Comhairle Contae an Chláir
Clare County Council

Limerick City Council
Comhairle Cathrach Luimnigh

Limerick Northern Distributor Road

Constraints Study

Volume 1 - Main Text

Draft Work In Progress - January 2011

An Roinn Iompair Turasóireachta agus Spóirt
Department of Transport, Tourism and Sport

Roughan & O'Donovan

MRG consulting engineers

Clare County Council

Limerick Northern Distributor Road

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Draft – Work In Progress

Document No: CSR**/**001

Made:..... Andrew Warwick/Lewis Feely

Checked ..... Michael Conroy

Approved ..... Richard Power

Clare County Council

Limerick Northern Distributor Road

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1.0 INTRODUCTION

Clare County Council, in conjunction with Limerick City Council and Limerick County Council, has identified the need for the provision of a northern distributor route along the northern environs of Limerick City. The road is not proposed to be a national route. The scheme is to be carried out in two phases;

- Phase 1 – Coonagh Knockalisheen Distributor Road (CKDR);
- Phase 2 – Limerick Northern Distributor Road (LNDR);

Phase 2 of the Limerick Northern Distributor Road connects to the Coonagh Knockalisheen Road Scheme at Knockalisheen Road and traverses the northern environs of Limerick City to the existing R445 (Old N7) to the east of Limerick City (Refer **Drawing CS-101 in Volume 2**).

This Study describes the initial step in the Route Selection Process for Phase 2 of the Limerick Northern Distributor Road, which is to identify the nature and extent of significant constraints within a defined Study Area. In accordance with the 2010 NRA Project Management Guidelines, these constraints are documented and mapped so that feasible route options could be designed to avoid such constraints, where possible.

The constraints documented and mapped in this Study relate to those identified up to the development of feasible route options in January 2011. The Constraints Study consisted primarily of a Desktop Study, with Windshield or Walkover Surveys undertaken where necessary to verify the nature and extent of certain constraints.

All work at this stage (identification of Constraints) is deemed 'work in progress' and is subject to change/refinement as of the Route Selection Process continues.

1.1 Need for the Scheme

The Limerick Northern Distributor Road has been identified as an infrastructure objective of the Mid-West Regional Planning Guidelines 2010 – 2012. The Planning Guidelines were developed by the Mid-West Regional Authority which consists of Clare County Council, North Tipperary County Council, Limerick City Council and Limerick County Council. The need for the Limerick Northern Distributor Road is supported by and has been incorporated into County Development Plans published within the mid-west region. A map of the Mid-West Region as developed by the National Spatial Strategy (NSS) is shown on **Plate 1.1**.

Historically, the need for the scheme was identified initially in 'The Limerick Planning, Land Use and Transportation Study' (PLUTS) for Greater Limerick. This study has been superseded by the Mid-West Regional Planning Guidelines 2010 – 2012 but was developed by Clare County Council, Tipperary North County Council and Limerick City and County Councils to guide and co-ordinate the planning and control of land use developments and the investment in and operation of transport systems within a significant part of the Mid-West Region focussed on the Limerick/Shannon gateway.

The Planning, Land Use and Transportation Study identified strategic issues that required consideration in the future planning of the region. The issues identified for County Clare focus upon the growth of Shannon Airport, the development of a West Coast Rail Corridor including the Shannon Rail Link, the development of a road network improving links between Limerick and Galway, the provision of a northern

distributor road around Limerick and a new bridge crossing over the Shannon to the north of Limerick City.

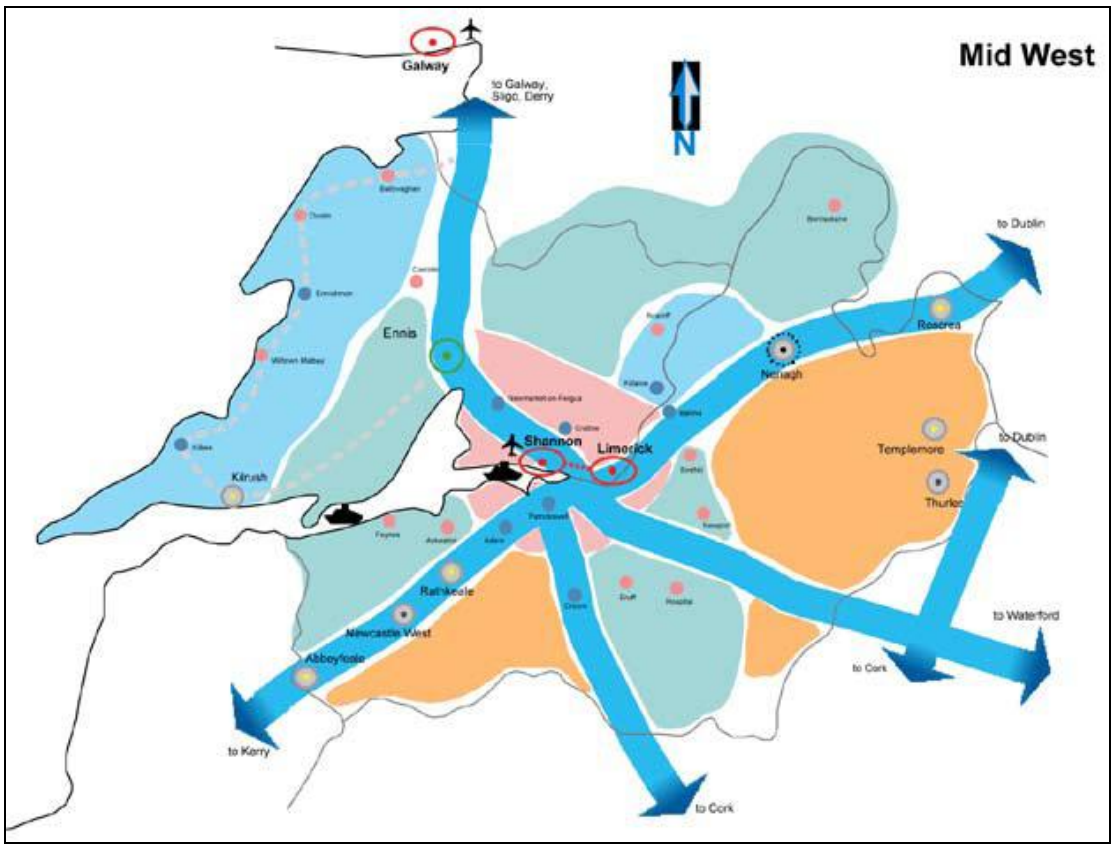


Plate 1.1 – NSS Map of the Mid-West Region

The proposed scheme will provide a northern distributor road around Limerick, improving accessibility to Limerick City from County Clare and relieving pressure on the existing river crossings in the city centre. The road will provide significant improvement in connectivity between different areas along the northern fringe of the city, allowing people living in residential areas to the east of Limerick to access the employment areas in the west of Limerick and vice versa. This will reduce traffic flows in city centre and facilitate public transport initiatives including bus corridors.

The need for the scheme was further highlighted in the report compiled by John Fitzgerald *"Addressing issues of Social Exclusion in Moyross and other disadvantaged areas of Limerick City"*, which states that one of three strands to dealing with social exclusion involves "Economic and infrastructural regeneration, to create employment, unlock value, improve access, and create a better commercial and housing mix". The report states that the infrastructure around Moyross estate is "extremely weak with poor transport links to the rest of the city". Poor access to facilities, such as education and areas of employment, inhibits any progressive growth in disadvantaged areas.

The report states that previous experience has shown that "a key element in developing economic activity, and ending the isolation of deprived areas, is through putting in place a sound roads and transport infrastructure". The Limerick Northern Distributor Road will meet this objective, which the report claims will "open up potential for mixed-use development and attract investment, allow for improved

transport links, and facilitate greater linkage between the local community and other parts of the city".

The scheme will provide this connectivity to the Moyross area, both to the peripheral routes of Limerick City and to the national route network. The need for the scheme has also been identified as an important aspect of the Moyross regeneration and is supported by the Limerick Northside Regeneration Agency.

1.2 Strategic and Local Policy Context

1.2.1 The National Spatial Strategy (NSS)

The National Spatial Strategy (NSS) for Ireland is a twenty-year planning framework designed to achieve a better balance of social, economic, physical development and population growth between regions. Amongst other things, the NSS sets out a future spatial strategy in the form of a proposed National Transport Framework.

As an international and national transport hub, both Limerick City and Shannon comprise an important 'Gateway' in the Mid-West with the Limerick Northern Distributor Road supporting each of the following NSS objectives:

- Support the economic growth of National Gateways;
- Promote balanced regional development;
- Achieve a better spread of investment and work opportunities across the country;
- Ensure growth of towns and cities meets the economic and social needs of an increasing population, while also protecting the environment; and
- Improve quality of life for Irish communities.

The NSS provides the basis for the roads programme contained in the National Development Plan which is a key element in meeting the above objectives.

1.2.2 The National Development Plan, 2007 – 2013

The Strategy for National Roads in the National Development Plan 2007 – 2013 (NDP) states that 'To optimise our choices for a better long-term future we need a roadmap, clearly marking out the landmark challenges we face such as:

- removing the remaining infrastructure bottlenecks that constrain our economic development and inhibit balanced regional development and environmental sustainability;
- further equipping our children and youth with the skills and education to grasp the opportunities presented to us;
- creating and sustaining high value employment opportunities; and
- redistributing the product of wealth to foster an inclusive society, including adequately catering for those who have already contributed to Ireland's success over previous decades.

The NDP (2007 – 2013) also acknowledges that Non-national roads play an important economic role in Ireland because of:

- The relatively dispersed nature of the population and economic activity;
- The importance of tourism and agriculture as generators of wealth and employment; and
- The priority attaching to rural development and urban regeneration.

The National Development Plan emphasises the importance of a good transport infrastructure as being crucial to the promotion of national competitiveness and sustainable development and that this can be achieved by further investment in roads to improve traffic flows, reduce congestion and thus result in lower rates of traffic emissions.

1.2.3 Regional Planning Guidelines 2010-2022

The Mid-West Regional Authority developed the Regional Planning Guidelines 2010-2022 to set clear objectives and targets to guide the development plans of the planning authorities that are specific in relation to future population, settlement strategy and development distribution and infrastructure investment priorities in line with the National Development Plan.

The guidelines identify the provision of the Limerick Northern Distributor Road as a key investment priority required to support the development of the Region and a critical element in ensuring the Region's integration, in providing access to its major facilities and in protecting major urban centres from large-scale traffic activity.

The guidelines state the Limerick Northern Distributor Road is a critical route linking the N7 and N18 to protect the City Centre, to enhance access to Shannon International Airport and its related industrial zone from eastern parts of the country, and to enhance access to the University of Limerick and its associated knowledge based industrial zone.

Relevant to the development of the Regional Planning Guidelines 2010-2022, the Mid-West Area Strategic Plan (MWASP) currently being prepared examines land-use and transportation issues in the region and will aim to:

a) Strengthen and enhance the functionality of the Limerick-Shannon Gateway as identified in the National Spatial Strategy 2002-2020;
b) Provide guidelines for the promotion of a more balanced regional settlement pattern through a more structured dispersal of population;
c) Identify Limerick and the Mid-West strategic requirements for the next 30 years;
d) Inform future social, physical, educational and economic infrastructural spending programs;
e) Inform the current and future National Development Plans, Regional Planning Guidelines and National Spatial Strategy areas;
f) Aid in securing National funding.

The key features of a more sustainable form of spatial development for the Limerick Area are:

a) Development that is concentrated rather than dispersed allowing for it to be served more efficiently by public transport;
b) Improved access to locations of employment, education, health, leisure and residence through the provision of a high quality sustainable public transport system;
c) Develop new residential neighbourhoods and employment zones that can be adequately served by public transport.

1.2.4 County and Local Development Plans

The proposed development is in accordance with the following Development Plans;

- Clare County Development Plan (2005 – 2011);

- South Clare Local Area Plan (2009 – 2017);
- Limerick City Development Plan (2004 – 2010);
- Limerick County Development Plan (2005 – 2011);
- Castletroy Local Area Plan (2009 – 2015).

In addition, the proposed development is in accordance with the following Draft Development Plans;

- Clare County Development Plan (2011 – 2017);
- Limerick City Development Plan (2010 – 2016);
- Limerick County Development Plan (2010 – 2016).

Both the Clare County Development Plan (2005 – 2011) and the Draft Clare County Development Plan (2011 – 2017) identify an Infrastructure Safeguard Road in South Clare within the Study Area (Refer **Drawing CS-102 in Volume 2**). The road commences at Knockalisheen Road, traverses the Study Area to the north of Parteen before terminating at the roundabout on Plassey Road in County Limerick.

The Castletroy Local Area Plan (2009 – 2015) maps an arrow identifying an indicative route for the Proposed Northern Distributor Road. The Local Area Plan shows a location for the route crossing the River Shannon upstream of the Mulkear River (Refer **Drawing CS-103 in Volume 2**).

1.2.5 Plans and Programmes of the National Roads Authority (NRA)

The Limerick Northern Distributor Road is a Local Authority Project that will provide a local distributor road around the northern fringe of Limerick City. The road is not proposed to be a national route. The scheme is to be developed adopting the current best engineering practices with the NRA 2010 Project Management Guidelines implemented.

The NRA 2010 Project Management Guidelines outline a framework for the phased approach to the development, management and delivery of Major National Road Schemes in Ireland. The Guidelines are structured so as to ensure consistency in this approach throughout the entire National Road Network.

The NRA has also developed a series of environmental guidelines to facilitate the integration of environmental issues into the planning of national road schemes. The latest versions of the published guidelines will be utilised and adhered to during the preparation of the EIS. This suite of guidelines is being constantly reviewed and updated with the most up to date published versions available on the NRA website. Where available, the EIA will take cognisance and adhere to the most up to date published and draft documents.

An EIS is required for this project under The Roads Act, 1993, together with the Roads (Amendment) Act 1998 and the Roads Regulations, 1994 (S.I. No 119 of 1994). Under these regulations an EIS is required for a road development that involves the construction of a new road of four or more lanes that would be 500m or more in length in an urban area.

1.3 Scheme Development

Roughan & O'Donovan Consulting Engineers (ROD) were appointed in October 2010 to develop the planning, design and environmental assessment to advance the

development of the Limerick Northern Distributor Road and associated infrastructure from a location in the vicinity of the Eastern end of the proposed Coonagh-Knockalisheen Strategic Route to a tie-in with the M7 or the R445 (Old N7) in Limerick.

The scheme will comprise the design and construction of approximately 10km of a northern distributor road that will include a crossing of the Head/Tailrace associated with Ardnacrusha as well as crossings of the Shannon and Blackwater Rivers.

The scheme is being commissioned by Clare County Council in conjunction with Limerick City Council and Limerick County Council. A Steering Committee has been set up which comprises technical officers from Clare County Council, Limerick City Council, Limerick County Council, the National Roads Authority (NRA) and Roughan & O'Donovan Consulting Engineers.

The proposed scheme is being managed by Clare County Council Transportation Section.

1.4 Format of the Constraints Study

The Constraints Study consists of two volumes. Volume 1 – Text documents the constraints identified during the Study with Volume 2 – Drawings mapping these constraints. Volume 1 – Text, provides an introduction and background to the scheme in addition to documenting the constraints identified. The Study is laid out as follows:

Chapter 1	Introduction
Chapter 2	Development of the Study Area
Chapter 3	Public Consultation
Chapter 4	Engineering and Topography
Chapter 5	Traffic and Road Accidents
Chapter 6	Geology, Hydrology and Hydrogeology
Chapter 7	Socio-Economic
Chapter 8	Planning, Development & Land-use
Chapter 9	Ecology
Chapter 10	Archaeology, Architecture and Cultural Heritage
Chapter 11	Landscape and Visual Analysis
Chapter 12	Noise and Vibration
Chapter 13	Air Quality
Chapter 14	Summary and Conclusion

1.5 Difficulties Encountered

The habitat survey report "Survey and Mapping of Habitats from Cratloe to Parteen, South East Clare" which was completed by RPS on behalf of Clare County Council did not survey or map the habitats within Knockalisheen Marsh pNHA. In order to fully inform the Route Selection Process, this area must be botanically surveyed and the habitats present identified and mapped. The best time for undertaking vegetation surveys is during the months of June and July. As such, this information is currently unavailable.

2.0 DEVELOPMENT OF THE STUDY AREA

2.1 Introduction

A preliminary study was carried out by collecting information on the major constraints within an initial Study Area. This information was collated in order to determine the best route possible resulting in minimal environmental impact. Issues considered as part of the constraints study included:

- Engineering constraints;
- Existing infrastructure, land use, topography and physical features;
- Planning, development and socio-economic character;
- Sites or areas of environmental significance or sensitivity.

The above information allows the creation of a Study Area within which the constraints study is based.

2.2 Defining the Study Area

The Study Area for the Limerick Northern Distributor Road Scheme is indicated in the Volume 2 of the Constraints Study (Refer **Drawings CS-201 to CS 205 in Volume 2** for detailed maps of the Study Area). The general principle that was used to define the extents of the Study Area was that it should be wide enough to include all reasonable route options, but that it should not be excessively wide as to entail collection of a large amount of information for a heavily developed urban area that would prove of little relevance to the project.

In creating an initial review of the Study Area the following broad constraints were considered:

- Land use;
- Ecology;
- Engineering;
- Archaeology;
- Purpose of the Scheme.

2.2.1 Land Use Constraints

In a developed urban environment, land use has a major influence on possible route corridors for a road scheme not only in terms of economic, cultural, environmental, heritage and recreational issues but on impacts on local communities. The existing land uses and strategic zoning for future developments within the Study Area have been established. Where significant open spaces are available a route could be developed. The workability of such routes in traffic and engineering terms is also investigated. The Study Area includes sections of urban development at Knockalisheen, Parteen, Ardnacrusha, Gortatogher, Newtown Cloonlara, Roo East, Cloonougher and Gilloge. To the western end of the Study Area, a large area of land in Clare County at Garraun is zoned for the development of the University of Limerick. In County Limerick, the land bounded by the Mulkear River and the adjacent National Technology Park is zoned for Industrial Development. Further south, the land from the National Technology Park to the R445 in Castletroy is zoned for residential development.

2.2.2 Ecological Constraints

An examination of sites of natural heritage and areas of conservation identified the following constraints within the Study Area;

- Knockalisheen Marsh (Refer **Photo 2.1**), a proposed Natural Heritage Area (pNHA) and a candidate Special Area of Conservation (cSAC);
- Lower River Shannon, a candidate Special Area of Conservation (cSAC).

The marsh extends from the junction of the R464 and Knockalisheen Road to the Knockalisheen graveyard. The western boundary of the Study Area, running parallel to the Knockalisheen Road was extended northward beyond the graveyard and the town land of Knockalisheen/Ballycannan to facilitate the development of potential routes outside Knockalisheen Marsh.

Photo 2.1 – Knockalisheen Marsh

The Lower River Shannon, a candidate Special Area of Conservation (cSAC) continues along the entire length of the River Shannon within the Study Area.

2.2.3 Engineering

The Limerick Northern Distributor Road, from the Knockalisheen Road to the tie-in point at the R445 (Old N7) or M7, will be required to cross the River Blackwater, the Errina Canal and the River Shannon and either the Tailrace or Headrace Canals at Ardnacrusha.

Headrace/Tailrace Canal

Due to the limited open space corridor available to provide a crossing over the Tailrace Canal between Parteen and Ardnacrusha, it was determined that the Study Area should be extended northwards to allow for the examination of a potential crossing over the Headrace Canal.

The extension of the northern boundary of the Study Area was restricted by the increasing ground levels to the northwest of Ardnacrusha towards Ballycannan West. Thus the northern boundary of the Study Area is defined to examine potential routes to the north of Knockalisheen and Ardnacrusha while skirting along the foothills of Ballycar.

Shannon, Blackwater and Groody Rivers

The extensive floodplain of the Shannon basin and the meandering characteristics of the River Shannon were identified as significant engineering constraint. Any potential route for the Limerick Northern Distributor Road would be required to traverse a vast floodplain and potentially cross the River Shannon at an acute angle. The Study Area was defined so as to provide a number of viable engineering options for crossing the River Shannon into East Limerick. As such, the southern boundary of the Study Area was extended south of the River Shannon in the Groody Valley to facilitate a potential tie-in with the R445. To the east of the University of Limerick, the Constraints Study was developed to provide a number of potential crossing points along the Shannon.

2.2.4 Archaeology

Following review of discovery mapping and subsequent site visits, numerous sites of potential archaeological interest were identified. These sites included the following;

- Knockalisheen Graveyard
- Cappavilla South Holy well
- Garraun Church and graveyard
- Srawickeen Enclosure
- Castletroy Tower House
- Mountshannon House (Refer **Plate 2.2**)

The Study Area was defined to allow for the development of potential route options through the Study Area that would minimise the impact of the Limerick Northern Distributor Road on these potential sites of archaeological interest.

Plate 2.2 – Mountshannon House

2.2.5 Purpose of the Scheme

The Limerick Northern Distributor Road is to be developed to provide a distributor road along the northern fringe of Limerick City from the western residential areas at Knockalisheen to potential tie-in at the R445 (Old N7) or M7. As a distributor road, any potential route developed should be designed to distribute traffic within local neighbourhood areas and form a link between district distributors and access roads, while facilitating the potential development of a bus corridor. The purpose of the road, while discouraging the major through movement of general traffic, will be designed to encourage public transport use, cyclists and pedestrians.

The objectives of the Limerick Northern Distributor Road outlined above, were used to define the eastern boundary of the Study Area. The eastern boundary of the Study Area runs from Oakfield, north of the Headrace Canal, in a south westerly direction past Newtown Cloonlara, Illaunyregan and Prospect to the M7. This was deemed to be the limit of the eastern boundary, as any extension of the boundary further east would compromise the objectives of the scheme, discourage public transport use, cyclists and pedestrians and fail to distribute traffic within local neighbourhood areas.

3.0 PUBLIC CONSULTATION

The Limerick Northern Distributor Road, a distributor road, is being progressed in accordance with the NRA 2010 Project Management Guidelines. As outlined in the guidelines, the first public consultation is scheduled to be held when a number of feasible Route Options have been developed and agreed with members of the Technical Steering Committee. This stage of the public consultation process will be held to inform members of the public and affected landowners of these Route Options.

The Constraints Study, defined in the guidelines as the initial step in the route selection process does not envisage a formal public consultation. However the guidelines state that the public should be made aware of the proposal to develop a number of route options leading to the selection of a Preferred Route Corridor.

In accordance with NRA 2010 Project Management Guidelines, the Lead Local Authority, Clare County Council undertook to raise awareness of the Scheme amongst members of the public.

3.1 Details of Publicity Information

In order to raise awareness of the proposed scheme amongst members of the public, the following measures were undertaken by the Lead Local Authority:

3.3.1 Briefing

On the Tuesday, 26th October 2010, Clare County Council held a presentation and a briefing at the Radisson Hotel, County Limerick to notify Elected Members of the affected Local Authorities of the proposed scheme.

3.3.2 Newspaper Advertisements

The Limerick Northern Distributor Road Press Advert was published in the Clare Champion dated Friday, 12th November 2010 and the Limerick Leader dated Thursday, 11th November 2010 (county edition) and Friday, 12th November 2010 (city edition) in advance of public information leaflets being made available to the public.

3.3.3 Radio Advertisements

Press announcements were broadcast on the Clare FM and Limerick Live 95FM over the weekend before Wednesday, 17th November 2010.

3.3.4 Web Advertisements

The Press advertisement was posted on the each of the affected Local Authority websites in advance of Wednesday, 17th November 2010.

3.3.5 Publicity Information Leaflets

Publicity Information Leaflets were made available to members of the public from Wednesday, 17th November 2010 to Wednesday, 15th December 2010 at the following Local Authority Offices:

- Clare County Council, Áras Contae an Chláir, New Road, Ennis;
- South East Clare Area Office, Westbury Centre;
- Limerick County Council, County Hall, Dooradoyle;
- Annacotty Area Office, Limerick County Council, Rivers, Castletroy;
- Limerick City Council, City Hall, Merchants Quay, Limerick City.

The publicity information leaflets provided details of the proposed Limerick Northern Distributor Road, explained the process involved in undertaking a Constraints Study and outlined the programme, subject to funding made available, to progress the scheme from the Constraints Study to both the first and second public consultations. The leaflet incorporated a map of the Study Area for members of the public to review. In addition, each of the above Local Authority Offices was provided with an A1 Map of the Study Area to show to members of the public on request.

3.4 Responses to the Publicity Information

The press advert and the information leaflet provided information to allow members of the public to email or post submissions to Clare County Council with regard to the Study Area.

3.4.1 Public Submissions

Following the publication of the Study Area, Clare County Council received submissions were received from the public in relation to the Study Area. The submissions received were primarily from members of the farming community. The submissions requested that full and due consideration be given to limit the impact of severance on existing farms.

A submission was also received from Parteen IFA on behalf of the farmers within the Study Area. The submission followed a briefing with representatives from the Irish Farmers' Association (IFA) held by Clare County Council held at the South East Clare Area Office in the Westbury Centre on Tuesday, 7th December 2010.

The briefing, held at the request of the Parteen IFA following the publication of the Information Leaflets, outlined details of the proposed Limerick Northern Distributor Road, explained the process involved in undertaking a Constraints Study and outlined the programme, subject to funding made available, to progress the scheme from the Constraints Study to the first public consultation.

With regard to the extent of the Study Area, a submission received highlighted the following:

- The extent of the western boundary of the Study Area implied that a connection point with the eastern end of the Coonagh Knockalisheen Distributor Road was predetermined;
- The provision of a potential link road between the Northern Distributor Road and the Groody Roundabout should enhance the prospect of the western expansion of the University of Limerick.

Appendix 3.1:

Constraints Study Brochure and Newspaper Advertisement

What is a Constraints Study?

A Constraints Study is a gathering of information on the study area before the Route Selection Process begins. The information sought is focused on determining the potential environmental, social, economic and engineering constraints which will influence the development of a number of route options before the selection of the preferred route corridor within the study area.

Purpose of This Information Leaflet

The purpose of this Information Leaflet is to inform the public of the Scheme and to invite written submissions on any aspects of the study area, i.e. matters of local concern or subjects requiring special attention. All comments will be recorded and considered during the Constraints Study.

What Happens Next?

On completion of the Constraints Study, which will include a review of the information gathered following the publication of this Information Leaflet, a number of route options will be developed. The First Public consultation (PC1) will be held when the route options will be displayed for your comment. Following PC1 a review of the comments received on these route options will be considered as part of the selection process for the preferred route corridor which will be brought to a further Public Consultation (PC2).

Programme

Subject to funding, the following table outlines the programme for the consultation process.

Stage	Period
Constraints Stage	Q4 2010
Route Selection Stage (PC1)	Q2 2011
Emerging Preferred Route (PC2)	Q3 2011

Contact Information

Submissions and observations, in writing, are invited from interested groups or individuals regarding the study. All submissions should be clearly endorsed with the project's name, Limerick Northern Distributor Road, and emailed to **LNDR@clarecoco.ie** or posted to the undersigned on or before **Wednesday, 15th December 2010**.

Senior Staff Officer,
Transportation Section,
Áras Contae an Chláir,
New Road,
Ennis,
Co. Clare.

Department of Transport An Roinn Iompair | NDP National Development Plan

Roughan & O'Donovan | MRG consulting engineers

Limerick Northern Distributor Road

Constraints Study Public Information Leaflet

Clare County Council in conjunction with Limerick City Council and Limerick County Council has commenced the planning process to advance the development of the Limerick Northern Distributor Road and associated infrastructure from a location in the vicinity of the Eastern end of the proposed Coonagh-Knockalisheen Strategic Route to a tie-in with the M7 or the R445 (Old N7) in Limerick.

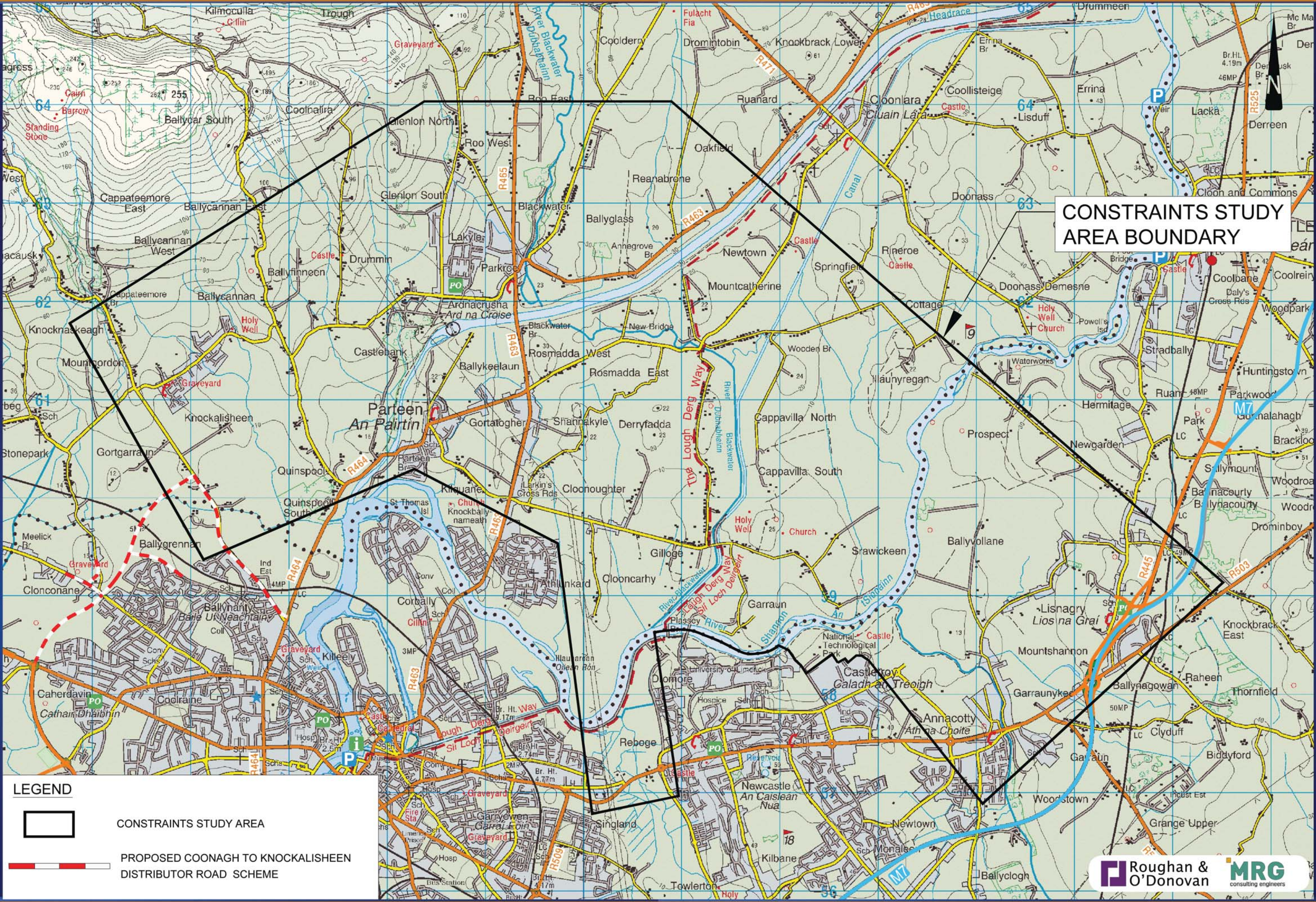
The scheme will comprise the design and construction of approximately 10km of a northern distributor road that will include a crossing of the Head/Tailrace associated with Ardnacrusha as well as crossings of the Shannon and Blackwater Rivers.

The planning stages of the development will involve:

- The completion of a Constraints Study to identify the nature and extent of significant constraints within the defined Study Area;
- The subsequent identification of a number of route options from which a preferred route corridor will be selected and a preliminary design developed;
- Environmental studies leading to the publication of an Environmental Impact Statement; and
- Completion of the statutory planning process including the publication of a Compulsory Purchase Order.

The first stage in this process is the identification of a study area and the completion of a Constraints Study which identifies all potential environmental, social, economic and engineering constraints which may influence the selection of the preferred route corridor within the study area.

The Constraints Study Area highlighted on the map overleaf was developed as a viable area within which feasible route options can be developed.



CONSTRAINTS STUDY
AREA BOUNDARY
LEGEND
CONSTRAINTS STUDY AREA
PROPOSED COONAGH TO KNOCKALISHEEN
DISTRIBUTOR ROAD SCHEME
Roughan &
O'Donovan
MRG
consulting engineers
N
Parteen
An Pairtín
Ardnacrusha
Ard na Croise
Cloonlara
Cluain Lára
Knockalisheen
Ballygrennan
Ballynanty
Baile Uí Neachtain
Caherdavin
Cathair Dhaibhín
Coolraine
Killeely
Corbally
Athlunkard
Castletroy
Caladh an Treoigh
Annacotty
Áth na Choite
Newcastle
An Caisleán Nua
Garryowen
Garraí Eoin
Lisnagry
Lios na Graí
Singland
Reboge
Dromore
University of Limerick
National Technological Park
Plassey
River Shannon
An tSionainn
River Blackwater
Canal
Headrace
The Lough Derg Way
Slí Loch Deirgeirt
R463
R464
R465
R471
R445
R503
R525
R509
M7

Comhairle Contae an Chláir
Clare County Council

Limerick Northern Distributor Road

Constraints Study Public Information Notice

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The first stage in this process is the identification of a study area and the completion of a Constraints Study which identifies all potential environmental, social, economic and engineering constraints which may influence the selection of the preferred route corridor within the study area.

As and from Wednesday, 17th November 2010, a Constraints Study Public Information Leaflet highlighting the proposed study area will be available from the following locations;

- Clare County Council, Áras Contae an Chláir, New Road, Ennis, Co. Clare.
- South East Clare Area Office, Westbury Centre, Knockballynameath, County Clare.
- Limerick County Council, County Hall, Dooradoyle, County Limerick.
- Annacotty Area Office, Limerick County Council, Rivers, Castletroy, Co. Limerick.
- Limerick City Council, City Hall, Merchants Quay, Limerick City, Ireland.

Submissions and observations, in writing, are invited from interested groups or individuals regarding the study. All submissions should be clearly endorsed with the project's name, Limerick Northern Distributor Road, and emailed to LNDR@clarecoco.ie or posted to the undersigned on or before Wednesday, 15th December 2010.

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Co. Clare.

Department of Transport
An Roinn Iompair

NDP
NATIONAL DEVELOPMENT PLAN

4.0 ENGINEERING AND TOPOGRAPHY

4.1 Geographical Description

The Study Area is located within both County Clare and County Limerick. The River Shannon defines the boundary between the two counties; with Limerick County to the south of the River Shannon and County Clare to the east of the Shannon.

The Study Area, located within the floodplain of the lower regions of the River Shannon, is low lying and has a topography which is predominantly flat. The upland regions of Woodcock Hill and Ballycar South are located to the north of the Study Area. **Photo 4.1** shows the topography from the foothills of Ballycar South looking south towards Limerick City.

Photo 4.1 – Existing Topography of Western Extent of Constraints Study

The confluence of the River Shannon with the Blackwater and Mulkear Rivers occurs within the Study Area. The other significant water bodies located within the Study Area are the Ardnacrusha Headrace and Tailrace Canals and the Errina Canal. The Headrace Canal commences at Parteen Weir, located at the southern end of Lough Derg and is 11.6km in length. The Headrace Canal ends at Ardnacrusha Power Station and it is from here that the Tailrace Canal commences. The Tailrace Canal joins the River Shannon south of Parteen Village. Both of these canals along with the River Shannon are operated and maintained by the ESB. The headrace canal is shown on **Photo 4.2**.

Photo 4.2 – Headrace Canal at Ardnacrusha

The River Shannon flows in a south westerly direction, meandering through the south eastern end of the Study Area. The Blackwater River flows in a north-south direction through the Study Area, traversing beneath the Headrace Canal before flowing into the River Shannon to north of the University of Limerick. The Mulkear River flows in a north westerly direction through Annacotty and flows into the Shannon north of the National Technological Park. The Groody River flows in a south-north direction under the R445 before flowing into the River Shannon at Groody Valley. The Errina Canal passes through the centre of the Study Area linking Limerick City and Killaloe.

4.2 Flooding and Drainage

The Study Area is dominated by the River Shannon and its expansive floodplain. The Shannon River Basin is the largest in Ireland and drains a total area of 18,000 square kilometres between its source in the Cuilcagh Mountains in Cavan and Fermanagh to the tip of the Dingle Peninsula in Kerry.

The river takes a sinuous route through the Study Area along a North East to South West axis from the town land of Prospect to Limerick City. There are no lakes along this section of the river however the low lying ground in the area is subject to flooding (Refer **Drawing CS-401 in Volume 2**). The extent of flooding adjacent to the National Technological Park in November/December 2009 is shown on **Plate 4.3**.

Plate 4.3 - Extent of November/December 2009 flooding north of the National Technological Park

The nature of this extensive floodplain and the occurrence of routine flooding can be regarded as a constraint as it may give rise to difficult and unsuitable ground conditions that may require significant bridging and culverts. Furthermore, roads constructed across flood plains may, without appropriate mitigation, affect the nature and extent of flooding in the area. Bridges and road embankments can obstruct the path of floodwaters, causing re-direction and re-distribution of the flow over the floodplains and within the channel, although this can be avoided by appropriate design.

It should be noted at this point that the selected route will have to comply with Section 50 of the Arterial Drainage Act 1945, the purpose of which is to ensure that the existing conveyance and storage capacities of channels and floodplains are maintained. The selected route will also have to comply with the requirements of Waterways Ireland, the OPW and the ESB Fisheries.

The proposed scheme will have to cross the River Shannon and the River Blackwater and their respective floodplains. Therefore, based on this information and from the perspective of constructional difficulty, throughout the route selection process the extent of floodplain to be crossed should be considered as a key constraint in the selection of the preferred river crossing.

4.3 Existing & Future Road Network

4.3.1 Existing Road Network

The Study Area contains a road network ranging from a Motorway to a number of Regional and Local Roads however there are no National Primary or Secondary Roads within the Study Area which may be attributed the relative low levels of development which have occurred within the lands enclosed by the River Shannon and the Ardnacrusha Headrace and Tailrace Canals.

The recently constructed M7, Dublin to Limerick road runs along the eastern extremities of the Study Area where it intersects the R445 (Old N7) and the R503. The M7 continues south bypassing Limerick City where it intersects the M20 Limerick to Cork Road and the N18 Limerick to Ennis Road.

The R445 is a regional road that connects Limerick City to Nenagh. This road was downgraded to a regional road after the opening of the M7. The R503 is a regional road that passes through the southern extremities of the Study Area adjacent to the M7. This road provides a link between Limerick City and Thurles, Co. Tipperary.

The R463, R464 and R465 are three heavily trafficked regional roads that provide important strategic connections between south Co. Clare and Limerick City. In addition, existing traffic issues on the Corbally Road are a significant constraint when travelling through Limerick City.

The R464 links the town of Parteen and western side of Limerick City. East of Parteen, the R464 intersects the R463 which runs in a north south direction between Ardnacrusha and the centre of Limerick City, south of the River Shannon. The R463 turns east after crossing the Headrace Canal and continues in a north easterly direction parallel to the canal to the town of Killaloe. At this location the R463 intersects the R465 which continues in a north south direction through the northern part of the Study Area linking Ardnacrusha and the town of Broadford.

4.3.2 Future Road Network

Limerick City Council has proposed the construction of Phase 1 of the Limerick Northern Distributor Road along the northwest fringes of the city extending from Coonagh Roundabout on the N18 northwards to the Knockalisheen Road. The proposed scheme will provide a link road to Moyross and an upgrade of the Knockalisheen Road. The scheme has been identified as an important aspect of the current Moyross regeneration programme which has recommended that a distributor road providing access to Moyross be progressed from Coonagh Roundabout to the north of Limerick City. The proposed Coonagh/Knockalisheen Distributor Road is approximately 3km in length and is proposed to be dual carriageway. This scheme is currently with Bord Pleanála awaiting planning approval. Refer **Drawing CS-401 in Volume 2** for details of the existing and future road network within the Study Area.

4.3.3 Railways

There are five railway lines leading in to Limerick City. The routes served by these railway lines are as follows:

1) Limerick-Dublin via Limerick Junction;
2) Limerick-Dublin via Birdhill;
3) Limerick-Ennis;
4) Limerick-Foynes;
5) Limerick-Irish Cement.

The Limerick–Dublin railway line via Birdhill is the only one of the above railway lines within the Study Area. The railway line runs along the south-eastern periphery of the Study Area for approximately 1km. This railway line serves the towns of Castleconnell, Birdhill, Nenagh, Cloughjordan and Roscrea before rejoining the main Limerick – Dublin Railway line at Ballybrophy. It is unlikely that any railway bridges would be required as it is anticipated that the scheme will terminate west of the Limerick-Dublin (via Birdhill) railway line.

4.4 Watercourse Crossings

The River Shannon basin, located within the Study Area, contains an extensive network of watercourses. The existing road network crosses a significant number of these watercourses (Refer **Drawings CS-402 to CS-404 in Volume 2**), with the smaller watercourses culverted beneath the existing roads. With regard to the larger watercourses within the Study Area, there is a total of 13 existing bridge crossings located within the Study Area:

- Annacotty Bridge;
- Groody Bridge;
- Plassey Bridge;
- University of Limerick Shannon Bridge;
- Living Bridge (Pedestrian Bridge);
- Gilloge Bridge;
- Blackwater Bridge (Derryfadda);
- New Bridge;
- Wooden Bridge;
- Blackwater Bridge (Headrace Canal);
- Blackwater Bridge (Ardnacrusha);
- Parteen Bridge;
- Athlunkard Bridge.

Any potential route for Phase 2 of the Limerick Northern Distributor Road, subject to constraints identified, may be required to cross the following larger watercourses:

- River Shannon;
- River Blackwater;
- Errina Canal;
- Tailrace Canal;
- Headrace Canal.

4.4.1 River Shannon Crossings

The River Shannon has total of six vehicular and two pedestrian crossings from the north bank of the River Shannon to Limerick City. Five of the existing vehicular crossings convey traffic directly into the city centre placing significant pressure on the road network and the existing river crossings. The sixth vehicular bridge crossing at the University of Limerick provides access from the south bank of the River Shannon to the Clare Campus only and does not provide any onward connectivity within the Study Area.

A stated objective of the Limerick Northern Distributor Road to relieve the pressure on the existing river crossings, protecting the city centre and improving accessibility from the disadvantaged areas of Limerick to educational and employment opportunities in Limerick City. It is therefore envisaged that the Limerick Northern Distributor Road will cross the River Shannon to meet these stated objectives.

The River Shannon, refer **Drawing CS-404 in Volume 2**, is relatively wide as it meanders through the Study Area. Typically, the shortest most direct crossing is preferable though the wide flood plains associated with the River Shannon throughout the Study Area will impact the selection of the preferred crossing point. In addition, the Lower River Shannon is a candidate Special Area of Conservation (cSAC) and any impacts of any potential crossing on the cSAC will need to be

assessed. This adds further complexity to identifying possible crossing locations as ideally the crossing of flood plains should be minimised.

Geotechnical constraints have been identified within the Study Area inclusive of numerous soft soil areas including alluvium and peat bog. Although the extent of soft soils in the vicinity of a crossing location should be minimised, it is possible to develop engineering solutions to overcome these constraints and therefore, should not preclude any crossing location from being considered.

The Shannon Crossing could be accommodated using a variety of bridge designs. The bridge selection is dependent on the alignment and general span arrangement of the structure. However other aspects including hydraulics, environmental, geotechnical and visual constraints will ultimately influence the final selection.

A simple beam or box girder bridge would generally be provided where the span lengths are relatively short. As the span lengths increase other solutions including suspended options may be more appropriate, particularly in light of environmental constraints. Ideally the bridge supports would be, where feasible, situated remote from the main river channel as this is likely to reduce the potential environmental impacts during construction stage.

4.4.2 Headrace Canal Crossing

The Headrace Canal has one existing crossing, the Blackwater Bridge, located within the Study Area (Refer **Photo 4.4**). The existing bridge, located along the R463, links the village of Parteen with Ardnacrusha. The bridge is heavily trafficked. The Study Area included areas north of the headrace, to examine a potential additional crossing of the Headrace Canal as part of the Limerick Northern Distributor Road.

The Headrace Canal at Ardnacrusha is 13km long and connects Parteen Weir to the concrete dam and power station at Ardnacrusha. Over the entire length of the Headrace Canal within the Study Area, embankments constructed on each side of the canal act as impoundment dams, impounding the water in the Headrace Canal. These embankments are categorised as Category 'A' dams. A Category 'A' dam is one where a breach could endanger lives in a community and cause extensive damage.

The Ardnacrusha Power Station and Headrace Canal upstream are key elements of the Strategic National Infrastructure. These structures are vital for power generation for the mid-west region and the State. In addition, the Headrace Canal diverts water to the Lower Shannon thus alleviating flooding in areas such as Castleconnell, Montpellier, Springfield and Mountshannon between Parteen Weir and Limerick City. A breach of the Headrace Dams would require the Ardnacrusha Power Station to be shut down, preventing the generation of power and would require the diversion of $450m^3/s$ of water from the Headrace Canal to the River Shannon, resulting in a significant flooding event downstream of Parteen Weir.

It is evident that any potential crossing of the Headrace Canal would be required to be a significant single span bridge to sufficiently clear both the canal and the associated Category 'A' dams. Notwithstanding the additional cost of such a structure, the risk of an object falling onto the impoundment dams during construction and causing a breach cannot be discounted. As noted by the ESB, the Headrace Canal and its embankments upstream of the power station should be deemed as a significant constraint due to the dam safety issues and the strategic nature of the headrace embankments, both for electricity generation and flood alleviation.

Photo 4.4 – Blackwater Bridge

4.4.3 Tailrace Canal Crossing

The Tailrace Canal is 2.4km long and the entire length of the canal is located within the Study Area. The canal is cut from solid rock and is spanned by one bridge at Parteen (Refer **Photo 4.5)**. The existing narrow bridge, and located along the R464 links the village of Parteen with the western residential areas of Limerick City. The bridge is heavily trafficked and a source of congestion within Parteen Village, due to its signal controlled one-way operation.

Photo 4.5 – Tailrace Canal Crossing, Parteen Bridge

4.4.4 River Blackwater Crossing

The River Blackwater flows southwards from the northern boundary of the Study Area, traversing beneath the Headrace Canal and running parallel to the Errina Canal before joining the River Shannon to the east of Groody Valley. The cross-section of the existing River Backwater is quite narrow without any adequate provision for pedestrians on its banks.

The existing Gilloge Bridge (Refer **Photo 4.6**) crossing the River Blackwater and the Errina Canal at Garraun is a structure proposed for protection under the draft Clare County Development Plan and is now included within the NIAH survey.

4.4.5 Errina Canal Crossing

The Errina Canal commences to the south of O'Briens Bridge, to the northwest of the Study Area, traversing in south westerly direction until it meets the River Blackwater (Refer **Drawings CS-403 to CS-404 in Volume 2**). Upstream of the River Blackwater, the Wooden Bridge crosses the Errina Canal. Similar to the existing Gilloge Bridge downstream at Garraun, the Wooden Bridge is a structure proposed for protection under the draft Clare County Development Plan.

Where the Errina Canal meets the River Blackwater, the canal changes direction and runs parallel to the river before joining the River Shannon at the University of Limerick. The Errina Canal is a small narrow canal with a very low flow of water and is currently disused.

The existing canal crossing, at Gillogue, is a 2-span masonry arch bridge crossing both the Errina Canal and the River Blackwater. As outlined above, the existing cross-section of the canal crossings is quite narrow, unsafe for pedestrian use, it inhibits the economic development of lands to the east of the canal.

Photo 4.6 –Existing Gilloge Bridge

4.5 Existing Services

As part of the constraints gathering exercise, all of the major service providers were contacted in order to establish the utility constraints within the Study Area. The major services identified within the Study Area to date are ESB Network, Board Gáis Network, Water Main, Eircom and Telecommunications (Refer **Drawings CS-405 to CS-410 in Volume 2**).

ESB Network

Ardnacrusha Power Station is located within the Study Area. There are overhead power lines of up to 110kv originating from this location and running in numerous directions throughout the Study Area. These are marked on the utilities **Drawing CS-408 to CS-410 in Volume 2**.

The power station, located at the start of the tailrace canal at Ardnacrusha dam to north of Parteen Village, is the main focal point from which four 110kv power lines radiate in different directions. Two lines run northwards and exit the Study Area at Ballycannan East. The other two run southwards towards Limerick City, crossing the River Shannon in Groody Valley.

Bord Gáis Network

There is a 200mm ST 19 Bar Bord Gáis transmission line within the Study Area along the R445 at Groody Valley.

There is also a Gas Distribution Network within the Study Area (Refer **Drawings CS-405 to CS-407 in Volume 2**).

Water Main

There are a number of water mains that exist within the Study Area. These generally run adjacent to local, regional and national roads.

Eircom

Eircom lines run along the majority of roads in the Study Area where housing is situated.

Telecommunications

Telecommunication services are mainly located to the south of the Study Area in Limerick City. The communications network runs from the M7, along the R465 and into the National Technological Park and the University of Limerick.

5.0 TRAFFIC AND ROAD ACCIDENTS

5.1 Introduction

This section describes the existing available traffic data and traffic modelling undertaken to date as part of previous road scheme studies and outlines additional traffic survey data and traffic modelling required as part of a traffic study to assess the proposed Limerick Northern Distributor Road Project.

The purpose of this traffic study is to facilitate the engineering and environmental (including air and noise) appraisal of the scheme. The findings of this study will be used for engineering design parameters such as cross sections, junction configurations and pavement design.

5.2 Existing Traffic Data and Reports

The Limerick Northern Distributor Road would run north of Limerick City into County Clare to the R463 and would then travel southeast back into Limerick City to connect to the R445 (Old N7) or the M7 Motorway, effectively linking the N18 to the west of Limerick City to the M7 east of Limerick City via the north of Limerick City. A number of traffic assessments and models have been prepared that overlap the Limerick Northern Distributor Road Scheme, as discussed below.

5.2.1 Proposed Coonagh to Knockalisheen Distributor Road

The Coonagh to Knockalisheen Distributor Road will provide a new high quality dual carriageway on the north western outskirts of Limerick City extending from the Coonagh Roundabout on the N18 northwards to the Knockalisheen Road and will provide a link road to Moyross and an upgrade of the Knockalisheen Road.

In terms of traffic impact, it is expected that the opening of the Coonagh/Knockalisheen Distributor Road will lead to a decrease in flow on the Cratloe Road, Ennis Road, Shelbourne Road and also lead to reductions in City Centre traffic. Traffic will use the distributor road to access the N7/N18 instead of the alternative mainly residential routes in the northwest of Limerick City.

The traffic model developed to assess the Coonagh to Knockalisheen Distributor Road estimated a traffic volume of 21,000 AADT (Average Annual Daily Traffic) in the design year of 2025.

The Knockalisheen Road Roundabout is identified as a possible docking point for the Limerick Northern Distributor Road. The traffic model for the Coonagh to Knockalisheen Distributor Road was therefore extended to include a notional Limerick Northern Distributor Road to get indicative traffic impacts on the Coonagh to Knockalisheen Distributor Road and surrounding road network. This model indicated that the impacts of opening the Limerick Northern Distributor Road are not just confined to the northwest of the city. The provision of a cross city will link relieve pressure on the existing river crossings in the city centre, and provide a significant improvement in connectivity between different areas along the northern fringe of the city.

5.2.2 Mid West Strategic Model

As part of the Mid West Strategic Area Plan, a traffic model is currently being developed by Limerick City Council, Clare County Council, North Tipperary and Limerick County Councils for the purpose of regional planning, land use and transportation studies. This model will provide a Base Year Traffic Model for

assessment of the Limerick Northern Distributor Road. The relevant area for investigation of the Limerick Northern Distributor Road will be cordoned from this model and reviewed. Additional traffic surveys will be required to support the Base Year Traffic Model and to refine the model in the vicinity of the proposed scheme.

5.3 Traffic Accidents

Traffic accident data has been obtained from the Road Safety Authority National Accident Database for the full Study Area for the period 1996 to 2009 inclusive. The results reported are personal injury accidents only and are shown on **Drawing CS-501 in Volume 2**.

These accident records within the Study Area over the period 1996 to 2009 are categorised as follows:

- 6 Fatal accidents;
- 26 Serious injury accidents;
- 197 Minor injury accidents.

6.0 GEOLOGY, HYDROLOGY & HYDROGEOLOGY

6.1 Soils and Geology

6.1.1 Introduction

This chapter outlines the geology, hydrology and hydrogeology of the Study Area. This includes the bedrock and soil types and details of soft or unstable ground, which may affect the route of the proposed distributor road.

6.1.2 Methodology

An initial desktop study of the soils and bedrock conditions was undertaken with information published by Geological Survey of Ireland, and other referenced sources of information as appropriate. A windscreen survey was also undertaken in November 2010. In addition, borehole information was available for several sites in and around the Study Area, giving general information on depth to bedrock and bedrock type.

6.1.3 Sources of Information

The assessment consisted of a desk study of available published information from the sources listed below:

- Geology of the Shannon Estuary. A Geological description to accompany the bedrock geology Scale 1: 100,000 Map Series 17'. Geological Survey of Ireland, 1999;
- Geological Survey of Ireland, Draft Aquifer Maps, 2010;
- Geological Survey of Ireland, Draft Vulnerability Maps, 2010;
- Geological Survey of Ireland, Karst Features Database, 2010;
- Geological Survey of Ireland, Draft Quaternary Maps, 2010;
- Geological Survey of Ireland, Geotechnical Borehole Records, 2010;
- EPA, Local Authority landfill sites in Ireland 1995-1997;
- Geological Survey of Ireland, Directory of active quarries, pits and mines in Ireland, 2001.

6.1.4 Geomorphology

The geomorphology of the landscape of the surrounding area is quite diverse, comprising glacial till deposits overlying either limestone bedrock in the undulating lowlands alongside the River Shannon or the sandstone bedrock in the protruding hills along the northern extent of the Study Area. Features influencing the bedrock geology include the 'Limerick Ramp', associated with deep water deposition and subsidence. In the Carboniferous period, the limestone was faulted and intruded during volcanic activity, affecting the bedrock to the central and southern parts of the Study Area.

More recent deposits include marine estuarine and lacustrine silts and clays, fen and cutover peats which generally overlie tills composed of both limestone and sandstone/shale. Made ground is also frequently present on account of the man-made constructions such as the hydroelectric power station, the headrace and tailrace canals at Ardnacrusha, and for housing or commercial/institutional developments throughout the Study Area.

6.1.5 Solid Geology

A summary of the geological sequence and main rock types likely to be encountered along the route from southeast to west are shown in Table 6.1.1. These are based on

the available information on the 1:100,000 scale Geological Survey of Ireland map of the area (Sheet 17 Bedrock Geology Map Series for the Shannon Estuary (1999)).

The site is shown to be underlain by undifferentiated limestone (VIS) of Visean, Carboniferous Age. Some of these rocks are non-argillaceous and should meet the NRA specifications for use in road projects. Rock outcrops and subcrops are recorded by the GSI in several locations within the Study Area. These include:

1) Between Ballyvollane/Mountshannon;
2) Prospect;
3) Along the River Blackwater between Cappavilla South and Ginoge;
4) Parteen/Quinspool;
5) From Quinspool South to Ballynanty;
6) Ballycannan.

Table 6.1.1: Geological formations occurring in the Study Area

PERIOD	FORMATION	ROCK TYPES	EXCAVAT-ABILITY	CUTTING STABILITY	MAP SYMBOL (WHERE USED)
Devonian/ Carboniferous	Tuff	Igneous tuff	Generally rippable	Generally stable	Tu
Carboniferous (Dinantian)	Waulsortian Limestone	Pale grey massive unbedded biomicrite Wackestone	Generally rippable	Generally stable, dip 5° to 25° syncline WSW to ENE	WA
Carboniferous (Dinantian)	Lough Gur Limestone	Dark grey to black cherty argillaceous Wackestone	Generally rippable	Generally stable, dip 5° to 20° syncline WSW to ENE	LR
Carboniferous (Dinantian)	Visean Limestone	(*undifferentiated*) Dark grey to black thinly bedded cherty argillaceous Wackestone and Packstone	Generally rippable	Generally stable, dip 5° to 20° syncline WSW to ENE	VIS
Carboniferous (Dinantian)	Volcani-clastic	(*undifferentiated*) Igneous breccia or conglomerate with ashy limestone to limestone ash, grit, slate and chert	Generally rippable	Generally stable, dip <15° to S/SW	V
Carboniferous (Dinantian)	Lower Limestone Shales	Calcareous shales with fine-grained sandstone, siltstone, mudstone and bioclastic limestone	Generally rippable	Generally stable	LLS
Devonian/ Carboniferous	Old Red Sandstone	Yellow to brown coarse-grained sandstone pebbly sandstone and conglomerate	Generally rippable	Generally stable, dip <30°	ORS

The distribution of various bedrock units within the Study Area is shown on **Drawing CS-601 in Volume 2**, reproduced from the GSI mapping.

Where rock is near the surface, steeply sloping ground or hard excavations pose the main difficulties for road construction. Most rocks are amenable to ripping or

hydraulic breaking but if bedding thickness and orientation are unfavourable, other techniques such as pre-splitting and blasting may be required.

6.1.6 Subsoil and Soil Deposits

Information on the subsoil/Quaternary geology of the Study Area has been obtained from the GSI and EPA websites. Where available, these are shown on **Drawing CS-602 in Volume 2.**

The following overburden types have been identified by the GSI:

- Made Ground
- Cutover and Fen Peats
- Marine Estuarine Silt/Clays
- Alluvium (undifferentiated)
- Lake sediments
- Glacio-Lacustrine Silt/Clays
- Till Derived from Devonian sandstones
- Till Derived from Lower Palaeozoic limestones

Glacial Deposits

Glacial deposits range from sandy gravelly clay to sands and gravels based on GSI data and information from nearby sites. These deposits do not pose a problem for road construction and for engineering purposes these deposits can be divided into glacial till (fine grained) and glacial till (coarse grained).

Glacial Till (Fine Grained)

Fine grained glacial tills dominate much of the Study Area.

The depth of the fine grained till occurring within the Study Area is not known and is likely to vary considerably between 0 and 10m below ground level.

The geotechnical properties of Irish glacial tills are well documented (Hanrahan, 1997). These soils are generally well graded, variable with gravel lenses, with an absence of clay minerals. The clay fraction (rock flour) typically amounts to about 15% and fines fraction (clay and silt) is about 30 to 40%. The glacial tills are generally over-consolidated and therefore possess low compressibility. These soils are usually firm to stiff, however due to their low plasticity, they are very susceptible to softening and deterioration in wet weather, especially if heavily trafficked. When the clayey tills are kept dry, they present relatively little difficulty to road construction.

Glacial Till (Coarse Grained)

Glacio-fluvial deposits of gravels may be present within the Study Area.

Gravel materials do not present problems for road construction, provided the road alignment is kept above the water table. Generally, gravels provide good formation for pavement construction and are generally suitable for reuse. Water bearing sand and silt layers, where encountered, can be problematic.

Soft Ground

More recent deposits include soft marine estuarine and lacustrine silts and clays, fen and cutover peats and alluvium. Construction in soft ground may be difficult due to

the presence of groundwater and the limited bearing capacity of these soils to accommodate surcharge loading. Existing ground surface is quite often well below the level required for road design.

Engineering design of road embankments through soft ground, although not desirable, is generally feasible where soil thicknesses are modest. To accommodate road embankments and suitable pavement, the excavation and replacement of soft soils, ground improvement or piled load transfer platforms are required. Also, the NRA specification places limits on settlements experienced by the constructed roadway in its design life. There are implications on design, programme and cost to meet these requirements, if construction is required through large or deep areas of soft ground. The rate of construction can be affected and environmental impacts are increased. The identification and sufficient investigation of soft ground early in the route selection process is advised.

The following sections describe the soft soils present in the Study Area, based on desk study and previous project experience.

Marine Estuarine Silts and Clays

Marine estuarine sediments have been deposited at various locations along existing and former estuarine grounds close to the River Shannon. These deposits are typically high plasticity silts and clays and may have an amount of organic content. They typically consist of normally or slightly over consolidated silt and clays or marine sands.

Lake Sediments

Lake sediments are associated with former basins and channels close to the River Shannon. These deposits are typically high plasticity silts and clays and may have an amount of organic content. They typically consist of normally or slightly over consolidated silt and clays or fluvial sands and gravels.

Alluvium

Alluvial deposits are associated with the River Shannon, its tributaries and streams, primarily the River Blackwater. These deposits are typically high plasticity silts and clays and may have an amount of organic content. They typically consist of normally or slightly over consolidated silt and clays or fluvial sands and gravels.

Peat deposits

Peat soils are naturally transitional, forming from waterlogged vegetation and consequently influencing the habitat as its geochemistry and moisture contents evolve. They are highly organic due to the accumulation and decay of vegetation over time through humification. The mass characteristics and presence of fibres, sands, silts or clays can strongly influence their engineering properties but they are generally low in strength. They are typically highly plastic, settling considerably if subject to surcharge loading.

Fen peat is present as marsh-like conditions, normally high in nutrient content, and comes about from surface water and percolating groundwater.

Cutover peat is what remains following extraction of peat fuel for human use. This would normally have been limited by thickness and water levels, although drainage measures may have been provided to optimise their removal. Thickness of peat in these areas is generally less than 1.5m.

Peat deposits have been identified in the Study Area at the following locations:

- Fen peat at Newtown, Springfield;
- Cutover peat at Shannakyle, Rosmadda East, Derryfadda and Gilloge;
- Cutover peat at Ballyglass;
- Cutover peat at Glenlon North.

Made Ground

Made ground occurs frequently as a result of various human activities and patterns. Site developments associated with housing, sportsfield, retail and industrial constructions can cause varied changes to ground topography, drainage and may often result in instability or long term settlements where located on soft soils or at tip areas following their removal. Construction in made ground may be complicated as a result.

Dredging of alluvium from rivers and construction of flood bunds, artificial channels and canals can also result in vastly differing ground conditions in areas of geotechnical or hydrological hazards.

A summary of the typical soil properties is included in Table 6.1.2.

Table 6.1.2: Typical Soil Properties

SOIL TYPE	PARTICLE SIZE/ TYPE	STRENGTH	COMPRESSIBILITY	USE AS EARTHWORKS
Glacial Till	Coarse	Good	Low	Good
	Fine	Variable	Low-medium	Variable, generally good
Alluvium	Coarse	Variable	Medium	Variable
	Fine	Poor	High	Poor
Lake Sediments	Fine	Poor	High	Poor
Peat (Cutover)	Fine / Organic	Very poor	Very high	Not suitable
Peat (Fen)	Fine / Organic	Very poor	Very high	Not suitable
Made Ground	Variable	Variable	Variable	Variable

Contaminated Lands

Certain land uses, typically waste removal, automotive servicing or dismantling, industrial fabrication and manufacturing, railways, and abstraction of minerals or soil/rock resources can cause or lead to land contamination. This may affect soils and surface water or groundwater, with significant impacts on construction methodology where these become disturbed by development. No licensed landfill sites are apparent in the EPA mapping within the Study Area.

No definite areas of contaminated land are currently known, although the likelihood of such cases in proximity to a major city is historically very high. It is advisable that

lands such as the risk areas listed be noted during the constraints study, and visited during the route selection and preferred route stages.

Such disused pits and quarries may also be synonymous with subsequent periods of dumping and the likelihood of this should be assessed at route selection stage where potential routes run close to such features. Any location where consistent dumping persisted over the years would generally be well known by locals and County Council staff.

6.1.7 Economic Geology

There are no active quarries or pits situated in the Study Area. The *GSI Directory of Active Pits and Quarries 2001* lists several sources of aggregates and other products within the region, generally from crushed limestone rock or from natural sands and gravels.

There are numerous disused quarries, gravel and sand pit locations as shown on **Drawing CS-603 in Volume 2**:

- Sand Pit, Ardnacrusha;
- Gravel Pit, The Cottage, Garraun/Fairy Hill;
- Quarry, Shoemaker's Hill, Parteen;
- Quarry, Castlebank;
- Quarry, Ballycannan North;
- Quarry, Mountgordon;
- Gravel Pit, Quinville House;
- Gravel Pit, Newtown;
- Quarry, Quinspool South;
- Quarry, Ilaunyregan;
- Quarry, Srawickeen;
- Quarries/Gravel Pits, Cappavilla South;
- Gravel Pits, Shanakyle;
- Lime Kiln, Ballykeelaun;
- Lime Kiln, Ballycannan North;
- Lime Kiln, Ballycannan West;
- Lime Kiln, Newtown.

Disused pits and quarries may be indicative of resources that have been fully removed or have been extracted as much as was feasible with available equipment and techniques. Depending on alignment, it could be possible, although not very likely, that further resources will become available if sufficiently deep cuttings are required. These are indicated on historic 6" and 25" OS mapping.

Mineral deposits are also present in the surroundings of the Study Area, as shown on **Drawing CS-603 in Volume 2**. Mapping of the Study Area itself is clear of any mineral deposits, other than the disused pits and quarries listed above. Deposits in the wider region generally comprise sands, gravels, brick clays or pyrites. Pyrites contained in aggregates can have a major detrimental impact on durability of construction materials as they swell with moisture.

6.1.8 Geological Heritage

A geological heritage site of Upper Palaeozoic (silurian) age is present at Ballycar South, the Ballycar South member of the Cratloes Formation. This is outside the Study Area by a distance of approximately 1km. Distinct bedrock units separate it from the rock in the Study Area, so it poses no constraint and will not affect any development.

6.1.9 Landslides

Records of landslides held by the GSI note several slides affecting different soil types in the wider region. Most involve peat in upland areas, with peat flows or bog bursts presumably brought about by episodes of heavy rainfall. However there are a few slides involving embankments and bridges:

- Fort Henry, 1948, earth embankment slide on the banks of the River Shannon, Ballina, Co. Tipperary;
- Bilbao Bridge, 1995, debris slide, Cappamore, Co. Limerick;
- Castlegarde, 1708, peat slide in raised bog, Cappamore, Co. Limerick.

While these records indicate incidences of failures involving soft soils, they must have also been brought about by elevated moisture levels and in some cases steeply sloping ground or sloping substrata. As with roads in soft ground in lowland areas, design and construction of roads through soft or sloping ground in upland areas with poor drainage, high runoff and/or large catchment is feasible, although not desirable. This is dependent on the identification of conditions through sufficient investigation. In some cases, it may be difficult to differentiate sloping substrata.

6.1.10 Inventory Geological Constraints

The geological constraints affecting the Study Area include the following:

- Rock outcrop/near surface rock;
- Soft ground including peat, alluvium and marine estuarine silt/clay, particularly where sloping ground or substrata are also present;
- Contaminated or made ground, if present.

6.1.11 Sources of information & References

Refer Section 6.3.9.

6.2 Hydrology

6.2.1 Introduction

This section outlines the general hydrological regime in the Study Area. The hydrology of the Study Area is dominated by the River Shannon with its associated network of lakes and tributaries. The River Shannon rises in a spring fed pool (the Shannon Pot) in the Cuilcagh Mountains on the Cavan-Fermanagh Border. The river flows south through Loughs Allen, Ree & Derg finally outfalling to the Atlantic Ocean via the Shannon Estuary. The Study Area falls within the reach of the river between Lough Derg and the Shannon Estuary which is characterised by a wide meandering channel and extensive floodplain.

6.2.2 Methodology

The hydrological constraints were established based on a review of the following information:-

- Extracts of Various Reports available on OPW Flood Hazard Mapping website;
- Flood Report November/December 2009 (Limerick County Council);
- River Shannon Flood of Winter 1999/2000 (ESB International);
- Parteen Weir to Limerick City Inundation Study (ESB International);
- Shannon River Basin Management Project – Current Management of Water Levels River Shannon.

6.2.3 Existing Hydrological Regime

The River Shannon drains a total area of more than 10,400km^2 from its source to Ardnacrusha Power Station (Refer **Plate 6.1**). The river is quite slow moving with out of bank flood waters remaining on the flood plains for long periods. The Shannon catchment is generally low lying with large areas below 50m O.D. The hydrology of the Shannon catchment and the hydraulic characteristics of its main channel, which is very flat with a series of natural and man-made controls, can be separated into the following four distinct sections;

- Upper Catchment – Source to Lough Allen Outlet
- Middle Catchment – Lough Allen Outlet to Lough Ree Outlet
- Lower Catchment – Lough Ree to Parteen Weir
- Downstream Parteen Weir

For the purposes of this Constraints Study, the section of the River Shannon downstream of the Parteen Weir is examined. The flow along this section of the River Shannon has been controlled for over 200 years to aid navigation and was further modified in the 1920's to facilitate the ESB hydro-electric power station at Ardnacrusha. Discharges through the headrace and tailrace at Ardnacrusha are controlled by the operation of the Power Station at Ardnacrusha at all times. The maximum discharge occurs when all four units at Ardnacrusha are on full load and amounts to about 400m^3/s. During floods, the ESB releases water at Parteen Weir which flows down the original river channel via O'Brien's Bridge, Castleconnell, Mountshannon, the University of Limerick and into Limerick City where the tailrace joins up with the original channel in Corbally.

Plate 6.1 – Aerial View of Ardnacrusha Power Station

6.2.4 Surface Water Features & Flooding

All the lands within the Study Area are drained to the River Shannon through the extensive network of tributaries. The Study Area has extensive areas of a high flood risk as can be seen on **Drawing CS-401 in Volume 2.** The River Shannon has a long history of flooding; a US Corps of Engineers 1956 report "River Shannon Flood Problem" states that:-

"*The problem of Shannon River flooding has been the subject of much study over the past 150 years. Because of the flat terrain through which the river flows, the almost imperceptible gradient of the stream with its series of lakes and connecting channels, and because of the large volume and long duration of flooding, no simple obvious solution has heretofore been found"*

The recent Limerick flooding event in November/December 2009 resulted in the highest discharge at Parteen Weir since the construction of Ardnacrusha Power Station. The highest discharge occurred around the 26th/27th November 2009 and was almost 500m^3/s. Refer Table 6.2.1 for details of the Flood Water Levels taken by the ESB during the November/December 2009 flood at a number of locations.

The area impacted by the November/December 2009 floods stretched from Montpelier village downstream through Castleconnell, Mountshannon, and Plassey to the confluence with the Groody River. Limerick County Council closed the following roads due to flooding in the Lower Shannon Region:

- R525 Castleconnell to Mountpelier / O'Briensbridge;
- Mountshannon Road in Annacotty;
- Belmont Road, Castleconnell;
- Castleconnell village:
  - from Charco's to Scanlan Park;
  - from the car park towards the village.

Local diversions were set up in the areas affected with two pedestrian bridges in Castletroy closed. There was also substantial damage done to roads and footpaths in the Castleconnell and Mountpelier areas.

Table 6.2.1: Highest Recorded Water Levels during Flood November 2009

Gauge Location	Grid Reference (Irish Grid)		Max. Recorded Level (27-11-2009)
	Easting	Northing	
O'Briens Bridge	166390.10	166801.00	28.51m
Castleconnell Car-Park	165847.50	162364.00	25.57m
Springfield	163249.70	161749.40	12.55m
Springfield	162420.60	161764.10	12.54m
Westbury	159535.00	158578.00	7.63m
Shannon Banks	158680.90	159402.20	7.55m

Note: All levels at Poolbeg Datum

In addition to the 2009 flooding event, information was obtained from OPW mapping which were compiled from aerial photographs taken on the 9th January 2000.

6.2.5 Tidal Constraints

Downstream of Ardnacrusha, the Tailrace Canal is influenced by the tidal conditions of the Shannon Estuary. Water levels in the tailrace vary with the flow through the power station and tide levels. Typically, the peak tailrace level, (measured downstream of Ardnacrusha dam), associated with the Highest Astronomical Tide (HAT) and station on full load is around 7.2mO.D (Poolbeg Datum). A tidal surge and/or adverse meteorological conditions such as low barometric pressure and/or a south westerly gale could cause this level to be higher.

6.2.6 Ardnacrusha Power Station

The maximum normal operating level in the Headrace Canal at the Ardnacrusha Dam is 33.56mO.D. The minimum allowable operating level in the headrace at Ardnacrusha Dam is 31.50mO.D. The maximum level occurs in the headrace when there is no discharge. The minimum level occurs when the flow is at a maximum through the headrace i.e. c 400m^3/s.

A flood is deemed to occur when:

- The water level in Lough Derg as measured at Killaloe, is above 33.56mOD
- The maximum normal operating level is rising
- The inflow to Lough Derg exceeds station full load throughput i.e. 400m^3/s.

During floods the power station is operated on full load thus diverting up to 400m^3/s through the headrace and tailrace and away from areas liable to flooding along the old channel between Parteen and Limerick City. As the level in Lough Derg increases, it drives more water through the channel between Lough Derg and

Parteen Weir and the spillway gates at Parteen are progressively opened to release excess water.

6.2.7 Catchments

Downstream of Parteen Weir the River Shannon flows a distance of approximately 20km to Limerick City. Tributaries which enter the Shannon in this reach include the Black, Kilmastulla, Mulkear, Groody and Blackwater Rivers. Flow which is diverted at Parteen Weir through Ardnacrusha Power Station via the Headrace Canal re-enters the Shannon just upstream of Limerick city via the Tailrace Canal.

6.3 Hydrogeology

6.3.1 Introduction

The hydrogeology of the area is reflective of the synclinal structure that surrounds Limerick City. As a result of the sequence and folding that features in the bedrock geological history, each bedrock unit traces a spoon-shaped ring around the city. The movement of water through the ground is governed by the permeability and connectivity of each bedrock unit.

6.3.2 Methodology

Review of the available GSI soil, aquifer and bedrock mapping and other records held in GIS database format, is the primary source of hydrogeological information. Interim vulnerability mapping has been prepared by GSI based on depths to rock, soil cover and bedrock characteristics.

General cross sections of the Study Area have also been assessed to identify connectivity and interaction between units. This information has been reviewed with a view to the potential road construction in each area along the route.

6.3.3 Aquifer Types and Classification

Table 6.3.1 outlines the bedrock aquifer classifications that occur in the Study Area. These apply to the rock units as discussed in Section 6.1.5.

Table 6.3.1: Bedrock Aquifers occurring within the Study Area

AQUIFER CLASSIFICATION	CODE	BEDROCK FORMATION	MAP SYMBOL (WHERE USED)
Regionally Important Aquifer – Bedrock which is Karstified (Diffuse)	**Rkd**	Waulsortian Limestone	WA
Locally Important Aquifer – Bedrock which is Moderately Productile only in Local Zones	**Ll**	Waulsortian Limestone	Tu
Locally Important Aquifer – Bedrock which is Moderately Productive	**Lm**	Lough Gur Limestone	LR
Locally Important Aquifer – Bedrock which is Moderately Productive	**Lm**	Visean Limestone	VIS
Locally Important Aquifer – Bedrock which is Moderately Productile only in Local Zones	**Ll**	Volcaniclastic	V
Poor Aquifer – Bedrock which is Generally Unproductive	**Pl**	Lower Limestone Shales	LLS
Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones	**Ll**	Old Red Sandstone	ORS

Code: Rkd : regionally important karstified (diffuse) aquifers
Lk: locally important karstified aquifers Lm: locally important aquifers that are generally moderately productive
Lm: locally important aquifers that are moderately productive
Ll: locally important aquifers that are moderately productive only in local zones
Pl: poor aquifer that is generally unproductive except for local zones

The Geological Survey of Ireland's bedrock mapping for the area illustrates that the Study Area is underlain by seven distinct geological formations / members as discussed above.

One formation is classified as a regionally important karstified (diffuse) aquifer (Rkd), the Waulsortian Limestone. Karst landforms include surface features such as swallow holes, dolines, dry valleys or subsurface features like solution enlarged cavities, and caves, depending on their development with time. Some features may have been previously active when levels and conditions of both sea and land were historically different. Many have since been infilled by the most recent glacial cover and are now essentially dormant. Detailed investigation of these features is required, whereever they are found to be close to a proposed route. Only one surface has been identified in the Study Area, a swallow hole at Mount Catherine.

It is noted that all karstified aquifers have limited attenuation capacity once a contaminant enters the aquifer. This is due to its solution enlarged fissures / conduits and fast through-flow velocities to discharge points (springs, wells, rivers, lakes etc). Further searches of aerial photographs (surface) or by geophysical survey results and preliminary site investigations (subsurface) should explore this further if the route is chosen in this aquifer where features are thought to be present. It would be advisable to avoid or minimise the length of the route through known karstified areas, as there may be implications for road foundations, structures foundations and road drainage design.

Two bedrock formations have been classified as locally important aquifers that are generally moderately productive (Lm). Groundwater flow in such aquifers is generally through a network of fractures, fissures and joints that are reasonably well connected and dispersed throughout the rock, giving a moderate permeability and groundwater throughput. Aquifer storage is moderate and groundwater flow paths can be up to several kilometres in length. There is likely to be a substantial groundwater contribution to surface waters ('baseflow') and large (>2,000 m^3/day), dependable springs may be associated with these aquifers.

Three bedrock formations have been classified as locally important aquifers that are moderately productive only in local zones (Ll). Such aquifers are characterised by a limited and relatively poorly connected network of fractures, fissures and joints, giving a low fissure permeability which tends to decrease further with depth. A shallow zone of higher permeability may exist within the top few metres of more fractured / weathered rock, and higher permeability may also occur along fault zones. These zones may be able to provide larger 'locally important' supplies of water. In general, the lack of connection between the limited fissures results in relatively poor aquifer storage and flow paths that may only extend a few hundred metres.

One bedrock formation has been classified as a poor aquifer that is generally unproductive except for local zones (Pl). Well yields in this type of aquifer will be <40 m^3/day, contributed to by a series of poorly connected fractures, fissures and joints. This low fissure permeability tends to decrease further with depth. A shallow zone of slightly higher permeability may exist within the top few metres of more fractured/weathered rock, and higher permeability may rarely occur along large fault zones. In general, the poor fissure network results in poor aquifer storage, short flow paths (tens of metres) and low 'recharge acceptance'. Groundwater discharge to streams ('baseflow') is very limited.

Consultation with the Geological Survey of Ireland (GSI) indicates that there are no quaternary sand and gravel aquifers within the Study Area.

6.3.4 Aquifer Vulnerability

The GSI has produced an interim vulnerability map for the Shannon region. The Study Area includes areas of variable vulnerability from extreme (rock near surface / karst) to low vulnerability (Refer **Drawing CS-604 in Volume 2**).

The most vulnerable sections of underlying aquifers are identified as being at Ballycannan, Parteen, Quinspool South, Cappavilla South, Newtown, Springfield, Ilaunyregan, Prospect, Ballyvollane and Mountshannon. Most of these are either in areas of Waulsortian or Visean Limestone bedrock.

Combining these "extreme" vulnerabilities with aquifer classifications provides an understanding of both the risk and the significance of the resource in terms of protecting groundwater from contamination during construction and operational phases.

6.3.5 Groundwater Resources

Groundwater resources include the aquifers themselves, particularly close to any feature which can be used for abstraction. This includes wells, boreholes, springs, spas and other surface water features that are either fed by or contribute to groundwater.

Group Water Schemes commonly abstract from boreholes drilled into rock for supply. Cuttings into rock for road construction may lead to local permanent drawdown. Water supply and quality may need supplemental measures to maintain the resource for continued use.

Springs and holy wells noted on historic 25" and 6" mapping include:

- Knockballynameath;
- Castlebank;
- Ballycannan North;
- Knockalisheen;
- Cottage;
- Prospect;
- Newgarden;
- Ballyvollane;
- Rosmadda West.

To the north of the Study Area in upland areas, the following springs are mapped:

- Ballycar South;
- Coolnalira;
- North of Roo East beside River Blackwater.

To the south of the Study Area in lowland areas, there are also springs and wells mapped, predominantly in areas of Visean limestone. The frequency and concentration of these wells in an aquifer of local importance would suggest that in this area the rock is faulted/fractured resulting in increased productivity.

GSI mapping of groundwater wells indicates that there are many in the Study Area (Refer **Drawing CS-605 in Volume 2).** The yield, depth and use of each groundwater well should be checked based on existing records. A more detailed audit of baseline water supply and quality may be necessary for assessment of environmental impact when proposed route alignments are known.

6.3.6 Karst

Karst features manifest themselves by the progressive dissolution of pure and nearly pure carbonate minerals from limestones. The weathered rock can display several characteristics such as swallow holes, springs or caves. Groundwater movements can be complicated in such an aquifer, with connectivity and transport times between locations being difficult to predict.

There can be serious impacts for structural foundations and road construction in karst terrain. Features require careful investigation as early as Route Selection Stage.

6.3.7 Ecology

If there is an ecological habitat depending on groundwater, particularly a fen or marsh, then the impacts of construction on the aquifer could have knock-on effects on wildlife habitats. For instance, at Knockalisheen there is a protected designated environment. The soils in the area are of marine estuarine silt and clay, which consequently contain significant moisture contents. Soft soils with plentiful moisture are entirely suited to many species which can thrive in the habitat.

It is unlikely that the groundwater is feeding directly through the silts and clays as cohesive soils impede drainage. It may be possible that the upstream side of the habitat receives a more constant surfacing of groundwater which slowly percolates along through the protected habitat closer to the surface.

6.3.8 Inventory of Hydrogeological Constraints

The hydrogeological constraints affecting the Study Area include the following:

- Karstified bedrock aquifers potentially supplying groundwater to the sensitive environment at Knockalisheen;
- Potential drawdown of groundwater where road cuttings required;
- Risk of impacts to groundwater abstraction where groundwater wells are present.

6.3.9 Sources of information & References

The following sources of information were used:

- Geological Survey of Ireland, Digital Mapping, 2010 (http://www.gsi.ie/Mapping.htm);
- Environmental Protection Agency, ENVision Digital Mapping, 2010 (http://maps.epa.ie/InternetMapViewer/mapviewer.aspx);
- Geological Survey of Ireland, Directory of active quarries, pits and mines in Ireland, 2001;
- Sleeman, A.G. & Pracht, M., 1999, Geology of The Shannon Estuary, A geological description to accompany the Bedrock Geology 1:100,000 Map Sheet 17, Geological Survey of Ireland;
- Hanrahan, E.T., 1977, Irish Glacial Till: Origin and Characteristics, Oighear-Thalamh Éireann;
- NRA, 2008, Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Hobbs, N.B., 2986, Mire Morphology and the Properties and Behaviour of some British and Foreign Peats, Quarterly Journal of Engineering Geology, London. Vol 19, p 7-80.

7.0 SOCIO-ECONOMIC

7.1 Introduction and Context

In order to identify all potential constraints it is appropriate to carry out an appraisal of the main socio-economic forces in operation within the Study Area. This chapter outlines the socio-economic profile of the Study Area and includes a review of the existing environment, the populations, profile and key economic features.

7.2 The Receiving Environment

Limerick City is the main conurbation in the area and has a population of approximately 60,000 (Census 2006). It has been identified as the "gateway city" for the mid-west region in the National Spatial Strategy. Limerick City is the economic driving force in the mid-west region performing the role of a regional hub supporting employment, services, transportation, learning and culture. In this role, Limerick is a centre for high technology, manufacturing and internationally traded services.

Within the Study Area the main population centres are based around Ardnacrusha Power Station (Refer **Drawing CS-701**). These population centres include:

- Athlunkard;
- Parteen;
- Ardnacrusha;
- Parkroe;
- Ballycannan North (Meelick);
- Gortatogher;
- Cloonoughter.

Beyond the influence of Ardnacrusha, Annacotty and Lisnagry are the main centres to the east of the Study Area. All of these villages have come under considerable development pressure as commuter villages on the east side of Limerick City. To the north of Limerick City, the further development of the villages around Ardnacrusha has been substantially constrained by the limitations of the available road network.

7.3 Economy, Business and Tourism

Agriculture is predominant throughout the Study Area and is important to the economy of the local communities. A number of major industries are located at the National Technological Park which has been established at Castletroy on the eastern extents of Limerick City. The National Technological Park houses many large companies such as Vistakon, O2 and Cook Ireland which are major sources of employment to Limerick City and its surrounding hinterlands. The O2 and Cook facilities are shown on **Photo 7.1** and **Photo 7.2**. Within the Study Area there are some private businesses such as hardware and garden stores, haulage depots and a number of local retail outlets. There is also a horticultural business which markets cut flowers.

The University of Limerick is located adjacent to the National Technological Park which is also another large source of employment in the area. The University of Limerick has over 11,300 students and 1,300 staff. The university offers a range of educational programmes in the disciplines of Arts, Humanities and Social Sciences, Business, Education and Health Sciences, Science and Engineering. The University is situated on a campus of over 133 hectares which includes lands on both sides of the River Shannon.

Photo 7.1 – O2 Buildings

Photo 7.2 – COOK Ireland Facility

The counties of Clare and Limerick possess many tourist attractions and in recent years the profile of tourism has been greatly raised with the development of river related tourism holidays such as cruising and angling. As a consequence there has been an expansion in the number of hotel rooms, guesthouses, restaurants and public houses. This development has further enhanced the attractiveness of the area as a tourist destination and as a result tourism is now integral to the economy of Limerick City and South Clare.

The villages support primarily local services such as the petrol station and retail outlet at the crossroads at Parkroe. The main centres of employment outside of Limerick City relate to Ardnacrusha Power Station and the Dairygold Cooperative Society at Parteen.

7.4 Transportation and Existing Infrastructure

Most of the major infrastructure within the region is located on the eastern, southern and western extents of Limerick and are generally outside the Study Area (Refer **Drawing CS-701 in Volume 2**). The M7 Limerick to Dublin Road passes through the eastern extents of the Study Area. The M7 continues south of Limerick City where it intersects the N24 Limerick to Waterford Road and the M20 Limerick to Cork Road. The N18 Limerick to Galway Road forms the western arm of the junction and continues west under the Shannon. The N18 provides a strategic connection between Shannon International Airport and Limerick City.

Many Regional Roads within the Study Area converge to Limerick City. The R463, R464 and the R465 provide an important link from South Clare to Limerick City. The R445 (Old N7) links Limerick City to Nenagh in South Tipperary.

Outside the Study Area, on the southern extents of Limerick City the R510, R511 and the R526, R512 all connect the surrounding areas to Limerick City. The Dublin – Limerick railway line via Birdhill runs along the eastern periphery of the Study Area for approximately 1km. This railway line serves the towns of Castleconnell, Birdhill, Nenagh, Cloughjordan and Roscrea before rejoining the main Limerick - Dublin railway line at Ballybrophy. The following four lines are connected to Limerick City however they are located outside the Study Area:

- Limerick – Dublin via Limerick Junction;
- Limerick – Ennis;
- Limerick – Foynes;
- Limerick – Irish Cement.

7.5 Community Facilities and Amenities

The Study Area contains many community services including two post offices, St. Patrick's Church in Parteen, Knockalisheen Refugee Centre and the following educational facilities:

- Lisnagry Primary School;
- Parteen National School;
- University of Limerick.

There are a number of recreational facilities within the Study Area including:

- Mackey Park – Ahane GAA Club (Refer **Photo 7.3**);
- Knockalisheen Park - Meelick GAA Club;
- Corbally United Soccer Grounds;
- Shanakyle All Purpose Weather Pitch;
- National Kart Centre at Gilloge;
- Parteen Pitch and Putt Course;
- Landscape Leisure 9 Hole Golf Club;
- Clonlara Equestrian Centre.

These clubs and playing fields are an integral part of their respective communities and it is important that any potential interference with these playing fields is kept to a minimum.

Photo 7.3 – Mackey Park, Ahane GAA Club

In terms of amenity facilities the River Shannon is widely promoted with the provision of angling stands, marina and boat moorings. The river is used by the University of Limerick's Rowing Club and their boat house and moorings is located within the Study Area. The ESB Lower Shannon Salmon Fisheries provide fishing amenities along this section of the river.

The Lough Derg Way is located within the Study Area. This Walking Trail stretches from Limerick City to Killaloe. This walk through the Study Area covers a distance of approximately 5.2km and is fully marked and sign posted.

A number of gun clubs are known to operate within the Study Area.

(Refer **Drawings CS 702-704** inclusive in Volume 2)

7.6 Public and Commercial Facilities

Churches & Burial Grounds

There are 2 no. existing Churches/Chapels and 3 no. graveyards located within the Study Area. St. Patrick's Church is located along the southern boundary of the Study Area in the townland of Parteen with St. Patrick's Chapel located in Parteen. The existing Killavoher Graveyard is located along the western boundary of the Study Area in the townland of Knocknalisheen. A second graveyard is located nearby in Ballycanon North. The third graveyard, Templenoegulla Graveyard is in ruin and is located just to the north of the River Shannon in the townland of Srawickeen.

Landfill Sites & Recycling Plants

The counties of Clare, Limerick and Kerry form part of the Limerick Clare Kerry Waste Management Region and operate three landfill sites and a number of recycling plants, none of which are located within the Study Area.

Quarries

Existing quarries, both operating and disused quarries, gravel and sand pit locations are highlighted in Section 6.1.7 of this Study (Refer **Drawing CS-603 in Volume 2**).

Treatment Plants

The following treatment plants, both wastewater and water, are located within the Study Area:

- Ballycannon WWTP. Ballycannon Heights, Meelick;
- Castletroy WWTP, County Limerick.

In addition to the above, treatment facilities are located at the site of the former Burlington Industries to north of the River Shannon in Gillogue. Refer **Plate 7.4.**

Plate 7.4 – Treatment Facilities, Gillogue

8.0 PLANNING, DEVELOPMENT AND LAND-USE

8.1 Introduction

The proposed scheme is in accordance with both County and Local Development Plans in terms of both Strategic and Local Policy. However it is equally pertinent within the context of a Constraints Study to outline any county and local planning policy issues and pending or awarded planning decisions which may have an impact on the identification of feasible route corridors.

8.2 Local and County Development Plan Policy

The Study Area encompasses land which falls within the administrative jurisdiction of both Clare County Council and Limerick County Council. As such the current Clare County Development Plan (2005 – 2011) and the Limerick County Development Plan (2005 – 2011) in conjunction with both the South Clare Local Area Plan (2009 – 2015) and the Castletroy Local Area Plan (2009 – 2015) require examination.

In addition, consideration should be given to the following Draft Development Plans;

- Clare County Development Plan (2011 – 2017);
- Limerick City Development Plan (2010 – 2016);
- Limerick County Development Plan (2010 – 2016).

8.2.1 Land-Use Policies

The overall strategic aim of all of these development plans is to promote the sustainable development of the counties and the settlements whilst protecting the environmental assets of same.

In order to mesh the promotion of economic development with the protection of environmental assets and resources each document contains broad planning policies. These include policies designed to promote and develop sustainable transport, community facilities, employment opportunities, etc. which are countered by policies to control indiscriminate rural settlement and to protect the landscape and visual amenity, the natural heritage and the built and architectural heritage.

By following the phases laid down by the National Roads Project Management Guidelines and the NRA's Environmental Assessment and Construction Guidelines all of these potential environmental impacts will be minimised. Therefore, at this point these land-use policies cannot be considered as quantifiable constraints, however reference to them is essential throughout the Route Selection and EIA stages.

8.2.2 Urban Development Limits and Zoning Strategies

The County and Local Development Plans promote development which reinforces existing towns and villages. To this end, for all the larger towns, villages and settlements a development envelope or limit is identified. Within these development limits Land-use Zoning Strategies are developed with the intention of concentrating like with like and thereby promoting and strengthening the social and economic role of each town or village.

The proposed scheme should endeavour not to impact these development limits and should, where feasible, have cognisance of the proposed zoning strategies contained therein.

The development limits are mapped on **Drawing CS-801 in Volume 2**, and the Zoning Strategies are shown on **Drawings CS-802** to **CS-804 in Volume 2.**

8.3 Housing and Development

The Study Area within County Clare and County Limerick contains a number of commuter towns and villages such as Parteen, Parkroe and Lisnagry. There is also a significant amount of ribbon development along many of the regional and local roads. An example of such ribbon development is the townland of Glenon South situated along the local road to the north of Ardnacrusha. Strips of ribbon development similar to this should be considered as a constraint.

There are many businesses and industries within the Study Area. Most of these businesses such as local shops, public houses and service stations are typical to most rural communities. Within the Study Area, The ESB's Hydroelectric Power Station at Ardnacrusha and the associated Headrace/Tailrace Canals is considered as a key constraint. The Study Area closer to Limerick City includes lands within Shannon Development's National Technology Park which includes major industries such as the Vistakon facility.

The Study Area also contains many community facilities such as Churches, Schools, GAA Grounds, Soccer Grounds, Golf and Pitch & Putt Courses. Knockalisheen Refugee Centre is also located along the western extremities of the Study Area which also contains large tracts of amenity areas.

An examination of the Clare and Limerick County Council planning lists was undertaken to identify any pending or awarded planning permissions within the Study Area. These are mapped on **Drawings CS-805, CS-806 and CS-807 in Volume 2**.

8.4 Land-Use

The primary land-use in County Clare is agricultural. Two thirds of the land in the county is deemed suitable for agricultural purposes however only one third is classified as being good for grassland. The average farm size in County Clare is 31.3 hectares which is similar to the national average of 31.4 Hectares.

Farming in many parts of County Clare is supported by other employment occasionally through farm diversification but more usually in employment not related to agriculture. A significant amount of farmland within the Study Area in County Clare is in the floodplain of the River Shannon and the River Blackwater which is revealed by the growth of rushes in fields and wet localized ground conditions as shown on **Photo 8.1**. The main agricultural practice within the Study Area is dry-stock farming and silage harvesting however there are also some dairy and equine farms. The ground conditions with the Study Area do not appear to lend themselves to the production of cereal crops and it is unlikely that any cereal producing farms will be impacted. A number of equine farms were identified within the Study Area with a substantial equine farm located in the townland of Illaunyregan.

Photo 8.1 – Land Conditions within Study Area

Similar to County Clare, County Limerick traditionally has had a very strong agricultural base. Approximately 45% of the land area is considered disadvantaged, with the more severely affected areas mainly in the west, south and east of the County. The average farm size is 32.6 hectares, slightly higher than the national average.

Dairy farming is by far the most prevalent activity, however beef farming and horse breeding is found in certain areas. Cereal farming in Limerick is concentrated in the hands of less than 50 farmers. The agricultural lands within the Study Area in County Limerick are predominantly used for dry stock farming and silage harvesting. Some of the lands are used for grazing horses and there are some dairy farms however these low lying and flood susceptible lands would generally not be suitable for intensive dairy or cereal farming. There is little agricultural activity in the Limerick City area within the Study Area.

Land is an important natural resource and care should be taken to minimise the impact of the preferred route on the farming community.

8.5 Land Ownership

A land search will be carried out at the Environmental Impact Assessment / Compulsory Purchase Order phase of the development to comprehensively identify ownership of the land in the vicinity of the preferred route. It is inevitable that some land holdings will be impacted by the development. However the scheme will be designed to minimise land take and severance and the number of landowners impacted.

9.0 ECOLOGY

9.1 Introduction

The objective of this chapter is to identify the international, national, county and local ecological constraints which should be avoided or that could affect the design of the scheme, delay progress or influence the costs.

Thus the aim of the exercise is to identify all known sites designated for nature conservation, all sites outside of designated areas which are known to provide an important component of a County or locality's ecological resource and to identify all known records of rare and protected species. As such the Ecology section of the Constraints Study is primarily a desk exercise that comprises a search for all available information, assisted by site reconnaissance as deemed appropriate.

9.2 Methodology

This section was compiled through information obtained from a windscreen review of the Study Area in early November and through desk studies. The websites of the National Parks & Wildlife Service (NPWS), Inland Fisheries Ireland and the Environmental Protection Agency (EPA) were accessed for information on designated sites in the Study Area. The list of consultees for the Constraints Study is included in Appendix A.

Information on habitats, flora and fauna were collated following a desk study of the available ecological literature and a review of available aerial photography and OS mapping. Particular attention was focussed on the South East Clare Habitat Mapping report (*Survey and Mapping of Habitats from Cratloe to Parteen, South East Clare*, RPS December 2008) and the relevant Chapters and appendices of the Coonagh to Knockalisheen Distributor Road EIS (June 2010).

In addition information from the National Parks and Wildlife Service (NPWS) database was received following the submission of a 'Request for Information' application and the following were contacted by letter and invited to provide information and/or comment on the proposal:

- Development Applications Unit, DoEHLG; and
- Inland Fisheries Ireland – Shannon River Basin District

The NRA *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (Revision 2, 1st June 2009) recommends the following geographic frame of reference be used when determining value of the ecological resources:

- International importance
- National Importance
- County Importance
- Local Importance (higher value)
- Local Importance (lower value)

This valuation method allows for the identification of the key ecological receptors, the potential impact of which will influence the identification of the preferred route corridor and the design of the scheme. Confirming the valuation of the lower order sites and accurately mapping the presence of protected species requires ongoing field surveys,

and must be progressed as the project develops through the Route Corridor Selection process.

9.3 General Description of Study Area

The Study Area primarily encompasses the south eastern extent of County Clare and a small area of northern County Limerick and Limerick City (Refer **Drawing CS–201 in Volume 2**). It extends from Knockalisheen in the west to Annacotty in the east. Watercourses, both natural and man-made, dominate the area. The Lower River Shannon weaves its way through the Study Area in a westerly direction before entering Shannon Estuary immediately west of Limerick. Within the Study Area the Shannon is intercepted by the Mulkear River, the River Blackwater and the Ardnacrusha Tailrace. The Ardnacrusha Headrace and the Errina Canal are also significant waterbodies in the Study Area.

The lands contained within the Study Area are primarily low lying floodplains which are used as pasture for cattle. The dominant habitat type is wet grassland. To the north west and above Knockalisheen the ground rises forming the hills of Ballycar South (255m) and Woodcock Hill (310m).

9.4 Designated Sites for Nature Conservation

9.4.1 Designated sites within 10km

The Designated sites for Nature Conservation within the Study Area are mapped on **Drawing CS-901 in Volume 2**. All the designated sites within 10km are described in Table 9.1 below (it should be noted that site descriptions / synopses are often not publicly available for pNHAs).

Table 9.1: Designated sites for Nature Conservation

SITE NAME	SITE CODE	STATUS	DESCRIPTION
Lower River Shannon	002165	cSAC	Refer Section 9.4.2 below
Knockalisheen Marsh	002001	pNHA/cSAC	Refer Section 9.4.3 below
River Shannon and River Fergus Estuaries	004077	SPA	Overwintering birds
Fergus Estuary and Inner Shannon (North Shore)	002048	pNHA	unknown
Inner Shannon Estuary (South Shore)	000435	pNHA	unknown
Woodcock Hill Bog	002402	NHA	Upland Blanket Bog
Glenomra Wood	001013	cSAC/pNHA	Semi-natural Woodland
Gortacullin Bog	002401	NHA	Upland Blanket Bog
Castle Lake	000239	pNHA	unknown
Rosroe Lough	002054	pNHA	unknown
Loughmore Common Turlough	000438	pNHA	Turlough
Carrannon Wood	001012	pNHA	Semi-natural Woodland
Slievefelim to Silvermines Mountains	004165	SPA	Hen Harrier

With regard to the sites referred to in Table 9.1, it is considered that the Lower River Shannon, which passes through the Study Area, warrants special consideration.

9.4.2 Lower River Shannon candidate Special Area of Conservation

The Lower River Shannon candidate Special Area of Conservation (cSAC) is a significant feature of the Study Area (Refer **Drawing CS-901**). This very large designated site encompasses the Shannon, Feale, Mulkear and Fergus Estuaries, the freshwater lower reaches of the River Shannon (between Killaloe and Limerick), the freshwater stretches of much of the Feale and Mulkear catchments and the marine area between Loop Head and Kerry Head.

As a consequence of the size and extent of the site, covering marine, freshwater and terrestrial habitats it has been selected as a candidate SAC for a range of habitats listed on Annex I of the EU Habitats Directive. These are lagoons, alluvial wet woodlands, floating river vegetation, *Molinia* meadows, estuaries, tidal mudflats, Atlantic salt meadows, Mediterranean salt meadows, *Salicornia* mudflats, sand banks, perennial vegetation of stony banks, sea cliffs, reefs and large shallow inlets and bays. The following cSAC selection habitats may occur within the Study Area:

- alluvial wet woodland;
- floating river vegetation;
- *Molinia* meadows.

Alluvial woodland occurs on the banks of the Shannon and on islands in the vicinity of the University of Limerick. The woodland is up to 50m wide on the banks and somewhat wider on the largest island.

Floating river vegetation characterised by species of Water-crowfoot (*Ranunculus* spp.), Pondweeds (*Potamogeton* spp.) and the moss *Fontinalius antipyretica* are present throughout the major river systems within the site.

Molinia meadows,a wet grassland habitat, occur in several parts of the designated site and the examples at Worldsend on the River Shannon are especially noteworthy. Here the areas of wet meadow dominated by rushes and sedges and supporting a diverse and species-rich vegetation, including such uncommon species as Blue-eyed Grass (*Sisyrinchium bermudiana*) and Pale Sedge (*Carex pallescens*).

The site is also selected for the following species listed on Annex II of the EU Habitats Directive – Bottle-nosed Dolphin, Sea Lamprey, River Lamprey, Brook Lamprey, Freshwater Pearl Mussel, Atlantic Salmon and Otter. Of these species Lamprey spp., Atlantic Salmon and Otter will be present within the Study Area.

With respect to these species it is imperative that the project has no impact on salmon or lamprey spawning grounds, suitable habitat for which has been recorded upstream of the Plassey Bridge, nor on otter holts or otter movement along the River Shannon and its tributaries.

9.4.3 Knockalisheen Marsh pNHA

Knockalisheen Marsh proposed Natural Heritage Area (pNHA) is located at the western end of the Study Area. The pNHA is included within the larger Lower River Shannon cSAC. The following is taken from the site synopsis:

This site is situated mostly within Co. Clare but just to the north of Limerick City. It consists of grassland that slopes gradually to a wetland area, which then drains into the River Shannon.

Much of the northern part of the site is unimproved pasture, while the lower parts near the river are extremely wet and consist of wet grassland and fen communities, which are very species rich. Though the nutrient status is low throughout the area there is a mixture of calcicole and neutral grassland/marsh species. The dominant grasses are Meadow Fescue (Festuca pratensis), Yorkshire Fog (Holcus lanatus) and Rough Meadow Grass (Poa trivialis). The commonest herb species are Yellow Rattle (Rhinanthus minor), Tufted Vetch (Vicia cracca), and Devil's-bit Scabious (Succisa pratensis), along with several rush species (Juncus spp.).

At the southern end of the site there is a reedbed of Common Reed (Phragmites australis) and Bulrush (Typha spp.).

The area is notable for the occurrence of several orchid species, especially Marsh Helleborine (Epipactis palustris). There is a colony of the wetland plant Skullcap (Scutellaria galericulata), a species which is rare in Co. Clare.

The ornithological importance of this site is not known but it is likely to serve as a roosting and feeding area for birds of the adjacent Shannon.

Low intensity grazing, mostly by cattle, has maintained the high species diversity of this site and should continue. The importance of this site is that it is a good example of an unimproved grassland/wetland, with high plant species diversity. This is now a scarce habitat, especially close to a large city.

The south eastern extent of Knockalisheen Marsh, alongside the River Shannon, is also designated, under the Wildlife Act, as a Wildfowl Sanctuary *(*Refer **Drawing CS-901).** The objective of this designation is to control the hunting of certain species of wildfowl.

9.4.4 Consideration of European Sites

European sites warrant additional consideration over and above other designated conservations areas and the Habitats Directive requires an 'appropriate assessment' to be carried out where a development is likely to have a significant impact on an SAC or SPA. On that basis it is important to note that 'significant impact' relates to the impacts on the site selection features and their associated conservation objectives. Any impact on these is likely to result in a negative finding in the appropriate assessment, which in turn requires the examination of alternative solutions, or, in the absence of alternative solutions, the identification of 'imperative reasons of over-riding public interest'.

An examination of the Study Area makes it clear that at least one crossing of the Lower River Shannon cSAC will be required. To that end Figure 3 of the NRA Guidelines for the Assessment of Ecological Impacts directs the requirement to record where, if known, the locations of the cSAC selection features. While this is not known in any detail, beyond the definite presence of alluvial wet woodland on the banks of the Shannon, it will be appropriate at this point to highlight the importance of habitat and species surveys at Route Selection Stage and consultation with NPWS. On this basis it is imperative that during the route selection process care is taken to ensure that the chosen River Shannon crossing point avoids impacting the cSAC habitat and species selection features (the Gorey Bypass was bought to a

Judicial Review on the basis that the best ecological crossing point was not selected on the basis of impact on cSAC habitat) and it should be noted that detailed surveys will be required to ensure that the chosen River Shannon crossing is ecologically the most appropriate.

9.5 Non-designated Sites of Nature Conservation Importance

In 2008 Clare County Council in association with the Heritage Council, Clare Biodiversity and Clare Heritage Forum commissioned RPS to survey and map the habitats within south east Clare. The subsequent report 'Survey and Mapping of Habitats from Cratloe to Parteen, South East Clare' produced habitat maps for the entire area and more detailed reports of those non-designated sites which were considered to be of ecological significance. This report has been reviewed and those sites recorded by this survey as being of ecological significance have been reviewed against the aerial photography and are mapped on **Drawing CS-902 in Volume 2**.

The Ecological Site Evaluation Scheme used by the report authors has been reviewed against the NRA Guidelines and it is considered that it is broadly representative such that 'High Ecological value in a local context' equates to NRA Guidelines ecological valuation 'County Importance' and 'Moderate Ecological value in a local context' equates to 'Local Importance (higher value)'. The following text references the NRA Guidelines valuation scheme.

Site number 1: 'Derryfadda'

This site is considered to be of National (or even International) Ecological Interest. The 47.9Ha site supports a number of viable habitats which are linked to Annex I Habitats within the Habitats Directive. These are North Atlantic Wet Heaths with *Erica tetralix*, Active Raised Bog, Bog Woodland and 'depressions on peat substrates of the *Rynchosporion*' (a sub-habitat of raised bog).

Site number 2: Cappateemore West

This 35.6Ha site is considered to be of County Importance as the oak/birch/holly woodland (WN1) present alongside the stream corresponds to the Annex I habitat 'old sessile oak woods with *Ilex* and *Blechnum* in the British Isles', although some non-native tree species are present.

Site number 3: Cappateemore

This is a semi-natural wet woodland (WN6) occurring alongside a small stream. It is comprised of Ash, Willows, Hawthorn and Blackthorn and is considered to be of County Importance.

Site number 4: Garraun

This 5Ha habitat is located on the banks of the River Blackwater where it converges with the Shannon in Garraun. It is comprised of wed Pedunculate Oak / Ash woodland (WN4) and is considered to be of County Importance as it corresponds to the the Annex I priority habitat 'alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior'.*

Site number 5: Cappavilla South

This is a small pocket of Wet pedunculate Oak Ash Woodland (WN4) located in a depression near the River Blackwater.

Site number 6: Newtown – Site A

This is a small are of wet Willow Ash Alder woodland (WN6) on the edge of a wet grassland field.

Site number 7: Newtown – Site B

This 3.8Ha site is located between the Errina Canal and the headrace canal and is comprised of species-diverse marsh and which grades into Wet Willow Alder woodland.

Site number 8: Glenlon North

This site is considered to be of local importance as it supports a range of semi-natural habitats including humid acid grassland (GS3), wet grassland (GS4) and wet Willow Alder woodland (WN6).

Site number 9: Shannakyle

This site is considered to be of Local Importance as it is an area of wet, species rich recolonising bare ground (ED3).

Site number 10: Mountcatherine – Site A

This is a mature stand of mixed broadleaf and conifer woodland and mature treeline which is considered to be of local importance.

Site number 11: Mountcatherine – Site B

This is an area of species rich wet grassland and treeline on the bank of the River Blackwater.

Site number 12: Errina Canal

The White Young Green report '*Waterway Corridor Study 2006, River Shannon and Errina and Park Canals: Final Ecology Report to the Heritage Council'* considers the Errina canal to be a "haven for wildlife" which is "likely to act as a significant wildlife corridor". The canal is described as being largely overgrown and inaccessible with the steep banks supporting dense broad-leafed woodland dominated by ash, and sycamore with occasional hawthorn and elder.

Tree Preservation Order sites

Listed tree preservation orders within the Study Area are shown on **Drawing CS-902 in Volume 2**. The NRA Guidelines dictate that these should be considered as of County Importance.

9.6 Other Sites of Potential Ecological Importance

The south east Clare habitat survey mapped and labelled the habitats across the whole area. These map layers have been reviewed and examined against the aerial photography and additional sites of potential ecological importance are shown on **Drawing CS-903 in Volume 2**.

These sites are primarily varying types of woodland or scrub habitat as the other dominant habitat type was registered as wet grassland and it is impossible at this point to view wet grassland as an ecological constraint as it is so widespread throughout the Study Area. It should be further noted that none of these sites were identified in RPS's list of Moderate Local Value sites and as such it can be concluded that survey authors considered them to be of (at best) Local Importance (lower value). These classifications will have to be confirmed by survey at Route Selection Stage.

9.7 Fisheries and the Aquatic Environment

9.7.1 Fisheries

The lower reach of the River Shannon runs along the Shannon valley from Killaloe to Loop Head, a distance of approximately 120km. The stretch of the River Shannon between Killaloe and Limerick is entirely freshwater. Within the Study Area, the Lower River Shannon cSAC is located in the eastern section. The site has been selected for the following species listed on Annex II of the Habitat's Directive – River Lamprey, Brook Lamprey, Freshwater Pearl Mussel and Atlantic Salmon. Castleconnell Salmon fishery, on the River Shannon, is owned and controlled by the Electricity Supply Board (ESB). The fishery is divided into eight beats each about 0.5 miles long.

The River Mulkear, a spate river, rises in the Slievefelim and Silvermines mountains in North Tipperary and flows north-westerly joining the river Shannon just below Annacotty in County Limerick. Its catchment area covers approximately 650km^2. Across the entire catchment of the River Mulkear, there are many types of semi-natural habitats such as wet grassland, wet woodland and marsh however, improved grassland is the most common. The Mulkear catchment is a renowned grilse fishery; although spring fish are also caught. The Mulkear River is ranked as one of Ireland's most populated salmon rivers and is home to approximately 15 fish species along with lamprey, eel and the native White-clawed crayfish. The river is also an important habitat for the kingfisher.

Response from Inland Fisheries Ireland

Inland Fisheries Ireland's Senior Environmental Officer responded to the request for information and provided the following additional information

- Smelt, one of the rarest fish in Ireland, is found in the Shannon and Fergus Estuaries and its principal spawning area is the Tailrace;
- All the rivers in the Study Area are considered salmon fisheries with the exception of the Blackwater which is a trout fishery;
- The Lower River Mulkear is a coarse fishery of match standards;
- Salmon and lamprey spawning grounds are specifically protected;
- The ESB operates a – currently suspended – commercial eel fishery on the Headrace and access to this must be maintained;
- The baseline survey must record in-stream and riparian habitat up and down stream of any proposed crossing
- The maintenance of water quality during the construction phase is of paramount importance;
- The larger rivers must be crossed with high level bridges (5 – 6m), all significant watercourses require 2m clearance on either bank for angler access, smaller water course crossing must be embedded box culverts;
- All water course crossings must be agreed with Inland Fisheries Ireland and reference should be made to the Shannon Regional Fisheries Board document "Protection and Conservation of Fisheries Habitat with Particular Reference to Road Construction".

9.7.2 Existing Water Quality

The EU Water Framework Directive 2000/60/EC was adopted in 2000 and implemented in 2003 on a National Level. It requires that all water bodies achieve

"good" ecological status by 2015 and that this status does not deteriorate. Ecological status is determined by a Biological Quality rating system - the Q value system.

The Environmental Protection Agency (EPA) online Water Quality list several monitoring stations which provide biological water quality data on the main rivers within the area. A water quality survey was conducted by the EPA throughout Ireland in 2008 and this is currently the most up to date information available. Data was taken at Cloon and Commons above Castleconnell for the River Shannon. Results from here indicated that the water quality was of moderate status (a Q value of 3 – 4). Data was taken for the Mulkear River where the recently completed M7 crosses over the river. Results indicate that the quality of this river is of good status (a Q value of 4). For the River Blackwater, data was taken at River Crossing Point on the "The Lough Derg Way". Results indicated that the water quality here is of high status (Q5).

The Zebra mussel (*Dreissena polymorpha*) has become a national pest and is now found throughout the main River Shannon and its associated lakes. It is important that the potential for further expansion of this species is kept at a minimum and appropriate mitigation measures are put in place.

9.7.3 Groundwater Dependent Ecosystems

An examination of the geology in the area has identified that there is a higher permeability aquifer present in the upland area. Where this meets the less permeable area at or north of Knockalisheen Marsh there is likely to be an upwelling of groundwater which may contribute to the inherent wetness of the upper grasslands on a year-round basis. This requires further investigation at Route Selection and subsequent stages and may require mitigation or appropriate design measures to maintain the hydro-geological regime.

9.8 Protected Species

The information received from NPWS includes records of species recorded in the Study Area over the past 30 years. A number of these are of note as they are legally protected species and have been recorded relatively recently. In addition the National Biodiversity Data Centre website and the Bat Conservation Ireland website (Bat records distribution maps) were reviewed for existing ecological records.

The National Parks and Wildlife Service request that the exact location of sensitive protected species is not made public and to that end supply the data locations in 10km (and where available 1km) square grid references. As it is not possible to pinpoint distinct locations or provide relevant local site names for where these species occur within the area, it is not, at this stage, plausible to accurately map their locations or to consider them as measureable constraints. However, at Route Corridor Selection consideration should be given to avoiding areas of suitable habitat and breeding or resting sites of these species (Refer Table 9.2). Similarly at EIA stage considerable additional survey effort will be required to ascertain the potential impact on these species and to bring forward appropriate mitigation measures.

Table 9.2, below, lists the protected fauna, identifies their conservation status and legal protection and Table 9.3 lists the protected flora for which records exist within the Study Area.

Table 9.2: Protected Fauna

SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	LEGAL PROTECTION
Pipistrellus pipistrellus	Common Pipistrelle Bat	Internationally Important	Annex IV; Wildlife Acts
Pipistrellus pygmaeous	Soprano Pipistrelle Bat	Unknown	Annex IV; Wildlife Acts
Myotis daubentii	Daubenton's Bat	Internationally Important	Annex IV; Wildlife Acts
Nyctalus leisleri	Leisler's Bat	Internationally Important	Annex IV; Wildlife Acts
Rhinolophus hipposideros	Lesser-horseshoe Bat	Internationally Important	Annex II; Wildlife Acts
Lutra lutra	Otter	Internationally Important	Annex II + IV; Wildlife Acts
Meles meles	Badger	Internationally Important	Wildlife Acts
Martes martes	Pine Marten	Internationally Important	Annex V; Wildlife Acts
Lepus timidus subsp hibernicus	Irish Hare	Internationally Important	Annex V; Wildlife Acts
Mustela erminea subsp hibernica	Irish Stoat	unknown	Wildlife Acts
Zootoca vivipara	Common Lizard	Unknown	Wildlife Act
Rana temporaria	Common Frog	Internationally Important	Annex V; Wildlife Acts
Lissotriton vulgaris	Smooth Newt	Unknown	Wildlife Acts
Lampetra fluviatilis	River lamprey	Indeterminate	Annex II + V
Petromyzon marinus	Sea Lamprey	Indeterminate	Annex II
Lampetra planeri	Brook Lamprey	Inderterminate	Annex II
Osmerus eperlanus	Smelt	Vulnerable	

Records of Protected Plant Species

Table 9.3 lists the protected plant species which have been recorded in the area. It should be noted that some of these records are historic (for example the record of *Groenlandia densa* is from 1899) and the plants may not currently be present. This does not, however, pre-determine that there is an absence of those protected or rare plants listed in the Flora Protection Order and the Irish Red Data lists and ongoing field surveys will be required to determine the status of these during Route Corridor Selection and EIA stage.

Table 9.3: Protected Flora

SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS	LEGAL PROTECTION
Groenlandia densa	Opposite-leaved pondweed	Vulnerable	Flora Protection Order
Hordeum secalinum	Meadow Barley	Vulnerable	Flora Protection Order
Schoenoplectus triqueter	Triangular Clubrush	Vulnerable	Flora Protection Order
Scleranthus annuus	Annual Knawel	unknown	Flora Protection Order

9.8.1 Protected Mammal Species

Bats

There are currently 10 known species of bat resident in Ireland, 5 of which have been recorded within the vicinity of the Study Area (Refer Table 9.2). Of note is the presence of the Lesser Horseshoe Bat in this vicinity in County Clare. The Lesser Horseshoe Bat is the only bat species which is protected under Annex II of the Habitats Directive. This species is considered a European priority species and as such care is required to ensure that there will be no impact on it. Its range in Ireland is limited to the six western counties - Clare, Cork, Galway, Kerry, Limerick and Mayo. It roosts mainly in roofs of old houses or in outhouses, stables or old cottages. In winter this species hibernates in caves, disused cellars, mines and souterrains. The Lesser Horseshoe Bat usually forages in woodland and scrub.

All other bats along with their breeding and resting places are protected by the Wildlife Acts and by Annex IV of the Habitats Directive and it is imperative therefore that all bat roosts are identified.

The elements of bat ecology which may be impacted by road construction projects includes the potential direct physical impact on bat roosts and also the impact the road scheme may have on the bats commuting routes, often linear landscape features, and feeding areas. Bats will utilise buildings, mature trees, caves, masonry arch bridges, etc as roosts.

The NRA's '*Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes'* highlights that habitat with good potential for bats should be identified and, where possible avoided, during the Route Corridor Selection Study. Habitat with good potential for bats (roosting or feeding) is identified as mature woodland; agricultural pasture with a small field network and hedgerows; rivers and watercourses; wetlands; areas with mines, caves or tunnels; and old farm buildings, estate houses, castles, etc..

Otter

Otter distribution in Ireland is widespread and they have been recorded in the watercourses throughout the Study Area. Otter requirements are food source and cover to use as over ground couches or holts. Holts at riversides tend to be tunnelled holes, cavities in tree roots or rock piles. Couches are generally mats of nesting material located in vegetation on riverbanks or away from water in secluded areas. They can be created in areas of dense scrub, reedbeds, etc. Otters will not tolerate disturbance of a holt site currently in use.

Otters are protected by Annex II and Annex IV of the Habitats Directive and by the Wildlife Acts and it is therefore imperative that potential habitat be avoided during the route selection exercise and that otter surveys be undertaken to identify otter activity and otter holts at EIA stage and that pre-construction otter surveys and mitigation measures highlighted in the NRA's *Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes* are followed.

Other mammal species

There are also records of Badger, Pine Marten and Irish Hare, the breeding and resting places of which are protected under the Wildlife Acts.

Badgers are widely distributed across a range of habitat types with setts often being located within hedgerows, scrub and woodland edges. This wide distribution makes it likely that badgers will be encountered on most road schemes and this must be confirmed, at EIA stage, during the multi-disciplinary field surveys through the observation of field signs such as setts, paths and latrines. Where possible impacts on active setts should be avoided and reference should be made to the NRA's Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes.

Pine Marten are historically associated with woodland, although they have adapted to a variety of more open habitats. Where records of Pine Marten exist, at EIA stage it may be necessary to undertake targeted Pine Marten survey. Where feasible existing and potential den sites should be avoided and reference should be made to the mitigation measures outlined in the NRA's Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes.

Irish Hare is protected by the Wildlife Acts, although as a recognised 'quarry' species a licence can be issued for hunting hares. Annex V of the Habitats Directive allows for the species to be hunted provided that this does not impinge on the attainment of Favourable Conservation Status. The Irish Hare preferred habitat is unimproved or semi-improved pasture or uplands with sufficient cover for resting. There is unlikely to be any direct impact on the local hare population with main impact of any proposed road scheme being increased habitat fragmentation.

9.8.2 Protected Fish Species

Atlantic Salmon occur in the area as do all three Lamprey species. These species and their spawning habitat are protected by Annex II of the Habitats Directive. Smelt are present in the estuary and spawn in the Tailrace. The presence of potential spawning habitat should be recorded during the multi-disciplinary walk-over survey at every watercourse crossing. Subsequently the timing of works and the design of all proposed bridges and culverts must be agreed with the Shannon Regional Fisheries Board and reference must be made to the NRA's *Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes.*

9.8.3 Protected Bird Species

Kingfishers tend to be found close to gently flowing lowland freshwater and are likely to be present along watercourses within the Study Area. This species is protected under Annex I of the EU Birds Directive and the initial walk-over survey must determine suitability of the habitat present as directed by the NRA's *Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes.*

9.8.4 Amphibians and Reptiles

Common (Smooth) Newts, Common Frogs and the Viviparous lizard have all been recorded as present within the Study Area. All of these species are protected by Section 23 of the Wildlife Act (1976) and as such it is imperative that they and their habitat are considered. A number of ponds, wetlands, etc which form potential habitat have been identified.

Any walk-over survey should determine suitability of the habitat present as directed by the NRA's *Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes.*

9.8.5 Other protected species – White-clawed Crayfish

Although not recorded on the NPWS received records for the Study Area, White-clawed Crayfish (*Austopotamobius pallipes)* have been recorded on the upstream reaches of the Mulkear system and should be considered as potentially present on the River Blackwater and smaller streams within the Study Area. This species is listed on Annex II of the Habitats Directive and as a result it requires strict protection. In streams the preferred habitat for this species is a shallow riffle with large stable rocks which can provide suitable refuges. In addition the species is most often associated with high water quality (unpolluted – Q value 4 - 5). Where the scheme is likely to have an impact on suitable Crayfish habitat, targeted surveys may be required. This should be undertaken with direction from the Local Conservation staff of the National Parks and Wildlife Service and reference should be made to the mitigation measures outlined in the NRA's *Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes*.

9.9 Conclusion

The most significant ecological constraint is undoubtedly the Lower River Shannon cSAC and the associated species and habitats. In addition the ecological sites identified by the RPS habitat mapping exercise, all the major waterbodies are considered as ecological constraints.

Throughout the Route Selection exercise, effort will be made to avoid any watercourses, or specific locations therein, identified as particularly sensitive during the Route Selection exercise. It is considered that with appropriate route selection, design and mitigation that all potentially adverse impacts can be avoided and minimised.

10.0 ARCHAEOLOGY, ARCHITECTURE AND CULTURAL HERITAGE

10.1 Introduction

10.1.1 General

The chapter details the results of a Cultural Heritage Constraint Study, which has been carried out in order to assess the archaeological and architectural resource within the environs of the proposed Limerick Northern Distribution Road. The study has been undertaken in order to inform the route options available of a proposed distribution road in this area..

The Study Area is located within County Limerick and County Clare. It includes a stretch of the River Shannon from Castleconnell to Groody Valley, along with part of the northwestern environs of Limerick City. A significant portion of the Headrace Canal is also located within the Study Area, along with a smaller section of the Errina Canal located between the River Shannon and the Headrace Canal. Although parts of the Study Area have been subject to suburban development, much of it still exists as open agricultural land.

A Cultural Heritage Constraint Study has been undertaken in order to identify all recorded archaeological and cultural heritage (including built heritage) sites and to highlight areas of archaeological or architectural potential within the Study Area. The location of these known constraints are plotted on **Drawings CS-1001** to **CS-1003 in Volume 2** and will in turn inform the future development of route options for the Northern Distribution Road.

10.1.2 Outline of Cultural Heritage Study

The assessment involved a study of the archaeological, architectural, historical and cultural background of the Study Area. This included information from the Record of Monuments and Places of Counties Limerick and Clare; review of all relevant County Development Plans and the National Inventory for Architectural Heritage.

The study has been carried out in accordance with the NRA Guidelines for the Assessment of Archaeological and Built Heritage Impacts of National Road Schemes (2005).

10.2 Statutory Protection of Cultural Heritage Sites

10.2.1 Protection of Cultural Heritage

The Cultural Heritage in Ireland is safeguarded through both National and International policy designed to secure the protection of the Cultural Heritage resource to the fullest possible extent (Dept. of Arts, Heritage, Gaeltacht and the Islands 1999, 35). This is undertaken in accordance with the provisions of the European Convention on the Protection of the Archaeological Heritage (Valletta Convention), ratified by Ireland in 1997. Cultural Heritage can be divided loosely into the archaeological resource covering sites and monuments from the prehistoric period to the 18th century, and the built heritage resource, encompassing standing structures and sites of cultural importance of a post-18th century date.

10.2.2 The Archaeological Resource

The National Monuments Act 1930 to 2004, the Heritage Act 1995 and relevant provisions of the National Cultural Institutions Act 1997 are the primary means of ensuring the satisfactory protection of archaeological remains, which are held to include all man-made structures of whatever form or date except buildings habitually used for ecclesiastical purposes. A national monument is described as 'a monument

or the remains of a monument the preservation of which is a matter of national importance by reason of the historical, architectural, traditional, artistic or archaeological interest attaching thereto' (National Monuments Act 1930 Section 2).

There are a number of mechanisms under the National Monuments Act, which are applied to secure the protection of archaeological monuments. These include the Register of Historic Monuments, the Record of Monuments and Places, and the placing of Preservation Orders on endangered sites.

Ownership and Guardianship of National Monuments

National monuments may be acquired by the Minister whether 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.

There are no National Monuments under state ownership or guardianship, located within the Study Area.

Register of Historic Monuments

Section 5 of the 1987 Act states that the Minister is required to establish and maintain a Register of Historic Monuments. Historic monuments and archaeological areas present on the register are afforded statutory protection under the 1987 Act. Any interference of sites recorded in the Register without the permission of the Minister is illegal, and two months notice in writing is required prior to any work being undertaken on or in the vicinity of a registered monument. This list was largely replaced by the RMP following the 1994 Amendment Act, but still holds records of monuments under Preservation Orders, Temporary Preservation Orders or those under ownership or guardianship of the State. All registered monuments are now included in the Record of Monuments and Places.

Preservation Orders and Temporary Preservation Orders

Sites deemed to be in danger of injury or destruction can be allocated Preservation Orders under the 1930 Act. Preservation Orders make any interference to 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 surrounding the site must be reviewed. Work may only be undertaken on or in the vicinity of sites under Preservation Orders by the written consent, and at the discretion, of the Minister. Consultation with the list of Preservations Orders has revealed that there is one site, AH 24 (Refer **Drawing CS-1001 in Volume 2**), within the Study Area that possesses a preservation order. Site AH 24 refers to a ringfort located within the townland of Ballycannan, Co. Clare. The order was made on 15th February 1973.

Record of Monuments and Places

Section 12 (1) of the 1994 Act provides that the Minister for Arts, Heritage, Gaeltacht and the Islands shall establish and maintain a record of monuments and places where the Minister believes that such monuments exist. The record comprises of a list of monuments and relevant places and a map or maps showing each monument and relevant place in respect of each county in the State. Sites recorded on the Record of Monuments and Places all receive statutory protection under the National Monuments Act 1994.

There are 53 recorded monuments within the Study Area. Each site is known by a unique SMR File Number (Sites and Monument Record) e.g. CL053-025: CL is used as a county prefix (designating Clare); 053 refers to six inch OS sheet/map number; 025 is the individual file number and is marked on the official RMP map. The Zone of Archaeological potential is an area outlined in black on the RMP maps, which hypothetically encloses each site. The area enclosed in each case is deemed by the National Monuments Service to have archaeological potential. All recorded monuments are represented on the accompanying maps and for the purpose of this Study has been given an AH (Archaeological Heritage) designation.

Section 12 (3) of the 1994 Act provides that "where the owner or occupier (other than the Minister for Arts, Heritage, Gaeltacht and the Islands) of a monument or place included in the Record, or any other person, proposes to carry out, or to cause or permit the carrying out of, any work at or in relation to such a monument or place, he or she shall give notice in writing to the Minister of Arts, Heritage, Gaeltacht and the Islands to carry out work and shall not, except in the case of urgent necessity and with the consent of the Minister, commence the work until two months after the giving of notice".

10.2.3 Architectural and Built Heritage

The Built Heritage is protected by the Heritage Act 1995, the Architectural Heritage (National Inventory) and National Monuments (Misc. Provisions) Act 1999, the Local Government (Planning and Development) Acts 1963-1999 and the Planning and Development Act 2000. Planning authorities also use the Architectural Heritage Protection Guidelines. Section 2.1 of the 1995 Heritage Act describes the architectural heritage as "all structures, buildings, traditional and designed, and groups of buildings including streetscapes and urban vistas, which are of historical, archaeological, artistic, engineering, scientific, social or technical interest, together with their setting, attendant grounds, fixtures, fittings and contents, and, without prejudice to the generality of the foregoing, includes railways and related buildings and structures and any place comprising the remains or traces of any such railway, building or structure". The Heritage Act promotes the interest in, knowledge and protection of the Irish heritage, including the architectural resource, with the establishment of the Heritage Council. All heritage buildings owned by a local authority are protected from damage and destruction by the 1995 Heritage Act.

The 1999 Architectural Heritage Act requires the Minister to establish a survey that will identify, record and assess the architectural heritage of the country. The National Inventory of Architectural Heritage (NIAH) records all built heritage structures within specific counties in Ireland. As inclusion in the inventory does not provide statutory protection, the document is used to advise local authorities on compilation of a Record of Protected Structures. The Record of Protected Structures is required as part of the Planning and Development Act 2000, and is included within the County Development Plan. The act requires that a development plan is carried out every six years and is considered to be the principal act for the protection of built heritage. An inventory was published for County Clare in 1997, whilst the survey for County Limerick was only published during December 2010. There are 19 buildings listed within the NIAH that are in or within the immediate vicinity of the Study Area.

Protection under the Record of Protected Structures

Structures of architectural, cultural, scientific, historical or archaeological interest can be protected under the Planning and Development Act, 2000, where the conditions relating to the protection of the architectural heritage are set out in Part IV of the act.

This act superseded the Local Government (Planning and Development) Act, 1999, and came into force on 1st January 2000.

The act provides for the inclusion of protected structures into the planning authorities' development plans and sets out statutory regulations regarding works affecting such structures. Under new legislation, no distinction is made between buildings formerly classified under development plans List 1 and List 2. Such buildings are now all regarded as 'protected structures' and enjoy equal statutory protection. Under the act the entire structure is protected, including a structure's interior, exterior, attendant grounds and also the structures within the attendant grounds.

The act defines a protected structure as (a) a structure or (b) a specified part of a structure which is included in a Record of Protected Structures (RPS), and, where that record so indicates, includes any specified feature which is in the attendant grounds of the structure and which would not otherwise be included in this definition. Protection of the structure or part thereof, includes conservation, preservation, and improvement compatible with maintaining its character and interest. Part IV of the act deals with architectural heritage, and Section 57 deals specifically with works affecting the character of protected structures or proposed protected structures and states that no works should materially affect the character of the structure or any element of the structure that contributes to its special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest.

The act requires local authorities to establish a RPS to be included in the County Development Plan (CDP). This plan includes objectives designed to protect the Cultural Heritage during the planning process. Buildings recorded in the RPS can include recorded monuments, structures listed in the NIAH or buildings deemed to be of architectural, archaeological or artistic importance by the Minister. Sites, areas or structures of archaeological, architectural or artistic interest that are listed in the RPS receive statutory protection from injury or demolition under the 2000 Planning Act. Any damage or demolition of a site registered on the RPS is considered an offence (Section 58, 4). All current RPS sites in Counties Limerick and Clare are listed in the relevant County Council Development Plans and Local Area Plans. The draft County Development Plan for County Clare (2011-2017) was also reviewed in order to assess whether any additional structures are proposed for the RPS.

There are 37 protected structures (or proposed protected structures) listed in the County Development Plans, which located in or within the immediate vicinity of the Study Area.

10.3 Methodology

10.3.1 Study Methodology

The Study Area covers a large area to the north and northeast of Limerick City. It is located within the Counties of Limerick and Clare and contains the Baronies of Pubblebrien, Clanwilliam and Municipal Borough, Kenry, Clanwilliam, Tulla Lower, and Bunratty Lower, along with all or part of six parishes within County Limerick (St. Munchins, St. Patrick's, Kildimo, Kilmurry, Killeenagarriff, Stradbally) and four parishes within County Clare (Kiltenanlea, St. Patrick's, O'Briensbridge, St. Munchins). It includes all or part of 64 townlands, which are listed below.

County Limerick

Ballygrennan, Reboge, Singland, Reboge Meadows, Dromore, Sreelane, Castletroy, Rivers, Newtown, Woodstown, Garraunykee, Carrowkeel, Ballynagowan,

Mountshannon, Ballyvollane, Richhill, Knockbrack West, Lisnagry, Prospect, Newgarden North, Newgarden North

County Clare

Illaunyregan, Springfield, Cappavilla North, Cappavilla South, Srawickeen, Garraun, Ruanard, Gilloge, Clooncarhy, Athlunkard, Oakfield, Reanabrone, Newtown, Mountcatherine, Derryfadda, Cloonoughter, Shannakyle, Rosmadda East, Ballyglass, Roo East, Roo West, Glenlon North, Glenlon South, Lakyle, Parkroe, Blackwater, Drummin, Ballycannan East, Ballycannan West, Ballycannan, Ballyfinneen, Castlebank, Ballykeelaun, Knockballynameath, Fairyhill, Kilquane, Garraun, Parteen, Quinspool North, Quinspool South, Knockalisheen, Mountgordon, Gortgarraun

Assessment of the Study Area was undertaken in a number of stages. The first stage comprised research of all available documentary, cartographic and recorded information to establish the number of known monuments and built heritage sites in the area.

The second stage involved the mapping of all recorded monuments and built heritage sites. These are presented in map form to accompany the cultural heritage Constraints Study.

10.3.2 Research

The initial research for this project comprised a paper survey of available archaeological, historical and cartographic sources relating to the Study Area. The following sources are the basis for archaeological and historical research for the area. Each source was examined and a list of sites and areas of archaeological and Cultural Heritage potential compiled:

- Record of Monuments and Places for Counties Clare and Limerick;
- Sites and Monuments Record for Counties Clare and Limerick;
- Monuments in State Care Database Counties Clare and Limerick;
- Preservation Orders Counties Clare and Limerick;
- Register of Historic Monuments Counties Clare and Limerick;
- Cartographic and written sources relating to the Study Area;
- National Inventory of Architectural Heritage Counties Clare and Limerick (Architectural & Garden Survey);
- Excavations Bulletin (1970-2007);
- Clare County Development Plan (2005-2011);
- Draft Clare County Development Plan (2011-2017);
- Limerick County Development Plan (2010-2016);
- Castletroy Local Area Plan (2009);
- South Clare Local Area Plan (2009-2015).

Record of Monuments and Places (RMP) is a list of archaeological sites known to the National Monuments Section, which are afforded legal protection under Section 12 of the 1994 National Monuments Act and are published as a record.

Sites and Monuments Record (SMR) holds documentary evidence and 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 information on their location. As a result these are omitted from the Record of Monuments and Places. SMR sites are 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 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.

Development Plans contain a catalogue of all the Protected Structures and archaeological sites within every county. The development plans for Counties Limerick and Clare were examined, along with the Local Area Plans for Castletroy (Limerick) and South Clare.

The **National Inventory of Architectural Heritage** 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 NIAH have also carried out a nationwide desk based survey of historic gardens, including demesnes that surround large houses.

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 2007 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 (www.excavations.ie) from 1970-2007.

10.3.3 Amalgamation of Information

Once all RMP (Archaeological Heritage) and Built Heritage (protected structures and NIAH structures) sites had been identified during the initial research and consultation stages, the information was mapped onto OS maps of the area (Refer **Drawings No. CS-1001 to CS-1003 in Volume 2**). In addition, further constraints, which may not be subject to statutory protection, but should none the less be considered as cultural heritage constraints, were also added. These include the River Shannon, which is considered to be a high Area of Archaeological Potential (AAP) and two industrial heritage sites, the 18th century Errina Canal and the 19th century Headrace Canal, which both pass through the Study Area.

10.4 Archaeological Heritage

10.4.1 Archaeological Background

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 of scatters of worked flint material; a by-product from the production of flint implements or rubbish middens consisting largely of shells (Stout & Stout 1997). The latter are commonly discovered in coastal regions or at the edge of lakes. Although it is likely that the River Shannon was a significant element for the Mesolithic populations in this landscape, as a food and travelling resource, there are no recorded Mesolithic sites within the boundary of the Study Area.

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. 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. Despite the relatively large Study Area, there are no definite recorded Neolithic sites located in this area. The only site tentatively assigned a Neolithic date consists of two pits that were excavated within the townland of Singland in the southern part of the area (AH 53). One of these pits contained some possible Neolithic pottery (Licence Ref.: 01E0946).

Bronze Age Period (c. 2500–600BC)

The most common Bronze Age site within the archaeological record is the burnt mound or *fulacht fiadh*. Over 4500 *fulachta fiadh* have been recorded in the country making them the most common prehistoric monument in Ireland (Waddell, 1998, 174). Although burnt mounds of shattered stone occur as a result of various activities that have been practiced from the Mesolithic to the present day, those noted in close proximity to a trough are generally interpreted as Bronze Age cooking/industrial sites. *Fulacht fiadh* generally consist of a low mound of burnt stone, commonly in horseshoe shape, and are found in low lying marshy areas or close to streams or rivers. Often these sites have been ploughed out and survive as a spread of heat shattered stones in charcoal rich soil with no surface expression in close proximity to a trough.

The term *fulacht* or *fulacht fiadh* is found in early Irish literature from at least the 9th century AD and refers to open air cooking places often associated with the young warrior hunters of the *fianna* and the legendary *fionn mac cumhail* (Waddell, 1998, 174). Even though they may have functioned as cooking sites, dates in the mid-late Bronze Age (1500–600BC) show that they significantly predate the cooking sites referred to in early Irish literature (Brindley & Lanting, 1990). There are four recorded *fulachta fiadh* located within the boundary of the Study Area (AH 7, 17, 19, 23). Further *fulachta fiadh* have been excavated recently as part of the N7 road development, located within the townland of Richhill in the eastern most part of the Study Area (Site Ref.: E2329).

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 NE/SW axis date to the Bronze Age having close affinity in orientation to similarly dated stone rows and pairs (Ronan et al 2009, 22). Some stones have been shown to mark burials, whilst others may have functioned as route or boundary markers. Standing stones are often found in proximity to other monuments such as stone rows, stone circles, boulder burials, cairns and rock art (*ibid.*). There is one recorded standing stone located within the townland of Quinspool South (AH 33) and one boundary stone located within the townland of Knockbrack East (AH 13).

Further Bronze Age activity has been recently recorded c. 1.4km southeast of the southernmost part of the Study Area within the townland of Kilbane. Here three *fulacht fiadh* were identified, along with 22 cremation deposits and 28 possible cremation deposits. These remains have been interpreted as potential forming part of three Bronze Age flat cemeteries with some peripheral domestic activity (Licence Ref.: 03E1382).

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 culture 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. There are no known Iron Age sites located within the Study Area, although the numerous enclosure recorded within the landscape have the potential to date from this period.

Early Medieval Period (AD500–1100)

During this period Ireland was not a united country but rather a patchwork of minor monarchies all scrambling for dominance, with their borders ever changing as alliances were formed and battles fought. Kingdoms were a conglomerate of clannish principalities with the basic territorial unit known as a 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. In Munster the Eóganachta formed the ruling dynasties until the middle of the 10th century. These kings were distributed strategically throughout the region and ruled over many tribal units.

During this often 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 is 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 of ringfort (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 is only one site listed as a ringfort within the Study Area (AH 24). This site is located within the townland of Ballycannan and is also protected with a Preservation Order. However, there are 12 enclosures, earthworks and potential sites listed within County Limerick (AH 2, 5, 6, 8-12, 15, 18, 21, 22), which all have the potential to represent the remains of ringforts. In County Clare there are 17 such sites (AH 24, 26, 27, 29, 32, 35, 40-45, 47, 49-52). These site types are by far the most numerous within the landscape and indicate that a large rural population was present during this period surrounding the River Shannon and probably settlement at Limerick.

This period was also characterised by the introduction of Christianity to Ireland. The new religion was a catalyst for many changes, one of the most important being literacy. Irish was written down for the first time using the ogham script. The ogham alphabet is thought to be based on the Latin alphabet of the later Roman Empire and today the majority of the inscriptions that survive are located on pillar stones or boulders. As well as this form of the written word, the church created impressive tomes in their official language, Latin. Examples of these include the Book of Kells and the Book of Durrow as well as other mundane works such as the Annals, which were an account of the history of the church. Monasticism was known in St. Patrick's time (mid 5th century) but it was not until the 6th and 7th centuries that the famous monastic houses such as Glendalough, Bangor, Clonfert, Clonard, Clonmacnoise and Durrow were founded (Ryan 1994, 125).

Within the Study Area, there are two recorded church sites, which although thought to be medieval in date, may have earlier roots (AH 38, 48). Both possess sub-circular enclosures surrounding the graveyards, which may represent the remains of a circular enclosing element of early medieval date.

It was during the later part of this period that attacks by the Norse on the lower Shannon area were recorded. The Annals of Clonmacnoise record that in AD 843 Foranan, Primate of Armagh, was taken hostage by the Vikings and held on their ships in Limerick (Lenihan 1866, 5). The location of the Norse settlement in the following century is notable as the lowest fording point of the River Shannon, at the head of the tidal reach (O'Rahilly, 1988, 141). The Danes fortified a settlement on the southern part of an island bounded by the west by the Shannon and all other sides by the Abbey River. Later known as "Kings Island", this naturally defended location had the double advantage that it was navigable from the sea and was presumably a crossing point over the Shannon. This provided the Vikings with a secure base from which raids could be conducted along the river upstream of Limerick (*ibid*, 141). Coonagh, to the west of the King's Island, was also described as an ancient fishing village of Viking origin, although to date no archaeological evidence for this exists (Spellissey, 1998, 316).

The strategic importance of Limerick and its environs was appreciated by both the neighbouring native clans and the advancing Anglo-Normans in the middle ages.

Brian Bóru sacked the town in AD 967 and 968, allowing the Viking inhabitants to remain within the walls on payment of heavy tributes, including 11,680 gallons of wine per annum (*ibid*, 22). By the time of the Battle of Clontarf, the Limerick Vikings had renewed their alliance with Bóru. His descendants, the O'Brien's, held sway over much of Limerick's hinterland, and by the 11th century were designated Kings of Thomond, establishing a new seat in the old Norse town of Limerick in AD 1100. St. Mary's Cathedral, built in the style of the Cistercians, was originally erected between 1168 and 1172 by Donal O'Brien, and is the sole surviving monument in the city from the pre-Norman occupation (O'Rahilly, 1988, 141).

Medieval Period (AD 1100-1600)

The beginning of the medieval period was characterised by political unrest that originated from the death of Brian Borumha in 1014. Diarmait MacMurchadha, deposed King of Leinster, sought the support of mercenaries from England, Wales and Flanders to assist him in his challenge for kingship. Norman involvement in Ireland began in 1169, when Richard de Clare and his followers landed in Wexford to support MacMurchadha. Two years later de Clare (Strongbow) inherited the Kingdom of Leinster and by the end of the 12th century the Normans had succeeded in conquering much of the country (Stout & Stout 1997, 53).

The arrival of the Anglo-Normans in 1175 took Limerick City by storm. They were forced to withdraw in 1176, and did not succeed in occupying the town until 1190. (Lee 1997, 19). Prince John granted Limerick a charter seven years later, declaring that the citizens would have all the liberties and free customs through all Ireland that were enjoyed by the citizens of Dublin (*ibid*, 24). In 1210, on a visit to Ireland, King John created counties from the portions of land under Anglo-Norman control, one of which became the county of Limerick. During this visit, John erected a castle (King John's Castle) and a bridge (Thomond Bridge) within the English town of the settlement (Dowd 1890, 33). The North Liberties of Limerick remained with Clare in Connaught until 1660 (Spellissey 1998, 36).

The importance of the town grew during the 13th century, when grants were given to fortify the town and repair King John's Castle. Municipal privileges were granted and a corporation was formed to initiate town improvements. The population at this time was growing so rapidly that in 1237 the corporation created taxes to finance the expansion and strengthening of the city defences (*ibid*, 37). A royal mint was also established between 1195 and 1199, which continued to operate sporadically until 1483 (*ibid*, 38).

The Study Area includes the north and northeast hinterlands of Limerick City. A number of castles are recorded within this area, with two located in County Limerick (AH 3 and 4) and five in County Clare (AH 25, 28, 34, 36, 37). The majority of these sites represent the remains of later castles or tower houses, which date to the 17th century. AH 36 now contains a 19th century house, although a 17th century castle belonging to the Earl of Thomond is thought to have occupied the site. It is possible that the tower house at Castletroy (AH 4) may be 16th century in date, whilst the remains of a tower house in the townland of Drummin (AH 25) are reputed to be 16th century in date. A potential medieval site exists in the form of a ring work in Fairyhill (AH 27). This is an early type of castle, which may date to the late 12th or 13th century. However, little is known about the site and it is equally possibly that the site may be earlier or later in date.

Photo 10.1 – Castletroy Tower House

Post Medieval Period (AD 1600-1900)

During the Desmond wars of the 16th century, sustaining loyalty to Elizabeth, Limericks chief role was as port and garrison to the incoming and outgoing troops. By the 17th century during the relatively peaceful reign in Munster of James I, Limerick had sustained two fires, which led to considerable improvement in building construction in the city. However, the protracted siege by Cromwell's forces in 1651 left the city besieged with famine, pestilence and death. The city finally surrendered with a death toll of five thousand inhabitants. The RMP records a post medieval roadway (AH 14) within the townland of Lisnagry, which is noted within the historic mapping as *Track of Cromwell's Road.* This may represent the route of Cromwell's troops to Limerick City and is partially located within the Study Area.

The Jacobean wars of the late 17th century saw the reactivation of the city mint to finance James II campaign. Gun money was minted in Dublin and Limerick, allegedly from the brass of old cannons, hence its name. The city withstood attacks by Williamite forces throughout 1690 and 1691, becoming the last Jacobean stronghold to repel William's army. After the slaughter of six hundred inhabitants who had become trapped outside the city walls and the failure of French reinforcements to arrive, Patrick Sarsfield signed the Treaty of Limerick in October 1691.

Evidence from the industrial age is also prevalent within the Study Area, as the Shannon was an important form of communications. The Errina Canal, which runs parallel to the River Blackwater, travels in a north-south direction through the Study Area. This was part of a development intended to make the River Shannon more easily navigable for transportation. One of the greatest obstacles hindering this was the Falls of Doonass further upstream. Goods had to be unloaded and taken around the falls adding to the expense of transportation and leaving scope for theft and accidents.

Work on improving the Shannon started near Limerick in 1757, but it was not until ten years later that the Commissioners for Inland Navigation undertook remedial and construction works on the Lower Shannon. This was spasmodic, expensive and varied greatly in quality. The canals were finally completed in 1799 but were never satisfactory. There were continual complaints of poor maintenance, differences in the size of the locks and the quality of construction. This all led to the passing of the Shannon Navigation Act in 1835. A new program of lock building, dredging and widening of the river was mostly completed by 1850.

Another industrial site is recorded within the townland of Sreelane and consists of the Plassy Mill (AH 1). Plassy Mill was a corn mill built in 1824 by a Major Hedges Maunsell. It was further developed in the mid 1860s by Richard Russell J.P, when he rebuilt the nearby Plassy House (BH 27). The mill took on a fortified appearance with the addition of mock battlements and the machinery was also improved at this time. The mill continued to be used until the early 20th century until decline in competition; worker dissatisfaction and a fire closed it down. This site is also a protected structure (BH 26).

Another typical element of the post medieval landscape, which was present within the landscape surrounding Limerick, was the development of ornamental demesne landscapes surrounding large country houses. One of the houses (Mountshannon) is listed within the RMP (AH 16) as well as being a protected structure (BH 19) and included within the National Inventory of Architectural Heritage (NIAH). The house and demesne are located within the eastern part of the Study Area. The original demesne accompanying this house (as marked on the first edition OS map) was very substantial, consisting unusually of three townlands (Ballyvollane, Mountshannon and Gaurraunykee). This is the largest of the demesnes within the Study Area, although the first edition mapping shows a large amount of demesne landscapes located in or partially within the Study Area. These are marked in pale orange on the constraint mapping that accompanies this assessment.

10.4.2 Recorded Monuments

There are a total of 24 recorded archaeological sites within County Limerick and 29 recorded archaeological sites within County Clare. These sites are located in or within the immediate vicinity of the Study Area. All of these sites are listed within the RMP (Recorded Monuments and Places). These sites are subject to statutory protection under the National Monuments Act and should be considered as cultural heritage constraints during the design of the proposed distribution road.

County Limerick

AH No.:	RMP No.:	Townland:	Classification:	NGR:	Legal Status:
AH 1	LI005-052	Sreelane	Watermill	160822/ 158564	RMP
AH 2	LI005-024	Reboge	Earthwork	159989/ 157618	RMP
AH 3	LI005-010	Ballygrennan	Castle	156001/ 159816	RMP
AH 4	LI006-017	Castletroy	Tower house	162791/ 158610	RMP
AH 5	LI006-059	Castletroy	Enclosure	163342/ 158419	RMP
AH 6	LI006-063	Rivers	Potential site	163785/ 157494	RMP

AH No.:	RMP No.:	Townland:	Classification:	NGR:	Legal Status:
AH 7	LI006-094	Rivers	Fulacht fiadh, corn drying kiln	163832/ 157438	RMP
AH 8	LI006-019	Rivers	Enclosure	164125/ 157159	RMP
AH 9	LI006-018	Rivers	Enclosure	164070/ 157681	RMP
AH 10	LI006-062	Woodstown	Potential site	164700/ 157244	RMP
AH 11	LI006-067	Ballynagowan	Enclosure, possible	165405/ 158049	RMP
AH 12	LI006-064	Mountshannon	Enclosure, possible	165011/ 158462	RMP
AH 13	LI006-058	Knockbrack East	Boundary stone	166565/ 159068	RMP
AH 14	LI006-007	Lisnagry	Road	165480/ 159213	RMP
AH 15	LI006-006	Lisnagry	Enclosure	156415/ 159408	RMP
AH 16	LI006-085	Mountshannon	Country House	165034/ 159072	RMP
AH 17	LI006-093	Ballyvollane	Fulacht fiadh	163839/ 158910	RMP
AH 18	LI006-002	Ballyvollane	Enclosure	163527/ 159682	RMP
AH 19	LI006-089	Ballyvollane	Fulacht fiadh	164070/ 159883	RMP
AH 20	LI006-083	Prospect	Burial	163691/ 160154	RMP
AH 21	LI006-003	Prospect	Enclosure	163857/ 160693	RMP
AH 22	LI006-001	Prospect	Enclosure	163543/ 160771	RMP
AH 23	LI006-090	Prospect	Fulacht fiadh	164202/ 160985	RMP
AH 53	LI005-107	Singland	Pits	160099/ 156943	RMP

County Clare

AH No.:	RMP No.:	Townland:	Classification:	NGR:	Legal Status:
AH 24	CL053-041	Ballycannan	Ringfort	156681/ 162325	RMP & Preservation Order
AH 25	CL053-042	Drummin	Tower house	157543/ 162493	RMP
AH 26	CL053-033	Roo West	Enclosure	158915/ 164058	RMP
AH 27	CL053-034	Roo West	Enclosure	159016/ 164013	RMP
AH 28	CL053-043	Newtown	Castle	162158/ 162519	RMP

AH No.:	RMP No.:	Townland:	Classification:	NGR:	Legal Status:
AH 29	CL053-048	Newtown	Earthwork	161937/ 162025	RMP
AH 30	CL063-003	Knockalisheen	Graveyard	155791/ 161191	RMP
AH 31	CL063-004	Ballycannan	Holy well	156460/ 161694	RMP
AH 32	CL063-005	Castlebank	Enclosure, site of	157323/ 161039	RMP
AH 33	CL063-006	Quinspool South	Standing stone	157302/ 160146	RMP
AH 34	CL063-008	Parteen	Castle	157878/ 159999	RMP
AH 35	CL063-009	Castlebank	Enclosure, site of	157984/ 161543	RMP
AH 36	CL063-010	Castlebank	Castle, site of	158065/ 161400	RMP
AH 37	CL063-025	Fairyhill	Castle/ring work	158493/ 160108	RMP
AH 38	CL063-011	Kilquane	Church and graveyard	158653/ 159918	RMP
AH 39	CL063-027	Kilquane	Hearth	158572/ 159835	RMP
AH 40	CL063-012	Rosmadda West	Earthwork	159362/ 161487	RMP
AH 41	CL063-013	Gortatoger	Enclosure, site of	159438/ 160675	RMP
AH 42	CL063-014	Shannakyle	Enclosure, site of	159438/ 160675	RMP
AH 43	CL063-015	Gilloge	Enclosure	161127/ 159143	RMP
AH 44	CL063-024	Derryfadda	Enclosure, possible	161358/ 159818	RMP
AH 45	CL063-016	Derryfadda	Enclosure	161276 160942	RMP
AH 46	CL063-017	Cappavilla South	Holy well	161698/ 159858	RMP
AH 47	CL063-018	Garraun	Enclosure	161944/ 159776	RMP
AH 48	CL063-019	Garraun	Church and graveyard	162011/ 159630	RMP
AH 49	CL063-020	Srawickeen	Enclosure	162820/ 159149	RMP
AH 50	CL063-023	Srawickeen	Enclosure	163272/ 160111	RMP
AH 51	CL063-021	Illaunyregan	Enclosure	163006/ 161284	RMP
AH 52	CL063-022	Illaunyregan	Enclosure	163307/ 161186	RMP

10.4.3 Summary of Previous Archaeological Fieldwork

Whilst the Study Area covers a relatively large area, much of it remains rural in nature and dominated by agricultural activities. Recent development is located along major route ways, such as the N7 and the eastern access road into Limerick. As a result, the majority of archaeological work has been carried out in this area.

The development of the N7 Neagh to Limerick Road Scheme (2006/2007) resulted in the excavation a *fulacht fiadh* in Lisnagry (Ref.: E2330), a hearth at Mountshannon (Ref.: E2334) along with a post medieval drain (Ref.: E2328) and burnt mounds (Ref.: E2329) at Richhill.

Within the townlands of Singland and Reboge, archaeological monitoring of topsoil stripping in association with a road upgrade was carried out in 2001 (00E0653). This resulted in the discovery of two potential Neolithic pits (AH 53), which were subsequently excavated (Licence Ref.: 01E0946).

In the townland of Rivers, further infrastructural upgrades resulted in the discovery of a *fulacht fiadh* and corn drying kiln (AH 7), which were located to the southeast of the site of an enclosure (AH 6) (Licence Ref.: 05E1251).

Pipeline schemes have also been carried out within the Study Area, which required archaeological monitoring. In 2001, monitoring of the Castleconnell Sewerage Scheme was carried out in Ballyvollane, Prospect and Newgarden North (Licence Ref.: 01E0416), although nothing of archaeological significance was identified. The development of the Clareville to Newcastle Rising Main resulted in the discovery of three *fulachta fiadh* (AH 17, AH 19, AH 23), which were excavated under licences 02E1348, 02E1403 and 02E1424.

In County Clare, only a handful of excavations have been carried out within the Study Area. These, for the most part are associated with the development of the University of Limerick campus, a new section of which is located on the northern side of the River Shannon. Monitoring and testing carried out at the site of the new fourth village resulted in the discovery of post medieval brick clamps in the townland of Garraun (Licence Ref.: 02E1216). An underwater archaeological assessment has also been carried out on the River Shannon at the site of a pedestrian bridge linking the two parts of the university campus, although nothing of archaeological significance was discovered (Licence Refs: 06D042, 06R076).

Further north, monitoring associated with the Limerick Main Drainage Scheme resulted in the discovery and excavation of a probable hearth within the townland of Kilquane (AH 29), although this site is located just outside of the Study Area.

10.4.4 Areas of Archaeological Potential

Areas of Archaeological Potential (AAP) can be defined as parts of the landscape that possess the potential to contain archaeological remains due to the presence of topographic features such as rivers, lakes, high defendable ground and bog. River and lakes are a focus for human habitation due to the obvious transport and food resources. They (along with bogs) also have the potential to preserve organic archaeological deposits or artefacts such as wood or leather, which do not usually survive within the alkaline conditions associated with terrestrial archaeology. Wooden track ways dating to the Bronze Age period and later have been excavated within bog land throughout Ireland. Rivers and lakes may have also played a role in prehistoric ritual, as significant artefacts from the prehistoric periods and into the early medieval period, are often found within river bed deposits.

The largest Area of Archaeological Potential within the Study Area is the River Shannon. The second largest water way is formed by the River Blackwater, although a significant portion of this was impacted upon by the construction of the Errina Canal in the late 18th century. There are also numerous smaller waterways throughout the Study Area. These should be also be considered as possessing archaeological potential.

10.5 Architectural Heritage

10.5.1 Architectural Background

The National Inventory of Architectural Heritage survey has now been completed for County Clare and County Limerick. A total of 19 NIAH structures are located in or within the immediate vicinity of the Study Area. Of these, ten are listed as country houses, showing that this type of architectural heritage is most common within the hinterlands of Limerick City. This is a common feature of large towns and cities, where the landed gentry established a country seat that was within easy reach of urban centres. Other buildings include three churches, a power station, three mills a bridge and a vernacular cottage.

There are 31 protected structures located within the Study Area, along with a further seven proposed protected structures as listed within the Draft Clare County Development Plan (2011-2016). Of the total of 38 structures, ten of these are listed as country houses, whilst five are classed as bridges. The remainder consist of three churches, two schools, a railway station, canal lock, memorial, mill, toll house, cottage and a power station.

The largest of the country houses is Mountshannon, which is listed as a protected structure (BH 19), included within the RMP (AH 16) and listed within the NIAH survey. It once possessed a substantial demesne landscape that was the largest in the area. The house, which is now an impressive ruin, was built in c. 1790 by the Fitz Gibbon family and was subsequently enlarged c. 1813 to the design of Lewis Wyatt for John Fitz Gibbon, first Earl of Clare and Lord Chancellor of Ireland. The NIAH survey (2010) notes that the remains of the imposing two-storey Ionic portico, which dates from this period of construction, constitutes a notable example of the neo-classical style. The house was burnt down in 1921 although retains demesne related structures such as the walled garden, gate lodges and an icehouse which later became a mausoleum. The mausoleum is also a protected structure.

Another large house located on the edge of the Study Area is Woodstown House, which is now used as a nursing home. The original demesne accompanying the house has been truncated by the Limerick Relief Road. This house is a protected structure along with its gate lodge (BH 22) and both structures are included within the NIAH survey. The house was built by the Bannatyne family on the site of the earlier Mulkear House and is a notable example of mid to late 19th century domestic architecture (NIAH survey 2010).

To the west of Woodstown is Plassy House (BH 27), which although still extant, is now located within the campus of Limerick University. The main house is located to the south of the Study Area and is a protected structure as well as being included within the NIAH survey. The house is also located within an Architectural Conservation Area, as designated by the Castletroy Local Area Plan (2009). Plassy House, a notable example of a Georgian villa style country house, was rebuilt in the Italianate style. Originally the estate was owned by Robert Clive who renamed it Plassey after his victory in India. He later became Lord Clive of Plassey. The Russell

family extended it in the 1860s with the work purportedly carried out by the architect William Fogarty (NIAH Survey 2010).

The largest of the extant houses in the constraint area within County Clare is Quinsborough House (BH 1). This is a protected structure and is included within the NIAH survey. The house was built in c. 1765 and extended and renovated in c. 1850 (NIAH Survey 1997).

From the mid to late 19th century, the Anglo-Irish landowning classes began to slowly loose their grip on the thousands of acres of Irish landscape that formed a large part of their estates. The large country house and demesne were often only a small part of the visible wealth possessed by such families and their demise was brought about by a number of factors including The Famine; the loss of a younger generation to the first world war and the fight for independence by the Republicans. The lower classes resented the amount of land that was owned by the Anglo-Irish gentry and in 1922 the Land Commission was established. The purpose of the Commission was to purchase these estates (often for a greatly reduced price) so they could be re-distributed amongst the lower classes. As a result of this, many families became little more than upper class farmers and as a result many left Ireland to return to England. The large houses and demesnes were often left to decay with the houses often demolished for building materials and the demesnes subsumed back into the landscape. At least five country houses were located within the constraint area have now disappeared or are in ruins.

A number of the buildings of architectural merit within the Study Area possess an industrial heritage association. These consist of two bridges that cross the Errina Canal (BH 9, BH 12) and Annabeg Lock (BH 13), which is located close to the confluence of the canal with the River Shannon. These buildings are proposed for protection under the draft Clare County Development Plan and are now included within the NIAH survey. The post medieval historical background of this chapter provides more detail on the Errina Canal.

Further buildings include Plassy Mill (BH 26, AH 1) and the remains of mill buildings within the townland of Prospect (BH 35). The NIAH report for BH 35 states that a mill has been present adjacent to the River Shannon at this location since the 1600s, although the main mill building is no longer extant, with only outbuildings remaining.

The most recent building included within the RPS is the Ardnacrusha Power Station (BH 5) at Ballykeelaun. This was built between 1925 and 1929 and consists of a twelve bay, six storey, Germanic style Hydroelectric Power Station. The structure also possesses a number of outbuildings and wings and is still in operation. It sits across the purpose built Headrace Canal, which is connected to the River Shannon further to the northeast. Plans to harness the Shannon's power were proposed from the mid 19th century onwards, although it seems that cost was always a factor in preventing the work from going ahead. The Irish War of Independence interrupted plans from continuing during the early 1920s. However, in 1924-25 the new Irish Free State's Minister for Industry and Commerce, Patrick McGilligan commissioned the engineer Dr. Thomas McLoughlin to submit proposals. Dr McLoughlin had started working for Siemens-Schuckert, a large German engineering firm in late 1922 and produced a scheme that would cost £5.2m. This caused considerable political controversy as the new state's entire budget in 1925 was £25m, but it was accepted.

The Shannon Scheme was officially opened at Parteen Weir on 22 July 1929. One of the largest engineering projects of its day it subsequently served as a model for large-scale electrification projects worldwide. In 2002 on the 75th anniversary of the

plant, its uniqueness was recognised by the American Institute of Electrical and Electronic Engineers, in partnership with the American Society of Civil Engineers, who marked the facility as an Engineering Milestone of the 20th century. The building is considered to be of national significance within the NIAH survey (1997).

10.5.2 Record of Protected Structures

A review of the County Development Plans for Clare and Limerick has revealed that there are a total of seven protected structures located within County Clare and 24 protected structures within County Limerick. All of these structures are located in or within the immediate vicinity of the Study Area. It should be noted that the draft County Clare Development Plan was also reviewed as this will be published in 2011. This contains a further six proposed protected structures, which have been included as cultural heritage constraints in this Study.

Seven of the structures listed within the County Limerick Development Plan have been listed within one group due to their proximity to one another (BH 28).

All protected structures are subject to statutory protection and should be considered as cultural heritage constraints during the design of the proposed distribution road.

County Clare

BH No.:	RPS No.:	Townland:	Classification:	NGR:	Legal Status:
BH 1	93	Parteen	Quinsborough House	157548/ 160372	RPS
BH 2	166	Parteen	Church	157900/ 160206	RPS
BH 3	92	Parteen	House (Parteen-A-Lax)	157958/ 160219	RPS
BH 4	168	Ballykeelaun	Church	158448/ 160673	RPS
BH 5	311	Ballykeelaun	Power Station	158614/ 161734	RPS
BH 6	84	Ballykeelaun	Former National School	158402/ 160826	RPS
BH 7	226 (proposed)	Castlebank	Country House	158065/ 161395	RPS
BH 8	94 (proposed)	Blackwater	Blackwater Bridge	159415/ 162427	RPS
BH 9	211 (proposed)	Mountcatherine/ Springfield	Wooden Bridge	161914/ 161697	RPS
BH 10	143	Cloon	Church	162352/ 163357	RPS
BH 11	225 (proposed)	Parteen	Post box	158348/ 160546	RPS
BH 12	210 (proposed)	Gilloge/Garraun	Gilloge Bridge	161369/ 159523	RPS
BH 13	209 (proposed)	Garraun	Annabeg Lock	160888/ 158823	RPS

County Limerick

BH No.:	RPS No.:	Townland:	Classification:	NGR:	Legal Status:
BH 14	130	Ballynacourty	Railway Station	166021/ 159871	RPS
BH 15	227	Carrowkeel	Roadside memorial	Exact location unknown	RPS
BH 16	457	Ballynacourty	Country House	165669/ 160195	RPS
BH 17	546	Mountshannon	Lodge	165410/ 158896	RPS
BH 18	545	Newgarden South	County House	165643/ 159603	RPS
BH 19	609/610	Mountshannon	County House (& mausoleum)	165034/ 159063	RPS
BH 20	663	Richhill	Country House	165551/ 158483	RPS
BH 21	664	Richhill	School	165447/ 158905	RPS
BH 22	748	Woodstown	County House	164665/ 157463	RPS
BH 23	1597	Rivers/ Ballyvollane	Foot Bridge	163184/ 158905	RPS
BH 24	1598	Castletroy	Tower House	162790/ 158607	RPS
BH 25	1599	Sreelane	Plassy Bridge	160818/ 158560	RPS
BH 26	1600	Sreelane	Plassy Mills	160818/ 158560	RPS
BH 27	1601/1602	Sreelane	County House (& lodge)	161433/ 158243	RPS
BH 28	1608 to 1614	Rivers	Seven buildings in a group including a creamery and mill	164237/ 157567	RPS
BH 29	1628	Reboge Meadows	Toll House	160350/ 157075	RPS
BH 30	1605	Castletroy	Country House	162796/ 157937	RPS
BH 32	1615	Newtown	Cottage	163677/ 157325	RPS

10.5.3 National Inventory of Architectural Heritage

A review of the National Inventory of Architectural Heritage revealed a total of six structures within the Study Area that are located within County Clare. A total of 13 structures are located within County Limerick. All of the structures listed within County Clare are also protected structures. All but four of the structures listed for County Limerick are protected structures.

Whilst most of the NIAH structures are already protected within the relevant county development plans, four are not included within the RPS. However, they made be

added at a later date and as such should be considered as cultural heritage constraints during the design of the proposed distribution road.

County Clare

BH No.:	NIAH No.:	Townland:	Classification:	NGR:	RPS
BH 1	20406302	Parteen	Quinsborough House	157548/ 160372	Yes
BH 2	20406304	Parteen	Church	157900/ 160206	Yes
BH 3	20406303	Parteen	House (Parteen-A-Lax)	157958/ 160219	Yes
BH 4	20406301	Ballykeelaun	Church	158448/ 160673	Yes
BH 5	20405308	Ballykeelaun	Power station	158614/ 161734	Yes
BH 10	20405301	Cloon	Church	162352/ 163357	Yes

County Limerick

BH No.:	NIAH No.:	Townland:	Classification:	NGR:	RPS
BH 19	21900617 & 618	Mountshannon	Country House (and mausoleum)	165034/ 159063	Yes
BH 20	21900620	Richhill	Country House	165551/ 158483	Yes
BH 22	21900604 & 0606	Woodstown	County House (and lodge)	164665/ 157463	Yes
BH 25	21900503	Sreelane	Plassy Bridge	160818/ 158560	Yes
BH 26	21900504	Sreelane	Plassy Mills	160818/ 158560	Yes
BH 27	21900505	Sreelane	County House	161433/ 158243	Yes
BH 28	21900605	Rivers	Mill		Yes
BH 30	21900610	Castletroy	Country House	162796/ 157937	Yes
BH 31	21900502	Ballygrennan	Country House	156001/ 159816	No
BH 32	21900607	Newtown	Cottage	163677/ 157325	Yes
BH 33	21900619	Garraunkee	House	164857/ 157859	No
BH 34	21900601	Prospect	Mill	164075/ 161199	No
BH 35	21900602	Prospect	County House	164371/ 160829	No

10.5.4 Demesne Landscapes

The first edition Ordnance Survey maps of County Clare and Limerick, which date to 1842 and 1844, show the extent of demesne landscapes within the Study Area, as shaded portions of land (Refer to **Drawings CS-1001 to CS-1003 in Volume 2**). Whilst the landscapes themselves are not subject to specific statutory protection, if associated with a house that is a protected structure, they may contain associated curtilage features such as gate lodges, stables buildings, walled gardens, follies or elaborate entrances. As such, demesne landscapes should be considered as heritage constraints. In some instances the original ornamental landscape has been subsumed back into the landscape or has been subject to radical change due to development.

A review of the first edition OS map indicates that a demesne landscape was associated with the following country houses:

- Woodtown House (BH 22, extant)
- Mount Shannon (BH 19, extant but in ruins)
- Rich Hill (BH 20, extant)
- Prospect House (BH 33, extant but in ruins)
- Belle Isle House (extant)
- Newtown House (no longer extant)
- Mount Catherine (extant)
- Rosmadd (extant)
- Castletroy (extant)
- Roselawn (no longer extant)
- Annagrove House (extant)
- Castlepark (BH 31, extant
- Quinaborough House (BH 1, extant)
- Ballycannan House (no longer extant)
- Whitehall (extant)
- Ruanard House (extant)
- Plassy House (BH 27, extant)
- Landscape House (extant)

It should be noted that the above analysis is desk based and proper field inspection would be required to assess the nature and extent of those houses and former demesnes that are extant.

10.5.5 Architectural Conservation Area

There is one Architectural Conservation Area partially located within the Study Area. This is designated within the Castletroy Local Areas Plan (2009). It consists parts of the townlands of Sreelane, Dromore and Castletroy. A small section of the eastern part and western part of the ACA is located within the Study Area. There are a total of six protected structures located within the ACA with a further 28 located in the remainder of the boundaries of the LAP. Structures of note within the ACA are Plassy Mill (BH 26, AH 1), Plassy Bridge (BH 25) and Plassy House (BH 27). Today the ACA is dominated by the campus associated with the University of Limerick.

The Castletroy LAP defines an ACA as a place, area or group of structures or townscapes, which are of special architectural, historical, archaeological, artistic, cultural, social, scientific or technical interest. It goes on to state that:

> *It is felt that the designation of an Architectural Conservation Area in and around the University Campus is necessary to secure the appreciation of the setting of the existing protected structures and the buildings of high architectural quality constructed since the University's foundation.*

The objective in establishing the Architectural Conservation Area has been to:

- *Safeguard the parklands associated with Plassey House in order for the evolved university complex to retain significant tree cover, green areas and vistas down to the River Shannon;*
- *Safeguard views out from, or in towards, the University's principal buildings;*
- *Safeguard elements associated with the historical evolution of the site such as waterways and water control mechanisms such as sluices or pumps;*
- *Ensure that the University's setting and amenities are safeguarded from unauthorised works and insensitive developments;*
- *Allow the University to develop on the left bank of the River Shannon in a sensitive and strategic manner without compromising the site's significance.*

The ACA should be considered as an important cultural heritage constraint during the design process of the proposed distribution road.

10.6 Summary and Conclusions

The purpose of this Study is to provide an analysis of the archaeological, architectural and cultural heritage resource within the defined Study Area in order to inform the design of the proposed Limerick Northern Distribution Road. The Study Area is located within the Counties of Limerick and Clare. The study has shown that there is a large archaeological resource within the area and a substantial amount of built heritage sites. The sites and areas listed within this Study and marked on the accompanying figures should be considered as constraints during the design process.

The study has been carried out in accordance with the NRA Guidelines for the Assessment of Archaeological and Built Heritage Impacts of National Road Schemes (2005).

The constraint area is located to the north and northeast of Limerick City. Whilst suburban development dominates the eastern part of the Study Area, much of the remaining landscape is characterised by scattered housing developments and agricultural activity. A total of 53 RMP sites of varying dates are listed within the Study Area indicating a continuance of activity and settlement in the region. A substantial number of these sites can be ascribed to the early medieval period, with enclosures (possible ringforts) dominating. There are also a number of Anglo-Norman (medieval and later medieval) sites indicating a steady continuance of settlement despite the changes in the political and demographic make-up of the area.

Whist there are no National Monuments in state ownership or guardianship within the Study Area, one recorded ringfort is further protected by a Preservation Order (AH 24). All recorded archaeological sites (AH sites) should be considered as cultural heritage constraints during the design of the proposed distribution road and avoided where possible.

A survey of the Excavations Bulletin (1970-2007) has revealed the nature of some of the recent excavations that have taken place within the Study Area. The majority of these have been as a result of the development of the road networks within the eastern part of the Study Area. A number of sites have been discovered as a result of pipeline schemes. Many of the excavations that yielded archaeological evidence have since been added to the RMP record.

The River Shannon passes through the Study Area. This is a significant feature of archaeological potential, which although not subject to statutory protection under the National Monuments Act, should be considered as a cultural heritage constraint. Whilst it is likely that the proposed distribution road will have to cross the River Shannon, the impact on the river should be minimised where possible.

An analysis of the built heritage within the area has provided a holistic view of the built heritage resource, with the later years of the post medieval period well illustrated by the presence of a substantial number of country houses, bridges and churches. Structures that are architecturally and socially important are listed as protected within the development plans and NIAH for Counties Clare and Limerick. These receive statutory protection that helps to ensure their preservation for the future. A total of 38 protected structures (including seven proposed) are located in or within the immediate vicinity of the Study Area. The NIAH survey has been completed for both Clare and Limerick and this contains 19 structures of architectural merit. Four of these structures are not listed within the RPS, whilst the remaining 15 are included. All protected structures and NIAH structures should be considered as cultural heritage constraints during the design of the proposed distribution road and avoided where possible.

A total of 18 former demesne landscapes have been identified within the Study Area. Some of these still retain their principal building, whilst others have been subject to large scale development resulting in the loss of the main house. However, the presence of these landscapes should be considered as cultural heritage constraints during the design of the proposed distribution road. It should be noted that analysis undertaken to date is desk based and field inspection will be required to assess the surviving nature and extent of the demesne landscapes within the Study Area.

There is one Architectural Conservation Area within the immediate vicinity of the Study Area. A small section of the eastern and western part in located within the Study Area. This ACA provides protection to the University of Limerick campus in order to prevent inappropriate development in the area and to preserve the setting of the existing protected structures. The ACA should be considered as a cultural heritage constraint during the design of the proposed distribution road and avoided if possible.

10.7 References

Bennett, I (ed). 1987-2007. *Excavations: Summary Accounts of Archaeological Excavations in Ireland*. Bray: Wordwell.

Brindley, A.L & Lanting, J. N 1990 *The Dating of Fulachta Fiadh* In Buckley, V 1990 *Burnt Offerings: International Contributions to Burnt Mound Archaeology* Wordwell: Dublin
Byrne, F. J 1973 *Irish Kings and High Kings* London

Castletroy Local Area Plan (2009)
Clare County Development Plan (2005-2011)

Department of Arts, Heritage, Gaeltacht and the Islands. 1999a. *Framework and Principles for the Protection of the Archaeological Heritage*. Dublin: Government Publications Office.

Department of Environment, Heritage and Local Government – the Heritage Service.

RMP and Sites and Monuments Record, Counties Louth, Monaghan and Cavan.

Draft Clare County Development Plan (2011-2017)

Environmental Protection Agency. 2003a *Advice Notes on Current Practice (in the preparation of Environmental Impact Statements)*. Dublin: Government Publications Office.

Environmental Protection Agency. 2003b *Draft Guidelines on the Information to be Contained in Environmental Impact Statements*. Dublin: Dublin: Government Publications Office.

Harbison, P. 1992 *Guide to the National and Historic Monuments of Ireland*. Dublin: Gill and Macmillan.

Institute of Field Archaeologists. 2001 *Standards and Guidance for Archaeological Desk-based Assessments.* Manchester: IFA.

Lee, D. 1997. *Remembering Limerick.* Limerick.

Lenihan, M 1866 *Limerick and its History and Antiquities, Ecclesiastical, Civil and Military from the Earliest Ages, with Copious Historical, Archaeological, Topographical and Genealogical Notes.* Dublin: Hodges and Sons

Limerick County Development Plan (2010-2016)

National Monument Section, Department of Environment, Heritage and Local Government. *Sites and Monuments Record*, County Clare and Limerick

National Road Authority Guidelines for the Assessment of Archaeological Heritage and Architectural Impacts of National Roads Scheme (2005)

O'Rahilly, C. 1988. "Recent Research in Limerick City " in (ed. Cooney, G.) *Archaeology Ireland, Vol 2, no. 4.* Bray.

Ronan, S, Egan, U & E, Byrne 2009 *Archaeological Inventory of County Cork, Volume 5* Dublin: The Stationary Office

South Clare Local Area Plan (2009-2015)

Spellissy, S 1998 *The History of Limerick City.* The Celtic Bookshop, Limerick.

Stout, G & Stout, M 1997 'Early Landscapes: from Prehistory to Plantation' In Aalen, F.H.A et al (eds) 1997 *Atlas of the Irish Rural Landscape* Cork University Press

Stout, M. 1997. *The Irish Ringfort*. Dublin: Four Courts

Waddell, J. 1998. *The Prehistoric Archaeology of Ireland*. Galway: Galway University Press.

Cartographic Sources

Ordnance Survey. *Map Editions 1842- 1844*

Electronic Sources

www.excavations.ie - Summary publication of every archaeological excavation that has taken place in Ireland (1970-2007), edited by Isabel Bennett.

www.archaeology.ie - DoEHLG website listing all SMR sites with aerial photographs, Database of archaeological sites known to the National Monuments Service

www.buildingsofireland.ie – DoEHLG website listing NIAH architectural and garden surveys. County Clare (1997), County Limerick (2010)

11.0 LANDSCAPE AND VISUAL ANALYSIS

11.1 Introduction

The landscape is the visible environment in its entirety, comprised of both natural and built elements including topography, water bodies, vegetation, wildlife habitats, open spaces, buildings and structures.

The purpose of this chapter is to examine the existing landscape and highlight any potential landscape and visual impacts of the proposed scheme at an early stage. The potential impacts identified during the Constraints Study will be taken into account during the route selection and design process with measures implemented to minimise perceived negative impact.

Landscape and visual impact assessment are assessed as two discreet topics. Landscape impact assessment is concerned with the alteration to the physical landscape which may give rise to changes in its character, how it is experienced and the ascribed value of the landscape.

Visual impact assessment is concerned with changes that arise in the overall effect on the area's visual amenity. Visual change is the alteration to a view; visual impact is the assessment of the significance of that change.

11.2 Receiving Environment

11.2.1 General Description

The Study Area primarily encompasses the south eastern extent of County Clare and a small area of northern County Limerick (Refer **Drawing CS–201 in Volume 2**). It extends from Knockalisheen in the west to Annacotty in the east. Watercourses, both natural and man-made, strongly dominate the area. The Lower River Shannon gently weaves its way through the Study Area before entering Shannon Estuary immediately west of Limerick, while the Headrace Canal and the Tailrace Canal divide the Study Area running from the north-east to the south-west corner of the Study Area.

The lands contained within the Study Area are primarily low lying, relatively flat floodplain pasture with strong hedgerows and treelines evident throughout (Refer **Photo 11.1**). Linear woodland is another significant landscape element occurring alongside the multiple streams which dissect the area.

To the north-west and above Knockalisheen the floodplains rise sharply forming the hills of Ballycar South (255m) and Woodcock Hill (310m). Bogland and conifer plantation is prominent on these hill tops.

The road network throughout the area is primarily minor and forms only a weak landscape element. In terms of landscape, transport impact is more evident in the form of the Errina and Headrace canals (Refer **Photo 11.2**).

The urban landscape is overpowered by the proximity of the area to Limerick City. However within the Study Area it can be described in terms of small clusters with substantial ribbon development linking neighbouring villages.

Photo 11.1: Typical low-lying floodplain pasture with treelines

Photo 11.2: Headrace Canal

11.2.2 Landscape Character Assessment

The "Landscape Character Assessment of County Clare" provides an analysis of the character, value, and sensitivity of landscapes identified within County Clare. The Study Area lies primarily within Landscape Character Area 9 '*River Shannon Farmlands'* as defined by County Clare's Landscape Assessment (Refer **Plate 11.3**). A small area is also included within Landscape Character Area 8 '*Sliabh Bernagh Uplands'*.

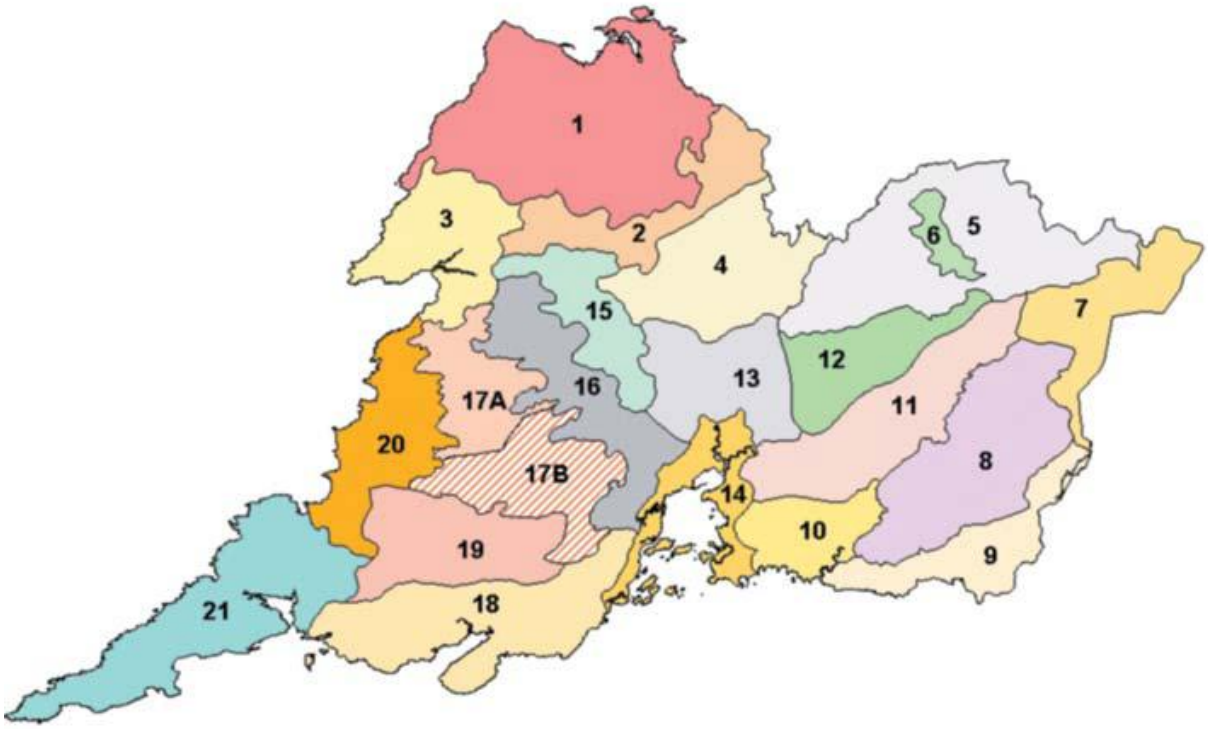

Plate 11.3: Landscape Character Areas

River Shannon Farmlands

The key characteristics of the River Shannon Floodplains Landscape Character Area are defined as:

- Lowland farming with meandering River Shannon providing key focus;
- Small settlements/villages;
- Well maintained agricultural/rural landscape

The area is described as "a largely rural landscape with fields usually enclosed by hedgerows, hedgebanks and trees. This helps create an intimate, well wooded landscape." The forces for change within the area are primarily development pressure from the expansion of Limerick City and the associated residential pressures on all the Study Area villages

Road upgrades are noted as a force for change, however the density of hedgerows, treelines and woodland copses make it possible to absorb new development into the landscape with minimal impact.

Sliabh Bernagh Uplands

The Slieve Bernagh Uplands extend south west to encompass Cratloe village and Woodcock Hill. The north westerly element of the Study Area is contained within this character area.

The key characteristic in this instance are rolling hills with minimal, scattered settlement and vegetation which is dominated by heather moorland with plantation forests and semi-natural woodland on the lower slopes and along watercourses.

The isolated and inaccessible nature of this landscape makes it visually vulnerable to inappropriate development, with minor access roads on hill tops to communication masts being noted as significant. A road on the lower slopes of this area will be widely visible and is likely to be considered as a significant landscape and visual impact.

11.3 Landscape Planning Policy

The following designations and associated policies are considered as landscape constraints as they have been formally recognised, by the planning authority, within the relevant Development Plans. Cognisance of these designations must therefore be borne in mind throughout the route selection exercise.

Clare County Development Plan 2009 – 2015

The Clare County Development Plan recognises that the landscape is unique and valuable while also being dynamic. It is identified that the policies seeking to preserve its character must also recognise and value the changes that result from management of the land and the development of the local economy and community.

The primary policy relates to the recognition of the differing sensitivities and absorptive capacities of different landscapes. To that end the Development Plan has designated areas as Vulnerable Landscapes which are protected by restrictive planning policy such as ***CDP 46***:

"In areas identified as being vulnerable landscapes the Planning Authority will only normally permit proposals for development of the highest quality in terms of siting and design and where the development will not adversely impact to a significant extent upon the character, integrity or uniformity of the landscape."

The hills to the north west of the Study Area are contained within a Vulnerable Landscape (Refer **Drawing CS – 1101 in Volume 2**).

South Clare Local Area Plan 2009 – 2015

The South Clare Local Area Plan recognises that the capacity of the landscape to absorb development is influenced by its natural and built features and that local elements of the landscape, such as woodlands, hedgerows and stone walls, make a significant contribution to the appearance and character of the local environment.

The South Clare Local Area Plan contains a number of landscape planning policies which need to be considered during the route selection exercise. These include:

Policy ENV7 Landscape Conservation

Proposals for development outside of defined settlement areas will only be considered when it can clearly be demonstrated that:

a) There will be no negative effects on the character of the landscape;
b) The proposed development will conserve and enhance the subject landscape through the incorporation of a high standard of site layout, design and building materials. In the case of proposals for residential development outside of built-up areas, regard must be had to the County Clare Rural House Design Guide and Landscape Characterisation Assessment; and
c) There will be no negative effects on the environment and/or Natura 2000 sites.

Policy ENV8 Retention, Protection and Enhancement of Landscape Features

Proposals for development will be considered where it can be clearly demonstrated that the development will retain, protect, maintain and where necessary enhance the appearance and character of existing local landscape features, in particular native trees, hedgerows, shelter belts and stone walls.

Policy ENV9 Protection of Vulnerable Landscapes

The Vulnerable Landscapes are areas that are considered visually vulnerable. The Vulnerable Landscape designation, therefore, seeks to protect views of the sea, prominent high ground and skylines, the character and uniformity of upland areas, etc; and as such views from public roads and footways are considered important.

Therefore proposals for development must clearly demonstrate that:

a) It will not detract from or adversely affect the character, integrity or uniformity of the landscape when viewed from either a close proximity or the surrounding areas;
b) The highest standards of site selection, site layout, design and building materials have been incorporated to conserve and enhance the landscape character;
c) The landscape is able to satisfactorily absorb new development; and
d) There will be no negative effects on the environment and/or Natura 2000 sites.

Limerick County Development Plan 2005 - 2011

The element of the Study Area which lies within the administrative jurisdiction of Limerick County Council is included within the Landscape Character Area defined as the *Shannon Integrated Coastal Zone Management.* This characterisation recognises the importance of a hedgerow dominated landscape.

The County Development Plan also lists a number of protected Scenic Views and Prospects. It is considered that the location of the Study Area ensures that there will be no impact on any of these.

Policy ENV6 Landscaping and Development

It is the Policy of the Council to ensure the adequate integration of development into the landscape by the retention of trees and landscape features and / or encouraging suitable planting.

Castletroy Local Area Plan 2009 – 2015

The south eastern element of the Study Area lies within the Castletroy Local Area Plan. Within this local plan there is a general appreciation of the important contribution of landscape features to the character of Castletroy's urban area and rural fringe. It is a policy of the Council to preserve, maintain and incorporate into new development proposals where appropriate the existing stands of mature trees and field boundaries which contribute to the overall character of both the built up and as yet undeveloped areas of Castletroy.

Within this plan there is also a Land-use zoning classified as 'Groody Valley Green Wedge' (Refer **Drawing CS-804 in Volume 2**).The purpose of this zoning objective is to preserve and protect the Groody Valley Green Wedge from development in order to maintain its importance in preventing the coalition of built up areas of Limerick City and suburbs and to retain its important role as a wildlife corridor and a flood risk management zone.

11.4 Conclusion

This desktop review has revealed that the proposed Limerick Northern Distributor Road will have a potential primary impact on the low lying farmland of the River Shannon Floodplains Landscape Character Area. It is considered that this landscape is robust enough to be capable of absorbing the proposed road provided the route is sensitively planned and uses the existing landforms and tree-lines to conceal the road from views from the hills to the north.

Throughout the planning and development of the route cognisance will have to be had to the landscape designations and the requirements of the landscape planning policies. With respect to potential landscape and visual impact the selection of the River Shannon crossing and the design of the bridge require careful consideration.

12.0 NOISE AND VIBRATION

12.1 Introduction

There are currently no Irish standards or limits governing the assessment of noise and/or vibration associated with either new or existing roads. The NRA Guidelines for the Treatment of Noise and Vibration in National Road Schemes lays down the procedures to be followed during the planning, design and implementation of national road schemes.

Under the guideline the specific objective of the noise input to the Constraints Study is to identify any receptors that may be deemed to be particularly sensitive to noise and/or vibration. Identifying the potential receptors at this stage in the process allows them to be taken into account in the route selection and design process such as to avoid or minimise adverse impact on sensitive receptors.

This input is based upon a site visit undertaken on the 9th November 2010 and a desk top review of the available OS mapping, overhead aerial photography and development plans.

12.2 The Receiving Environment

The prevailing noise climate of the Study Area is typically rural. The predominant noise sources throughout the Study Area include road traffic from the existing road network, especially from the M7 to the east of the Study Area, agricultural activity and the industrial activity ongoing at the technology park. The larger urban centres such as the urban fringes of Limerick City and the towns of Annacotty, Parteen and Ardnacrusha have a higher noise climate due to the nature of activity going on and the traffic within them.

Large employment zones such as that at the National Technology Park and the associated Industrial Estate will create greater noise levels through the nature of the industries and operations contained therein and through the number of employees and associated traffic movements.

An exercise has been undertaken to identify sensitive receptors within the Study Area. These include schools, churches, community and amenity facilities, sports clubs etc. In the majority of instances these sensitive receptors are located in proximity to urban areas or clusters such as at Meelick and thereby in locations which would by their nature be difficult to locate a route corridor.

In addition many of the local roads are quite densely developed with residential ribbon development. Where these are accumulated into recognisable clusters these have been mapped as sensitive receptors. Due to their rural nature these properties will be sensitive to minor increases in background noise levels.

12.3 Potential Mitigation Measures

At the Constraints Study stage, it is necessary to consider the location of the sensitive noise receptors so that throughout the Route Selection process the requirement to avoid them where feasible and minimise the impact on them in the second can be considered and weighted. This is done by routing of potential route corridors in areas where, in the first instance there are no sensitive receptors. The second option available is to use the existing topography and other natural features to hide the route from the sensitive receptors.

With respect to the proposed Limerick Northern Distributor Road the landform is dominated by the relatively flat Lower River Shannon floodplains. This topography will only provide limited screening and so natural features such as treelines and woodlands are important in a noise context. Other noise abatement solutions include the provision of noise bunds or barriers where no alternative is feasible. Finally the provisions of a low noise surfacing may reduce the noise levels by between 3 and 5 decibels (dB).

13.0 AIR QUALITY

13.1 Introduction

Pollutant emissions from road traffic may cause health and environmental impacts at both the local and national/international level. In order to reduce the risk to human and environmental health from poor air quality, National and European statutory bodies have set limit values in ambient air for a range of pollutants.

The National Roads Authority *Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes* lays down the procedures to be followed, with respect to air quality assessment, during the planning, design and implementation of national road schemes.

With respect to the Constraints study the primary objective as outlined in the Guidelines is to characterise the existing air quality in the area and to identify sensitive receptor locations. Sensitive receptor locations will include all areas where members of the public are likely to be regularly present, ie residential housing, schools, hospitals, etc. Identifying the sensitive receptors at this stage in the process allows them to be taken into account in the route selection and design process.

This input is based upon a site visit undertaken on the 9th November 2010 and a desk top review of the available OS mapping, overhead aerial photography and development plans.

13.2 The Receiving Environment

Air quality monitoring programs have been undertaken in recent years by the EPA and Local Authorities. The EPA website provides both monitoring data and the results of previous air quality assessments. In terms of air monitoring and assessment Limerick is categorised as Zone C (specified population centres with greater than 15 000 inhabitants) and non-urban areas are categorised as Zone D.

Air quality in Ireland is generally of a high standard across the country due to prevailing Atlantic airflows, relatively few large cities and the lack of widespread heavy industries. However, levels of particulate matter and nitrogen dioxide remain of concern. Traffic is the primary source of nitrogen dioxide and is also one of the main sources of particulate matter.

EPA Report "Air Quality in Ireland 2009" shows that with respect to all monitored pollutants the air quality in all Zones C and D is good (considerably below set limit values).

This is corroborated by the Air Quality Assessment undertaken as part the Environmental Impact Assessment for the Coonagh to Knockalisheen Distributor Road scheme (published June 2010) which found confirmed the air quality to be good. This proposed scheme is present on the western border of the Study Area (Refer **Drawing CS-201 in Volume 2**) and as such the air quality findings for this scheme can be considered to be indicative of the receiving environment of the Limerick Northern Distributor Route.

The following statement from the Coonagh to Knockalisheen EIS highlights this finding:

"...average NO_2 concentrations measured over the one month period were all well below the national and EU annual limit value, reaching at most 13% of this value."

The only significant industrial zone within proximity of the Study Area relates to the National Technology Centre and associated industrial park located to the south east. The Ardnacrusha hydroelectric power station does not impact air quality.

An exercise has been undertaken to identify sensitive receptors within the Study Area, these include the many churches, schools and community facilities. In the majority of instances these sensitive receptors are located in proximity to urban areas or residential clusters and thereby in locations which would by their nature be difficult to locate a route corridor.

A review of all live planning permissions is included in Chapter 8 of this Study and shown on **Drawings CS-805 to 807**.

13.3 Potential Mitigation Measures

At operation stage mitigation measures to reduce air quality are generally very limited. Therefore, at the Constraints Study stage it is necessary to consider air quality so that throughout the Route Selection process the requirement to avoid the sensitive receptors can be considered and weighted. Where feasible, this is achieved by routing of the potential route corridors away from the sensitive receptors.

14.0 SUMMARY AND CONCLUSION

The Constraints Study has resulted in the identification of the nature and extent of significant constraints within a defined Study Area during the initial step in the Route Selection Process for Phase 2 of the Limerick Northern Distributor Road.

The proposed scheme will provide a northern distributor road around Limerick City, improving accessibility to the City from County Clare and relieving pressure on the existing river crossings in the City Centre. The road will provide significant improvement in connectivity between different areas along the northern fringe of the City, allowing people living in residential areas to the east of Limerick to access employment areas in the west of Limerick and vice versa. This will reduce traffic flows in the city centre and facilitate public transport initiatives.

The Study Area is dominated by the Lower River Shannon and its significant floodplains, with the associated topography being relatively flat. In terms of engineering the major constraints relate to the crossing of the Lower River Shannon and the requirement to cross either the Ardnacrusha Headrace Canal or Tailrace Canal. As a result of the presence of the Ardnacrusha Power Station there are also 110kv overhead power lines originating from the power station and running throughout the Study Area.

In terms of geology, hydrology and hydrogeology the primary constraints relate to the extensive area of land subject to flooding, the high water table, areas of soft ground (including peat, alluvium and estuarine silt/clay) and the presence of multiple surface water features.

The Lower River Shannon candidate Special Area of Conservation, which includes Knockalisheen Marsh, is an important ecological constraint. The significance of crossing an area designated as Special Area of Conservation has been highlighted. In addition a number of further ecological sites, identified by previous studies, have been mapped.

A wealth of recorded sites, monuments and protected structures are present within the Study Area. The presence of the River Shannon and a high number of demesne landscapes highlight that the Study Area is of high archaeological potential.

With respect to Landscape the Study Area is predominantly within the low lying farmland of the River Shannon Floodplains Landscape Character Area. It is considered that this landscape is robust enough to be capable of absorbing the proposed road provided the route is sensitively planned and uses the existing landforms and tree-lines to conceal the road from views from the hills to the north.

This Study documents and maps these constraints which are 'work in progress' and subject to change/refinement as of the Route Selection Process continues. In light of some of the constraints identified which exist within the Study Area, surveys and data collection will be ongoing throughout the route selection stage and beyond. Similarly, further consultations with the public and with statutory consultees, such as NPWS, are imperative if an agreed route corridor is to be attained.

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Appendix A

Constraints Study – Key Consultees

CONSTRAINTS STUDY – KEY CONSULTEES

CONSULTEE
University of Limerick
Shannon Development
IDA Ireland
The Irish Farmers Association
Office of Public Works (OPW)
Eircom
Waterways Ireland
Electricity Supply Board (ESB)
ESB networks
Bord Gáis
Bus Éireann
National Parks and Wildlife Service (NPWS)
Environmental Protection Agency (EPA)
Department of Environment Heritage and Local Government
Inland Fisheries Ireland
Clare County Council
Limerick County Council
An Taisce - The National Trust
Road Safety Authority