels led by Fr John Murphy attacked the Yeomen at The Harrow and killed Lieutenant Bookey, his house would have presented itself as a desirable target. As a result a large part of the house was destroyed, and not re-built until the beginning of the 19th century when it was purchased by a family of Quakers from Ferns, called the Houghtons (Beryl Jameson Pers Comm.). The house now consists of a detached five bay, two-storey structure with a hipped slate roof and a number of outbuildings, some of which incorporate a gothic architectural theme. The house has been in the current family for the past 200 years.

During the 18th and 19th centuries, accommodation for the workers on large estates was usually provided by the landlord in cottages that are more recognisable due to the use of more formal architecture. The gate lodge is a good example of this, where a small building was ornamented to indicate its status and position within the landscape. There are no gatte lodges recorded within the receiving environment of the Proposed Schemes, although a number of them are extant outside of the receiving environment. These include lodges associated with Ballycourcy House (BH 32). However, rural labourers often still inhabited small one or two roomed cottages during the 19th century, and it was not until the commencement of The Labourers' Act in 1883 that something was done to accommodate them. This act enabled local authorities to erect 50,000 cottages for the landless labourers by 1921. Early cottages were detached or semi-detached and located on road sides on c. 0.2 acres (Aalen 1997:162). Most possessed a more formal type of architecture than private dwellings, but were generally constructed from local materials. Although common within the south and east of the country, where there were more land labourers, only four examples of this type of housing exist within the receiving environments of the Proposed Schemes (BH 8, 53, 54, 58). BH 8 represents a well preserved example, which has not been altered by later additions and located on a relatively large plot adjacent to a small tertiary road. Interestingly, it is positioned only 100m west of the derelict, part mud built vernacular cottage (BH 7) and could have been constructed to re-home the family that were living in BH 7. The presence of both structures on this road illustrates the development of living conditions for the rural poor of this region.

15.2.2.5 Cartographic Analysis

Please see section 14.3.1.9 of this chapter of the EIS.

15.2.2.6 Development Plan

County Wexford Development Plan (2007-2013)

The County Council defines a Protected Structure as:

> *a structure that the County Council considers to be of special interest from an* architectural*, historical, archaeological, artistic, cultural, scientific, social or technical point of view.*

The Council has a number of policies that intend to protect the architectural heritage of County Wexford. They will ensure the proper preservation and maintenance of Protected Structures, and prohibit the demolition of such buildings unless it is demonstrated that exceptional circumstances exist. Any Protected Structures that are currently vacant, re-use will be encouraged. However, change of use for a structure will have to be assessed sufficiently before the council can permit any such change of use. Further objectives are outlined in Appendix 15.4 in Volume 3 of this EIS. There are a total of two Protected Structures within the receiving environment of the Proposed Scheme. None of the structures will be directly impacted on by the Proposed Scheme.

BH No.:	**Townland:**	**Designation:**	**RPS No.:**	**Dist from route:**
BH 6	Ballymore	Former school house	WCC0509	131m
BH 12	Rockspring	Garden folly	WCC0708	176m

It should be noted that the results of the Draft Architectural Survey, carried out by the National Inventory of Architectural Heritage will, when published, inform the County Council of further structures of architectural significance that could be included within the list of Protected Structures.

Enniscorthy Town and Environs Development Plan (2008-2014)

The receiving environment of the Proposed Scheme is outside of the area covered by the boundary that designates Enniscorthy Town and Environs. However, its immediate vicinity to the Proposed Scheme makes its review pertinent to this assessment. As with the County plan, the town plan recognises the statutory protection afforded to all protected structures. The closest protected structure to any of the proposed national routes is the derelict windmill on Vinegar Hill. This is also located within an Architectural Conservation Area, which covers the entire hill. The hill is located c. 1.5km west of the M11/N11 Mainline.

15.2.2.7 National Inventory of Architectural Heritage

Architectural Survey

The draft results for the Architectural Survey of County Wexford were made available as part of this assessment by the National Inventory of Architectural Heritage. A total of 17 buildings were identified within the receiving environment of the M11/N11 Mainline, N80 Link and the N30 Mainline, which possess architectural heritage significance. Definitions of significance are included in Section 15.1.4 of this chapter of the EIS. It should be noted that the draft results do not represent the final published work and alterations may be made to the survey in the future.

The below measurements have been made from the edge of the footprint of the Proposed Schemes to the building itself, rather than to the constraint area surrounding the building designated as part of this report.

M11/N11 Mainline

BH No:	**Townland:**	**Designation:**	**NIAH No.:**	**Significance:**	**Dist. from route:**
BH 1	Ballinclay	Ballinclay House	15701117	Regional	352m
BH 3	Ballyeden	House	15701608	Regional	84m
BH 6	Ballymore	Former school house	15701607	Regional	131m
BH 11	Rockspring	Rockspring House and complex	15701605	Regional	208m
BH 12	Rockspring	Garden folly	15801601	Regional	176m
BH 19	Tinnacross	Bridge	15702035	Regional	41m
BH 20	Tomsallagh	Summerville House	15702030	Regional	308m
BH 30	Ballynabarny	Bridge	15702026	Regional	240m
BH 32	Ballycourcy-more	Ballycourcy House	15702639	Regional	152m
BH 51	Cronyhorn	Vernacular House	15801602	Regional	167m

N80 Link

BH No:	**Townland:**	**Designation:**	**NIAH No.:**	**Significance:**	**Dist. from route:**
BH 4	Ballynabarny	House	15702023	Regional	260m
BH 26	Ballynabarny	Yorke Ville House	15702022	Regional	224m

N30 Mainline

BH No:	Townland:	Designation:	NIAH No.:	Significance:	Dist. from route:
BH 34	Coolnahorna	House & Post box	15702003/ 04	Regional	254m
BH 44	Askunshin	Bridge	15701928	Regional	Adjacent to bridge
BH 47	Ballybrannis	Urrinfort House	15701915	Regional	321m
BH 49	Dunsinane	Dunsinane House	15702540	Regional	392m
BH 50	Clohass	Clohass House	15702539	Regional	356m

Garden Survey

As part of the NIAH garden survey, a specific site report is produced to cover each demesne marked on the first edition OS map. This report includes the following information:

- Initial Overview: general comment on the overall site and impact of any recent development;
- Architectural Features: the presence and survival of the principal buildings and other structures such as gatehouses and garden buildings;
- Movement within Site: the presence of drives, walks and avenues and changes in these since the maps were made;
- Landscape Features: the presence of key features such as walled gardens, woodland, orchards, formal gardens, vistas, lakes and rivers. A short comment will normally be provided on the character and condition of the landscape.

In the Initial Overview there is a reference to the Feature Richness Index. This is a figure that can range from 1 (being the lowest) to 16 (being the highest) and represents the total number of major traditional garden features identified through the desk based assessment by the NIAH. It could be a high figure for a site that is partially destroyed, but could also be a low figure for a site that is virtually complete and unchanged. *The Feature Richness Index is not an indication of heritage significance or merit.* It should also be noted that features could survive that are not visible on the aerial photography as this is only a desk based assessment carried out by the NIAH.

There are five possible options identified for the Statement of Condition:

- Main features substantially present: - no loss of integrity
- Main features substantially present: - some loss of integrity

- Main features substantially present:- peripheral features unrecognisable
- Main features unrecognisable: - peripheral features visible
- Virtually no recognisable features

M11/N11 Mainline

There is no garden inventory entry for Rockspring House (D 2), Summerville House (D 4) and Ballyvarna House.

Site Name	Designation	Chainage (m)	NIAH Feature index rating	Statement of condition
Ballinclay House (BH 1, D 1)	House and demesne	2,400	1	Main features unrecognisable: - peripheral features visible
Comment:	Few features of the designed landscape shown on the 1836 - 1846 OS map are visible in aerial photography. The house is listed within the draft NIAH architectural inventory.			
Mountgeorge (D 2)	Former demesne	8,350-9,250	1	Main features unrecognisable: - peripheral features visible
Comment:	The main house is no longer present. Its former location is occupied by a modern house and modern farm buildings.			
Solsborough Demesne	Former demesne	17,500-18,200	3	Main features unrecognisable: - peripheral features visible
Comment:	Most areas of structural woodland have been removed from the site. Few features of the designed landscape shown on the 1836 - 1846 OS map are visible in aerial photography. The site of the house and the remaining outbuildings and walled garden are recorded within the draft NIAH architectural survey.			
Ballycourcy House (BH 32)	House and demesne	2,2850	2	Main features unrecognisable: - peripheral features visible
Comment:	Woodland now grows on the site of the ornamental lake shown on the first edition map. The house is listed within the draft NIAH architectural survey.			

N80 Link Road

Site Name	Designation	Chainage (m)	NIAH Feature index rating	Statement of condition
Yorke Ville (BH 26)	House and demesne	3,150	2	Main features unrecognisable: - peripheral features visible
Comment:	This house is listed within the draft NIAH architectural survey.			

N30 Mainline

There are no garden entries for Clohass House or Urrinfort House.

Site Name	Designation	Chainage m	NIAH Feature index rating	Statement of condition
Monart House (D 5)	House and demesne	5,100-6,600	3	Main features unrecognisable: - peripheral features visible
Comment:	A large demesne, the accompanying house is listed within the draft NIAH architectural survey but located outside of the receiving environment.			
Verona House	House and demesne	6,800-7,150	0	Main features unrecognisable: - peripheral features visible
Comment:	Elements of the structural footprint of the designed landscape shown on the first edition OS map are visible in aerial photography but features are degraded.			
Dunsinane House (BH 48 and 49).	House and demesne	7,150-7,800	1	Main features unrecognisable: - peripheral features visible
Comment:	This house is listed within the draft NIAH architectural survey.			

15.2.2.8 Conclusions on Architecture

The receiving environments of the Proposed Scheme travel through a landscape that contains structures of built heritage significance, which represent the social circumstances of the people who lived here for at least the past 250 years. Structures represent domestic and ornamental functions as well as industrial and infrastructural. A total of 51 structures have been identified through desk top assessment and field inspection. Of these, 17 are listed within the Draft architectural survey carried out by the NIAH for County Wexford. All of these buildings have been attributed with a regional significance. Two of the NIAH structures are also listed as Protected Structures within the County Wexford Development Plan (2007-2013). None of the Protected Structures or NIAH structures will be directly impacted on by the Proposed Schemes.

In addition to the structures within the receiving environment, a total of 13 former demesnes have also been identified. The Proposed Scheme will impact directly on five of these areas (Ballinclay (D 1), Rockspring (D 2), Mountgeorge (D 3), Summerville (D 4), Monart (D 5). However, field inspection and a review of the NIAH garden survey has shown that many of the main original demesne features have disappeared and the once ornamental landscapes have been subsumed back into the landscape. Where the Proposed Schemes do impact on former demesne area, there will be no severance of demesne features or buildings (for example gate lodge from main house).

Of the 51 Built Heritage sites, the most common noted within the receiving environments are the farm complexes that characterise the landscape. Many of these are still functioning farms, although a number have become derelict or completely ruinous. A total of 17 such sites have been identified within the receiving environment of the Proposed Schemes. Another common site is the country house or large farm house of the upper middle classes and lower landed gentry. A total of 10 such buildings have been identified during the assessment. The other features and buildings consist of 7 bridges, one of which is a railway bridge; the others provide passage across rivers and streams; 10 houses and cottages have been identified, along with two tracks, one demesne entrance, a school house and a garden folly,. Two post boxes have also been identified.

15.2.3 Cultural Heritage

Although the term 'cultural heritage' can be applied to any archaeologically or architecturally significant site, it is also a term that describes the more ephemeral aspects of the landscape. These often exist as oral traditions or events that hold a special place in the minds of local people, or can even be of national significance. This aspect of cultural heritage can often be difficult to place within the landscape as folklore and tradition cannot always be tied to a certain place. However, certain sites, such as the village of The Harrow, which played a role within the 1798 rebellion, can be designated as a cultural heritage site. Vinegar Hill, although outside of the receiving environment, is an excellent definition of a cultural heritage site. Here the derelict windmill has been designated as a National Monument and Protected Structure and the archaeological potential of the hill has been recognised. However, none of these tangible things are as important as the events that took place there during the rebellion, for those events form part of the nation's psyche. However, cultural heritage can also describe recent events and can include modern structures such as road side memorials. Here the relatives of people killed in road accidents wish the place to be signified and remembered. This is a cultural response to a tragedy and forms part of the heritage of the locale.

A total of six Cultural Heritage sites have been identified within the receiving environment of the Proposed Schemes. Five of these are located within the receiving environment of the M11/N11 Mainline, whereas one site is located within the receiving environment of the N80 Link. No specific Cultural Heritage sites have been identified within the receiving environment of the N30 Mainline.

15.2.3.1 M11/N11 Mainline

CH No.:	Townland:	Classification:	Dist. to alignment
CH 1	Rockspring	Site of spring	<50m
CH 2	Ballycarrigeen Upper & Lower	The Harrow – village involved in the 1798 Rebellion	>100m
CH 4	Scurlocksbush	Roadside memorial (modern)	0m
CH 5	Scurlocksbush	Roadside memorial (modern)	0m
CH 6	Knockrathkyle & Ballycourcy-more	Darby's Gap – route of rebels escape during 1798 Rebellion	0m

15.2.3.2 N80 Link Road

CH No.:	Townland:	Classification:	Dist. to alignment
CH 3	Coolnahorna	Roadside memorial (modern)	0m

15.2.3.3 N30 Mainline

No Cultural Heritage sites have been identified within the receiving environment of the N30 Mainline.

15.2.3.4 Cultural Heritage Background

The cultural heritage background of the receiving environment is dominated by one major event, which is seen as an event of national importance in Ireland's fight for independence from the British.

<u>The 1798 Rebellion</u>

The rebellion of 1798 was the most violent and tragic event in Irish history between the Jacobite wars and the Great Famine. After years of mutterings and sporadic outbreaks of violence, by people such as Theobald Wolfe Tone, who wanted a united Ireland, a major rebellion started in County Wexford on the 28th May 1798. After executions at Carnew, Father John Murphy of Boolavogue led several thousand men and women armed with pikes and scythes into resistance and won an important victory on the Hill of Oulart, c. 6.75km east of the M11/N11 Mainline. They made their way to Ferns, burnt the bishop's palace and then went on to overwhelm Enniscorthy where they established their base on Vinegar Hill, c. 1.5km west of the M11/N11 Mainline, before taking Wexford Town. Of the twenty-four battles that took place in Ulster and Leinster, eleven were located in County Wexford, where up to 20,000 lives were lost, representing a substantial proportion of the estimated population of 120,000.

As noted in section 15.3.2 of this chapter, Rockspring House (BH 11) at the time of the rebellion was the abode of the Commander of the Camolin Yeoman, Lieutenant Thomas Bookey. The day before the Battle of Oulart Hill, Fr John Murphy and his rebels ambushed a platoon of 20 yeoman at the village of The Harrow (CH 2) as they were on their way to the house of John Boyne (Cleary 1996:82). This was the first significant clash of the rebellion and resulted in the death of Bookey. The Harrow is a small village located 400m to the east of the M11/N11 Mainline. Once the clash had taken place warnings were issued to the surrounding settlements as retribution was taken by the yeoman who burned 170 houses belonging to the rebels and Fr Murphy's chapel at Boolavogue (*ibid.*).

The Battle of Oulart Hill (c. 6.75km to the east of the proposed M11/N11 Mainline) took place on the 27th May 1798, with approximately 1000 rebels, although a number of those were women and youths. The militia attempted to lure the rebels from the hill by setting fire to cabins at the base. However, this failed and after a successful ambush of the soldiers, the remaining rebels charged down militia and killed 105 members of the 110 strong force. Many of these were chased from the hill and followed until they were caught and killed (Cleary 1996:95). The rebels only lost six men and went on to capture Enniscorthy a day later. The nation's first republic was set up four days later at Wexford under the leadership of four Catholics and four Protestants.

The Battle of Vinegar Hill, which took place on the 21st June (c. 1.5km west of the proposed M11/N11 Mainline), is the most prominent and commemorated of the events connected with the 1798 Rebellion in Wexford. A number of battles took place between Vinegar Hill and Oulart, including the battle of New Ross, Bunclody and Tubberneering. The phrase 'Vinegar Hill' and the events and personalities involved have survived in folk memory and are celebrated in song, ballad, poetry, drama and fiction, ensuring their place in popular culture as well as historic accounts. As is stated in a publication to mark the celebration of the Millennium in Enniscorthy '*Even after 200 years the place names involved in the Rising, Boolavohue, Killanne, Oulart, The Harrow, Vinegar Hill have the power to touch the soul of Wexford people*' (Enniscorthy 2000).

The importance of Vinegar Hill to the identity of the town of Enniscorthy and its role in tourism promotion is highlighted by the establishment of the National 1798 Rebellion Centre in the town. Vinegar Hill can be seen in the distance from a number of locations along the N30 Mainline and the M11/N11 Mainline although is located over 1km outside of the receiving environment. It will not be impacted on by the Proposed Schemes. The battle commenced at dawn on the 21st with the bombardment of the Irish positions on Vinegar Hill. A large force of insurgents, estimated at around 20,000 were almost completely surrounded by Generals Lake and Johnson who advanced up the hill after the bombardment had made an impact on the Irish numbers. Lake's forces had moved on the hill from Solsborough Estate (close to the site of Solsborough House) where they had been stationed the previous day (Furlong 2000:54). A canon bank,

reconstructed in 1998, is present within the former demesne area, but is located well outside of the receiving environment of the Proposed Schemes.

The insurgents were poorly armed and after the bombardment took its toll, the British troops appeared on the hill and it was decided to retreat through the last remaining gap in enemy lines. This was the Drumgold-Templeshannon sector south of the hill and next to the eastern bank of the River Slaney. The M11/N11 Mainline passes through parts of the Drumgold and Templeshannon. Furlong (2004, 57) states that between Darby's Gap and Mye Cross (where the proposed M11/N11 Mainline will travel), a retreating insurgent, Fr Thomas Clinch was pursued and shot down by Lord Roden and his men who had mistaken him for the rebel leader, Fr John Murphy. However, a recent 2008 study of the battle (Eneclann Ltd & Headland Ltd 2008) states that Clinch was shot prior to the insurgents reaching Darby's Gap as when the insurgents reached this point, a rear guard was able to hold off the British forces. However, the British cavalry units had pursued a large body of stragglers, mainly non-combatants, who could not keep up with the fleeing forces and inflicted heavy casualties on them. According to commentator Charles Dickson, most of these were killed in the vicinity of Beale's Barn. These casualties were added to by the use of grapeshot, and by infantry who joined in the pursuit. Others were killed in the resulting stampede amongst the non-combatants (Eneclann Ltd & Headland Ltd 2008, 10). It is likely that Clinch was shot closer to Enniscorthy prior to the retreating insurgents being joined by Roche and Monk.

The rebel leaders, Edward Roche and Dick Monk moved forward at Darby's Gap to form the rearguard and protect the retreat, successfully halting Lake's troops to enable the insurgents to pass through the gap left unattended by General Needham. This escape route became known locally as Needham's Gap after the general whose late arrival allowed the gap to remain open (ibid.). A memorial to this retreat through Needham's Gap is located at the crossroads at Darby's Gap (CH 6), c. 150m to the west of the M11/N11 Mainline. It is estimated that almost between 600 and 1,200 rebels were killed during the battle. However, the rebels were not defeated and most managed to escape. Continuing resistance then took the form of mobile warfare, raids, and large scale guerilla-type operations.

15.2.3.5 Place name Analysis

Place names are an invaluable source of information on topography, land ownership and land use within the landscape. They also provide information on history; possible archaeological monuments and folklore of an area. A place name may refer to a long forgotten site, and may indicate the possibility that the remains of certain sites may still survive below the ground surface. The Ordnance Survey surveyors wrote down townland names in the 1830's and 1840's, when the entire country was mapped for the first time. Some of the townland names in the study area are of Irish origin and through time have been anglicized. The main reference used for the

place name analysis is *Irish Local Names Explained* by P.W Joyce (1870). The website Logainm.ie (Placename Database of Ireland) was also consulted although the majority of townland names within the receiving environment have yet to be translated and included within this resource.

M11/N11 Mainline

Parish of Liskinfere – This name appears to derive from a number of elements *Lios* meaning fort, *ceann* meaning head and *fear* or *feara* meaning man or men. Therefore the name could mean Head Fort of the Men or Man. Alternatively it could mean Head Man of the Fort.

Frankfort – It is possible that this refers to a fort such as a *rath* or *lios* possibly belonging to *Fhranic* or something similar. Possibly the name could have originally been *Rathfhranic*, which was anglicised to Frankfort at a later date. Logainm.ie gives the name as *Bhaile na Fraince*, but does not state the origin of *Fraince*.

Clogh – This name is derived from the Irish word meaning stone (*cloch*) and can be applied to mean a stone castle or stoney place.

Ballinclay – Ballin comes from the Irish *baile* meaning town or possibly townland, whereas clay may be a derivative of *cladh* meaning ditch or *clais* meaning trench.

Ballygullen – Bally comes from the Irish *baile* meaning town or townland, whereas gullen may be a derivative of *gallaun* meaning standing stone.

Toberanierin Upper – *Tobar* is an Irish word for well or spring, with *an* meaning the. The final part of the name is difficult to translate but many derive from *rin* or *rine* meaning point of land. This name may refer to a holy well in the Upper or Lower sections of the townland, although there are no recorded sites.

Parish of Toome – This name derives from *Tuaim* meaning burial mound or tumulus.

Ballyoughter - Bally comes from the Irish *baile* meaning town or townland, whereas oughter could derive from *uachdar*, meaning upper – Upper Town.

Ballyeden - Bally comes from the Irish *baile* meaning town or townland, whereas eden derives from *eudan* meaning a brow, either of a head or hill – Hill Brow Town.

Tullabeg – Tulla comes from *tulach* meaning little hill, whereas beg comes from *beag,* also meaning small. This could then mean Small Hill.

Medophall – This name is likely to come from Edmund Medhop or Medhope who obtained a grant in 1621 to create the manor of Medophall. It is likely that this townland formed part of that estate, which may have also included Norrismount (Loeber & Loeber 1987:193).

Knockrobin Upper & Lower – Knock comes from the Irish word *cnoc* meaning hill. Robin may well be a direct translation from the Irish word *spideog,* or relate to the Irish name *Roibín* meaning Robert or Robin.

Parish of Kilbride – From *Cill Bhrighde* meaning St. Brigid's Church.

Ballymore - Bally comes from the Irish *baile* meaning town or townland, whereas more derives from *mor* meaning large or great.

Rockspring – It is possible that this is an English name that was given to this townland, which may have replaced an earlier Irish name. Directly translated from English to Irish, the name could have been *Carraig Tobar.*

Quarry – This may also be an English name that was applied to this particular townland due to quarrying processes. Directly translated to Irish the name would be *Cairéil.*

Cronyhorn – The Crony element may derive from *Crón* meaning dark or brown, or *Croagh,* meaning a stacked up hill or rick. It is not clear where the horn element drives from but it may be a form of *mhór,* meaning a great many.

The Parish of Ferns – From *fearna* or *farna* meaning the place of alders.

Effernoge – Possibly also derived from *fearna* or *farna* (*farnoge*), also relating to the alder tree.

Parish of Kilcormick – Cill Chormaic, Church of St. Cormac.

Mountgeorge – An English name, which is unlikely to relate to any previous Irish name. The townland forms a demesne, and as such was likely renamed during the post medieval period.

Carrigeen – Meaning Little Rocks.

Ballycarrigeen Lower - Bally comes from the Irish *baile* meaning town or townland, whilst *carrigeen* means Little Rocks – Town of the Little Rocks

Knockavocka – Is possibly an Anglicised version of *Cnoc an Bhogha*, the 12th century inauguration site of the Mac Murchadas, located in close proximity to Ferns, which was the Mac Murchadas capital (Culleton 1999:50).

Myaugh – It is possible that the first element of this name derives from *Magh,* meaning plain, with the second element coming from *augh,* meaning either field or ford.

Parish of Clone – *Clone* is an Irish word meaning meadow.

Tinnacross – Tinna may come from *teine,* meaning fire, whereas cross comes from *cros* or *crois,* possibly resulting in the name Cross of Fire. Alternatively the first element could come from *teach*, meaning house, resulting in Cross House.

Toom - This name derives from *Tuaim* meaning burial mound or tumulus.

Tomsallagh – The first element of this name derives from *tuaim* meaning burial mound or tumulus. Sallagh derives from *saileach*, meaning a sallow, which is a type of willow – Mound of Willows.

Oulartard – Oulart comes from *abhallghort* meaning orchard, whereas *ard* is the Irish word for high or height. – High Orchard.

Crane – Possibly deriving from the Irish word *crann,* meaning tree.

Garryphelim – Garry comes from *gaura,* meaning garden – Phelim's Garden.

Ballydawmore - Bally comes from the Irish *baile* meaning town or townland, whereas more derives from *mor* meaning large or great. Daw comes from *da* meaning two – Two Large Towns.

Killabeg – *Cil* meaning church, with la possibly deriving from *lagh* meaning hill. Beg indicates small – Church of the Little Hill.

Solsborough – Likely an English name for what is a demesne landscape. However, the first element of the name may derive from *sollohed,* meaning a willow wood.

Parish of Templeshannon – From *Teampeall Senáin* meaning Church of St. Senán.

Corbally – *Cor* has several meanings and can mean odd, or round hill – Odd Town or Town of the Round Hill.

Tomnafunshoge - The first element of this name derives from *tuaim* meaning burial mound or tumulus, whereas *na* means of. The final element derives from *fuinseog*, meaning ash tree – Town of the Ash Trees.

Drumgold – Drum comes from *druim* meaning a ridge or long hill. Gold possibly comes from *gouleen* or *gola* meaning little fork – Long Hill of the Fork.

Parish of Edermine – The first element may derive from *Eudan* meaning forehead or hill brow, whereas mine may comes from a number of words, including *meen* (smooth, fine, small), *moin* (bog) or *muine* (shrubbery).

Ballybanoge - Bally comes from the Irish *baile* meaning town or townland, whereas *ban* is the Irish word for white, and *oge* can mean young or little – Little White Town.

Craaneroe – *Craan* is an Irish word meaning stoney place, and can also mean trees. It is possible that the roe element comes from *ruadh* meaning red – Red Stoney Place or Red Tree Place.

Garrynisk - Garry comes from *gaura,* meaning garden, whereas it is possible that the nisk element derives from *fionnuisce*, meaning clear water – Clear Water Garden.

Glenteige – Glen comes from *gleann* meaning glen or valley, whereas the second element may derive from *teach* meaning house – Glen of the House/houses.

Monroe – Mon comes from *moin* meaning bog, whereas roe comes from *ruadh* meaning red – Red Bog.

Riverview – An English name for a townland that is located in close vicinity to the River Slaney.

Roperstown – Possibly an English name applied to an area where rope making was an industry.

Scurlocksbush – The first element refers to the Old English family name of Scurlock, whereas the second element may derive from *buidhe* meaning yellow. Alternately it may be a direct translation from the Irish word for bush – *seeach.*

Parish of Ballyhuskard - Bally comes from the Irish *baile* meaning town or townland, whereas husk is likely to derive from *uisce* meaning water, and *ard* meaning high – Town of the High Water.

Ballycourcy Beg & More – Bally comes from the Irish *baile* meaning town or townland. The second element is slightly more complicated, but could derive from *cor-suidhe* giving the meaning Town of the Round Hill Seat (possibly referring to a fort) or Sitting Round Hill.

Cooladine – Cool comes from *cuil* meaning corner or angle, whereas the second element may derive from *duibh* meaning black.

Knockrathkyle – Three elements exist within this name, which translates as Fort of the Wooded Hill or Church Hill. Knock comes from *cnoc*, *rath* meaning fort and kyle coming from either *cill* or *coill* meaning either church or wood.

N80 Link Road

Kilcannon – There may be a number of meanings attached to this name. The first element *Cil* means church. It is possible that the second element derives from *ceann an* meaning head of. It

is also possible that cannon is a derivative a Saint's name such as St Conan or relates to a family name. Saint Conan was an Irish missionary who reputedly became Bishop of the Isle of Man during the 5th or 6th century. He was also known as Mochonna and may have also founded a monastery at Clashmore in County Waterford. There are also two further minor Irish Saints, Conan of Assaroe and Conan of Ballinmore.

Ballynahallin - comes from the Irish *baile* meaning town or townland, whereas *na* means of. The final element may derive from *augh* and *lann* meaning field/ford and house/church. There could be a number of meanings taken from this, and due to the proximity of the River Slaney to the townland, this may indicate a former ford in the area.

Ballynabarney - Bally comes from the Irish *baile* meaning town or townland, whereas *na* means of. The final element comes from *barnagh* meaning gap – Town of the Gap.

N30 Mainline

Clavass – It is possible that the first element derives from *cladh* meaning ditch, whereas the second element may derive from *assaun,* which can mean waterfall, but can also mean small ass.

Moyne Middle – From *maighin* meaning little plain.

Askunshin – It is possible that the ask element relates to a waterfall or small ass (*assaun)*, whereas the second element may derive from *sidhean* meaning fairy hill.

Ballybrannis - Bally comes from the Irish *baile* meaning town or townland. Brannis may relate to a family name, although it could derive *bruis*, meaning mansion.

Ballyorril - Bally comes from the Irish *baile* meaning town or townland. The second element may derive from *abhall* meaning orchard. Alternately it may derive from *eochaill* meaning yew wood.

Bessmount – An English name relating to the demesne landscape surrounding Monart House.

Coolnahorna - Cool comes from *cuil* meaning corner or angle, whereas *na* means of. The final element is not so easy to define, but may come from *Samhuin,* which is the first of November and the day of a major pagan festival but it may also be a form of *mhór,* meaning a great many.

Milehouse – An English name used to describe this townland. The original name has been lost.

Monart East - Mon comes from *moin* meaning bog, whereas art is likely to derive from *ard* meaning high – High Bog.

Clohass – The first element relates to *cloch,* which means stone or sometimes stone castle. The second element possibly comes from *assaun,* which may mean waterfall in this case, but can also mean small ass.

Dunsinane – *Dun* means a fort, whereas the second element is not so clear. It may derive from *sionnach,* meaning fox, or even *samhuin* as with Coolnahorna. It may also refer to the River Slaney, which is *Sláine* in Irish.

Templescoby - From *Teampeall* meaning church. However, the second element does not appear to represent a Saint's name and may derive from *scairbh* meaning a shallow ford – Church of the Shallow Ford. This is where the name Scarawalsh also derives from.

15.2.3.6 Townlands

The townland is an Irish land unit of considerable longevity as many of the units are likely to represent much earlier land divisions. However, the term townland was not used to denote a unit of land until the Civil Survey of 1654. It bears no relation to the modern word 'town' but like the Irish word *baile* refers to a place. It is possible that the word is derived from the Old English *tun land* and meaning 'the land forming an estate or manor' (Culleton 1999: 174). There are a total of 63 townlands located within the receiving environment of the Proposed Scheme.

Gaelic land ownership required a clear definition of the territories held by each sept and a need for strong, permanent fences around their territories. It is possible that boundaries following ridge tops, streams or bog are more likely to be older in date than those composed of straight lines (*ibid.* 179).

The vast majority of townlands are referred to in the 17th century, when land documentation records begin. Many of the townlands are mapped within the Down Survey of the 1650s, so called as all measurements were carefully 'laid downe' on paper at a scale of forty perches to one inch. Therefore most are in the context of pre-17th century landscape organisation (McErlean 1983, 315).

In the 19th century, some demesnes, deer parks or large farms were given townland status during the Ordnance Survey and some imprecise townland boundaries in areas such as bogs or lakes, were given more precise definition (*ibid.*). Larger tracts of land were divided into a number of townlands, and named Upper, Middle or Lower, as well as Beg and More (small and large) and north, east, south and west (Culleton 1999:179). By the time the first Ordnance Survey had been completed a total of 62,000 townlands were recorded in Ireland.

The townlands through which the Proposed Scheme travels vary in size from 71 to 702 acres. Overall the acreage is quite small. This is likely to be a reflection of the high quality of the land in County Wexford from an agricultural perspective. McErlean (1983, 324) writes that '*the size*

differential prompts the question: do small townlands reflect more intensive settlement, occasioned either by the location of good quality land or other factors?'. This is supported by Culleton (1999:178) who states that the smaller townlands found near to the coast in Wexford may represent intensive farming patterns associated with Anglo-Norman settlement. The larger units found further away from the coast were not so productive for agriculture and as a result the native Irish were allowed to remain but subject to Norman over lords

15.2.3.6 Conclusions on Cultural Heritage

The receiving environments of the Proposed Scheme pass through a landscape that contains the memories of a number of events that have both a national and local significance. Events connected to the 1798 rebellion are recorded within the receiving environment of the Proposed Scheme and include the ambush of the Camolin Yeomen at The Harrow (CH 3), where the commander was killed, and the withdrawal through Needham's gap (Darby's Gap CH 6) of the Irish rebels after the Battle of Windmill Hill. The ambush at The Harrow represents the first clash of the rebellion, and the commander Thomas Bookey lived prior to this at Rockspring House, which is also within the receiving environment. The house was sacked and burnt after the death of Bookey. Less than a month after the ambush at The Harrow, the Battle of Vinegar Hill and Enniscorthy town took place. The site of the battle is located c. 1.5km west of the M11/N11 Mainline. However, the M11/N11 Mainline passes through the approximate area of retreat of the Irish rebels, where it passes to the east of Darby's Gap.

An analysis of the place names found within the receiving environment has provided some light as to the original usage of the landscape, although the date of the units cannot be known for sure. Those referring to ringforts or churches within the landscape or those bounded by natural features such as streams, are likely to be of greater date than the post medieval demesne landscapes. Of the 63 townlands within the receiving environments, a total of 6 have a name that may indicate an early medieval date. A total of 7 have possible English names and 13 are prefixed by a derivative of *baile*, which may also indicate some antiquity. A total of 53 townland crossings have been identified during the course of the assessment, with 39 along the M11/N11 Mainline, 2 along the N80 Link and 12 along the N30 Mainline. Of these crossings a total of 31 are formed by a river or stream. The townland boundary crossings have been included as Areas of Archaeological Potential due to the possible physical remains that may be located within these areas.

Three road side memorials of recent date have also been included within this assessment as sites possessing cultural heritage significance. These memorials represent a place within the landscape that relatives of the deceased wish to remember and for others to see. They are a characteristic of the Irish landscape and represent a culture of remembrance that in turn contributes to the cultural heritage of a place.

15.3 Potential Impacts of the Proposed Scheme

15.3.1 Potential Impacts on sites of Cultural Heritage Significance

15.3.1.1 M11/N11 Mainline

The proposed M11/N11 Road Scheme will have an indirect slight negative impact on one known archaeological site and an indirect imperceptible negative impact on a further 5 known archaeological sites. There will not be any direct negative moderate, significant or profound impacts on any recorded Archaeological Heritage sites (AH). There will be a direct significant negative impact on 37 Areas of Archaeological Potential (AAPs), which includes direct significant negative impacts on a total of 24 watercourse crossings. There will be a direct negative profound impact on a total of 7 Sites of Archaeological Potential (SAPs), whereas a direct negative significant impact is applicable to 4 SAPs. There will be 5 indirect negative slight impacts and one imperceptible. There will be no negative moderate impacts on any SAPs.

The proposed M11/N11 Mainline will have a direct significant negative impact on 4 Built Heritage (BH) sites, although none of these are listed within the RPS or draft NIAH. There will be no direct profound impacts. It will have an indirect negative moderate impact on 2 BH sites; an indirect negative slight impact on 10 BH sites and an indirect negative imperceptible impact on 9 BH sites. There is a no predicted impact (neutral) on three BH sites. The M11/N11 Mainline will also have a direct significant negative impact on a total of 4 former demesne landscapes (D 1-D 4).

The proposed M11/N11 Mainline will have a direct significant negative impact on 3 sites of Cultural Heritage (CH) significance and an indirect slight impact on one CH site. There will also be an indirect negative imperceptible impact on one further CH site.

15.3.1.2 N80 Link Road

The proposed N80 Link Road will have an indirect slight negative impact on 4 known archaeological sites and an indirect imperceptible negative impact on a further 3 known archaeological sites. There will not be any direct negative moderate, significant or profound impacts on any recorded Archaeological Heritage sites (AH). There will be a direct significant negative impact on 3 Areas of Archaeological Potential (AAPs), which includes direct significant negative impacts on a total of 2 watercourse crossings and an indirect slight negative impact at the crossing of the River Slaney. There will be a direct negative profound impact on a total of 3 Sites of Archaeological Potential (SAPs), whereas a direct negative significant impact is applicable to 3 SAPs. There will be 1 indirect negative slight impact and no negative moderate or imperceptible impacts on any SAPs.

The proposed N80 Link Road will have a direct significant negative impact on one Built Heritage (BH) site, although this site is not listed within the RPS or draft NIAH. There will be no direct

profound impacts or indirect moderate or slight impacts. It will have an indirect negative imperceptible impact on 4 BH sites and there will be no direct significant negative impacts on any demesne landscapes.

The proposed N80 Link Road will have a direct significant negative impact on one site of Cultural Heritage (CH) significance.

15.3.1.3 N30 Mainline

The proposed N30 Mainline Road Scheme will have an indirect slight negative impact on 2 known archaeological sites and an indirect imperceptible negative impact on a further 3 known archaeological sites. There will not be any direct negative moderate, significant or profound impacts on any recorded Archaeological Heritage sites (AH). There will be a direct significant negative impact on 13 Areas of Archaeological Potential (AAPs), which includes direct significant negative impacts on a total of 6 watercourse crossings and a indirect slight negative impact at the crossing of the River Urrin. There will be a direct negative profound impact on a total of 9 Sites of Archaeological Potential (SAPs), whereas a direct negative significant impact is applicable to 2 SAPs. There will be one indirect negative slight impact and 2 indirect negative moderate impacts.

The proposed N30 Mainline will have no direct significant or profound negative impacts on any Built Heritage (BH) sites. There will be no indirect moderate impacts either. It will have an indirect negative slight impact on 9 BH sites; an indirect negative imperceptible impact on 4 BH sites. There is a no predicted impact (neutral) on 4 BH sites. The M11/N11 Mainline will also have a direct significant negative impact on one former demesne landscape (D5).

The proposed N30 Mainline will not have any impacts on sites of Cultural Heritage (CH) significance.

15.3.1.4 Overall

In total the Proposed Schemes will not have any direct impacts on the recorded archaeological sites within the receiving environment. However, there will be direct significant negative impacts on a total of 53 Areas of Archaeological Potential, which includes 32 watercourse crossings. There will be an indirect slight negative impact on the two major river crossings of the River Slaney and Urrin. There will be a total of 19 direct profound negative impacts on Sites of Archaeological Potential, along with 9 direct significant negative impacts, and 11 indirect negative impacts (7 slight, 2 moderate, 1 imperceptible).

The Proposed Schemes will not have any direct profound impacts on the Built Heritage sites located within the receiving environment. However, there will be direct significant negative

impacts on 5 BH sites and a total of 2 indirect moderate negative impacts. There will be 19 indirect slight negative impacts and 17 indirect imperceptible negative impacts. A total of 7 BH sites will experience no predicted impact. There will also be a total of 5 direct significant negative impacts on former demesne landscapes.

With regards to sites of Cultural Heritage (CH) significance the Proposed Schemes will have a direct significant negative impact on 4 CH sites; an indirect slight negative impact on one CH site and an indirect imperceptible negative impact on one further CH site.

Summary Tables below provide a summary of the impacts and proposed mitigation measures. Distances in each case are measured from the edge of the proposed footprint of the routes unless other wise stated. The location of these sites can be seen on Figure 15.1. A detailed description of all the sites is given in the Appendix 15.1-15.5.

15.4 Mitigation Measures

15.4.1 General

The design development of the Proposed Schemes has endeavored to minimise the impact on the archaeological, architectural and cultural heritage resource wherever possible. Where it has not been possible to avoid adverse impacts, mitigation measures have been proposed, as discussed below. Mitigation measures, both at pre-construction and construction phases, will be undertaken in compliance with national policy guidance and statutory provisions for the protection of the archaeological and cultural heritage, including the following:

- National Monuments Acts 1930-2004
- Code of Practice (2000) between the National Roads Authority and Department of Arts, Heritage, Gaeltacht & the Islands
- Framework & Principles for the Protection of the Archaeological Heritage (1999). Department of Arts, Heritage, Gaeltacht & the Islands
- Policy & Guidelines on Archaeological Excavation (1999). Department of Arts, Heritage, Gaeltacht & the Islands
- Architectural Heritage Protection, Guidelines for Planning Authorities (2001). Department of Arts, Heritage, Gaeltacht & the Islands

All archaeological works will be undertaken in accordance with directions issued by the Minister for Environment Heritage & Local Government under the supervision of the Project

Archaeologist. Proposed mitigation measures are presented as recommendations as they are subjected to the approval of Department of the Environment, Heritage and Local Government.

15.4.2 Recommendations and Mitigation

15.4.2.1 Measures – Prior to Construction

It is recommended that the following measures be undertaken in advance of the construction phase. This is aimed at allowing a satisfactory time frame in which the mitigation measures can be conducted and the results assessed without causing delays to the construction program.

Non Intrusive Survey

The following non-intrusive recommendations and mitigation measures are recommended prior to construction:

Geophysical Survey

Specific geophysical survey work is recommended along selected sections of the Proposed Schemes to aid in interpreting the archaeological landscape, in advance of a program of intrusive archaeological investigation. This is recommended in two locations, at AAP 14 and AAP 23.

Underwater Inspection & Survey

Underwater inspection is recommended for water bodies that will be significantly impacted upon by the Proposed Schemes. Underwater Inspection and Survey is recommended for sites AAP 4, AAP 14, AAP 15, AAP 16, AAP 18, AAP 19, AAP 21, AAP 22, AAP 24, AAP 26, AAP 27, AAP 28, AAP 29, AAP 30, AAP 31, AAP 32, AAP 33, AAP 34, AAP 36, AAP 37, AAP 38, AAP 39, AAP 40, AAP 41, AAP 42, AAP 44, AAP 45, AAP 49, SAP 4, SAP 35.

Written and Photographic Record

A written and photographic record is recommended for all townland boundaries along with a number of archaeological and built heritage sites. This will consist of a photographic record for each site, including its landscape context with a description of the site/building or composition of the townland boundary. This is recommended for sites AH 14, AH 5, AH 7, AH 9, AH 10, AH 16, AH 17, BH 2, BH 3, BH 6, BH 8, BH 9, BH 13, BH 14, BH 15, BH 17, BH 18, BH 19, BH 21, BH 24, BH 31, BH 33, BH 35, BH 36, BH 38, BH 39, BH 41, BH 42, BH 43, BH 44, BH 51, CH 2, CH 6 and SAP 13 and for the 5 former demesne landscapes to be directly impacted on. For BH 7, the written and photographic record should include a floor plan of the structure.

It is also recommended that a full measured written and photographic record of the three memorial stones (CH 3, 4 & 5) be made prior to the commencement of construction of the

Proposed Schemes. These can then be dismantled and stored safely before being reconstructed in consultation with the relatives of the deceased.

Intrusive Survey

If this scheme is approved by *An Bord Pleanala* it is the intention of Wexofrd County Council to apply to the Minister for Environment Heritage and Local Government for directions, under Sect. 14A (2) of the National Monuments Acts 1930 to 2004, for all archaeological works on this scheme. The following works are recommended:

Archaeological Test Trenching

It is recommended that archaeological test trenching be carried out along the path of the Proposed Schemes by a licence eligible archaeologist, prior to the construction phase. This should be undertaken in order to locate sites of archaeological significance in advance of construction. Test trenching is recommended for all Areas of Archaeological Potential and Sites of Archaeological Potential located within proposed CPO of the road schemes as well as at site BH 15, BH 25 and site CH 6. Mitigation strategies can then be adopted to deal with such findings in advance of construction, thereby helping to minimise delays during the construction phase. Such mitigation strategies can involve preservation by record of the archaeological deposits (archaeological excavation) or preservation *in situ*.

15.4.2.2 Measures During Construction

Mitigation measures at construction phase will be undertaken in compliance with national policy guidance and statutory provisions for the protection of the archaeological and cultural heritage. This may include archaeological monitoring of the topsoil stripping if deemed appropriate following assessment of the pre-construction investigations.

Discovery of Archaeological Material In the event of potential archaeological deposits being uncovered during the construction phase, initial assessment will determine the nature, extent and significance of the archaeology present. As a result of the assessment, decisions on the most appropriate mitigation strategy will be taken with the approval of the DoEHLG. Section 23 of the National Monuments Acts 1930 (as amended) provide that finding of an archaeological object must be reported to the Director of the National Museum or the *Garda Siochana* within 96 hours of discovery.

Fencing and Protection

Fencing and protection of any archaeological sites may be necessary once discovered and during their excavation. No works are anticipated outside the land acquisition boundary.

However, in the exceptional event of any construction activity taking place outside of the land acquisition boundary and in the vicinity of particular sites (due to their close proximity), it is recommended that the sites are fenced off and protected during construction phase.

Screening

During the construction phase it is recommended that permanent screening be erected in order to preserve the setting of BH 3

15.5 Residual Impacts of the Proposed Scheme

If all recommended mitigation measures are followed then there will be no residual impact on the archaeological, architectural and cultural heritage resource in and within the immediate vicinity of the Proposed Schemes.

15.6 Monitoring

The mitigation measures recommended above would also function as a monitoring system to allow the further continuing *assessment* of the scale of the predicted impacts and the effectiveness of the recommended mitigation measures as archaeological investigations continue.

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
M11/N11 Mainline								
AH 1	Balloughter	Enclosure	4,010	SMR/RMP	277m	Indirect	Imperceptible negative	No specific mitigation required
AH 2	Myaugh	Moated site	13,780	SMR/RMP	246m	Indirect	Imperceptible negative	No specific mitigation required
AH 3	Oulartard	*Fulacht fiadh*	16,370	SMR/RMP	64m	Indirect	Imperceptible negative	No specific mitigation required
AH 12	Tomnafunshoge	Moated site	21,475	SMR/RMP	183m	Indirect	Imperceptible negative	No specific mitigation required
AH 13	Ballycourcymore	Moated site	23,400	SMR/RMP	268m	Indirect	Imperceptible negative	No specific mitigation required
AH 14	Ballycourcymore	Rectilinear enclosure	24,250	SMR/RMP	180m	Indirect	Slight negative	Written and photographic record of landscape context.
AAP 1	Frankfort/Ballinclay	Townland boundary	2,300	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 2	Ballinclay/Ballygullen	Townland boundary	2,550	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 3	Ballygullen	Large drumlin	2,730	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing
AAP 4	Ballygullen/ Balloughter	River Bracken and townland boundary	3,325	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey.

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
M11/N11 Mainline								
AAP 5	Balloughter/Tullabeg	Townland boundary	4,150	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 6	Tullabeg/Ballyeden	Townland boundary	4,370	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 7	Ballyeden/Medophall	Townland boundary	5,220	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 8	Medophall/ Knockrobin Lower	Townland boundary	5,840	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 9	Knockrobin Lower/ Knockrobin Upper	Townland boundary (site of)	6,650	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing
AAP 10	Knockrobin Upper/ Ballymore	Townland boundary	6,870-7,460	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 11	Ballymore/ Rockspring	Townland boundary	7,600	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
M11/N11 Mainline								
AAP 12	Crane/Toom	Townland boundary	17,600	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 13	Rockspring/Quarry	Townland boundary and stream	8,710	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 14	Quarry/Mountgeorge	Townland boundary, stream, proximity to holy well	9,170-9,940	None	0m	Direct	Significant negative	Geophysical survey. Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey.
AAP 15	Mountgeorge/ Ballycarrigeen Lower	Townland boundary	10,000	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey.
AAP 16	Ballycarrigeen Lower	Riverine environment	10,090-10,700	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing
AAP 17	Ballycarrigeen Lower/ Carrigeen	Townland boundary	11,480	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 18	Carrigeen/ Knockavocka	Townland boundary and stream	12,350	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
M11/N11 Mainline								
AAP 19	Knockavocka/ Effernoge/ Myaugh	Two townland boundaries and two streams	12,560-13,430	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 20	Myaugh/Tinnacross	Townland boundary and stream	14,230	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 21	Tinnacross/ Tomsallagh/ Oulartard	Two townland boundaries and two streams	14,650-15,650	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 22	Oulartard/ Tomsallagh/ Crane	Two townland boundaries and two streams	15,860-16,840	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 27	Toom/Ballydawmore	Townland boundary and stream	18,300-18,700	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 28	Ballydawmore/ Ballydawmore	Townland boundary and stream	19,180	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 29	Ballydawmore/ Corbally	Townland boundary and stream	19,550	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
M11/N11 Mainline								
AAP 30	Corbally/ Tomnafunshoge	Townland boundary and stream	20,400	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 31	Tomnafunshoge/ Drumgold	Townland boundary and stream	21,660-21,800	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 32	Drumgold/Cooladine	Townland boundary and stream	22,710-23,000	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 33	Cooladine/ Ballycourcymore	Townland boundary and two streams	23,210-24,130	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 34	Knockrathkyle/ Ballybanoge/Monroe	Two townland boundaries and one stream	24,980-25,330	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 35	Monroe	Wetland	25,400-26,050	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing.
AAP 36	Monroe/Craanroe/ Glenteige	Three townland boundaries and two streams	26,070-26,350	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
M11/N11 Mainline								
AAP 37	Glenteige/Riverview	Townland boundary and stream	26,550-26,700	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 38	Riverview	Stream	26,850	None	0m	Direct	Significant negative	Underwater survey
AAP 39	Riverview/ Roperstown	Townland boundary and stream	27,150	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 40	Roperstown/ Garrynisk/ Scurlocksbush	Townland boundary	27,180-28,000	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
SAP 1	Ballyeden	Possible enclosure	4,400	None	198m	Indirect	Imperceptible negative	No specific mitigation required
SAP 2	Knockrobin Upper	Possible rectilinear enclosure	7,070	None	12m	Indirect	Slight negative	Archaeological investigations in the form of testing within the CPO adjacent to the potential archaeological site.
SAP 3	Knockrobin Upper	Two mounds	7,220	None	32m to site	Indirect	Slight negative	Archaeological investigations in the form of testing within the CPO adjacent to the potential archaeological site.
SAP 4	Mountgeorge	Holy Well	9,900	None	46m to site	Indirect	Moderate negative	Written and photographic record of landscape context.
SAP 5	Ballycarrigeen Lower	Possible *fulacht fiadh*	10,230	None	0m	Indirect	Profound negative	Archaeological investigations in the form of testing.

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
M11/N11 Mainline								
SAP 6	Tinnacross	Site of school house	14,460	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 7	Oulartard	Site of weir/head of mill race	15,550	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing. Underwater survey.
SAP 8	Oulartard	Site of mill and mill race	15,960-16,300	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing.
SAP 15	Ballydawmore	Former PM settlement	19,200	None	24m to site	Indirect	Slight negative	Archaeological investigations in the form of testing within the CPO adjacent to the potential archaeological site.
SAP 16	Tomnafunshoge	Surface anomaly	20,750	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 17	Tomnafunshoge	Former track	20,980	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing.
SAP 18	Cooladine	Surface anomaly	22,800	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 19	Ballycourcymore	Former PM settlement	24,300	None	32m to site	Indirect	Slight negative	Archaeological investigations in the form of testing within the CPO adjacent to the potential archaeological site.
SAP 20	Ballycourcymore/ Knockrathkyle	Former PM settlement and townland boundary	24,850	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
SAP 21	Riverview	Struck flint find spot	27,060	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing.

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
M11/N11 Mainline								
SAP 22	Roperstown	Surface anomaly	27,560	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 23	Garrynisk	Former PM settlement	27,720	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing.
BH 1	Ballinclay	Ballinclay House	2,470	Draft NIAH	260m	No Predicted Impact	Neutral	No specific mitigation required
BH 2	Ballygullen	Railway bridge	3,100	None	38m	Indirect	Slight negative	Written and photographic record of bridge and landscape context
BH 3	Ballyeden	House	4,950	Draft NIAH	47m	Indirect	Moderate negative	Written and photographic record of house and landscape context. Screening.
BH 5	Knockrobin	Farm and house	6,450	None	232m	Indirect	Imperceptible negative	No specific mitigation required
BH 6	Ballymore	Former school house	7,500	RPS	108m	Indirect	Slight negative	Written and photographic record of house and landscape context
BH 7	Ballymore	Vernacular cottage (derelict)	7,580	None	0m	Direct	Significant negative	Written and photographic record of cottage and landscape context along with a full floor plan.
BH 8	Ballymore	Cottage	7,600	None	38m	Indirect	Slight negative	Written and photographic record of cottage and landscape context
BH 9	Rockspring	Vernacular cottage (in ruins)	8,370	None	0m	Direct	Significant negative	Written and photographic record of remains of cottage and landscape context

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
M11/N11 Mainline								
BH 10	Rockspring	Entrance to Rockspring House	8,350	None	119m	Indirect	Imperceptible negative	No specific mitigation required
BH 11	Rockspring	Rockspring House and complex	8,400	Draft NIAH	179m	Indirect	Imperceptible negative	No specific mitigation required
BH 12	Rockspring	Garden folly	8,340	RPS	174m	Indirect	Imperceptible negative	No specific mitigation required
BH 13	Ballycarrigeen Lower	Vernacular house and farmyard	10,900	None	104m	Indirect	Slight negative	Written and photographic record of farm complex and landscape context
BH 14	Ballycarrigeen Lower	Vernacular house and farmyard (derelict)	11,000	None	60m	Indirect	Slight negative	Written and photographic record of farm complex and landscape context
BH 15	Ballycarrigeen Lower	Hollow trackway	11,160	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing.
BH 16	Ballycarrigeen Lower	Farm complex	11,400	None	180m	Indirect	Imperceptible negative	No specific mitigation required
BH 17	Carrigeen	Farm complex	11,650	None	86m	Indirect	Slight negative	Written and photographic record of farm complex and landscape context
BH 18	Myuagh	Farm complex (in ruins)	13,800	None	101m	Indirect	Slight negative	Written and photographic record of farm complex and landscape context
BH 19	Tinnacross	Bridge	14,450	Draft NIAH	49m	Indirect	Moderate negative	Written and photographic record of bridge and landscape context
BH 20	Tomsallagh	Summerville House	16,450	Draft NIAH	256m	Indirect	Imperceptible negative	No specific mitigation required

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
M11/N11 Mainline								
BH 21	Crane	Farm complex (in ruins)	16,800	None	58m	Indirect	Slight negative	Written and photographic record of farm complex and landscape context
BH 22	Crane	Bridge	17,000	Draft NIAH	272m	No Predicted Impact	Neutral	No specific mitigation required
BH 23	Crane	Vernacular house	17,200	None	134m	Indirect	Imperceptible negative	No specific mitigation required
BH 24	Toom	Farm complex (in ruins)	17,850	None	21m	Indirect	Slight negative	Written and photographic record of farm complex and landscape context
BH 29	Ballydawmore	Farm complex	19,030	None	188m	Indirect	Imperceptible negative	No specific mitigation required
BH 30	Ballynabarny	Bridge	20,500	None	235m	No Predicted Impact	Neutral	No specific mitigation required
BH 31	Tomnafunshoge	Post box	21,100	None	0m	Direct	Significant negative	Written and photographic record of Post box and landscape context
BH 32	Ballycourcymore	Ballycourcy House	22,850	Draft NIAH	110m	Indirect	Imperceptible negative	No specific mitigation required
BH 33	Monroe	Farm complex	25,180	None	87m	Indirect	Slight negative	Written and photographic record of farm complex and landscape context
BH 51	Cronyhorn	Vernacular house	9,900	Draft NIAH	95m	Indirect	Slight negative	Written and photographic record of house and landscape context

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
M11/N11 Mainline								
CH 1	Rockspring	Site of spring	8,280	None	22m	Indirect	Imperceptible negative	No specific mitigation required
CH 2	Ballycarrigeen Upper & Lower	The Harrow – village involved in the 1798 Rebellion	11,400	None	209m	Indirect	Slight negative	Written and photographic record of village and its landscape context
CH 4	Scurlocksbush	Roadside memorial (modern)	28,000	None	0m	Direct	Significant negative	Written and photographic record of memorial – reconstruction after scheme complete
CH 5	Scurlocksbush	Roadside memorial (modern)	28,000	None	0m	Direct	Significant negative	Written and photographic record of memorial – reconstruction after scheme complete
CH 6	Knockrathkyle & Ballycourcy-more	Darby's Gap – route of rebels escape during Battle of Vinegar Hill	24,730-25,190	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of the landscape through which the rebels passed.
D 1	Ballinclay	Former demesne of Ballinclay House	2,300-2,550	None	0m	Direct	Significant negative	Written and photographic record of former demesne lands to be impacted on
D 2	Rockspring	Former demesne of Rockspring House	8,375-8,500	None	0m	Direct	Significant negative	Written and photographic record of former demesne lands to be impacted on
D 3	Mountgeorge	Former demesne of Mountgeorge House	9,300-10,000	None	0m	Direct	Significant negative	Written and photographic record of former demesne lands to be impacted on
D 4	Tomsallagh	Former demesne of Summerville House	16,275-16,680	None	0m	Direct	Significant negative	Written and photographic record of former demesne lands to be impacted on

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
N80 Link Road								
AH 4	Clavass	Ring ditch	600	SMR/RMP	177m	Indirect	Imperceptible negative	No specific mitigation required
AH 5	Ballynahallin	Ring ditch	1,210	SMR/RMP	33m	Indirect	Slight negative	Written and photographic record of landscape context
AH 6	Kilcannon	Enclosure site	1,860	SMR/RMP	180m	Indirect	Imperceptible negative	No specific mitigation required
AH 7	Kilcannon	Holy well	2,500	SMR/RMP	90m	Indirect	Slight negative	Written and photographic record of landscape context
AH 8	Kilcannon	Church	2,500	SMR/RMP	131m	Indirect	Imperceptible negative	No specific mitigation required
AH 9	Kilcannon	Pit alignment	2,360	SMR/RMP	36m	Indirect	Slight negative	Written and photographic record of landscape context
AH 10	Ballynabarny	Enclosure	3,160	SMR/RMP	51m	Indirect	Slight negative	Written and photographic record of landscape context
AH 11	Ballynabarny	Rectilinear enclosure	3,965	SMR/RMP	192m	Indirect	Imperceptible negative	No specific mitigation required
AAP 23	Ballynahallin	Riverine environment	0-950	None	0m	Direct	Significant negative	Geophysical survey. Archaeological investigations in the form of testing.
AAP 24	Ballynahallin/Kilcannon	Townland boundary and stream	1,690	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 25	Kilcannon/Ballynabarny	River Crossing	2,690-2,825	None	0m	Indirect	Slight negative	Archaeological investigations in the form of testing either side of River Slaney

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
N80 Link Road								
AAP 26	Ballynabarny/Toom	Townland boundary and stream	3,620-4,010	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
SAP 9	Ballynahallin	Surface anomaly	400	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 10	Ballynahallin	Surface anomaly	540	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 11	Ballynahallin	Linear anomaly	875	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing.
SAP 12	Kilcannon	Former PM settlement	1,715	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 13	Kilcannon	Former PM settlement	2,275	None	15m	Indirect	Slight negative	Written and photographic record of landscape context
SAP 14	Ballynabarny	Former PM settlement	3,490	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing.
SAP 39	Kilcannon	Possible enclosure	6,225	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing.
BH 4	Ballynabarny	Ballyvarna House	3,420	Draft NIAH	184m	Indirect	Imperceptible negative	No specific mitigation required
BH 25	Kilcannon	Trackway	2,085	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of track.
BH 26	Ballynabarny	Yorke Ville House	3,200	Draft NIAH	190m	Indirect	Imperceptible negative	No specific mitigation required
BH 27	Ballynabarny	Bridge	2,900	None	100m	Indirect	Imperceptible negative	No specific mitigation required

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
N80 Link Road								
BH 28	Clonhasten	Whitefield House	2,835	None	217m	Indirect	Imperceptible negative	No specific mitigation required
CH 3	Coolnahorna	Roadside memorial (modern)	0	None	0m	Direct	Significant negative	Written and photographic record of memorial – reconstruction after scheme complete

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
N30 Mainline								
AH 15	Clavass	Moated site	400	SMR/RMP	178m	Indirect	Imperceptible negative	No specific mitigation required
AH 16	Clavass	Enclosure	540	SMR/RMP	50m	Indirect	Slight negative	Written and photographic record of landscape context
AH 17	Coolnahorna	Redundant record	815	SMR/RMP (de-listed)	57m	Indirect	Slight negative	Written and photographic record of landscape context
AH 18	Coolnahorna	Ring ditch	940	SMR/RMP	139m	Indirect	Imperceptible negative	No specific mitigation required
AH 19	Ballybrannis	Redundant record	6,125	SMR/RMP (de-listed)	223m	Indirect	Imperceptible negative	No specific mitigation required
AAP 23	Clavass	Riverine Environment	0-600	None	0m	Direct	Significant negative	Geophysical survey. Archaeological investigations in the form of testing.
AAP 41	Clavass/Coolnahorna	Townland boundary and stream	520	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 42	Coolnahorna/Ballyorril	Townland boundary	1,400	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 43	Ballyorril	Riverine environment and townland boundary	1,700-1,640	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
N30 Mainline								
AAP 44	Ballyorril/Moyne Middle	Two townland boundaries and two streams	2,050-2,600	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 45	Ballyorril/Killalligan North	Townland boundary and stream	3,220-3,340	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 46	Killalligan North/ Askunshin	Townland boundary	3,900	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 47	Askunshin/Milehouse	Townland boundary	4,550-4,800	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 48	Milehouse	Elevated ground	4,800-4,950	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing.
AAP 49	Milehouse/Monart East	Townland boundary and stream	5,050-5,180	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 50	Monart East/Bessmount	Townland boundary	5,170-5,900	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
N30 Mainline								
AAP 51	Bessmount/Templescoby	River Urrin crossing	6,300-6,600	None	0m	Direct	Slight negative	Archaeological investigations in the form of testing either side of the river.
AAP 53	Templescoby/Dunsiane	Townland boundary	7,000	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 54	Dunsinane/Templescoby	Townland boundary	7,850	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
SAP 24	Coolnahorna	Surface anomaly	1,350	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 25	Ballyorril	Surface anomaly	2,050	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 26	Moyne Middle	Spring	2,300	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 27	Ballyorril	Surface anomaly	2,550	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 28	Ballyorril	Surface anomaly	2,650	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 29	Ballyorril	Surface anomaly	2,670	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 30	Ballyorril	Surface anomaly	2,750	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 31	Askunshin	Former PM settlement	4,400	None	21m to site	Indirect	Moderate negative	Archaeological investigations in the form of testing adjacent to site.

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
N30 Mainline								
SAP 32	Milehouse	Mill race	4,900-5,070	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing.
SAP 33	Bessmount	Former PM settlement	5,350	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 34	Bessmount	Former PM settlement	5,400	None	36m to site	Direct	Moderate negative	Archaeological investigations in the form of testing adjacent to site.
SAP 35	Bessmount	Mill race	6,400	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Underwater survey.
SAP 36	Templescoby	Surface anomaly	6,600	None	44m to site	Indirect	Slight negative	Archaeological investigations in the form of testing adjacent to site.
SAP 37	Templescoby	Former PM settlement	6,980	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 38	Bessmount	Former PM settlement	6,240	None	0m	Direct	Imperceptible negative	No specific mitigation required as site occupied by modern buildings.
BH 34	Coolnahorna	House & Post box	0	Draft NIAH	224m	Indirect	Imperceptible negative	No specific mitigation required
BH 35	Ballyorril	Small country house	1,555	None	101m	Indirect	Slight negative	Written and photographic record of house and landscape context
BH 36	Ballyorril	Farm complex	2,480	None	80m	Indirect	Slight negative	Written and photographic record of farm complex and landscape context
BH 37	Ballyorril	Cottage	2,525	None	197m	Indirect	Imperceptible negative	No specific mitigation required

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
N30 Mainline								
BH 38	Ballyorril	Cottage	2,870	None	70m	Indirect	Slight negative	Written and photographic record of cottage and landscape context
BH 39	Ballyorril	Farm complex	3,100	None	65m	Indirect	Slight negative	Written and photographic record of farm complex and landscape context
BH 40	Askunshin	Farm complex (derelict)	3,975	None	219m	Indirect	Imperceptible negative	No specific mitigation required
BH 41	Killalligan North	Vernacular house and farm (derelict)	3,450	None	44m	Indirect	Slight negative	Written and photographic record of farm complex and landscape context
BH 42	Askunshin	Farm complex	4,270	None	35m	Indirect	Slight negative	Written and photographic record of farm complex and landscape context
BH 43	Askunshin	Cottage	4,350	None	12m	Indirect	Slight negative	Written and photographic record of cottage and landscape context
BH 44	Askunshin	Bridge	5,000	Draft NIAH	Side road alignment adjacent to bridge	Indirect	Slight negative	Written and photographic record of bridge and landscape context
BH 45	Milehouse	Farm complex	5,015	None	102m	Indirect	Slight negative	Written and photographic record of farm complex and landscape context
BH 46	Bessmount	House	6,330	None	135m	Indirect	Imperceptible negative	No specific mitigation required

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
N30 Mainline								
BH 47	Ballybrannis	Urrinfort House	6,100	Draft NIAH	269m	No Predicted Indirect	Neutral	No specific mitigation required
BH 48	Dunsinane	Former entrance to Dunsinane House	7,180	None	283m	No Predicted Indirect	Neutral	No specific mitigation required
BH 49	Dunsinane	Dunsinane House	7,600	Draft NIAH	284m	No Predicted Indirect	Neutral	No specific mitigation required
BH 50	Clohass	Clohass House	8,000	Draft NIAH	283m	No Predicted Indirect	Neutral	No specific mitigation required
D 5	Bessmount	Former demesne of Monart House	5,140-6,500	None	0m	Direct	Significant negative	Written and photographic record of former demesne lands to be impacted on

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16 WASTE IMPACT ASSESSMENT

16.1 METHODOLOGY

The baseline assessment for the Proposed Scheme was carried out according to the methodology specified by the Environmental Protection Agency (EPA, 2002, 2003).

The baseline assessments involved a review of desktop information. Typical waste composition data reviewed were obtained from the Irish EPA National Waste Database Reports (EPA, Johnstown Castle, Wexford, 2003 - 2006).

An extensive document review was completed to assist in identifying current and future requirements for waste management including the Southeast Waste Management Plan 2006 – 2011 (RPS, MCOS, 2006)

16.2 RECEIVING ENVIRONMENT

In terms of waste management, the receiving environment is characterised by construction and demolition (C&D) waste collection services provided by private waste contractors.

16.2.1 Overview of Waste Management Policy in Ireland

M11/N11 Mainline, N80 Link Road & N30 Mainline

The Government issued a Policy Statement in September 1998 known as Changing Our Ways (DoEHLG, 1998) which identified objectives for the prevention, minimisation, reuse, recycling, recovery and disposal of waste in Ireland. The target for C&D waste in this strategy was to recycle at least 50% within a five year period (by 2003), with a progressive increase to at least 85% over fifteen years (by 2013), which are the recycling targets defined in the Waste Management (Planning) Regulations 1997 (S.I 137 of 2007).

In response to the Changing Our Ways report, a task force (Task Force B4) representing the waste sector of the already established Forum for the Construction Industry, released a report titled Recycling of Construction and Demolition Waste (Forum for Construction, 2002). Such document addressed the development and implementation of a voluntary construction industry programme and included a list of 66 recommendations to help meet government objectives for the recovery of C&D waste as stated in the Changing Our Ways report.

The National Construction and Demolition Waste Council (NCDWC) was launched in June 2002, as one of the recommendations of the Forum for the Construction Industry, in the Task Force B4 final report.

Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects were published by the DoEHLG (in conjunction with the NCDWC) (DoEHLG, 2006). These Guidelines outline the issues that need to be addressed at the pre-planning stage of a development all the way through to it's completion.

Best Practice Guidelines sets thresholds for the requirement for the preparation of C&D plans for developments. The proposed development, the M11 Gorey to Enniscorthy Scheme, exceeds the following thresholds:

- Civil Engineering projects producing in excess of 500m^3 of waste, excluding waste materials used for development works on the site.

Comprehensive reports regarding the quanities of C&D waste produced in Ireland have been compiled by the Environmental Protection Agency (EPA, 2003 - 2006). National Waste (Database) Reports detailing, among other things, C&D generation and the level of recycling, recovery and disposal of this material, provide estimates based on information from waste companies and contractors.

At a regional level, the Southeast (Wexford, Waterford, Tipperary South and Kilkenny) Local Authorities produced a waste management plan (WMP) in 1999, with a replacement Plan for the period 2006 – 2011 then published (RPS, MCOS, 2006). The WMP sets out targets and strategy for waste management within the region.

The recycling rates for C&D waste adopted in the Southeast Waste Management Plan are to achieve the National targets for recycling for C&D waste, i.e. at least 85% by 2013.

16.3 CHARACTERISTICS OF THE PROPOSED SCHEME

The Proposed Scheme will give rise to a wide variety of waste streams during the construction phase, including soil, subsoil and bedrock, concrete, asphalt, timber, metals, packaging and municipal waste. It is imperative that waste management at the application site is tightly controlled, and has the least possible effect on the surrounding environment.

Demolition waste will be generated as a number of existing structures will be demolished to facilitate construction of the Proposed Scheme. The structures to be demolished are detailed in Table 16.4.1.

Table 16.4.1 Buildings to be Demolished

Townland	Chainage(m)	Description	Location
M11/N11 Mainline			
Ballymore	7,580	Cottage	Under M11/N11 Mainline
Rockspring	8,380	Ruins	Under Access Road
Tomnafunshoge	21,000	Partially constructed house	Under M11/N11 Mainline

Table 16.4.1 Buildings to be Demolished (Cont.)

Townland	Chainage(m)	Description	Location
N30 Mainline			
Bessmount	6,180	Shed	Under N30 Mainline
	6,205	Motor vehicle repair workshop	Under N30 Mainline
	6,230	Shed	Under N30 Mainline
	6,240	Shed / Boiler House	Under N30 Mainline
	6,250	House	Under N30 Mainline

Note: Chainages are approximate

Demolition wastes will include the following materials: concrete, steel and other metals, plaster, asphalt, cement, insulation materials, wood, slates/tiles and may contain installations such as electrical wiring, gas reticulation systems and telecommunications.

Significant volumes of subsoil and bedrock will be excavated to accommodate the construction of the Proposed Scheme. The estimated earthworks (cut/fill volumes) comprise a total gross volume of cut for the preliminary design of approximately 5.28Mm^3 and a total gross volume of fill of approximately 5.52Mm^3, including an estimated 0.24Mm^3 of imported capping. Therefore it is predicted that all soil or bedrock material generated will be reused on site.

The construction phase of the Proposed Scheme will produce wastes at the following stages: preparation and excavation; laying the road; and services. During construction, the following materials will be brought onto site, and waste from all materials can be anticipated: concrete, steel, road pavement materials, cement, hardcore/gravel, pipes, chemicals and oils.

The European Waste Codes (EWC) (EPA, 2002) for typical waste materials that may possibly be generated during the construction of the Proposed Scheme are provided in Table 16.4.2.

Table 16.4.2 Waste Types and EWC

Waste Material	EWC
Non-Hazardous	
Bituminous mixtures, coal tar and tarred products	17 03
Metals (including their alloys)	17 04
Soil, stones and dredged spoil	17 05

Table 16.4.2 Waste Types and EWC (Cont.)

Waste Material	EWC
Hazardous	
Electrical and Electronic Components	16 02
Batteries	16 06
Wood Preservatives	03 02
Liquid Fuels	13 07
Soil and stones containing dangerous substances	17 05 03
Other insulation materials consisting of or containing dangerous substances	17 06 03
Other construction and demolition wastes containing dangerous substances	17 09 03

16.4 POTENTIAL IMPACTS OF THE PROPOSED SCHEME

16.4.1 Construction Phase

M11/N11 Mainline, N80 Link Road & N30 Mainline

The potential impacts of the Proposed Scheme, in relation to construction and demolition waste are that, should a C&D Waste Management Plan (WMP) not be implemented, the target recycling rates outlined in the Southeast Waste Management Plan of 85%, by 2013, will not be achieved.

In addition, if waste is not managed and stored correctly on site, this may lead to litter issues. Litter may be generated from packaging taken from materials, mixed waste produced by the construction workers (lunches, cigarette waste etc), or from debris from leftover/damaged construction materials. In addition, poor management of waste may result in water and ground pollution on the site or adjacent to the site.

Fuels and hydraulic oils/lubricants that will be used during the construction phase are classed as hazardous. There will be fuel stored on the site for machinery and construction vehicles along with oils and lubricants. All fuel tanks and draw-off points will be bunded and the correct procedures for mitigating these potential impacts are outlined in detail in the Chapter 11 (Hydrology and Hydrogeology) of this EIS.

Some waste mixtures at the construction phase can often contain dangerous substances classifying the material as hazardous waste, i.e. timber that has been used for hoarding/screening that has been painted, or demolition materials containing asbestos etc. Often, this material cannot be segregated in recyclable elements and therefore it may require

disposal at an appropriate site. Disposal of hazardous materials can only be undertaken at a licensed hazardous waste facility.

There are a number of structures to be demolished to facilitate construction of the Proposed Scheme. These include dwellings, sheds and a workshop. Demolition procedures must be prepared and followed in order to ensure that optimum recycling or reuse (including salvage) of materials generated during demolition is achieved. In addition, there may be potentially hazardous substances/materials present, which need to be identified and, if present, removed and disposed of appropriately in order to prevent soil and/or water contamination. Mitigation measures outlined in Section 16.6.1 will address these potential impacts.

16.4.2 Operation Phase

M11/N11 Mainline, N80 Link Road & N30 Mainline

There are potential waste issues that may arise during the operational phase, including litter and repairs/maintenance of the roads and ancillary items, such as lighting etc.

Litter may be generated at any point along the Proposed Scheme, as a result of people throwing litter from vehicles. The most likely places for this to occur are at locations of emergency telephones. At these points, vehicles may stop for a period and at this time discard litter from the vehicles. The most significant form of this would be fly-tipping, where large quantities of waste are discarded along the route or at lay-bys. Remoulds from vehicle tires are also often discarded on roads, often without the driver realizing.

It is important to note however, that these potential impacts are not unique to this road scheme, but common to all roads.

Maintenance and repair work will be required along the Proposed Scheme in the future. Waste may be generated during these times, with wastes streams such as bitumen products, asphalt and aggregate, paints, old signage etc produced, if the waste materials are not contained and brought away in the maintenance vehicle(s) when the work is completed.

16.4.3 Cumulative Impacts

M11/N11 Mainline, N80 Link Road & N30 Mainline

The potential impacts outlined above may occur on any or all of the routes and therefore the cumulative impact of poor waste management for the overall Proposed Scheme is that low levels of recycling and/pr reuse of materials will occur.

16.4.4 “Do-Nothing” Scenario

The “Do-Nothing” scenario would result in no additional waste being generated in terms of the construction waste. However, waste on the existing roads currently used instead of the Proposed

Scheme, would continue to be produced, including litter, fly-tipping and maintenance and repair derived waste.

16.5 MITIGATION MEASURES

16.5.1 Construction Phase

M11/N11 Mainline, N80 Link Road & N30 Mainline

All current and applicable waste management legislation will be applied and adhered to. Waste contractors that are engaged to transport waste off-site will comply with the provisions of the Waste Management Acts 1996 - 2008 and associated Regulations. This includes the requirement that a contactor handle, transport and dispose of waste in a manner that ensures that no adverse environmental impacts occur as a result of any of these activities. A collection permit to transport waste must be held by the relevant contractor which is issued by the Local Authority. This is the Local Authority where the waste has been generated, i.e. Wexford County Council.

Waste receiving facilities must also be appropriately licensed or permitted for the waste that it is receiving. Operators of such facilities can not receive any waste, unless in possession of a waste permit granted by the Local Authority under the Waste Management (Facility Permit & Registration) Regulations 2007 or a waste license granted by the EPA. The permit/license held will specify the type and quantity of waste able to be received, stored, sorted, recycled and/or disposed of at the specified site.

Recommended mitigation measures to manage impacts arising from waste generated during construction of the Proposed Scheme are summarised below, with more detail provided for each mitigation measure:

- On-site segregation of all waste materials at source, i.e. as they are generated and prior to collection and transportation, into appropriate categories including:
  - topsoil
  - sub-soil;
  - bedrock;
  - asphalt, tar and tar products;
  - metals;
  - dry recyclables e.g. cardboard, plastic, timber, plastics;
- Uncontaminated excavated material (made ground, sub-soil, etc) will be re-used on site in preference to importation of fill from off-site;

- Suspected contaminated material will be assessed and classified prior to removal from the site;
- All waste leaving site will be recycled, with the exception of those waste streams where appropriate recycling facilities are currently not available;
- All waste leaving the site will be recorded and copies of relevant documentation maintained.

There will be temporary construction compounds built at selected locations along the Proposed Scheme during the construction phase, to be finalised at the detailed design stage of the construction works. Each temporary compound will have a dedicated Waste Storage Area (WSA) for construction waste generated. Receptacles/skips or bays will be provided for each recyclable material.

Demolition procedures that will be developed by the contractor must be followed to ensure that optimum recycling and/or reuse of materials is achieved. For the demolition of each of the structures, the following procedures as a minimum should be followed (Note: some structures will not require all of these procedures due to the nature of the structure, i.e. sheds may not have foundations or installations):

- Check for Hazards

  Prior to commencing works, buildings and structures to be demolished will be checked for any likely hazards including asbestos containing materials, electric power lines or cables, gas reticulation systems, telecommunications, unsafe structures, and fire and explosion hazards, e.g. combustible dust.

  If asbestos containing materials are identified on site these must be removed by a specialist asbestos company and disposed of at an approved licensed facility.

- Removal of Components

  All components from within the buildings/structures that can be salvaged will be removed first. This will primarily include steel components but may also include structural timbers, doors, windows, cabinets, appliances, hardwood flooring, galvanised piping, wiring and metal ducting, etc.

  An inspection will be carried out in the buildings/structures to be demolished to see if technical installations can be taken out for reuse on another site. These include technical installations for lighting, heating, telephone etc. These installations will be removed and salvaged if possible.

- Removal of Roofing

  Wooden roof trusses, steel roof supports, beams, slates etc will be dismantled and taken away for recycling/salvage.

- Demolition of Structure

  The breakdown of walls will be carried out once all salvageable or reusable materials have been taken from the buildings. If sufficient quantities are generated, clean, uncontaminated concrete may be crushed on site using a mobile crusher.

  Finally any existing foundations will be excavated, and again, any concrete slabs that are suitable, may be crushed on site prior to reuse or removal.

16.5.1.1 Bedrock, Blocks and Concrete

The majority of the waste C&D material will be clean, inert material and it is proposed to reuse it for construction purposes where feasible.

Bedrock will be excavated to facilitate construction of the Proposed Scheme. Bedrock excavated will be processed and reused on site.

During construction of the structure over the River Slaney plus other watercourse crossings, concrete waste may be produced. Mitigation measures for the protection of the water environment are provided in Chapter 11 of this EIS. Concrete or cement waste will be adequately contained and stored within the dedicated WSA of the temporary construction compounds and disposed of to a permitted or licensed facility.

16.5.1.2 Soil / Subsoil

Soil and subsoil will not be removed from the site during bulk excavation of the Proposed Scheme. Inert soils and subsoils excavated will be used as fill on site or for landscaping purposes. Any fill material excavated at the site, which is deemed to be contaminated (i.e. non-hazardous or hazardous) will be stored separately to the inert material, sampled and tested, in order to appropriately classify the material as non-hazardous or hazardous in accordance with *Council Decision 2003/33/EC (EC, 2003)*, which establishes the criteria for the acceptance of waste at landfills, before being transported to an appropriately licensed facility by permitted contractors.

16.5.1.3 Plastic

As plastic is now considered a highly recyclable material, much of the plastic generated during construction (mainly from packaging) will be diverted from landfill and recycled. The plastic will be segregated at source and kept as clean as possible and stored in a dedicated covered skip.

16.5.1.4 Timber

There will be timber waste generated from the construction work as off-cuts or damaged pieces of timber. Timber that is uncontaminated, i.e. free from paints, preservatives, glues etc, will all be recycled. It will be collected on site in a designated area, and collected by a timber recycling company, or a recycling company that will pass it on to a timber recycling company. Such companies shred the timber and use it for manufacture of wood products or for landscaping (wood chips etc).

16.5.1.5 Scrap Metal

Steel is a highly recyclable material and there are numerous companies that will accept waste steel and other scrap metals. A segregated skip will be available for steel storage on site pending recycling.

16.5.1.6 Hazardous Materials

If hazardous materials are used on site i.e. timber with paint, or generated, i.e. asbestos from demolished buildings, a specialised contractor will be employed to carry out an environmental clean-up to remove all traces of contaminated material from the site. The specialised contractor will be licensed under the Waste Management (Collection Permit) Regulations of 2007. This will be disposed of at a disposal facility licensed under the Waste Management Acts of 1996 - 2005 and the Waste Management (Facility Permit & Registration) Regulations of 2007.

16.5.1.7 Tracking and documentation procedures for off-site waste

All waste will be weighed and documented prior to leaving the site or at the receiving facility. Waste will be weighed by the Contractor (either by weighing mechanism on the truck or at the receiving facility). These records will be kept by the contractor (both hard and soft copies).

All movement of waste and the use of waste contractors will be undertaken in accordance with the *Waste Management Act 1996*, *Waste Management (Facility Permit & Registration) Regulations 2007*, and the *Waste Management (Collection Permit) Regulations 2007*.

This includes the requirement for all waste contractors to have a waste collection permit issued by Wexford County Council. The Waste Manager will maintain a copy of all waste collection permits.

If the waste is being transported to another site, a copy of the waste permit or EPA Waste Licence for that site must be provided to the Waste Manager. If the waste is being shipped abroad, a copy of the Transfrontier Shipping (TFS) document must be obtained from Dublin City Council (as the relevant authority on behalf of all local authorities in Ireland) and kept on site along with details of the final destination (permits, licences etc). A receipt from the final destination of the material will be kept as part of the on-site waste management records.

All information will be entered in a waste management system to be maintained on site.

16.5.1.8 Disposal of C&D Waste

There will be a general skip or receptacle for C&D waste not suitable for reuse or recovery. This skip will include general wet waste (mixed food waste and food packaging), polystyrene, contaminated cardboard, contaminated plastic etc. Workers on the site will be encouraged to recycle as much municipal waste as possible, i.e. cardboard, plastic, metals and glass.

Prior to removal, the municipal waste receptacle will be examined by either the foreperson or a member of his/her team to determine if recyclable materials have been placed in there. If this is the case, efforts will be made to determine the cause of the waste not being segregated correctly.

16.5.2 Operational Phase

M11/N11 Mainline, N80 Link Road & N30 Mainline

Litter management during the operational phase of the Proposed Scheme will be the responsibility of the Maintaining Authority. Litter management will be carried out along the route in accordance with the relevant Road Authority policy.

For maintenance and repair work, all maintenance teams involved will take all wastes generated on site back to their compounds to be placed in appropriate waste receptacles designated for recycling, reuse or disposal, or directly to an appropriately permitted or licensed waste facility. No waste will be left at the site of the repair or maintenance.

16.6 RESIDUAL IMPACTS OF THE PROPOSED SCHEME

16.6.1 Construction Phase

M11/N11 Mainline, N80 Link Road & N30 Mainline

Following provision of appropriate receptacles for all waste streams generated by the construction phase, and the onsite segregation of the waste, the residual impact will be imperceptible.

16.6.2 Operation Phase

M11/N11 Mainline, N80 Link Road & N30 Mainline

Litter management procedures implemented by the Local Authority and correct procedures adopted by all maintenance and repair crews during the operational phase, will result in an imperceptible residual impact.

16.7 MONITORING

Monitoring of construction waste generated throughout the construction phase to be carried out to endure that correct and diligent segregation of waste streams is carried out and a high level of recycling/reuse is being achieved. Monitoring of all receiving waste facilities and waste collection vehicles must also be carried out to ensure that legal compliance is being achieved.

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17 INTER-RELATIONSHIPS

17.1 INTRODUCTION

All environmental factors are inter-related to some extent. The combination of two impacts may have a greater adverse effect than the sum of the same two impacts. It is important to co-ordinate individual topics and to examine the overall impact of the proposed development.

As a requirement of the *European Communities (Environmental Impact Assessment) Amendment Regulations, 1999 (S.I No. 93 of 1999)*, not only are the individual significant impacts required to be considered, but so must the inter-relationship between these factors be identified and assessed.

Part II (Second Schedule) of the Regulations requires that the interactions between human beings, flora and fauna, soil, water, air and climatic factors, landscape, material assets and architectural, archaeological and cultural heritage, be assessed. In the interest of completeness, the interactions between these elements and noise have also been considered.

The aspects of the environment likely to be significantly affected by the proposed works (during both the construction and operational phases of the developments) have been considered in detail in the relevant Chapters of the EIS. In order to demonstrate the areas in which significant interactions occur and to grade these interactions, a matrix has been prepared (Table 17.1).

Where any environmental element in the top row of the matrix (the receptor) is likely to be significantly affected by any element in the left most column (the impactor), which contains the list of aspects of the environment likely to be significantly affected by the proposed works, the impact is identified at the relevant intersection point on the matrix.

Discussion – Positive Impacts

Inter-relationships Between Various Environmental and Socio-economic Issues

The operation of the Proposed Scheme will have a number of positive environmental impacts which additionally will bring benefits to local communities. These include;

- an improvement in travel times, safety and convenience for all road users;
- an improvement in economic activity facilitated by better accessibility to and within the south east region;
- an improvement in quality of the environment for visitors, residents and businesses in the towns of Enniscorthy, Ferns and Camolin as well as those located along the existing N11 due to reduced traffic congestion, air pollution and noise;
- the potential to discover previously unknown archaeological features and artefacts in the area, enhancing local knowledge of cultural heritage and history;

- the introduction of extensive areas of new landscaping and planting in the area.

Inter-relationship between Ecology and Landscape

The introduction of large areas of new planting will bring a small benefit for local wildlife. The landscaping proposals have been carefully designed to bring both landscaping and ecological benefits, with certain areas targeted specifically in the planting proposals to provide new wildlife habitat or to facilitate fauna species in the area (e.g. planting around wildlife underpasses to ensure their success, planting overbridges for bats, providing suitable planting for owls etc.).

Inter-relationship between Soils and Geology, Waste, Landscape and Visual, Air, Noise and Socio-economic Impacts

The vertical alignment within the preliminary design for the Proposed Scheme has been developed to facilitate achievement of an overall balance between cut and fill volumes and amongst other reasons, landscape and visual impacts. Most of the soil material found along the Proposed Scheme is considered suitable for re-use as fill material for either engineering or landscaping works. The reusability of the soil material and the balance in the vertical alignment of the scheme have a number of potential benefits such as;

- reducing volumes of waste to be exported off-site;
- reducing volumes of fill material to be imported on-site;
- reducing levels of visual impacts through use of material in landscaped earth embankments where necessary; and
- reducing levels of air and noise impacts once the scheme is in operation through the creation of landscaped earth berms at certain locations along the scheme.

The reduced need for importing fill material and exporting waste material will have knock-on benefits for noise and air quality, and in turn local communities, due to the reduced need for vehicle and machinery movements during the construction stage.

Discussion – Negative Impacts

Inter-relationships Between Various Environmental and Socio-economic Issues

Virtually all of the identified environmental impacts have potential to also cause nuisance and disturbance to local communities during the construction of the scheme. Such impacts may cause inconvenience to local residences, businesses, landowners and road users if the works are not carefully managed. Such inconveniences may include noise, dust, poor air quality, visual intrusion, temporary diversions, disruption of services, traffic congestion and delays. These impacts are fully assessed in Chapters 4 to 16 of this EIS.

The operation of the Proposed Scheme will bring benefits to many road users as already discussed above. However, additionally the Proposed Scheme will potentially cause a number of negative impacts to local communities such as;

- longer travel journeys for certain road users where existing access arrangements would be altered to the detriment of the road user e.g. road and right of way closures;
- severance of some landowners' properties which could negatively impact on the value of landowners' properties and businesses. The division of many landowners properties could result in the prevention of farms been managed as a collective unit, resulting in difficulties moving livestock between severed land parcels leading to additional costs and safety issues;
- loss of pasting trade to certain businesses / organizations located on the existing N11 or in Enniscorthy, Ferns and Camolin as traffic will be routed away from them;
- reduction in the quality of the environment at residents' and landowners' properties located in close proximity to the Proposed Scheme, in the form of increased noise and air pollution as well as visual intrusion.

These potential impacts have been addressed in detail throughout the specialist Chapters of this EIS which should be referred to for more detail.

Inter-relationships Between Various Environmental Aspects and Ecology

The construction of the Proposed Scheme gives rise to a wide range of associated ecological impacts under virtually all environmental disciplines. Many of the impacts caused by construction works associated with soils and geology, hydrology and hydrogeology, air, noise, landscape, archaeology and waste will additionally have potential to cause knock-on disturbance to the many flora and fauna species and habitats within the area. An example of such potential interaction is between hydrology and ecology, if for example accidental fuels or other chemical spills cause pollution to watercourses, this in turn could result in fish kills or death to other fauna species. These range of potential impacts are addressed in detail in Chapter 9 of this EIS with necessary mitigation measures recommended to reduce the level of impacts as far as is feasible.

A number of structures fall within the land acquisition extents of the Proposed Scheme and will be demolished. Two of these are considered to have potential for bats (which are protected species) although none were found to be present during the ecological surveys carried out by the proposed scheme. Chapter 9 has fully addressed this potential impact and identified a range of measures to minimise disturbance to bat species.

Inter-relationships Between Various Environmental Aspects and Soils & Geology

The excavation and movement of soils during the construction of the Proposed Scheme has potential for knock-on reduction in environmental quality in the areas of ecology, hydrology & hydrogeology, air, noise, landscape, archaeology and waste. Examples include a reduction in water quality as a result of release of silt laden surface water run-off during excavations or destruction of previously unknown features of archaeological interest. These potential impacts have been addressed throughout this EIS in various Chapters with appropriate mitigation recommended where necessary.

Receptor / Impactor	Socio-economic	Agriculture	Material Assets – Property	Material Assets - Infrastructure	Ecology	Soils & Geology	Hydrology & Hydrogeology	Air & Climate	Noise	Landscape	Archaeology	Waste
Socio-economic		×	×	×	×	×	×	× ✓	×	× ✓	× ✓	× ✓
Agriculture	×		-	-	-	-	-	-	-	NA	NA	-
Material Assets – Property	×	-		-	×	-	-	-	-	-	-	-
Material Assets - Infrastructure	×	-	-		-	-	-	-	-	-	-	-
Ecology	×	-	×	-		×	×	×	×	✓	×	×
Soil & Geology	× ✓	-	-	-	×		×	× ✓	× ✓	× ✓	×	× ✓
Hydrology & Hydrogeology	×	-	-	-	×	×		-	-	NA	NA	-
Air & Climate	× ✓	-	-	-	×	× ✓	-		✓	✓	NA	✓
Noise	×	-	-	-	×	× ✓	-	NA		✓	NA	✓
Landscape	× ✓	NA	-	-	✓	× ✓	NA	✓	✓		-	-
Archaeology	× ✓	NA	-	-	×	×	NA	NA	NA	-		-
Waste	× ✓	-	-	-	×	× ✓	-	NA	NA	-	-	

Table 17.1 Inter-relationships Matrix

The Key to the Matrix is as follows:

Key	Impact	Definition
-	Neutral	An interaction which does not significantly affect the quality of the environment
✓	Positive	An interaction which improves the quality of the environment
×	Negative	An interaction which reduces the quality of the environment
NA		Not applicable

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18 SCHEDULE OF ENVIRONMENTAL COMMITMENTS

This chapter collates the environmental commitments proposed within the Environmental Impact Statement for the M11 Gorey to Enniscorthy Scheme. However, the reader is directed to the relevant chapters within the EIS to gain an understanding of the context within which the various commitments are recommended.

CHAPTER 3 DESCRIPTION OF THE PROPOSED SCHEME

- As regards structures provided for Access Roads, or provided to minimise severance of agricultural lands, those that are to facilitate the passage of agricultural vehicles will generally have a minimum headroom clearance of 4.5m and a minimum width of 4.0m and those that are to facilitate the passage of livestock, but not agricultural vehicles, will generally have a minimum headroom clearance of 3.0m and a minimum width of 3.0m.
- The structure over the River Slaney will include a 5m minimum width immediately adjacent to the western bank of the River Slaney that is clear of any structural elements, such as piers. The main, central span will avoid the River Slaney and its banks and will provide a clear span over the Slaney River Valley candidate Special Area of Conservation (cSAC). The structure will include two side spans, one of which will facilitate uninterrupted flow of flood waters immediately adjacent to the western (right) bank of the river channel.
- Included within the earthworks embankment, which takes the N80 Link Road over an area of the River Slaney flood plain, will be a series of flood relief culverts, evenly spaced over the remaining width of the flood plain. These culverts, together with the structure side span on the western bank of the river channel, will facilitate the continued migration of flood waters along the important right conveying overbank, across the full width of the River Slaney flood plain.
- The design flow for the structure over the River Slaney together with the adjacent flood relief culverts will be a 100 year flood rate plus a proposed climate change allowance of a 20% increase in peak flow rates. The structure together with the adjacent flood relief culverts will result in minimal changes to the flood regime and will avoid contraction of the overbank flood flow.
- Bottomless culverts will be used at all crossings of the Tinnacross Stream, Corbally Stream and Pullinstown Stream.
- The culvert facilitating the M11 Mainline crossing of the Ballydwamore Stream, in the region of the Ballydawmore Junction, will comprise 3 sections with intermediate light ports between each section.

- The hydraulic effects created by the structures over watercourses and culverts forming part of the Proposed Scheme will be minimised or managed through compliance with the requirements, guidelines and design standards as set out in:-
  - (i) 'A Guide to Applying for Consent under Section 50 of the Arterial Drainage Act, 1945' (OPW, date unknown);
  - (ii) 'Guidelines for the Crossing of Watercourses During the Construction of National Road Scheme' (NRA, 2006);
  - (iii) 'Requirements for the Protection of Fisheries Habitats during Construction and Developments Works at River Sites (ERFB, 2006);
  - (iv) 'Culvert Design Manual – Report 168' (CIRIA, 1997);
  - (v) United Kingdom Highways Agency Design Manual for Roads and Bridges (UK DMRB) HA 106; and
  - (vi) UK DMRB HA 107.
- The hydrological analysis will be representative of the rainfall and design flood peak flows that can be expected at the location of the proposed watercourse crossings and will include a range of techniques to estimate the most likely design flood peak flow.
- The design of the watercourse crossings will be based on a design flood peak flow for a 1 in 100 event plus a 20% uplift to allow for climate change.
- The detailed design of the road drainage systems for the national routes will be developed in accordance with the NRA DMRB HD 33, supplemented with best management practice as included within the UK DMRB HD 33.
- At outfall locations, the proposed road drainage systems for the national routes will flow via petrol / oil bypass interceptors into balancing ponds before discharging into watercourses. The balancing ponds will be designed so that the maximum rate of outflow into the receiving waters will be, at most, equivalent to the existing greenfield runoff rate.
- The design of the balancing pond will be undertaken in accordance with UK DMRB HA 103 and will be based on a 100-year storm event with a duration of 48 hours. The design will also include for a 20% increase in rainfall intensity, to account for climate change.
- Traffic route lighting will be provided by energy-efficient high pressure sodium lanterns (SONP-T) of up to 250 Watts each, mounted on galvanised steel lighting columns up to a maximum of 12m high above finished road level. All lanterns will be of the fully cut-off, flat glass type to minimise light spill and ensure that light is concentrated on the road surface.
- Fencing will be erected to delineate the site boundary.

- To aide delivery of the environmental mitigation measures described in this EIS that relate to the construction process the Contractor will develop, implement and maintain an environmental operating plan for the Proposed Scheme during the construction phase, taking into account the guidance included within the *Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan* (NRA, 2007).
- Erosion and sediment control measures will be consistent with the guidance contained within *Control of Water Pollution from Linear Construction Projects* (Technical Guide C648 and Site Guide C649, CIRIA, 2006).

CHAPTER 5 SOCIO-ECONOMIC IMPACT ASSESSMENT

- Local businesses and residents will be informed, in advance by the successful Contractor, of the date of commencement of the main construction works and will be provided with information on the intended construction programme.
- Information will also be provided, in advance by the successful Contractor, on any alternative access / traffic management arrangements, disruption in services and the like. Any such proposals will be well managed by the successful Contractor and appropriate measures will be undertaken so as to minimise disruption to the local communities.
- A Traffic Management Plan will be included within the Environmental Operating Plan, which will be produced by the Contractor prior to construction works commencing. The planning, designing, implementing and maintaining of traffic management measures are the responsibility of the Contractor and will be undertaken in compliance with the requirements of the Road Authority and the Gardaí.
- In order to minimise impacts to adjacent lands, fencing will be erected to clearly delineate the Lands Made Available to the successful Contractor. Works will not extend outside of the lands made available to the successful Contractor without prior written agreement of the Local Planning Authority (Wexford County Council) and / or relevant landowners / occupiers.
- In order to minimise impacts on environmental resources and features of socio-economic interest, all of the mitigation measures described within this EIS, particularly those relating to construction control measures (e.g. control of surface water and dust, maintenance of accesses and rights of way leading to, from or crossing the Proposed Scheme, maintaining the working site free from mud, debris or other hazardous substances that are deposited through construction operations) will be fully implemented by the successful Contractor. The Summary of Environmental Commitments included in this Chapter 18 of this EIS will be written into the main works tendering documentation and contract documentation for full implementation. The Contractor will implement an Environmental Operating Plan as per NRA guidelines (Guidelines for the Creation,

Implementation and Maintenance of an Environmental Operation Plan, NRA 2006) which will contain all mitigation measures contained in this EIS.

CHAPTER 6 AGRICULTURAL IMPACT ASSESSMENT

- Precautions will be taken by the Contractor to control dust, noise and vibration as discussed in Chapters 12 Air and Climate as well as 13 Noise and Vibration.

- Good communication with farmers will facilitate the organisation of farm enterprises, so that vulnerable livestock are kept as far away as possible from the construction work during critical times. A contact person will be appointed by the successful Contractor during the construction phase to facilitate communications between affected landowners and the successful Contractor. The successful Contractor will put in place a Public Communications Strategy as part of the Environmental Operating Plan which will contain procedures to inform members of the community directly affected by the construction phase on schedules for any activity of a particularly disruptive nature which is likely to impinge on their property (e.g. blasting, demolition, dredging, pile driving) and any mitigating actions that are being taken (e.g. shielding, restriction on work hours, etc) to minimise such disruption.

- The Contractor put in place a Public Communications Strategy as part of the Environmental Operating Plan which will contain procedures to inform members of the community directly affected by the construction phase on schedules for any activity of a particularly disruptive nature so that sensitive or valuable livestock may be kept as far away as possible from the construction work during critical times. The Public Communications Strategy which will form part of the Environmental Operating Plan will ensure that difficulties in relation to access to land parcels can be minimised.

- The Contractor will maintain reasonable access to severed land parcels at all times during the construction of the Proposed Scheme until such time as the permanent access arrangements are in place and operational, unless agreed otherwise in writing by the landowner and / or occupier. Temporary fencing may be erected to facilitate the use of affected areas during construction

- The Contractor will maintain reasonable continuity of all existing ground and surface water drainage systems, such as lands drains, ditches and private outfalls, affected by the Proposed Scheme until the permanent drainage systems for the Proposed Scheme are installed and functioning satisfactorily.

- The Contractor will maintain reasonable continuity of all existing services (e.g. electricity supply, mains water supply) affected by the Proposed Scheme until the permanent supply systems for the Proposed Scheme are installed and functioning satisfactorily.

- Access Roads and Access Structures will be included within the Proposed Scheme at the approximate chainages and as described in Chapter 3 of this EIS, in order to minimise severance of agricultural lands. Tables 1 and 3 in Appendix 6.2 (contained in Volume 3 of this EIS) summarise the level and nature of the impact the Proposed Scheme will have on each individual farm holding and proposed mitigation measures relating to severance.

CHAPTER 7 MATERIAL ASSETS – PROPERTIES

- The Contractor will maintain reasonable continuity of all existing services (e.g. electricity supply, mains water supply) affected by the Proposed Scheme until the permanent supply systems for the Proposed Scheme are installed and functioning satisfactorily. Where existing services (e.g. electricity supply, water supply) are permanently affected by the Proposed Scheme these will be restored or alternative supplies will be provided.
- The Contractor will maintain reasonable access to all properties at all times during the construction of the Proposed Scheme. This may require temporary alternative access arrangements at some locations.
- Information will be made available to affected landowners on the construction programme and its impact on properties.
- The NRA code of practice *Guide to Process and Code of Practice for National Road Projects Planning and Acquisition of Property for National Roads* will be adhered to with respect to all land potentially impacted by the construction of the scheme. These measures include the following:
  - The local authority will appoint a Project Liaison Officer who will liaise and engage with the affected parties or their representatives on matter relating to the road scheme. The Project Liaison Officer will act as first point of contact should individual encounter difficulties.
  - Before any construction is begun in the vicinity of an existing dwelling house / building in use, which may be impacted by the Proposed Scheme, a competent independent expert, selected by the property and appointed with the consent of the local authority, will prepare a written photographic record of their condition.
  - Where excavations interfere with water supplies, sewers, or septic tanks, these services will be restored as a matter of urgency by the local authority or those acting on its behalf, provided the property owner facilitates all necessary access to enable this to be done

- Steps will be undertaken to minimise dust and mud from construction activities. Measures will include, as appropriate, the watering of the road and containment of material with dust or mud potential and are further outlined in (Chapter 12 Air and Climate) of this EIS.

CHAPTER 8 MATERIAL ASSETS – INFRASTRUCTURE

- A Traffic Management Plan will be included within the Environmental Operating Plan, which will be produced by the Contractor prior to construction works commencing. The planning, designing, implementing and maintaining of traffic management measures are the responsibility of the Contractor and will be undertaken in compliance with the requirements of the Road Authority and the Gardaí.
- The existing, single track Dublin-Wexford railway will be crossed by the M11 Mainline in Ballygullen at approximate chainage M11/N11:3,250m and by the N80 Link Road in Ballynabarney at approximate chainage N80:2,800m. At both locations the Proposed Scheme will pass over the existing railway via proposed road over rail bridges. These bridges will accommodate a future second rail line.
- There will be associated construction and operational impacts at the two Dublin-Wexford railway crossing locations. Both such impacts will be minimised via compliance with the requirements of Iarnród Éireann and Córas Iompair Éireann (CIE), including:
  - works proposed to be undertaken over the operational railway will only be carried out during possessions arranged with Iarnród Éireann;
  - construction works affecting the operational railway will only be undertaken under protection provided by Iarnród Éireann; and
  - plant and machinery used during construction and maintenance of the Proposed Scheme will not be allowed to swing over or foul railway property.
- The Contractor will be required to liaise with all services providers, such as ESBi and Eircom, to establish safe working practices for undertaking work in the vicinity of existing plant and to implement agreed procedures to minimise construction phase impacts on the plant in the region of the Proposed Scheme.

CHAPTER 9 ECOLOGICAL IMPACT ASSESSMENT

<u>Design measures incorporated into scheme to reduce impacts on ecology</u>:

- Planting of trees or hedgerows in all areas where Barn Owls are considered to potentially forage, to discourage them from flying along the verge. Included on landscape plan.
- Balancing/ attenuation ponds will be planted with species such as Common Reed, Reed Canary-grass *Phalaris arundinacea*, Yellow Iris *Iris pseudacorus* and Bulrush *Typha*

latifolia to assist in the removal of silt, nutrients and pollutants from surface water prior to discharge at outfall locations.

- Badger underpasses and access underpasses with suitable planting to encourage use by Badgers:

Proposed Badger safe crossing locations

Chainage	Description
M11/ N11 Mainline	
3,400	Access underpass location; planting to facilitate Badger use
9,340	Access underpass location; planting to facilitate Badger use
13,380	Access underpass location; planting to facilitate Badger use
16,690	Access underpass location; planting to facilitate Badger use
18,200	Badger underpass
19,100	Badger underpass
20,400	Access underpass location; planting to facilitate Badger use
24,350	Badger underpass
25,790	Access underpass location; planting to facilitate Badger use
N80 Link Road	
1,680	Access underpass location; planting to facilitate Badger use
2,490	Badger underpass
3,900	Access underpass location; planting to facilitate Badger use
N30 Mainline	
1,600	Badger underpass
3,350	Access underpass location; planting to facilitate Badger use
6,500	Bridge over the River Urrin. Clear span bridge with bankside planting suitable for Badger passage.

- Increased heights on certain culverts to facilitate passage by Bats and planting measures to guide Bats to underpasses and/ or culverts:

Bat safe crossing locations

Chainage	Structure on Proposed Scheme that may facilitate crossing point by Bats	Landscaping
M11/ N11 Mainline		
4,900	Ch: 4,880 - Overbridge for Local Road L-5092-1	Hedgerow on lead in to match existing hedgerow.
7,600	Ch 7,590 - Overbridge for Local Road L-5093-1	Hedgerow on lead in to match existing hedgerow.
11, 400	Ch: 11,500 - Overbridge for Local Road L-1023-3	Hedgerow to be planted on S side. Hedgerow to match existing on N side. No planting on slip road as it may lead Bats to cross road rather than use overbridge.
14,450	Ch: 14480 - Underpass for local Road L-2011-2. Dimensions will be sufficient for Common Pipistrelle	Hedgerow planting within 0-50m of underpass to be less than 2m to guide Bats to underpass but not encourage them to fly above and cross road. For same reason, no planting above underpass.

Bat safe crossing locations

Chainage	Structure on Proposed Scheme that may facilitate crossing point by Bats	Landscaping
15,700	Ch: 15,520 – Bottomless culvert M11-C-15** (Height 4m x Width 7m x Length 66m).	None
16,800	Ch: 16,750 - Bottomless culvert M11-C-17** (Height 4m x Width 7m x Length 93m).	2m high hedgerow planting on approach.
	Ch: 16,690 - Access underpass, which will have minimum clear dimensions of 4.0m wide by 4.5m high	2m high hedgerow planting on approach.
17,400	Ch: 17370 - Overbridge for Local Road L-2021-1	Hedgerow on lead in to match existing hedgerow.
17,800	None at this chainage but overbridge 450m to N (Ch: 17370 - Overbridge for Local Road L-2021-1)	2m wide hedgerow planting to W of Proposed Scheme to direct Bats to overbridge
19,700	Ch: 19680 - Overbridge for Local Road L-2024-2	Hedgerow on lead in to match existing hedgerow.
20,380	Ch: 16,750 - Bottomless culvert M11-C-20** (Height 4m x Width 7.1m x Length 78m).	None
	Ch: 20,400 - Access underpass, which will have minimum clear dimensions of 4.0m wide by 4.5m high	Hedgerow on lead in to match existing. 2m high planting.
22,290	Ch: 22,300 - Overbridge for Local Road L-6055-1	Hedgerow on lead in to match existing.
N80 Link Road		
2,500	Ch: 2,800 - Underpass for River Slaney, Dublin – Wexford Railway and Local Road L-2020-2. Ch: 2,500 - Badger underpass.	Hedgerow planting 2m high on approach to Badger underpass
N30 Mainline		
1,400	Ch: 1390 - Overbridge for Local Road L-2015-2	Existing woodland retained on E side. Planting of cutting on lead in to W.
2,950	Ch: 2,950 - Underpass for Local Road L-2014-1	Hedgerow planting within 0-50m of underpass to be less than 2m to guide Bats to underpass but not encourage them to fly above and cross road. For same reason, no planting above underpass.
3,900	Ch: 3,890 - Overbridge for Local Road L-2012-3	Hedgerow on lead in to match existing.
4,800	Milehouse roundabout on existing route is to be lit and is therefore unsuitable for Bats to cross. Ch: 5,100 - Bottomless culvert 0N30-C-06** (Height 4m x Width 5.5m x Length 81m).	Planting of at least 2m high from Milehouse roundabout to culvert to direct Bats to culvert location.
6,300	Ch: 6,310 - Underpass for Local Road L-2030-6	Hedgerow planting of 2m high on lead in.

Bat safe crossing locations

Chainage	Structure on Proposed Scheme that may facilitate crossing point by Bats	Landscaping
7,000	Ch: 6,940 - Overbridge for Local Road L-6122-1	Hedgerow planting on lead in to match existing.
7,800	Ch: 7,820 - Overbridge for Old N30	Hedgerow planting on lead in to match existing.

- Use of bottomless culverts and increase to 4m height on all important Salmonid streams:

Culvert design measures to reduce impact on protected fauna species

Watercourse	Culvert & location	Culvert dimensions H x W x L (m)	Culvert type
M11/ N11 Mainline			
Tinnacross Stream	Ch: 9,300 M11-C-04**	4*x 5 x 78	Bottomless
	13,140 M11-C-08**	4* x 6 x 68	Bottomless
	13,350 M11-C-09**	4 x 6 x 81	Bottomless
	14,700 M11-C-11**	4* x 7.5 x 73	Bottomless
	15,520 M11-C-13**	4* x 7 x 73	Bottomless
	16,130 M11-C-15**	4* x 7 x 66	Bottomless
	16,750 M11-C-17**	4* $(2.4)^1$ x 7 x 93	Bottomless
Ballydawmore Stream	18,400 M11-C-18	2.2 x 2.4 x 170	Box – to include light ports
Corbally Stream	20,380 M11-C-20**	4* x 7.1 x 78	Bottomless
N80 Link Road			
None			
N30 Mainline			
Pullinstown Stream	Ch: 5,100 N30-C-06**	4* x 5.5 x 81	Bottomless

Mitigation measures which apply to the whole scheme

Terrestrial habitats

- During construction work, unnecessary disturbance of habitats outside of the landtake extents for the Proposed Scheme must be avoided. Construction works should be confined to within the landtake extents which should be clearly marked out or fenced. It is possible that the Contractor may identify areas for site compounds or other uses outside of the landtake extents for the Proposed Scheme. In this case it will be the

Contractor's responsibility to ensure compliance with environmental legislation. As a general rule the Contractor should not locate any site compounds or other construction related activities, which have not already been covered by this EIS, in the following areas:

- Within or immediately adjacent to a SAC, SPA or NHA.
- Within or immediately adjacent to any areas of woodland.
- Within 10 m of either watercourses, drainage ditches, hedgerows or treelines.
- Within any wetland areas.

- A table of ecologically sensitive areas that are outside of the landtake but were surveyed as part of this EIS are listed for each section of the Proposed Scheme. These areas should not be used for construction compounds.
- Where semi-natural habitats are outside of but near the landtake extents for the Proposed Scheme they must be fenced off to prevent impacts outside of the direct landtake. These should be put in place before construction works commence. An ecologist should be consulted regarding the nature and placement of fencing at sensitive locations.
- The Contractor will have regard to the NRA Guidelines 'Guidelines for the protection and preservation of Trees, Hedgerows and Scrub prior to, during and post construction of National Road Schemes' and guidelines listed in the sections below for Bats, Badgers, Otters and watercourses.

Nesting birds

- Best practice recommends that vegetation (e.g. hedgerows, woodland, trees, scrub and grassland) should not be removed between the beginning of March and the end of August, primarily to avoid impacts on nesting birds and breeding small mammals. This timing restriction is provided for in the Wildlife Act 1976 (as amended). However, an exemption from the restriction on the time of year of vegetation clearance is provided for road construction works under the Wildlife (Amendment) Act, 2000. It is recommended that in accordance with best ecological practice, where feasible, hedgerows, trees, scrub and woodland areas will not be felled between 1st March and 31st August. Where the construction programme does not allow this time restriction to be observed, then these areas must be inspected by a qualified ecologist for the presence of breeding birds or mammals prior to clearance. Where any are found present the appointed ecologist will

need to make a recommendation as to whether a licence is required for vegetation removal.

Badgers

- Badger mitigation measures will have regard to international good practice and national guidelines:
    - Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes (National Roads Authority, 2006).
    - Design Manual for Roads and Bridges: Mitigating Against Effects on Badgers (Highways Agency, 2001).
- The Contractor will prepare a method statement, with advice from a suitable qualified ecologist, which will have regard to the above. This will include specific measures as outlined below. All contractors working on site should be made aware of relevant measures. Any works to setts (including sett monitoring), must be carried out under the supervision of qualified and experienced personnel under licence from the NPWS:
    - Pre-construction Badger surveys of setts 10-12 months prior to commencement of construction activities. This survey will include setts within a certain distance of the Proposed Scheme; the distance required will depend on the nature of the work being undertaken and the timing of the surveys in relation to the baseline EIS survey work (as outlined in the above NRA guidelines).
    - Exclusion and removal[1] of any setts that are within the landtake for the Proposed Scheme to avoid badger mortalities from construction works.
    - Provision of artificial setts where a main sett is located within the landtake of the Proposed Scheme and there are no alternative Main setts within the vicinity[2].
    - Exclusion[1] of certain setts within 50m of the Proposed Scheme, where it has been identified (during the pre-construction survey) that there may be disturbance during construction.
    - Protection (e.g. fencing) of setts and prohibited working areas.
    - Clear identification (e.g. signing) of setts and prohibited working areas.
    - Distances within which work should not be undertaken near setts for defined types of work (e.g. use of different types of machinery and manual work) and times of year to which these restrictions apply.

- Fencing of relevant areas of Proposed Scheme, as per *Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes'* (NRA, 2006) to prevent Badgers from crossing a road at unsafe locations and to help guide them to underpass locations were they can cross under the road safely.

[1]Setts which are found to be inactive may be blocked and destroyed, regardless of the time of year. Setts which are found to be active may only be evacuated and excavated during the period July to November (inclusive) in order to avoid the badger breeding season. This timing restriction needs to be factored into the appointed contractor's work schedule.

[2]Land for artificial setts has been included within the CPO line of the Proposed Scheme. Artificial sett provision is detailed for each section of the Proposed Scheme.

- The pre-construction surveys will identify any new setts which have become established since the surveys carried out for this EIS were undertaken and will also determine the precise mitigation required for each sett depending on the level of activity and the breeding status of setts at that time. Although provisional recommendations for mitigation at each sett are provided for each section of the Proposed Scheme (below), the pre-construction surveys will verify whether these mitigation measures are adequate to address possible impacts on badgers.

- Underpasses will be provided in areas of high Badger activity. These will be constructed according to the *Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes* (NRA, 2006). Planting on approach to these will comprise hedgerow planting, ensuring that this does not obscure the entrance (as outlined in the above guidelines). Underpass locations are outlined for each section of the Proposed Scheme, below.

- In relation to watercourse crossings, the following mitigation will be specified in the contractor's method statement. Regard should also be had to the NRA (2005). *Guidelines for the crossing of watercourses during the construction of National Road Schemes.*

  - Inclusion of mammal ledges or dry culvert, suitable for Badger passage, in all culverts.
  - Inclusion of ramps for access to ledges or dry culverts, where required.
  - Measures to guide Badgers to ledges or dry culverts.

Bats

All Bat mitigation measures will have regard to international good practice and national guidelines:

- *Guidelines for the Treatment of Bats during the Construction of National Road Schemes* (NRA, 2005).
- *Bat Mitigation Guidelines for Ireland* (NPWS, 2006).
- *Design Manual for Roads and Bridges*: *Nature Conservation Advice in Relation to Bats* (Highways Agency, 2001).

- All Bat species are listed on Annex IV of the EC Habitats Directive. Therefore, in accordance with NPWS guidelines '*Guidance on compliance with Regulation 23 of the Habitats Regulations 1997* (NPWS Circular 2/07), a (draft) derogation licence application has been included with this EIS (Appendix 9.7 in Volume 3 of this EIS). Mitigation measures are also summarised below.

1) Mitigation in respect of the buildings to be demolished

- Pre-construction bat surveys of the structures to be demolished must be carried out to ensure that Bats have not taken up residence in them between the time of the EIS surveys and the commencement of construction works.
- If Bats are not found to be present then the Bat specialist will determine whether it is still necessary to be present during building demolition.
- A derogation licence will be required for the removal or disturbance of any confirmed Bat roosts.
- No Bat roosts were confirmed in buildings to be demolished during the survey work. If Bats are found during pre-construction surveys of these buildings then revision of this derogation licence will be required and an experienced bat specialist will need to prepare a mitigation strategy. Any changes to the proposed mitigation will need to be agreed in advance of demolition works commencing with the NPWS.

2) Mitigation in respect of vegetation clearance within woodlands and hedgerows

- Prior to the commencement of construction works a survey will need to be undertaken by a suitably qualified and experience bat worker to identify any trees which have potential for bat roosts within the landtake of the Proposed Scheme.
- Where trees with potential for bats are situated along the boundary of the landtake, the potential of retaining these trees will need to be discussed with the appointed contractor. Those trees regarded as having potential for bats will need to be clearly marked.

- Trees which have high potential for bat roosts must be surveyed by a bat specialist at night prior to felling. Where Bats are not recorded during this survey, these should be felled the day immediately following the survey. The bat specialist will determine the level of survey work required and whether they are required to be present for the tree felling works.

    - Trees which have low potential for bat roosts will not require pre-felling night time surveys, but will require some precautionary measures during felling. The bat specialist will determine the level of survey work required and whether they are required to be present for the tree felling works.
    - The precise methodology for felling trees with Bat potential will be determined by the bat specialist. In some cases it will be appropriate to fell trees by gently pushing them over by machine, while in others it would be better to fell them in sections and lower sections to the ground.
    - Locations where bat boxes will be installed on trees and in woodland are listed for each section of the Proposed Scheme. The precise number and locations within woodland and on trees will be determined by the bat specialist. This bat worker will also provide instruction to contractors on the proper erection of bat boxes. The pre-construction assessment of trees for bat potential by the bat specialist will identify further suitable locations for bat boxes.
    - All trees that are identified by the bat specialist to have potential to support Bats, regardless of whether they are high or low potential and whether or not Bats are found present, must be felled between either late August to early November or late February to mid-April. These are times when bats are capable of flight and are outside of the summer breeding and winter hibernation periods when they would be most vulnerable to disturbance.

Watercourse protection during construction

- Contractors will have regard to the following guidelines to ensure that watercourses are adequately protected from construction work:

    - Construction Industry Research and Information Association CIRIA *C649: Control of water pollution from linear construction projects: Technical guidance* (Murnane *et al.* 2006)
    - CIRIA *C649: Control of water pollution from linear construction projects: Site guide* (Murnane *et al.* 2006)
    - DMRB HD33/06: *Surface and sub-surface drainage systems for highways.* Design Manual for Roads and Bridges. Volume 4: 2, (2006).

- The Contractor will also follow measures outlined in Chapter 11 for the protection of watercourses. The contractor will prepare a method statement, which will have regard to the above, and will include specific measure in relation to the following:
    - Storage of fuels, oils, greases and hydraulic fluids.
    - Locations for refuelling of machinery and machine servicing.
    - Control of run-off from concrete mixing.
    - Erosion control in relation to cleared lands.
    - Control of silt run-off.
    - Control of surface-water run-off.
    - Location and size of stockpile areas for sands and gravel.
    - Control of sand and gravel run-off.
    - Inspection and maintenance of settlement ponds.

Watercourse crossings

- In addition to the guidelines listed above, when undertaking watercourse crossings and in-stream works, contractors must have regard to the following guidelines to ensure that watercourses are adequately protected from construction work:
    - NRA (2005). *Guidelines for the crossing of watercourses during the construction of National Road Schemes.*
    - ERFB (2006). *Requirements for the protection of fisheries and habitats during construction and development works at river sites.*
- The Contractor will also follow measures outlined in Chapter 11 for the protection of watercourses. The Contractor will prepare a method statement, which will have regard to the above and the consultation advice from ERFB included in Appendix 9.1 in Volume 3 of this EIS and will include specific measure in relation to the following:
    - Timing of works to avoid the Annual Close Season for Salmonids*.
    - Methods to control run-off of silt and suspended solids entering watercourses.
    - Response measures to potential pollution incidents.
    - Maintenance of flow during in-stream works (e.g. via temporary stream diversion) and fish removal if required.
    - Methods to stabilise watercourse banks that have been cleared of vegetation.
    - Maintenance of machinery to be used in-stream.

- Removal and replacement of stream bed material in diverted watercourses.

* The above NRA guidelines (2005) define the Annual Close Season for Salmonid species as the beginning of October to the end of February, with instream works being permitted from March to September. However they recommend that consultation over the exact timing is discussed with the relevant Regional Fisheries Board. The season is defined in the above ERFB guidelines (2006) as running from the beginning of October to the end of April, with instream works being permitted between May and September.

- As described in the impact section, bottomless culverts are to be used on important Salmonid watercourses. In addition, the contractor must have regard to the above NRA Guidelines: *Guidelines for the crossing of watercourses during the construction of National Road Schemes* in relation to culvert design and installation. Culvert design aspects that must be suitable for fish passage include:

  - Culvert slope (and hence flow levels through culvert).
  - Level of the culvert bottom (invert) below the level of the natural stream bed.
  - Design of pools at entrance and exit to culvert for fish passage.
  - Maintenance of minimum water level within culvert.*

  *Baffles are to be used to ensure maintenance of required minimum water levels through culverts. As all watercourses have the potential to support Lamprey species (ERFB, pers. comm.) all baffles will be notched to facilitate Lamprey passage.
  In addition, mammal ledges, or dry culverts, for mammal passage will be included at all watercourse crossings, as outlined in the above guidelines and in this chapter in relation to Badgers and Otters.

Invasive species

- Indian Balsam was recorded at the crossing point of the River Slaney. Invasive plant species were not recorded at any other watercourse crossing location. Indian Balsam and Japanese Knotweed are both present in the area (NPWS, pers. comm.) and as these species can rapidly invade new habitats, particularly on watercourse banks, their presence at watercourse crossings prior to construction works cannot be ruled out. NPWS recommended therefore that pre-construction surveys, by a suitably qualified ecologist, are undertaken for invasive plant species at all watercourse crossing points. Appropriate mitigation will be outlined for crossing points where invasive plant species are found to be present. This will have regard to the 'Invasive species Ireland' Best Practice Guidelines and Management Plans, where these exist for the species concerned.

Planting of riparian habitat

- Watercourse banks may require planting for stabilisation and to prevent invasive species such as Indian Balsam from becoming established. Planting of riparian habitats will have regard to the following guidelines:
    - NRA (2005). *A guide to landscape treatments for National Road Schemes in Ireland.*
- The planting scheme will ensure that the species used are native, reflect the existing plant communities at that location and do not contain invasive species. If translocation of existing plant material is to be used then this must be free of invasive species. A suitable qualified ecologist will be consulted in relation to the planting scheme in these locations.

Otter

- Otter mitigation measures will have regard to international good practice and national guidelines:
    - *Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes* (NRA, 2006).
    - *Design Manual for Roads and Bridges: Nature Conservation Advice in Relation to Otters* (Highways Agency, 2001).
- Otter is listed on Annex IV of the EC Habitats Directive. Therefore, in accordance with NPWS guidelines '*Guidance on compliance with Regulation 23 of the Habitats Regulations 1997* (NPWS Circular 2/07), a (draft) derogation licence application has been included with this EIS (Appendix 9.8 in Volume 3 of this EIS). Mitigation measures that the contractor must follow are summarised below; refer to the above NRA and DMRB guidelines for full details:
    - Pre-construction Otter surveys of holts within 150m of the Proposed Scheme.
    - Exclusion and removal* of any holts that are within the landtake for the Proposed Scheme.
    - Exclusion and/ or removal* of holts close to landtake, where there may be temporary disturbance.
    - Specification of distances within which work should not be undertaken near holts where breeding females or cubs are present.
    - Timing of works to avoid breeding season (requires survey to determine as Otters may breed at any time of year) where holt is not to be excluded.

- Specification of distances within which work should not be undertaken near active, non-breeding holts.
- Protection (e.g. fencing) of holts and prohibited working areas.
- Clear identification (e.g. signing) of holts and prohibited working areas.
- Fencing of relevant areas of Proposed Scheme to prevent Otters from crossing a road at unsafe locations and will help to guide them to underpass locations were they can cross under the road safely.

*Excavation and removal of Otter holts will follow the NRA (2005) *Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes*, as recommended by the *Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes* (NRA, 2006).

- In relation to watercourse crossings, the following mitigation will be specified in the contractor's method statement. Regard should also be had to the NRA (2005). *Guidelines for the crossing of watercourses during the construction of National Road Schemes.*
  - Inclusion of mammal ledges or dry culvert, suitable for Otter passage, in all culverts.
  - Inclusion of ramps for access to ledges or dry culverts, where required.
  - Measures to guide Otters to ledges or dry culverts.

Kingfisher

- Although Kingfisher breeding banks were recorded at or immediately adjacent to the proposed watercourse crossing points, a pre-construction Kingfisher survey of all watercourse locations will be carried out by a qualified ecologist. This will ensure that no Kingfisher nests have become established at or adjacent to watercourse crossing locations between the time of the EIS surveys and the commencement of construction. Should any nesting holes be located during the pre-construction surveys, the appointed ecologist will need to make a recommendation as to whether a derogation licence is required to allow disturbance to the breeding place of species listed in the EC Habitats and Birds Directives. If derogation licences are required, suitable mitigation strategies will need to be prepared and approved by the NPWS in the consideration of any such derogation licences.

Common Frog

- Watercourse crossings of drainage ditches and land drains must avoid damaging Common Frogs and their larvae and eggs, which are not mobile. This does not apply to

main watercourses (rivers and streams) which are unlikely to be suitable for Common Frogs as breeding sites. Damage to Common Frogs and their larvae and eggs can be avoided by undertaking works between August to January, outside of the breeding season. If this is not possible then the crossing points will need to be surveyed by a suitable qualified ecologist prior to construction work taking place. Where eggs or larvae are present, a derogation licence and appropriate mitigation strategy will need to be prepared and approved by the NPWS.

Mitigation measures specific to the M11/ N11 Mainline

Location of construction compounds

- A list of sensitive habitats, where construction compounds should not be situated, is shown in Table 9.48, Chapter 9.

Compensation planting

- In addition to the landscape planting along the scheme, including planting to facilitate mammal crossing and discourage Barn Owl crossing, there will be an area of compensatory woodland habitat created. This is located to the east of the M11/ N11 Mainline from chainage 9.300 to 10,250 and is approximately 32,000km^2 in area. This will comprise native woodland planting, dominated by Oak and Ash with some Hazel and Hawthorn. The planting will be merged with the existing hedgerow along the Tinnacross Stream bank at this location, with occasional Willow and Alder planting.

Badgers

- Mitigation for setts located within 50 metres of the Proposed Scheme is outlined in Table 9.49, Chapter 9. The three Main setts that are to be destroyed and require artificial sett provision are highlighted in the table. Land that has been included in the CPO line for artificial sett provision is shown in Figure 9.4 in Volume 4 of this EIS.

- All 30 culverts will have mammal ledges for Badger passage.

Bats

- In addition to the standard mitigation measures, Bat boxes will be provided at suitable locations as indicated in Table 9.50 (Chapter 9) to mitigate for the loss of potential Bat tree roosts. The provision of Bat boxes will be subject to landowner permission and access and precise locations will need to be determined by the successful Contractor and the appropriately qualified Bat ecologist.

Watercourse protection during construction

- In addition to the watercourse protection measures outlined in the mitigation for the entire scheme, special mitigation measures are required in relation to Culvert M11-C-03 (A-C), which crosses the Bracken Tributary BRT02. This flows into the River Bann, which supports Freshwater Pearl Mussel. Given the sensitivity of this species to increased silt load, measures are required to prevent downstream erosion of the watercourse banks below the culvert. This will reduce the risk of silt entering the River Bann as a result of construction works. An ecologist will be involved in the exact design of the bank erosion protection measures. This will use materials such as logs and tree tops (as detailed in Grady, 2006) to reinforce the banks and encourage vegetation to colonise and stabilise the banks. Materials such as concrete will not be used.

Otters

- There are five holts located within 150m of the M11/ N11 section of the Proposed Scheme. These will be surveyed during pre-construction survey work and appropriate mitigation action taken as required. Potential mitigation measures are outlined in Table 9.51, Chapter 9.

<u>Mitigation measures specific to the N80 Link Road</u>

Terrestrial habitats

- A list of sensitive habitats, where construction compounds should not be situated, is shown in Table 9.52, Chapter 9.

Badgers

- Mitigation for setts located within 50 metres of the Proposed Scheme is outlined in Table 9.53, Chapter 9. No setts are located within landtake.

- All 4 culverts will have mammal ledges for Badger passage.

Bats

- One Leisler's tree roost has already been identified and suitable replacement roosts in the form of bat boxes on trees to be retained at Chainage N80:2,500m on the N80 Link Road have been recommended.

- In addition to the standard mitigation measures, Bat boxes will be provided at suitable locations as indicated in Table 9.54 (Chapter 9) to mitigate for the loss of potential Bat tree roosts. The provision of Bat boxes will be subject to landowner permission and

access and precise locations will need to be determined by the successful Contractor and the appropriately qualified Bat ecologist.

Mitigation measures specific to the N30 Mainline

Location of construction compounds

- A list of sensitive habitats, where construction compounds should not be situated, is shown in Table 9.58, Chapter 9.

Badgers

- Mitigation for setts located within 50 metres of the Proposed Scheme is outlined in Table 9.56, Chapter 9. No setts are located within landtake.

- All 9 culverts will have mammal ledges for Badger passage.

Bats

- In addition to the standard mitigation measures, Bat boxes will be provided at suitable locations as indicated in Table 9.50 (Chapter 9) to mitigate for the loss of potential Bat tree roosts. The provision of Bat boxes will be subject to landowner permission and access and precise locations will need to be determined by the successful Contractor and the appropriately qualified Bat ecologist.

- In addition to the standard mitigation measures, Bat boxes will be provided at suitable locations as indicated in Table 9.57 (Chapter 9) to mitigate for the loss of potential Bat tree roosts. The provision of Bat boxes will be subject to landowner permission and access and precise locations will need to be determined by the successful Contractor and the appropriately qualified Bat ecologist.

Otters

- One holt was located within 150m of the M11/ N11 section of the Proposed Scheme. This will be surveyed during pre-construction survey work and appropriate mitigation action taken as required. Potential mitigation measures are outlined in Table 9.58, om Chapter 9, Volume 3 of this EIS.

CHAPTER 10 SOILS AND GEOLOGY IMPACT ASSESSMENT

- In order to minimise the extent of soil loss arising from the Proposed Scheme, soil will be excavated and stockpiled along the Proposed Scheme, pending re-use and re-establishment, insofar as practicable, along embankment and cutting side slopes, on verges adjacent to the road carriageway, on screening mounds and at landscaping

areas. The overall effect of this will be to reduce the loss of soil cover within the Proposed Scheme from a potential 335 hectares to 99 hectares (or 30% of the overall landtake requirement). Any excess soil, not required for the permanent works, will be re-used for site reclamation and / or restoration works at sites in the local area, ideally contiguous to the Proposed Scheme.

- Insofar as practicable, and where provided for by landscape design proposals, excavations developed in rock cuttings along the Proposed Scheme will be scaled and trimmed and left exposed for future inspection and earth science study (ie. they will not be obscured by topsoil cover and / or new planting).
- In order to expand the understanding of Ireland's geological heritage, the successful Contractor will be required as part of the main works construction contract to record geological data revealed in roadside cuttings during construction using the GSI's Temporary Exposures Form.
- In order to conserve existing local reserves of sand and gravel and bedrock for future extraction and aggregate production, embankment and road construction materials along the Proposed Scheme will be sourced, insofar as practicable, from within the confines of the landtake for the Proposed Scheme.
- Where possible, all excavated bedrock will be processed and used for pavement construction purposes and failing this, for embankment construction purposes. It is anticipated that sufficient quantities of acceptable subsoil material can be sourced across the Proposed Scheme to facilitate construction of embankments and there is unlikely to be any requirement to import embankment construction materials from local pits and quarries.
- The re-use of soft, wet or marginal subsoils excavated along the Proposed Scheme can be maximised by processing it in one of several possible ways. These include spreading it in thin layers and allowing it to dry naturally, excavating drainage channels prior to bulk excavation (if groundwater level is close to ground level) or stockpiling wet soils with interbedded layers of dry soil (if available). Maximising the re-use of subsoil materials in this way reduces the requirement to import primary aggregates from local quarries
- In order to minimise soil erosion and the potential discharge of sediment to local watercourses, the following measures will be implemented during the construction phase of the Proposed Scheme (refer also to Chapter 11 of this EIS (Hydrological and Hydrogeological Impact Assessment)):
    - leaving vegetation and soil in place for as long as possible prior to excavation and minimising excavation and stockpiling of soil during wet weather periods;

- shaping of soil stockpiles so as to shed water
- interception and channelling of surface water run-off over exposed soil surfaces to sumps and to silt traps or settlement lagoons thereafter;
- construction of silt traps, settlement lagoons / ponds or wetlands (either temporary or permanent) at sensitive outfalls at an early stage in the construction programme;
- construction of cut-off ditches to divert surface water run-off from entering excavations; and
- placing of granular materials over bare soil, particularly in the vicinity of watercourses, to prevent erosion of fines and/or rutting by site traffic.

- In order to minimise the potential degradation of soil as a result of construction activities, the following measures will be implemented during the construction phase of the Proposed Scheme
- insofar as practicable, compaction of soil will be avoided and soil stockpiles will be restricted to less than 2m height
- repeated handling of soils will be avoided and ideally all soil stockpiles will remain undisturbed pending re-use and re-establishment of soil along the Proposed Scheme
- It is expected, on the basis of the preliminary design, that the amount of unsuitable mineral subsoil requiring transfer off-site to existing waste disposal or recovery facilities during the construction phase will be minimal. Efforts will be made to process unsuitable or marginal subsoils and/or re-use them within the landtake boundary for the Proposed Scheme. Potential opportunities for re-use of marginal subsoils include construction of visual screening bunds and filling in areas of landscape / ecological planting.
- The construction contract will require any excess soil or unsuitable subsoil not used in construction of the Proposed Scheme to be disposed of and/or recovered in accordance with the requirements of the Waste Management Acts and Regulations 1996-2008 and the NRA *Guidelines on Waste Management for National Road Schemes* (2008).
- In this respect, consideration will be given to using any excess material, not required for the permanent works, for agricultural, ecological or landscape improvement works in areas contiguous to the Proposed Scheme, in accordance with local planning controls and required licences or permits.
- Alternatively, excess material may be hauled to a nearby quarry facility for backfilling purposes or processed and stored, pending re-use on future public works and / or private development projects in the area.

- In order to reduce the risk of soil contamination arising as a result of spills or leakages during the construction phase, a number of measures will be implemented to control the storage and handling of fuels, lubricants and waste. These measures include, but are not limited to, the following (refer to Chapter 11 of this EIS (Hydrological and Hydrogeological impact Assessment):
- storing fuels, soils, chemicals, liquid and solid wastes on impermeable surfaces;
- undertaking refuelling of plant, equipment and vehicles on impermeable or hardstanding surfaces. Where this is not possible, refuelling may take place using mobile, double skinned bowsers. No refuelling will be permitted in soil or rock cuttings.
- ensuring all tanks and drums are bunded in accordance with established best practice guidelines;
- provision of spill kits at refuelling areas and high risk / sensitive sites;
- development and implementation of a Construction Waste Management Plan to ensure correct handling and disposal of construction waste streams (most notably wet concrete and asphalt) in accordance with the Waste Management Acts and Regulations 1996 to 2008. This plan will form part of the Environmental Control Plan prepared for construction of the Proposed Scheme.
- In order to reduce the potential for soil erosion across and along the Proposed Scheme, vegetation will be re-established on all bare or exposed soil surfaces. Details of the preliminary Landscape Masterplan are provided in Chapter 14 of this EIS (Landscape Impact Assessment).
- In order to further minimise the potential long-term increase in the volume and rate of surface water run-off along the Proposed Scheme, arising from the loss of soil cover and the sealing of the ground, positive drainage control measures in the form of balancing ponds will be installed at all proposed national route carriageway runoff outfall locations.
- Balancing ponds will form an integral part of the Proposed Scheme to ensure that there is no increase in the rate of surface water run-off within local river catchments or maximum (peak) flows in local watercourses. This in turn will ensure that the erosive power of peak flows in existing watercourses will not increase as a consequence of the Proposed Scheme. Details of the proposed drainage scheme are provided in Chapter 3 and (Description of the Scheme) and Chapter 11 (Hydrological and Hydrogeological Impact Assessment) of this EIS.

CHAPTER 11 HYDROLOGY AND HYDROGEOLOGICAL IMPACT ASSESSMENT

- In order to minimise the potential impacts from the Proposed Scheme, the following mitigation measures will be implemented. These measures will minimise the risk of

contamination of groundwater and surface water occurring during normal, and/or emergency conditions during the construction and operational phases.

- The Department of the Marine and Natural Resources (1997) published guidelines, which were designed to ensure the impact of construction work on the water environment is minimised. The UK Department of the Environment (EA) has also published guidance on the approach to minimise impacts of construction and operation of developments on the water environment. The contractor will follow current guidance from the UK EA and the Department of the Marine and Natural Resources during the construction phase.
- In addition, mitigation measures for culverts, balancing ponds and watercourse crossings will be designed based on guidance from the UK Design Manual for Roads and Bridges, the Eastern Regional Fisheries Board publication R*equirements for the Protection of Fisheries Habitats during Construction and Development Works at River Sites* and the NRA Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes (NRA, 2006).
- Stockpiling of construction materials, such as earthworks/pavement materials and fuels, will not occur within 10 m of the nearest watercourse, in order to minimise the risk Groundwater and surface water pollution will be minimised by the implementation of good construction practices as contained in the publication by the Construction Industry Research and Information Association (CIRIA) *Control of Water Pollution from Construction-sites, Guidance from Consultants and Contractors (Master et al. 2001).* An emergency response protocol for the management of pollution incidents that may occur during the construction phase will be established as part of the Environmental Operating Plan for the Proposed Scheme by the Contractor and regularly updated. Based on the guidance documents referred to in this chapter of the EIS this protocol will include: containment measures; a list of appropriate clean-up materials and equipment; details on staff responsibilities and trained personnel; and contact details for pollution clean-up companies and relevant Local Authorities.
- Discharge to the River Slaney, River Bann, Owenavorragh River, River Boro or River Urrin, their tributaries or any other river / stream / watercourse along the Proposed Scheme or from the temporary construction compounds during the construction phase will be controlled. It is expected that welfare facilities at the construction compounds will comprise port-a-loos and the release of foul effluent from the compounds into nearby watercourses will not occur.
- Temporary construction compounds will not be situated in areas where the vulnerability of the underlying aquifer/groundwater body has been classified as ‘Extreme’ and will not be located close to surface water bodies. Temporary construction compounds will not be located close to road cuttings where it is likely that groundwater will be encountered.

Procedures to minimise the risk of pollution to surface water and groundwater will be put in place prior to the commencement of construction work at any particular section of the Proposed Scheme.

- In order to minimise any impact on surface water and groundwater from material spillages, all oils, solvents and paints used during construction will be stored within suitably designed bunded areas at the temporary construction compounds, in accordance with *Guidance Note for the Control of Pollution (Oil Storage) (England) Regulation 2001* by the Department of Environment, Food and Rural Affairs (DEFRA) in the UK. Oil and fuel storage tanks will be stored on designated areas of hardstanding, and these areas will be bunded to a volume of 110% of the capacity of the largest tank / container within the bunded area(s) (plus an allowance of 30 mm for rainwater ingress). Filling and draw-off points will be located entirely within the bunded area(s). Drainage from the bunded area(s) will be diverted for collection and safe disposal off-site in accordance with current waste management legislation.
- Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles / equipment, will take place in designated areas of hardstanding within the temporary construction compounds, away from surface water gullies or drains. The vehicles will not be left unattended during refuelling. Spill kits and hydrocarbon adsorbent packs will be stored in these areas and operators will be fully trained in the use of this equipment. An adequate supply of spill kits and hydrocarbon adsorbent packs will also be stored along the construction areas for the Proposed Scheme. All relevant personnel will be fully trained in the use of this equipment.
- Should it not be possible for machinery or vehicles to return to the temporary compounds for refuelling or maintenance purposes, refuelling or maintenance may take place outside the temporary compounds. In this event, fuel will be transported in a mobile, double skinned tank and a spill tray will be used when refuelling is carried out in this manner. Spill kits will be available during such refuelling operations. In areas where cutting into subsoil and bedrock is required no refuelling on site will be undertaken in order to limit the exposure of the aquifers to potential contamination.
- Wet concrete and cement will be carefully controlled so as to minimise the risk of any material entering the water, particularly from shuttered structures or the washing of equipment. The use of quick setting mixes will be used. Concrete pouring will be prevented during periods of heavy rainfall. An emergency response protocol will be implemented by the Contractor in the event of concrete spillages during pouring operations and the document detailing this protocol will form part of the Environmental Operational Plan for the construction phase of the Proposed Scheme.

- Also, controlling measures which limit the use and movement of potentially contaminating materials such as fuels and hydrocarbons will be identified, implemented and enforced by the Contractor. All associated hazardous waste residuals will also be stored within suitably designed bunded storage areas at the compounds prior to removal by an appropriate EPA or a Wexford County Council approved waste management contractor for off-site treatment / recycling / disposal.
- All other waste material will be stored appropriately, removed and disposed of by contractors licensed under the Waste Management Act of 1996 and the Waste Management (Collection Permit) Regulations of 2007.
- of solids entering the water. Stockpiles of soil, including topsoil and earthworks material that will be kept on site for long periods will need to be graded and seeded to promote stability of the soil. Placing of granular materials over bare soil, particularly in the vicinity of watercourses will aid in preventing erosion of fines and/or rutting by site traffic, which could lead to increased sediment release into nearby watercourses. The disturbance of soils during the construction of the River Slaney Bridge will need to be minimised and carefully managed in order to minimise the release of sediment into this water body during construction work.
- Silt traps or geotextile membrane barriers and / or appropriately designed settlement lagoons will be put in place to prevent sediment from stockpile and excavated areas entering nearby watercourses. The guidance outlined in the NRA Guidelines for the Crossing of Watercourses (NRA, 2006) will be followed by the contractor during construction. Geotextile membrane barriers, where used, will be erected between the construction works and water courses. This membrane barrier will be a minimum of 0.5 m in height above ground and will be staked at 2 m intervals and the trailing edge of the barrier will be buried with soil on the landward side of the barrier, to provide a seal with the ground surface. It is also important that the discharge of surface runoff from the Proposed Scheme during the construction phase is properly attenuated. The lagoons will not be located close to areas of significant cut, as the thickness of subsoil will be reduced in these areas. This will ensure that the underlying aquifer in each case is not put at increased risk of polluting emissions entering the aquifer.
- In addition, construction of cut-off ditches to divert surface water run-off from entering excavations will be utilised, again reducing the risk of infiltration of contaminants into the subsoil and potentially the groundwater.
- The contractor will liaise with the Eastern Regional Fisheries Board and National Parks and Wildlife Service regarding the precise methodology for works to water courses in advance of construction works commencing. Guidance from these bodies and mitigation

measures included in this chapter as well as Chapter 9 (Ecology) of this EIS will be followed.

- De-watering may be required along some sections of the Proposed Scheme, in particular in areas situated next to surface water bodies or where groundwater is encountered during excavation or piling operations. Excessive and or prolonged dewatering operations have the potential to cause a reduction in groundwater yields in water supply wells in the surrounding area. The importance and sensitivity of water supply wells in the vicinity of the Proposed Scheme is understood. Appropriate mitigation measures will be implemented in order to ensure that the quality and quantity of water supply wells in the area are not compromised. Pump tests (72 hour) will be carried out at sections of the Proposed Scheme where significant or prolonged dewatering of groundwater in excavations is required. The pump tests will determine the required pump out rate and the cone of depression (or zone of influence) from the area being dewatered. Based on the findings of the pump test, dewatering operations will be properly controlled and managed in order to not adversely affect nearby water supply wells. In the event that groundwater levels are reduced temporarily in nearby wells to the extent that the water supply is interrupted, the dewatering operations will cease until the problem is investigation. Where existing water supplies (including private water supply wells) are permanently affected by the Proposed Scheme, these will be restored or alternative supplies will be provided (see Chapter 3 Material Assets in this EIS). Pre-construction groundwater quality monitoring will be carried out at a select number of wells along the Proposed Scheme.
- Water, which is generated by dewatering operations (to remove surface water or groundwater from excavations), will be treated by means of a suitable silt trap prior to discharge to a holding tank/attenuation pond. It is proposed that a permanent drainage system will be used to manage groundwater encountered at the cut at Rockspring. Once the water is deemed to be of satisfactory quality with respect to suspended solids and hydrocarbons, it will be discharged at a controlled rate to the surface watercourses subject to agreement with Wexford County Council. This will also apply to any silty surface water runoff that may be generated within the temporary construction compounds. The temporary compounds may also require hydrocarbon interceptors should a risk of fuel or oil spills/leaks, be suspected or recorded.
- In the event that the water generated by dewatering operations is found to be contaminated, it will be treated to a standard specified under a Trade Effluent Discharge License by Wexford County Council or removed off-site for appropriate treatment and/or disposal.

- Surface water drainage systems along the Proposed Scheme will be regularly maintained and inspected (as per the methodology outlined in the Environmental Operational Plan) by the Contractor to ensure that they are working correctly.
- Requirements specific to drainage design features are as follows:
    1. Culverts
        - The installation of the culverts will only be carried out where absolutely necessary;
        - Their length will be limited where feasible;
        - The culverts will be: at least the same width; and have a similar gradient as the existing watercourse dimensions;
        - Bottomless culverts (as opposed to box culverts) will be installed where feasible, and as a minimum at the locations required by the Eastern Regional Fisheries Board and where identified in Chapter 3 of this EIS;
        - The culverts will be adequately maintained;
        - Culverts will not adversely alter the existing flow rates in watercourses, which could contribute to downstream flooding (if too high) or limit water levels downstream (if too low);
        - Watercourse Diversions
        - The dimensions of the new, diverted section of the watercourse will be similar to that of the existing watercourse. This will minimise the alteration of flow rates within the watercourse and thus minimising any contribution to flooding events.
    2. Balancing Ponds
        - It is important that they do not alter the underlying groundwater quality through the release of contaminants (for example hydrocarbons or metals from runoff from the road). Based on the information available, the balancing ponds will be of suitable construction in order to avoid releases towards groundwater sources. In addition, it is important that the ponds do not alter the direction of groundwater flow. Given the relatively shallow depth (maximum depth of 2 m BGL) of the ponds included within the preliminary design as described in this EIS, the potential for this to occur is low.
- The implementation of the above mitigation measures will minimise the potential for accidental inputs to and subsequent contamination of surface water and groundwater

during normal and or emergency conditions during the construction phase. It should be noted that the implementation of the mitigation measures outlined above will be especially important in areas where construction work is taking place either within or next to water courses (for example the culverting of watercourses, the diversion of watercourses and the construction of bridges over watercourses).

- In relation to flooding, it is not expected that the proposed Enniscorthy Drainage Scheme will be affected by the construction of the Proposed Scheme; however liaison with the OPW will be carried out prior to the construction of the Proposed Scheme as required.
- At outfall locations, the proposed road drainage systems for the Proposed Scheme will flow via petrol/oil bypass interceptors into balancing ponds before discharging into watercourses at the locations outlined in Chapter 3 of this EIS and at Greenfield rates of flow. The hydrocarbon interceptors will minimise the risk that any spills or leaks from vehicles using the Proposed Scheme will enter the existing watercourses. Suitable plant species will be established in the balancing pond in order to help remove contaminants (metals), if present in the surface water runoff from the proposed scheme. In addition, the plants would trap and suspended solids present in surface water runoff. The balancing ponds will be appropriately maintained in order to ensure that they operate properly.
- The design of the balancing ponds will be undertaken in accordance with the UK DMRB HA 103/06 and will be based on a 100-year storm event with a duration of 48 hours. The design will also include for a 20% increase in rainfall intensity, to account for climate change in accordance with current best management practice of the UK DMRB HD 33/06. This will allow for the controlled release of water into the watercourses in the vicinity of the balancing ponds and mitigate the impact of increased surface water runoff from the Proposed Scheme.
- A regular inspection and maintenance / desludging programme will be implemented by the maintaining authority whereby any oil / solids / debris trapped within the hydrocarbon bypass interceptors will be removed and disposed appropriately by a suitably licensed EPA approved waste disposal contractor. If the balancing ponds become silted up over time as a result of silt contained in surface water runoff, they may require dredging/cleaning out.
- In the event of a major oil or chemical spillage from vehicles using the Proposed Scheme, it is vital that the emergency protocol, prepared by the maintaining authority or equivalent as part of the Environmental Operating Plan is implemented. Reference will be made to the *Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan* by the NRA.

- Due to the reduced thickness of subsoils that will result in cut sections along the Proposed Scheme, groundwater will be more susceptible to emissions from vehicles, such as hydrocarbon leaks or spills. The detailed drainage system design for the surface water runoff will be designed to capture the surface water runoff and direct it through petrol/oil interceptors prior to discharge to balancing ponds. The detailed design of these ponds is the responsibility of the Contractor and will be based on a number of criteria, including the vertical and horizontal alignments of the Proposed Scheme in relation to the thickness of the underlying subsoil and depth to bedrock.
- Based on the nature of the Proposed Scheme, foul effluent will not be generated during the operational phase.

CHAPTER 12 AIR AND CLIMATE IMPACT ASSESSMENT

- A dust minimisation plan will be formulated and implemented during the detailed design and implementation phases of the Proposed Scheme.
- Site roads will be regularly cleaned and maintained as appropriate;
- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads will be restricted to essential site traffic only. Furthermore, any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions.
- Vehicles using site roads will have their speeds restricted where there is a potential for dust generation;
- Vehicles exiting the site to make use of a wheel wash facility, where appropriate, prior to entering onto public roads;
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind;
- Water misting or sprays will be used as required if particularly dusty activities are necessary during dry and / or windy periods;
- During the movement of materials with a potential for dust generation to an off-site location, trucks will be enclosed or covered;
- A liaison officer will be appointed to provide a point of contact with local residents and to deal with any concerns raised regarding dust emissions.

CHAPTER 13 NOISE IMPACT ASSESSMENT

- The contract documents will clearly specify that the Contractor will be obliged to take specific noise abatement measures and comply with the recommendations of BS 5228: Part 1 and the European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001. These measures will ensure that:

- No plant used on site will be permitted to cause an ongoing public nuisance due to noise.
- The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract.
- Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers.
- Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use.
- Any plant, such as generators or pumps, that is required to operate before 07:00hrs or after 19:00hrs will be surrounded by an acoustic enclosure or portable screen.
- During the course of the construction programme, supervision of the works will include ensuring compliance with the limits detailed in Table 13.15 using methods outlined in BS 5228 “Noise and Vibration Control on Construction and open sites”, Annex E. It should be noted that BS 5228 does not detail any specific noise limits in relation to construction noise.

- Table 13.25 presents predicted construction noise levels assuming that the exhaust on the dozer has been attenuated, and that the piling equipment has been fitted with a dampened bit and an acoustic shroud.

Table 13.25 Noise levels from construction plant items at various distances from the road, assuming basic mitigation

Plant Item	Distance from road, meters				
	25	50	100	150	200
Dozer	67	61	55	51	49
Dump Truck	66	60	54	50	48
Asphalt Spreader	67	61	55	51	49
Road Roller	67	61	55	51	49
Wheeled Crane	62	56	50	46	44
Drop hammer for piling	62	56	50	46	44

- These values demonstrate that is possible for the Contractor to comply with the adopted noise level limits in Table 13.15.

- The contractor undertaking blasting works will be required to ensure that all nearby structures and ground features are investigated prior to the blasting through either geophysical surveys or rotary core holes. The most suitable method for rock extraction will be chosen based on the localised ground conditions. The measures outlined in section 13.4.1 will serve to minimise disruption caused by blasting.

- Based on the Proposed Scheme design as assessed here, the proposed mitigation measures consist of a set of barriers as described in detail in Chapter 13 of this EIS. Barriers shall conform to the requirements of *Series 300 – National Roads Authority Specification for Contract Works*. In a number of cases, a section of low-noise surface is also called for. Based on Paragraph 16.2 in CRTN, a low-noise surface has a reduction in noise level of 3.5dB(A) when compared to hot-rolled asphalt. Predicted noise levels with the mitigation measures in place are presented in Table 13.26.

CHAPTER 14 LANDSCAPE AND VISUAL IMPACT ASSESSMENT

- The Contractor will be responsible for developing the Preliminary Landscape Mitigation Masterplan into the final landscaping proposals, which will form the Landscape Mitigation Masterplan for the Proposed Scheme, during the detailed design and implementation phases of the Proposed Scheme. The Landscape Mitigation Masterplan for the Proposed Scheme will be developed in accordance with the concepts contained within the preliminary masterplan as described in this EIS.

- The Landscape Mitigation Masterplan for the Proposed Scheme will be developed in accordance with the proposed planting concept within the preliminary masterplan, which includes the application of three main plant mix types:- hedgerows; dense shrub/woodland planting; and a species rich grassland mix. Proposed hedges will be located where existing hedgerows are currently prevalent in the landscape and/or where a row of screening planting is required. Shrub/woodland planting will provide screening, in particular where a dense band of trees is required to screen lighting such as at new junctions and to help integrate the Proposed Scheme into existing vegetation patterns. The shrub/woodland planting will also be included, often in conjunction with species rich grassland, to provide driver interest along long stretches of road cutting.

- Areas of significant cut and fill are to be planted, where feasible, to help soften the visual impact of the earthworks for both drivers and as seen in views from the wider landscape. In addition, the landscape treatment is intended to provide driver interest through enclosing and opening out views to the surrounding landscape.

- Proposed planting will also take account of ecological mitigation requirements and cultural heritage protection as detailed in those relevant Chapters of the EIS. Continuation of this comprehensive approach to landscape mitigation is essential.

- The Landscape Mitigation Masterplan for the Proposed Scheme will be detailed in close consultation with an ecologist to ensure planting will achieve anticipated screening, maximum benefits to landscape character and mitigation of impacts on ecological values.

- Areas where badger crossing facilities are required are to be planted to provide appropriate cover for the badgers to move through. Watercourses, in the region of new culverts and/or watercourse diversions, are to be re-planted to return each area to as close to original condition as feasible, integrating the new section back into the old alignments. Where Side Roads are intercepted by the proposed national routes the Landscape Mitigation Masterplan will include, where appropriate, for replanting vegetation to match existing roadside treatment such as hedgerows and tree lines in recognition of the importance of this roadside vegetation as habitat for species moving through the rural landscape. Proposed planting along the M11/N11 Mainline, N80 Link Road and N30 Mainline enables severed field boundary vegetation to be re-connected with new connections made possible for wildlife, such as bats, to move through the landscape.

- Landscaping is proposed to soften views to the noise barriers where they are visible from private property, where feasible.

- Balancing ponds will be constructed to appear naturalistic in the landscape with shallow slopes to surrounding bunds and planting to help integrate the new landforms into the existing landscape character.

- Where feasible, shrub/woodland mix planting is proposed in dense bands or thickets in and around the major junctions to enable maturing trees to reduce the degree of light spill into the wider landscape. The lighting will be provided by fully cut-off, high pressure sodium lanterns, to minimise light spill and the impacts of lighting visible at night. The minimum height of lighting columns feasible in each situation will be used, and the maximum height of such columns will be 12m above finished road level. The quantity of lighting included within the Proposed Scheme will be the minimum necessary for road safety.

- Embankment and cutting slopes planted to reduce visibility and integrate the Proposed Scheme to existing landscape pattern and character. Suitable topsoil will be required to accommodate landscaping proposals.

- Planting proposed in conjunction with noise barriers to screen visual impact of barriers, where feasible. Barriers and planting combined will reduce visibility and noise to reduce impact on perception of tranquillity.

- Planting proposed to match existing around cultural heritage sites to help retain landscape setting of the sites in accordance with archaeologists' recommendations. For example along the road corridor in the vicinity of Ballyeden house. Additional landscape treatment may be required in conjunction with further archaeological assessment proposed as part of detailed design and construction phase of the Proposed Scheme.

- Provision of Shrub/woodland planting and hedges planted along cuttings and embankments to re-establish field boundary vegetation patterns that provide a significant contribution to landscape character,

- Provision for planting along disturbed or realigned Side Roads to match existing conditions to re-establish existing vegetation patterns, rural road character and ecological value. Planting will also provide and/or re-establish screening to Side Roads from adjacent houses.

- Detailed landscape plans, including plant species selection, will be prepared by the Contractor, in consultation with an ecologist, during the detailed design and implementation phase of the Proposed Scheme to achieve maximum benefit for landscape character, screening and ecological mitigation together. This detailed landscaping will comply with the planting as outlined on the Landscape Masterplan for the Proposed Scheme.

- Prior to construction of the Proposed Scheme protection of existing vegetation that is to be retained with and adjacent to the land acquisition extents will be put in place in accordance with recommendations outlined in Chapter 9 (Ecology) of this EIS. Site compounds and temporary access will avoid any impact on mature trees and vegetation.

- Provision of tree planting at major junctions to reduce visibility of the road/traffic and lighting at night. Such planting will also provide ecological mitigation (for example, tall trees reduce roadkill of bats and birds – refer to details in Ecology Chapter 9 of this EIS).

- Where feasible, where small parcels of land are severed from wider field pattern, these small areas will be planted in woodland planting to match existing woodland planting in the area, to enhance ecological value, provide screening potential and to retain and enhance landscape character and pattern.

- Provision of hedgerows along the Proposed Scheme to restore severed field pattern and landscape character and to also help mitigate disruption to wildlife (commuting routes, habitat and food source).

- Provision of varied landscape treatment along the proposed national routes to provide interest to drivers and minimise fatigue.

- The Proposed Scheme permanent fencing strategy will be determined in consultation with a qualified Landscape Architect to minimise the opportunity for such fencing resulting in a negative visual impact.

- Where areas of existing woodland and hedgerow are removed planting is proposed to replace any significant losses with new planting. For example, at the River Urrin crossing significant areas of new woodland planting are proposed to soften both the visual and ecological impact of the proposed crossing embankments. It is also proposed to re-connect severed field boundaries.

CHAPTER 15 ARCHAEOLOGICAL, ARCHITECTURAL AND CULTURAL HERITAGE IMPACT ASSESSMENT

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
M11/N11 Mainline								
AH 1	Balloughter	Enclosure	4,010	SMR/RMP	277m	Indirect	Imperceptible negative	No specific mitigation required
AH 2	Myaugh	Moated site	13,780	SMR/RMP	246m	Indirect	Imperceptible negative	No specific mitigation required
AH 3	Oulartard	*Fulacht fiadh*	16,370	SMR/RMP	64m	Indirect	Imperceptible negative	No specific mitigation required
AH 12	Tomnafunshoge	Moated site	21,475	SMR/RMP	183m	Indirect	Imperceptible negative	No specific mitigation required
AH 13	Ballycourcymore	Moated site	23,400	SMR/RMP	268m	Indirect	Imperceptible negative	No specific mitigation required
AH 14	Ballycourcymore	Rectilinear enclosure	24,250	SMR/RMP	180m	Indirect	Slight negative	Written and photographic record of landscape context.
AAP 1	Frankfort/Ballinclay	Townland boundary	2,300	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 2	Ballinclay/Ballygullen	Townland boundary	2,550	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 3	Ballygullen	Large drumlin	2,730	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing
AAP 4	Ballygullen/ Balloughter	River Bracken and townland boundary	3,325	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey.

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
AAP 5	Balloughter/Tullabeg	Townland boundary	4,150	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 6	Tullabeg/Ballyeden	Townland boundary	4,370	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 7	Ballyeden/Medophall	Townland boundary	5,220	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 8	Medophall/ Knockrobin Lower	Townland boundary	5,840	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 9	Knockrobin Lower/ Knockrobin Upper	Townland boundary (site of)	6,650	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing
AAP 10	Knockrobin Upper/ Ballymore	Townland boundary	6,870-7,460	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 11	Ballymore/ Rockspring	Townland boundary	7,600	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 12	Crane/Toom	Townland boundary	17,600	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP	Rockspring/Quarry	Townland	8,710	None	0m	Direct	Significant	Archaeological investigations in

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
13		boundary and stream					negative	the form of testing. Written and photographic record of townland boundary.
AAP 14	Quarry/Mountgeorge	Townland boundary, stream, proximity to holy well	9,170-9,940	None	0m	Direct	Significant negative	Geophysical survey. Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey.
AAP 15	Mountgeorge/ Ballycarrigeen Lower	Townland boundary	10,000	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey.
AAP 16	Ballycarrigeen Lower	Riverine environment	10,090-10,700	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing
AAP 17	Ballycarrigeen Lower/ Carrigeen	Townland boundary	11,480	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 18	Carrigeen/ Knockavocka	Townland boundary and stream	12,350	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 19	Knockavocka/ Effernoge/ Myaugh	Two townland boundaries and two streams	12,560-13,430	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 20	Myaugh/Tinnacross	Townland boundary and stream	14,230	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP	Tinnacross/	Two townland	14,650-	None	0m	Direct	Significant	Archaeological investigations in

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
21	Tomsallagh/ Oulartard	boundaries and two streams	15,650				negative	the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 22	Oulartard/ Tomsallagh/ Crane	Two townland boundaries and two streams	15,860-16,840	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 27	Toom/Ballydawmore	Townland boundary and stream	18,300-18,700	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 28	Ballydawmore/ Ballydawmore	Townland boundary and stream	19,180	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 29	Ballydawmore/ Corbally	Townland boundary and stream	19,550	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 30	Corbally/ Tomnafunshoge	Townland boundary and stream	20,400	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 31	Tomnafunshoge/ Drumgold	Townland boundary and stream	21,660-21,800	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 32	Drumgold/Cooladine	Townland boundary and stream	22,710-23,000	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
AAP 33	Cooladine/ Ballycourcymore	Townland boundary and two streams	23,210-24,130	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 34	Knockrathkyle/ Ballybanoge/Monroe	Two townland boundaries and one stream	24,980-25,330	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 35	Monroe	Wetland	25,400-26,050	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing.
AAP 36	Monroe/Craanroe/ Glenteige	Three townland boundaries and two streams	26,070-26,350	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 37	Glenteige/Riverview	Townland boundary and stream	26,550-26,700	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 38	Riverview	Stream	26,850	None	0m	Direct	Significant negative	Underwater survey
AAP 39	Riverview/ Roperstown	Townland boundary and stream	27,150	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 40	Roperstown/ Garrynisk/ Scurlocksbush	Townland boundary	27,180-28,000	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
SAP 1	Ballyeden	Possible enclosure	4,400	None	198m	Indirect	Imperceptible negative	No specific mitigation required

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
SAP 2	Knockrobin Upper	Possible rectilinear enclosure	7,070	None	12m	Indirect	Slight negative	Archaeological investigations in the form of testing within the CPO adjacent to the potential archaeological site.
SAP 3	Knockrobin Upper	Two mounds	7,220	None	32m to site	Indirect	Slight negative	Archaeological investigations in the form of testing within the CPO adjacent to the potential archaeological site.
SAP 4	Mountgeorge	Holy Well	9,900	None	46m to site	Indirect	Moderate negative	Written and photographic record of landscape context.
SAP 5	Ballycarrigeen Lower	Possible *fulacht fiadh*	10,230	None	0m	Indirect	Profound negative	Archaeological investigations in the form of testing.
SAP 6	Tinnacross	Site of school house	14,460	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 7	Oulartard	Site of weir/head of mill race	15,550	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing. Underwater survey.
SAP 8	Oulartard	Site of mill and mill race	15,960-16,300	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing.
SAP 15	Ballydawmore	Former PM settlement	19,200	None	24m to site	Indirect	Slight negative	Archaeological investigations in the form of testing within the CPO adjacent to the potential archaeological site.
SAP 16	Tomnafunshoge	Surface anomaly	20,750	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 17	Tomnafunshoge	Former track	20,980	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing.
SAP 18	Cooladine	Surface anomaly	22,800	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
SAP 19	Ballycourcymore	Former PM settlement	24,300	None	32m to site	Indirect	Slight negative	Archaeological investigations in the form of testing within the CPO adjacent to the potential archaeological site.
SAP 20	Ballycourcymore/ Knockrathkyle	Former PM settlement and townland boundary	24,850	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
SAP 21	Riverview	Struck flint find spot	27,060	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing.
SAP 22	Roperstown	Surface anomaly	27,560	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 23	Garrynisk	Former PM settlement	27,720	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing.
BH 1	Ballinclay	Ballinclay House	2,470	Draft NIAH	260m	No Predicted Impact	Neutral	No specific mitigation required
BH 2	Ballygullen	Railway bridge	3,100	None	38m	Indirect	Slight negative	Written and photographic record of bridge and landscape context
BH 3	Ballyeden	House	4,950	Draft NIAH	47m	Indirect	Moderate negative	Written and photographic record of house and landscape context. Screening.
BH 5	Knockrobin	Farm and house	6,450	None	232m	Indirect	Imperceptible negative	No specific mitigation required
BH 6	Ballymore	Former school house	7,500	RPS	108m	Indirect	Slight negative	Written and photographic record of house and landscape context
BH 7	Ballymore	Vernacular cottage (derelict)	7,580	None	0m	Direct	Significant negative	Written and photographic record of cottage and landscape context along with a full floor plan.

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
BH 8	Ballymore	Cottage	7,600	None	38m	Indirect	Slight negative	Written and photographic record of cottage and landscape context
BH 9	Rockspring	Vernacular cottage (in ruins)	8,370	None	0m	Direct	Significant negative	Written and photographic record of remains of cottage and landscape context
BH 10	Rockspring	Entrance to Rockspring House	8,350	None	119m	Indirect	Imperceptible negative	No specific mitigation required
BH 11	Rockspring	Rockspring House and complex	8,400	Draft NIAH	179m	Indirect	Imperceptible negative	No specific mitigation required
BH 12	Rockspring	Garden folly	8,340	RPS	174m	Indirect	Imperceptible negative	No specific mitigation required
BH 13	Ballycarrigeen Lower	Vernacular house and farmyard	10,900	None	104m	Indirect	Slight negative	Written and photographic record of farm complex and landscape context
BH 14	Ballycarrigeen Lower	Vernacular house and farmyard (derelict)	11,000	None	60m	Indirect	Slight negative	Written and photographic record of farm complex and landscape context
BH 15	Ballycarrigeen Lower	Hollow trackway	11,160	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing.
BH 16	Ballycarrigeen Lower	Farm complex	11,400	None	180m	Indirect	Imperceptible negative	No specific mitigation required
BH 17	Carrigeen	Farm complex	11,650	None	86m	Indirect	Slight negative	Written and photographic record of farm complex and landscape context
BH 18	Myuagh	Farm complex (in ruins)	13,800	None	101m	Indirect	Slight negative	Written and photographic record of farm complex and landscape context
BH 19	Tinnacross	Bridge	14,450	Draft NIAH	49m	Indirect	Moderate	Written and photographic record

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
							negative	of bridge and landscape context
BH 20	Tomsallagh	Summerville House	16,450	Draft NIAH	256m	Indirect	Imperceptible negative	No specific mitigation required
BH 21	Crane	Farm complex (in ruins)	16,800	None	58m	Indirect	Slight negative	Written and photographic record of farm complex and landscape context
BH 22	Crane	Bridge	17,000	Draft NIAH	272m	No Predicted Impact	Neutral	No specific mitigation required
BH 23	Crane	Vernacular house	17,200	None	134m	Indirect	Imperceptible negative	No specific mitigation required
BH 24	Toom	Farm complex (in ruins)	17,850	None	21m	Indirect	Slight negative	Written and photographic record of farm complex and landscape context
BH 29	Ballydawmore	Farm complex	19,030	None	188m	Indirect	Imperceptible negative	No specific mitigation required
BH 30	Ballynabarny	Bridge	20,500	None	235m	No Predicted Impact	Neutral	No specific mitigation required
BH 31	Tomnafunshoge	Post box	21,100	None	0m	Direct	Significant negative	Written and photographic record of Post box and landscape context
BH 32	Ballycourcymore	Ballycourcy House	22,850	Draft NIAH	110m	Indirect	Imperceptible negative	No specific mitigation required
BH 33	Monroe	Farm complex	25,180	None	87m	Indirect	Slight negative	Written and photographic record of farm complex and landscape context
BH 51	Cronyhorn	Vernacular house	9,900	Draft NIAH	95m	Indirect	Slight negative	Written and photographic record of house and landscape context

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
CH 1	Rockspring	Site of spring	8,280	None	22m	Indirect	Imperceptible negative	No specific mitigation required
CH 2	Ballycarrigeen Upper & Lower	The Harrow – village involved in the 1798 Rebellion	11,400	None	209m	Indirect	Slight negative	Written and photographic record of village and its landscape context
CH 4	Scurlocksbush	Roadside memorial (modern)	28,000	None	0m	Direct	Significant negative	Written and photographic record of memorial – reconstruction after scheme complete
CH 5	Scurlocksbush	Roadside memorial (modern)	28,000	None	0m	Direct	Significant negative	Written and photographic record of memorial – reconstruction after scheme complete
CH 6	Knockrathkyle & Ballycourcy-more	Darby's Gap – route of rebels escape during Battle of Vinegar Hill	24,730-25,190	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of the landscape through which the rebels passed.
D 1	Ballinclay	Former demesne of Ballinclay House	2,300-2,550	None	0m	Direct	Significant negative	Written and photographic record of former demesne lands to be impacted on
D 2	Rockspring	Former demesne of Rockspring House	8,375-8,500	None	0m	Direct	Significant negative	Written and photographic record of former demesne lands to be impacted on
D 3	Mountgeorge	Former demesne of Mountgeorge House	9,300-10,000	None	0m	Direct	Significant negative	Written and photographic record of former demesne lands to be impacted on
D 4	Tomsallagh	Former demesne of Summerville House	16,275-16,680	None	0m	Direct	Significant negative	Written and photographic record of former demesne lands to be impacted on

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
N80 Link Road								
AH 4	Clavass	Ring ditch	600	SMR/RMP	177m	Indirect	Imperceptible negative	No specific mitigation required
AH 5	Ballynahallin	Ring ditch	1,210	SMR/RMP	33m	Indirect	Slight negative	Written and photographic record of landscape context
AH 6	Kilcannon	Enclosure site	1,860	SMR/RMP	180m	Indirect	Imperceptible negative	No specific mitigation required
AH 7	Kilcannon	Holy well	2,500	SMR/RMP	90m	Indirect	Slight negative	Written and photographic record of landscape context
AH 8	Kilcannon	Church	2,500	SMR/RMP	131m	Indirect	Imperceptible negative	No specific mitigation required
AH 9	Kilcannon	Pit alignment	2,360	SMR/RMP	36m	Indirect	Slight negative	Written and photographic record of landscape context
AH 10	Ballynabarny	Enclosure	3,160	SMR/RMP	51m	Indirect	Slight negative	Written and photographic record of landscape context
AH 11	Ballynabarny	Rectilinear enclosure	3,965	SMR/RMP	192m	Indirect	Imperceptible negative	No specific mitigation required
AAP 23	Ballynahallin	Riverine environment	0-950	None	0m	Direct	Significant negative	Geophysical survey. Archaeological investigations in the form of testing.
AAP 24	Ballynahallin/Kilcannon	Townland boundary and stream	1,690	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 25	Kilcannon/Ballynabarny	River Crossing	2,690-2,825	None	0m	Indirect	Slight negative	Archaeological investigations in the form of testing either side of

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
								River Slaney
AAP 26	Ballynabarny/Toom	Townland boundary and stream	3,620-4,010	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
SAP 9	Ballynahallin	Surface anomaly	400	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 10	Ballynahallin	Surface anomaly	540	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 11	Ballynahallin	Linear anomaly	875	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing.
SAP 12	Kilcannon	Former PM settlement	1,715	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 13	Kilcannon	Former PM settlement	2,275	None	15m	Indirect	Slight negative	Written and photographic record of landscape context
SAP 14	Ballynabarny	Former PM settlement	3,490	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing.
SAP 39	Kilcannon	Possible enclosure	6,225	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing.
BH 4	Ballynabarny	Ballyvarna House	3,420	Draft NIAH	184m	Indirect	Imperceptible negative	No specific mitigation required
BH 25	Kilcannon	Trackway	2,085	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of track.
BH 26	Ballynabarny	Yorke Ville House	3,200	Draft NIAH	190m	Indirect	Imperceptible negative	No specific mitigation required
BH 27	Ballynabarny	Bridge	2,900	None	100m	Indirect	Imperceptible negative	No specific mitigation required

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
BH 28	Clonhasten	Whitefield House	2,835	None	217m	Indirect	Imperceptible negative	No specific mitigation required
CH 3	Coolnahorna	Roadside memorial (modern)	0	None	0m	Direct	Significant negative	Written and photographic record of memorial – reconstruction after scheme complete

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
N30 Mainline								
AH 15	Clavass	Moated site	400	SMR/RMP	178m	Indirect	Imperceptible negative	No specific mitigation required
AH 16	Clavass	Enclosure	540	SMR/RMP	50m	Indirect	Slight negative	Written and photographic record of landscape context
AH 17	Coolnahorna	Redundant record	815	SMR/RMP (de-listed)	57m	Indirect	Slight negative	Written and photographic record of landscape context
AH 18	Coolnahorna	Ring ditch	940	SMR/RMP	139m	Indirect	Imperceptible negative	No specific mitigation required
AH 19	Ballybrannis	Redundant record	6,125	SMR/RMP (de-listed)	223m	Indirect	Imperceptible negative	No specific mitigation required
AAP 23	Clavass	Riverine Environment	0-600	None	0m	Direct	Significant negative	Geophysical survey. Archaeological investigations in the form of testing.
AAP 41	Clavass/Coolnahorna	Townland boundary and stream	520	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
								Underwater survey
AAP 42	Coolnahorna/Ballyorril	Townland boundary	1,400	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 43	Ballyorril	Riverine environment and townland boundary	1,700-1,640	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 44	Ballyorril/Moyne Middle	Two townland boundaries and two streams	2,050-2,600	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 45	Ballyorril/Killalligan North	Townland boundary and stream	3,220-3,340	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary. Underwater survey
AAP 46	Killalligan North/ Askunshin	Townland boundary	3,900	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 47	Askunshin/Milehouse	Townland boundary	4,550-4,800	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 48	Milehouse	Elevated ground	4,800-4,950	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing.
AAP 49	Milehouse/Monart East	Townland boundary and	5,050-5,180	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
		stream						and photographic record of townland boundary. Underwater survey
AAP 50	Monart East/Bessmount	Townland boundary	5,170-5,900	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 51	Bessmount/Templescoby	River Urrin crossing	6,300-6,600	None	0m	Direct	Slight negative	Archaeological investigations in the form of testing either side of the river.
AAP 53	Templescoby/Dunsiane	Townland boundary	7,000	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
AAP 54	Dunsinane/Templescoby	Townland boundary	7,850	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Written and photographic record of townland boundary.
SAP 24	Coolnahorna	Surface anomaly	1,350	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 25	Ballyorril	Surface anomaly	2,050	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 26	Moyne Middle	Spring	2,300	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 27	Ballyorril	Surface anomaly	2,550	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 28	Ballyorril	Surface anomaly	2,650	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 29	Ballyorril	Surface anomaly	2,670	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
SAP 30	Ballyorril	Surface anomaly	2,750	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 31	Askunshin	Former PM settlement	4,400	None	21m to site	Indirect	Moderate negative	Archaeological investigations in the form of testing adjacent to site.
SAP 32	Milehouse	Mill race	4,900-5,070	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing.
SAP 33	Bessmount	Former PM settlement	5,350	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 34	Bessmount	Former PM settlement	5,400	None	36m to site	Direct	Moderate negative	Archaeological investigations in the form of testing adjacent to site.
SAP 35	Bessmount	Mill race	6,400	None	0m	Direct	Significant negative	Archaeological investigations in the form of testing. Underwater survey.
SAP 36	Templescoby	Surface anomaly	6,600	None	44m to site	Indirect	Slight negative	Archaeological investigations in the form of testing adjacent to site.
SAP 37	Templescoby	Former PM settlement	6,980	None	0m	Direct	Profound negative	Archaeological investigations in the form of testing.
SAP 38	Bessmount	Former PM settlement	6,240	None	0m	Direct	Imperceptible negative	No specific mitigation required as site occupied by modern buildings.
BH 34	Coolnahorna	House & Post box	0	Draft NIAH	224m	Indirect	Imperceptible negative	No specific mitigation required
BH 35	Ballyorril	Small country house	1,555	None	101m	Indirect	Slight negative	Written and photographic record of house and landscape context
BH 36	Ballyorril	Farm complex	2,480	None	80m	Indirect	Slight	Written and photographic

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
							negative	record of farm complex and landscape context
BH 37	Ballyorril	Cottage	2,525	None	197m	Indirect	Imperceptible negative	No specific mitigation required
BH 38	Ballyorril	Cottage	2,870	None	70m	Indirect	Slight negative	Written and photographic record of cottage and landscape context
BH 39	Ballyorril	Farm complex	3,100	None	65m	Indirect	Slight negative	Written and photographic record of farm complex and landscape context
BH 40	Askunshin	Farm complex (derelict)	3,975	None	219m	Indirect	Imperceptible negative	No specific mitigation required
BH 41	Killalligan North	Vernacular house and farm (derelict)	3,450	None	44m	Indirect	Slight negative	Written and photographic record of farm complex and landscape context
BH 42	Askunshin	Farm complex	4,270	None	35m	Indirect	Slight negative	Written and photographic record of farm complex and landscape context
BH 43	Askunshin	Cottage	4,350	None	12m	Indirect	Slight negative	Written and photographic record of cottage and landscape context
BH 44	Askunshin	Bridge	5,000	Draft NIAH	Side road alignment adjacent to bridge	Indirect	Slight negative	Written and photographic record of bridge and landscape context
BH 45	Milehouse	Farm complex	5,015	None	102m	Indirect	Slight negative	Written and photographic record of farm complex and landscape context
BH 46	Bessmount	House	6,330	None	135m	Indirect	Imperceptible negative	No specific mitigation required

Site ID	Townland	Classification	Chainage (m)	Statutory Protection	Proximity	Impact type	Potential Impact	Mitigation Measures
BH 47	Ballybrannis	Urrinfort House	6,100	Draft NIAH	269m	No Predicted Indirect	Neutral	No specific mitigation required
BH 48	Dunsinane	Former entrance to Dunsinane House	7,180	None	283m	No Predicted Indirect	Neutral	No specific mitigation required
BH 49	Dunsinane	Dunsinane House	7,600	Draft NIAH	284m	No Predicted Indirect	Neutral	No specific mitigation required
BH 50	Clohass	Clohass House	8,000	Draft NIAH	283m	No Predicted Indirect	Neutral	No specific mitigation required
D 5	Bessmount	Former demesne of Monart House	5,140-6,500	None	0m	Direct	Significant negative	Written and photographic record of former demesne lands to be impacted on

CHAPTER 16 WASTE IMPACT ASSESSMENT

- All current and applicable waste management legislation will be applied and adhered to.
- A collection permit to transport waste must be held by the relevant contractor which is issued by the Local Authority.
- Waste receiving facilities will be appropriately licensed or permitted for the waste that it is receiving.
- All waste materials will be segregated on site at source i.e. as they are generated and prior to collection and transportation, into appropriate categories including:
  - topsoil
  - sub-soil;
  - bedrock;
  - asphalt, tar and tar products;
  - metals;
  - dry recyclables e.g. cardboard, plastic, timber, plastics;
- Uncontaminated excavated material (made ground, sub-soil, etc) will be re-used on site where feasible in preference to importation of fill from off-site;
- Suspected contaminated material will be assessed and classified prior to removal from the site;
- All waste leaving site will be recycled, with the exception of those waste streams where appropriate recycling facilities are currently not available;
- All waste leaving the site will be recorded and copies of relevant documentation maintained.
- Dedicated WSA (Waste Storage Areas) will be set up in all construction compounds for waste generated.
- Demolition procedures will be followed to ensure that optimum recycling and/or reuse of materials is achieved.
- Litter management will be carried out along the route in accordance with the relevant Road Authority policy.
- For maintenance and repair work, all maintenance teams involved will take all wastes generated on site back to their compounds to be placed in appropriate waste receptacles designated for recycling, reuse or disposal, or directly to an appropriately permitted or licensed waste facility. No waste will be left at the site of the repair or maintenance.