Shannon Bridge Crossing Feasibility Study and Preliminary Report

Constraints Study Report

RPS-MCOS Ltd.
Innishmore
Ballincollig
Co. Cork
Tel: +353 (0) 21 487 0200
Fax: +353 (0) 21 487 3742

May 2005

CONSTRAINTS STUDY REPORT

Contents

APPENDICES

Appendix A: Questionnaire & Information Leaflet

Appendix B: Site Synopses

Appendix C: Scientific Names

Appendix D: Figures

TABLES

Figures

Refer to Appendix D.

1. EXECUTIVE SUMMARY

The purpose of the Shannon Bridge Crossing project is to link the R525, R466 or R494 with the R463 via a new bridge across the River Shannon in the vicinity of Killaloe/Ballina and O'Briensbridge/Montpelier to improve the flow of traffic on the existing road network and to alleviate traffic congestion on the existing bridges.

The traffic problems within the Study Area are best demonstrated at the narrow and historic Killaloe Bridge crossing over the River Shannon, which links the towns of Killaloe and Ballina. This Bridge has a 4.95 m wide carriageway, which is shared by both vehicles and pedestrians. The Bridge is only just wide enough to allow two cars to pass each other. Traffic flow is often reduced to 'one way' as a result of HGV's and other large vehicles crossing the bridge. As a result traffic on the approaches becomes congested and delayed at peak times.

A similar situation occurs on the two bridges at O'Briensbridge/Montpelier approximately 6kms south of Killaloe/Ballina. The bridge over the headrace canal is 5.0m wide with a segregated footpath on one side. The bridge over the River Shannon is 4.65 m wide with no footpaths. Again traffic on the approaches becomes congested and delayed at peak times.

The purpose of this Report is to map all the identified constraints within the Study Area that might impact on choosing potential routes for the Shannon Bridge Crossing. This data collection is focussed on determining what constraints (physical, procedural, legal, environmental, etc.) exist that could affect the **design** of the scheme, that could delay the **progress** of the scheme, and that could influence the **cost** of the scheme.

The constraints noted in this section have been identified as being of primary importance for the route selection of the Shannon Bridge Crossing project.

The primary constraints are identified to be the following:

Environmental Constraints

The Study Area overlaps three designated sites: Lower River Shannon candidate Special Area of Conservation (cSAC); Lough Derg (Shannon) Special Protection Area (SPA) and Lough Derg proposed Natural Heritage Area (pNHA). These sites collectively, are known to hold a number of habitats and species listed for protection under the EU Habitats Directive; the EU Birds Directive; The Wildlife Act (1976); The Wildlife (Amendment) Act (2000) and the Flora (Protection) Order (1999). Protected species and habitats are also known to occur outside of these designated sites in the vicinity of the Study Area.

National Parks and Wildlife Service of the Department of Environment, Heritage and Local Government, the statutory authority responsible for implementation of nature conservation legislation have provided recommendations and comments which have been addressed in this report, and have requested that consultation with their staff regarding the project should continue throughout the project.

The Study Area as a whole, and the River Shannon and its associated marginal habitats in particular, are considered to be environmentally sensitive, and of relatively high conservation value in a national context.

The River Shannon is an important fishery, the main fish of commercial and amenity value within the Study Area are salmon, pike, perch, bream, brown trout, eels and various coarse fish hybrids. There are also ranges of coarse fish species, which are part of the biodiversity of the area.

Given the importance of the Shannon River, with respect to angling and tourism, and other rivers within the Study Area, for several fish species, including salmon, trout and eel, it is likely that seasonal restrictions on in-stream works, or other mitigating measures to reduce temporary impacts on fish and fisheries may be prescribed.

The Shannon Regional Fisheries Board are the authority responsible for conservation, management and development of inland fisheries and sea angling resources of the Shannon catchment and much of the Mid-West. They have provided recommendations and comments, which have been incorporated into this report, and have requested that consultation with their staff regarding the project should continue throughout the project.

Physical Constraints

- **Existing Road Infrastructure,** in particular the N7 (Dublin – Limerick), R494 (Birdhill – Ballina – Portroe - Nenagh), R463 (Limerick – Killaloe – Scariff) and R466 (Birdhill – O'Briensbridge), which are likely to be impacted by the proposed scheme. These are busy routes, and the short-term construction disruptions and long term junction needs must be carefully considered.

- **Proposed Road Infrastructure**, in particular the N7 Nenagh to Limerick High Quality Dual-carriageway, with its associated junction at Birdhill.

- Existing **Landuse**, in particular the built-up areas of Killaloe, Ballina, O'Briensbridge, Montpelier and Birdhill.

- Existing **Utilities,** in particular water, sewage, power and telecommunications apparatus.

- ESBI have indicated that a minimum lateral clearance of 35m must be maintained from the centre line of the high voltage Transmission Line at Moys.

- The River Shannon and associated headrace canal and flood embankments are major constraints. The width of the river at possible crossing locations will affect the length of the bridge, which will have a bearing on the cost and the viability of the scheme.

Landscape and Visual Constraints

- The proposed bridge will act as new a focal point for the selected area, altering the perception of the landscape.

- A range of landscape character types are found within the Study Area, each type having a different capacity to absorb the development of a new large scale structure spanning the width of the river.

- The concentration of short, medium, and long-range visual receptors varies between regions of high and low population densities, within the Study Area.

These constraints in addition to other constraints within the broad categories above, and other constraints relating to cultural heritage, archaeology, leisure, recreation and general environmental factors have been identified in this study.

Potential routes will be examined as part of the Route Selection process having regard to these constraints and bearing in mind the need to mitigate adverse impact as far as possible.

2. INTRODUCTION

2.1 Overview of Proposed Scheme

The Shannon Bridge Crossing Scheme will consist of a river crossing of the Shannon, with associated approach roads and junctions as required, to improve the flow of traffic on the existing road network.

This Scheme will link the R463 regional road (Limerick to Scariff via Killaloe) to the west of the Study Area with one of the following regional roads to the east of the Study Area: -

- R466 (O'Briensbridge – Birdhill)
- R494 (Birdhill – Ballina – Portroe – Nenagh)
- R525 (Castleconnell – O'Briensbridge)

The R463, R466, R494 and R525 can be seen on Figure 2.1, Location Plan and Figure 2.2, Study Area.

The existing N7, National Primary Road (Dublin – Limerick) passes through the southeastern corner of the Study Area. The proposed N7 Nenagh to Limerick High Quality Dual Carriageway can be seen on Figure 2.2 just south of the Study Area.

Clare County Council (the Client), acting on behalf of Limerick County Council, North Tipperary County Council and themselves, has engaged the services of RPS-MCOS Ltd. to undertake a feasibility study for the crossing consisting of the following: -

- Constraints Study – this Constraints Study Report is the culmination of this stage
- Route Selection – a Route Selection Report evaluating feasible routes and crossing locations
- Preliminary Design – Preliminary Design Report providing sufficient design information to allow the CPO process to proceed,

Timeframe for the above stages is expected to be as follows: -

- Constraints Study Report – May 2005
- Route Selection Report – August 2005
- Preliminary Design Report – November 2005

2.2 Study Area

Broadly, the Study Area encompasses an area bounded by Killaloe and Ballina to the North, Birdhill to the East and O'Briensbridge to the South as indicated in Figure 2.2. This Study Area is believed to contain all likely route corridors. The drawings attached to this Constraints Report split this Study Area into 6 sections as indicated on the key plan, for convenience of mapping.

The River Shannon flows through the Study Area from north to south. The width of the channel varies considerably within the Study Area.

2.3 Purpose of Report

The purpose of this Report is to identify all the appropriate constraints within the Study Area that might impact on choosing potential routes for the Shannon River Crossing scheme. This data collection is focussed on determining what constraints (physical, procedural, legal, environmental, etc.) exist that could affect the **design** of the scheme, that could delay the **progress** of the scheme, and that could influence the **cost** of the scheme.

2.4 Public Information Sessions

The guidelines for national road schemes are laid out in the National Roads Project Management Guidelines, which was published by the NRA in March 2000. Even though this scheme does not involve national roads, these guidelines shall generally be followed where appropriate. The guidelines include for a Public Information session prior to issuing of the Constraints Report. A public information session, which included a briefing session for Public Representatives was held at the Kincora Hotel in Killaloe on 19th April 2005 between the hours of 2:00pm and 8:00pm.

Each person attending was asked to 'sign in' and was given an Information Leaflet and Questionnaire. Copies of the Information Leaflet and the Questionnaire are included in Appendix A.

The following maps were put on display: -

- Location Plan (A1)
- Study Area (A1)
- Orthophotography (A0)
- Designated Areas and Archaeological Sites (A1)
- Community and Business Activities (A1)
- Flooding and Drainage (A1)
- General Information

During the course of the day 36 members of the general public signed in, and a presentation was made to 13 Public Representatives. The closing date for receipt of completed questionnaires was 26th April 2005. A total of 27 completed questionnaires were received on or before this date.

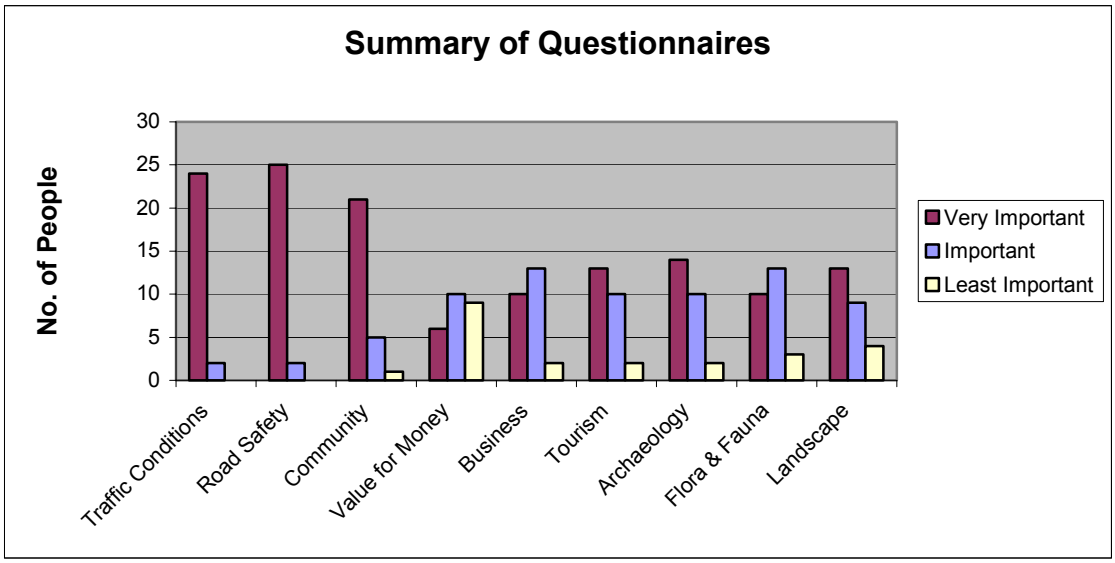
Question 3 of the questionnaire asked "*Are you in favour of the proposed bridge crossing?*". 24 people answered 'yes', 2 answered that it 'depends on location' and 1 replied 'no'.

Question 4 of the questionnaire asked "*Would you be a regular user of a new bridge crossing?*". 22 people answered 'yes', 3 answered that it 'depends on location' and 2 replied 'no'.

Question 8 of the questionnaire asked *"In your opinion, how important to this project are the following": -*

- Improvement in traffic conditions
- Improvement in road safety
- Impact on community near crossing
- Best value for money
- Effect on business
- Effect on tourism
- Conservation of archaeology
- Conservation of flora and fauna
- Impact on landscape

A summary of the responses given to question 8 can be seen on the chart below.



The questionnaire also enabled correspondents to provide comments in relation to the proposed scheme.

Some of the more important comments/concerns expressed on the questionnaires are as follows: -

- The vast majority agreed with the need for a new crossing.
- Some expressed concern that a bypass of Killaloe did not seem to be part of the current plan.
- Some suggested that the new crossing and the associated road network should be linked to the proposed N7.
- Some expressed their concern of the damage caused to the old bridges, particularly the historic Killaloe/Ballina Bridge, as a consequence of traffic volumes and HGV traffic crossing the bridge.
- When asked which features the public would like to be avoided, many suggested archaeological and historic features, the widest part of the Shannon, the weir, Inishlosky Island and the Clarisford area.
- Weight restrictions should be imposed on the existing two bridges once the new bridge is open to traffic.

In addition to the completed questionnaires mentioned above a number of submissions were also received from the following groups/individuals: -

- Lough Derg Science Group
- O'Briensbridge/Montpelier Environmental Protection Group
- Mark D. Pollard
- Janet Gooberman
- Ailbe McDonnell
- Brian Byrne
- John Lefroy
- Brian Brislane

A summary of the issues raised and sentiments expressed is as follows: -

Lough Derg Science Group

- Bypass of Killaloe should be considered
- Does traffic study take account of seasonal traffic and long-term projections?
- EIS should be undertaken
- Appropriate air draught for boat traffic should be taken into account
- Bridge should take account of special landscape and heritage value of Ballina/Killaloe
- Tunnel option should be considered

O'Briensbridge/Montpelier Environmental Protection Group

- Consider provision of two bridges
- If only a single crossing it should contain a link to the N7 and also a bypass of Killaloe
- Introduce a permit system to control HGV traffic on both of the existing bridges

Mark D. Pollard

- A new bridge would be of no use without new roads and road improvements in order to by-pass Killaloe
- New bridge will be detrimental to the appearance, amenity and character of the towns and their immediate surroundings
- HGV's should be banned from using Killaloe/Ballina Bridge between 7:30am – 9:30am and 3:30pm – 7:30pm.
- Dedicated pathway should be attached to the side of the bridge
- Approaches to Killaloe/Ballina Bridge should be splayed and widened

Janet Gooberman

- Previous survey carried out by student from DCU should be consulted

Ailbe McDonnell

- Manage the existing situation
  - Provide a new walkway
  - Limit access by large vehicles
  - Manage local traffic
- Build a new bridge as part of a National Plan
- Heritage and tourism potential could be lost if bridge too close to town

Brian Byrne

- Ballina/Killaloe is a High Amenity location
- Land on Tipperary side of Lower Lough Derg is designated as a candidate Special Area of Conservation
- Traffic flows could be improved by
  - Introduction of weight restrictions
  - Introduction of peak-period restriction for HGV's
  - Provision of a dedicated pedestrian boardwalk
  - Provision of traffic lights
  - Increased exit radius at each bridgehead
  - Restricting parking on approach roads

John Lefroy

- No possibility of locating bridge to the north of Killaloe/Ballina for environmental and aesthetic reasons
- Provision of a causeway through the flood-plain should be considered

Brian Brislane

- Weight restriction should be considered for HGV's

Original copies of the completed questionnaires and submissions received during the Constraints Study phase of the project can be viewed at the offices of Clare County Council. The opinions expressed will be taken into consideration during the Route Selection phase of the project.

2.5 Bodies Consulted

During the course of this Constraints Study a number of different bodies were consulted, as follows: -

- Clare County Council – Conservation Officer, Heritage Officer, Planning Department, Sanitary Services Department
- North Tipperary County Council – Heritage Officer, Planning Department, Sanitary Services Department
- Limerick County Council – Conservation Officer, Heritage Officer, County Archaeologist, Planning Department, Sanitary Services Department
- Office of Public Works (OPW)
- Shannon Regional Fisheries Board
- Waterways Ireland
- ESB (Networks)

- ESB (Ardnacrusha)
- ESB (Fisheries)
- ESB International (ESBI)
- Eircom
- Bord Gáis
- Shannon Development
- Iarnród Éireann
- Department of Environment, Heritage and Local Government – National Parks and Wildlife Service (NPWS), National Monuments Service
- Geological Society of Ireland (GSI)

3 PROJECT DESCRIPTION AND CONTEXT

3.1 Purpose of the Project

The purpose of the project is to provide a new crossing via a bridge across the River Shannon to link the regional road R463 on the west side of the Shannon to the regional roads R525/R494/R466 on the east side in the vicinity of Killaloe/Ballina and O'Briensbridge/Montpelier. Refer to the Study Area shown on Figure 2.2.

There are two existing river crossings in the Study Area, one at Killaloe/Ballina and the other at O'Briensbridge/Montpelier. The next alternative to the north is at Portumna, at the north end of Lough Derg, and the next alternative crossing to the south is at Limerick. The existing bridges thus carry a large volume of through traffic, particularly HCV's, as well as local traffic.

There are a number of quarries located in the vicinity of the Study Area, resulting in a steady flow of HCV's across the existing bridges.

Traffic circulation around Killaloe and Ballina is restricted as all of the radial routes to the town converge at the single river crossing at the Killaloe Bridge. As a result severe congestion occurs on all approaches to the Bridge especially at peak times. The bridge at Killaloe/Ballina is an historic, long masonry arch structure with a width of only 4.95 metres, which is inadequate for two-way traffic, and has no separate provision for pedestrians who use the same narrow carriageway. This severely limits the capacity of the bridge, which has become grossly deficient, and is unsatisfactory for pedestrians. A pedestrian/cyclist survey undertaken for the Killaloe Bridge Widening Environmental Impact Statement (Michael Punch & Partners May 2000) showed that 748 pedestrians and 8 cyclists used the bridge in a 12-hour period (7am – 7pm on Thursday 9th of March 2000). It is expected that the construction of a new river crossing will alleviate a large proportion of this congestion by providing for the through traffic, particularly heavy goods vehicles.

The crossing at O'Briensbridge consists of two bridges, one over the Shannon and the other over the adjacent Ardnacrusha headrace. The Shannon Bridge is also an historic masonry arch structure with a width of only 4.65 metres, which does not allow for two-way traffic, and has no separate provision for pedestrians. The headrace bridge was constructed around 1930 and has a width of 5.0 metres with a separate pedestrian walkway. While this bridge width permits limited two-way traffic, the carriageway is very narrow for the current traffic volumes, and a sharp crest curve on the bridge obstructs visibility along its length.

The following sections outline documents relevant to the development of a new crossing, in some of which the problems with the existing crossings have been referred to or described.

Headrace Bridge at O'Briensbridge

3.2 The National Spatial Strategy (2002 – 2020)

The proposed scheme is consistent with Section 4.5 of the National Spatial Strategy (2002 – 2020), which provides for the development of the mid-west region (Clare, Limerick and North Tipperary). This section reads as follows: -

"Limerick-Shannon will be supported by Ennis as a hub, ……Other towns and rural areas should be supported in developing complimentary roles which avail of the spin-off benefits which the performance of the Limerick-Shannon gateway will bring to the region".

> *"Villages and Rural Areas*
>
> *In aiming to achieve a greater spread of economic and spatial development, it is possible to identify the following broad areas of opportunity in the Mid West.*
>
> *The success of established tourism areas, such as those along the coast of Clare and the Lough Derg area, can be sustained through effective management and the sustainable development of assets such as the natural and cultural heritage".*

3.3 County Development Plans

The Shannon Bridge Crossing – Feasibility Study and Preliminary Design scheme is being undertaken by Clare County Council on behalf of Limerick County Council, North Tipperary County Council and themselves. There are development plans available for each Local Authority, as follows: -

Clare County Development Plan (1999)
Draft Clare County Development Plan (2005 – 2011)
Limerick County Development Plan (2005)
North Tipperary County Development Plan (2004)

The Clare County Development Plan is augmented by the **East Clare Draft Local Area Plan (2004)** and the **South Clare Economic Corridor Local Area Plan 2003**.

3.3.1 Clare County Development Plans

3.3.1.1 Clare County Development Plan (1999)

The Clare County Development Plan (1999) does not make specific reference to the proposed scheme.

The proposed scheme is consistent with the general development objectives of the Draft Clare County Development Plan (2005-2011). The vision statement states that: -

> *"There will be a safe, efficient and comfortable network of roads organised in an appropriate hierarchy in order to ensure safe passage throughout the county for those on foot and in vehicles."*

Reference to a Shannon River Crossing in the vicinity of Killaloe/Ballina and O'Briensbridge/Montpelier, is made in the Draft County Development Plan, as being one of a number of schemes which are of fundamental importance to the development of the county.

The following is an extract from the Draft Clare County Development Plan (2005 - 2011): -

> *"B Settlement Strategy*
>
> *Killaloe/Ballina*
>
> *3.13 Killaloe is a small town with significant appeal for development because of its proximity to Limerick and location on one of the few crossings of the River Shannon. The limitations on growth because of the town's historic settlement pattern and infrastructure deficiency have encouraged the rapid growth of the village of Ballina on the eastern bank of the river in County Tipperary. The historic importance of the abbey town of Killaloe and its location at the southern end of Lough Derg are major visitor attractions.*
>
> *3.15 The need to conserve the historic core of Killaloe and the rise of land to Slieve Bernagh to the west of the town means that the town will not be able to sustain significant levels of growth. The linking of the town with its neighbour offers an opportunity to develop a quality settlement capable of capitalising on a diverse tourism product mixing cultural and historic assets and high quality landscape and recreational facilities. The limitations of the river crossing offer opportunities for a close association between the two towns not inhibited by significant traffic growth.*

C Infrastructure

3.7 Road Transport

Strategic Policies

3.7.7 The Planning Authority have identified the following key network elements as necessary to achieve the objectives of the Plan:

i) Shannon River Crossing – Killaloe/O'Briensbridge"

3.3.1.2 East Clare Draft Local Area Plan (2004)

The proposed scheme is consistent with the general development principles of the East Clare Draft Local Area Plan. The following are extracts from the Plan: -

"3 Development Strategy

6 To make provision for the growth of tourism in the East Clare area by promoting the unique natural, built and cultural heritage of the Plan area, in particular the network of loughs, villages towns and walkways."

The Plan makes specific reference to the proposed scheme as follows: -

"11 Transportation and Movement

31 The linked settlements of Killaloe/Ballina have their own issues. They are linked by a long narrow bridge over the River Shannon. There is no separation between pedestrians and vehicles which results in considerable traffic congestion. It is particularly difficult for large vehicles as they are unable to pass other vehicles and experience difficulty negotiating the acute turn at the Killaloe end. Regular damage occurs at this point to the parapets. The bridge is a protected structure and cannot be widened or improved to accommodate present traffic requirements. The Limerick Planning, Land Use and Transportation Study (2001) recommends a fourth crossing of the River Shannon in the Limerick environs and a joint venture by Clare, North Tipperary and Limerick County Councils has been established to address traffic congestion on both Killaloe and O'Briensbridge bridges by investigating the practicalities of a new bridge crossing in these environs and its implications on the wider area. It is the objective of the County Council to safeguard the route of a new river crossing in the vicinity of Killaloe."

Part B: Settlement Plans
"Killaloe/Ballina

Planning Background
Killaloe and Ballina have suffered for a number of years from traffic congestion on the old bridge. The PLUTS recommends a fourth crossing of the Shannon in the Limerick environs and a joint venture by Clare, North Tipperary and Limerick County Councils has been established to address traffic congestion on both Killaloe and O'Briensbridge bridges by investigating the practicalities of a new bridge crossing in these environs and its implications on the wider area. The formulation of these findings will affect zoning and the development of the bridge will have a significant impact on the traffic flow in the area."

"Objectives

6. To resolve traffic management issues and facilitate any proposals to alleviate congestion on Killaloe Bridge and town centre."

"Policies and Proposals
T1: Route of New Bridge Crossing.
The Council will reserve a route corridor as identified on the settlement map, to provide for a future bridge crossing of the Shannon in order to alleviate traffic congestion on the old bridge. Proposals for development that will prevent the development of the bridge and associated roads will not be permitted."

3.3.1.3 South Clare Economic Corridor Local Area Plan (2003)

The South Clare Economic Corridor Local Area Plan (2003) sets out an overall strategy for the proper planning and sustainable development of an area defined by Clare County Council as the 'South Clare Economic Development Corridor'. The proposed scheme is consistent with the general principles and specific objectives of the Plan.

The following are extracts from the Plan: -

"2.2 Regional Framework

2.2.1 The regional strategic study, Limerick Planning Land Use Transportation Study (PLUTS) sets out a strategic (25 year) framework for landuse and transportation for Limerick and its environs, including the entire South Clare Economic Corridor.

2.2.4 The PLUTS also recommends a northern relief road utilising the route of the R471 between Newmarket-on-Fergus (N18), Sixmilebridge and O'Briensbridge to improve traffic movement and accessibility to the north of Limerick City. However a new or upgraded crossing of the River Shannon will be required to form an appropriate link to the N7 at Birdhill within Limerick County."

Settlement Boundaries and Plans
"O'BRIENSBRIDGE

Policies and Proposals

Transportation

Transportation and traffic safety is a critical issue in O'Briensbridge. There are few footways through the village. Noticeably lacking is a footway leading up to or on the bridge, yet there is reasonable pedestrian demand for such.

O'Briens bridge itself is only 4.5 metres wide wall to wall, with one-way vehicular flow only (although not controlled) and no provision for pedestrians. There is heavy traffic movement through the village including high HGV flow, which impacts on local roads and most critically the bridge.

T1 – Road Safety
The Council will in consultation with Limerick County Council investigate road safety

improvements within the village and on the approach roads in order to facilitate the safe and free flow of vehicular and pedestrian movement and which may include the following: -

- *Provision of clear and unambiguous carriageway markings and associated signage indicating directional priorities at the bridge and other main junctions. Said proposal shall include the implementation of a one-way traffic system at the triangulated junction at the northern side of the bridge indicating traffic priority;*
- *Provision of footpath on the bridge for pedestrian users extending to Montpelier."*

3.3.2 North Tipperary County Development Plan (2004)

The proposed scheme is consistent with the general development principles of the North Tipperary County Development Plan, which includes the following extract: -

"Policy ENV 38: Lough Derg
It is the policy of the Council to facilitate improvements in tourist facilities around the lake, provided that such facilities:

(a) protect and enhance the visual amenities of the lake and foreshore;
(b) do not lead to an increase in traffic or access problems; and
(c) can be serviced through existing or proposed services and infrastructure."

In addition, the following specific reference is included in the Plan: -

"7.4.4 Specific Road Improvement Objectives

2. To provide a new bridge over the lower Shannon between Ballina and O'Briensbridge to replace the inadequate bridges at both locations.
To link this new bridge to the regional and national road network and in particular the proposed N7 dual carriageway/motorway."

3.3.3 Limerick County Development Plan (2005)

The proposed scheme is consistent with the general development principles of the Limerick County Development Plan (2005), although the plan makes no specific reference to the proposed scheme. The Plan refers to the Montpelier Local Area Plan (2002-2008) which includes the following: -

"Roads and Traffic
The issue of traffic movement and vehicular and pedestrian traffic safety is an important one for Montpelier. There is heavy vehicular traffic movement through the settlement and a particularly high flow of HGV vehicles, which impacts on the roads and, most critically, the bridge connecting Montpelier with O'Briensbridge. The bridge is too narrow (at 4.5 metres) to cater for the current levels of vehicular and pedestrian traffic using it.
Plan Policies
The Council is concerned to improve the traffic safety and general pedestrian

environment within Montpelier and on the approaches to the village. In particular, the issue of improvements to facilitate movements across O'Brien's Bridge is important given the dependence of Montpelier on the settlement of O'Briensbridge across the river. The Council will investigate various options to improve pedestrian and vehicle movement on the bridge."

3.3.4 North Tipperary Western Area Plan (2005)

North Tipperary County Council is currently preparing a Western Area Plan. This plan is in draft form and is due to be put on public display in May/June 2005. Specific reference will be made in this Plan to Ballina, to the need for the new crossing and to this Constraints Study Report.

3.4 Previous Studies

3.4.1 Ballina/Killaloe Traffic Management Strategy (2003)

The Ballina/Killaloe Traffic Management Strategy (2003) (JB Barry & Partners) made extensive reference to the existing crossings and their associated problems. The following are extracts from that report: -

4.2 "Key Issues

- *The need to provide a new bridge over the River Shannon, or to upgrade the existing one.*

6.3.3 Long Term Bridge Strategy

…... the introduction of traffic signals at either end of the Killaloe Bridge can alleviate some of the problems currently experienced with traffic operations along the Bridge. However, in the longer-term, as future demand to cross the river increases (resulting from development pressure and regional traffic growth) demand will eventually exceed the capacity of the signals. It will therefore be necessary to adopt a Bridge Strategy for the longer-term.

New Bridge Downstream

Consistent with previous studies, the proposal to construct a new river crossing downstream of the existing Killaloe Bridge with a bypass to the southwest of Killaloe is considered the best long-term strategy. A new bridge downstream is considered best for the following reasons: -

- *There are suitable locations downstream where a new bridge crossing would not be constrained by the width of the river or the associated land topography;*
- *It would provide a strategic link between the National Primary N7 route (via the proposed new Birdhill Interchange) and the west;*
- *It would reduce a significant volume of 'through' traffic from Ballina and Killaloe and therefore reduce a lot of pressure currently placed on the approaches to the existing bridge; and*
- *It would cater for additional development planned along the corridor between Limerick and the twin towns."*

The document makes relevant reference to the following earlier reports: -

Killaloe Ballina Action Plan (1969) containing, inter alia, the following recommendation: -

> *A new bridge be constructed across the River Shannon at some stage in the future. The suggested best alignment was downstream between the Temple Hallow River and the entrance to Clarisford Estate.*

Killaloe Ballina Theme Town Study (1989) containing, inter alia, the following recommendation: -

> *Examine the viability of a new road bridge.*

Ballina Strategic Development Study (1997) containing, inter alia, the following recommendation: -

> *Improvement work to the Killaloe Bridge be given high priority, whilst maintaining the visual quality and integrity of the existing structure.*

3.4.2 Feasibility Report on Bridge Widening (1996)

The Feasibility Report on Bridge Widening (1996) (Michael Punch & Partners) considered the issues relevant to a possible widening of the existing Killaloe/Ballina Bridge. Widening of the existing bridge has subsequently been ruled out by Clare & North Tipperary County Councils for reasons which include the bridge being a protected structure.

3.4.3 Killaloe Bridge Widening: Environmental Impact Assessment (2000)

Killaloe Bridge Widening: Environmental Impact Assessment (2000) (Michael Punch & Partners) considered the environmental impact relevant to three alternative options to increase the capacity of the bridge. The options considered were: -

1. New stand alone footbridge adjacent to the existing bridge,
2. New bridge c. 1.1 km downstream of the existing bridge accommodating two way traffic and pedestrians, and,
3. New bridge adjacent downstream to the existing bridge, accommodating one way traffic and pedestrians, which would act in conjunction with the existing bridge.

The EIS concluded that from a cultural heritage point of view, option 2 was clearly most advantageous. The preferred location of this crossing point was just north of the Clarisford Estate.

3.5 Legislation and Regulation

3.5.1 Irish and EU Legislation

The proposed scheme will be subject to the provisions of the **Roads Act (1993)** and the **Planning and Development Act (2000)**. An EIS on the proposed scheme will be required.

A summary of Irish and EU legislation relevant to Protected Areas and Habitats is included in Section 6 below.

3.5.2 Funding

The funding for the project is being procured from the EU co-financed specific improvement grant scheme.

4 TRAFFIC SURVEYS AND ACCIDENT DATA

4.1 Introduction

This section summarises the traffic surveys and provide a preliminary analysis of the dataset obtained. The data will subsequently be used in the next phase of the study to produce the SATURN traffic model that will be used to test various route options for an additional crossing of the River Shannon in the proximity of Killaloe/Ballina and O'Briensbridge/Montpelier.
Included is a summary of the traffic surveys undertaken together with a brief review of the study area road network.

A comprehensive programme of surveys was undertaken in order to build the data set required as input to the base year traffic model.

All surveys were undertaken in March 2005 during periods when traffic conditions would be considered normal. Surveys undertaken, together with a brief summary of the results are presented below.

Number plate matching surveys were undertaken at all cordon points to the Study Area, as shown in Figure 4.1, and listed as follows: -

1 R463 at Craglea
2 R494 in vicinity of Newtown Bridge
3 N7 at Carrigatogher
4 R503 at Derrygareen
5 N7 at Lisnagry (north of R503)
6 R463 north of junction with R471
7 R466 at Bridgetown
8 Killaloe/Ballina Bridge (not a cordon point but included as a data check)

Video cameras were located at all survey points between the hours of 08:00 to 18:00, and the registration numbers of all vehicles passing through each location by time and direction were recorded. This period covers the AM and PM peak hours which were established to be 08:30 to 09:30 and 17:00 to 18:00 from the junction count surveys (as described below).

Number plate recognition and matching software was then used to trace vehicle trips through the network resulting in a comprehensive picture of all through traffic movements in the area.

The five most popular origins and destinations for daily trips passing through the study area derived from the number plate matching surveys are shown in Figure 4.2 for all vehicle categories. The main points to note are: -

- Some 1,450 trips were observed during the 10-hour period crossing the river Shannon, passing straight through the study area, and may therefore be considered cross River Shannon through trips. **It should be noted that these numbers do not include shorter local cross River Shannon trips.** These local or "internal study area trips" will be estimated during the traffic forecasting and modeling element of the next phase of the study.
- The main desire lines for cross River Shannon through trips are between the N7 north (site 3) and the R463 north (site 1), and between the N7 south (site 5) and the R463 north (site 1), with a total of 370 trips and 360 trips observed during the 10-hour period respectively.

- Other popular desire lines through the study area exist between the N7 north (site 3) and the R463 south (site 6, 280 trips), and between the N7 south (site 5) and the R463 south (site 6) and the R466 (site 7) with a combined demand of 440 trips.

Junction count surveys were undertaken at all locations shown in Figure 4.3 and listed below: -

1 R463/ Killaloe/Ballina Bridge (west)
2 R464 /Killaloe/Ballina Bridge (east)
3 R496/R494
4 N7/R499
5 N7/R496
6 N7/R494
7 N7/R466
8 R466/R525
9 R463/R466
10 N7/R525
11 R503/R504

All junction counts were undertaken during the AM (07:00 to 10:00) and PM (16:00 to 19:00) peak periods. Observed link flows are shown separately for "all vehicles" and "HCV's only" for the AM and PM peak hours (observed to be 08:30 to 09:30 and 17:00 to 18:00) in Figures 4.4 to 4.7.

The figures show that: -

- In terms of cross River Shannon trips the PM peak hour was observed to be the busier of the two, with flows observed to be 6% higher than the AM peak.

- Of the 2 existing crossing points on the River Shannon, the Killaloe/Ballina Bridge is the busier, providing for 603 2-way movements during the AM peak hour compared to 432 movements on the O'Briensbridge/Montpelier crossing during the same period. The PM peak hour was observed to be busier than the AM peak with 644 and 453 movements crossing the Killaloe/Ballina and O'Briensbridge/Montpelier bridges respectively,

- Of the regional roads in the study area, the busiest are the R494 just north and south of the Killaloe/Ballina Bridge, providing for 670 – 680 2-way movements during the critical PM peak hour, followed by the R463 south of O'Briensbridge which provides for 484 2-way movements during the PM peak hour.

A preliminary review of the survey data would suggest that the majority of the existing trips across the bridges in the study area are short local trips. This view is based on the fact that while 1,097 total trips were observed crossing the bridges during the PM peak hour alone (from the junction count surveys), a total of just 1,600 trips were observed crossing the River Shannon and passing straight through the Study Area during a 10 hour period (from the number plate matching surveys).

A comparison of peak hour flows on the Killaloe/Ballina Bridge from 2001 and 2005 show that AM peak hour flows have increased by an average of 3.5% per annum (530 in 2001 rising to 608 vehicles in 2005) while flows during the PM peak hour have increased by an average of 5% per annum (520 in 2001 rising to 632 vehicles in 2005).

An additional traffic survey was undertaken on the Bank Holiday Monday, 2nd May 2005, in order to establish the absolute peak traffic and pedestrian demand across the existing bridges. The surveys were undertaken between 14:00 and 16:00 in order to include both tourist traffic and trips associated with a local hurling match. The results revealed that during the peak hour on a Bank Holiday Monday: -

The maximum 2-way hourly traffic flow across Killaloe/Ballina was observed to be 662 vehicles, just 3% higher that the volume observed crossing during the PM peak hour on an average weekday.

Traffic demand across the O'Briensbridge/Montpelier Bridge is 5% less (428 vehicles compared to 453) than that observed during the PM peak hour on an average weekday.

Pedestrian sample counts were undertaken on the Killaloe/Ballina Bridge in March 2000 as part of the Ballina/Killaloe Traffic Management Strategy and repeated on the Bank Holiday Monday 2nd May 2005. It is interesting to note that an average weekday lunchtime is the period of maximum demand with some 211 2-way trips observed between 12:00 and 13:00 with only 164 movements observed during the Monday Bank Holiday peak hour.

Sample journey time surveys were undertaken during the interpeak period on the cross River Shannon routes, as shown in Figure 4.8, with the survey results provided in Table 4.1.

Table 4.1 Cross River Shannon Journey Times

From	To	Via	Journey time
a) Killaloe	c) Montpelier	Killaloe/Ballina Bridge	16
c) Montpelier	a) Killaloe	Killaloe/Ballina Bridge	15
Average			**15.5**
a) Killaloe	c) Montpelier	O'Briensbridge/Montpelier Bridge	12
c) Montpelier	a) Killaloe	O'Briensbridge/Montpelier Bridge	13
Average			**12.5**
b) Ballina	d) O'Briensbridge	Killaloe/Ballina Bridge	12
d) O'Briensbridge	b) Ballina	Killaloe/Ballina Bridge	12
Average			**12**
b) Ballina	d) O'Briensbridge	O'Briensbridge/Montpelier Bridge	16
d) O'Briensbridge	b) Ballina	O'Briensbridge/Montpelier Bridge	16
Average			**16**

This information will be used to help calibrate the traffic model and clearly shows that the west bank of the Shannon (R463) is the more attractive route compared to the east side (R494 and R466) due to it being shorter in distance between the crossing points (7.9 kms compared to 10.1 kms). Trips on the west bank also do not experience any junction delays while those on the east bank incur delays at the R466/N7 and R494/N7 junctions.

A **Network width survey** was undertaken at all locations shown in Figure 4.9 and listed in Table 4.2. The carriageway widths will be used to estimate links capacities throughout the network for traffic modeling purposes during the route selections stage.

Table 4.2 Observed Carriageway Widths

Index	Road	Width	Pavement	Road Markings	Hard Shoulder
1	**R525**	6	No	Yes	No
2	**R525**	5.4	No	No	No
3	**R466**	4.2	No	No	No
4	**R466**	7.1	Both Sides	No	No
5	**R466**	4.3	North Side	Yes	No
6	**R466**	5.9	No	Yes	No
7	**R463**	6.5	No	Yes	No
8	**R463**	6	No	Yes	No
9	**R463**	5.7	No	Yes	No
10	**R463**	5.5	No	Yes	No
11	**R463**	5.9	No	Yes	No
12	**R463**	5.7	No	Yes	No
13	**R463**	5.2	No	Yes	No
14	**R463**	7	Both Sides	Yes	No
15	**Unnamed**	11.4	Both Sides	Yes	No
16	**R463**	4.4	Both Sides	Yes	No
17	**R463**	5.6	Both Sides	No	No
18	**R463**	5.5	Both Sides	Yes	No
19	**R463**	6.1	No	Yes	No
20	**R494**	4.1	No	Yes	No
21	**R494**	8.2	Both Sides	Yes	No
22	**R494**	8.6	East Side	Yes	No
23	**R494**	5.1	No	Yes	No
24	**R494**	5.4	No	Yes	No
25	**R494**	5.4	Yes	Yes	No
26	**R496**	5.4	No	Yes	No
27	**R494**	6.1	No	Yes	No
28	**R494**	5.8	No	Yes	No
29	**R504**	5.5	No	Yes	No
30	**R466**	5.5	No	Yes	No
31	**R466**	4.5	No	Yes	No
32	**R525**	6	East Side	Yes	No

4.2 Constraints on Existing Bridges

The traffic data collected together with site observations highlights the obvious conflict between the capacity of the existing bridges across the River Shannon and the canal in the study area, compared to the traffic demand wishing to use them.
In the case of the Killaloe/Ballina Bridge the following observations were noted: -

"Killaloe Bridge- East Side"

- While the 4.95 metre (wall to wall) carriageway was observed to accommodate two cars passing at low speed, one-way operation is self-enforcing when a medium sized commercial vehicle (or larger) is present.
- Resulting queues for the opposing flow were observed to reach 10 vehicles long with a maximum observed delay of 75 seconds.
- Conditions for pedestrians are hazardous due to the lack of footpaths and narrow carriageway width. As a result the vehicular capacity of the bridge is reduced further during periods of peak pedestrian activity.
- Capacity across the River Shannon is further restricted on the Killaloe side at the junction with the R463, due to narrow carriageways (5.5 to the north, and 4.4 to the south of the bridge) and a lack of formal junction markings.
- Traffic signals are currently being implemented at both of the existing priority junctions at either end of the bridge, formalising an alternating one-way operation and permitting the introduction of a pedestrian footway. This revised layout will be taken into account during the traffic forecasting stage of this study.

Similarly, the following constraints were observed to exist on the river and canal bridge crossings at O'Briensbridge/Montpelier: -

"O'Briensbridge Canal Crossing"

- Similar to the Killaloe/Ballina crossing, both the canal and the river crossings at O'Briensbridge/Montpelier are very narrow, 5.0 metres and 4.65 respectively, with barely sufficient room for two cars to pass.
- The canal crossing has a further disadvantage of the capacity being further reduced due to the lack of visibility caused by severe gradients on the bridge.
- Again there is no provision for pedestrians crossing the river between O'Briensbridge and Montpelier. There is, however, a narrow footway on the north side of the canal crossing. However, the number of pedestrians using these bridges is significantly less than at the Killaloe/Ballina Bridge.
- The severe bend on the R466 just to the north of the river crossing in O'Briensbridge both restricts visibility and capacity.
- The presence of a medium sized HCV requires one-way operation on both crossings with delays of 25 seconds observed during peak periods.

4.3 The Surrounding Road Network

Links
The road network in the study area consists of regional and local roads with the exception of a short section of the N7 National Road on the eastern side of the River Shannon.

All road surfaces were observed to be well maintained with the centre line marked, with the only exceptions being the bridges across the River Shannon and sections of the R525 between O'Briensbridge and Castleconnel, where there are no markings.

The carriageway width at potential crossing points are as follows (refer to Fig. 4.9): -

- South of existing O'Briensbridge crossing – 6.5 metres on the west bank (R463, location 7) and 5.4 metres on the east bank (R466, location 2)
- Just north of O'Briensbridge – 6.0 metres on the west side (R463, location 8) and 4.5 metres on east side (R466, location 31)
- Just south of Killaloe/Ballina – 7.0 metres on the west side (R463, location 14) and 5.4 metres on east side (R494, location 25)
- Just north of Killaloe/Ballina – 6.1 metres on the west side (R463, location 19) and 5.1 metres on east side (R494, location 23)

"Just South of Killaloe/Ballina East Side- 5.5 metres"

From this broad assessment of carriageway widths it is apparent that roads within the Study Area on the west of the River Shannon have slightly greater widths, and therefore capacity, than the parallel route on the east.

Junctions

The critical junctions in the network where performance will be monitored for future year traffic conditions and for various route options are as follows:

- R494/N7 priority junction, Birdhill – Delays for R494 traffic accessing the N7, and for N7 traffic turning right into the N494 towards Ballina, are common. This will likely be remedied with the completion of the new N7 Nenagh to Limerick scheme, which will remove all strategic (long distance) trips from the existing N7.
- N7/ R466 Coosane Road priority junction, Birdhill - Similar to above.

- N7/ N496 (Dunally Line) priority junction – Priority junction with peak hour delays for N496 traffic accessing the N7. This junction will likely be relieved with the completion of the new N7 and associated link into Birdhill.
- R466/R525, 3 priority junctions, O'Briensbridge – No existing problems were observed at this triangle of priority junctions although it will be monitored for future traffic flows.
- R463/R466 Coosane Road crossroads, O'Briensbridge - Some queuing was observed for traffic approaching the R463 from O'Briensbridge due to "platooning" caused by traffic queues formed at the canal bridge. Relief from current HCV volumes will be a priority.
- R463/bridge crossing, Killaloe – This location forms a major pinch point on the network. The operation of this junction requires redesigning and would also benefit from the removal of HCV's. Account will be taken of the traffic management proposals for Killaloe.
- R494/bridge crossing, Ballina – As for above.
- R494/R496 (Dunally Line) priority junction, Ballina – No queues were observed at this location although it will also be monitored for future traffic volumes under future scenarios. It is noted that there are plans by North Tipperary to alter the existing junction layout to improve entry angles and sight lines.

4.4 Additional issues raised in the Constraint Study

In light of the high percentage of HCV's observed in the study area and the resulting impact they clearly have on the local highway network, it is proposed that the methodology set out in the original proposal is refined in order that the impact of HCV's may be more accurately assessed. It is proposed that separate trip matrices will be produced for HCV's and general traffic in order that they may be assigned separately to the road network within the traffic model. This will allow different vehicle types to be assigned different routes, permitting the impact of HCV bans on either of the existing crossings to be assessed, if required.

Of the traffic issues raised during the public consultation held as part of the constraints study, the most frequently raised was that of the need to provide bypasses of Killaloe and Ballina in addition to a new crossing of the river Shannon. Although these issues are not within the study brief the traffic model will be formulated to allow testing of these schemes if and when required.

4.5 Existing Roads Pavement Condition Assessment

4.5.1 R463 – Limerick to Scariff via Killaloe

Road Length: 10km approx. within Study Area

Road Width: 5.5m average

Pavement Condition
In general the pavement condition on this road is good. There are no major structural defects e.g. cracking, potholes, rutting. The ride quality of the road is reduced in sections with a lot of slight depressions. The surfacing also suffers from a large amount of ravelling, where the aggregate and binder has worn away leaving patchy balding of the pavement surface.

Remedial Measures
The approaches to a new junction on this road may require resurfacing to improve the ride quality and to restore skid resistance.

4.5.2 R466 – O'Briensbridge to Birdhill (Coosane Rd.)

Road Length: 4.8km approx. within Study Area

Road Width: 4.6m near O'Briensbridge increasing to 5.2m closer to Birdhill

Pavement Condition
The pavement condition of this road is good. There are small localised sections with some small depressions, small potholes, low severity alligator cracking or ravelling.

Remedial Measures
The pavement may require localised strengthening should the proposed location for a new junction coincide with one of the small weaker sections of the existing pavement

4.5.3 R494 – Birdhill to Nenagh via Ballina and Portroe

Road Length: 4.5km approx. within Study Area

Road Width: 6.2m

Pavement Condition:
The pavement condition of this road is good. There is some ravelling and a lot of small depressions but no obvious signs of major structural defects. The section of road opposite the Business Park is showing some signs of alligator cracking, possibly caused by increased volumes of turning heavy goods vehicles at this location. However as the road approaches the Ballina town centre there are signs of some structural distresses. These are primarily evident in poor quality patching and depressions and cracking associated with these patches.

Remedial measures:
The approaches to a new junction on this road may require resurfacing to improve the ride quality and to restore skid resistance. If the new junction is proposed in the vicinity of the Business Park the section of road at this location will require strengthening.

4.5.4 Other Roads

The other roads in the area are generally local roads which are surface dressed and may require some reconstruction if they were to be incorporated into any scheme providing access to a new River Shannon crossing.

4.6 Rail Network

There is one rail line within the Study Area. This is the Limerick-Dublin via Birdhill joining the main line at Ballybrophy. There are two trains daily from Hueston Station to Limerick (Monday to Saturday incl.) in each direction. The Limerick to Heuston trains depart at 7:00 and 15:00 while the Heuston to Limerick trains depart at 8:30 and 17:30.

The railway line crosses under the road infrastructure at: -

- R466 just east of Birdhill
- R494 about 400m north of its junction with the N7

The railway line can be seen in Figure 2.2.

4.7 Road Traffic Accident Data

The accident information shown in Figure 4.10 has been compiled from National Roads Authority data taken from An Garda Siochana records for the years 1996 to 2002.

During the period 1996 to 2002 there were 38 recorded accidents within the Study Area. Of these 2 were fatal, 5 were serious and 31 were considered minor. 37% (14 no.) of the accidents involved a single vehicle only and 58% (22 no.) involved two vehicles. Pedestrians were involved in 8 accidents, 2 of which were serious.

Figure 4.10 shows that the accident locations are concentrated around the existing bridges in the urban areas, Killaloe/Ballina and O'Briensbridge/Montpelier.

It is difficult to correlate accident figures with causal factors. An accident is a rare, random event where people have failed to cope with a given situation. There are many contributory factors. If a proportion of the through traffic is diverted from the existing river crossings at Killaloe/Ballina and O'Briensbridge/Montpelier to a new River Shannon crossing, the accident rate may decrease in these urban areas.

Table 4.3 below summarises the accident figures within the Study Area for the period 1996 to 2002.

	R463	R466	R494	Total
Fatal	2	0	0	2
Serious	3	1	1	5
Minor	17	4	10	31
Total	22	5	11	38
Pedestrian Involvement	4	2	2	8

Table 4.3: Accident Figures (1996 – 2002)

5 PHYSICAL CONSTRAINTS

5.1 Natural Environment

5.1.1 Topography

The proposed crossing will link the regional road R463 on the west side of the Shannon River to the regional roads R525/R466/R494 on the east side. The crossing will therefore include roadworks at each end of the proposed bridge linking in to the regional roads. Contoured topographical plans have been prepared from an Ordnance Survey Digital Terrain Model, with contours derived at 1.0 metre intervals, and plotted to 1:10 000 scale. These plans are included in Appendix D of this report (Figures 5.1 – 5.6). Orthophotography plans have also been included in Appendix D (Figures 5.7 – 5.12).

The land to the west of the Study Area between Killaloe and O'Briensbridge is generally flat to gently undulating. Contours are generally between 30mOD and 60mOD with some local high points around 70m and 80mOD. These high points occur in the southwestern corner of the Study Area in the vicinity of O'Briensbridge and in the northwestern corner of the Study Area to the north of Killaloe.

The land to the east of the Study Area from Ballina to Birdhill and Montpelier is also flat to gently undulating. Contours are generally between 30mOD and 60mOD with some local high points of 100m and 110mOD. These high points occur to the east of the Study Area in the vicinity of Birdhill and in the northeastern corner of the Study Area to the north of Ballina.

The levels shown on the plans, and generally used in this report, are to the current OD at Malin Head. Levels shown on earlier plans, and data supplied by the ESB and Waterways Ireland are to the earlier OD at Poolbeg. For transparency, data supplied to OD Poolbeg has been shown as such, with a corresponding OD Malin Head level. Datum at Malin Head at is approximately +2.7 m OD Poolbeg.

5.1.2 Ardnacrusha Headrace

A crossing in the O'Briensbridge/Montpelier area, south of the headrace weir, would involve a bridge over both the Shannon River and the headrace canal to the Ardnacrusha power station.

Navigation from the lower Shannon River at Limerick is available along the tailrace and headrace canals to the weir at the northern end of the headrace in the Study Area. A double lock at Ardnacrusha power station allows for vessels to bypass the station. A gate at the weir exists to control water entering the headrace from the river, but the ESB have advised that this gate has never been closed, and that it will remain permanently open. The two consequences of this policy are that the water levels in the canal and the river above the weir are always approximately equal, and that navigation from the canal into the river is always available.

Hydrographic records have been obtained from the ESB for the river and headrace canal. The records show that the levels in the river above the weir (and thus the headrace) are

maintained reasonably constant at approximately 33.5 m OD Poolbeg (30.8m OD Malin), with the minima and maxima recorded in the last 50 years being 32.15m OD Poolbeg (29.45m OD Malin) and 33.97m OD Poolbeg (31.27m OD Malin) respectively.
The ESB have advised that they would not favour a crossing of the headrace canal in the stretch immediately south of the weir. At this location, the water level in the canal is above natural ground on both sides of the canal and the integrity of the canal is thus dependent on the integrity of the embankments on each side. They cite a reasonable concern that piling and/or other construction works to the abutments could pose a risk to the integrity of the embankments, which would be a hazard with very serious consequences. This situation however only affects the canal for approximately 500 metres from the weir, to a location just north of Inishlosky Island.

The headrace generally has a constant width of c. 80 metres at water level and c. 100 metres at top of embankment level. There is however a point about 0.65 km downstream of the existing canal bridge at O'Briensbridge where the canal is in a rock cutting and the width between embankments is reduced to about 50 metres. The reduced width and good founding conditions at this location, together with the proximity of the R463 would indicate that the construction cost of a canal bridge at this location would be relatively low. The ESB have indicated a preference for a canal crossing at this location.

The ESB have requested that they approve the technical details of any bridge over the canal.

5.1.3 Shannon River

The Shannon River traverses the Study Area from north to south and is the principal constraint to be considered. The river within the Study Area consists of three distinct sections. The northern section extends from the northern end of the study area (at the south end of Lough Derg) to Moys, which is some 1.5 km south of Killaloe/Ballina Bridge. The mid section, referred to as the basin, extends from Moys to the Parteen Weir, a distance of some 4.5 km. The south section is below the weir and extends from the weir to the south end of the Study Area, a distance of some 3.5 km.

The water level in the northern and mid sections is raised above the natural river level by the presence of the Parteen Weir which was constructed around 1930 for the development of the Ardnacrusha power station. The weir raised the water level in the river by approximately 2.5 to 3 metres. Prior to the construction of the weir, the northern section of the river, which has a relatively steep gradient, was characterised by relatively shallow water which included a number of rapids along this section. To facilitate navigation, a canal was constructed along the west bank of this section of the river, and this canal remains in existence today although it is no longer used for navigation due to the raised water level facilitating navigation in the river. This section has relatively steep banks with the result that despite the increase in the water level, the width of the river generally does not exceed 150 metres, except for the last 0.5 km of the section near Moys, where the width increases to about 250-280 metres. While bathymetric data is not available (see para. 5.1.5 below), it can be expected that the original channel is less than 150 metres wide. A bridge could be constructed across the full width of the river, or a shorter bridge could be constructed over the original channel only, with short approach embankments extending into the river on either side, although this may not be acceptable from an environmental point of view.

The mid section of the river has a relatively flat gradient and was navigable with relatively deep water prior to the construction of the weir. The rise in water level following construction

of the weir increased the width of the river considerably, and the width in this section now varies between 600 and 900 metres. It can be expected however that the width of the original channel again is generally less than 150 metres. The outline of the original channel is shown on Figures 5.16 to 5.21. On each side of the original channel the depth of water will be relatively shallow, probably varying between 0 and 3 metres. A bridge extending over the full width of the river in this section would clearly be a long structure, with a high cost. The cost is likely to be prohibitively high, and might be similar to the cost of providing a crossing both at Killaloe and O'Briensbridge, which would likely offer better value for money. A bridge could be constructed across the original channel only, with approach embankments constructed over the shallow water on each side. This may however not be acceptable from an environmental point of view. The cost of the embankments may also be a reasonably significant fraction of the price of a bridge. These issues would be evaluated at route selection stage.

The southern section of the river, below the weir, is the shallowest and narrowest section of the river, with the width of the river generally less than 100 metres wide. Construction of a bridge over this section is likely to be cheaper than for either of the other sections, but would also involve the construction of a bridge over the headrace canal.

5.1.4 Hydrographic Data

The following relevant historical hydrographic data has been obtained from the ESB at the locations indicated: -

Data	Location
Water levels	Above Killaloe Bridge
	Above Parteen Weir
Flow volume	Lough Derg
	Above Parteen Weir

The data is sufficient for bridge design purposes. This data has not been included as an Appendix due to the volume of information involved.

5.1.5 Bathymetric Data

Bathymetric data is not generally available for the Shannon River bed in the Study Area.

Data is available from the ESB for some of the section between the weir and O'Briensbridge, but where it is available; generally the data only extends from the west bank to the centreline of the river.

Data has been received from ESBI, for the section of the river near the Clarisford Estate, south of Killaloe. Bathymetric data for the inundated basin areas, is also being sought from the Ordnance Survey and the ESB.

Detailed data for the headrace canal is available.

The limited bathymetric data should not be seen as a significant disadvantage at this Constraints Study stage. It is very unlikely that bathymetry would be a critical factor in the

route selection process, given the importance of other constraints, which will affect the selection of a route. Bathymetric data can be surveyed at the route selection stage if it is deemed necessary. It is reasonable to assume that an economically acceptable technical solution will be found to cater for the bathymetry that can be expected. Bathymetry could be a significant constraint affecting cost if embankments across the basin in the mid section of the river were being considered.

5.1.6 Air Draught

Waterways Ireland have advised that it would be desirable to maintain air draught for vessels under a proposed bridge which would not be less than that prevailing at the existing bridges over the canal. This would apply to a new bridge over either the canal, or the river above the weir. They have requested a required bridge soffit level of 39.64 m OD Poolbeg (36.94m OD Malin). This would result in an air draught of 6.14 metres under normal conditions. In the case of the canal this would result in the soffit of the bridge being some 1.8 metres above the top of the embankments which are at 37.8 m OD Poolbeg (36.1m OD Malin).

The existing air draught under the navigation span of the Killaloe Bridge was recorded as 4.0 metres on the 25th April 2005.

Air draught for vessels under a bridge across the river below the weir would not be required as that section of the river is not navigable.

5.1.7 Flooding and Drainage

The principal feature affecting flooding and drainage in the Study Area is the weir. The weir consists of two parts, one across the entrance to the headrace, and the other across the Shannon. As discussed above, the gates at the headrace weir remain permanently open. The water level in the river basin above the weir is thus controlled by discharge permitted over the weir to the river course below. The level in the basin is controlled at approximately 33.5 m OD Poolbeg (30.8 m OD Malin) and while it has dropped as low as 32.15 m (29.45 OD Malin) in the last 50 years, it has not exceeded 33.97 m (31.27 m OD Malin) in the same period. Flooding in the Study Area above the weir resulting from a rise in level of the Shannon River thus will not be expected.

The river basin above the weir is contained by berms on each side of the river. The berms extend upstream of the weir as shown on the Study Area map (Figure 2.2). On the east side, the berm extends for a distance of approximately 3 km and the topography behind the berm is below the level of the Shannon basin over a significant area. This area drains into the Kilmastulla River, which has been diverted from its natural course to flow along behind the berm and discharge into the Shannon immediately downstream of the weir. This low lying area is subject to flooding due to its level in relation to the Shannon River and is shown in Figure 5.13.

On the west side, a similar situation exists but to a lesser extent, where the river basin is contained by a berm extending approximately 0.7 km upstream of the weir. Again, the area regarded as liable to flooding due to its level in relation to the Shannon River and is shown on the plan and is shown in Figure 5.13.

The water level in the river below the weir is variable and is dependent on the discharge from the weir. During flood conditions, the discharge is increased to maintain the level in the basin above the weir, and in the headrace canal, at approximately the target level of 33.5 m OD Poolbeg (30.8 m OD Malin). The area liable to flooding below the weir has been obtained from the ESB for the very extreme 1000-year return period event, and is shown on the plan.

5.2. Community and Business

5.2.1 Community Activities

Police Boundaries

The Study Area is covered by two Garda sub-districts. These are: -

- Killaloe sub-district, served by Killaloe Police Station
- Castleconnell sub-district, served by Castleconnell Police Station

Townlands within each of these sub-districts are as follows: -

- Killaloe sub-district – Shantraud, Clarisford, Killestry, Cloonfadda, Ardcloony, Knockadrohid, Inishlosky, Pollagh, Coolnadornory, Garrynatineel.
- Castleconnell sub-district – Montpelier, Fairyhall.

The route of the Shannon Bridge Crossing may dissect both of these sub-districts. It is therefore important that personnel in these stations are kept informed of possible routes, etc.

Fire Station

Killaloe Fire Station is a 1 Bay Fire Station with a Station Officer a Sub-Station Officer, Driver Mechanic and 7 Retained Firefighters. (Refer to Figure 5.14)

Killaloe Fire Station

Hospitals

There are no hospitals situated within the Study Area.

Schools

There are a number of schools both primary and post primary located within, or immediately adjacent to, the Study Area (Refer to Figure 5.14): -

Primary Schools

- Killaloe Boys National School, Killaloe
- Killaloe Convent of Mercy National School, Killaloe
- Scoil Naisunta, Baile an Atha, Ballina

- Scoil Naisunta, Baile an Droichid, O'Briensbridge

Post Primary Schools

- St. Anne's Community College, Clarisford, Killaloe. Built in the late 1980's and catering for approximately 480 students.

It is important to recognise that bus routes are already established to service each of these schools and care should be taken to try and limit the effect of new roads on these routes.

The Montpelier national school was closed down in 1969. Since then children in Montpelier have attended the school in nearby Castleconnell. The school is currently being used as a Church with adjoining community hall. The hall serves not only the community of Montpelier but also that of O'Briensbridge across the river.

A Montessori school (Tir Na nOg) is located at Cloonfadda adjacent to the R463.

Churches

There are four churches located within the Study Area namely; St. Flannan's Cathedral, Killaloe, St. Flannan's Church, Killaloe, Church of our Lady and St. Lua in Ballina, and Montpelier Church. Maintaining ease of access to these churches is a constraint on future road developments, especially as many of the churchgoers are elderly and walk to church. The locations of these churches can be seen on Figure 5.14.

St. Flannan's Cathedral, Killaloe

Pedestrian and Cyclist Access

The pedestrian and cyclist facilities currently provided in Ballina/Killaloe can only be described as poor.

It is important to note that where existing pedestrian access along designated existing pedestrian paths becomes segregated that measures will have to be taken to maintain or replace these. This will be particularly important in the vicinity of schools, churches and hospitals where large numbers of people access these facilities by walking.

The new bridge and associated road network will have a single lane in each direction. Cyclist and pedestrian access to the new bridge/road will be considered.

5.2.2 Sports, Leisure and Tourist Activities

Playing Fields

St. Anne's Community College has two outdoor multi-purpose courts, a full sized playing pitch and a practice pitch and there are plans to develop a running track. The college has a large hall suitable for a variety of indoor games.

Ballina GAA Club is located within the Study Area to the north of Killaloe/Ballina Bridge. This facility is located in a built up area and surrounded by residential property. Refer to Fig. 5.14.

Smith O' Brien's GAA Club is located within the Study Area in Killaloe. It is located adjacent to the Boys National School in a built up area surrounded by residential property. Refer to Fig. 5.14.

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.

Tennis

Killaloe/Ballina Tennis Club is located within the Study Area in Killaloe. Refer to Fig. 5.14.

Golf

There are no golf clubs located within the Study Area. The golf courses in East Clare, Limerick City and Nenagh, Co.Tipperary are easiest to reach. Pitch-and-putt is available on the outskirts of Killaloe within the Study Area. Refer to Fig. 5.14.

Lough Derg Equestrian Centre

Lough Derg Equestrian Centre is located on the R494 approx 1.5km south of Killaloe Bridge within the Study Area. Refer to Figure 5.14.

Leisure Craft on the Shannon

The Shannon river and associated canal routes is highlighted in the Government's **Operational Programme For Tourism** as a product target. This would involve financial support for cruising bases at various locations thereby providing a framework to entice tourists to take cruising holidays on the River Shannon.

In 2002 the Limerick Navigation Project was completed. This has led to major improvements to the navigation for boats through Limerick City and was a venture spearheaded by Shannon Development in conjunction with Waterways Ireland and Limerick City Council. The net result of this is that there are increasing numbers of boats transiting through Limerick and Ardnacrusha to Killaloe. Therefore in any proposed works, sufficient clearance and headroom should be incorporated into the design. With regard to air-draft of the pleasure crafts coming from up stream, the existing bridges in Limerick already set height limitations (< 3.3m at MHWS).

Tourism

The linked towns of Killaloe and Ballina offer history, an exceptionally beautiful riverside setting and access to Ireland's greatest waterway. Joined by a 13-arched stone bridge, the twin towns lie on either side of the River Shannon, where it narrows after passing through Lough Derg. Killaloe, on the left bank, in County Clare is a network of charming narrow streets, flanked by old shops and houses, that climb up the steep hillside and look down over the 13th century cathedral. The buildings of Ballina, in North Tipperary line the roadway that runs parallel to the river. The high ground is dominated by the Lakeside Hotel. Below it, one of the many first-class pubs in the town stands by the old quayside. Just upstream, a new marina caters for the hundreds of leisure craft that make Killaloe/Ballina one of the best centres for water activities.

Tourism is an important source of revenue in Killaloe and Ballina, with tourism and leisure development in the area largely concentrated on the shores of Lough Derg. Water based activities are a vital component, with angling and cruises on the river being popular. Killaloe and Ballina have a complimentary provision of services to meet this demand. With Killaloe providing historical and cultural attractions in the historic core and Ballina providing much of the open space, restaurants and car parking on the shores of the lake.

The Killaloe Tourist Office located at the Brian Boru Heritage Centre, is open during the main season and provides advice, maps, guides and other services.

Recreation

Watersports are the key to the popularity of Killaloe. Boats of all kinds from rowing boats to Shannon cabin cruisers are available for hire and water-skiing has long been popular. Short (circa one-hour) tours of the River Shannon and Lough Derg are available from the Ballina side aboard the 50-seater passenger boat Spirit of Killaloe.

The Spirit of Killaloe

Lough Derg is navigable, over its total length of just under 40kms, from Portumna at its northern tip to Killaloe and Ballina in the south, and also has access to over 200kms of navigable inland waterways.

The Lough Derg Way stretches from Limerick City to Killaloe 26kms (16mls.) and Killaloe / Ballina to Dromineer 32kms (20mls.) along the banks of the River Shannon, the old Shannon navigational canal and the eastern shores of Lough Derg.

The East Clare Way follows a 180km circular route through some of the region's most spectacular and varied scenery. From Killaloe, the way crosses the Slieve Bernagh Mountains before descending to the Clare Lakeland areas around Tulla and Feakle. Circling Lough Graney, the route then climbs again over the Slieve Aughtys back towards Lough Derg. The way returns through the hills towards Scariff and on to complete its circuit back at Killaloe.

The banks of the old canal are good spots for fishing, while the River Shannon and Lough Derg offer great boat fishing. Within a few miles of Killaloe there are many lakes teeming with fish including well know angling waters of the East Clare Lakelands. Within 30 minute drive you can be fishing in Castleconnell – a world-famous centre for Salmon.

5.2.3 Retail, Commercial and Industrial Activities

Shannonside Business Park is located on the R494 just outside Birdhill. There are a number of units located here including, Broderick Grass Machinery and Hunter Building Products. There are still units available to rent or buy.

There are also some commercial units located further along the R494 closer to Ballina. These include an EMO filling station, Quality Tiles, Marine Action Boats, Ballina Engineering and MBS Engineering Ltd.

There are numerous commercial activities in Killaloe/Ballina; including hotels, bed and breakfasts, public houses and restaurants. Killaloe has a mix of convenience and floorspace but this is relatively limited in terms of meeting shopping needs, even when combined with that of Ballina. There are a number of vacant units in the heart of the town centre, which

would indicate a lack of market interest, and many residents travel to Limerick City and environs to meet their shopping needs.
Ballina has a limited number of outlets and it is envisaged that Killaloe will absorb much of the future growth in town centre retail and commercial elements in the Ballina/Killaloe area.

O'Briensbridge has bed and breakfasts, public houses and restaurants. It contains a town core with affiliated retail activities including a post office.

With the exception of one public house Montpelier does not have any shopping or other commercial facilities and the residents rely heavily on the facilities available across the river in O'Briensbridge.

5.2.4 Agricultural Activity

The land within the Study Area is predominantly agricultural with the exception of the built-up areas of Killaloe/Ballina, O'Briensbridge/Montpelier and Birdhill.

The Clare County Council Development Plan (1999) states that 64% of the land in County Clare is suitable for agriculture. The land quality varies from excellent/good in some areas of the East and South and is poor in large areas of the West and North of the County.

According to the Limerick County Council Development Plan (1999) 75% of the land in County Limerick is used for agricultural purposes and its importance to the economy of Limerick is significant.

Agriculture is still the predominant land-use in North Tipperary with 149,411 ha of land under agriculture.

During the Route Selection Stage of this project a study of agricultural activity within the Study Area and particularly in the vicinity of potential routes will be undertaken.

5.3 Planning and Land Ownership Issues

5.3.1 Planning Constraints

Planning applications which have been approved within the past five years or are currently pending are indicated on Figure 5.15 of Appendix D. Important applications, approved or proposed, include: -

- 6 no. apartments at Moys, Killaloe
- 10 no. houses at Moys, Killaloe
- 32 no. houses at Shantraud, Killaloe for Portard Developments Ltd.
- 10 no. houses at Clarisford, Killaloe for Domus Ltd.
- Caravan Park and Marina at Ardcloony, Killaloe
- Extension to Sand and Gravel Pit in Montpelier for Doneen Concrete Ltd.
- 67 Bedroom Nursing Home, Birdhill

5.3.2 Land Holdings

The average farm size in County Limerick is 70 acres (28 hectares). Farms in County Clare are predominantly small with 50% of the farms having less than 20 hectares and only 20% having an area in excess of 40 hectares.

A land search will be carried out during the Route Selection stage of the project to reveal the extents/ownership of the land holdings in the vicinity of potential routes. The Land Registry in Waterford contains details of land holdings in County Limerick and County Tipperary. The Land Registry Offices in Dublin contain details of land holdings in County Clare.

Whatever route option is eventually chosen for the Shannon Bridge Crossing a number of land holdings will be impacted. These land holdings will vary in size and function while the impact felt by individual landowners is likely to vary from minor to very serious.

5.3.3 Planning Land Usage

Available Zoning Maps have been received from all three Local Authorities. Due to the status of the Western Tipperary Local Area Plan (refer to Section 3.3.4) zoning in the vicinity of Ballina is not currently available.

Land Use and Zoning maps can be seen in Figures 5.16 – 5.21 of Appendix D.

5.4 Utilities

5.4.1 ESB Infrastructure

Details of the ESB infrastructure within the Study Area were received from ESB Networks. The ESB infrastructure, which is mapped on Figures 5.22 to 5.27, comprises high (38kV and 400kV) and medium voltage (10kV) lines and a 38 kV sub-station.

The high voltage lines passing through the Study Area are: -

- The Dunstown – Moneypoint 400kV line
- The Ardna – Birdhill 38kV line (including at 38kV station at Birdhill)

High voltage ESB lines are a significant constraint where they arise within the Study Area. Correspondence has been received from ESB International (ESBI) which states: -

> *" A minimum lateral clearance of 35m must be maintained from the centre line of the Transmission Line. If this clearance is maintained then there in no height restriction for dwellings/sheds outside this lateral clearance, i.e. a corridor width of 70m must be free of buildings etc. Proposed roadways and bridge crossings within the lateral clearances must be checked by ESBI."*

5.4.2 Eircom

The Eircom network within the Study Area is shown on Figures 5.22 to 5.27. In general the Eircom infrastructure consists of overhead lines along the existing road network with some underground cables in the urban areas of O'Briensbridge and Killaloe/Ballina. There is also a fibre optic cable commencing in Killaloe, which crosses Killaloe Bridge to Ballina and follows the R494 southwards towards Birdhill.

5.4.3 Bord Gáis

There is a 250mm diameter Bord Gáis distribution main in the R494 carriageway between Ballina and Birdhill. The route of this main is shown on Figures 5.22 to 5.27. The distribution network crosses the River Shannon approximately 600m south of the existing Killaloe Bridge. This crossing feeds a 90mm diameter network in Killaloe and a 90mm diameter branch running southbound along the R463.

There are no Bord Gáis transmission mains in the vicinity of the Study Area.

5.4.4 Water and Sanitary Services

Clare County Council's water services network within the Study Area is concentrated in the urban areas of Killaloe and O'Briensbridge with a connecting main running along the length of the R463. The public sewers in Killaloe feed into the sewage treatment plant in Ballina on the opposite side of the River Shannon.

Limerick County Council has a network of water mains in the area surrounding Montpelier. There is currently no public sewerage system in Montpelier. Treatment and disposal of wastewater from existing development is dependant for the most part on individual septic tank systems. There is one communal septic tank in Montpelier, which serves the Church, community hall and the housing estate (14 houses) immediately behind.

North Tipperary County Council's water services network within the Study Area is concentrated in the urban areas of Ballina and Birdhill with a connecting main running along the length of the R494. There is also a water main running along the R466 from Birdhill, which continues to Montpelier. The Ballina Sewage Treatment Plant is located in the town of Ballina.

The water and sewer network as outlined above is shown on Figures 5.22 to 5.27 of this report.

6 Environmental Constraints

6.1 Introduction

The purpose of this section of the report is to describe the environmental conditions in the Study Area that need to be considered to enable selection of a route that will cause least impact on the environment. The Study Area is located to the south of Lough Derg and contains part of the River Shannon, the longest river in Ireland.

The Study Area, which is shown in Figure 2.2, is located between the villages of O'Briensbridge/Montpelier and Killaloe/Ballina. The Study Area is predominantly rural in character with the exception of the villages of O'Briensbridge, Montpelier, Birdhill, Killaloe and Ballina.

Screening of possible environmental impacts was carried out for this project and an evaluation based on this screening process is presented in this report.

Consultation, in writing, was also carried out with a number or relevant stakeholders and consultees, who were invited to submit information or requirements that they considered should be included in the selection potential route corridors and/or the design of the bridge.

6.2 Guidelines

The design of the project is being carried out in a phased approach generally as recommended by the National Roads Project Management Guidelines 2000. This approach requires that the project be carried out according to the following phases: -

- Phase 1 Pre-Planning
- Phase 2 Constraints Study
- Phase 3 Route Selection
- Phase 4 Preliminary Design and Environmental Impact Statement
- Phase 5 Construction Documents Preparation/Tender/Award
- Phase 6 Scheme Construction

The Constraints Study is thus carried out prior to the Route Selection and the Environmental Impact Statement and its purpose is to identify the local issues that must be taken into account so that the more technical phases to follow can be properly planned.

6.3 Constraints Study

The purpose of this environmental Constraints Study is to compile as much relevant information regarding environmental issues as possible. This desk based data collection is focussed on determining the environmental constraints that could affect the proposed location of the new Shannon Bridge in the vicinity of Killaloe/Ballina and O'Briensbridge/Montpelier.

The range of topics considered in this section are based on the European Communities (Environmental Impact Assessment) (Amendment) Regulations, 1989 (S.I. 349 of 1989) as follows; -

- Human Beings
- Flora
- Fauna
- Soil (& Geology)
- Noise
- Water Quality
- Air Quality
- Landscape
- Archaeology & Cultural Heritage

The following sections describe the findings under each of the headings below: -

- Noise, Vibration and Air Quality
- Landscape and Visual
- Flora and fauna
- Surface Water and Aquatic Environment
- Archaeology and Cultural Heritage
- Soils, Geology and Hydrogeology
- Human Environment

6.4 Noise, Vibration and Air Quality

6.4.1 Introduction

This section discusses the potential effects of the proposed new bridge on the noise and air environment of the Study Area, and makes recommendations for work to be undertaken as part of the noise and air quality assessments for the Route Selection Stage.

Sensitive receptors which must be assessed to consider potential impacts associated with noise (and vibration) and air quality associated with the construction and operation of the proposed new bridge crossing, include schools, hospitals, clinics, and residential homes in addition to outdoor amenity areas. This section aims to identify sensitive receptors to noise (and vibration) and air quality within the Study Area.

6.4.2 Methodology

A preliminary desk-based noise and air quality assessment of the proposed new Shannon Bridge, and the associated potential noise, vibration and air impacts was carried out.

It should be noted that the ambient noise levels at sensitive receptors in the vicinity of the Study Area have not been determined, given that this is a desk-based environmental assessment of the proposed scheme. Similarly, air quality measurements have not been carried out in the Study Area.

6.4.3 Existing Environment

As Killaloe/Ballina, O'Briensbridge/Montpelier are small settlements, the majority of services are located within or near the centre of the town, such as the post office, shops, schools and residential developments. The ambient noise levels experienced in these areas would be expected to be primarily influenced by road traffic travelling within the town. The population of each of the towns is outlined in Table 6.1.

Table 6.1: Population of Towns in Study Area

Town	Census 1996	Census 2002
Killaloe	972	1,174
Ballina	598	1,185
O' Briensbridge/Montpelier	409	375

Source: Census 2002, Central Statistics Office (CSO) July 2003

The noise sensitive receptors located in the area immediate to the towns of Killaloe/Ballina, and O'Briensbridge/Montpelier, would primarily comprise of residential properties. In the Killaloe/Ballina area, the majority of existing resident population is situated on the Ballina (eastern) side of the Shannon. Killaloe is a relatively small town with a population of 1,174 (refer to Table 6.1) and residential growth is relatively constrained by issues such as topography, vehicular access over the existing bridge, and local protected landscapes. The steep slopes of Ballykildea Mountain to the north and west of Killaloe prevent new development from extending in these directions at the same pace as lands to the north, east, and south of Ballina. Ballina's residential capacity is growing, with several new housing developments stretching north, east, and south of the town, within the outer fringe.

The town centre and town fringe gradually merge into new residential development zones and ribbon development along the R494, south of Ballina town centre, the R496 east of Ballina, and other local roads leading east of Ballina.

Whilst ribbon development outside of Killaloe does occur south of the town, along the R463, there are comparatively few new housing development pockets, therefore less sensitive receptors, within the town fringe.

The predominant sitting of residents, or noise sensitive receptors, at O'Briensbridge/ Montpelier are sited within the town centre, with some ribbon development occurring between the town and Birdhill, along the R466. Ambient noise levels experienced by residents in the town would be expected to be influenced by traffic within the town, traffic passing along the regional roads and agricultural activity in the area.

The ambient noise levels in the areas around the towns of Killaloe/Ballina, O'Briensbridge/Montpelier would be expected to be dominated by road traffic noise, and also from noise generated by commercial activity and light industrial / commercial facilities, found in locations south of the towns of Killaloe and Ballina.

South of Killaloe, along the R463 and R494, on the Ballina side, the Study Area is primarily agricultural in nature, with the exception of the Ballina Sewage Treatment Plant and light industrial activity at Cloonfadda. It is expected that the ambient noise levels experienced by dispersed residential properties in these areas would be influenced by agricultural activity, birdsong and traffic travelling along local roads, and subsequently significantly lower than those closer to the town and built up areas.

6.4.4 Potential Impacts

Noise is described as unwanted sound, and because of its subjective nature, and the variability of different noise sources, the impact on individuals, and the associated level of annoyance is difficult to assess. The EPA has produced guidelines that define levels of acceptability of industrial noise at adjacent residential dwellings. With regard to acceptable ambient noise levels, the noise level outside noise sensitive areas should be kept below 55 dB(A) during the daytime (08:00 – 22:00) and 45 dB(A) during the night-time (22:00 – 08:00).

6.4.4.1 Construction Air Quality

There is the potential for a number of emissions to the atmosphere during the construction of the bridge and associated approach roads. In particular, the construction activities may generate quantities of dust in the vicinity of earth moving operations and on associated haul roads. Construction vehicles, generators etc., will also give rise to some exhaust emissions.

6.4.4.2 Construction Noise Criteria

The method and phasing of construction of the proposed Shannon Bridge Crossing scheme has not been determined at this stage. It is anticipated that varying degrees of overburden removal, potentially including rock breaking/piling may be required in a number of areas along the alignment of the crossing and approach roads. In addition, there will be noise impacts during the construction of the bridge and associated approach roads when a variety of items of plant will be used, such as earth moving equipment and site vehicles. However, these impacts will be temporary and limited to the construction phase of the proposed project. Noise sensitive receptors i.e. residential houses, may experience adverse impacts attributable to noise from the construction site.

There are no mandatory noise limits for construction noise in Ireland or in the UK. In setting criteria for construction noise, account has to be taken of the technical feasibility of the proposed criterion, and also the trade-off between the noise level, and the duration of the noise exposure.

The National Roads Authority (NRA) has published construction noise limits in its “Guidelines for the Treatment of Noise and Vibration in National Roads Schemes” (October 2004). These limits, which are presented in Table 6.2, represent a reasonable compromise between the practical limitations in a construction project, and the need to ensure an acceptable ambient noise level for the residents.

Table 6.2: Maximum Permissible Noise Levels at the Façade of Dwellings During Construction (NRA Published Draft Guidelines 2003)

Days and Times	$L_{Aeq\ (1hr)}$ dB	L_{Amax} dB
Monday to Friday 07.00 to 19.00	70	80
Monday to Friday 19.00 to 22.00	60	65
Saturday 08.00 to 16.30	65	75
Sundays and Bank Holidays 08.00 to 16.30	60	65

6.4.4.3 Construction (Rock Breaking/Piling) Vibration Criteria

There is no published Irish guidance relating to vibration during construction activities. Common practice in Ireland has been to use guidance from internationally recognised standards. Vibration standards come in two varieties, those dealing with human comfort and those dealing with cosmetic or structural damage to buildings.

In the case of nominally continuous sources of vibration, such as traffic, vibration is perceptible at around 0.5 mm/s and may become disturbing or annoying at higher magnitudes. However, higher levels of vibration are typically tolerated for single events or events of short duration. For example piling and blasting, two of the primary sources of vibration during construction are typically tolerated at vibration levels up to 12 mm/s and 2.5 mm/s respectively.

Therefore, the National Roads Authority guidelines identify 2.5mm/s as the vibration level that may be considered tolerable due to piling works. The potential vibration levels that could be generated by rock breaking/piling works, if required would be expected to be comparable to the level of vibration that may be generated by piling works. The vibration level of 2.5 mm/s is substantially below the guideline values for protection of properties against cosmetic damage. The NRA limits for protection against cosmetic damage are given as a function of vibration frequency, and are: -

- 8 mm/s (vibration frequency <10Hz)
- 12.5 mm/s (vibration frequency 10 to 50Hz)
- 20 mm/s (vibration frequency >50 Hz).

The NRA 2.5mm/s limit is for piling, which is a continuous activity. This limit provides for protection against the vibration nuisance, and is comfortably within the limits for cosmetic damage. In addition, it should be noted that there is a significant safety margin accounted for within the NRA limits.

As a general guide, for houses where a significant impact due to rock breaking may become apparent, the impact would be of particular significance in the event that the noise impact substantially exceeded the national roads authority guidelines. The impact would be termed significant for works of relatively short duration, the order of a few days, and potentially severe for works of prolonged duration, the order of weeks. In such circumstances, mitigation would be required.

6.4.4.4 Operational Traffic Noise Criteria

This document proposes a design target of 60 dB(A) L_{den} for new road schemes. The term "L_{den} " refers to the "day, evening, night" noise level. This is the new EU environmental noise measurement parameter, as defined in the European Union Environmental Noise Directive 2002/49/EC. L_{den} is a 24-hour average noise level (L_{Aeq}), but with penalty weightings of +5dB applied to the evening noise level, and +10 dB applied to the night-time noise levels.

The National Roads Authority (NRA) "Draft Guidelines for the Treatment of Noise & Vibration in National Road Schemes" was published in April 2004. The Draft Guidelines were subsequently finalised and the NRA "Guidelines for the Treatment of Noise & Vibration in National Road Schemes" were published in October 2004.

In addition to the absolute noise criterion of 60 dB(A) described above, the perceived noise impact of traffic noise depends on the change in noise level. The subjective response to changes in noise levels are shown in Table 6.3.

Table 6.3. Subjective assessment of changes in noise levels, in terms of perceived change and loudness

Change in Noise Level	Subjective Change	%Change in Loudness
0	No change	0%
1 to 2 dB	Negligible change	10%
3 to 5 dB	Noticeable change	30%
6 to 9 dB	Clearly noticeable	70%
>10 dB	Substantial change	>100% (more than twice as loud)

6.4.4.5 Operational Vibration Criteria

There will be vibration impacts as vehicles move along the proposed bridge, produced by the interaction of the wheels and the road surface and by direct acoustic transmission through the air. The vehicle movement generates waves in the road, which are transmitted through the ground to adjacent buildings. The acoustic transmission of waves arises from the size, shape and speed of the vehicle and from pressure fluctuations due to engine, exhaust and other noises generated by the vehicle, and these waves enter adjacent buildings via the building fabric, i.e., foundations, doors and windows, etc.

6.4.5 Recommendations

It is recommended that an environmental noise monitoring survey should be undertaken in the preparation of the noise impact assessment for the Route Selection Phase that will be prepared at a later date. The noise survey would be undertaken in accordance with *ISO 1996* "*Description and Measurements of Environmental Noise*". The surveys would determine the existing ambient noise levels in the study area and facilitate the identification of areas with greater levels of susceptibility to increases in noise levels. Subsequently, the potential impact of a new Shannon bridge would be assessed for noise sensitive locations in order to identify the route option with the least potential impact on the receiving noise and air quality environments of the Study Area.

6.5 LANDSCAPE AND VISUAL

6.5.1 Introduction

The screening process undertaken identified that there may be a significant environmental impact on landscape in the Study Area; therefore an assessment has been conducted to examine capacity of the receiving environment to visually absorb the proposed development of an additional bridge across the Shannon, into the present landscape and visual fabric. In visual terms, the development proposals should be viewed as the bridge, lighting (and other services), and the increased intensity of use.

6.5.2 Methodology

The assessment methodology is based upon the following guideline documents:

- Guidelines from the Department of the Environment, Heritage, and Local Government (DoEHLG) Landscape and Landscape Assessment.
- Consultation Draft of Guidelines for Planning Authorities (June 2000).
- Environmental Protection Agency (EPA) Guidelines on the Information to be contained in Environmental Impact Statements (March 2002).
- Environmental Protection Agency (EPA) Advice Notes on Current Practice in the preparation of Environmental Impact Statements (1995).
- The Landscape Institute & Institute of Environmental Assessment (LI/IEA) Guidelines for Landscape and Visual Impact Assessment, 2nd Edition 2002.
- Highways Agency Design Manual for Roads & Bridges (1994).

RPS Group Ltd Planning and Environmental Consultants have carried out the assessment. Preparation for the report included the following: -

- Desk-top study of available data and published literature to establish landscape baseline
- Site visits to establish landscape baseline
- Preparation of a photographic record.

6.5.2.1 Landscape Designations

The following itemised designations and objectives are considered landscape constraints, as they have been identified by the local planning authorities, and will influence the selection of the options for bridge construction sites.

Draft Clare County Development Plan 2005 – 2011

- Designated scenic route R466 between Broadford and O'Briensbridge
- Designated scenic route R463 from O'Briensbridge through Killaloe to outside Ogonnelloe
- Objective 9: To conserve, protect and where possible enhance the landscape character of the County as a natural asset in its own right and as a resource for the support and promotion of the sustainable economic growth and quality of life in the County, including those views and prospects and amenities of places and features of natural beauty and interest whose protection does not conflict with development necessary to sustain rural communities
- Objective 17: To promote and facilitate the growth of the tourism product through the integration of tourist facilities, including sites, attractions and recreational and leisure infrastructure, identification of locations for appropriate developments, the conservation of landscape and the conservation of the natural and built environment
- CDP 40: In areas identified as being vulnerable landscapes the Planning Authority will only normally permit proposals for development of the highest quality in terms of sitting and design and where development will not adversely impact upon to a

significant extent upon the character, integrity, or uniformity of the landscape.

- CDP 42: The Planning Authority will normally only permit development outside settlements where it can be clearly demonstrated that regard has been had to the recognised landscape values and character of the area
- CDP 43: The Planning Authority will normally only permit development where it can be clearly demonstrated that the appearance and character of existing local landscape features are where appropriate retained, protected and enhanced, in particular hedgerows, shelter belts and stone walls
- CDP 44: The Planning Authority will normally only permit development where trees and groups of trees of high amenity value are retained and where such retention is not possible to require that suitable replanting takes place within or adjacent to the site.
- CDP 45: It will be the policy of the Planning Authority to require that those seeking to carry out development in the environs of a scenic route to demonstrate that there will be no adverse obstruction or degradation of the views towards and from visually vulnerable features, or significant alterations to the appearance or character of these areas.

Montpelier (Limerick) Local Area Plan

- Policy ENV 2: Protection of Trees and Hedgerows
- Policy ENV 3: Areas of Local Environment Importance
- Local Environment Area (LE)1: The Fair Green
- LE 2: Riverbank East of O'Briensbridge
- LE 3: Riverbank West of O'Briensbridge

6.5.2.2 Landscape Character Constraints

The Study Area comprises a linear corridor between Ballina/Killaloe and O'Briensbridge/Montpelier, along the Shannon River. The overall landscape character of the local Shannon river valley comprises a gently undulating agricultural landscape, dominated by the river itself, and the small towns of Killaloe/Ballina and O'Briensbridge/Montpelier at north and south extents, respectively. For the purpose of this report, the existing environment in the Study Area has been divided into 4 separate regions:

- Killaloe town,
- Killaloe/Ballina residential fringe,
- Agricultural lands on both sides of river, between Killaloe/Ballina fringes and O'Briensbridge
- O'Briensbridge/Montpelier towns.

Each region comprises specific landscape character types, which are illustrated in Figure 6.1.

6.5.2.3 Killaloe Town

The twin towns of Killaloe/Ballina are seen as a single community, but do not share the same character make-up. Killaloe is well known for its status as a heritage town, and for having a historical character that can be seen in the buildings and streets of its town centre. Modern development is restricted to the outer fringes of the town, mainly screened from riverside

views by established woodland and rising contours of the town. Ballina has a relatively historical town centre, however more commercial buildings and new-built residential houses are visible within the Study Area, when compared to the town of Killaloe.
The existing bridge over the Shannon River is a local historical icon and very much an important feature in the visual environment of the towns. The bridge has an exposed natural stone finish, an established network of climbing plants and ferns within the exposed stones, and wrought-iron light posts reflecting the character of the historical features of Killaloe.

The natural stone finish of the bridge is repeated within the streetscape of Killaloe, as seen in the buildings adjacent to the riverside car park, the channel wall lining the riverside at the car park, the Derg House café, the Killaloe cathedral and the ESB facility south of the bridge on the Killaloe riverbank. Other buildings within the river-facing street network of Killaloe are distinctly historical in character, as are the narrow, winding streets.

The local landscape character within this particular section of the Study Area is one of *Historical town centre landscape.*

6.5.2.4 Killaloe/Ballina Fringe

The neighbourhoods on the outskirts of Killaloe and Ballina town centres are made up of new-built housing developments and associated services typical of a town growing in size, such as school, service station, sewerage treatment plant, commercial buildings and some light industry. Residential developments appear new in character and comprise a mix of dwelling types such as town houses, detached, semi-detached and apartment style accommodation.

The local landscape character within this particular section of the Study Area is one of *Urban fringe and mixed-use landscape.*

6.5.2.5 Agricultural Lands Between Killaloe/Ballina and O'Briensbridge

The Scenic Route R463 traverses lands between Killaloe and O'Briensbridge, which are predominantly agricultural in nature. Such lands are scenic in nature and offer views of the Shannon from several vantage points along the length of the road. Portions of the R463 are aligned with the Lough Derg Way, a walking trail popular with tourists. Freestanding residential dwellings occur along the route, on large blocks of land, which are often associated with farmland in the area. The Landuse between the R463 and the Shannon River comprises patchwork fields with associated hedgerows defining field boundaries, as well as small blocks of woodland, small streams draining into the river, and occasional archaeological sites.

Lands across the river from the R463, south of Ballina, are of similar Landuse and landscape character, however the Ballina fringe extends comparatively farther south into this agricultural landscape, than that of Killaloe town.

The lands through which the scenic route R463 traverses between the Killaloe/Ballina urban fringes and O'Briensbridge, as well as parallel-oriented lands across the river, are considered *Rural/agricultural landscapes.*

6.5.2.6 O'Briensbridge Town

The town of O'Briensbridge is predominantly rural in character; surrounded by undeveloped land made up of wildlife sanctuary, canals with grassed embankments, pine forest, and agricultural fields. The town has a small residential population, and most buildings in town are confined to the single main street, and a few roads spurring off of the main road, lined with residences. The adjacent town of Montpelier, across the river to the east of O'Briensbridge, is likewise a rural village surrounded by countryside. Both towns lack any major commercial or industrial buildings within their town centres and are mainly comprised of residential and agricultural components.

The local landscape characters within this particular section of the Study Area are small villages within a *Rural/agricultural landscape*.

6.5.3 Visual Constraints

The Study Area is predominantly linear, as it focuses on the Shannon River, which flows in a north-south direction from Killaloe to O'Briensbridge. On either side of the river, the contours of the land rise steeply to form the Slieve Bernagh uplands and Ballykildea Mountain in the west, and to the east, lands gradually rise to form the Arra and Silver Mine Mountains. Such topographical features result in a high degree of visual enclosure from medium-range views, due to landform intrusion. Therefore, views to the site are mainly confined to short and long-range. However, due to the large scale of contours and vast tracts of land between the study area and the mountain ranges, long-range views to the site are high in number yet minimal in clarity when seen through the intervening distance, topography and vegetation. As a result, short-range (between <1-3 km) views to the Study Area are the most sensitive.

6.5.3.1 Synopsis of Views

Visual receptors include the public or community at large, residents, visitors, and other groups of viewers affected by a proposed development, or structure. When evaluating the effects on views and the visual amenity of the identified visual receptors, the magnitude or scale of visual change is described by reference to the distance of the viewpoint from the proposal. Short-range views often experience high visual impacts due to a development, or structure, as the visual receptor is in close proximity to the proposal. Therefore the proposal appears larger in scale or magnitude, as opposed to when observed from a long-range viewpoint.

Short-range views to the existing bridge and town centre of Killaloe are the most exposed within the Study Area. The buildings and structures of the town can be clearly viewed from across the river in Ballina, as well as from Lough Derg. A river crossing at Killaloe/Ballina town centre would be highly visible by a high number of town residents, pedestrians, motorists, and recreational users of The Lough, at all times.

A river crossing at, or immediately south of, the Killaloe residential fringe would be visible only within the immediate area by residents and R494 road users due to a bend in the river and mature, established woodlands along the riverside. Such a proposed crossing south of the

Ballina boat slip and sewerage treatment plant (near the T-junction of the R496 and R494, following alignment of power lines), would result in fewer short-range lines of sight, compared to a town centre location.

A crossing between O'Briensbridge/Montpelier and the weir north of town would result in a low number of short-range views to the proposed structure. This would be attributed to the small population in the area, and low level of through-traffic. However, due to the location being within a sensitive landscape (wildlife refuge), as well as adjacent to the R463 scenic route, the sensitivity level of visual impact in this area would be significant.

The lands associated with the R463 between Killaloe fringe and O'Briensbridge are also susceptible to a high visual impact, as there are panoramic views to these lands from along the scenic route, as well as from lands across the river along the R466 in North Tipperary. As they are wide-spanning, open, low-lying river valley lands made up of mainly agricultural fields, a new bridge and associated construction phase, and traffic flow would be highly visible from the expanses of rural land within the middle section of the Study Area.

6.6 Flora and Fauna

6.6.1 Introduction and Methodology

This section of the report examines the potential constraints pertaining to natural habitats, flora and fauna within the Study Area. This section has been prepared in accordance with the National Roads Authority's *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2004), which has been suggested as an appropriate framework and methodology for this Section of the Constraints Study in correspondence received from the National Parks and Wildlife Service (NPWS) of the Department of the Environment, Heritage and Local Government (DEHLG).

Initially, a review of NPWS published data was made in order to identify designated sites for nature conservation within the vicinity of the proposed development, and to collect information on the specific habitats, flora and fauna features, for the conservation of which these sites have been designated.

Further information on habitats, flora and fauna of nature conservation and biodiversity importance was collected from a number of published sources, the details of which are provided within each sub-section of this section.

6.6.2 Existing Environment

During a constraints study, it is necessary to consider designated protected areas when planning for proposed or new developments. NRA (2004) specifies that all protected areas within 10km of the proposed development should be considered. Details of the location of these designated sites are presented below and in Figure 6.2. Protected species of flora and fauna must also be considered and impacts on other habitats and species of conservation value should also be considered. There are a number of such sites, habitats and species that require consideration, and these are described in the following sections.

6.6.2.1 Designated Sites of International Importance

Candidate Special Areas of Conservation (cSACs)

Legal backing for the cSACs is provided by EU Directive on the Conservation of Natural Habitats and of Wild Flora and Fauna (92/43/EEC; commonly known as the 'Habitats Directive') as transposed into Irish law by European Communities (Natural Habitats) Regulations, 1997; S.I. No. 94 of 1997. These regulations place the responsibility for protecting the sites on the Minister for Arts, Heritage, Gaeltacht and the Islands. The cSACs form part of the EU Natura 2000 Network.

Under the terms of the Directive, any plan or proposed project likely to have significant adverse impacts on a site must be subject to an assessment of its implications for the site. The statutory authority can agree to such plans or projects only after having ascertained that they will not adversely affect the integrity of the cSAC concerned, and if appropriate, after having obtained the opinion of the general public.

The Study Area overlaps the Lower River Shannon Special Area of Conservation (cSAC) (site code: 2165). The cSAC boundary includes the channel of the Shannon from the southern end of the Study Area north to the existing bridge in Killaloe, and also includes sections of land of varying width on either bank of the river. Within the Study Area, a branch of the cSAC also extends eastwards from the Shannon along the Kilmastulla River (see Figure 6.2).

The Lower River Shannon cSAC as a whole is very large, occupying a total of 72,138 hectares. The following is an extract from the National Parks and Wildlife Service (NPWS) Site Synopsis for the site. The complete site synopsis is provided in Appendix B.

> *"This very large site stretches along the Shannon valley from Killaloe to Loop Head/ Kerry Head, a distance of some 120 km. The site thus 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. The Shannon and Fergus flow through Carboniferous limestone as far as Foynes, but west of Foynes Namurian shales and flagstones predominate (except at Kerry Head, which is formed from Old Red Sandstone). The eastern sections of the Feale catchment flow through Namurian Rocks and the western stretches through Carboniferous Limestone. The Mulkear flows through Lower Palaeozoic Rocks in the upper reaches before passing through Namurian Rocks, followed by Lower Carboniferous Shales and Carboniferous Limestone. The Mulkear River itself, immediately north of Pallas Green, passes through an area of Rhyolites, Tuffs and Agglomerates. Rivers within the sub-catchment of the Feale include the Galey, Smearlagh, Oolagh, Allaughaun, Owveg, Clydagh, Caher, Breanagh and Glenacarney. Rivers within the sub-catchment of the Mulkear include the Killeenagarriff, Annagh, Newport, the Dead River, the Bilboa, Glashacloonaraveela, Gortnageragh and Cahernahallia".*

There are 15 habitat types within the Lower River Shannon cSAC that are listed under Annex I of the Habitats Directive. However, 12 of these habitat types are associated with saline coastal conditions and it is therefore unlikely that these will be present within the Study Area.

The 3 remaining Annex I habitat types that occur within the cSAC are as follows: -

1. Habitat Type 6410
   Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinia caeruleae*)

2. Habitat Type 3260
   Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

3. Habitat Type 91E0 (a priority habitat under the EU Habitats Directive)
   Alluvual forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-padion, Alnion incanae, Salicion albae)

Each of the three habitat types listed above account for 1% cover of the total Lower River Shannon cSAC and it is possible that they occur within the Study Area. Correspondence from NPWS indicates that the latter habitat; Alluvual forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-padion, Alnion incanae, Salicion albae) (91E0), occurs within Lough Derg pNHA in Knockyclovaun, to the north of Killaloe. Field survey work and further consultation with NPWS will be required in order to ascertain the presence or absence, and extent, of these habitat types, or of other EU Habitats Directive Annex I habitats within the Study Area.

The Lower River Shannon cSAC is also designated on the basis of a number of species listed in Annex II of the Habitats Directive.

Two mammals listed on Annex II occur within the Lower River Shannon cSAC, namely otter and bottle-nosed dolphin. Whilst the freshwater habitats within the Study Area are not suitable for bottle-nosed dolphin, otter is highly likely to occur throughout the wetlands sections of the Study Area, and potential impacts on this species must be considered.

A number of fish species listed under Annex II of the Habitats Directive also occur within the Lower River Shannon cSAC. These are sea lamprey, river lamprey, brook lamprey and Atlantic salmon. The Study Area provides potentially suitable habitat for all of the species and impacts on these and other fish must be considered. Impacts on fisheries are discussed in detail in the Aquatic Ecology section of this Report

The Lower River Shannon cSAC also holds the freshwater pearl-mussel, which is listed under Annex II of the Habitats Directive. See the aquatic ecology section for a discussion of this species.

A further five cSACs lie within 10km of the Study Area as follows:

- Slieve Bernagh Bog cSAC (site code 2312) lies approximately 3.1km to the northwest of the study area at its closest point. This site holds the Habitats Directive Annex I habitats, blanket bog, wet heath and dry heath; and also breeding Hen Harriers, a species listed on Annex I of the Birds Directive.

- Silvermines Mountains West cSAC (site code 2258) lies approximately 7.9km to the east of the study area at its closest point. This site holds the Habitats Directive Annex I habitat, wet heath; and is of importance to breeding Hen Harriers, a species listed on Annex I of the Birds Directive.

- Glenomra Wood cSAC (site code 1013) lies approximately 4.5 km to the west of the proposed development at its closest point (this site is also a pNHA; see Section 6.6.2.2). This high quality woodland site holds the Habitats Directive Annex I habitat 'old sessile oak woods with *Ilex* and *Blechnum* in the British Isles (91AO)' and is important for vertebrates.

- Clare Glen cSAC (site code 0930) lies approximately 8.2km to the southeast of the proposed development at its closest point (this site is also a pNHA; see Section 6.6.2.2). This woodland of oak and Ash is rich in bryophytes, and conforms to a Habitats Directive Annex 1 habitat type. The site also holds a very rare Flora (Protection) Order plant species.

- Keeper Hill cSAC (site code 1197) is located 10km to the east of the proposed development at its closest point (this site is also a pNHA; see Section 6.6.2.2). The site holds blanket bog and species-rich *Nardus* grassland both of which are listed as priority habitats under Annex I of the EU Habitats Directive. The site also holds Peregrine, a species listed under Annex I of the EU Birds Directive; and Red Grouse, a bird species of high conservation concern in Ireland.

No impacts on any of these other cSACs is anticipated as a consequence of construction or operation of the proposed development.

Special Protection Areas

SPAs are designated for the protection of Internationally Important populations of birds. Legal backing for SPAs is provided by EU Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna ('Habitats Directive'), which supersedes EU Directive 79/409/EEC on the Conservation of Wild Birds ('Birds Directive'; 79/409/EEC) and the Conservation of Wild Bird Regulations (S.I. 291 of 1985), (Hickie, 1997).

The extreme northern part of the Study Area overlaps Lough Derg (Shannon) Special Protection Area (SPA) (site code: 4058). Within the Study Area, the SPA includes the channel of the Shannon within Lough Derg and also small sections of the western shore of the Lough. No other SPAs lie within 10km of the proposed development.

Lough Derg SPA is designated primarily on the basis of its Internationally Important wintering population of Black-tailed Godwit. The site also holds nationally important numbers of Mute Swan (Hunt *et. al*. 2000).

Site Synopses for SPAs are not currently available from NPWS, however the site synopsis for Lough Derg pNHA (site code 0011) discusses the nationally important numbers of bird species present within the site, including important numbers of wintering wildfowl including Greenland White-fronted Geese. The Lough also holds nationally important numbers of Common Tern and Cormorant. Both Greenland White-fronted Goose and Common Tern are listed under Annex I of the Birds Directive. The site synopsis also gives count data from the Iris Wetlands bird survey (I-WeBS), which indicates that the Lough holds nationally important numbers of Mute Swan, Cormorant, Mallard, Teal, Tufted Duck and Goldeneye.

The extent to which these and other bird species utilise the sections of the SPA that overlap the Study Area, and hence the potential for impacts on these species, can be determined through field survey work and through consultation with NPWS and with Birdwatch Ireland.

6.6.2.2 Designated Sites of National Importance

Proposed Natural Heritage Areas (pNHAs)
Proposed Natural Heritage Areas (pNHAs) are protected under the Wildlife (Amendment) Act of 2000. Whilst the Act has been passed into law the pNHAs will not have full legal backing until consultative processes have been completed. This process is currently underway.

The northern portion of the Study Area, to the north of the existing bridge at Killaloe/Ballina, overlaps Lough Derg pNHA (Site Code 0011). Within the Study Area, the pNHA covers the channel of the Shannon north from the bridge and within Lough Derg, and also sections of both the eastern and western banks of the river.
The following is and extract from the NPWS site synopsis for Lough Derg pNHA. The full site synopsis is presented in Appendix B.

> *Lough Derg is one of the major freshwater lakes of Ireland and the largest of the River Shannon lakes. The lake covers 13,000 ha of non-tidal waters, measuring 33 km from Killaloe, Co. Clare to Portumna, Co. Galway. Its maximum breath across the Scarriff-Youghal Bay transect is about 13 km. For most of its length the breath is less than 5 km. The lake is relatively shallow at the northern end being mostly 6 m in depth but in the middle region it has an axial trench and descends to over 25 m in places. The east-west section (from Scarriff Bay to Youghal Bay) has a narrow*

trench along the southern margins with depths up to 36 m while the narrow southern end of the lake has the greatest average depth, with a maximum of 34 m.

The greater part of the lake lies on Carboniferous limestone but the narrow southern section is underlain by Silurian strata and there is Old Red Sandstone on the southern shores of the east-west section. Most of the lower part of the lake is enclosed by hills on both sides, the Slieve Aughty Mountains to the west and the Arra Mountains to the east. The northern end is, however, bordered by relatively flat country.

The NPWS site synopsis lists five Habitats Directive Annex I habitats that are found within the pNHA, these are: *Cladium* fen, Petrifying spring and Yew woodland (these three are priority habitats), alkaline fen and Juniper scrub formations on heath and calcareous grasslands. The site synopsis states that the priority habitats are found mainly at the north and north east of the lake and are therefore not likely to be present within the Study Area.

Lough Derg is the only known site in the country for the Red Data Book species Irish Fleabane which occurs along the lake shore.

A further eight pNHAs lie within 10km of the proposed development as follows:

- Gortacullin Bog pNHA (site code 2401) lies approximately 9.5km to the west of the proposed development at its closest point. This site is a mosaic of upland blanket bog and wet heath. Red Grouse, a bird species of high conservation concern in Ireland occurs at the site.
- Bleanbeg Bog pNHA (site code 2450) lies approximately 8.6km to the east of the proposed development at its closest point. This site is an area of relatively undamaged upland blanket bog. Red Grouse, a bird species of high conservation concern in Ireland occurs at the site, and Hen Narrier, a Birds Directive Annex I species uses the site for feeding.
- Knockalisheen Marsh pNHA (site code 2001) lies approximately 9.6km to the southwest of the proposed development at its closest point. This site holds species rich unimproved grassland, marsh and fen habitats.
- Doon Lough pNHA (site code 0337) lies approximately 9.8km to the west of the proposed development at its closest point. This is a large lake system with a variety of fringing habitats, which include scrub, woodland, marsh, wet grassland and raised bog.
- Derrygareen Heath pNHA (site code 0931) lies approximately 8.2km to the southeast of the proposed development at its closest point. No NPWS site synopsis is currently available for this site.
- Glenomra Wood pNHA (site code 1013) lies approximately 4.5 km to the west of the proposed development at its closest point (this site is also a cSAC; see Section 6.6.2.1 for details).
- Clare Glen pNHA (site code 0930) lies approximately 8.2km to the southeast of the proposed development at its closest point (this site is also a cSAC; see Section 6.6.2.1 for details).
- Keeper Hill pNHA (site code 1197) is located 10km to the east of the proposed development at its closest point (this site is also a cSAC; see Section 6.6.2.1 for details).
- No impacts on any of these other pNHAs is anticipated as a consequence of

construction or operation of the proposed development.

6.6.2.3 Additional Sites

Lough Derg SPA has been identified as an Important Bird Area (IBA) by Birdlife International on the basis of its population of Black-tailed Godwit, which is of International Importance (Hunt *et. al*., 2000). The extent to which these birds utilise sections of the Lough that lie within the Study Area can be determined through field survey work and through consultation with NPWS and with Birdwatch Ireland.

A number of environmental Non Governmental Organisations have undertaken a review of areas of conservation importance in Ireland. The result was a publication produced by the Irish Peatland Conservation Council entitled "*Protecting Nature in Ireland.* "*The NGO Special Areas of Conservation Shadow List"* (Dwyer, 2000). This document was reviewed to establish if there are any additional areas of importance within the Study Area.

Dwyer *et. al*. (2000), have proposed that Lough Derg proposed candidate Special Area of Conservation should be designated for the following, in addition to the habitats and species on which its pcSAC designation is currently proposed: Orchid-rich grassland (habitat code 6210), freshwater pearl-mussel (species code 1029), Atlantic salmon (species code 1106) and otter (species code 1355).

6.6.2.4 Flora

The Study Area lies within Ordnance Survey National Grid 10km squares R66 and R67. A plant species list for these 10km squares was generated from the CD-Rom version of the *New Atlas of British and Irish Flora* (Preston *et. al.,* 2002). This list was then compared to the lists of species protected under the Flora (Protection) Order of 1999; and those included in the Irish Red Data Book (Curtis and McGough, 1988).

In 10km Grid Square R67, which includes the southern part of the Study Area, one Flora Protection Order species was recorded between 1970 and 1986, Opposite-leaved Pondweed. This species is listed in the Irish Red Data Book as Vulnerable. Correspondence received from NPWS indicates that this species is known from slow-flowing waters to the north of Killaloe, and may occur elsewhere within the Study Area where suitable habitat conditions exist. In addition, Cowslip (non-rare or threatened, but scheduled in Northern Ireland) was recorded between 1987 and 1999 and Bird Cherry (non-rare or threatened) was recorded between 1987 and 1999.

In 10km Grid Square R66, which includes the southern portion of the Study Area, one Flora Protection Order species was recorded between 1970 and 1986; Annual Knawel. This species is not listed in the Irish Red Data Book. Four Red Data Book species are known for the 10km square as follows, Bog-rosemary was recorded between 1987 and 1999 (non-rare or threatened, but scheduled in Northern Ireland); Cowslip was recorded between 1987 and 1999; Bird Cherry was recorded prior to 1970; and Blue-eyed Grass was recorded between 1987 and 1999 (non-rare or threatened, but scheduled in Northern Ireland).

Potentially suitable habitat is likely to be present for all of these species within the Study Area. The precise sites for these species can be determined through consultation with NPWS and with other organisations such as the Botanical Society of the British Isles, and if necessary, can be confirmed through field survey work.

Lough Derg is the only known site in the country for the Red Data Book species Irish Fleabane which occurs along the lake shore. This plant is legally protected by the Flora Protection Order 1987 and is listed in the Irish Red Data Book (Curtis and McGough, 1988). This species has, however not been recorded in 10km National Grid Square R67, and therefore presumably occurs to the north of the Study Area. The same applies to two other Red Data Book species present within the Lough Derg pNHA: Marsh Pea and Ivy Broomrape.

6.6.2.5 Fauna

Mammals

Table 6.4 shows the protected mammal species recorded by Hayden and Harrington (1999) as occurring in the 20km x 20km square in which the Study Area is located. The 20km x 20km square is composed of four OS 10km National Grid Squares: R66, R67, R76 and R77.

Table 6.4 Protected mammal species recorded from the 20km square in which the Study Area is located, as indicated in Hayden and Harrington (2000).

Species	Indication of population	Level of Protection
Hedgehog	Throughout Ireland	Bern Convention Appendix III.
Pygmy shrew	Throughout Ireland	Bern Convention Appendix III.
Lesser horseshoe bat	Confines to Western counties from Cork to Mayo	Irish Red Data Book 'Internationally Important'. Habitats Directive Annex II and IV. Bern Convention Appendix II.
Natterer's bat	Distributed widely throughout Ireland	Protected through Wildlife (Amendment) Act 2000. Appendix II of the Bern Convention. Bonn Convention. Annex IV of the EU Habitats Directive. Red Data Book 'Indeterminate'.
Whiskered bat	Distributed widely throughout Ireland	Protected through Wildlife (Amendment) Act 2000. Appendix II of the Bern Convention. Bonn Convention. Annex IV of the EU Habitats Directive. Red Data Book 'Indeterminate'.
Daubenton's bat	Scattered throughout Ireland	Irish Red Data Book 'Internationally Important'. Habitats Directive Annex IV. Bern Convention Appendix II.
Leisler's bat	Scattered throughout Ireland	Irish Red Data Book 'Internationally Important'. Habitats Directive Annex IV. Bern Convention Appendix II.
Common / soprano pipistrelles	Throughout Ireland	Irish Red Data Book 'Internationally Important'. Habitats Directive Annex IV. Bern Convention Appendix II.
Brown long-eared bat	Found throughout Ireland	Protected through Wildlife (Amendment) Act 2000. Appendix II of the Bern Convention. Bonn Convention. Annex IV of the EU Habitats Directive. Red Data Book 'Internationally Important'
Irish (mountain) hare	Throughout Ireland	Protected under Wildlife Order 1985.Irish Red Data Book 'Internationally important'. Annex V Habitats Directive Annex V. Bern Convention Appendix III.
Red squirrel	Scattered throughout Ireland, but with evidence of a recent decline.	Wildlife (Amendment) Act (2000).
Pine Marten	Found predominantly in western Ireland with scattered sites elsewhere.	Wildlife (Amendment) Act (2000). Bern Convention Appendix III. Irish Red Data Book 'Internationally Important'.
(Irish) stoat	Found throughout Ireland	Wildlife (Amendment) Act (2000). Bern Convention Appendix III.

Badger	Found throughout Ireland	Irish Red Data Book 'Internationally Important' Wildlife (Amendment) Act (2000).

Species	Indication of population	Level of Protection
Otter	Found throughout Ireland	Irish Red Data Book 'Internationally important'. Habitats Directive Annex II and IV. Bern Convention Appendix III. Wildlife (Amendment) Act (2000).
Red Deer	Found in the northwest and the southeast portions of the country	Protected under the Wildlife Acts of 1976, but also designated as a quarry species and may be hunted under licence.
Fallow Deer	Found mainly in central and northern parts of Ireland	Protected under the Wildlife Acts of 1976, but also designated as a quarry species and may be hunted under licence.

The suitability of habitats within the Study Area for these species, and the presence or absence and distribution of these species within the Study Area can be determined through field survey work.

Breeding Birds

Table 6.5 shows bird species of conservation concern recorded by Gibbons *et. al*. (1993) as breeding within 10km grid squares R66 and R67 in which the Study Area is located. Species considered here to be of high conservation concern are those listed either on the 'Red List' by Newton *et. al*. (2000), as being of high conservation concern in Ireland; those listed in the Irish Red Data Book (RDB) (Whilde, 1993) or those listed under Appendix 1 of the EU 'Birds Directive'.

Table 6.5 Selected bird species (those of high conservation concern) recorded from 10km National Grid Squares R66 and R67 during the 'New Atlas survey' 1988-91 (Gibbons *et al*., 1993).

Species	Breeding status within 10km square R66	Breeding status within 10km square R67	Notes
Corncrake	Possible / probable breeding		BWI 'Red List', RDB 'Endangered'
Lapwing	Possible / probable breeding	Confirmed breeding	BWI 'Red List'
Curlew	Possible / probable breeding		BWI 'Red List'
Barn Owl	Confirmed breeding		BWI 'Red List', RDB 'Indeterminate'

The suitability of habitats within the Study Area for these species, and the presence or absence and distribution of these species within the Study Area can be determined through field survey work and through consultation with Birdwatch Ireland.

Invertebrates

Neither White-clawed Crayfish (Reynolds, 1998), Marsh Fritillary butterfly (Asher *et. al*., 2001) nor and of the three species of *Vertigo* snails listed under Annex 2 of the EU Habitats Directive (Kerney, 1999) are recorded from National Grid 10km Squares R66 or R67 and are therefore not likely to be present within the Study Area.

6.6.3 Potential Impacts

Field investigation is required to confirm which species and habitats are present within the Study Area and are therefore subject to direct impacts resulting from the proposed bridge. These field studies will take place during the Route Selection Stage and at further stages in the impact assessment process.

Broadly speaking, the following potential impacts will need to be considered. This list is not necessarily exhaustive, but covers the most likely potential impacts that are evident at this point in time. Further potential impacts may become apparent during future stages of the impact assessment process, for example during consultation with statutory and non-statutory bodies; during field survey work for a route option assessment, and during desktop reviews.

Direct Land Take

Land take for the road will result in habitat loss. This applies to habitats that are in themselves of conservation value; and also to habitats that are suitable as living places for rare or protected species of flora and fauna.

Habitats and species of high conservation value are likely to occur not only within designated sites (see Section 6.6.1), but also outside of these areas. Correspondence received from NPWS indicates that areas of woodland, wetland, surface water and peatland of ecological value exist within the Study Area, but lie outside of the Lower River Shannon cSAC or any other designation. These areas include habitats listed under Annex I of the EU Habitats Directive, and hold species listed under Annex I of the EU Birds Directive, and Annexes II and IV of the EU Habitats Directive. Extensive field survey works at the Route Selection Stage; and further correspondence with NPWS will be required to identify the locations where these habitats and species occur.

Increased Disturbance

During both construction of the road and during operation of the road, there are potential negative impacts on flora fauna due to increased levels of disturbance. This can be in the form of increased noise levels; increased visual disturbance from people and vehicles constructing or using the road; increased trampling due to increased ease of access to the area for people; increased light levels at night from both traffic and lighting associated with the road; etc.

Road Traffic Casualties

Mammals and birds are subject to collision with vehicles using the new road.

Habitat Fragmentation

The new bridge and associated approach roads may result in patches of habitat becoming isolated from one another. Continuous corridors of existing habitat such as riverbanks and hedgerows may be broken. Such fragmentation reduces the ecological value of these features, as networks and corridors of interconnected habitats are of importance to wildlife. Correspondence from NPWS indicates that in this regard, Article 10 of the EU Habitats Directive should be noted:

Member states shall endeavour, where they consider it necessary, in their land-use planning and development policies and, in particular, with a view to improving the ecological coherence of the Natura 2000 network, to encourage the management of features of the landscape which are of major importance for wild fauna and flora. Such features are those which, by virtue of their linear and continuous structure (such as rivers with their banks or the traditional systems for marking field boundaries) or their function as stepping stones (such as ponds and small woods), are essential for the migration, dispersal and genetic exchange of wild species.

Other Secondary Impacts

The potential for secondary impacts on flora and fauna resulting from such issues as contamination of watercourses; changes to the groundwater regime or deterioration in air quality should be considered.

6.7 Surface Waters and Aquatic Environment

6.7.1 Introduction

The screening study identified potential significant impacts on the aquatic environment of the Study Area. This section of the report highlights the potential constraints relating to the aquatic environment of Killaloe/Ballina and O'Briensbridge/Montpelier. The report also incorporates the observations and recommendations as received from the Shannon Regional Fisheries Board (SRFB) who were consulted regarding the potential issues relating to aquatic ecology and fisheries in the Study Area.

6.7.2 Existing Environment

The Lower Shannon River SAC (site code 002165) lies within the Study Area. The River Shannon is the backbone of a vast network of inland waterways, joined to the Erne via the newly restored Shannon-Erne link, formerly known as the Ballinamore and Ballyconnell Canal.

The Lower Shannon SAC is selected for several fish that are listed on Annex II of Council Directive 92/43/EEC. These are as follows: -

1. River Lamprey (*Lampetra fluviatilis*)
2. Brook Lamprey (*Lampetra planeri*)
3. Sea Lamprey (*Petromyzon marinus*)
4. Atlantic Salmon (*Salmo salar*)

Kurz and Costello (1999) state that brook lamprey is known to be common in the lower Shannon catchment and they also state that river lamprey and sea lamprey have been observed spawning in the lower Shannon catchment. The three lamprey species are listed in Annex II of the Habitats Directive (92/43/EEC).

The Lower River Shannon cSAC also holds the Freshwater Pearl Mussel (*Margaritifera margaritifera*), which is listed under Annex 2 of the Habitats Directive. This mussel requires clean, cool, well-oxygenated water free from mud and suspended matter, and is known to occur abundantly in parts of the Cloon River.
The Study Area lies within Ordnance Survey 10km National Grid Squares R66 and R67. Freshwater Pearl Mussel is not known from either of these grid squares, and is indeed not known from Lough Derg or from the main River Shannon (Moorkens, 1999) and is therefore unlikely to be subject to impacts as a result of the proposed development.
The River Shannon is an important fishery, the main fish of commercial and amenity value within the Study Area are salmon, pike, perch, bream, brown trout, eels and various coarse fish hybrids. The SRFB note that: -

> "*in addition there are a range of other coarse fish species, which are part of the biodiversity of the area*".

The Study Area attracts significant numbers of anglers and the SRFB note that: -

> "*The likely area for this bridge has been highlighted as having high to exceptional quality in terms of fly-fishing and for the entire length up to and beyond Killaloe, the area is considered to be of high quality for trout trolling. Angling for coarse fish species and pike in particular also takes place in this area* [downstream of Killaloe] *from the shore and from boats. The area is considered to be exceptional for pike trolling".*

The O'Briensbridge area is an important area for angling and contains stocks of coarse fish, trout and salmon. Angling and the visitors it attract is an important component of the tourism industry within the Study Area. The importance of the River Shannon is highlighted in the submission received from the Shannon Regional Fisheries Board (SRFB): -

> "*Please be advised that the River Shannon in its entirety is an important fishery. The fish, other aquatic species and the aquatic habitat are part of our natural heritage and must be protected*".

The fishing rights of the entire river are vested in the Electricity Supply Board (ESB) whose essential role is to maintain and preserve the Atlantic salmon and European eel. The river downstream of Killaloe Bridge is an important zone of passage for eels and salmon. The game fish, salmon and trout can be found, but since the construction of the hydro-electric station at Ardnacrusha in the 1920's only an occasional salmon is caught and a licence is required to fish for Salmon in the river. The entire fall of the River below Meelick (a lock and weir north of Lough Derg) is harnessed for Ardnacrusha and the E.S.B manage a salmon hatchery at Parteen weir. Consultation with the SRFB has highlighted that: -

> "*salmon are an extremely important fish and considerable efforts and investment has been made by this Board and the E.S.B, to ensure that this fish is able to migrate upstream and that the fish survives as a species in the river*".

Eels are commercially important in the River Shannon, an issue which was also highlighted by the SRFB in their submission: -

"*Eels are also important and have an immediate commercial context as the E.S.B. commercially net eels at Killaloe and at other locations downstream*".

Lough Derg, pNHA, located at the north of the Study Area, is home to a natural mixed fishery offering angling, primarily for pike and other coarse fish (perch and bream), but with a good stock of wild brown trout which are most popularly fished during the Mayfly season. Killaloe is one of the busiest fishing and boating centres in the Midwest and is a starting point for the Shannon cruise, from where it is possible to navigate all the way to Lough Key in Sligo.

In addition to the River Shannon, several other rivers, as well as numerous small streams, drain into the River Shannon within the Study Area. From north to south of the Study Area, these are the Ballyteige River, Kilmastulla River, Ardcloony River and Black River.

The lower Kilmastulla River, which lies within the Study Area, has been classified in a previous study as a "*very productive and important salmon nursey area for the Shannon system, in addition to providing good brown trout angling*" (N7 Nenagh-Limerick High Quality Dual Carriageway EIS, November 2003). Indeed this study reported that one tributary of the Kilmastulla was "*found to have very high quality salmon nursey habitat and a significant population of juvenile salmon*". The stream was classified in the study as being of "*high value and locally important*".

6.7.2.1 River Water Quality

A National Rivers water-monitoring programme is undertaken annually by the Environmental Protection Agency (EPA) and the most recent published reports are contained in Water Quality for Ireland 1998-2000. The objectives of this programme include the following: -

- To establish the ongoing quality of our rivers and streams
- To monitor quality changes and trends over time
- To assess performance of pollution control and abatement measures.

Water quality can be determined based on biological and chemical methods. The physio-chemical parameters which are routinely measured by local authorities and the EPA include pH, conductivity, dissolved oxygen, chloride, nitrates and orthophosphate. Each parameter reflects the overall physico-chemical condition of the water. For biological analysis of river quality, the Biological River Water Classification, or Q-value Ratings system is used (Table 6.6). For example, rivers with a high diversity of macroinvertebrates with good water quality indicate unpolluted, pristine conditions and are assigned a Q value of Q5.

Table 6.6: The Biological River Quality Classification System (from Lucey et al, 1999)

Q-Value	Quality Status	Water Quality	Condition	Macroinvertebrate Community Diversity
Q5	Unpolluted	Good	Satisfactory	High
Q4	Slightly polluted	Fair	Satisfactory	Reduced
Q3	Moderately polluted	Doubtful	Unsatisfactory	Much Reduced
Q2	Heavily polluted	Poor	Unsatisfactory	Low
Q1	Grossly polluted	Bad	Unsatisfactory	Very Low

Water quality information is available on the EPA website for the Ardcloony River (Station No. 0100, River Code 25A03) for the Bridge at Mill View. This monitoring station, which is the closest point on the River to the Study Area, has received a water quality rating of Q5, indicating unpolluted conditions with good water quality and a high diversity of macroinvertebrates. Chemical data is not available for this monitoring station.

Water quality data available on the Kilmastulla River is from a monitoring station at Cool Bridge (Station 1000, River Code 25K04), which lies within the Study Area. From 1985 to 1987 this river received a rating of Q4-5 indicating river conditions slightly polluted to unpolluted conditions. The trend continued to decline between 1993 and 1996 when the river reported slightly pollution to moderate pollution. However, conditions have since improved and the latest Q rating available for the River of Q4 indicate slight pollution, fair water quality with a reduced macroinvertebrate community.

Lake Water Quality

The Environmental Protection Agency (EPA) has published lake water quality data available for 1998-2000, which details the status of Irish lakes in terms of water quality.

The trophic status of Lough Derg, located in the north of the Study Area, is classified as mesotrophic. The EPA have reported recent changes in reduced planktonic algal growth which they consider may be attributable to the presence of zebra mussels, which may be the principal factor in the reduction of phytoplankton growth. In Spring 1997, large numbers of

Zebra mussels (Dreissena polymorpha) were first recorded in Lower Lough Derg and in the River Shannon upstream of Limerick (McCarthy et al 1997). It is suspected that the zebra mussels may have been introduced to the lake system as early as 1994 and by 1998 has spread through the navigable reaches of the systems as far north as Lough Key.

Zebra mussels have the effect of reducing concentrations of planktonic algae and particulate matter in the water leading to an increase in water transparency. The mussels have an important influence on the concentration of nutrients which cause eutrophication, on water transparency and on concentrations of chlorophyll.

Since 1997, the lakes monitoring programme on the Shannon lakes have reported that symptoms of eutrophication, increased chlorophyll concentrations and reduced water transparency, have ameliorated significantly (Bowman, 1998 and 2000). These reductions have coincided with the invasion of the zebra mussel and completion of a major programme of remedial measures, including phosphorous removal at 17 waste treatment works serving the principal urban areas in the catchment (McGarrigle et al, 2000). The EPA report that there is strong evidence that the zebra mussels are controlling the size of populations of planktonic algae and Cyanobacteria in the Shannon lakes and that in the event of a decline in zebra mussel populations, concentrations of chlorophyll will increase again as concentrations of phosphate in the lakes are sufficient during plant growing season to support higher growth of Cyanobacteria and algae (McGarrigle et al, 2000). Lough Derg is currently classified by the EPA as being in a satisfactory mesotrophic status, based on chlorophyll levels, however a higher trophic status might be more appropriate for some of these waters (McGarrigle et al, 2000).

6.7.3 Potential Impacts

The construction phase of the bridge will have potential impacts on the Lower Shannon SAC throughout the Study Area. In addition, there may be potential impacts on other rivers within the Study Area dependent upon the location chosen for the bridge, and in turn location of associated tie-in of Regional roads.

There will be potential impacts during the construction phase of the bridge and during construction of the associated tie-in with Regional roads. These impacts may include suspended sediment due to runoff of soil from the construction area. It is known from laboratory studies that fish may avoid sediment plumes implying that migration routes for fish may be blocked if the concentrations of suspended solids are too high. Suspended sediment due to runoff of soil from construction areas, or due to disturbance of fine sub-surface sediments in the course of instream construction and excavation, can have severe negative impacts on invertebrate and plant life and on all life stages of fish.

Suspended solids would be an important potential impact within the Study Area during the spawning and angling seasons. The SRFB in their submission note that: -

> "*Levels of suspended solids are also important for all fish that are spawning in the wild and steps to minimise the impact of suspended solids will be absolutely essential*".

The importance of the headrace canal has been highlighted by the SRFB, who state that: -

> "*it is an extremely important zone of passage for adult salmon migrating upstream and for salmon smolt descending downstream. Large numbers of eels also descend*

into the canal making their way back to sea".

They state that: -

> "*even though suspended solids may not severely impact on the operation of the power station they could seriously inhibit the movement of salmon into the fish passes on their migration upstream in particular*".

Potential impacts on the headrace canal will require ongoing consultation with both the E.S.B and the SRFB.

The SRFB also highlighted the importance of the ESB salmon hatchery and the sensitivity of salmon to pollution: -

> "*Salmon are extremely sensitive to pollution. In this case [ESB salmon Hatchery] we are dealing with salmon ova as well as juvenile fish. Therefore pollution, particularly pollution in the form of suspended solids, must be avoided or attenuated to such an extent that they will not impact on the ova*".

Should the bridge be located near O'Briensbridge, there will be potential impacts on fisheries and on the angling amenity of the area. The area is noted by the SRFB as: -

> "*an extremely important angling area….important as a mixed fishery containing stocks of coarse fish, trout and salmon. The area is widely promoted by the Board*".

Other substances associated with the construction process, such as raw or uncured concrete and grout, runoff from exposed aggregate surfaces, cast-in-place concrete and concrete trucks, fuels, lubricants and hydraulic fluids used on the construction site can lead to pollution events.

The SRFB have also flagged the potential for the possibility of "pollan", a species of freshwater fish *Coregonus autumnalis*, being present downstream of Killaloe: -

> "*Please also be aware of that there is a real possibility that the rare fish "pollan" could also be in this area. Some of this area could be important as spawning grounds for this fish and it will have extremely high priority if it is found in the area. Little is actually known of the spawning potential for pollan in the area, but they used to be observed in large numbers around Killaloe*".

During the operational phase of the bridge, there is potential for runoff of pollutants from the bridge road surface. The pollutants of most concern in roadway runoff vary greatly but may include hydrocarbons, sediments, metals and salts and nutrients. Accidental spillages along the bridge road surface may occur and these can consist of almost any polluting substance with varying impacts.

As in the case of any road project, there is potential for accidental spillages during the operational phase of the bridge, which could potentially runoff into the River Shannon SAC and/or adjacent watercourses.

6.7.4 Constraints and Recommendations

The main legal constraints on the proposed development in relation to aquatic flora, fauna, habitats and fisheries include the Local Government (Water Pollution) Act, 1977 (and associated regulations); The Fisheries (Consolidation) Act, 1959 as amended by the Fisheries (Amendment) Act, 1962, Fisheries (Amendment) Act 1999; and The Wildlife Act 1976.

Given the importance of the Shannon River, with respect to angling and tourism, and other rivers within the Study Area, for several fish species, including salmon, trout and eel, it is likely that seasonal restrictions on in-stream works, or other mitigating measures to reduce temporary impacts on fish and fisheries may be prescribed. The submission received from the SRFB for this Constraints Report recommended that: -

> *"a suitable window of opportunity to carry out in stream works must be agreed with both the ESB and this Board prior to any works commencing. A detailed method statement will be of paramount importance".*

In addition, the SRFB, with respect to reed beds on either bank downstream of Killaloe , have requested that: -

> *"care must be taken to preserve as much spawning grounds as possible. This applies for all aquatic species".*

On the issue of potential adverse impacts from the impact of suspended solids, the SRFB state that: -

> *"it is imperative that serious consideration is given to this aspect when designing the bridge at any location.*

The SRFB have expressed their concern regarding the possible siting of a bridge near O'Briensbridge: -

> "*we would have serious concerns about the imposition of a bridge on this fishery and would request much more detailed information as to the likely location and bridge type if a location in this area is to be selected. The introduction of a bridge in this area would seriously impair the angling potential of the area. Noise, artificial light, loss of habitat, loss of angling and angling amenity are all critical factors that should be considered*".

In addition, the riverbank at Montpelier is protected under Policy ENV 4 of Montpelier Local Area Plan 2002 which states that: -

> "*The Council will not permit development which compromises or threatens the amenity value or recreational use of the riverbank at Montpelier*".

The Montpelier Local Area Plan 2002 Policy ENV 6 states that: -

> "*Proposals for development are required to have regard to the quality and quantity of water resources. Development will only be permitted where it can be clearly demonstrated that there will be no direct or indirect damaging effects on water resources"*

The SRFB have requested that the angling industry in this area: -

> "*be protected notwithstanding the necessity to have a bridge".*

The physical height of the proposed bridge will be constrained in salmon angling areas near O'Briensbridge. The SRFB state that: -

> "*the height of the bridge above water would be a factor. To use salmon rods the bridge height above the water should be at least seven metres. It is not really practicable to have a bridge lower in height than this*".

The SRFB also state that: -

> *"fishing rights" must also be considered as "property rights" and compensation for damage caused could be an issue. There may be a requirement to carry out compensatory works to offset damage to and loss of habitat or angling*".

As the bridge will require new access roads, the construction of which will have potential impacts from pollutants, the SRFB state that: -

> "*sufficient land must be taken to incorporate attenuation including the provision of constructed wetlands, oil and grit interceptors, swales etc. The type of bridge, it's height above water, the mode of construction and the pollutants that arise during and after construction will be important*".

The SRFB also state that: -

> "*lights on the bridge structures will also be important and design should prevent light pollution and in particular minimise the amount of light that falls on the water as this can inhibit fish movement*".

Given the importance of fisheries, aquatic habitat, angling and the biodiversity of the area, the SRFB in their submission have stated that: -

> "*it will be important that detailed consultation with the Board and the fishery owners, the ESB, should be undertaken at all stages of the development. In particular, when this project is going to tender, we have found that problems arise unless all the companies tendering properly liase and meet with the Fisheries Board*".

The risk of impacts on fish and fisheries will be assessed in connection with the preparation of the Route Selection report and in consultation with the Shannon Regional Fisheries Board.

6.8 ARCHAEOLOGY AND CULTURAL HERITAGE

6.8.1 Introduction

This section of the report examines the likely environmental constraints of the proposed development on the cultural heritage resources in the environs adjacent to Killaloe/Ballina and O'Briensbridge/Montpelier.

6.8.2 Methodology

A desktop survey of heritage and scenic amenity sites within the area of the proposed development scheme was carried out in order to assess cultural heritage constraints.

The *Sites and Monuments Record* (SMR) of Counties Clare, Limerick and Tipperary, as published by the Archaeological Survey of Ireland, available from the Department of the Environment, Heritage and Local Government, was the principal source for identifying archaeological constraints.

In addition the following sources were consulted: -

- North Tipperary County Development Plan 2004-2010
- Clare County Development Plan 2005
- East Clare Draft Local Area Plan 2004
- Montpelier Local Area Plan 2002
- Limerick County Development Plan 2005-2011
- Consultation, in writing, with the Department of the Environment, Heritage and Local Government (DEHLG) and the Clare County Council Conservation Officer.

6.8.3 Archaeological Legislation and Statutory Controls

Ireland has a number of legislative mechanisms, which protect our cultural heritage. The primary pieces of legislation are the National Monuments Acts 1930-1994, the Heritage Act 1995 and relevant provisions of the National Cultural Institutions Act 1997. This legislation allows for the registering and recording of monuments, which require permission to be obtained before monuments can be interfered with in any way. Preservation Orders can also be issued, under the 1930 Act, to ensure protection in the event of potential threats. All Recorded Monuments have statutory protection. The legislation also requires that some forms of archaeological investigation require a licence. All excavations are subject to licence. Provision for the protection of Architectural Heritage can be found in The Architectural Heritage (National Inventory) and National Monuments (Miscellaneous Provisions) Act 1999 and The Local Government (Planning and Development) Act 1999. Maritime heritage is protected under the National Monuments Acts and under the Merchant Shipping Act. As of July 2003, the Minister for Environment, Heritage and Local Government is charged with responsibility for the administration of national policy in relation to archaeological heritage management.

6.8.4 Ownership and Guardianship of National Monuments

National monuments may be acquired by the Minister for Environment, Heritage and Local Government whether by agreement or by compulsory purchase order. The State or Local Authority may assume guardianship or any national monument (other than dwellings). The owners of national monuments (other than dwellings) may also appoint the Minister for Environment, Heritage and Local Government 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.

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 listed 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. The register was largely made redundant with the establishment of the Record of Monuments and Places by regulations under the National Monuments (Amendment) Act, 1994.

In addition, work may also only be undertaken on or in the vicinity of sites under Preservation Orders by the written consent, and at the discretion, of the Minister.

6.8.5 Existing Environment

Killaloe has been a place of strategic importance for thousands of years. Its greatest claim to historical fame is as the site of Kincora, the palace of Brian Ború, the 11th century high king of Ireland and one of its most powerful rulers of all time. Brian Ború's royal residence stood on the summit of the hill, above the bridge at Killaloe.

The historical town of Killaloe (CL045-033) on the left bank, in County Clare is a network of narrow streets, flanked by old shops and houses, that climb up the steep hillside and look down over the 13th century cathedral, St. Flannan's Cathedral. The riverside towns of Killaloe and Ballina are linked by an early eighteenth-century bridge, which is a recorded monument (RPS number 210). The importance of the heritage of this bridge was highlighted in a submission received from the Lough Derg Science Group who stated that "the Ballina-Killaloe is a heritage bridge and was never designed for motorised traffic. Yet heavy traffic has been given priority and has repeatedly damaged wall sections and persistent vibration may be responsible for destabilising the canal bank that could lead to its future collapse".

St. Flannan's cathedral, so called after the first Archbishop of Killaloe in 639, dates back to the 13th century. However, it was not the first cathedral built here. The first cathedral was destroyed sometime in the 12th century and the Romanesque doorway of the present cathedral belonged to the original one.

St. Molua's Church originally stood on Friar's Island in the Shannon (about 1km downstream from Killaloe), but was removed and re-erected onto the grounds of the Catholic Church in Killaloe when the island was flooded and submerged in the Shannon Hydroelectric Scheme in 1929 (information from www.shannonregiontourism.com). The Shannon hydro-electric scheme has had the effect of creating an artificial lake between Lough Derg, which acts as the main reservoir or mill-dam and the weir at O'Briensbridge downstream.

Twenty-seven Sites and Monument Records (SMRs) are present within the Study Area. These records are listed in Table 6.7 below and illustrated on Figure 6.3.

Table 6.7: Site and Monument Records (SMR) within the Study Area as provided by the Archaeological Survey of Ireland

Monument Number*	National Grid	Function	Classification
CL045-032---	16977, 17321**	Religious	Holy Well
TN025-008---	17010, 17321	Landscape	Weir
TN025-09403-	17041, 17306	Landscape	Weir
TN025-015---	17082, 17258	Military	Castle
TN025-016---	17079, 17243	Religious	Church & Graveyard
TN025-094-02	17047,17316	Military	Tower House
CL045-033---	17018, 17296	Habitation	Historic Town
TN025-094---	17052, 17316	Habitation	Town
TN025-01901	17102, 17233	Ceremony	Standing Stone
TN025-01902	17098, 17228	Ceremony	Standing Stone
TN025-021---	17062, 17208	Religious	Holy Well
TN025-02202	17062, 17196	Funerary	Burial Ground
CL045-050---	17051, 17192	Religious	Cross
CL045-049---	16960, 17176	Undefined	Enclosure
CL045-04801-	16908, 17096	Ceremony	Standing Stone
CL045-04802	16920, 17096	Ceremony	Standing Stone
CL045-04803	16924, 17103	Ceremony	Standing Stone
CL045-047---	16847, 17021	Habitation	Fulacht Fiadh
CL054-006---	16689, 16796	Undefined	Enclosure
CL054-008---	16725, 16756	Undefined	Enclosure
CL054-005---	16647, 16705	Funerary	Cist (Buried)
TN031-005---	16917, 16771	Ceremony	Standing Stone
TN031-006---	16945, 16764	Funerary	Burial Ground
CL054-00702-	16716, 16721	Religious	Graveyard
LI001-006---	16683, 16691	Funerary	Graveyard
LI001-005---	16639, 16686	Transport	Bridge
CL054-003---	16537, 16676	Transport	Road

* The term “Monument Number” refers to a coding system developed by the Archaeological Survey of Ireland for their Sites and Monument Record (SMR). The system ensures that every known archaeological site in the country is accorded a unique reference number. The SMR consists of a computer database and a map register based on the Ordnance Survey’s Six-Inch Map Series. The first two letters refer to the county and the next number referring to the relevant map sheet (i.e. “CL032 stands for OS map number 32 for County Clare. The next component relates to a specific site (i.e. 032--- stands for the sixteenth archaeological record recorded on that particular map sheet.)

** The Six Figure Grid Reference e.g. for 16977, 17321 is R697732

Enclosures are classified as such when a bank and/or fosse cannot be clearly defined. When excavated they often prove to be ringforts but some times are found to be earlier, dating to the Bronze Age. Three enclosures have been identified within the Study Area.

Fulacht fiadh or ancient cooking places – dating to the Bronze Age – usually survive as mounds composed of burnt material (heat shattered stones, ash and charcoal). One fulacht fiadh (CL045-047) has been identified from the Study Area.

There are a number of ecclesiastical sites, which occur within the Study Area. A holy well is any location where water is used as the focal point for devotion or, the waters of which are seen are curative. Most are associated with a particular person, usually a patron saint. There are two holy wells within the Study Area (one in the Clare part of the Study Area CL045-032--- and one in North Tipperary TN025-021---). A number of recorded graveyards and burial grounds have also been identified within the Study Area, as listed in Table 6.7.

A total of six standing stones were identified within the Study Area. The majority of Irish prehistoric standing stones are Bronze Age in date, although a few may be from the Iron Age.

In the south of the Study Area is the recorded bridge at O'Briensbridge (LI001-005---) and a listed and protected road (CL054-003---).

All of the above SMRs, identified within the Study Area, are illustrated on Figure 6.3.

There are a number of Record of Monuments and Places (RMP) identified within the Clare County Development Plan 2005 and the North Tipperary County Development Plan (October 2004)

The following are listed in the Clare County Development Plan 2005: -

RPS 91: Riverside, O'Brien's Bridge
RPS 94: Ross House, O'Brien's Bridge
RPS 95: Tinerana House, Killaloe
RPS 133: Sacred Heart Church, Garraunboy, Killaloe
RPS 193: Canal Bridge, O'Brien's Bridge
RPS 210: Killaloe Bridge
RPS 215: O'Brien's Bridge
RPS 228: Tullies Harbour, Tinarana Beg, Killaloe
RPS 252: Killaloe High Cross
RPS 439: Abbey House, Abbey Street, Killaloe
RPS 440: Ballyvalley House Gate Lodge, Killaloe
RPS 101: Church of Ireland, Killaloe
RPS 441: Clarisford Palace, Moys Td., Killaloe
RPS 442: Courthouse, Court House Road, Killaloe
RPS 443: E. Richardson, Main Street Killaloe,
RPS 153: St. Flannan's Cathedral
RPS 155: St. Flannan's Church
RPS 445: The Deanery, Abbey Street, Killaloe

There are also published records of protected structures, listed by townland, in The North Tipperary County Development Plan (October, 2004).

Two other structures, in the area of Garryatineel, were identified by a resident who brought them to the attention of the project. These are as follows: -

- A cut stone (granite) railway bridge under the avenue to the Fort Henry estate from the public road
- A cut-stone gate lodge and entrance piers to the avenue above.

The key heritage features identified in the Montpelier Local Area Plan 2002, relevant to the Study Area, are O'Briensbridge and the riverbank, "*The bridge has served as an important link between Counties Limerick, Clare and Tipperary since the 16th Century and is a Protected Structure*". The Riverbank is protected under Policy ENV 4 of the Montpelier Local Area Plan 2002.

Prior to preparation of the Montpelier Local Area Plan 2002, the local community of Montpelier were consulted and conservation of O'Briensbridge was one of the issues raised

> "*The O'Briens Bridge needs to be better protected (traffic controls and weight limits)*" (listed under Comments from Public Consultation, page 67 of Montpelier Local Area Plan 2002).

6.8.6 Cultural Heritage Constraints

The Study Area is rich in archaeological heritage and given its historical nature, there is potential for uncovering previously undetermined archaeological remains. All of the SMR sites within the Study Area will be surrounded by a buffer area of at least 120m. The location of known SMR sites within the Study Area also increases the possibility of there being other related unidentified sites in the vicinity.

6.8.7 Recommendations

Ideally the location of the new Shannon bridge crossing should avoid all known archaeological sites known from the Study Area. The Clare County Development Plan 2005, under the heading 'The Vision of the Clare County Development Plan 2005 –2011' states that: -

> "*The archaeological and architectural heritage of the county will be appreciated and will be protected by ensuring that it is not damaged either by its own decay or destruction or by unsympathetic developments nearby*".

The Clare County Planning Authority will: -

> "*only permit developments which can clearly demonstrate that there would be no adverse impacts upon the archaeological or historical importance of recorded sites or monuments*"
>
> (CDP 47, Draft Clare County Development Plan 2005-2011)

The Montpelier Local Area Plan 2002, in the Environment and Amenity Chapter, states that: -

> "*Natural and cultural heritage, whether it be of national, international or local significance makes an important contribution to local identity, contributing to the quality of life of local people and attracting visitors and tourist to an area*"

Policy ENV 24 of the Limerick County Development Plan 2005-2001 states: -

> "*It is the policy of the Council to seek the preservation (in situ, or at a minimum, preservation by record) of all sites and features of historical and archaeological interest".*

North Tipperary's policy on protection of archaeology and protection of protected structures is provided under Policy ENV 42 (Section 4.9.3) and ENV 43 (Section 4.9.4) of their County Development Plan 2004-2010.

It is important therefore that all development proposals acknowledge and give regard to archaeological and architectural heritage of Study Areas, and to the objectives and policies of the Development Plans and Local Area Plans for the Study Area.

During the Route Selection Stage of the project, selected routes shall be walked and inspected by an archaeologist in order to identify any previously unknown or unrecorded sites. Any new sites discovered in this way should be reported to the appropriate authorities. As well as monuments, the Topographical Files of the National Museum of Ireland record thousands of artefacts from the River Shannon, ranging in date from the prehistoric to the late medieval period. It is therefore recommended that provision be made for an archaeological investigation of the river locations, selected for bridge location, as part of the site investigation for the route selection phase.

The Department of the Environment, Heritage and Local Government, in their response to consultation on the project, had no comment from an archaeological perspective.

6.9 Soils, Geology and Hydrogeology

6.9.1 Introduction

This section examines the soils, geology and hydrogeology of the proposed Study Area. The Study Area extends from approximately 1.5km north of Killaloe/Ballina to 0.5km south of O'Briensbridge/Montpelier.

6.9.2 Methodology

This report is based on a desk study. Information on the geology and hydrogeology of the area has been obtained from the Geological Survey of Ireland (GSI). Information supplied by the GSI in electronic format included: -

- Bedrock Geology Data
- Aquifer Classification
- Subsoils / Quaternary Geology
- Well Database
- Karst Database

6.9.3 Existing Environment

6.9.3.1 Bedrock Geology

Information on the bedrock geology was obtained in digital format from the GSI. The Study Area is covered by Geological Survey of Ireland, Sheet 18 Geology of Tipperary (Scale 1:100,000) map and accompanying geological description. The geological description has been prepared based on the GSI report accompanying Sheet 18. Bedrock within the Study

Area ranges in age from Silurian to Carboniferous. The oldest rocks (Silurian) are found to the north of Killaloe with the youngest rocks found north of O'Briensbridge (Carboniferous). The bedrock geology of the area is illustrated on Figure 6.4.

In the northern portion of the Study Area the bedrock is composed of rocks of Silurian age. The River Shannon cuts through the area of Slieve Bernagh to the west (height 532m) and the Arra Mountains to the east (457m). Within the area immediately south of Killaloe and immediately north of O'Briensbridge Devonian age rocks form the bedrock. These rocks are not differentiated into different formation names and have been grouped together as Old Redsandstone (undifferentiated). The Devonian rocks outcrop on the northern and southern edges of the limestone cored syncline. These areas are generally found on the perimeter of the uplands with the Silurian rocks forming the higher areas.

An unusual feature within the Study Area is the Killaloe Gorge in the southern portion of Lough Derg. In this area the River Shannon departs from the limestone floored lowlands to cut through the Slieve Bernagh and Slieve Arragh Mountains via the Killaloe Gorge. The river cuts through an upland area of relatively hard rocks (Silurian & Devonian in age) instead of following the limestone floored corridor at Tuamgraney to sea at Newmarket on Fergus (GSI, Sheet 18 Report). This is considered to be in some way a result of glacial erosion.

A description of each of the geological units follows.

Broadford Formation (BF)

This formation forms the bedrock in the area north of Killaloe and extends as far north as Rinnaman Point. The Broadford Formation is described as a fine to conglomeratic graded greywacke which is Silurian in age. There is some variation in lithology within this formation depending on its location. On the southern limb of the Slieve Bernagh Syncline it is predominantly argillaceous in character (60% of outcrop) but contains a higher proportion of coarser grained clastics. On the northern limb of the syncline fine grained greywackes predominate. These greywackes are indicated on the bedrock geology map as (gw). There are reported (GSI) to be a number of slate quarries on both sides of the Shannon within the Broadford Formation.

Hollyford Formation (HF)

The Hollyford Formation forms the bedrock in a small area immediately to the north of Birdhill. This formation is composed of greywackes and greenish grey mudstones, interbedded with thin siltstones and or blackish grey laminated siltstones with a few fossils occasional grits and a few ashes.

Old Red Sandstone (ORS)

Within the Study Area the boundary between the Silurian and Devonian is represented by an unconformable boundary. This means that some of the geological succession is absent. The Old Red sandstone (undifferentiated) is described as comprising of red conglomerate, sandstone and mudstone. In this part of the country the Old Red Sandstone is thinner than seen further south as it is located outside of the Munster Basin. The thickness of Old Red sandstone in the Study Area is no more than a few hundred metres thick.

Lower Limestone Shale

The Lower Limestone Shale forms the bedrock in the area south of O'Briensbridge,

Ardbacartan Cross Roads and Cloonfadda. This formation is composed of grey sandstones, siltstones, shales and mudstone and thin limestone. This unit is Lower Carboniferous in age and represents the transition from the sandstones and mudstones of Devonian age to the Carboniferous Limestones.

Ballysteen Formation (BA)

The Ballysteen Formation forms the bedrock to the north of Bridgetown (west side) and north of Birdhill (east side). This formation is composed of well-bedded blue grey to mid grey argillaceous limestones. The shales and limestones are very fossiliferous. This formation is composed mainly of wackestones and packstones and only locally grainstones.

The Ballynash Member (BAbn) is often found at the top of the Ballysteen Formation associated with transmission to Waulsortian Limestones. This is a grey, orange weathering shaly cherty and wavy nodular often micritic wackestones which is variably fossiliferous.

Waulsortian Limestone

The Waulsortian Formation forms the bedrock in the centre of the core and therefore outcrops only over a small area to the north west of Birdhill. The bedrock is composed of pale grey, sparry, fossiliferous poly mud micritic limestones, often massive knoll forms with crinoidal or pale cherty shaly interbeds, frequently dolomitised.

Cross Patrick Formation

The Cross Patrick Formation within the Study Area forms the bedrock beneath a limited area south of Bridgetown. This Formation is a pale grey well bedded crinoidal limestones with nodules of blue or black chert.

Karst Database

The Geological Survey of Ireland conducted a search of their Karst Database and there are no reported karst localities within the Study Area.

6.9.3.2 Depth to Bedrock Data

Information on the depth to bedrock has been obtained from the Well Database from the Groundwater Section of the Geological Survey. The available data for the Study Area is illustrated on Figure 6.4. There is only depth to bedrock data for a limited number of locations within the Study Area (9 no.) and it should be noted that the locations tend to be approximate.

6.9.3.3 Geological Heritage

The Geological Survey of Ireland was consulted in relation to the Irish Geological Heritage Programme to confirm whether there were any geological heritage sites within the Study Area. There are no sites identified by the GSI within the Study Area as being under consideration for possible NHA status or as County Geological Sites.

The Geological Survey indicated that if a route is selected within the narrow Killaloe stretch

there is a possibility that excavations into bedrock would provide new exposures. The GSI would be interested in recording these as in this area the Devonian and Silurian rocks have an unconformable boundary and the GSI would welcome the opportunity to examine any new exposures.

6.9.3.4 Structure

Within the Study Area the structure is dominated by the presence of the Slieve Bernagh Syncline. The bedrock of the area has been folded with the Carboniferous rocks forming the bedrock in the core and the Devonian rocks found on the margins of the syncline. The syncline has a north east to south west trending axis. The Slieve Bernagh Syncline is cut by a north west to south east trending fault.

To the north of Killaloe within the Broadford Formation there is a north east to south west trending anticlinal axis.

6.9.3.5 Overburden Geology

Information on the subsoil / Quaternary geology of the area has been obtained from the GSI.

The following overburden types have been classified by the GSI: -

- Alluvium (undifferentiated)
- Glaciofluvial gravel
- Peat
- Sandstone till
- Rock within 1m of surface
- Estuarine Sediments
- Till derived from Devonian Sandstone
- Till derived from Lower Palaeozoic Shale

According to the GSI there is no information on quaternary deposits available at this time for the North Tipperary area, which makes up the east portion of the Study Area.

Areas of soft soil deposits have been identified to the South of O'Briensbridge and North West of Birdhill. The GSI Quaternary soils information indicates peat in several areas to the south of O'Briensbridge and to east of Bridgetown.

On the west side of the River Shannon immediately adjacent to the River Shannon the subsoils deposits are as follows. From Killaloe area as far south as the Ballyteige River there is an area of alluvium deposits. The area of Cloonfadda is mapped as being underlain by till derived from Lower Palaeozoic Shale while the area north of the Black River is underlain by estuarine deposits. Further west an area of glaciofluvial gravel is found extending to the edge of the lowland from Killaloe to Bridgetown.

There is no subsoil information available for the east side of the River Shannon at this time apart from the O'Briensbridge area and the area north of Birdhill indicated as being underlain by a locally important sand and gravel aquifer (Figure 6.5). The area immediately adjacent to the river is underlain by alluvium while further south there is sandtones till, glaciofluvial gravel and peat deposits.

6.9.3.6 Hydrogeology

The Study Area includes a portion of counties Limerick, Tipperary and Clare.

Information on the hydrogeology of the area is based on the aquifer classification data provided by the Geological Survey of Ireland for the Study Area. The Geological Survey of Ireland aquifer classification scheme is based on the value of the groundwater resources and the hydrogeological characteristics of the aquifer. Eight categories of aquifer have been defined by the GSI as follows: -

Regionally Important Aquifers (R): -

- Karstified Aquifers (Rk)
- Fissured Bedrock Aquifers (Rf)
- Extensive Sand and Gravel Aquifers (Rg)

Locally Important Aquifers (L)

- Sand / gravel (Lg)
- Bedrock which is Moderately Productive (Lm)
- Bedrock which is Moderately Productive Only In Local Zones (Ll)

Poor Aquifers (P)

- Bedrock which is Generally Unproductive Except for Local Zones (Pl)
- Bedrock which is Generally Unproductive (Pu)

In general the Silurian rocks are generally fine grained siltstones, mudstones and sandstones. Within these formations secondary permeabilities are increased by intense folding, faulting and cleaving. However openings have become recemented in places by siliceous infiltration. Due to the rock type and absence of secondary permeability these formations tend to form Poor Aquifers with low groundwater potential.

Within the Study Area the Old Red Sandstone are thin in comparison to the typical thickness seen elsewhere in the country. In the County Limerick Groundwater Protection Scheme Report the GSI indicate that the unconformity between Devonian and the underlying Silurian rocks may represent a high transmissivity zone. Structural deformation is likely to have increased secondary permeability. Higher groundwater yields may be found in proximity to major fault zones. The GSI have classed the formation as a Locally Important aquifer that is moderately productive only in local zones.

The Carboniferous rocks with the exception of the Lower Limestone Shale are classed as a Locally Important aquifer which is moderately productive only in local zones. The Lower Limestone Shale is classed as a Poor Aquifer.

There is one area of Locally Important Sand and Gravel Aquifer (Lg) between Birdhill and Ballina (Figure 6.5).

The aquifer types within the Study Area are limited to Locally Important Aquifers and Poor Aquifers (Figure 6.5). The Geological Survey of Ireland Aquifer Classification System is linked to potential well yield.
Locally important aquifers are capable of good well yields 100 – 400m^3/d. Typically poor aquifers would generally have moderate or low well yields less than 100m^3/d. The poor aquifers will typically yield enough water to supply a house or small farm however supplies tend to be unreliable as the permeability tends to be limited to the upper most few metres of broken and weathered rock and yield decreases markedly during dry spells.

Table 6.8: Aquifer Classification Within Study Area

Geological Formation	Aquifer Classification
Broadford Formation	Pl
Old Redsandstone	Ll
Lower Limestone Shale	Pl
Ballysteen Formation	Ll
Ballynash member of Ballysteen	Ll
Waulsortian	Ll
Volcanics	Ll
Cross Patrick Formation	Pl
Hollyford Formation	Pl
Birdhill Sand & Gravel	Lg

Private Wells

Information on private wells within the Study Area was obtained from the Groundwater Section of the GSI. The well database provides approximate locations for private wells within the Study Area. There are likely to be additional private wells within the Study Area. The locations of the known private wells are illustrated on Figure 6.6. The GSI well data is categorised into 6 different yield categories these being:

F – Failure
P – Poor (< 40m^3/d)
M – Moderate (40 – 100m^3/d)
G – Good (100 – 400m^3/d)
E - Excellent (> 400m^3/d)
U – Unknown yield

Within the Study Area the well data indicates 1 no. good wells, 17 no. moderate wells, and 2 no. poor wells. No excellent yielding wells were identified.

6.9.3.7 Groundwater Flow Direction

No water level information is available for discrete boreholes within the Study Area however the groundwater flow direction is likely to be a reflection of the topography with the discharge of groundwater to the River Shannon. In lowland areas the water table is expected to be within 10m of ground surface. The GSI report that the annual fluctuation in the water table is generally 3m to 7m in lowland areas. In the uplands water levels are within a few metres of ground level in winter but may fall to 20m below ground level in dry summers.

6.9.3.8 Aquifer Vulnerability

The Environmental Protection Agency / Geological Survey of Ireland Aquifer Vulnerability / Protection Zone Classification scheme is based on the aquifer's vulnerability to contamination from point and diffuse sources of contamination.
The following table outlines the hydrogeological conditions associated with the vulnerability classifications.

Table 6.9: GSI, Vulnerability Classification Scheme

Vulnerability Rating	Hydrogeological Conditions				
	Subsoil Permeability (Type) and Thickness)			Unsaturated Zone	Karst Features
	High permeability (sand/gravel)	Moderate permeability (e.g. sandy subsoil)	Low permeability (e.g. clayey subsoil, clay, peat)	(Sand/gravel aquifers only)	(<30m radius)
Extreme (E)	0 – 3.0m	0 – 3.0m	0 – 3.0m	0 - 3.0m	-
High (H)	>3.0m	3.0 – 10.0m	3.0 – 5.0m	>3.0m	N/A
Moderate (M)	N/A	>10.0m	5.0 – 10.0m	N/A	N/A
Low (L)	N/A	N/A	>10.0m	N/A	N/A

Information on the aquifer classification for the aquifers within the Study Area was obtained from the Geological Survey of Ireland. The data is illustrated on Figure 6.5.

The vulnerability classification illustrated on Figure 6.7 was obtained from the Geological Survey of Ireland and is generally taken as being conservative. The classification would be likely to change based on site specific data collected during future site investigations within the Study Area.

6.9.4 Potential Impacts/Constraints

The following potential impacts of the proposed scheme have been identified in relation to geological and hydrogeological aspects of the Constraints Study.

6.9.5 Constraints

There are no sites of geological heritage located within the Study Area there are no sites identified by the GSI within the Study Area as being under consideration for possible NHA status or as County Geological Sites. The proposed development has a positive impact in relation to the collection of additional bedrock geology data in that it has the potential to provide new exposures of bedrock which the GSI have expressed an interest in studying.

A possible constraint to the location of the proposed bridge would be areas of potential subsidence. The GSI karst database did not indicate the presence of swallow holes or other karst features within the Study Area. The potential for karst development cannot be ruled out

within the limestone formations within the Study Area without site investigations. In other parts of the country these limestone formations contain karst features. In other parts of the country the Waulsortian Limestone exhibits karstification and dolomitisation. In areas with the potential for dolomitisation special care should be taken with the discharge of surface water to avoid washout of clay filled karst features.

Three main areas of peat / soft ground peat have been identified within the Clare and Limerick portions of the Study Area based on the subsoils / Quaternary data (Figure 6.4). Two of these
areas are south of O'Briensbridge on the southern edge of the Study Area. An area of peat deposits was identified east of Bridgetown.

There are a number of private wells within the Study Area. The GSI well database indicates 21 number wells within the Study Area.

6.9.6 Potential Impacts

The construction of the bridge has the potential to impact on surface water and groundwater quality as a result of the uncontrolled discharge of surface water runoff. The discharge of surface water runoff from proposed bridges and access road needs to be controlled in areas where aquifer vulnerability is extreme or high in order to prevent the pollution of groundwater supplies. The potential exists for accidental spillages of oil, fuel and lubricants during the construction stage from site machinery. In addition the potential exists for accidental spills during the operational phase of the bridge from normal traffic movements and accidents. This impact could be mitigated through the development of containment methods and emergency procedures to deal with accidental spillages.

6.10 Human Environment

6.10.1 Introduction

During a Constraints Study, it is necessary to consider potential impacts of proposed or new developments on the human environment of the Study Area. These are described in the following sections.

6.10.2 Development Context

The Limerick Planning Land Use and Transportation Strategy for Greater Limerick is a strategic plan prepared by Clare County Council, Tipperary North County Council and Limerick and City County Councils. Its purpose is to guide and co-ordinate the planning and control of land use developments in and operation of transport systems. A significant part of the Mid-West Region is focussed on the Limerick/Shannon gateway and the strategy identifies several issues which need to be considered in the future planning of the region, which include a new bridge crossing over the Shannon to the north of Limerick City.

The County Development Board Strategy for Clare provides a Spatial Development Policy for the county which will support the decentralisation of public service agencies to identified growth centres throughout the county. Killaloe has been identified by the Board as one of the growth centres for this purpose. In addition, the Draft Clare County Development Plan 2005 - 2011 recognises the importance of major settlements such as Killaloe to the viability of rural communities around it.

The Clare County Planning Authority has identified the Shannon river crossing (Killaloe/O'Briensbridge) as one of the "key network elements as necessary to achieve the objectives of the Plan".

The Draft Clare County development Plan 2005-2011 in its discussion of linked settlements in the county, Section 3.3 states that: -

> "*many of the rural towns of the county are looking to tourism as the key to future economic growth and offering a viable tourism package for smaller settlements is not easily achieved. The linking of these key towns with other settlements that have complimentary economic and cultural activity has the potential to provide a wider tourism product and establish sufficient critical mass for more diverse economic growth*".

6.10.3 Existing Environment

There are three principal elements to the community of the Study Area. These can be considered as follows:

- The resident community;
- The working community;
- The visiting community.

6.10.3.1 The Resident Community

In the Killaloe/Ballina area, the majority of existing residential population is on the Ballina side of the Shannon. Killaloe is comparatively small in population and residential growth is relatively constrained by issues such as topography, vehicular access over the existing bridge, and local protected landscapes. The steeply rising contours of Ballykildea Mountain to the north and west of Killaloe prevent new development from sprawling in these directions at the same pace as lands north, east, and south of Ballina. The town is growing in residential capacity, with several new housing developments stretching north, east, and south of the town, within the outer fringe of Ballina. The town centre and town fringe gradually merge into new residential development zones and ribbon development along the R494, south of Ballina town centre, the R496 east of Ballina, and other roads leading east of Ballina.

Whilst ribbon development outside of Killaloe occurs south of the town along the R463, there are comparatively few new housing development pockets within the town fringe.

In the main, residential developments at O'Briensbridge/Montpelier are located within the town centre, with some ribbon development occurring between the town and Birdhill, along the R466.

6.10.3.2 The Working Community

A wide variety of business and commercial opportunities for residents are found on either side of the Shannon River, within the Study Area. Tourism is a major component of business in the area, as Lough Derg is a popular destination for anglers, outdoors enthusiasts, and other holidaymakers. Likewise, the walking trails of the Lough Derg Way and East Clare Way attract tourists to the area, as does the wildlife sanctuary located in O'Briensbridge. Due to a strong tourism industry based around the Shannon River, the tourism sector provides employment opportunities both towns.

Other employment sectors of the region include light industrial and waste treatment facilities, found in locations south of the towns of Killaloe and Ballina, respectively. Local schools, service stations, tool hire, and private sector small businesses make up the smaller components of the working community in the Study Area.

With a driving time of under one hour from Killaloe/Ballina/O'Briensbridge/Montpelier to Limerick, it is conceivable that the towns may become satellite town(s) to their nearest large-scale urban neighbour.

6.10.3.3 The Visiting Community

The towns of Killaloe/Ballina attract large number of tourists due to their historic status, fishing/angling and recreation amenities, and pleasant town atmosphere. The towns of Killaloe/Ballina are heritage towns that form part of the national heritage towns programme. Killaloe/Ballina, with good access to both Limerick and the N7 road to Dublin, acts as an important tourist attraction. The towns offer a variety of tourist related services including hotels, bed and breakfast accommodation, restaurants and public houses. The Study Area is also renowned for boating and cruising holidays.

The Killaloe Heritage Centre, situated within the Study Area north of the bridge in Killaloe, provides visitors with information on Celtic Ireland and on the history of the arrival of Christianity and the monastic tradition, as well as the development of the Shannon River as a transport system from early times.

O'Briensbridge, situated on the Lower Shannon River, takes its name after the bridge crossing of the river at this point. The town is popular for fishing and licensed fishing for Atlantic salmon takes place at O'Brien's Bridge with good success. The variety of lakes, for example Doon, Bridget, Kilgory, Clondanagh and Lough Derg, in proximity to both O'Briensbridge/Montpelier and Killaloe/Ballina provide visitors with a base to explore and visit these Lakeland's.

The Study Area is a gateway for tourism to explore other amenities and attractions in close proximity.

6.10.4 Constraints

During the construction of the bridge there will be potential for disruption to residents, workers and tourists. These effects will be temporary in nature and limited to the construction phase. The increased accessibility to the Study Area afforded by the new bridge should ensure an improved flow in the visitor population, and ease of access for residents and commercial interests, who currently experience traffic congestion in the Study Area.

With regard to the increasing numbers of boats transiting through Limerick and Ardnacrusha to Killaloe, Shannon Development in their response to consultation on potential constraints stated that: -

> "*in any proposed works, sufficient clearance and headroom which would take account of the heights of the majority of cruisers and boats transiting would be incorporated into the design. At a minimum, the height should be significantly in excess of the clearance of the bridge in Killaloe at high water mark*".

Shannon Development suggested that: -

> "*the location of the proposed bridge crossing would be towards the northern end of the proposed Study Area as outlined in your map. The reason for this is because of the visitor traffic flows which travel via the N7, the N18 and N24, to access Lough Derg*".

The construction of a new Shannon bridge will constitute an asset for this area and will enhance the mobility options of the residential and employment populations of the area. The impact on the resident population is likely to be less significant in the environs of Killaloe and Ballina.

7.0 Conclusion

This Report has considered the key constraints that could impact on the possible routing of the proposed Shannon Bridge Crossing. These are explained within the text of the report, and summarised in the Executive Summary at the start of the Report.

The next stage in the Shannon Bridge Crossing Project is Route Selection. This phase will also be carried out in accordance with the NRA National Roads Project Management Guidelines publication. This will include a further Public Consultation phase to obtain public comment on potential route locations.

References

Asher, J., Warren, M., Fox, R., Harding P., Jeffcoate, G. and Jeffcoate S. (2000). *The Millennium Atlas of Butterflies in Britain and Ireland*. Oxford University Press.

Bowman, J.J. (1998). *River Shannon – Lake Quality Monitoring 1995 to 1997*. Wexford Environmental Protection Agency

Bowman, J.J. (2000). *River Shannon – Lake Quality Monitoring 1998 and 1999*. Wexford Environmental Protection Agency

Curtis T.G.F. and McGough, H.N. (1988). *The Irish Red Data Book. 1. Vascular Plants*. The Stationary Office, Dublin.

Consultation Draft of Guidelines for Planning Authorities (June 2000).

Dwyer, R.B. (2000). *Protecting Nature in Ireland. The NGO Special Areas of Conservation Shadow List*. A Report prepared for An Taisce, BirdWatch Ireland, Coastwatch Ireland, Irish Peatland Conservation Council and the Irish Wildlife Trust. IPCC, Dublin.

Environmental Protection Agency (EPA) *Guidelines on the Information to be contained in Environmental Impact Statements* (March 2002).

Environmental Protection Agency (EPA) *Advice Notes on Current Practice in the preparation of Environmental Impact Statements* (1995).

Gibbons, D.W., Reid, J.B. and Chapman, R.A. (1993). *The New atlas of Breeding Birds in Britain and Ireland: 1988-1991*. T & AD Poyser, London, UK.

Guidelines from the Department of the Environment, Heritage, and Local Government (DoEHLG) Landscape and Landscape Assessment.

Hayden, T. and Harrington, R. (2000). *Exploring Irish Mammals.* Dúchas, The Heritage Service, Dublin.

Hickie, D. (1997) *Evaluation of Environmental Designations in Ireland*. The Heritage Council.

Highways Agency Design Manual for Roads & Bridges (1994).

Hunt, J., Derwin, J., Coveney, J. and Newton, S. (2000). Pp 365 - 416 in Heath M.F. and Evans, M.I., eds. *Important Bird Areas in Europe: Priority sites for conservation*. 1: Northern Europe, Cambridge, UK: BirdLife International (BirdLife conservation Series No. 8).

Kerney, M. (1999). *Atlas of the Non-marine Mollusca of the British Isles*. Harley Books, Colchester, UK.

Lucey, J. *et al* (1999). *Water Quality in Ireland 1995-1997*. Environmental Protection Agency.

McCArthy, T.K., Fitzgerald, J., Cullen, P., Doherty, D. and Copley, L. (1997). Zebra Mussels in the River Shannon. A report to ESB Fisheries Conservation. Zoology Dept., University College Galway.

McGarrigle, M.L., Bowman, J.J., Clabby, K.J., Lucey, J, Cunningham, P., MacCarthaigh, M, Keegan, M, Cantrell, B, Lehane, M, Clenaghan, C and Toner P.F. (2000). Water Quality in Ireland 1998-2000. Environmental Protection Agency

National Roads Authority (NRA) *Guidelines for the Treatment of Noise and Vibration in National Road Schemes*, October 2004

National Roads Authority (NRA) *National Roads Project Management Guidelines*, March 2000

NRA (2004). *Guidelines for Assessments of Ecological Impacts of National Road Schemes*. National Roads Authority, Ireland.

Newton, S., Donaghy, A., Allen, D., & Gibbons, D. (2000) *Birds of Conservation Concern in Ireland*. Irish Birds 1999, Vol6, no3.

Preston, C.D., Pearman, D.A. and Dines, T.D. (2002). *New Atlas of the British and Irish Flora. An Atlas of the Vascular Plants of Britain, Ireland the Isle of Man and the Channel Islands*. Oxford University Press.

Reynolds, J. (1998). Conservation Management of the White-clawed crayfish *Austropotmobius pallipes.* Part 1. Irish Wildlife Manuals, No. 1. (Series Editor, F. Marnell). Dúchas, The Heritage Service.

The Landscape Institute & Institute of Environmental Assessment (LI/IEA) Guidelines for Landscape and Visual Impact Assessment, 2nd Edition 2002.

Whilde, A. (1993). Threatened Mammals, Birds, Amphibians and Fish in Ireland. Irish Red Data Book 2: Vertebrates. HMSO, Belfast.

APPENDIX A

Questionnaire & Information Leaflet

New Shannon Bridge Crossing

Public Consultation Meeting No. 1

Information Leaflet

The Project

Clare County Council, in conjunction with North Tipperary and Limerick County Councils, have commissioned a Feasibility Study and Preliminary Report for a new bridge crossing over the River Shannon within the study area shown on the attached map.

The purpose of the proposed bridge is to alleviate the traffic congestion currently being experienced at the existing bridges at Ballina/Killaloe and at O'Briensbridge/Montpelier, both of which are narrow bridges with limited traffic and pedestrian capacity. The bridge and associated approach roads will connect the R463 on the west side of the river to the R525/R466/R494 on the east side.

The Current Phase

The current phase of the project is a Constraints Study, during which information and data is collected which should subsequently be taken into account in selecting a preferred route for the proposed crossing. This constraints phase of the project will be completed during April 2005, and will be followed by the Route Selection and Preliminary Design phases of the project.

The Purpose of the Public Consultation Meeting

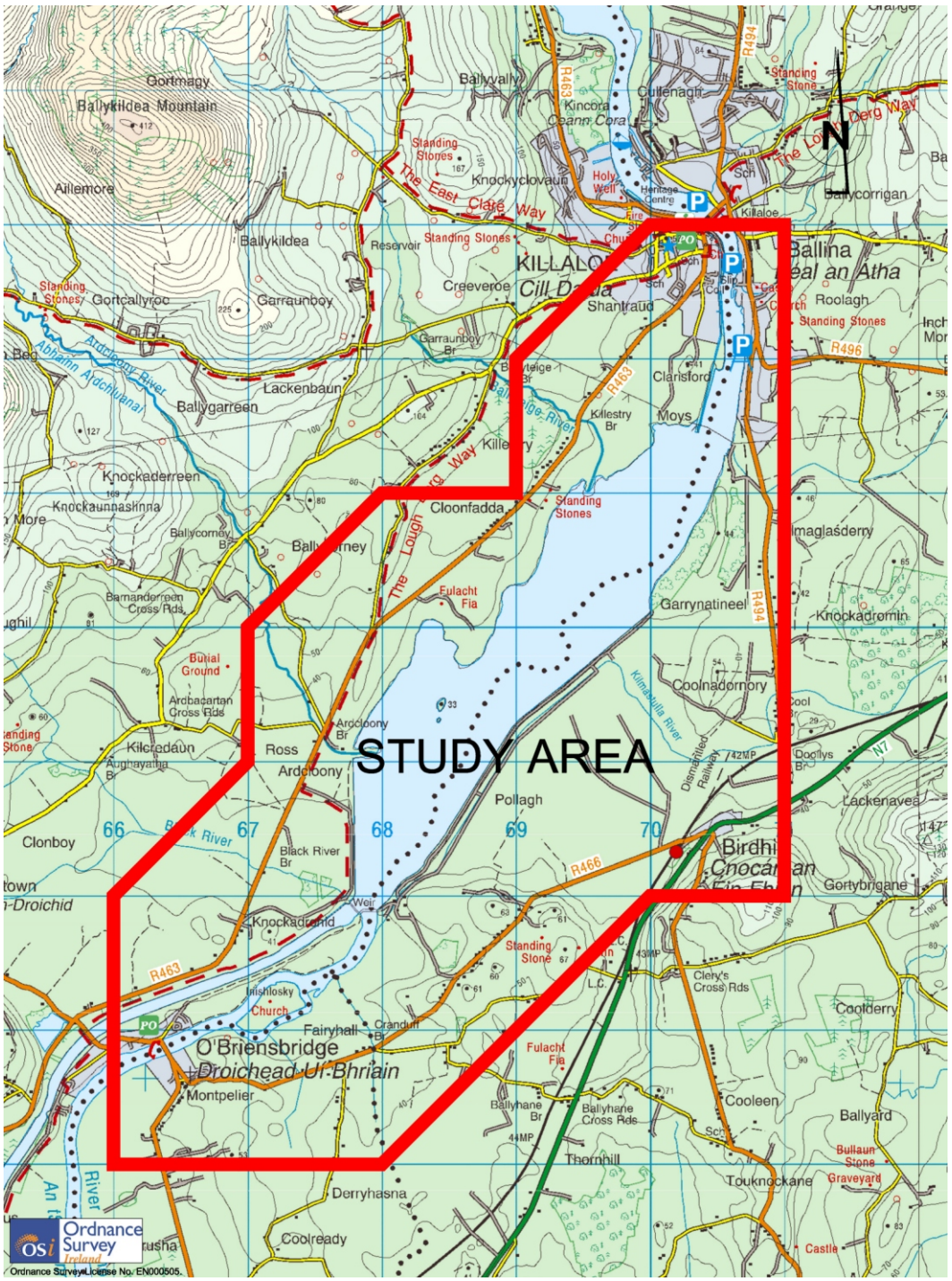
The purpose of this meeting is to:

1. Inform the public of the proposed project.
2. Provide an opportunity to the public to address queries directly to Council officials and their design consultants relating to the project.
3. Receive comments or submissions relating to the project which members of the public wish to be considered in the selection of the preferred route of the crossing.

Future Public Consultation Meetings

A further public consultation meeting shall be held during the Route Selection phase following the Consultant's recommendation of the preferred route of the crossing.

RPS mcos


STUDY AREA
N
Ordnance Survey Ireland
Ordnance Survey License No. EN000505.

New Shannon Bridge Crossing

Public Consultation Meeting No. 1

Questionnaire

We would greatly appreciate if you would give us your views on the proposed New Shannon Bridge Crossing and any information which you would like to be considered in the selection of the preferred route of the crossing.

Please complete this form and hand it in at the Public Consultation or return it in the envelope provided before 26th April 2005 to:

Clare County Council,
Road Design Office,
Quin Road Business Park,
Quin Road,
Ennis,
Co. Clare.

1. Do you own, rent or occupy property in the study area? (see Information Leaflet)
Yes ☐
No ☐

2. If yes, is the property in the
Ballina/Killaloe area ☐
O'Briensbridge/Montpelier area ☐
Between the above areas ☐

3. Are you in favour of the proposed new bridge crossing?
Yes ☐
No ☐
Comment _____

4. Would you be a regular user of a new bridge crossing?
Yes ☐
No ☐
Comment _____

5. What area or feature do you believe should be avoided in the selection of the preferred route?

_____

6. What do you regard as the main advantages of providing the new crossing?

_____

_____

RPS mcos

7. What do you regard as the main disadvantages of providing the new crossing?

_____

_____

8. In your opinion, how important in relation to this project are the following? Please tick.

Effect	Very Important	Important	Least Important
Improvement in traffic conditions			
Improvement in road safety			
Impact on community near crossing			
Best value for money			
Effect on business			
Effect on tourism			
Conservation of archaeology			
Conservation of flora and fauna			
Impact on landscape			
(Other)			

Please record below any other comment you may wish to make in connection with the proposed crossing and the selection of the preferred route.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Name: _____

Address: _____

_____

_____

Contact No. _____

RPS mcos

APPENDIX B

Site Synopses

SITE NAME : LOUGH DERG

SITE CODE : 000011

Lough Derg is one of the major freshwater lakes of Ireland and the largest of the River Shannon lakes. The lake covers 13,000 ha of non-tidal waters, measuring 33 km from Killaloe, Co. Clare to Portumna, Co. Galway. Its maximum breath across the Scarriff-Youghal Bay transect is about 13 km. For most of its length the breath is less than 5 km. The lake is relatively shallow at the northern end being mostly 6 m in depth but in the middle region it has an axial trench and descends to over 25 m in places. The east-west section (from Scarriff Bay to Youghal Bay) has a narrow trench along the southern margins with depths up to 36 m while the narrow southern end of the lake has the greatest average depth, with a maximum of 34 m.

The greater part of the lake lies on Carboniferous limestone but the narrow southern section is underlain by Silurian strata and there is Old Red Sandstone on the southern shores of the east-west section. Most of the lower part of the lake is enclosed by hills on both sides, the Slieve Aughty Mountains to the west and the Arra Mountains to the east. The northern end is, however, bordered by relatively flat country.

The site is of significant ecological interest, with five habitats listed on Annex I of the EU Habitats Directive. Three of these are priority habitats - *Cladium* fen, Petrifying spring and Yew woodland. Other annexed habitats present include, alkaline fen and Juniper scrub formations on heath and calcareous grasslands. These priority habitats are found mainly at the north and north east of the lake. In addition, the site is an SPA of National Importance as it supports important numbers of wintering wildfowl, Greenland White-fronted Geese (*Anser albifrons flavirostris*), Common Terns (*Sterna hirundo*) and Cormorants (*Phalacrocorax carbo*). Both the Greenland White-fronted Geese and terns are listed under Annex I of the Birds Directive. A Wildlife Sanctuary is located in the lake close to Portumna Forest Park and there are four Corine Sites located within the pNHA.

The priority Annex I habitat, *Cladium* fen occurs occasionally along the lake margins, mainly in association with alkaline fens, *Phragmites* and other swamp vegetation. Typically Saw Sedge (*Cladium mariscus)* forms dense stands up to 2 m in height. Associated species include Common Reed (*Phragmites australis),* Black Bog-rush (*Schoenus nigricans),*Water Horsetail (*Equisetum fluviatile*) Bottle Sedge (*Carex rostrata*) and occasional Slender Sedge (*Carex lasiocarpa*). This community generally merges with alkaline fen dominated by Black Bog-rush with Purple Moor-grass (*Molinia caerulea,),* Marsh Horsetail (*Equisetum palustre),* Meadowsweet (*Filipendula ulmaria)* and scattered tussocks of Greater Tussock-sedge (*Carex paniculata*).

Yew (*Taxus baccata*) woods in Ireland are confined to the west of the country. However, a substantial area of Yew is located on limestone at Cornalack, where Yew forms a scrub woodland along the east shore of Lough Derg. Here, Yew is found in association with small amounts of Juniper (*Juniperus communis)*, which forms protection against grazing for the young Yew. Other notable species present include, Hawthorn (*Crataegus monogyna),* Hazel (*Corylus avellana*), Holly (*Ilex aquifolium*) Cotoneaster *(Cotoneaster microphyllus)* along with occasional Ivy (*Hedera helix),* Strawberry (*Fragraria vesca),* Bramble (*Rubus fruticosus* agg.) and Wood-sorrel (*Oxalis acetosella*).

Elsewhere, small stands of Yew up to 5 m high occur with Spindle (*Euonymus europaeus),* Blackthorn (*Prunus spinosa),* Gorse *(Ulex europaeus)* and Ash (*Fraxinus excelsior*). Due to shading and in places cattle trampling the ground flora supports few herbs. However, the bryophyte layer is good with many moss covered rocks present.

Juniper occurs throughout this site in a range of habitats, associated with calcareous grasslands, heath and limestone outcrops. Some of the finest examples of Juniper formations in Ireland occur along the lake edge where upright, bushy Juniper shrubs up to 6m tall are found. Typically, Juniper forms dense hedges with Ash, Hawthorn, Gorse, Hazel, and Bramble and occasional Yew. These tall Juniper shrubs are a unique feature in Ireland, where it is typically found growing in prostrate form. In places along the lakeshore Juniper forms a mosaic with Black Bog-rush and Saw Sedge fen. The best examples are seen at the north and north east of the site.

On drier ground above the flood level, Juniper occurs in association with species-rich calcareous grassland with Mouse-ear Hawkweed (*Hieracium pilosella),* Daisy (*Bellis perennis),* Lady's Bedstraw (*Galium verum*), Thyme (*Thymus praecox)* and Burren Blue Grass *(Sesleria albicans*). An extensive area of this variety is seen north of Kilgarvan Quay.

At Cornalack, along the eastern shore of Lough Derg, tall Juniper is found in association with loose limestone rubble with a significant cover of Yew. This habitat could also be described as limestone pavement as defined in the EU Habitats Directive Manual.

Many of the islands support significant Juniper cover. This is particularly evident on Bounla Island. Juniper generally occurs as fringing vegetation around the Islands, which typically have wooded centres.

Other habitats present within the site include wooded islands, semi-natural deciduous woodland, callow grasslands and improved grassland. The latter areas are included in the site because they are used as feeding grounds by waterfowl.

The woodlands are a notable feature and are dominated alternatively by Oak (*Quercus* spp). as at Bellevue and Hazel with Ash in many of the examples along the north eastern shore. The woodlands along the lake edge at Portumna are Birch (*Betula* spp.) dominant with some Willow (*Salix* spp.), Ash and Hazel. Typically the ground layer includes Early-purple Orchid (*Orchis mascula*), Violets (*Viola* spp.), Ivy (*Hedera helix*), Lesser Celandine (*Ranunculus ficaria*), Bluebell (*Hyacinthoides non-scripta*), Wood Anemone (*Anemone nemorosa*), Wood-sorrel, Primrose (*Primula vulgaris*), Bramble, Ground Ivy (*Glechoma hederacea*), Pignut (*Conopodium majus*) and Honeysuckle (*Lonicera periclymenum*).

Beech (*Fagus sylvatica*) and Scots Pine *(Pinus sylvestris*) are often present at the lake edge along areas which were once parts of estates. Some areas of coniferous forestry have been included within the site. When these areas are felled no further planting should take place as afforestation damages the wetland habitats between the plantation and lake edge.

The only known site in the country for the Red Data Book species *Inula salicina* occurs along the lakeshore. This plant is legally protected by the Flora Protection Order 1987. Other Red Data Book species present within this site are Marsh Pea (*Lathyrus palustris*) and Ivy Broomrape (*Orobanche hederae*). In addition plants which do not have a very wide spread distribution in the country are found in the site including Buckthorn (*Rhamnus catharticus*) and Whitebeam (*Sorbus aria s.l.*). The Red Data Book stonewort, *Chara tomentosa*, has its stronghold in Lough Derg. This species is very sensitive to pollution.

The lake is rated as nationally important for waterfowl. The entire lake to the HWM and including all islands are within an SPA (Special Protection Area: Lough Derg, site code 2220). Counts from *I-WeBS* Report 1995/96 carried out at 7 locations on the lake indicate that the lake holds nationally important numbers of Mute Swan (*Cygnus olor*), Cormorant, Mallard (*Anas platyrhynchos*), Teal (*Anas crecca*), Tufted Duck (*Aythya fuligula*) and Goldeneye (*Bucephala clangula*). The lake also supports a number of Greenland White-fronted Geese, a bird species listed on Annex I of the Birds Directive and

in the Irish Red Data Book. There is a Wildlife Sanctuary at the north western edge of the lake known as Lough Derg (parts).

The Otter (*Lutra lutra*) and Badger (*Meles meles*) have been recorded within the site. Both of these species are listed in the Irish Red Data Book and are legally protected by the Wildlife Act 1976.

Lough Derg is also a well known fishing lake with a good Trout (*Salmo trutta*) fishery.

The Lamprey listed under Annex II of the E.U. Habitats Directive is associated with Lough Derg. The existence of a landlocked River Lamprey (*Lampetra fluviatilis*) population in Lough Derg, is suspected. Brook Lamprey (*L. planeri*) is known to be common in the lower Shannon catchment where all three Lamprey species breed.

The endangered fish species Pollan (*Coregonus autumnalis pollan*) is recorded from Lough Derg, one of only three sites in Ireland and in western Europe. The Pollan is a landlocked species of Coregonid or "White Fish" thought to have colonised Irish waters after the last Ice Age. Its nearest relative, the Arctic Cisco, is found as far away as Alaska, Northern Canada and Siberia. Although it is anadromous throughout most of its northern range, the Irish population are all non-migratory and purely freshwater.

Atlantic Salmon (*Salmo salar*) also use the lake as a spawning ground. Although this species is still fished commercially in Ireland, it is considered to be endangered or locally threatened elsewhere in Europe and is listed on Annex II of the Habitats Directive. White-clawed Crayfish (*Austropotamobius pallipes*), also an Annex II species, is found in many of the rivers which feed into the eastern edge of the lake. These rivers flow over Carboniferous limestones and include the Lorrha River, the Carrigahoric River, the Borrisokane River, the Ballinderry River, the Nenagh River and the Ballycolliton River. The Annex II animal Freshwater Pearl-mussel (*Margaritifera margaritifera*) occurs in many of the rivers which flow from the Slieve Aughty Mountains and feed into the western edge of the lake.

Landuse within the site is mainly of a recreational nature with many boat hire companies, holiday home schemes and angling clubs located at the lake edge. Recreational disturbance may pose a threat to the wintering wildfowl populations though tourism is scaled down during the winter. The water body is surrounded mainly by improved pastoral farmland to the south and east with areas of bog to the southwest and west. Coniferous plantations are present along the west and north west shore and small areas of these are included within the site.

The main threats to the quality of the site are water polluting activities resulting from intensification of agricultural activities around the lake shore, uncontrolled discharge of sewage which is causing eutrophication of the lake, housing and boating development which has resulted in the destruction of lakeshore habitats. There is also significant fishing and shooting pressure on and around the lake. Forestry can result in the loss of some areas of wetland habitat.

The spread of Zebra Mussel (*Dreissena polymorpha*) on Lough Derg has already been documented. They can clog intake pipes, drains and screens causing reduced delivery to boat engines, power plants, industries, fish hatcheries and municipal waterworks resulting in engine overheating, fish mortalities, increased maintenance costs and sometimes short term closures in production. In addition these mussels occur in such numbers that they can change the ecology of some aquatic systems.

5.6.1998

SITE NAME: LOWER RIVER SHANNON

SITE CODE: 002165

This very large site stretches along the Shannon valley from Killaloe to Loop Head/ Kerry Head, a distance of some 120 km. The site thus 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. The Shannon and Fergus flow through Carboniferous limestone as far as Foynes, but west of Foynes Namurian shales and flagstones predominate (except at Kerry Head, which is formed from Old Red Sandstone). The eastern sections of the Feale catchment flow through Namurian Rocks and the western stretches through Carboniferous Limestone. The Mulkear flows through Lower Palaeozoic Rocks in the upper reaches before passing through Namurian Rocks, followed by Lower Carboniferous Shales and Carboniferous Limestone. The Mulkear River itself, immediately north of Pallas Green, passes through an area of Rhyolites, Tuffs and Agglomerates. Rivers within the sub-catchment of the Feale include the Galey, Smearlagh, Oolagh, Allaughaun, Owveg, Clydagh, Caher, Breanagh and Glenacarney. Rivers within the sub-catchment of the Mulkear include the Killeenagarriff, Annagh, Newport, the Dead River, the Bilboa, Glashacloonaraveela, Gortnageragh and Cahernahallia.

The site is a candidate SAC selected for lagoons and alluvial wet woodlands, both habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected for 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 all habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected for the following species listed on Annex II of the same directive – Bottle-nosed Dolphin, Sea Lamprey, River Lamprey, Brook Lamprey, Freshwater Pearl Mussel, Atlantic Salmon and Otter.

The Shannon and Fergus Estuaries form the largest estuarine complex in Ireland. They form a unit stretching from the upper tidal limits of the Shannon and Fergus Rivers to the mouth of the Shannon estuary (considered to be a line across the narrow strait between Kilcredaun Point and Kilconly Point). Within this main unit there are several tributaries with their own 'sub-estuaries' e.g. the Deel River, Mulkear River, and Maigue River. To the west of Foynes, a number of small estuaries form indentations in the predominantly hard coastline, namely Poulnasherry Bay, Ballylongford Bay, Clonderalaw Bay and the Feale or Cashen River Estuary.

Both the Fergus and inner Shannon estuaries feature vast expanses of intertidal mudflats, often fringed with saltmarsh vegetation. The smaller estuaries also feature mudflats, but have their own unique characteristics, e.g. Poulnasherry Bay is stony and unusually rich in species and biotopes. Plant species are typically scarce on the mudflats, although there are some Eel-grass beds (*Zostera* spp.) and patches of green algae (e.g. *Ulva* sp. and *Enteromorpha* sp.). The main macro-invertebrate community, which has been noted from the inner Shannon and Fergus estuaries, is a *Macoma-Scrobicularia-Nereis* community.

In the transition zone between mudflats and saltmarsh, specialised colonisers of mud predominate: swards of Common Cord-grass (*Spartina anglica*) frequently occur in the upper parts of the estuaries. Less common are swards of Glasswort (*Salicornia europaea* agg.). In the innermost parts of the estuaries, the tidal channels or creeks are fringed with species such as Common Reed (*Phragmites australis*) and Club-rushes (*Scirpus maritimus, S. tabernaemontani* and *S. triqueter*). In addition to the nationally rare Triangular Club-rush (*Scirpus triqueter*), two scarce species are found in some of these creeks (e.g. Ballinacurra Creek): Lesser Bulrush (*Typha angustifolia*) and Summer Snowflake (*Leucojum aestivum*).

Saltmarsh vegetation frequently fringes the mudflats. Over twenty areas of estuarine saltmarsh have been identified within the site, the most important of which are around the Fergus Estuary and at Ringmoylan Quay. The dominant type of saltmarsh present is Atlantic salt meadow occurring over mud. Characteristic species occurring include Common Saltmarsh Grass (*Puccinellia maritima*), Sea Aster (*Aster tripolium*), Thrift (*Armeria maritima*), Sea-milkwort (*Glaux maritima*), Sea Plantain (*Plantago maritima*), Red Fescue (*Festuca rubra*), Creeping Bent (*Agrostis stolonifera*), Saltmarsh Rush (*Juncus gerardi*), Long-bracted Sedge (*Carex extensa*), Lesser Sea-spurrey (*Spergularia marina*) and Sea Arrowgrass (*Triglochin maritima*). Areas of Mediterranean salt meadows, characterised by clumps of Sea Rush (*Juncus maritimus*) occur occasionally. Two scarce species are found on saltmarshes in the vicinity of the Fergus Estuary: a type of robust Saltmarsh-grass (*Puccinellia foucaudii*), sometimes placed within the compass of Common Saltmarsh-grass (*Puccinellia maritima*) and Hard-grass (*Parapholis strigosa*).

Saltmarsh vegetation also occurs around a number of lagoons within the site. The two which have been surveyed as part of a National Inventory of Lagoons are Shannon Airport Lagoon and Cloonconeen Pool. Cloonconeen Pool (4-5 ha) is a natural sedimentary lagoon impounded by a low cobble barrier. Seawater enters by percolation through the barrier and by overwash. This lagoon represents a type which may be unique to Ireland since the substrate is composed almost entirely of peat. The adjacent shore features one of the best examples of a drowned forest in Ireland. Aquatic vegetation in the lagoon includes typical species such as Beaked Tasselweed (*Ruppia maritima*) and green algae (*Cladophora* sp.). The fauna is not diverse, but is typical of a high salinity lagoon and includes six lagoon specialists (*Hydrobia ventrosa, Cerastoderma glaucum, Lekanesphaera hookeri, Palaemonetes varians, Sigara stagnalis* and *Enochrus bicolor*). In contrast, Shannon Airport Lagoon (2 ha) is an artificial saline lake with an artificial barrier and sluiced outlet. However, it supports two Red Data Book species of Stonewort (*Chara canescens* and *Chara cf. connivens*).

Most of the site west of Kilcredaun Point/Kilconly Point is bounded by high rocky sea cliffs. The cliffs in the outer part of the site are sparsely vegetated with lichens, Red Fescue, Sea Beet (*Beta vulgaris*), Sea Campion (*Silene maritima*), Thrift and Plantains (*Plantago* spp.). A rare endemic Sea Lavender (*Limonium recurvum* subsp. *pseudotranswallinum*) occurs on cliffs near Loop Head. Cliff-top vegetation usually consists of either grassland or maritime heath. The boulder clay cliffs further up the estuary tend to be more densely vegetated, with swards of Red Fescue and species such as Kidney Vetch (*Anthyllis vulneraria*) and Bird's-foot Trefoil (*Lotus corniculatus*).

The site supports an excellent example of a large shallow inlet and bay. Littoral sediment communities in the mouth of the Shannon Estuary occur in areas that are exposed to wave action and also in areas extremely sheltered from wave action. Characteristically, exposed sediment communities are composed of coarse sand and have a sparse fauna. Species richness increases as conditions become more sheltered. All shores in the site have a zone of sand hoppers at the top and below this each of the shores has different characteristic species giving a range of different shore types in the pcSAC.

The intertidal reefs in the Shannon Estuary are exposed or moderately exposed to wave action and subject to moderate tidal streams. Known sites are steeply sloping and show a good zonation down the shore. Well developed lichen zones and littoral reef communities offering a high species richness in the sublittoral fringe and strong populations of *Paracentrotus lividus* are found. The communities found are tolerant to sand scour and tidal streams. The infralittoral reefs range from sloping platforms with some vertical steps to ridged bedrock with gullies of sand between the ridges to ridged bedrock with boulders or a mixture of cobbles, gravel and sand. Kelp is very common to about 18m. Below this it becomes rare and the community is characterised by coralline crusts and red foliose algae.

Other coastal habitats that occur within the site include the following:

- stony beaches and bedrock shores - these shores support a typical zonation of seaweeds (*Fucus* spp., *Ascophyllum nodosum* and kelps).
- shingle beaches - the more stable areas of shingle support characteristic species such as Sea Beet, Sea Mayweed (*Matricaria maritima*), Sea Campion and Curled Dock (*Rumex crispus*).
- Sandbanks which are slightly covered by sea water at all times – there is a known occurrence of sand/gravel beds in the area from Kerry Head to Beal Head.
- Sand dunes - a small area of sand dunes occurs at Beal Point. The dominant species is Marram Grass (*Ammophila arenaria*).

Flowing into the estuaries are a number of tidal rivers. In some cases non-tidal portions of the rivers have been included in the site, most notably the Shannon from Killaloe to Limerick (along with some of its tributaries, such as the Mulkear and Feale catchments and the Kilmastulla River), the Fergus up as far as Ennis, and the Cloon River. The three rivers are very different in character: the Shannon being broad, generally slow-flowing and naturally eutrophic; the Fergus being smaller and alkaline; while the narrow, fast-flowing Cloon is acid in nature. Semi-natural habitats, such as wet grassland, wet woodland and marsh occur by the rivers, however, improved grassland is most common. One grassland type of particular conservation significance, *Molinia* meadows, occurs in several parts of the site and the examples at Worldsend on the River Shannon are especially noteworthy. Here are found 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*).

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. The rivers contain an interesting bryoflora with *Schistidium alpicola* var. *alpicola* recorded from in-stream boulders on the Bilboa, new to county Limerick.

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. The most prominent woodland type is gallery woodland where White Willow (*Salix alba*) dominates the tree layer with occasional Alder (*Alnus glutinosa*). The shrub layer consists of various willow species with sally (*Salix cinerea* ssp. *oleifolia*) and what appear to be hybrids of *S. alba* x *S. viminalis.* The herbaceous layer consists of tall perennial herbs. A fringe of Bulrush (*Typha* sp.) occurs on the riverside of the woodland. On slightly higher ground above the wet woodland and on the raised embankment remnants of mixed oak-ash-alder woodland occur. These are poorly developed and contain numerous exotic species but locally there are signs that it is invading open grassland. Alder is the principal tree species with occasional Oak (*Quercus robur*), Elm (*Ulmus glabra, U. procera*), Hazel (*Corylus avellana*), Hawthorn (*Crataegus monogyna*) and the shrubs Guelder-rose (*Viburnum opulus*) and willows. The ground flora is species-rich.

Woodland is infrequent within the site, however Cahiracon Wood contains a strip of old Oak woodland. Sessile Oak (*Quercus petraea*) forms the canopy, with an understorey of Hazel and Holly (*Ilex aquifolium*). Great Wood-rush (*Luzula sylvatica*) dominates the ground flora. Less common species present include Great Horsetail (*Equisetum telmeteia*) and Pendulous Sedge (*Carex pendula*).

In the low hills to the south of the Slievefelim Mountains, the Cahernahallia River cuts a valley through the Upper Silurian rocks. For approximately 2km south of Cappagh Bridge at Knockanavar, the valley sides are wooded. The woodland consists of Birch (*Betula* spp.), Hazel, Oak, Rowan (*Sorbus aucuparia*), some Ash (*Fraxinus excelsior*) and Willow (*Salix* spp.). Most of the valley is not grazed by

stock, and as a result the trees are regenerating well. The ground flora feature prominent Greater wood-rush and Bilberry (*Vaccinium myrtillus*) with a typical range of woodland herbs. Where there is more light available, Bracken (*Pteridium aquilinum*) features.

The valley sides of the Bilboa and Gortnageragh Rivers, on higher ground north east of Cappamore, support patches of semi-natural broadleaf woodland dominated by Ash, Hazel, Oak and Birch. There is a good scrub layer with Hawthorn, Willow, Holly and Blackthorn (*Prunus spinosa*) common. The herb layer in these woodlands is often open with a typically rich mixture of woodland herbs and ferns. Moss species diversity is high. The woodlands are ungrazed. The hazel is actively coppiced in places.
There is a small area of actively regenerating cut away raised bog at Ballyrorheen. It is situated approx. 5km north west of Cappamore Co. Limerick. The bog contains some wet areas with good moss (*Sphagnum*) cover. Species of particular interest include the Cranberry (*Vaccinium oxycoccos*) and the White Sedge (*Carex curta*) along with two other regionally rare mosses including *S. fimbriatum*. The site is being invaded by Birch (*Betula pubescens*) scrub woodland. Both commercial forestry and the spread of rhododendron has greatly reduced the overall value of the site.

A number of plant species that are Irish Red Data Book species occur within the site - several are protected under the Flora (Protection) Order, 1999:

- Triangular Club-rush (*Scirpus triqueter*) - in Ireland this protected species is only found in the Shannon Estuary, where it borders creeks in the inner estuary.
- Opposite-leaved Pondweed (*Groenlandia densa*) - this protected pondweed is found in the Shannon where it passes through Limerick City.
- Meadow Barley (*Hordeum secalinum*) - this protected species is abundant in saltmarshes at Ringmoylan and Mantlehill.
- Hairy Violet (*Viola hirta*) - this protected violet occurs in the Askeaton/Foynes area.
- Golden Dock (*Rumex maritimus*) - noted as occurring in the River Fergus Estuary.
- Bearded Stonewort (*Chara canescens*) - a brackish water specialist found in Shannon Airport lagoon.
- Convergent Stonewort (*Chara connivens*) - presence in Shannon Airport Lagoon to be confirmed.

Overall, the Shannon and Fergus Estuaries support the largest numbers of wintering waterfowl in Ireland. The highest count in 1995-96 was 51,423 while in 1994-95 it was 62,701. Species listed on Annex I of the E.U. Birds Directive which contributed to these totals include: Great Northern Diver (3; 1994/95), Whooper Swan (201; 1995/96), Pale-bellied Brent Goose (246; 1995/96), Golden Plover (11,067; 1994/95) and Bar-tailed Godwit (476; 1995/96). In the past, three separate flocks of Greenland White-fronted Goose were regularly found but none were seen in 1993/94.

Other wintering waders and wildfowl present include Greylag Goose (216; 1995/96), Shelduck (1,060; 1995/96), Wigeon (5,976; 1995/96); Teal (2,319; 1995-96); Mallard (528; 1995/96), Pintail (45; 1995/96), Shoveler (84; 1995/96), Tufted Duck (272; 1995/96), Scaup (121; 1995/96), Ringed Plover (240; 1995/96), Grey Plover (750; 1995/96), Lapwing (24,581; 1995/96), Knot (800; 1995/96), Dunlin (20,100; 1995/96), Snipe (719, 1995/96), Black-tailed Godwit (1062; 1995/96), Curlew (1504; 1995/96), Redshank (3228; 1995/96), Greenshank (36; 1995/96) and Turnstone (107; 1995/96). A number of wintering gulls are also present, including Black-headed Gull (2,216; 1995/96), Common Gull (366; 1995/96) and Lesser Black-backed Gull (100; 1994/95). This is the most important coastal site in Ireland for a number of the waders including Lapwing, Dunlin, Snipe and Redshank. It also provides an important staging ground for species such as Black-tailed Godwit and Greenshank.

A number of species listed on Annex I of the E.U. Birds Directive breed within the site. These include Peregine Falcon (2-3 pairs), Sandwich Tern (34 pairs on Rat Island, 1995), Common Tern (15 pairs: 2 on Sturamus Island and 13 on Rat Island, 1995), Chough (14-41 pairs, 1992) and Kingfisher. Other breeding birds of note include Kittiwake (690 pairs at Loop Head, 1987) and Guillemot (4010 individuals at Loop Head, 1987)

There is a resident population of Bottle-nosed Dolphin in the Shannon Estuary consisting of at least 56-68 animals (1996). This is the only known resident population of this E.U. Habitats Directive Annex II species in Ireland. Otter, a species also listed on Annex II of this directive, is commonly found on the site.

Five species of fish listed on Annex II of the E.U. Habitats Directive are found within the site. These are Sea Lamprey (*Petromyzon marinus*), Brook Lamprey (*Lampetra planeri*), River Lamprey (*Lampetra fluviatilis*), Twaite Shad (*Allosa fallax fallax*) and Salmon (*Salmo salar*). The three lampreys and Salmon have all been observed spawning in the lower Shannon or its tributaries. The Fergus is important in its lower reaches for spring salmon while the Mulkear catchment excels as a grilse fishery though spring fish are caught on the actual Mulkear River. The Feale is important for both types. Twaite Shad is not thought to spawn within the site. There are few other river systems in Ireland which contain all three species of Lamprey.

Two additional fish of note, listed in the Irish Red Data Book, also occur, namely Smelt (*Osmerus eperlanus*) and Pollan (*Coregonus autumnalis pollan*). Only the former has been observed spawning in the Shannon.

Freshwater Pearl-mussel (*Margaritifera margaritifera*), a species listed on Annex II of the E.U. Habitats Directive, occurs abundantly in parts of the Cloon River.

There is a wide range of landuses within the site. The most common use of the terrestrial parts is grazing by cattle and some areas have been damaged through over-grazing and poaching. Much of the land adjacent to the rivers and estuaries has been improved or reclaimed and is protected by embankments (especially along the Fergus Estuary). Further, reclamation continues to pose a threat as do flood relief works (e.g. dredging of rivers). Gravel extraction poses a major threat on the Feale.

In the past, Cord-grass (*Spartina* sp.) was planted to assist in land reclamation. This has spread widely, and may oust less vigorous colonisers of mud and may also reduce the area of mudflat available to feeding birds.

Domestic and industrial wastes are discharged into the Shannon, but water quality is generally satisfactory - except in the upper estuary, reflecting the sewage load from Limerick City. Analyses for trace metals suggest a relatively clean estuary with no influences by industrial discharges apparent. Further industrial development along the Shannon and water polluting operations are potential threats.

Fishing is a main tourist attraction on the Finn and there are a large number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. The River Feale is a designated Salmonid Water under the E.U. Freshwater Fish Directive. Other uses of the site include commercial angling, oyster farming, boating (including dolphin-watching trips) and shooting. Some of these may pose threats to the birds and dolphins through disturbance. Specific threats to the dolphins include underwater acoustic disturbance, entanglement in fishing gear and collisions with fast moving craft.

This site is of great ecological interest as it contains a high number of habitats and species listed on Annexes I and II of the E.U. Habitats Directive, including the priority habitat lagoon, the only known resident population of Bottle-nosed Dolphin in Ireland and all three Irish lamprey species. A good number of Red Data Book species are also present, perhaps most notably the thriving populations of Triangular Club-rush. A number of species listed on Annex I of the E.U. Birds Directive are also present, either wintering or breeding. Indeed, the Shannon and Fergus Estuaries form the largest estuarine complex in Ireland and support more wintering wildfowl and waders than any other site in the country. Most of the estuarine part of the site has been designated a Special Protection Area (SPA), under the E.U. Birds Directive, primarily to protect the large numbers of migratory birds present in winter.

24.5.2004

APPENDIX C

Scientific Names

Scientific Names of Plants and Animals Mentioned in the Text

Common Name	Scientific name
Annual Knawel	*Scleranthus annuus*
Bird Cherry	*Prunus padus*
Blue-eyed Grass	*Ssiyrhynchium bermudiana*
Bog-rosemary	*Andromeda polifolia*
Cowslip	*Primula veris*
Irish Fleabane	*Inula salicina*
Ivy Broomrape	*Orobanche hederae*
Marsh Pea	*Lathyrus palustris*
Opposite-leaved Pondweed	*Groenlandia densa*
Yew	*Taxus baccata*

Table C.1 Scientific Names of Plants Mentioned in Text

Common Name	Scientific name
Freshwater Pearl-mussel	*Margaritifera margaritifera*
Marsh fritillary	*Euphydryas aurinia*
White-clawed crayfish	*Austropotamobius pallipes*

Table C.2 Scientific Names of Invertebrates Mentioned in Text

Common Name	Scientific name
Atlantic salmon	*Salmo salar*
Sea lamprey	*Petromyzon marinus*
Brook lamprey	*Lampetra planeri*
River lamprey	*Lampetra fluviatilis*

Table C.3 Scientific Names of Fish Mentioned in Text

Common Name	Scientific name
Barn Owl	*Tyto alba*
Black-tailed Godwit	*Limosa limosa*
Common Tern	*Sterna hirundo*
Cormorant	*Phalacrocorax carbo*
Corncrake	*Crex crex*
Curlew	*Numenius arquata*
Goldeneye	*Bucephala crangula*
Greenland White-fronted Goose	*Anser albifrons flavirostris*
Lapwing	*Vanellus vanellus*
Mallard	*Anas platyrhynchos*
Mute Swan	*Cygnus olor*
Teal	*Anas crecca*
Tufted Duck	*Aythya fuligula*

Table C.4 Scientific Names of Birds Mentioned in Text

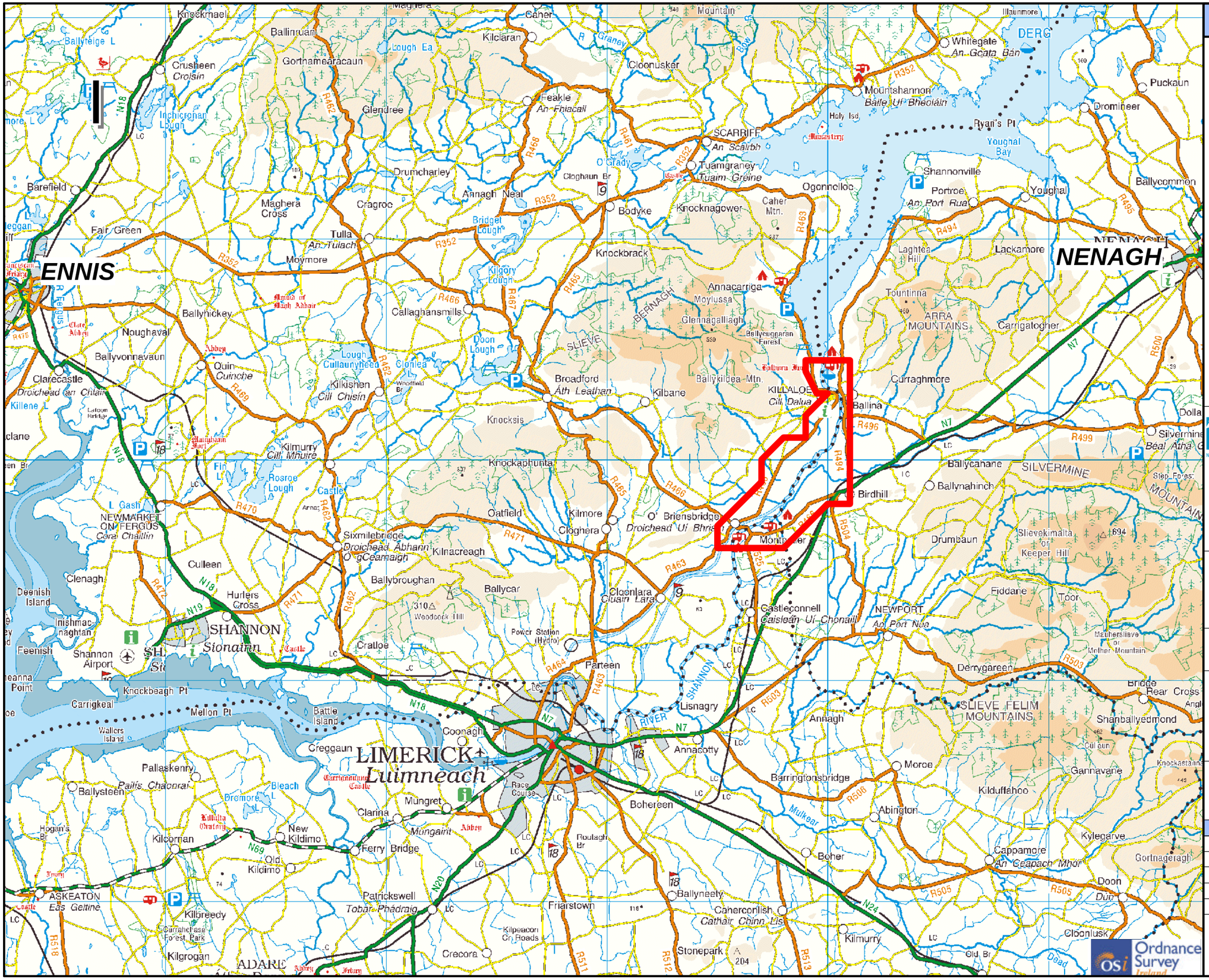
Common Name	Scientific name
Badger	*Meles meles*
Bottle-nosed dolphin	*Tursiops truncatus*
Brown Long-eared bat	*Plecotus auritus*
Common pipistrelle	*Pippistrellus pipistrellus*
Daubenton's bat	*Myotis daubentoni*
Fallow deer	*Dava dava*
Hedgehog	*Erinacaceus europaeus*
Irish (mountain) hare	*Lepus timidus hibernicus*
(Irish) stoat	*Mustela erminea*
Leisler's bat	*Nyctalus leisleri*
Lesser horseshoe bat	*Rhinolophus hipposideros*
Natterer's bat	*Myotis nattereri*
Otter	*Lutra lutra*
Pine Marten	*Martes martes*
Pygmy shrew	*Sorex minutes*
Red deer	*Cervus elaphus*
Red squirrel	*Sciurus vulgaris*
Soprano pipistrelle	*Pippistrellus pygmaeus*
Whiskered bat	*Myotis mystacinus*

Table C.5 Scientific Names of Mammals Mentioned in Text

APPENDIX D

Figures

Shannon Bridge Crossing
Constraints Study Report
List of Figures



Legend

Constraints Study Area

NDP NATIONAL DEVELOPMENT PLAN

Project
Shannon Bridge Crossing- Feasibility Study & Prelim Report

Title

LOCATION PLAN

Figure 2.1

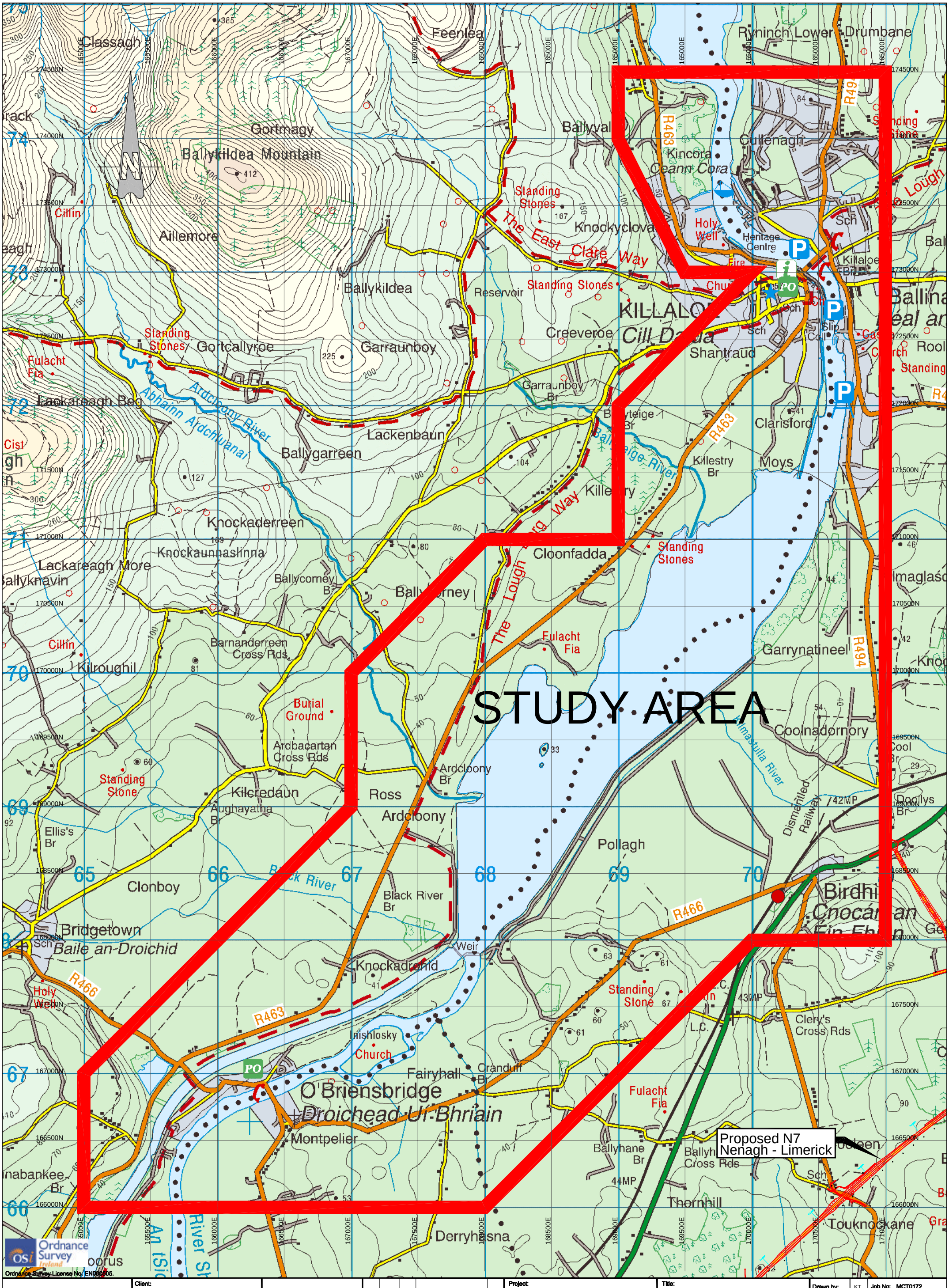
RPS mcos
Innishmore
Ballincollig
Co. Cork
Phone: 021-4870200
Fax No. 021-4873742
rpsmcos@rpsgroup.ie
www.rpsgroup.ie

Issue Details

Drawn:	T Hurley	**Project No.**	MCT0172
Checked:	L Barry	**File Ref.**	
Approved:	P Fitzgerald	MCT0172MI0001A01	
Scale:	1:165,000 @ A3	**Drawing No.**	**Rev.**
Date:	April 05	0001	A01

Notes
1. This drawing is the property of RPS-MCOS. It is a confidential document and must not be copied, used, or its contents divulged without prior written consent.
2. All levels are referred to Ordnance Datum, Malin Head.
3. NOT TO SCALE, use figured dimensions only, if in doubt ask.
4. Ordnance Survey Ireland Licence No. EN 0005005 Copyright Government of Ireland.

osi Ordnance Survey Ireland



A01	29/04	KT / LB	Issue for Approval	PF
D02	03/03	KT / LB	Study Area Changed	PF
D01	15/02	KT / LB	Draft Issue	PF
No.	Date	Dr / Ch	Amendment / Issue	App.

NDP NATIONAL DEVELOPMENT PLAN

Client:

RPS MCOS

RPS-MCOS Ltd., Innishmore, Ballincollig, Co. Cork, Ireland.
T: +353 21 487 0200 - F: +353 1 487 3742
E: rpsmcos@rpsgroup.ie W: www.rpsmcos.ie

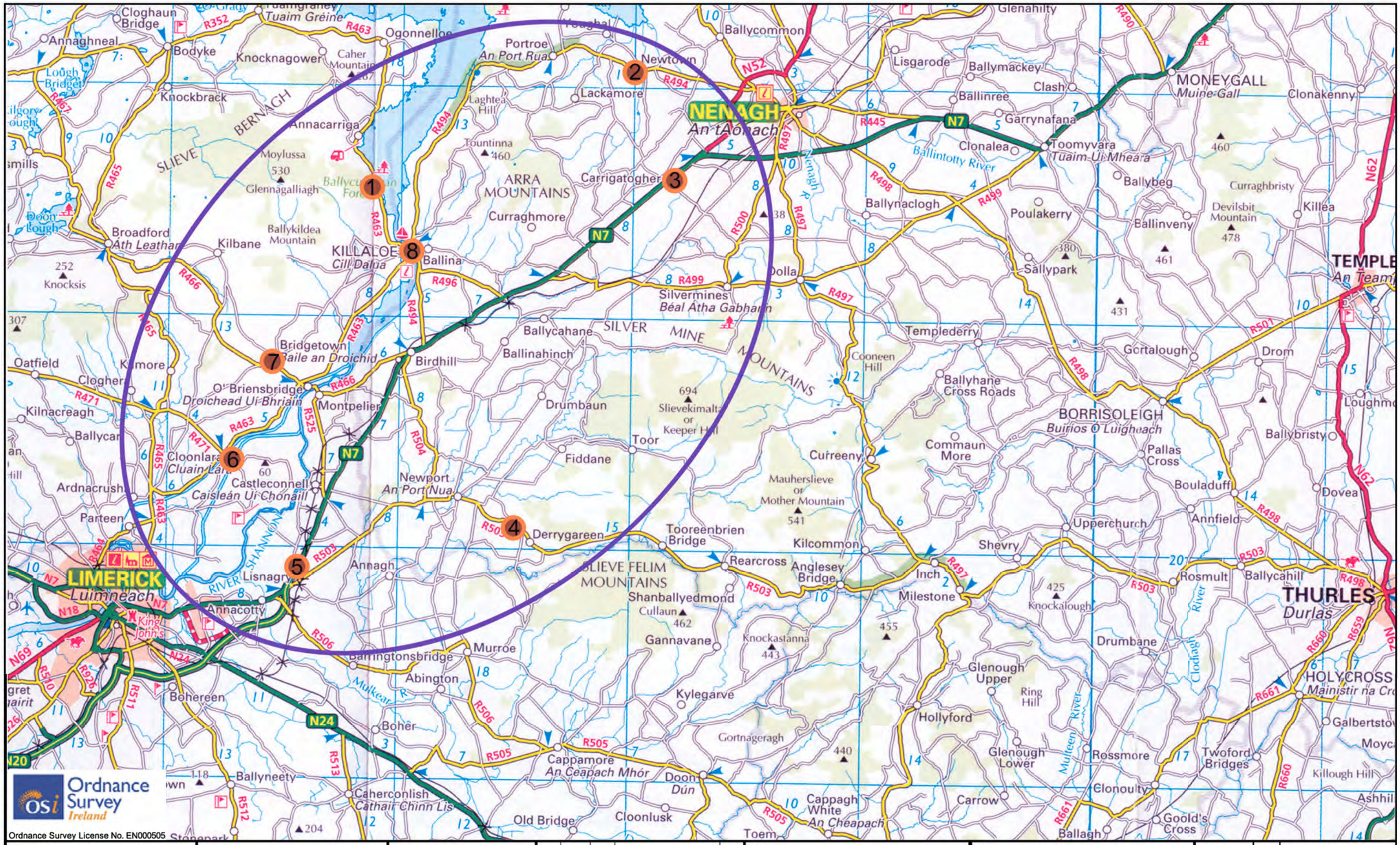
Project:

SHANNON BRIDGE CROSSING
- FEASIBILITY STUDY AND PRELIMINARY REPORT

Title:

STUDY AREA
Fig. 2.2

Drawn by:	KT	Job No:	MCT0172
Checked by:	LB	File No:	MCT0172SK0001
Approved by:	PF	Drg. No:	SK-01
Scale:	1:25000	Rev:	A01
Date:	15/02/05		



Client:

NDP NATIONAL DEVELOPMENT PLAN

RPS MCOS

RPS-MCOS Ltd., Innishmore, Ballincollig, Co. Cork, Ireland.
T: +353 21 487 0200 - F: +353 1 487 3742
E: rpsmcos@rpsgroup.ie W: www.rpsmcos.ie

No.	Date	Dft. Chk.	Amendment / Issue	App.

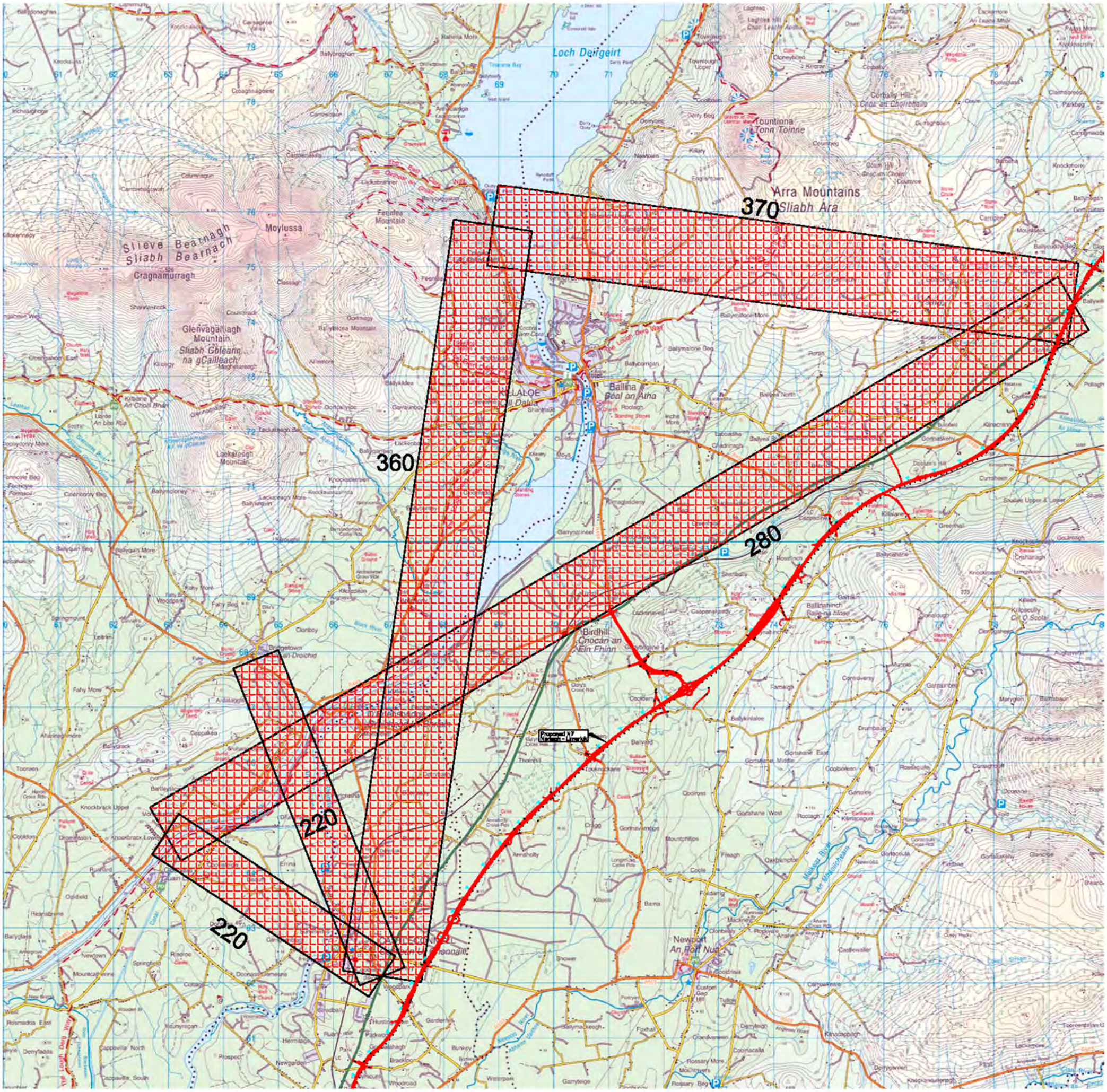
Project:

SHANNON BRIDGE CROSSING - FEASIBILITY STUDY AND PRELIMINARY REPORT

Title:

NUMBER PLATES MATCHING SURVEY LOCATIONS

Drawn by:	AW	Job No: MCT0172	
Checked by:	AL	File No:	
Approved by:	AL	Drg. No: Fig. 4.1	Rev:
Scale: NTS			
Date: 03/05/05			



Ordnance Survey Ireland

Ordnance Survey License No. EN000505.

Client: NDP National Development Plan

RPS MCOS

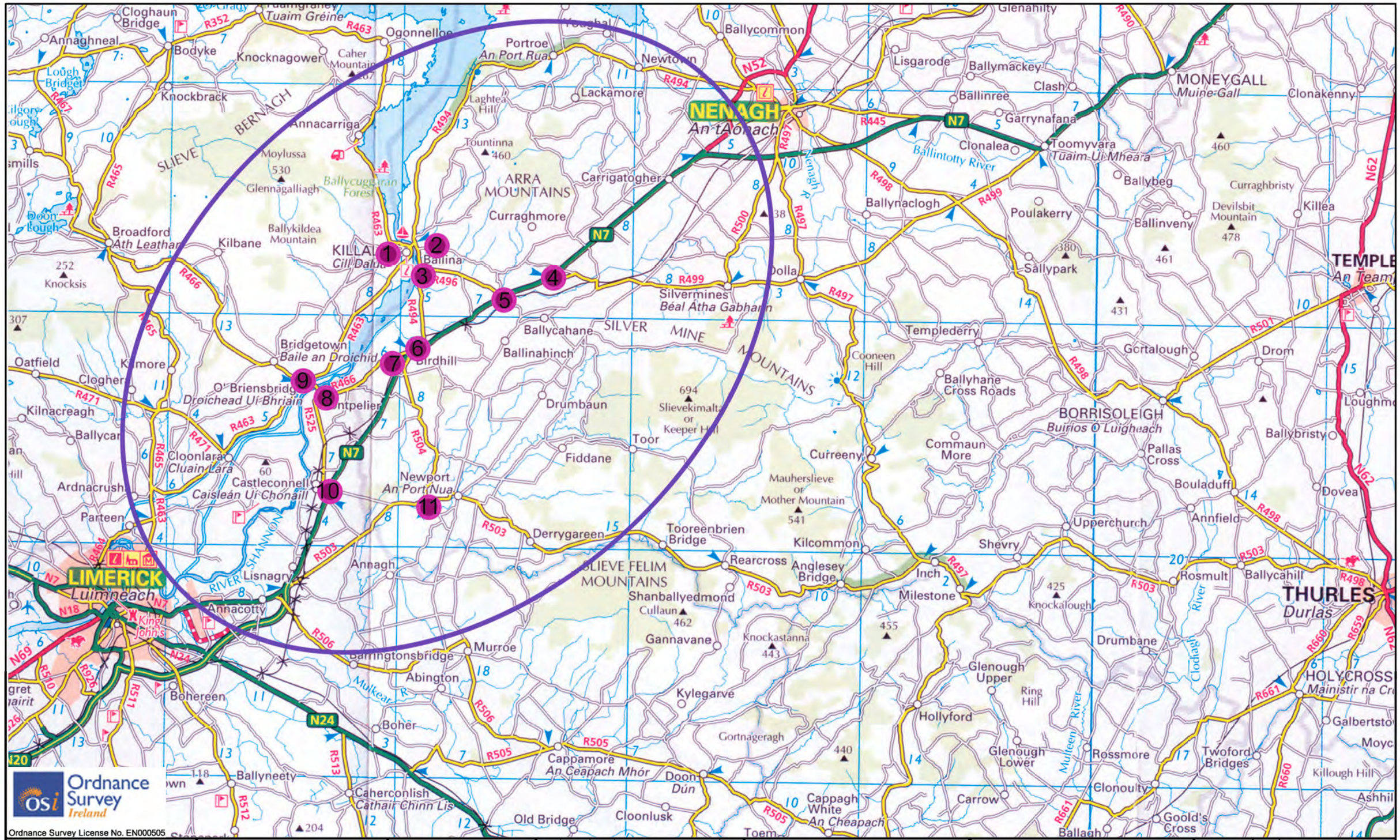
RPS-MCOS Ltd., Innishmore, Ballincollig, Co. Cork, Ireland.
T: +353 21 487 0200 - F: +353 1 487 3742
E: rpsmcos@rpsgroup.ie W: www.rpsmcos.ie

No.	Date	Dr. Ch.	Amendment / Issue	App.

Project: SHANNON BRIDGE CROSSING - FEASIBILITY STUDY AND PRELIMINARY REPORT

Title: OBSERVED THROUGH TRIP PATTERN, ALL VEHICLES 08:00 TO 18:00

Drawn by:	AW	Job No: MCT0172	
Checked by:	AL	File No:	
Approved by:	AL	Drg. No: Fig. 4.2	Rev:
Scale: NTS			
Date: 03/05/05			


1
2
3
4
5
6
7
8
9
10
11
NENAGH
An tAonach
LIMERICK
Luimneach
KILLALOE
Cill Dalua
THURLES
Durlas
TEMPLE
An Teampa
MONEYGALL
Muine Gall
BORRISOLEIGH
Buirios Ó Luighaigh
THOMASTOWN
Baile Mhic Andáin
HOLYCROSS
Mainistir na Cr
BERNAGH
SLIEVE
ARRA MOUNTAINS
SILVER MINE MOUNTAINS
SLIEVE FELIM MOUNTAINS
RIVER SHANNON
Ballintotty River
Nenagh R.
Mulkear R.
Clodiagh River
Multeen River
N7
N52
N62
N24
R352
R463
R494
R497
R498
R499
R500
R501
R503
R505
R506
R445
R466
R471
R525
R504
R464
R465
R467
R490
R496
R660
R661
R659
N18
N69
R510
R926
R511
R513
R512
Ordnance Survey Ireland
Ordnance Survey License No. EN000505
Client:
NDP
NATIONAL DEVELOPMENT PLAN
RPS MCOS
RPS-MCOS Ltd., Innishmore, Ballincollig, Co. Cork, Ireland.
T: +353 21 487 0200 - F: +353 1 487 3742
E: rpsmcos@rpsgroup.ie W: www.rpsmcos.ie
No. | Date | Dft/Chk | Amendment / Issue | App.
Project:
SHANNON BRIDGE CROSSING - FEASIBILITY STUDY AND PRELIMINARY REPORT
Title:
JUNCTION COUNTS LOCATION
Drawn by: AW
Checked by: AL
Approved by: AL
Scale: NTS
Date: 03/05/05
Job No: MCT0172
File No:
Drg. No: Fig. 4.3
Rev:

Key

Two Way Totals

Flow By Direction

Feenlea
Ryninch Lower
Drumbane
Ballyvally
Kincora
Ceann Cora
Cullena
R463
R494
Standing Stone
259
361
620
Standing Stones
157
131
288
The East Clare
Holy Well
Heritage Centre
269
334
603
Killaloe Br
Aillemore
Ballykildea
Reservoir
Standing Stones
Church
KILLALOE
Cill Dalua
Creeveroe
Smaltraud
Castle
Slip
Coll
Sch
Standing Stones
Gortcallyroe
Garraunboy
225
200
581
262
319
99
171
273
444
Garraunboy Br
Ballyteige Br
Ballyteige River
Killestry Br
Killestry
94
193
362
144
218
Abhainn Ardchluanai
Ardcloony River
Lackenbaun
Ballygarreen
Knockaderreen
Knockaunnaslinna
Ackareagh More
Ballycorney Br
Ballycorney
Cloonfadda
Standing Stones
The Lough Derg Way
Kilmagla
Cillin
Kilroughil
Barnanderreen Cross Rds
Fulacht Fia
Garrynatineel
Burial Ground
Ardbacartan Cross Rds
Standing Stone
Kilcredaun
Aughayatha Br
Ross
Ardcloony
Ardcloony Br
Coolnadornory
Kilmastulla River
Dismantled Railway
327
114
213
Pollagh
497
780
1277
Clonboy
Black River
Black River Br
Bridgetown
Baile an-Droichid
R466
72
67
139
Weir
Knockadrehid
Standing Stone
Cillin
L.C.
43MP
Clery's Cross Rds
249
98
205
130
411
151
R463
Inishlosky
Church
75
223
PO
Fairyhall
Cranduff Br
238
65
Bridgensbridge
Droichead Ui Bhriain
188
194
432
1110
405
705
102
47
55
Fulacht Fia
172
85
150
Ballyhane Br
Proposed N7 Nenagh - Limerick
Cross Rds
44MP
245
417
320
128
192
Thornhill
Touknockane
Derryhasna
Coolready
Ordnance Survey Ireland
Ordnance Survey License No. EN000505.

Client: NDP National Development Plan

RPS MCOS
RPS-MCOS Ltd., Innishmore, Ballincollig, Co. Cork, Ireland.
T: +353 21 487 0200 - F: +353 1 487 3742
E: rpsmcos@rpsgroup.ie W: www.rpsmcos.ie

No.	Date	By	Amendment / Issue	App.

Project: SHANNON BRIDGE CROSSING - FEASIBILITY STUDY AND PRELIMINARY REPORT

Title: PEAK HOUR LINK FLOW ALL VEHICLES 0830:0930

Drawn by:	AW	Job No:	MCT0172
Checked by:	AL	File No:	
Approved by:	AL	Drg. No:	Fig. 4.4
Scale:	NTS	Rev:	
Date:	03/05/05		

Key

Two Way Totals

Flow By Direction

Ordnance Survey License No. EN000505.

Client: NDP National Development Plan	RPS MCOS RPS-MCOS Ltd., Innishmore, Ballincollig, Co. Cork, Ireland. T: +353 21 487 0200 - F: +353 1 487 3742 E: rpsmcos@rpsgroup.ie W: www.rpsmcos.ie	No. / Date / Dr. / Amendment / Issue / App.	Project: SHANNON BRIDGE CROSSING - FEASIBILITY STUDY AND PRELIMINARY REPORT	Title: AM PEAK HOUR LINK FLOWS HCV's ONLY 0830:0930	Drawn by: AW	Job No: MCT0172
					Checked by: AL	File No:
					Approved by: AL	Drg. No: Fig. 4.5
					Scale: NTS	Rev:
					Date: 03/05/05	

Key

Two Way Totals

Flow By Direction

Feenlea
Ryninch Lower
Drumbane
Ballyvally
R463
R494
Kincora
Ceann Cora
Standing Stones
Standing Stone
Cullenard
426
254
680
117
170
287
358
286
644
674
387
287
187
180
367
452
270
182
124
225
101
Heritage Centre
Fire Stn
Church
PO
Killaloe
KILLALOE
Cill Dalua
Creeveroe
Shanaraud
Castle
Slip
Aillemore
Ballykildea
Reservoir
Standing Stones
The East Clare Way
Gortcallyroe
Garraunboy
Garraunboy Br
Ballyteige Br
Ballyteige River
Killestry Br
Killestry
Lackenbaun
Ballygarreen
Abhainn Ardchluanaí
Ardcloony River
Knockaderreen
Knockaunnaslinna
Ballycorney Br
Ballycorney
Cloonfadda
Standing Stones
The Lough Derg Way
Kilmaglas
Garrynatineel
Fulacht Fia
Barnanderreen Cross Rds
Kilroughil
Cillin
Burial Ground
Ardbacartan Cross Rds
Standing Stone
Kilcredaun
Aughayatha Br
Ross
Ardcloony
Ardcloony Br
Coolnadornory
Kilmastulla River
Cool Br
376
237
139
Dismantled Railway
Pollagh
908
608
1516
100
86
186
Standing Stone
Cillin
L.C.
43MP
Clery's Cross Rds
63
123
60
1319
803
516
Fulacht Fia
Ballyhane Br
44MP
Thornhill
Touknockane
Proposed N7 Nenagh - Limerick
Cross Rds
Clonboy
Black River
Black River Br
Bridgetown
Baile an-Droichid
Knockadrehid
Weir
303
196
207
86
492
107
121
233
259
216
237
108
453
77
185
291
193
484
302
177
125
Irishlosky Church
Fairyhall
Cranduff Br
Broadbridge
Brochead Ui Bhriain
Mon
Derryhasna
Coolready
An tSionnach
River Sha
Portcrusha
R466
R463
65
66
67
68
69
70
71
Ordnance Survey Ireland
Ordnance Survey License No. EN000505.

Client: NDP National Development Plan

RPS MCOS
RPS-MCOS Ltd., Innishmore, Ballincollig, Co. Cork, Ireland.
T: +353 21 487 0200 - F: +353 1 487 3742
E: rpsmcos@rpsgroup.ie W: www.rpsmcos.ie

No.	Date	Dr. Ch.	Amendment / Issue	App.

Project: SHANNON BRIDGE CROSSING - FEASIBILITY STUDY AND PRELIMINARY REPORT

Title: PM PEAK HOUR LINK FLOWS ALL VEHICLE 1700:1800

Drawn by:	AW	Job No:	MCT0172
Checked by:	AL	File No:	
Approved by:	AL	Drg. No:	Fig. 4.6
Scale:	NTS	Rev:	
Date:	03/05/05		

Key

Two Way Totals

Flow By Direction

Feenlea
Ryninch Lower
Drumbane
Ballyvally
Kincora
Ceann Cora
Standing Stones
The East Clare Way
Aillemore
Ballykildea
Reservoir
Standing Stones
KILLALOE
Cill Dalua
Creeveroe
Standing Stones
Gortcallyroe
Garraunboy
Garraunboy Br
Ballyteige Br
Abhainn Ardcloony River
Ballygarreen
Lackenbaun
Ballyteige River
Killestry Br
Killestry
Knockaderreen
Knockaunnaslinna
Ballycorney Br
Ballycorney
Cloonfadda
Standing Stones
The Lough Derg Way
Barnanderreen Cross Rds
Fulacht Fia
Garrynatineel
Kilroughil
Burial Ground
Ardbacartan Cross Rds
Standing Stone
Kilcredaun
Ross
Ardcloony Br
Ardcloony
Kilmastulla River
Coolnadornory
Dismantled Railway
Clonboy
Black River
Black River Br
Pollagh
Bridgetown
Baile an-Droichid
Weir
Knockadrohid
Standing Stone
Cillín
Inishlosky
Church
Fairyhall
Cranduff Br
Fulacht Fia
Clery's Cross Rds
Proposed N7 Nenagh - Limerick
Ballyhane Br
Cross Rds
Thornhill
Derryhasna
Touknockane
Coolready
Portcrusha
An tSionnach River
R463
R494
R466
Ordnance Survey Ireland
Ordnance Survey License No. EN000505.

Client: NDP National Development Plan

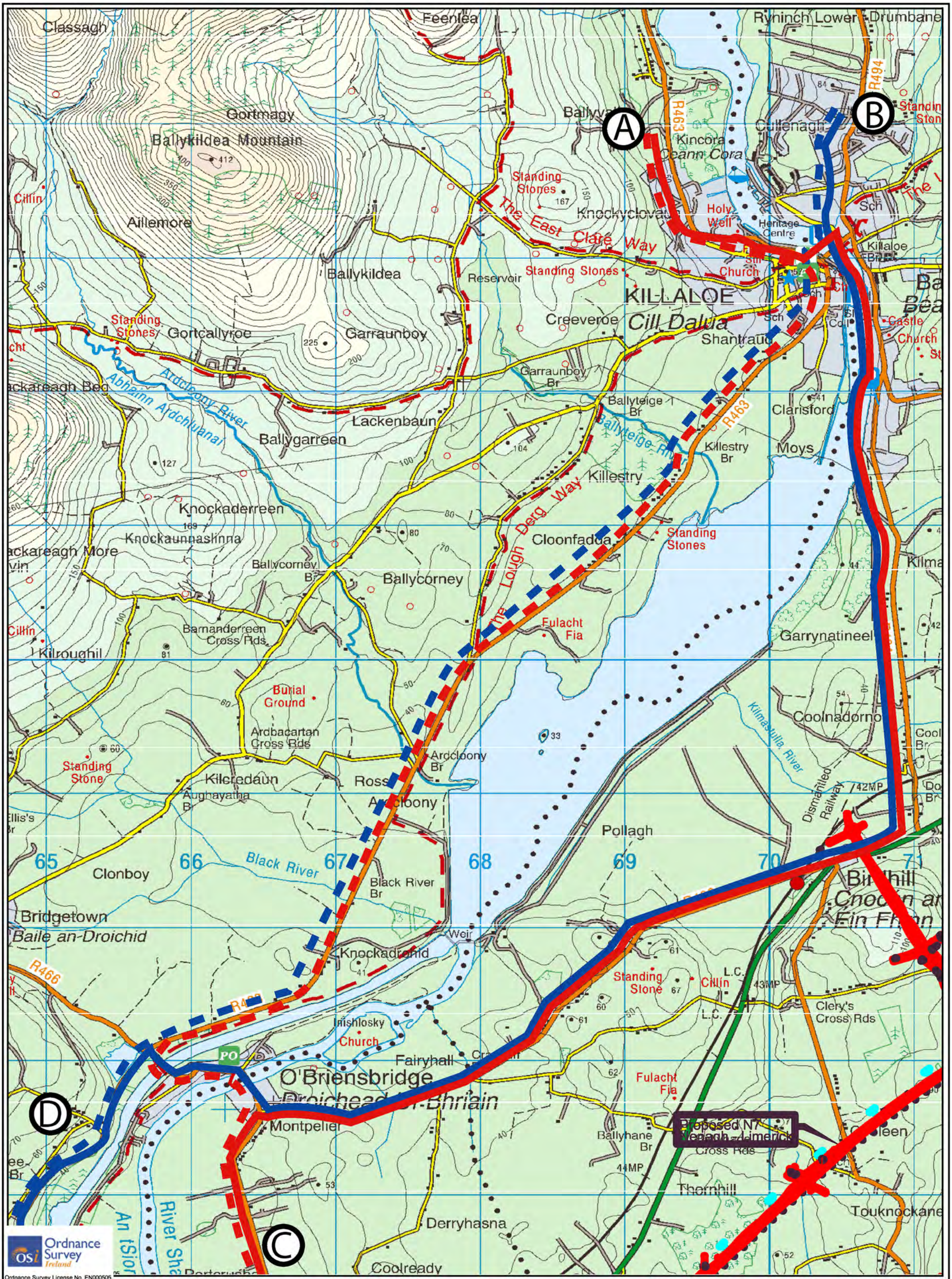
RPS MCOS
RPS-MCOS Ltd., Innishmore, Ballincollig, Co. Cork, Ireland.
T: +353 21 487 0200 - F: +353 1 487 3742
E: rpsmcos@rpsgroup.ie W: www.rpsmcos.ie

No.	Date	By	Amendment / Issue	App.

Project: SHANNON BRIDGE CROSSING - FEASIBILITY STUDY AND PRELIMINARY REPORT

Title: PM PEAK HOUR LINK FLOWS HCV's ONLY 1700:1800

Drawn by:	AW	Job No: MCT0172	
Checked by:	AL	File No:	
Approved by:	AL	Drg. No: Fig. 4.7	Rev:
Scale: NTS			
Date: 03/05/05			



Client: NDP National Development Plan

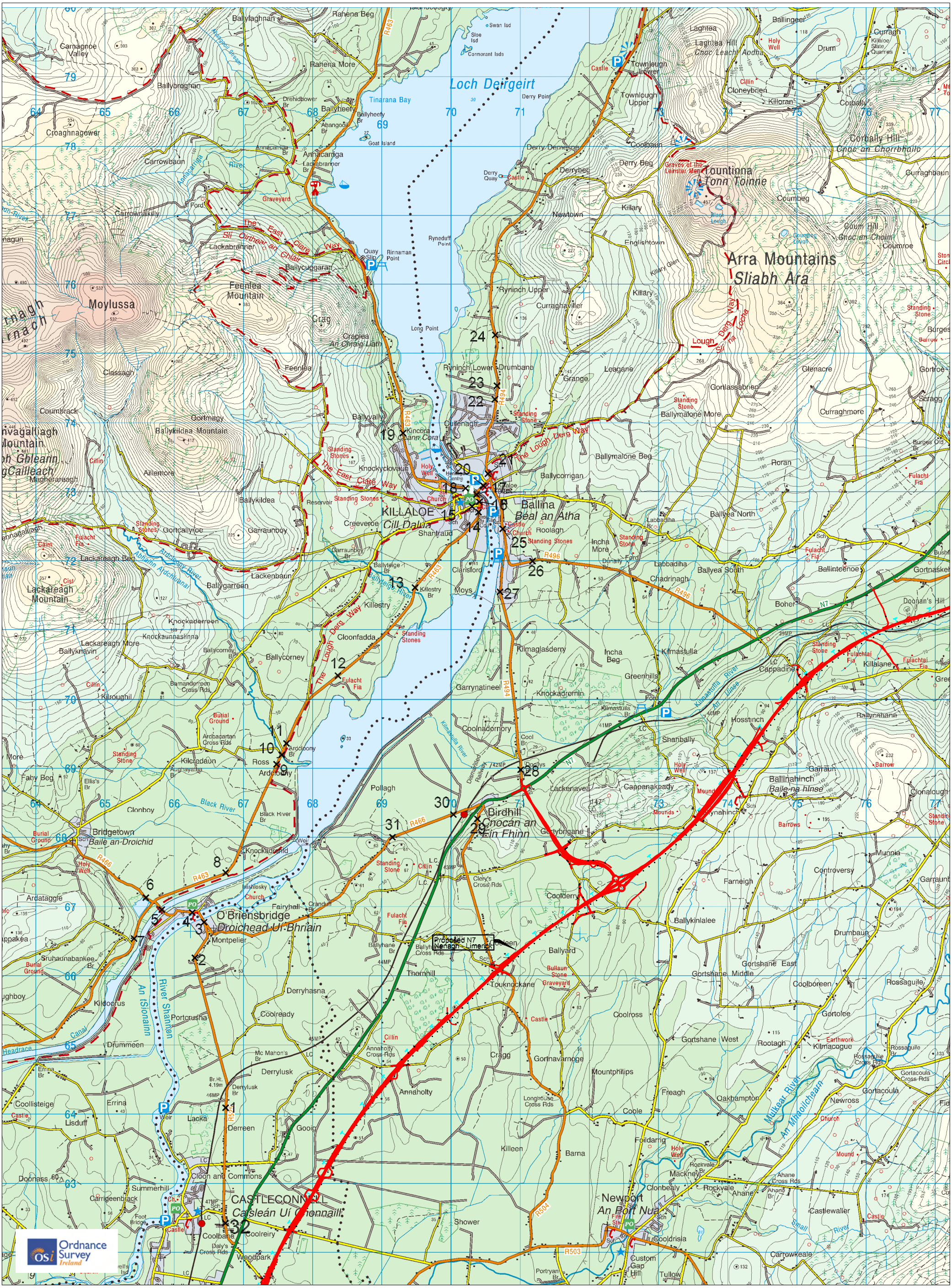
RPS MCOS
RPS-MCOS Ltd., Innishmore, Ballincollig, Co. Cork, Ireland.
T: +353 21 487 0200 - F: +353 1 487 3742
E: rpsmcos@rpsgroup.ie W: www.rpsmcos.ie

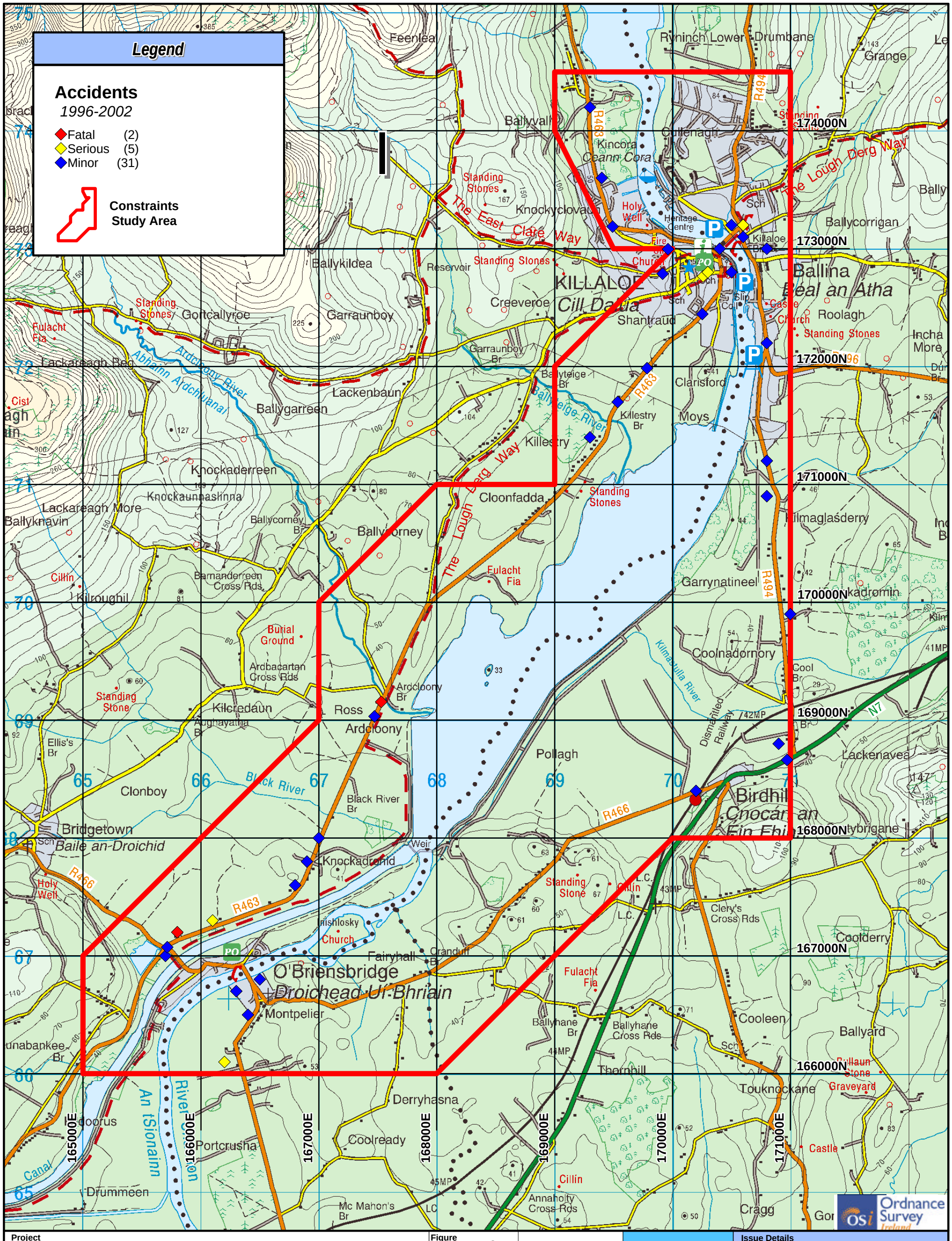
No.	Date	Dft.	Amendment / Issue	App.

Project: SHANNON BRIDGE CROSSING - FEASIBILITY STUDY AND PRELIMINARY REPORT

Title: JOURNEY TIME ROUTES

Drawn by:	AW	Job No: MCT0172	
Checked by:	AL	File No:	
Approved by:	AL	Drg. No: Fig. 4.8	Rev:
Scale: NTS			
Date: 03/05/05			


Loch Deirgeirt
Tinarana Bay
Derry Point
Swan Isd
Stoe Isd
Cormorant Isds
Goat Island
Rahena Beg
Rahena More
Ballylaghnan
Ballybroghan
Carnagnoe Valley
Croaghnagower
Drehidbower Br
Ballyheefy
Ballyheefy Br
Ahangooil Br
Annacarriga Br
Annacarriga
Lackabrannier Br
Carrowbaun
Carrowmakilly
Graveyard
Ford
The East Clare Way
Sli Oirthear an Chlair
Lackabrannier
Ballycuggaran
Quay Slip
Rinnaman Point
Ryneduff Point
Long Point
Feenlea Mountain
Moylussa
Crag
Craglea
An Chraig Liath
Feenlea
Classagh
Coumbrack
Gortmagy
Ballykildea Mountain
Ailleamore
Magherareagh
Cillin
Ballykildea
Reservoir
Standing Stones
Gortcallyroe
Garraunboy
Garraunboy Br
Creeveroe
Shantraud
KILLALOE
Cill Dalua
Church
Castle
Roolagh
Standing Stones
Ballina
Beal an Atha
Ballyea North
Ballyea South
Labbadiha
Incha More
Dunally Br
Ford
Chadrinagh
Boher
Ballinteenoe
Gortnaskeha
Doonan's Hill
Lackareagh Beg
Lackareagh Mountain
Cist
Cairn
Fulacht Fia
Abhainn Ardchuanal
Ardcloony River
Lackenbaun
Ballygarreen
Ballyteige Br
Ballyteige River
Killestry Br
Killestry
Moys
Clarisford
Knockaderreen
Knockaunnashinna
Lackareagh More
Ballyknavin
Ballycorney Br
Ballycorney
Cloonfadda
The Lough Derg Way
Standing Stones
Kilmaglasderry
Incha Beg
Kilmastulla
Kilmastulla River
Cappadine
Killalane
Fulachtai Fia
Greenhills
Garrynatineel
Knockadromin
Kilroughil
Barnanderreen Cross Rds
Burial Ground
Ardbacartan Cross Rds
Ardcloony Br
Ross
Ardcloony
Kilcredaun
Aughayatha Br
Fahy Beg
Ellis's Br
Coolnadornory
Cool Br
Doolys
Shanbally
Hosstinch
Ballycahane
Kilmastulla River
Dismantled Railway
Pollagh
Clonboy
Black River
Black River Br
Bridgetown
Baile an-Droichid
Knockadromid
Holy Well
Lackenavea
Cappanakeady
Mounds
Ballinahinch
Baile-na hInse
Garraun
Clonalough
Birdhill
Cnocán an Ein Fhinn
Gortybrigane
Ballymalone More
Ballymalone Beg
Ballycorrigan
Ballykinlalee
Drumbaun
Farneigh
Controversy
Coolderry
Clery's Cross Rds
Ardataggle
Fairyhall
Crandun Br
O'Briensbridge
Droichead Uí Bhriain
Montpelier
Sruhaunabankee Br
Burial Ground
Kildoorus
Portcrusha
Coolready
Derryhasna
Drummeen
Canal
Headrace
An tSionainn
River Shannon
Errina Br
Errina
Coollisteige
Lisduff
Castle
Weir
Lacka
Derreen
Gooig
Cloon and Commons
Summerhill
Carrigeenbrack
Doonass
CASTLECONNELL
Caisleán Uí Chonnaill
Foot Bridge
Coolbane
Coolreiry
Daly's Cross Rds
Woodpark
Shower
Killeen
Barna
Foildarrig
Mackney
Rockvale Br
Rockvale
Clonbealy
Ahane
Ahane Cross Rds
Ahane Br
Newport
An Port Nua
Castlewaller
Cooldrisla
Carrowkeale
Custom Gap Hill
Tullow
Portryan Br
Small River
Mulkear River
An Mhaoilcheann
Newross
Gortacoula
Gortacoula Cross Rds
Rossaguile
Rossaguile Br
Rossaguile Cross Rds
Gortolee
Coolboreen
Gortshane East
Gortshane Middle
Gortshane West
Rootagh
Kilmacogue
Earthwork
Coolross
Touknockane
Bullaun Stone
Graveyard
Ballyard
Thornhill
Ballyhane Br
Ballyhane Cross Rds
Proposed N7 Nenagh - Limerick
Toureen
Annaholty
Annaholty Cross Rds
Longhouse Cross Rds
Mountphilips
Freagh
Oakhampton
Coole
Cragg
Gortnavarnoge
Derrylusk
Derrylusk Br
Mc Mahon's Br
Br.Ht. 4.19m
Lacka
Derreen
Gooig
Killeen
Barna
Foildarrig
Holy Well
Mound
Church
Munnia
Garraun
Ballinahinch
Baile-na hInse
Clonalough
Barrows
Standing Stone
Burges Old Br
Roran
Fulacht Fia
Ballintaggart
Ballykinlalee
Drumbaun
Gortshane East
Gortshane Middle
Gortshane West
Coolboreen
Rossaguile
Gortolee
Gortacoula
Newross
Oakhampton
Freagh
Coole
Mountphilips
Gortnavarnoge
Cragg
Annaholty
Derrylusk
Mc Mahon's Br
Derreen
Gooig
Killeen
Barna
Foildarrig
Holy Well
Mound
Church
Castlewaller
Cooldrisla
Carrowkeale
Custom Gap Hill
Tullow
Newport
An Port Nua
Shower
Coolreiry
Coolbane
Daly's Cross Rds
Woodpark
CASTLECONNELL
Caisleán Uí Chonnaill
Cloon and Commons
Summerhill
Carrigeenbrack
Doonass
Lisduff
Coollisteige
Errina
Errina Br
Kildoorus
Portcrusha
Coolready
Derryhasna
Drummeen
Canal
Headrace
An tSionainn
River Shannon
Sruhaunabankee Br
Burial Ground
Montpelier
Fairyhall
Crandun Br
O'Briensbridge
Droichead Uí Bhriain
Ardataggle
Coolderry
Clery's Cross Rds
Ballykinlalee
Drumbaun
Farneigh
Controversy
Garraun
Ballinahinch
Baile-na hInse
Clonalough
Barrows
Standing Stone
Burges Old Br
Roran
Fulacht Fia
Ballintaggart
Munnia
Ballyard



Project	*Shannon Bridge Crossing-Feasibility Study & Prelim Report*	**Figure**	**4.10**
Title	**Accident Data**		

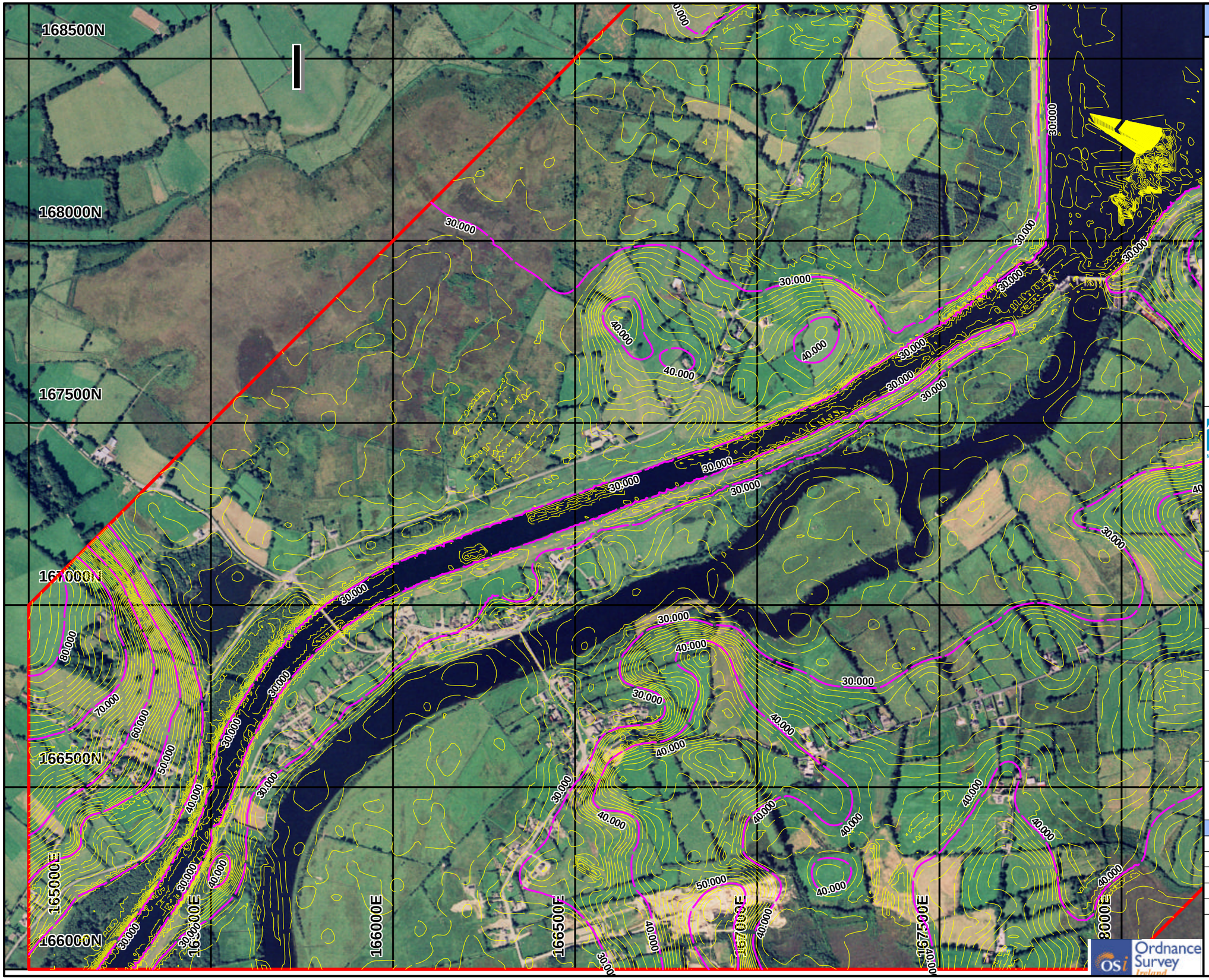
RPS mcos
Innishmore
Ballincollig
Co. Cork
Phone: 021-4870200
Fax No. 021-4873742
rpsmcos@rpsgroup.ie
www.rpsgroup.ie

NDP NATIONAL DEVELOPMENT PLAN

Issue Details

Drawn:	T Hurley	**Project No.**	MCT0172
Checked:	K Barry	**File Ref.**	MCT0172MI0032A01
Approved:	P Fitzgerald		
Scale:	1:30,000 @ A3	**Drawing No.**	**Rev.** MI0032 A01
Date:	April 05		

Notes
1. This drawing is the property of RPS-MCOS. It is a confidential document and must not be copied, used, or its contents divulged without prior written consent.
2. All levels are referred to Ordnance Datum, Malin Head.
3. NOT TO SCALE, use figured dimensions only, if in doubt ask.
4. Ordnance Survey Ireland Licence No. EN 0005005 Copyright Government of Ireland.

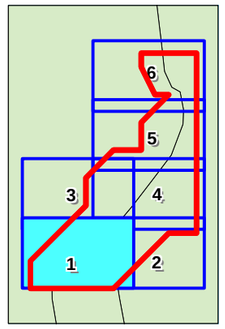


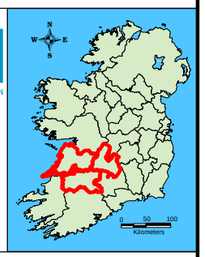
Legend

Constraints Study Area

1m Contour Data

10m Contour Data





NDP NATIONAL DEVELOPMENT PLAN

Project
Shannon Bridge Crossing- Feasibility Study & Prelim Report

Title

TOPOGRAPHY Sheet 1 of 6

Figure 5.1

RPS mcos
Innishmore
Ballincollig
Co. Cork
Phone: 021-4870200
Fax No. 021-4873742
rpsmcos@rpsgroup.ie
www.rpsgroup.ie

Issue Details

Drawn:	T Hurley	**Project No.**	MCT0172
Checked:	L Barry	**File Ref.**	MCT0172MI0015A01
Approved:	P Fitzgerald		
Scale:	1:10,000 @ A3	**Drawing No.**	**Rev.** 0015 A01
Date:	April 05		

Notes
1. This drawing is the property of RPS-MCOS. It is a confidential document and must not be copied, used, or its contents divulged without prior written consent.
2. All levels are referred to Ordnance Datum, Malin Head.
3. NOT TO SCALE, use figured dimensions only, if in doubt ask.
4. ' ©Ordnance Survey Ireland. All rights reserved. Licence number 2003/07/CCMA/Clare County Council'

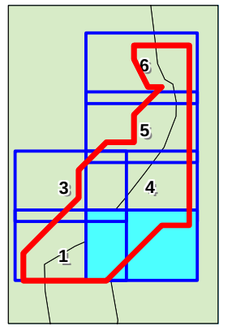
osi Ordnance Survey Ireland

Legend

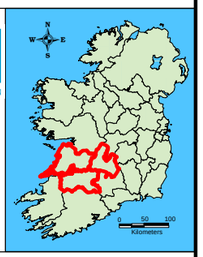
Constraints Study Area

1m Contour Data

10m Contour Data



NDP NATIONAL DEVELOPMENT PLAN



Project

Shannon Bridge Crossing- Feasibility Study & Prelim Report

Title

TOPOGRAPHY
Sheet 2 of 6

Figure **5.2**

RPS mcos
Innishmore
Ballincollig
Co. Cork
Phone: 021-4870200
Fax No. 021-4873742
rpsmcos@rpsgroup.ie
www.rpsgroup.ie

Issue Details

Drawn:	T Hurley	**Project No.**	MCT0172
Checked:	L Barry	**File Ref.**	MCT0172MI0016A01
Approved:	P Fitzgerald		
Scale:	1:10,000 @ A3	**Drawing No.**	0016
Rev.	A01		
Date:	April 05		

Notes

1. This drawing is the property of RPS-MCOS. It is a confidential document and must not be copied, used, or its contents divulged without prior written consent.
2. All levels are referred to Ordnance Datum, Malin Head.
3. NOT TO SCALE, use figured dimensions only, if in doubt ask.
4. ' ©Ordnance Survey Ireland. All rights reserved. Licence number 2003/07/CCMA/Clare County Council'

osi Ordnance Survey Ireland

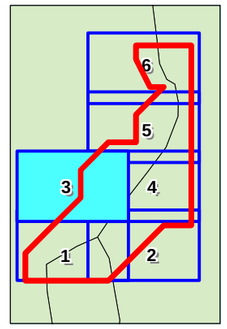
170500N
170000N
169500N
169000N
168500N
165000E
165500E
166000E
166500E
167000E
167500E
70.000
60.000
50.000
40.000
30.000

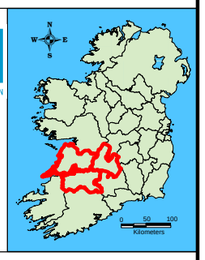
Legend

Constraints Study Area

1m Contour Data

10m Contour Data





NDP NATIONAL DEVELOPMENT PLAN

Project
Shannon Bridge Crossing- Feasibility Study & Prelim Report

Title
TOPOGRAPHY
Sheet 3 of 6

Figure **5.3**

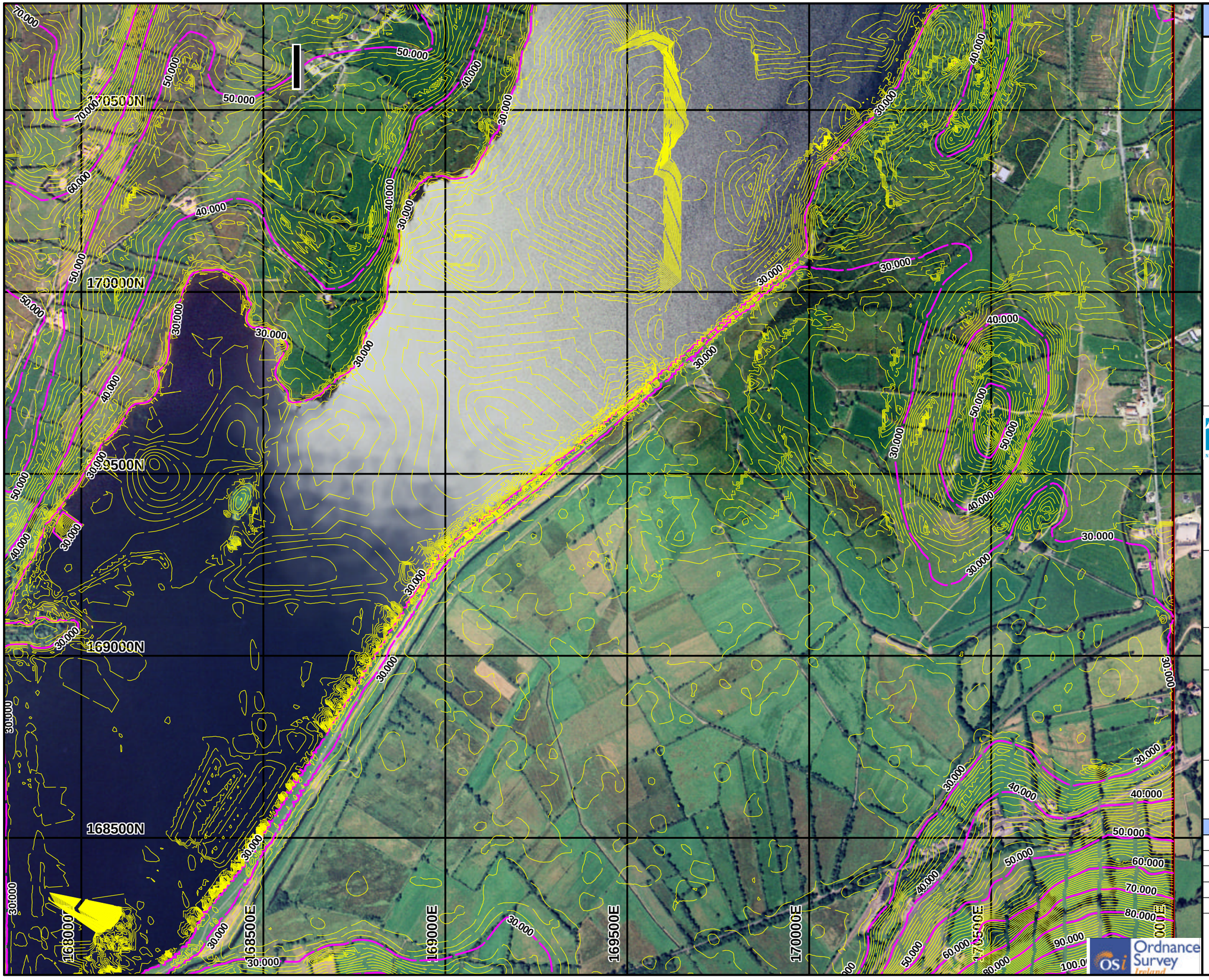
RPS mcos
Innishmore
Ballincollig
Co. Cork
Phone: 021-4870200
Fax No. 021-4873742
rpsmcos@rpsgroup.ie
www.rpsgroup.ie

Issue Details

Drawn:	T Hurley	**Project No.**	MCT0172
Checked:	L Barry	**File Ref.**	MCT0172MI0017A01
Approved:	P Fitzgerald		
Scale:	1:10,000 @ A3	**Drawing No.**	0017
		Rev.	A01
Date:	April 05		

Notes
1. This drawing is the property of RPS-MCOS. It is a confidential document and must not be copied, used, or its contents divulged without prior written consent.
2. All levels are referred to Ordnance Datum, Malin Head.
3. NOT TO SCALE, use figured dimensions only, if in doubt ask.
4. '©Ordnance Survey Ireland. All rights reserved. Licence number 2003/07/CCMA/Clare County Council'

osi Ordnance Survey Ireland

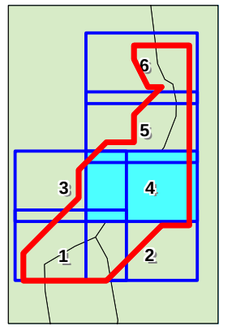


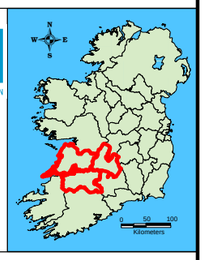
Legend

Constraints Study Area

1m Contour Data

10m Contour Data





Project
Shannon Bridge Crossing- Feasibility Study & Prelim Report

Title

TOPOGRAPHY
Sheet 4 of 6

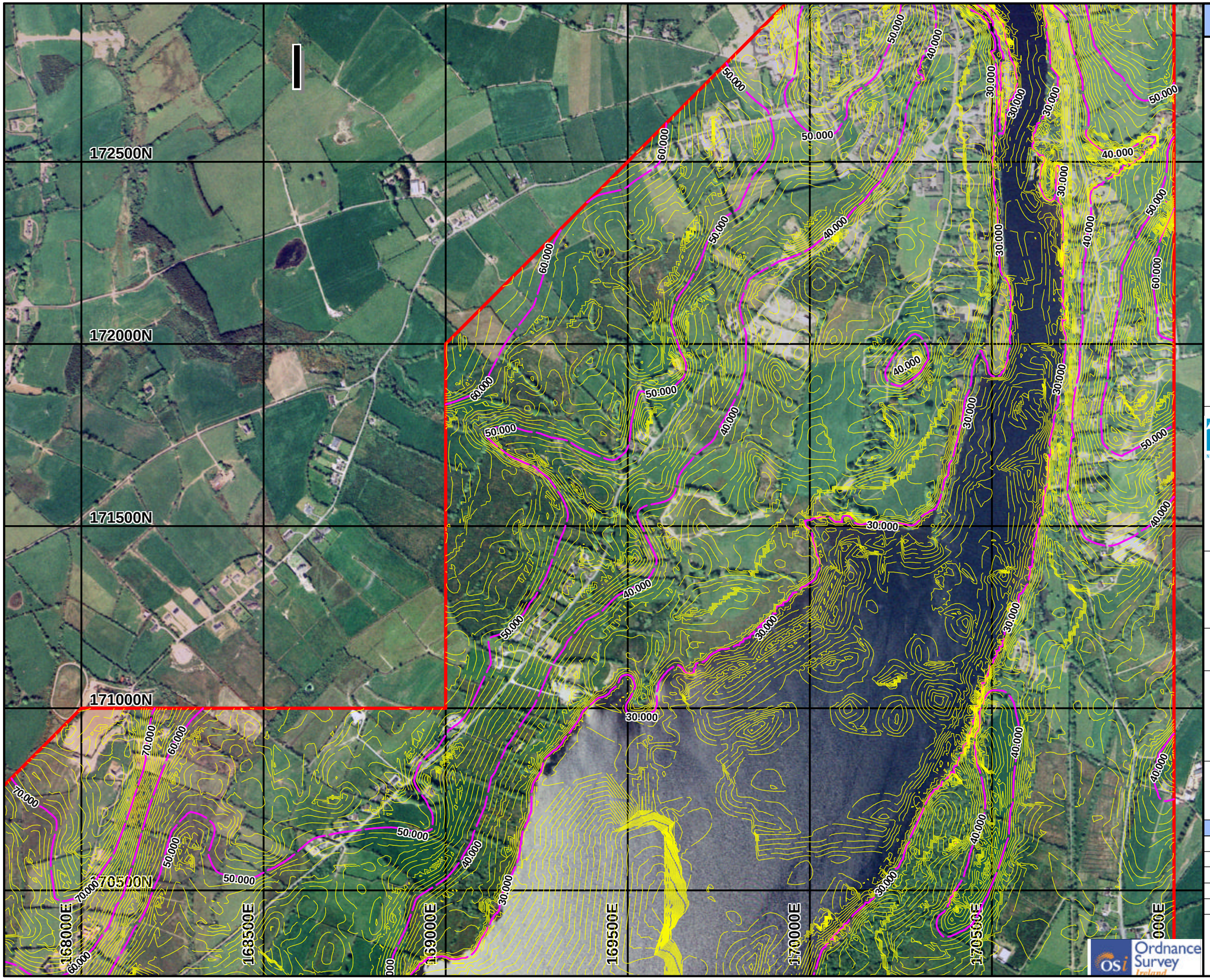
Figure 5.4

RPS mcos
Innishmore
Ballincollig
Co. Cork
Phone: 021-4870200
Fax No. 021-4873742
rpsmcos@rpsgroup.ie
www.rpsgroup.ie

Issue Details

Drawn:	T Hurley	**Project No.**	MCT0172
Checked:	L Barry	**File Ref.**	MCT0172MI0018A01
Approved:	P Fitzgerald		
Scale:	1:10,000 @ A3	**Drawing No.**	0018
Date:	April 05	**Rev.**	A01

Notes
1. This drawing is the property of RPS-MCOS. It is a confidential document and must not be copied, used, or its contents divulged without prior written consent.
2. All levels are referred to Ordnance Datum, Malin Head.
3. NOT TO SCALE, use figured dimensions only, if in doubt ask.
4. ' ©Ordnance Survey Ireland. All rights reserved. Licence number 2003/07/CCMA/Clare County Council'

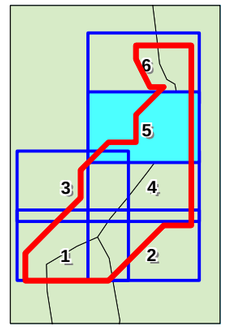


Legend

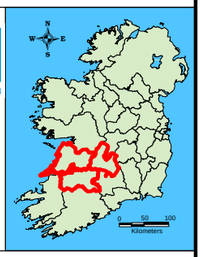
Constraints Study Area

1m Contour Data

10m Contour Data



NDP NATIONAL DEVELOPMENT PLAN



Project
Shannon Bridge Crossing- Feasibility Study & Prelim Report

Title
TOPOGRAPHY
Sheet 5 of 6

Figure 5.5

RPS mcos
Innishmore
Ballincollig
Co. Cork
Phone: 021-4870200
Fax No. 021-4873742
rpsmcos@rpsgroup.ie
www.rpsgroup.ie

Issue Details

Drawn:	T Hurley	**Project No.**	MCT0172
Checked:	L Barry	**File Ref.**	
Approved:	P Fitzgerald	MCT0172MI0019A01	
Scale:	1:10,000 @ A3	**Drawing No.**	**Rev.**
Date:	April 05	0019	A01

Notes
1. This drawing is the property of RPS-MCOS. It is a confidential document and must not be copied, used, or its contents divulged without prior written consent.
2. All levels are referred to Ordnance Datum, Malin Head.
3. NOT TO SCALE, use figured dimensions only, if in doubt ask.
4. ' ©Ordnance Survey Ireland. All rights reserved. Licence number 2003/07/CCMA/Clare County Council'

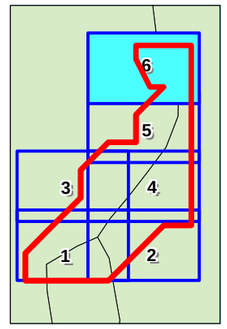
osi Ordnance Survey Ireland

Legend

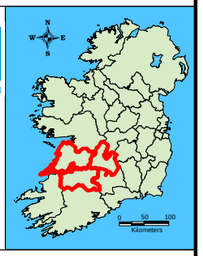
Constraints Study Area

1m Contour Data

10m Contour Data



NDP NATIONAL DEVELOPMENT PLAN



Project
Shannon Bridge Crossing- Feasibility Study & Prelim Report

Title
TOPOGRAPHY
Sheet 6 of 6

Figure 5.6

RPS mcos
Innishmore
Ballincollig
Co. Cork
Phone: 021-4870200
Fax No. 021-4873742
rpsmcos@rpsgroup.ie
www.rpsgroup.ie

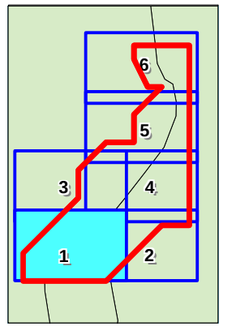
Issue Details

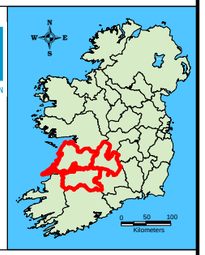
Drawn:	T Hurley	**Project No.**	MCT0172
Checked:	L Barry	**File Ref.**	
Approved:	P Fitzgerald	MCT0172MI0020A01	
Scale:	1:10,000 @ A3	**Drawing No.**	**Rev.**
Date:	April 05	0020	A01

Notes
1. This drawing is the property of RPS-MCOS. It is a confidential document and must not be copied, used, or its contents divulged without prior written consent.
2. All levels are referred to Ordnance Datum, Malin Head.
3. NOT TO SCALE, use figured dimensions only, if in doubt ask.
4. ' ©Ordnance Survey Ireland. All rights reserved. Licence number 2003/07/CCMA/Clare County Council'

Legend

Constraints Study Area





Project

Shannon Bridge Crossing- Feasibility Study & Prelim Report

Title

ORTHOPHOTOGRAPHY Sheet 1 of 6

Figure **5.7**

RPS MCOS
Innishmore
Ballincollig
Co. Cork
Phone: 021-4870200
Fax No. 021-4873742
rpsmcos@rpsgroup.ie
www.rpsgroup.ie

Issue Details

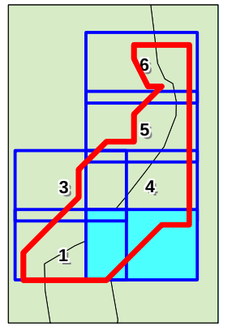
Drawn:	T Hurley	**Project No.**	MCT0172
Checked:	L Barry	**File Ref.**	MCT0172MI0003A01
Approved:	P Fitzgerald		
Scale:	1:10,000 @ A3	**Drawing No.**	**Rev.** 0003 A01
Date:	April 05		

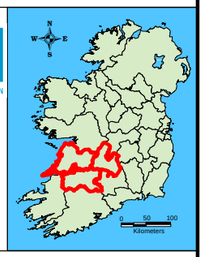
Notes

1. This drawing is the property of RPS-MCOS. It is a confidential document and must not be copied, used, or its contents divulged without prior written consent.
2. All levels are referred to Ordnance Datum, Malin Head.
3. NOT TO SCALE, use figured dimensions only, if in doubt ask.
4.

Legend

Constraints Study Area





Project
Shannon Bridge Crossing- Feasibility Study & Prelim Report

Title

ORTHOPHOTOGRAPHY Sheet 2 of 6

Figure 5.8

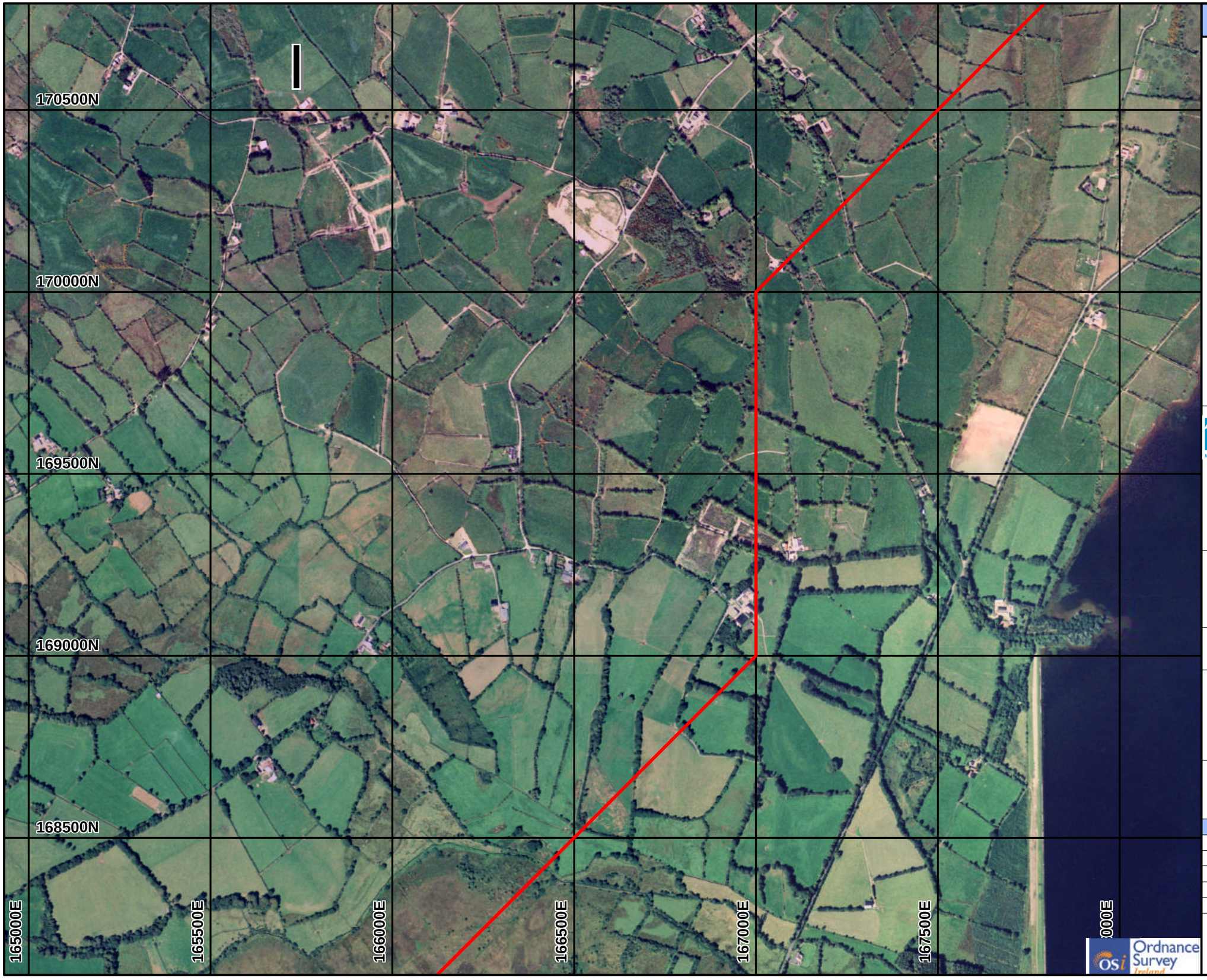
RPS MCOS
Innishmore
Ballincollig
Co. Cork
Phone: 021-4870200
Fax No. 021-4873742
rpsmcos@rpsgroup.ie
www.rpsgroup.ie

Issue Details

Drawn:	T Hurley	**Project No.**	MCT0172
Checked:	L Barry	**File Ref.**	MCT0172MI0004A01
Approved:	P Fitzgerald		
Scale:	1:10,000 @ A3	**Drawing No.**	**Rev.** 0004 A01
Date:	April 05		

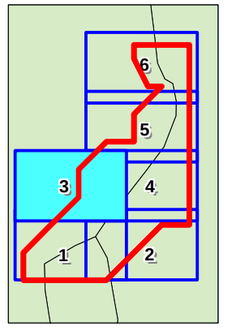
Notes
1. This drawing is the property of RPS-MCOS. It is a confidential document and must not be copied, used, or its contents divulged without prior written consent.
2. All levels are referred to Ordnance Datum, Malin Head.
3. NOT TO SCALE, use figured dimensions only, if in doubt ask.
4. ' ©Ordnance Survey Ireland. All rights reserved. Licence number 2003/07/CCMA/Clare County Council'

Ordnance Survey Ireland

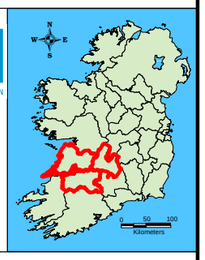


Legend

Constraints Study Area



NDP NATIONAL DEVELOPMENT PLAN



Project
Shannon Bridge Crossing- Feasibility Study & Prelim Report

Title

ORTHOPHOTOGRAPHY Sheet 3 of 6

Figure 5.9

RPS mcos
Innishmore
Ballincollig
Co. Cork
Phone: 021-4870200
Fax No. 021-4873742
rpsmcos@rpsgroup.ie
www.rpsgroup.ie

Issue Details

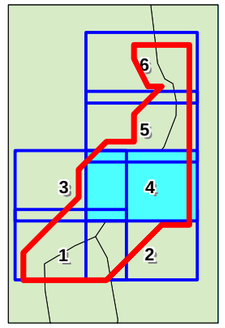
Drawn:	T Hurley	**Project No.**	MCT0172
Checked:	L Barry	**File Ref.**	MCT0172MI0005A01
Approved:	P Fitzgerald		
Scale:	1:10,000 @ A3	**Drawing No.**	0005
Date:	April 05	**Rev.**	A01

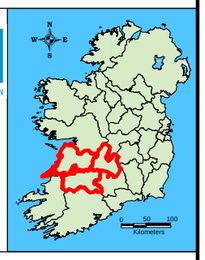
Notes
1. This drawing is the property of RPS-MCOS. It is a confidential document and must not be copied, used, or its contents divulged without prior written consent.
2. All levels are referred to Ordnance Datum, Malin Head.
3. NOT TO SCALE, use figured dimensions only, if in doubt ask.
4.

osi Ordnance Survey Ireland

Legend

Constraints Study Area





Project

Shannon Bridge Crossing- Feasibility Study & Prelim Report

Title

ORTHOPHOTOGRAPHY Sheet 4 of 6

Figure 5.10

Innishmore
Ballincollig
Co. Cork
Phone: 021-4870200
Fax No. 021-4873742
rpsmcos@rpsgroup.ie
www.rpsgroup.ie

Issue Details

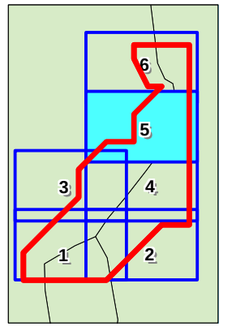
Drawn:	T Hurley	**Project No.**	MCT0172
Checked:	L Barry	**File Ref.**	MCT0172MI0006A01
Approved:	P Fitzgerald		
Scale:	1:10,000 @ A3	**Drawing No.**	0006
Date:	April 05	**Rev.**	A01

Notes

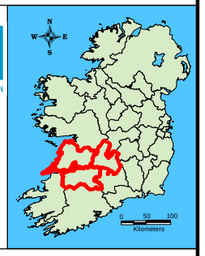
1. This drawing is the property of RPS-MCOS. It is a confidential document and must not be copied, used, or its contents divulged without prior written consent.
2. All levels are referred to Ordnance Datum, Malin Head.
3. NOT TO SCALE, use figured dimensions only, if in doubt ask.
4.

Legend

Constraints Study Area



NDP NATIONAL DEVELOPMENT PLAN



Project
Shannon Bridge Crossing- Feasibility Study & Prelim Report

Title

ORTHOPHOTOGRAPHY Sheet 5 of 6

Figure 5.11

RPS mcos
Innishmore
Ballincollig
Co. Cork
Phone: 021-4870200
Fax No. 021-4873742
rpsmcos@rpsgroup.ie
www.rpsgroup.ie

Issue Details

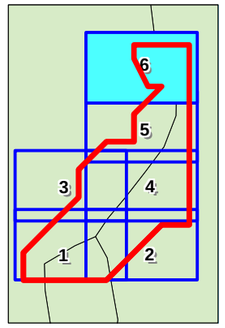
Drawn:	T Hurley	**Project No.**	MCT0172
Checked:	L Barry	**File Ref.**	MCT0172MI0007A01
Approved:	P Fitzgerald		
Scale:	1:10,000 @ A3	**Drawing No.**	0007
Date:	April 05	**Rev.**	A01

Notes
1. This drawing is the property of RPS-MCOS. It is a confidential document and must not be copied, used, or its contents divulged without prior written consent.
2. All levels are referred to Ordnance Datum, Malin Head.
3. NOT TO SCALE, use figured dimensions only, if in doubt ask.
4.

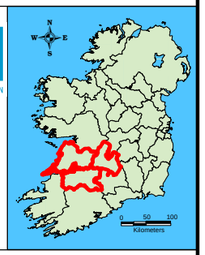
Ordnance Survey Ireland

Legend

Constraints Study Area



NDP NATIONAL DEVELOPMENT PLAN



Project
Shannon Bridge Crossing- Feasibility Study & Prelim Report

Title

ORTHOPHOTOGRAPHY Sheet 6 of 6

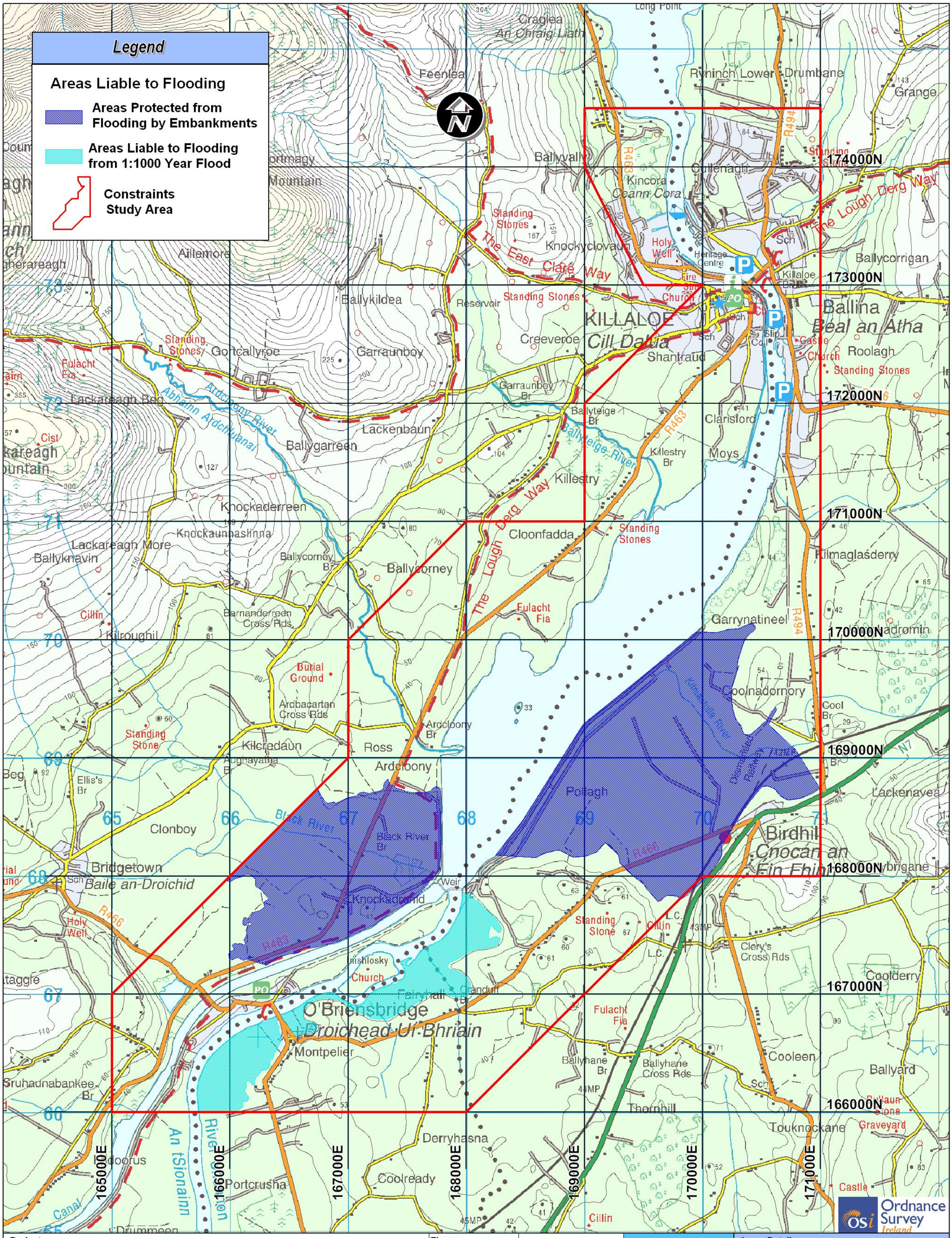
Figure 5.12

RPS mcos
Innishmore
Ballincollig
Co. Cork
Phone: 021-4870200
Fax No. 021-4873742
rpsmcos@rpsgroup.ie
www.rpsgroup.ie

Issue Details

Drawn:	T Hurley	**Project No.**	MCT0172
Checked:	L Barry	**File Ref.**	MCT0172MI0008A01
Approved:	P Fitzgerald		
Scale:	1:10,000 @ A3	**Drawing No.**	**Rev.** 0008 A01
Date:	April 05		

Notes
1. This drawing is the property of RPS-MCOS. It is a confidential document and must not be copied, used, or its contents divulged without prior written consent.
2. All levels are referred to Ordnance Datum, Malin Head.
3. NOT TO SCALE, use figured dimensions only, if in doubt ask.
4. '©Ordnance Survey Ireland. All rights reserved. Licence number 2003/07/CCMA/Clare County Council'


Legend
Areas Liable to Flooding
Areas Protected from Flooding by Embankments
Areas Liable to Flooding from 1:1000 Year Flood
Constraints Study Area
174000N
173000N
172000N
171000N
170000N
169000N
168000N
167000N
166000N
165000E
167000E
168000E
169000E
170000E
171000E
Craglea
An Chraig Liath
Feenlea
Ballyvally
Ryninch Lower
Drumbane
Grange
Kincora
Ceann Cora
Cullenaghi
Standing Stones
Knockyclovaun
Holy Well
Heritage Centre
Ballycorrigan
Killaloe
Ballina
Beal an Átha
KILLALOE
Cill Dalua
Creeveroe
Shantraud
Roolagh
Aillemore
Ballykildea
Reservoir
Gortcallyroe
Garraunboy
Fulacht Fia
Lackareagh Beg
Abhainn Ardchuilinal
Ardcooney River
Lackenbaun
Ballygarreen
Garraunboy Br
Ballyteige Br
Ballyteige River
Clarisford
Killestry Br
Moys
Killestry
Knockaderreen
Knockaunnaslinna
Lackareagh More
Ballyknavin
Ballycorney Br
Ballycorney
Barnanderreen Cross Rds
Cillin
Kilroughil
Cloonfadda
Kilmaglasderry
Garrynatineel
Burial Ground
Ardbacartan Cross Rds
Kilcredaun
Ross
Ardcloony
Ardcloony Br
Aughayatha Br
Ellis's Br
Clonboy
Black River
Black River Br
Bridgetown
Baile an-Droichid
Knockadarrid
Weir
Holy Well
Standing Stone
Cillin
Clery's Cross Rds
Coolderry
Fulacht Fia
Fairyhall
Grandiff
O'Briensbridge
Droichead Uí Bhriain
Montpelier
Ballyhane Br
Ballyhane Cross Rds
Cooleen
Ballyard
Thornhill
Touknockane
Graveyard
Castle
Sruhaunabankee Br
Doorus
An tSionainn
River Shannon
Canal
Portcrusha
Coolready
Derryhasna
Cillin
Drumeen
Coolnadornory
Cool Br
Lackenavea
Birdhill
Cnocán an Fin Fhiúil
Pollagh
Shannon-Foynes Port Company
Shannon Estuary
The Lough Derg Way
The East Clare Way
R463
R494
R466
N7
Project
Shannon Bridge Crossing-Feasibility Study & Prelim Report
Figure
5.13
Title
Flooding & Drainage
RPS mcos
Innishmore
Ballincollig
Co. Cork
Phone: 021-4870200
Fax No. 021-4873742
rpsmcos@rpsgroup.ie
www.rpsgroup.ie
NDP
NATIONAL DEVELOPMENT PLAN
Issue Details
Drawn: T Hurley
Project No. MCT0172
Checked: K Barry
File Ref. MCT0172MI0033A02
Approved: P Fitzgerald
Scale: 1:30,000 at A3
Drawing No. MI0033
Rev. A02
Date: May 05
Notes
1. This drawing is the property of RPS-MCOS. It is a confidential document and must not be copied, used, or its contents divulged without prior written consent.
2. All levels are referred to Ordnance Datum, Malin Head.
3. NOT TO SCALE, use figured dimensions only, if in doubt ask.
4. Ordnance Survey Ireland Licence No. EN 0005005 Copyright Government of Ireland.
Ordnance Survey Ireland

LEGEND

- Constraints Study Area
- Church
- Garda Station
- School
- Railway Station
- Walkway
- Dense Development
- Fire Station
- Swimming Pool
- Equestrian Centre
- Commercial Area
- Tennis Club
- GAA Grounds
- Pitch & Putt

BALLINA

KILLALOE

BIRDHILL

O'BRIENSBRIDGE

MONTPELIER

Client:

RPS MCOS Ltd., Innishmore, Ballincollig, Co. Cork, Ireland.
T: +353 21 487 0200 - F: +353 1 487 3742
E: rpsmcos@rpsgroup.ie W: www.rpsmcos.ie

No.	Date	Dr. / Ch.	Amendment / Issue	App.
A01	Apr.05	KT / LB	Issue for Approval	PF
D01	Apr.05	KT / LB	Draft Issue	PF

Project:

SHANNON BRIDGE CROSSING - FEASIBILITY STUDY AND PRELIMINARY REPORT

Title:

COMMUNITY & BUSINESS ACTIVITIES
Fig. 5.14

Drawn by:	K.T.	Job No:	MCT0172
Checked by:	L.B.	File No:	MCT0172DG0006
Approved by:	P.F.		
Scale:	1:25000	DG-06	Rev: A01
Date:	06/04/05		

LEGEND

- Constraints Study Area
- Planning Permission granted
- Planning application, decision pending

Client:

RPS MCOS

RPS-MCOS Ltd., Innishmore, Ballincollig, Co. Cork, Ireland.
T: +353 21 487 0200 - F: +353 1 487 3742
E: rpsmcos@rpsgroup.ie W: www.rpsmcos.ie

No.	Date	Amendment / Issue	App.
A01	Apr.05	Issue for Approval	PF
D01	Apr.05	Draft Issue	PF

Project:

SHANNON BRIDGE CROSSING - FEASIBILITY STUDY AND PRELIMINARY REPORT

Title:

PLANNING APPLICATIONS
Fig. 5.15

Drawn by:	K.T.	Job No:	MCT0172
Checked by:	L.B.	File No:	MCT0172PA0001
Approved by:	P.F.		
Scale:	1:25000	PA-01	Rev: A01
Date:	06/04/05		

LEGEND

- Settlement Boundary
- Other Settlement Land
- Infrastructure Safeguard
- Residential
- Strategic Reserve
- Town Centre
- Protected Structure
- Architectural Safeguard
- Open space
- Industry
- Community
- Recreation
- Recorded Monument
- Architectural Conservation Area
- Trees for Preservation
- Existing Development
- Retail/Commercial Facilities
- Area of Local Environment Importance
- Pressure Area

R1 R2 R3 R4 R5 C1 C2 OS1 OS2 OS3 LE1 LE2 LE3 H1 H2 CE1

NDP NATIONAL DEVELOPMENT PLAN

Client:

RPS MCOS
RPS-MCOS Ltd., Innishmore, Ballincollig, Co. Cork, Ireland.
T: +353 21 487 0200 - F: +353 1 487 3742
E: rpsmcos@rpsgroup.ie W: www.rpsmcos.ie

NOTES

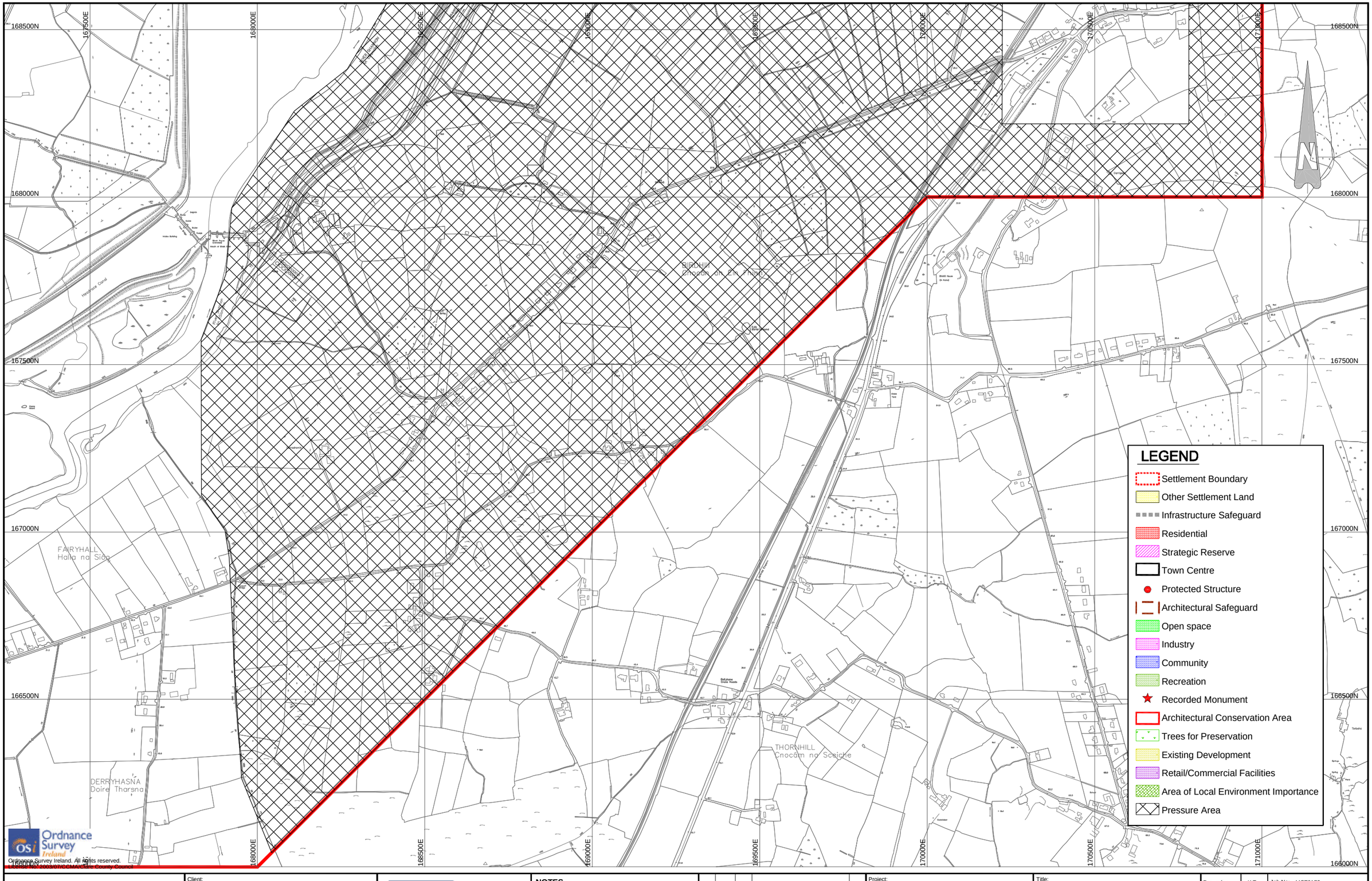
1. This drawing is the property of RPS-MCOS Ltd., it is a confidential document and must not be copied, used, or its content divulged without prior written consent.
2. All Levels refer to Ordnance Survey Datum, Malin Head.
3. DO NOT SCALE, use figured dimensions only, if in doubt ask.

No.	Date	Amendment / Issue	App.
A01	Apr.05	Issue for Approval	PF

Project: SHANNON BRIDGE CROSSING - FEASIBILITY STUDY AND PRELIMINARY REPORT

Title: LAND USE & ZONING (SHEET 1 OF 6) Fig. 5.16

Drawn by:	K.T.	Job No:	MCT0172
Checked by:	L.B.	File No:	MCT0172DG0007
Approved by:	P.F.	Drg. No:	DG-07
Scale:	1:10000	Rev:	A01
Date:	29/04/05		



NDP NATIONAL DEVELOPMENT PLAN

Client:

RPS mcos
RPS-MCOS Ltd., Innishmore, Ballincollig, Co. Cork, Ireland.
T: +353 21 487 0200 - F: +353 1 487 3742
E: rpsmcos@rpsgroup.ie W: www.rpsmcos.ie

NOTES

1. This drawing is the property of RPS-MCOS Ltd., it is a confidential document and must not be copied, used, or its content divulged without prior written consent.
2. All Levels refer to Ordnance Survey Datum, Malin Head.
3. DO NOT SCALE, use figured dimensions only, if in doubt ask.

No.	Date	By / Ch	Amendment / Issue	App.
A01	Apr.05	K.T. / L.B.	Issue for Approval	PF

Project:
SHANNON BRIDGE CROSSING
- FEASIBILITY STUDY AND PRELIMINARY REPORT

Title:
LAND USE & ZONING
(SHEET 2 OF 6)
Fig. 5.17

Drawn by:	K.T.	Job No:	MCT0172
Checked by:	L.B.	File No:	MCT0172DG0007
Approved by:	P.F.	Drg. No:	DG-08
Scale:	1:10000	Rev:	A01
Date:	29/04/05		

LEGEND

- Settlement Boundary
- Other Settlement Land
- Infrastructure Safeguard
- Residential
- Strategic Reserve
- Town Centre
- Protected Structure
- Architectural Safeguard
- Open space
- Industry
- Community
- Recreation
- Recorded Monument
- Architectural Conservation Area
- Trees for Preservation
- Existing Development
- Retail/Commercial Facilities
- Area of Local Environment Importance
- Pressure Area

Client:

RPS-MCOS Ltd., Innishmore, Ballincollig, Co. Cork, Ireland.
T: +353 21 487 0200 - F: +353 1 487 3742
E: rpsmcos@rpsgroup.ie W: www.rpsmcos.ie

NOTES

1. This drawing is the property of RPS-MCOS Ltd., it is a confidential document and must not be copied, used, or its content divulged without prior written consent.
2. All Levels refer to Ordnance Survey Datum, Malin Head.
3. DO NOT SCALE, use figured dimensions only, if in doubt ask.

No.	Date	By / Ch	Amendment / Issue	App.
A01	Apr.05	K.T. / L.B.	Issue for Approval	PF

Project:

SHANNON BRIDGE CROSSING
- FEASIBILITY STUDY AND PRELIMINARY REPORT

Title:

LAND USE & ZONING
(SHEET 3 OF 6)
Fig. 5.18

Drawn by:	K.T.	Job No:	MCT0172
Checked by:	L.B.	File No:	MCT0172DG0007
Approved by:	P.F.	Drg. No:	DG-09
Scale:	1:10000	Rev:	A01
Date:	29/04/05		

LEGEND

- Settlement Boundary
- Other Settlement Land
- Infrastructure Safeguard
- Residential
- Strategic Reserve
- Town Centre
- Protected Structure
- Architectural Safeguard
- Open space
- Industry
- Community
- Recreation
- Recorded Monument
- Architectural Conservation Area
- Trees for Preservation
- Existing Development
- Retail/Commercial Facilities
- Area of Local Environment Importance
- Pressure Area

NDP NATIONAL DEVELOPMENT PLAN

Client:

RPS-MCOS Ltd., Innishmore, Ballincollig, Co. Cork, Ireland.
T: +353 21 487 0200 - F: +353 1 487 3742
E: rpsmcos@rpsgroup.ie W: www.rpsmcos.ie

NOTES

1. This drawing is the property of RPS-MCOS Ltd., it is a confidential document and must not be copied, used, or its content divulged without prior written consent.
2. All Levels refer to Ordnance Survey Datum, Malin Head.
3. DO NOT SCALE, use figured dimensions only, if in doubt ask.

No.	Date	By / Chk	Amendment / Issue	App.
A01	Apr.05	K.T. / L.B.	Issue for Approval	PF

Project:

SHANNON BRIDGE CROSSING
- FEASIBILITY STUDY AND PRELIMINARY REPORT

Title:

LAND USE & ZONING
(SHEET 4 OF 6)
Fig. 5.19

Drawn by:	K.T.	Job No:	MCT0172
Checked by:	L.B.	File No:	MCT0172DG0007
Approved by:	P.F.	Drg. No: DG-10	Rev: A01
Scale:	1:10000		
Date:	29/04/05		

LEGEND

- Settlement Boundary
- Other Settlement Land
- Infrastructure Safeguard
- Residential
- Strategic Reserve
- Town Centre
- Protected Structure
- Architectural Safeguard
- Open space
- Industry
- Community
- Recreation
- Recorded Monument
- Architectural Conservation Area
- Trees for Preservation
- Existing Development
- Retail/Commercial Facilities
- Area of Local Environment Importance
- Pressure Area

SR1 R3 R2 C3 C9 C12 C8 REC2 C7 R5 R4 C13 T1

167500E 168000E 168500E 169000E 169500E 170000E 170500E 171000E

172500N 172000N 171500N 171000N 170500N

GARRA BANN LA FADDA BALLYCORNEY CREEVEROE KILLESTRY CLOONFADDA SHANTRAUD MOYS MOYS Maigh Shannon River ROOLAGH CARRYCASTLEEN Baile an Chaisleáin KINNAGLASDERRY Cinn Mhac Laistre

Killestry Bridge Bunyeleigh Bridge Waterford Barrowtie River River Shannon Clarisford Killaloe Wayo Lock

NDP NATIONAL DEVELOPMENT PLAN

Client:

RPS-MCOS Ltd., Innishmore, Ballincollig, Co. Cork, Ireland.
T: +353 21 487 0200 - F: +353 1 487 3742
E: rpsmcos@rpsgroup.ie W: www.rpsmcos.ie

NOTES

1. This drawing is the property of RPS-MCOS Ltd., it is a confidential document and must not be copied, used, or its content divulged without prior written consent.
2. All Levels refer to Ordnance Survey Datum, Malin Head.
3. DO NOT SCALE, use figured dimensions only, if in doubt ask.

No.	Date	Dr. / Ch.	Amendment / Issue	App.
A01	Apr.05	K.T. / L.B.	Issue for Approval	PF

Project: SHANNON BRIDGE CROSSING - FEASIBILITY STUDY AND PRELIMINARY REPORT

Title: LAND USE & ZONING (SHEET 5 OF 6) Fig. 5.20

Drawn by:	K.T.	Job No:	MCT0172
Checked by:	L.B.	File No:	MCT0172DG0007
Approved by:	P.F.	Drg. No:	DG-11
Scale:	1:10000	Rev:	A01
Date:	29/04/05		

LEGEND

- Settlement Boundary
- Other Settlement Land
- Infrastructure Safeguard
- Residential
- Strategic Reserve
- Town Centre
- Protected Structure
- Architectural Safeguard
- Open space
- Industry
- Community
- Recreation
- Recorded Monument
- Architectural Conservation Area
- Trees for Preservation
- Existing Development
- Retail/Commercial Facilities
- Area of Local Environment Importance
- Pressure Area

NDP NATIONAL DEVELOPMENT PLAN

Client:

RPS mcos
RPS-MCOS Ltd., Innishmore, Ballincollig, Co. Cork, Ireland.
T: +353 21 487 0200 - F: +353 1 487 3742
E: rpsmcos@rpsgroup.ie W: www.rpsmcos.ie

NOTES

1. This drawing is the property of RPS-MCOS Ltd., it is a confidential document and must not be copied, used, or its content divulged without prior written consent.
2. All Levels refer to Ordnance Survey Datum, Malin Head.
3. DO NOT SCALE, use figured dimensions only, if in doubt ask.

No.	Date	By / Ch	Amendment / Issue	App.
A01	Apr.05	K.T. / L.B.	Issue for Approval	PF

Project: SHANNON BRIDGE CROSSING - FEASIBILITY STUDY AND PRELIMINARY REPORT

Title: LAND USE & ZONING (SHEET 6 OF 6) Fig. 5.21

Drawn by:	K.T.	Job No:	MCT0172
Checked by:	L.B.	File No:	MCT0172DG0007
Approved by:	P.F.	Drg. No:	DG-12
Scale:	1:10000	Rev:	A01
Date:	29/04/05		

LEGEND

E.S.B.

- KV KV — 10 kV cable
- KV KV — 38 kV cable
- KV KV — 400 kV cable

GAS MAINS

- Gas Gas — 250mm P.E.
- Gas Gas — 900mm P.E.

TELECOMMUNICATIONS

- EIRCOM EIRCOM — Eircom cable
- EIRCOM EIRCOM — Optic Fibre

LOCAL AUTHORITY

- WATER WATER — Watermains
- Sewer

CLONBOY
Cluain Buí

O'BRIEN'S BRIDGE
Droichead Uí Bhriain

Inishlosky

FAIRYHALL
Halla na Sióg

MONTPELIER

DERRYHAGUE
Doire Tharnaí

Montpelier

168500N
168000N
167500N
167000N
166500N
166000N
165500E
166000E
166500E
167000E
167500E
168000E
168500E

NDP NATIONAL DEVELOPMENT PLAN

Client:

RPS mcos
RPS-MCOS Ltd., Innishmore, Ballincollig, Co. Cork, Ireland.
T: +353 21 487 0200 - F: +353 1 487 3742
E: rpsmcos@rpsgroup.ie W: www.rpsmcos.ie

NOTES

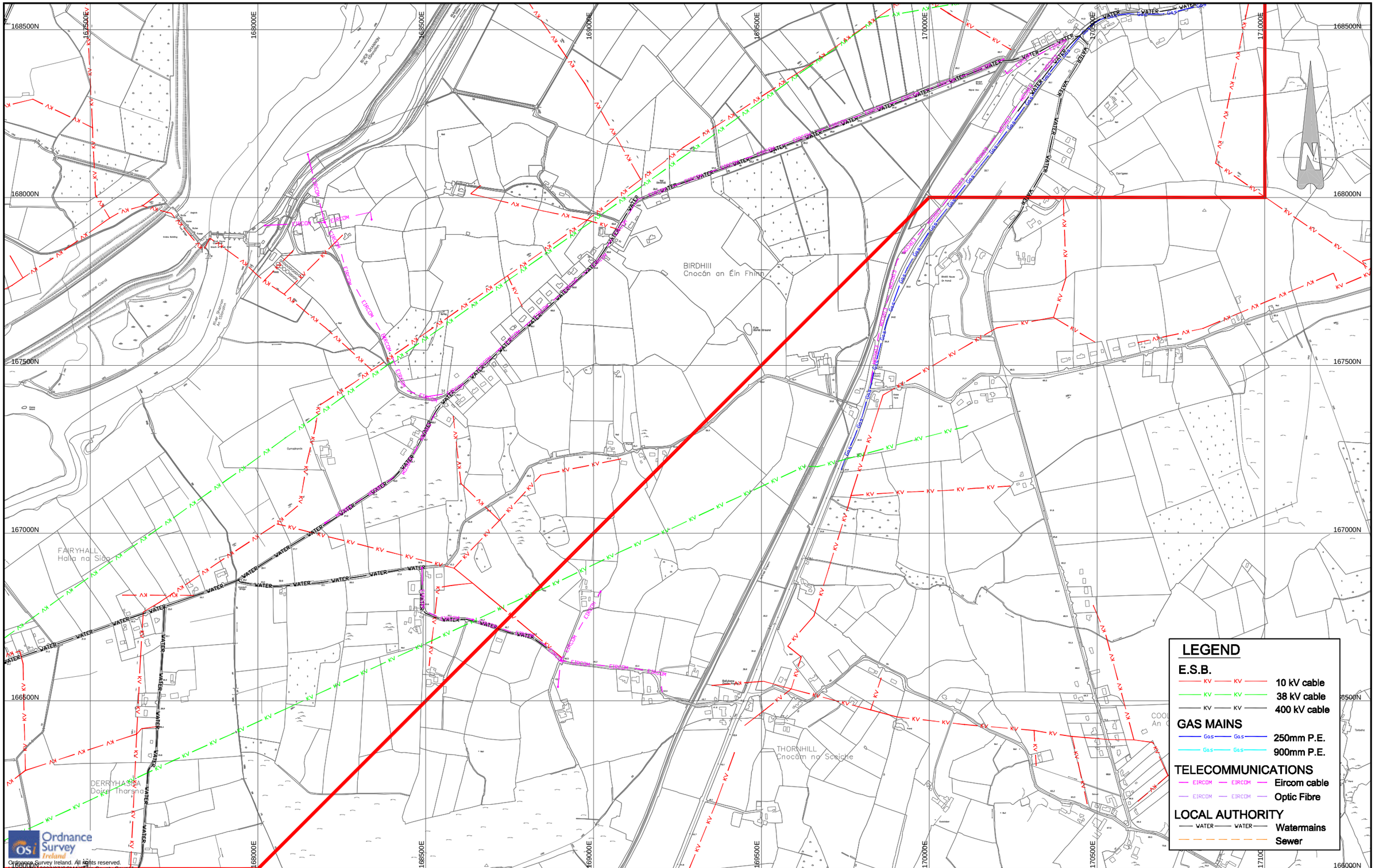
1. This drawing is the property of RPS-MCOS Ltd., it is a confidential document and must not be copied, used, or its content divulged without prior written consent.
2. All Levels refer to Ordnance Survey Datum, Malin Head.
3. DO NOT SCALE, use figured dimensions only, if in doubt ask.

No.	Date	Amendment / Issue	App.
A01	Apr.05	Issue for Approval	PF
D01	Apr.05	Draft Issue	PF

Project:
SHANNON BRIDGE CROSSING
- FEASIBILITY STUDY AND PRELIMINARY REPORT

Title:
UTILITIES
(SHEET 1 OF 6)
Fig. 5.22

Drawn by:	K.T.	Job No:	MCT0172
Checked by:	L.B.	File No:	MCT0172UT0001
Approved by:	P.F.	Drg. No:	UT-01
Scale:	1:10000	Rev:	A01
Date:	05/04/05		



NDP NATIONAL DEVELOPMENT PLAN

Client:

RPS MCOS
RPS-MCOS Ltd., Innishmore, Ballincollig, Co. Cork, Ireland.
T: +353 21 487 0200 - F: +353 1 487 3742
E: rpsmcos@rpsgroup.ie W: www.rpsmcos.ie

NOTES

1. This drawing is the property of RPS-MCOS Ltd., it is a confidential document and must not be copied, used, or its content divulged without prior written consent.
2. All Levels refer to Ordnance Survey Datum, Malin Head.
3. DO NOT SCALE, use figured dimensions only, if in doubt ask.

No.	Date	By / Ch	Amendment / Issue	App.
A01	Apr.05	K.T. / L.B.	Issue for Approval	P.F.
D01	Apr.05	K.T. / L.B.	Draft Issue	P.F.

Project:
SHANNON BRIDGE CROSSING
- FEASIBILITY STUDY AND PRELIMINARY REPORT

Title:
UTILITIES
(SHEET 2 OF 6)
Fig. 5.23

Drawn by:	K.T.	Job No:	MCT0172
Checked by:	L.B.	File No:	MCT0172UT0001
Approved by:	P.F.	Drg. No:	UT-02
Scale:	1:10000	Rev:	A01
Date:	05/04/05		

LEGEND

E.S.B.

- 10 kV cable
- 38 kV cable
- 400 kV cable

GAS MAINS

- 250mm P.E.
- 900mm P.E.

TELECOMMUNICATIONS

- Eircom cable
- Optic Fibre

LOCAL AUTHORITY

- Watermains
- Sewer

NDP NATIONAL DEVELOPMENT PLAN

Client:

RPS-MCOS Ltd., Innishmore, Ballincollig, Co. Cork, Ireland.
T: +353 21 487 0200 - F: +353 1 487 3742
E: rpsmcos@rpsgroup.ie W: www.rpsmcos.ie

NOTES

1. This drawing is the property of RPS-MCOS Ltd., it is a confidential document and must not be copied, used, or its content divulged without prior written consent.
2. All Levels refer to Ordnance Survey Datum, Malin Head.
3. DO NOT SCALE, use figured dimensions only, if in doubt ask.

No.	Date	By / Ch	Amendment / Issue	App.
A01	Apr.05	K.T. / L.B.	Issue for Approval	P.F.
D01	Apr.05	K.T. / L.B.	Draft Issue	P.F.

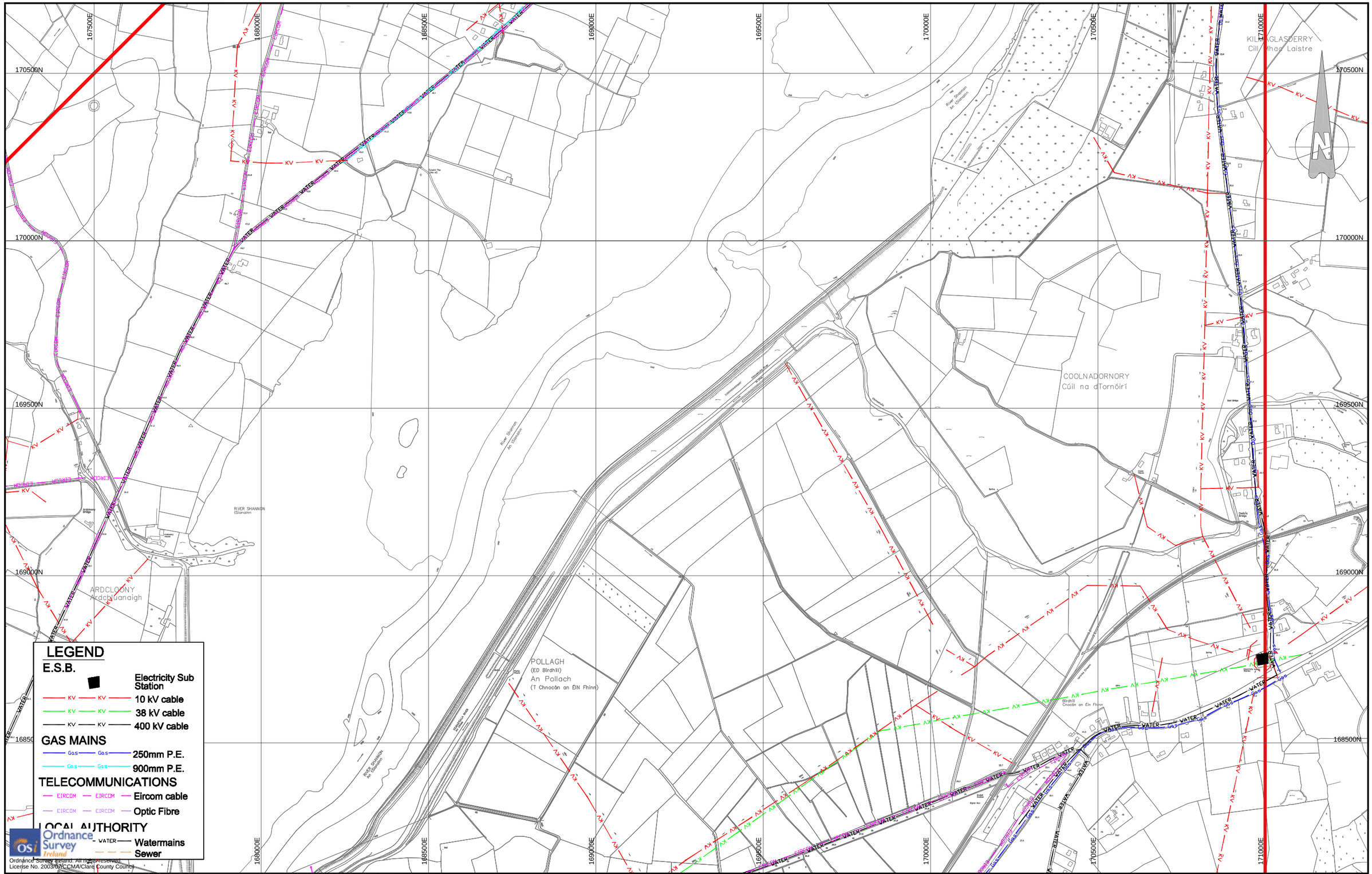
Project:

SHANNON BRIDGE CROSSING
- FEASIBILITY STUDY AND PRELIMINARY REPORT

Title:

UTILITIES
(SHEET 3 OF 6)
Fig. 5.24

Drawn by:	K.T.	Job No:	MCT0172
Checked by:	L.B.	File No:	MCT0172UT0001
Approved by:	P.F.	Drg. No:	UT-03
Scale:	1:10000	Rev:	A01
Date:	05/04/05		



NDP NATIONAL DEVELOPMENT PLAN

Client:

RPS MCOS
RPS-MCOS Ltd., Innishmore, Ballincollig, Co. Cork, Ireland.
T: +353 21 487 0200 - F: +353 1 487 3742
E: rpsmcos@rpsgroup.ie W: www.rpsmcos.ie

NOTES

1. This drawing is the property of RPS-MCOS Ltd., it is a confidential document and must not be copied, used, or its content divulged without prior written consent.
2. All Levels refer to Ordnance Survey Datum, Malin Head.
3. DO NOT SCALE, use figured dimensions only, if in doubt ask.

No.	Date	By / Ch	Amendment / Issue	App.
A01	Apr.05	K.T. / L.B.	Issue for Approval	P.F.
D01	Apr.05	K.T. / L.B.	Draft Issue	P.F.

Project:
SHANNON BRIDGE CROSSING
- FEASIBILITY STUDY AND PRELIMINARY REPORT

Title:
UTILITIES
(SHEET 4 OF 6)
Fig. 5.25

Drawn by:	K.T.	Job No:	MCT0172
Checked by:	L.B.	File No:	MCT0172UT0001
Approved by:	P.F.	Drg. No:	UT-04
Scale:	1:10000	Rev:	A01
Date:	05/04/05		

LEGEND

E.S.B.

- 10 kV cable
- 38 kV cable
- 400 kV cable

GAS MAINS

- 250mm P.E.
- 900mm P.E.

TELECOMMUNICATIONS

- Eircom cable
- Optic Fibre

LOCAL AUTHORITY

- Watermains
- Sewer

NDP NATIONAL DEVELOPMENT PLAN

Client:

RPS-MCOS Ltd., Innishmore, Ballincollig, Co. Cork, Ireland.
T: +353 21 487 0200 - F: +353 1 487 3742
E: rpsmcos@rpsgroup.ie W: www.rpsmcos.ie

NOTES

1. This drawing is the property of RPS-MCOS Ltd., it is a confidential document and must not be copied, used, or its content divulged without prior written consent.
2. All Levels refer to Ordnance Survey Datum, Malin Head.
3. DO NOT SCALE, use figured dimensions only, if in doubt ask.

No.	Date	By / Chk	Amendment / Issue	App.
A01	Apr.05	K.T. / L.B.	Issue for Approval	P.F.
D01	Apr.05	K.T. / L.B.	Draft Issue	P.F.

Project:

SHANNON BRIDGE CROSSING
- FEASIBILITY STUDY AND PRELIMINARY REPORT

Title:

UTILITIES
(SHEET 5 OF 6)
Fig. 5.26

Drawn by:	K.T.	Job No:	MCT0172
Checked by:	L.B.	File No:	MCT0172UT0001
Approved by:	P.F.	Drg. No:	UT-05
Scale:	1:10000	Rev:	A01
Date:	05/04/05		

LEGEND

E.S.B.

- 10 kV cable
- 38 kV cable
- 400 kV cable

GAS MAINS

- 250mm P.E.
- 900mm P.E.

TELECOMMUNICATIONS

- Eircom cable
- Optic Fibre

LOCAL AUTHORITY

- Watermains
- Sewer

RYNINCH LOWER
DRUMBANE
CULLENAGH
BALLINA
GARRAUNBOY
ROOLAGH
Killaloe
Ballina
Scanteach an Aiffrinn

NDP NATIONAL DEVELOPMENT PLAN

Client:

RPS mcos
RPS-MCOS Ltd., Innishmore, Ballincollig, Co. Cork, Ireland.
T: +353 21 487 0200 - F: +353 1 487 3742
E: rpsmcos@rpsgroup.ie W: www.rpsmcos.ie

NOTES

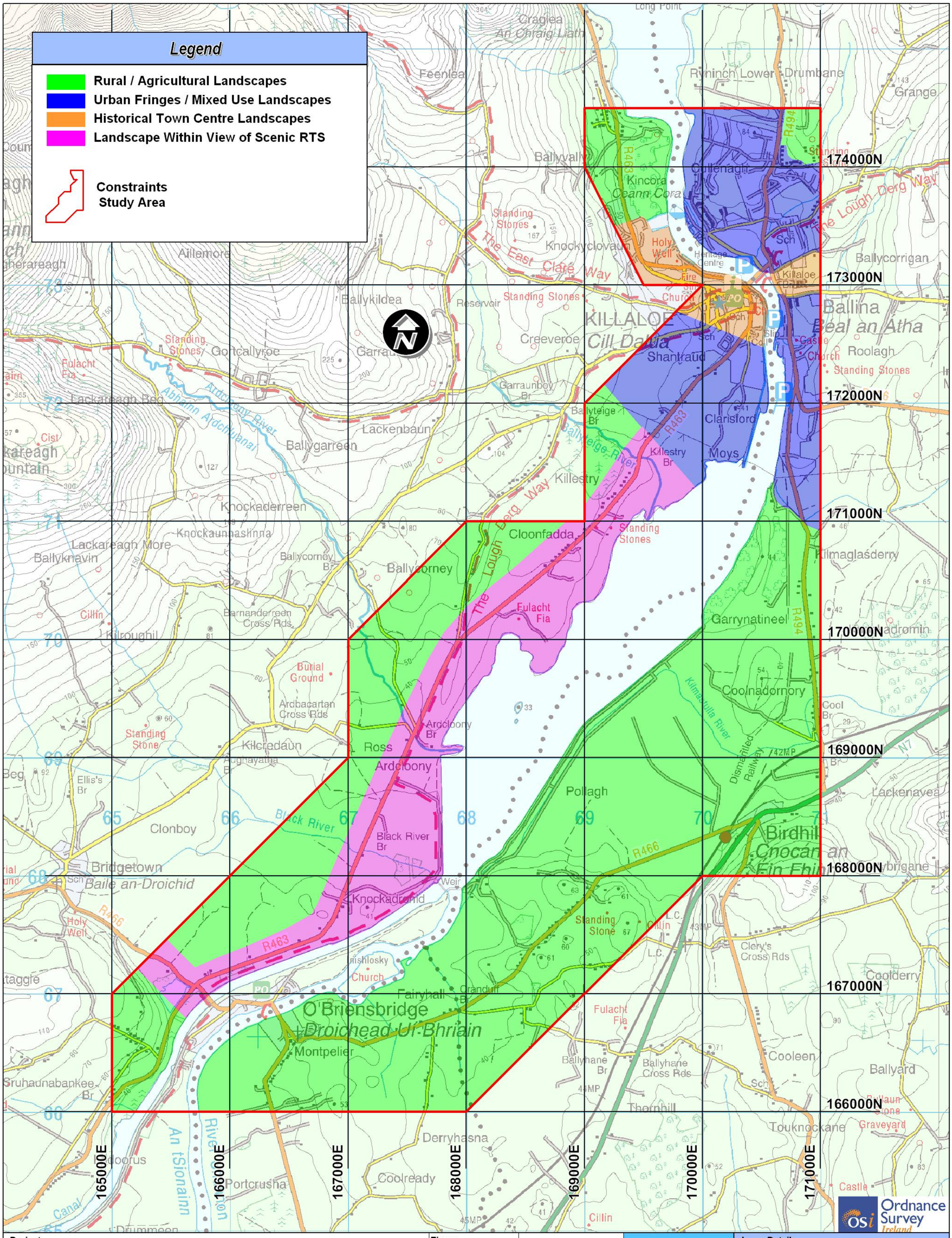
1. This drawing is the property of RPS-MCOS Ltd., it is a confidential document and must not be copied, used, or its content divulged without prior written consent.
2. All Levels refer to Ordnance Survey Datum, Malin Head.
3. DO NOT SCALE, use figured dimensions only, if in doubt ask.

No.	Date	By / Ch	Amendment / Issue	App.
A01	Apr.05	K.T. / L.B.	Issue for Approval	P.F.
D01	Apr.05	K.T. / L.B.	Draft Issue	P.F.

Project:
SHANNON BRIDGE CROSSING
- FEASIBILITY STUDY AND PRELIMINARY REPORT

Title:
UTILITIES
(SHEET 6 OF 6)
Fig. 5.27

Drawn by:	K.T.	Job No:	MCT0172
Checked by:	L.B.	File No:	MCT0172UT0001
Approved by:	P.F.	Drg. No:	UT-06
Scale:	1:10000	Rev:	A01
Date:	05/04/05		



Project	*Shannon Bridge Crossing-Feasibility Study & Prelim Report*	**Figure**	6.1
Title	**Landscape Areas**		

RPS MCOS
Innishmore
Ballincollig
Co. Cork
Phone: 021-4870200
Fax No. 021-4873742
rpsmcos@rpsgroup.ie
www.rpsgroup.ie

NDP NATIONAL DEVELOPMENT PLAN

Issue Details

Drawn:	T Hurley	**Project No.**	MCT0172
Checked:	K Barry	**File Ref.**	MCT0172MI0024A02
Approved:	P Fitzgerald		
Scale:	1:30,000 at A3	**Drawing No.**	MI0024
Date:	May 05	**Rev.**	A02

Notes
1. This drawing is the property of RPS-MCOS. It is a confidential document and must not be copied, used, or its contents divulged without prior written consent.
2. All levels are referred to Ordnance Datum, Malin Head.
3. NOT TO SCALE, use figured dimensions only, if in doubt ask.
4. Ordnance Survey Ireland Licence No. EN 0005005 Copyright Government of Ireland.

Slieve Bernagh Bog cSAC (site code 2312)

Lough Derg (Shannon) SPA (site code 4058)

Doon Lough pNHA (site code 0037)

Study Area

Lough Derg pNHA (site code 0011)

Gortakullin Bog pNHA (site code 2401)

Silvermines Mountains West cSAC (site code 2258)

Glenomra Wood cSAC / pNHA (site code 1013)

Keeper Hill cSAC / pNHA (site code 1197)

Lower River Shannon cSAC (site code 2165)

Bleanbeg Bog pNHA (site code 2450)

Lower River Shannon cSAC (site code 2165)

Knockalisheen Marsh pNHA (site code 2001)

Derrygareen Heath pNHA (site code 0931)

Clare Glen cSAC / pNHA (site code 0930)

Legend

- Natural Heritage Areas (NHAs)
- Special Areas for Conservation (SACs)
- Special Protection Areas (SPAs)
- Constraints Study Area

Project
Shannon Bridge Crossing- Feasibility Study & Prelim Report

Title

Designated Areas

Figure 6.2

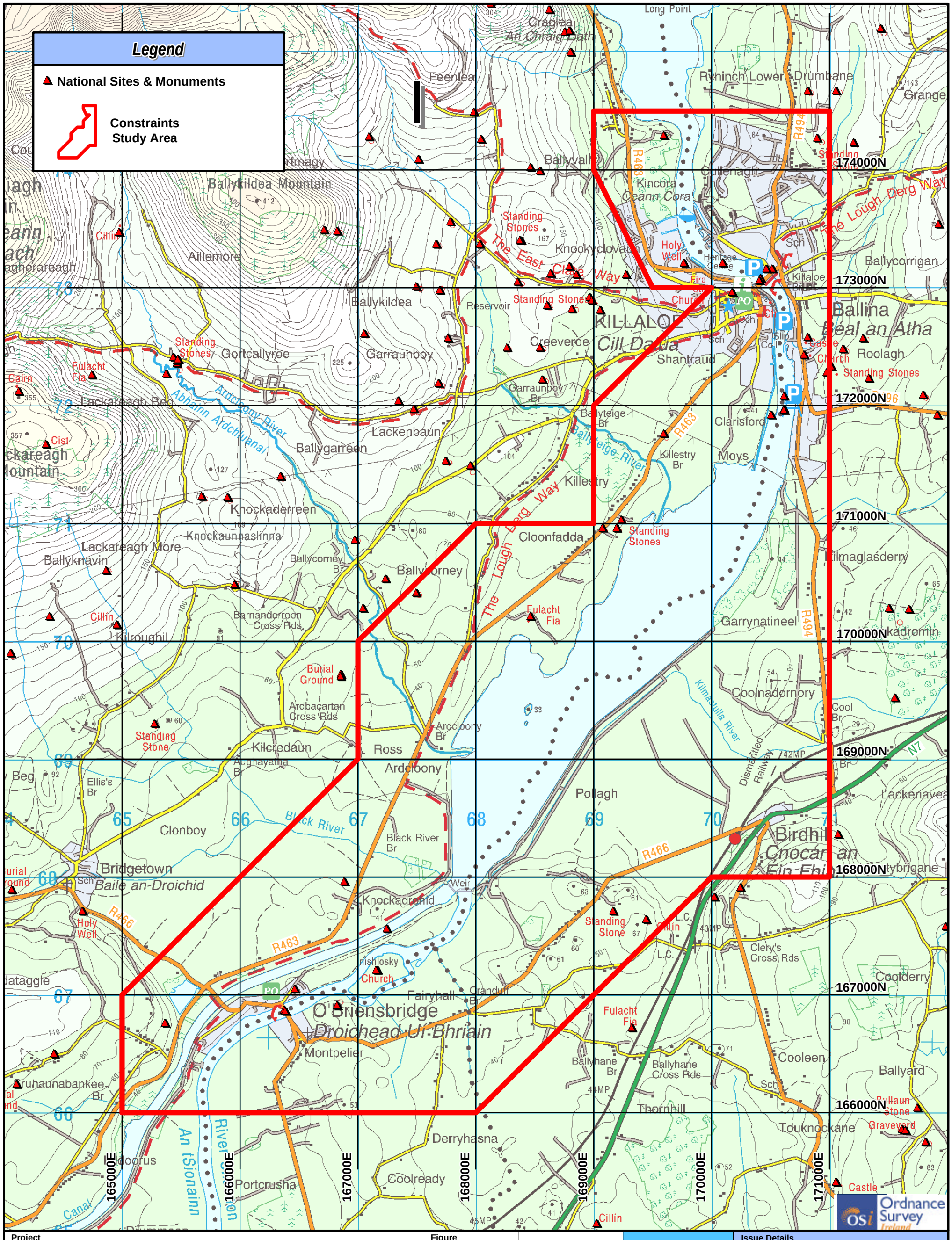
RPS MCOS
Innishmore
Ballincollig
Co. Cork
Phone: 021-4870200
Fax No. 021-4873742
rpsmcos@rpsgroup.ie
www.rpsgroup.ie

Issue Details

Drawn:	T Hurley/R Mundy	Project No.	MCT0172
Checked:	L Barry	File Ref.	
Approved:	P Fitzgerald	MCT0172MI0025A02	
Scale:	1:10,000 @ A3	Drawing No.	Rev.
Date:	May 05	0025	A02

Notes
1. This drawing is the property of RPS-MCOS. It is a confidential document and must not be copied, used, or its contents divulged without prior written consent.
2. All levels are referred to Ordnance Datum, Malin Head.
3. NOT TO SCALE, use figured dimensions only, if in doubt, ask.
4. Ordnance Survey Ireland Licence No. EN 0005005 Copyright Government of Ireland.

Ordnance Survey Ireland


Legend
National Sites & Monuments
Constraints Study Area
174000N
173000N
172000N
171000N
170000N
169000N
168000N
167000N
165000E
166000E
167000E
168000E
169000E
170000E
171000E
Long Point
Craglea
An Chraig Liath
Feenlea
Ryninch Lower
Drumbane
Grange
Ballykildea Mountain
Ballyvall
Kincora
Ceann Cora
Cullenagh
Standing Stones
The East Clare Way
Knockyclovaun
Holy Well
Heritage Centre
Fire Sta
Killaloe Bridge
Ballycorrigan
Ailemore
Ballykildea
Reservoir
KILLALOE
Cill Dalua
Creeveroe
Shantraud
Ballina
Béal an Átha
Roolagh
Standing Stones
Gortcallyroe
Garraunboy
Garraunboy Br
Fulacht Fia
Cairn
Lackareagh Beg
Abhainn Ardchluanai
Ardcloony River
Lackenbaun
Ballygarreen
Ballyteige Br
Ballyteige River
Killestry Br
Clarisford
Moys
Cist
Knockaderreen
Knockaunnaslinna
Lackareagh More
Ballyknavin
Ballycorney Br
Ballycorney
The Lough Derg Way
Cloonfadda
Standing Stones
Tilmaglasderry
Cillín
Kilroughil
Barnanderreen Cross Rds
Fulacht Fia
Garrynatineel
R494
Kadromin
Burial Ground
Ardbacartan Cross Rds
Coolnadornory
Kilmastulla River
Standing Stone
Kilcredaun
Ross
Ardcloony Br
Ardcloony
Aughayatha Br
Ellis's Br
Pollagh
Dismantled Railway
42MP
Lackenavea
Clonboy
Black River
Black River Br
Bridgetown
Baile an-Droichid
R466
R463
Holy Well
Knockadrehid
Weir
Standing Stone
L.C.
43MP
Clery's Cross Rds
Coolderry
Birdhill
Cnocán an Éin Ehi
Ilybrigane
Fairyhall
Cranduff Br
O'Briensbridge
Droichead Uí Bhriain
Montpelier
Fulacht Fia
Ballyhane Br
Ballyhane Cross Rds
Cooleen
Ballyard
Thornhill
44MP
Touknockane
Pullaun Stone Graveyard
Castle
Cruhaunabankee Br
Doorus
An tSionainn
River Shannon
Canal
Portcrusha
Derryhasna
Coolready
Cillín
45MP
Project: Shannon Bridge Crossing-Feasibility Study & Prelim Report
Figure: 6.3
Title: Archaeological Locations
Innishmore
Ballincollig
Co. Cork
Phone: 021-4870200
Fax No. 021-4873742
rpsmcos@rpsgroup.ie
www.rpsgroup.ie
NDP
NATIONAL DEVELOPMENT PLAN
Ordnance Survey Ireland
Issue Details
Drawn: T Hurley
Checked: K Barry
Approved: P Fitzgerald
Scale: 1:30,000 at A3
Date: March 05
Project No. MCT0172
File Ref. MCT0172MI0026A01
Drawing No. MI0026
Rev. A01
Notes
1. This drawing is the property of RPS-MCOS. It is a confidential document and must not be copied, used, or its contents divulged without prior written consent.
2. All levels are referred to Ordnance Datum, Malin Head.
3. NOT TO SCALE, use figured dimensions only, if in doubt ask.
4. Ordnance Survey Ireland Licence No. EN 0005005 Copyright Government of Ireland.

Legend

Bedrock Geology

- BA - Ballysteen Fm
- BAbn - Ballynash Member Ballysteen Fm
- BF - Broadford Fm
- cgSB - Slieve Bernagh Fm
- CR - Croane Fm
- gwBF - Greywacke
- HF - Hollyford Fm
- KH - Keeper Hill Fm
- LLS - Lower Limestone Shale
- ORS - Old Redsandstone
- V - Volcanics
- WA- Waulsortian

Constraints Study Area

Depth to Bedrock (mbgl)

Project	Shannon Bridge Crossing-Feasibility Study & Prelim Report	Figure	6.4
Title	Bedrock Geology		

RPS mcos
Innishmore
Ballincollig
Co. Cork
Phone: 021-4870200
Fax No. 021-4873742
rpsmcos@rpsgroup.ie
www.rpsgroup.ie

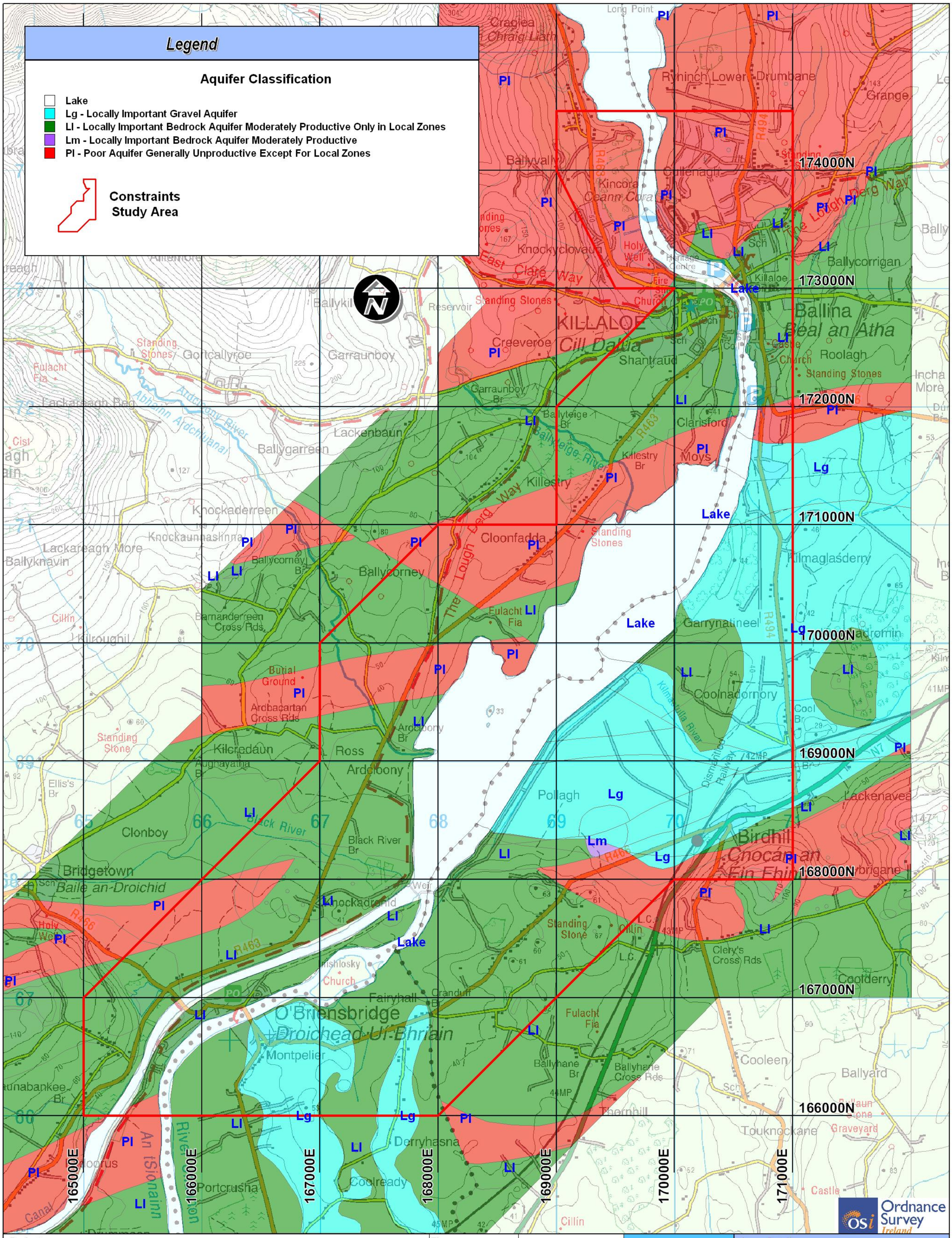
NDP NATIONAL DEVELOPMENT PLAN

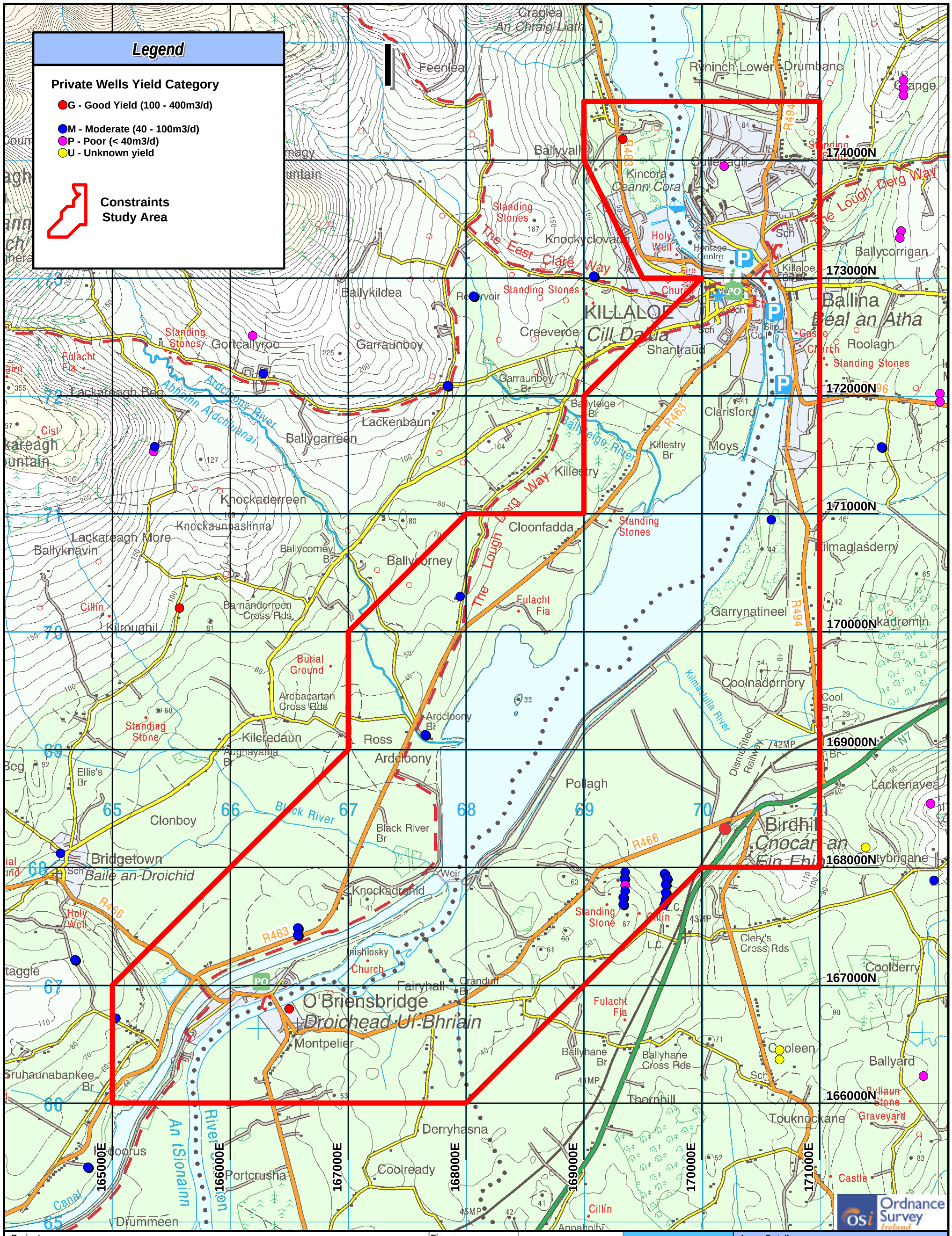
Issue Details

Drawn:	T Hurley	Project No.	MCT0172
Checked:	C Doyle	File Ref.	MCT0172MI0027A01
Approved:	P Fitzgerald		
Scale:	1:30,000 @ A3	Drawing No.	MI0027
Date:	April 05	Rev.	A01

Notes
1. This drawing is the property of RPS-MCOS. It is a confidential document and must not be copied, used, or its contents divulged without prior written consent.
2. All levels are referred to Ordnance Datum, Malin Head.
3. NOT TO SCALE, use figured dimensions only, if in doubt ask.
4. Ordnance Survey Ireland Licence No. EN 0005005 Copyright Government of Ireland.

Ordnance Survey Ireland


Legend
Aquifer Classification
Lake
Lg - Locally Important Gravel Aquifer
Ll - Locally Important Bedrock Aquifer Moderately Productive Only in Local Zones
Lm - Locally Important Bedrock Aquifer Moderately Productive
Pl - Poor Aquifer Generally Unproductive Except For Local Zones
Constraints
Study Area
174000N
173000N
172000N
171000N
170000N
169000N
168000N
167000N
166000N
165000E
166000E
167000E
168000E
169000E
170000E
171000E
KILLALOE
Cill Dalua
Ballina
Beal an Átha
Ballycorrigan
Killaloe
Lake
Roolagh
Standing Stones
Creeveroe
Shantraud
Garraunboy
Ballyvally
Knockyclovaun
Kincora
Ceann Cora
Cullenagh
Ryninch Lower
Drumbane
Grange
Long Point
Craglea
Chraig Liath
Ballykil
Reservoir
Gortcallyroe
Fulacht Fia
Lackareagh Beg
Ardcanny River
Abhainn Ardchuanai
Lackenbaun
Ballygarreen
Knockaderreen
Knockaunnaslinna
Lackareagh More
Ballyknavin
Ballycorney
Ballycorney Br
Barnanderreen Cross Rds
Kilroughil
Cillin
Ardbacartan Cross Rds
Kilcredaun
Ross
Ardcloony
Ardcloony Br
Garraunboy Br
Ballyteige Br
Ballyteige River
Killestry
Killestry Br
Cloonfadda
Standing Stones
Moys
Clarisford
Kilmaglasderry
Garrynatineel
Coolnadornory
Kilmacduilla River
Cool Br
Pollagh
Lackenavea
Birdhill
Cnocán an Fhia Fhiain
Clery's Cross Rds
Coolderry
Ballyhane Br
Ballyhane Cross Rds
Cooleen
Ballyard
Thornhill
Touknockane
Graveyard
Castle
Cillin
Derryhasna
Coolready
Portcrusha
Moorus
Canal
Clonboy
Black River
Black River Br
Bridgetown
Baile an-Droichid
Knockadrehid
Fairyhall
Grandiff Br
O'Briensbridge
Droichead Uí Bhriain
Montpelier
Ballyhane Br
Fulacht Fia
Irishlosky Church
Holy Well
Standing Stone
Ellis's Br
Aughayatha Br
Ardcloony Br
Lackenavea
Ballycorney Br
Barnanderreen Cross Rds
Ardbacartan Cross Rds
Kilcredaun
Aughayatha Br
Ellis's Br
Standing Stone
Cist
Fulacht Fia
Holy Well
Cillin
Graveyard
Castle
Standing Stones
Heritage Centre
Fire Stn
Church
Sch
PO
Bally
Incha More
Lackenavea
Kilmaglasderry
Garrynatineel
Coolnadornory
Cool Br
Ballyard
Cooleen
Coolderry
Clery's Cross Rds
Birdhill
Cnocán an Fhia Fhiain
Pollagh
Clarisford
Moys
Killestry
Killestry Br
Ballyteige Br
Ballyteige River
Garraunboy Br
Shantraud
Roolagh
Standing Stones
Ballycorrigan
Killaloe
Lake
Creeveroe
Cill Dalua
KILLALOE
Ballina
Beal an Átha
Grange
Ryninch Lower
Drumbane
Long Point
Craglea
Chraig Liath
Kincora
Ceann Cora
Cullenagh
Ballyvally
Knockyclovaun
Holy Well
Standing Stones
Reservoir
Ballykil


Legend
Private Wells Yield Category
G - Good Yield (100 - 400m3/d)
M - Moderate (40 - 100m3/d)
P - Poor (< 40m3/d)
U - Unknown yield
Constraints Study Area
174000N
173000N
172000N
171000N
170000N
169000N
168000N
167000N
166000N
165000E
166000E
167000E
168000E
169000E
170000E
171000E
KILLALOE
Cill Dalua
Ballina
Béal an Átha
Ballykildea
Garraunboy
Creeveroe
Shantraud
Roolagh
Ballycorrigan
Lackareagh Beg
Lackareagh More
Ballygarreen
Lackenbaun
Knockaderreen
Knockaunnaslinna
Ballyknavin
Cloonfadda
Ballycorney
Garrynatineel
Kilmaglasderry
Coolnadornory
Ross
Ardcloony
Pollagh
Clonboy
Bridgetown
Baile an-Droichid
Knockadrohid
Birdhill
Cnocán an Fhia Fhiú
Lackenavea
Cooleen
Ballyard
Touknockane
Derryhasna
Coolready
Portcrusha
O'Briensbridge
Droichead Uí Bhriain
Montpelier
Thornhill
Cillín
Moys
Killestry
Clarisford
Ryninch Lower
Drumbane
Kincora
Ceann Cora
Craglea
An Chraig Liath
Feenlea
Ballyvalley
Knockyclovagh
Standing Stones
Holy Well
Heritage Centre
Fulacht Fia
Cist
Gortcallyroe
Barnanderreen Cross Rds
Kilroughil
Ardbacartan Cross Rds
Burial Ground
Kilcredaun
Augharyatha Br
Ellis's Br
Black River Br
Ardcloony Br
Ballycorney Br
Garraunboy Br
Ballyteige Br
Killestry Br
Cool Br
Ballaun Stone
Graveyard
Castle
Church
Fairyhall
Crandluff
Mishlosky
Coorus
Drummeen
Abhainn Ardchuanail
Ardcloony River
Ballyteige River
Kilmaguilla River
Dismantled Railway
The Lough Derg Way
The East Clare Way
R463
R466
R494
N7
42MP
43MP
45MP
Project
Shannon Bridge Crossing-Feasibility Study & Prelim Report
Figure
6.6
Title
Locations of Private Wells
Innishmore
Ballincollig
Co. Cork
Phone: 021-4870200
Fax No. 021-4873742
rpsmcos@rpsgroup.ie
www.rpsgroup.ie
NDP
NATIONAL DEVELOPMENT PLAN
Issue Details
Drawn: T Hurley
Checked: K Barry
Approved: P Fitzgerald
Scale: 1:30,000 at A3
Date: April 05
Project No. MCT0172
File Ref. MCT0172MI0030A01
Drawing No. MI0030
Rev. A01
Notes
1. This drawing is the property of RPS-MCOS. It is a confidential document and must not be copied, used, or its contents divulged without prior written consent.
2. All levels are referred to Ordnance Datum, Malin Head.
3. NOT TO SCALE, use figured dimensions only, if in doubt ask.
4. Ordnance Survey Ireland Licence No. EN 0005005 Copyright Government of Ireland.
Ordnance Survey Ireland

Legend

Resource Protection Zones

- Lg/H Locally Important Gravel / High Vulnerability
- LI/E Locally Important Aquifer / Extreme Vulnerability
- LI/H Locally important Aquifer / High Vulnerability
- LI/L Locally Important Aquifer / Low Vulnerability
- LI/M Locally Important Aquifer / Moderate Vulnerability
- Lm/E Locally Important Aquifer / Extreme Vulnerability
- PI/E Poor Aquifer / Extreme Vulnerability
- PI/H Poor Aquifer / High Vulnerability
- PI/L Poor Aquifer Low Vulnerability
- PI/M Poor Aquifer Moderate Vulnerability

Constraints
Study Area

174000N
173000N
172000N
171000N
170000N
169000N
168000N
167000N
166000N
165000E
166000E
167000E
168000E
169000E
170000E
171000E

Project	*Shannon Bridge Crossing-Feasibility Study & Prelim Report*	**Figure**	6.7

Title

Groundwater Protection Zones

RPS mcos
Innishmore
Ballincollig
Co. Cork
Phone: 021-4870200
Fax No. 021-4873742
rpsmcos@rpsgroup.ie
www.rpsgroup.ie

NDP NATIONAL DEVELOPMENT PLAN

Issue Details

Drawn:	T Hurley	**Project No.**	MCT0172
Checked:	C Doyle	**File Ref.**	
Approved:	P Fitzgerald	MCT0172MI0029A01	
Scale:	1:30,000 at A3	**Drawing No.**	**Rev.**
Date:	April 05	MI0029	A01

Notes
1. This drawing is the property of RPS-MCOS. It is a confidential document and must not be copied, used, or its contents divulged without prior written consent.
2. All levels are referred to Ordnance Datum, Malin Head.
3. NOT TO SCALE, use figured dimensions only, if in doubt ask.
4. Ordnance Survey Ireland Licence No. EN 0005005 Copyright Government of Ireland.

Ordnance Survey Ireland