Connemara Greenway - Clifden to Oughterard

Environmental Impact **Statement**
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Connemara Greenway Project – Clifden to Oughterard

Environmental Impact Statement

Volume 1

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NON-TECHNICAL SUMMARY

INTRODUCTION

Chapter 1 of the EIS sets out the background to the EIS.

In May 2011 Galway County Council appointed RPS as environmental consultants for the Connemara Greenway Project from Clifden to Oughterard. The project will consist of developing a walking/cycle track (Greenway) along the dismantled Galway to Clifden railway line from Oughterard to Clifden. The purpose of the project is to provide all members of the local community and visitors alike with a safe and accessible way of using the dismantled railway line for walking and cycling. It is envisaged that this will also benefit the local economy.

The project is being developed by local community groups in Clifden, Recess and Oughterard with support from Fáilte Ireland, Galway County Council and Forum Connemara Ltd.

The Greenway will form part of the Bord Fáilte National Cycle Network. The National Cycle Network, as promoted in '*A Strategy for the Development of Irish Cycle Tourism*' (2007) sets out a plan of long-distance cycle routes across the country.

This EIS assesses potential environmental impacts associated with the proposed Connemara Greenway Project – Clifden to Oughterard project.

This Non-Technical Summary is divided into Chapters which correspond to the main Environmental Impact Statement (EIS) as follows:

Chapters 1 - 7: Summarises in non-technical language the following:

1. Introduction,
2. Environmental Impact Assessment (EIA),
3. Policy, Planning and Legislation,
4. Consultations,
5. Study area,
6. Project description, and
7. Need for the scheme and alternatives considered.

Chapter 8 - 16: Summarises in non-technical language the findings of the baseline assessments (existing environment) and impacts assessment of the proposed Greenway on the following elements of the environment:

8. Hydrology and drainage,

9. Soils, geology and hydrogeology,
10. Terrestrial and Aquatic ecology,
11. Air quality and climate,
12. Noise and vibration,
13. Archaeology, architectural and cultural heritage,
14. Landscape and visual environment,
15. Human beings and material assets, and
16. Traffic.

Chapter 17 - 19: Summarises in non-technical language the following:

17. Impact interactions and cumulative impacts,
18. Summary of mitigation measures, and
19. Conclusions.

ENVIRONMENTAL IMPACT ASSESSMENT

Chapter 2 of the EIS sets out the requirements, steps and environmental aspects of the EIS.

Environmental Impact Assessment (EIA) can be described as "*the process for anticipating the effects on the environment caused by a development. An Environmental Impact Statement (EIS) is the document produced as a result of that process"* (EPA, 2002)[1].

The purpose of producing an EIS for the Connemara Greenway Project - Clifden to Oughterard is to identify the potential environmental impacts of the proposed Greenway project and examine how these impacts can be avoided or reduced during the implementation and operation of the project.

This EIS is prepared having regard to all relevant EU Directives and National legislation.

The main purpose of the EIA process is to identify the likely significant impacts on the human environment, the natural environment and on cultural heritage associated with the proposed Greenway project and to determine how to eliminate or minimise such impacts. The EIS summarises the environmental information collected during the impact assessment.

Several interacting steps typify the early stages of the EIA process and include:

[1] *Guidelines on the Information to be Contained in Environmental Impact Statements, EPA, 2002*

- Screening,
- Scoping and Consultation,
- Assessing Alternatives, and
- Assessing and Evaluating.

Environmental aspects considered include:

- Hydrology and drainage,
- Soils, geology and hydrogeology,
- Terrestrial ecology,
- Aquatic ecology and water quality,
- Air quality and climate,
- Noise and vibration,
- Archaeology, architectural and cultural heritage,
- Landscape and visual environment,
- Human beings and material assets,
- Traffic, and
- Interaction of the foregoing.

This EIS has been prepared by RPS on behalf of Galway CountY Council. Input was also obtained from Aardwolf Wildlife Surveys and Irish Archaeological Consultancy Services Ltd.

POLICY, PLANNING AND LEGISLATION

Chapter 3 of the EIS sets out current EU, national, regional and where relevant, local policy and legislation relating to this Greenway construction and its place within the planning and development system. The purpose of this Chapter is to consider the Connemara Greenway Project - Clifden to Oughterard in the context of this policy and legislation.

The primary EU legislation include the **Water Framework Directive (2000/60/EC)** which aims to protect surface and groundwater, the **Habitats Directive (92/43/EEC)** which aims to maintain/conserve habitats and species of community interest within the study area and the **Birds**

Directive (2009/147/EC) which aims to maintain/conserve wild bird species occurring in the study area.

At a national level planning legislation which applies to the project is the **European Communities Planning and Development Regulations 2001 (SI 600 of 2001)**, as amended. The project must undergo Environmental Impact Assessment in accordance with Article 120 of these regulations – Sub-Threshold Developments.

A number of national level legislation applies to the terrestrial and aquatic ecology aspects of the project. These include the **European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477/2011)**, which enforces the requirement to undergo screening for Appropriate Assessment for plans or projects in order to satisfy Articles 6(3) and 6(4) of the Directive, the **Wildlife Act 1976 (as amended)**, under which certain species are afforded statutory protection and as such there is a requirement that any proposed development assesses the likelihood of impacting such species. Under **The Fisheries (Amendment) Act 1999** and **The Fisheries (Consolidation) Act 1959 (as amended)** all works during development and operation of the project must aim to conserve fish and other species of fauna and flora habitat; biodiversity of inland fisheries and ecosystems and protect spawning salmon and trout.

There are a number of pieces of national legislation which aim to protect archaeological heritage and which will be applicable during the construction of the proposed Greenway. These include **The National Monuments Acts 1930-2004**, **The Heritage Act 1995**, **The Architectural Heritage (National Inventory) and The Historic Monuments (Miscellaneous Provisions) Act, 1999.** Under this legislation all works during development and operation of the project must aim to ensure the satisfactory protection of archaeological remains, which are held to include all man-made structures and to protect and where possible preserve architectural heritage which "includes railways and related buildings and structures and any place comprising the remains or traces of any such railway, building or structure".

On a regional and local level the **Regional Planning Guidelines for the West 2012-2022** apply. The project should comply with Policy IP23 of these guidelines: "Pedestrian and cycling routes must be designed to minimise impact on habitats and species and should not adversely impact on the conservation objectives or site integrity of SAC, SPA or other ecologically sensitive sites". From the **Galway County Development Plan, 2009-2015**, the project should comply with **Policy ED20**: "Positively support and promote sustainable Tourism Infrastructure development related to the enhancement of the County's tourism profile, ...ensure that all such developments are built to a high environmental standard to protect the County's most significant tourism asset – its natural environment and landscape"; and **Policy HL95**: "Preserve the status of traditionally open/unfenced landscape. The merits of each case will be considered in light of landscape Sensitivity Ratings and views of amenity importance".

The project should also comply with the environmental objectives of the **Western River Basin Management Plan, 2009-2015** which are to be achieved generally by 2015, namely: to prevent deterioration; to restore good status; to reduce chemical pollution: and to achieve water related protected areas objectives.

Where the project is within the Clifden area it should comply with Policy 3.12.8 of the **Clifden Local Area Plan 2009-2015**: "Co-operate with Fáilte Ireland West and the local community and other stakeholders in the development of sustainable tourism products". Where the project is within the Oughterard area it should comply with Policy 3.12.3 of the **Oughterard Local Area Plan 2003-2009**: "Co-operate with Ireland West Tourism, the local community and other stakeholders in the development of sustainable tourism products".

CONSULTATION

Chapter 4 of the EIS outlines consultations carried out during the EIA process for the Connemara Greenway Project - Clifden to Oughterard with the purpose of identifying the key issues of concern to the stakeholders, both statutory and non-statutory. The early involvement of stakeholders has helped to ensure that the views of various groups or individuals were taken into consideration from the constraints stage through choosing preferred Greenway route and in the preparation of this EIS. Consultation was carried out through written communication with statutory and non-statutory stakeholders in August 2011. An additional meeting and email and phone consultations were held with the National Parks and Wildlife Service (NPWS) to illicit views on the overall project and scope of the EIS.

STUDY AREA

Chapter 5 of the EIS sets out key characteristics of the Connemara Greenway Project - Clifden to Oughterard study area.

The Connemara Greenway Project – Clifden to Oughterard proposes to develop the dismantled Galway to Clifden railway line into a walking/cycling track (Greenway) between Oughterard and Clifden, a distance of 52.4km. The Galway to Clifden railway line ceased operations in 1935 and was subsequently dismantled. The remnants of the railway line between Oughterard and Clifden are the focus of this project. There is a well defined corridor for much of the length of the dismantled railway line, with some of the original rail bridges still intact. At a number of locations along its corridor, the dismantled railway line merges and crosses over existing local roads and the main Galway to Clifden road (N59).

The landscape across which the dismantled railway corridor crosses, varies along its length with extensive areas of bog, scrub, forestry, bog woodland, mountains, rivers, numerous small and some large lakes, improved grassland and farmland being encountered.

The study area contains several environmental designations (Natura 2000 Sites) and as a result an Appropriate Assessment is required to be completed in order to comply with the Habitats Directives (92/43/EEC). The route runs through or lies adjacent to: four candidate Special Areas of Conservation (cSAC), including the Twelve Bens/ Garraun Complex, Maumturk Mountains, Connemara Bog Complex cSAC and Lough Corrib cSAC; and two Special Protection Areas (SPAs) Lough Corrib SPA and Connemara Bog Complex SPA. The study area is shown in **Figure 1.1**.

Land use along the route of the proposed Greenway is confined to dispersed pockets of agricultural land and forestry within the expanse of peat bog-lands that contains an abundance of small lakes. This rugged landscape, consisting of rock outcrops and bogs, extends westwards from Oughterard to Clifden and beyond.

In the Galway County Development Plan 2009 – 2015 (GCDP 2009-2015) the Landscape Sensitivity between Oughterard and Clifden is rated from Class 3 (High) to Class 5 (Unique), predominately the latter.

Population growth at national and regional levels, as measured during the 2006 Census, had been faster than envisaged in either the National Spatial Strategy or the West Regional Authority Regional Planning Guidelines 2004 – 2016 with Oughterard and Clifden seeing substantial population growth in the inter-census period 2002-2006 of 7.9% and 10.5% respectively. The recent 2011 Census has shown a slow down in population growth in the inter-census period 2007-2011 to 1.6% in Oughterard however Clifden has shown a 23.2% increase (CSO, 2012). Outside of town environs a typically rural

settlement pattern is evident with relatively sparse development on the local road network and a greater, though still low development density, along the existing N59.

The principal study area for the proposed Greenway project is the dismantled Galway to Clifden railway line and immediate surrounding areas extending, approximately, from Clifden to Oughterard.

PROJECT DESCRIPTION

Chapter 6 of the EIS sets out the details of the Connemara Greenway Project - Clifden to Oughterard.

It is proposed to upgrade the existing disused railway corridor between Clifden and Oughterard to accommodate walkers and cyclists along its length. This will require the upgrading of the surface to provide safe and secure walking and cycling, appropriate fencing and access points, and upgrading of water crossings and bridges as deemed necessary.

Between Recess and Maam Cross the proposed Greenway will run adjacent to the existing N59. The N59 on-line section of the Greenway is approximately 11.47km in length.

This proposed Greenway development is a community driven project by local community groups in Clifden, Recess and Oughterard with support from Fáilte Ireland, Galway County Council and Forum Connemara Ltd. It is hoped that this development would benefit local communities by providing a secure and safe environment for walkers, and cyclists leading to an increased opportunity for physical exercise. It would also provide a unique and novel experience for visitors to the area.

The proposed Greenway base will consist of 150mm of crushed stone which will be rolled and compacted. The final surface will consist of an asphalt surface which shall conform to European standards.

Fencing will be provided both sides of the proposed Greenway where it is required by landowners. Cattle stops will be used where livestock need to be moved across the Greenway in order to enable farmers to move livestock in a safe manner both for the stock and for Greenway users.

It will be necessary to construct seven new timber or steel bridges as those currently in place are dilapidated and in need of replacement. These will be located at Cloonbeg River Bridge, Cloonbeg River Bridge, Bunscanniff Bridge, Letterfore River Bridge, Glengowla River Bridge, Leadmines Bridge and Oughterard River Bridge. The replacement bridges will range in span from 6m to 15m.

Where the proposed Greenway crosses a roadway it is proposed that combined cyclist and pedestrian crossings be installed. These combined crossings will be uncontrolled and road traffic will have priority. A variety of uncontrolled crossings will allow cyclists and pedestrians to stop and cross the main traffic safely. These include solutions that passively reduce traffic speeds and/or address the crossing as a two-stage process. It is proposed that cyclists and pedestrians must wait for a suitable gap in the traffic before crossing. The volume and speed of traffic on the main road will influence the choice of these solutions. Heavier traffic and higher speeds will generally require controlled crossings.

Signage, information boards and mapping will be required for:

- Identifying the start of the trail,
- Directions to off-trail facilities such as toilets, huts or car parks,

- Directions when the trail changes direction or changes terrain sharply (e.g. cross-country trail joins road for short distance and then resumes),
- Road crossings,
- Warning and cautions about the trail or features (e.g. slip prone area; narrow, winding trail; single file track or structure),
- Occasional route markers (especially in remote areas) to advise riders that they are still on the trail,
- Town names and features/facilities within the towns (cafes, toilets etc), and
- Advance information signage (such as “next toilet – 11 km”).

Information Board

Basic information about trails must be available on an information board at the trail head and on longer trails, at popular access points along the trail. Information should include:

- A map showing a clearly defined route with a start and finish point and a ‘you are here’ pointer.
- Information on the trail grading (difficulty rating) including a definition of the grades.
- The length of the trail from the start to finish, the total ascent in meters and the estimated time to complete the trail for the average user.
- Details of waymarking used on the trail.
- Where a trail traverses open/ exposed terrain a warning about the risks involved should there be a change of weather.
- A contact email for users to provide feedback and/or report incidents or issues on the trail.
- Contact details for the nearest emergency services.
- Information on whether dogs are permitted on the trail.
- The “Leave No Trace” principles.

It is proposed that works will be carried out over a period of 24 months. Construction of the proposed Greenway will be linear i.e. construction will start at the Clifden end of the project and proceed progressively along the disused rail eastwards finishing at a point close to Oughterard.

It is proposed to carry out the work using two teams working in tandem and the machinery will comprise 360 degree track machines, dumpers, vibrating rollers, cranes, road graders and road pavers.

The majority of the proposed Greenway will be located on the existing disused railway line between Clifden and Oughterard. There will also be ground disturbances, such as topsoil removal carried out in areas that are undisturbed (alternate routes in the townlands of Gowlan West, Garroman, Lurgan and Glengowla West). It is proposed that the existing topsoil and scrub will be removed from the railway line in preparation for the laying down of the proposed Greenway route surface materials. Any material which will be removed during site preparation will be sidecast within the confines of the proposed Greenway corridor and used to form embankments along the path. It is anticipated that a maximum of 127,500m³ of overburden (predominantly topsoil) will be removed from the proposed route in preparation for the laying of the proposed Greenway track surface. It is not envisaged that rock breaking will be required.

Construction materials and machinery will be stored at one of seven compounds located along the route. These site compounds will also serve as access points to the route. As the construction of the proposed Greenway is a linear project there will be no need for new access areas. It is envisaged that there will be seven site compounds which include short term staff welfare facilities and plant and materials storage for the proposed works.

Operation of the Proposed Greenway

It is expected that the proposed Greenway will cater for approximately 160,000 cyclists and walkers per annum.

There will be ongoing maintenance of the proposed Greenway after the initial track clearing, formation and development. The following maintenance activities will be required as part of the Greenway upkeep:

- It will be necessary to carry out annual weed spraying of the Greenway surface and preventative measures to ensure the eradication of noxious and nuisance weeds. Details on the control of noxious weeds and non-native invasive species are dealt with in detail in Chapter 10.

- After storm conditions, there will be a need to make storm repairs to both the Greenway surface and the clearing of any debris left on the track from broken tree branches or fallen trees. Track wash outs, surface damage, etc. will require repair or redressing to provide a suitable surface again.

- Fences, gates, cattle stops and signage will also require maintenance effort with age, weather, stock, vehicle and vandalism damage.

As part of Fáilte Ireland's 'Leave no trace' initiative it is intended that there will be no litter bins provided along the Greenway. It is also intended that there will only be seating furniture along the route as the provision of picnic tables is seen to encourage litter issues. There will however, be welfare facilities provided every 10km along the route, in particular at the following locations:

- Oughterard - Maam Cross (Facilities at each location),

- Maam Cross – Recess (Facilities in Maam Cross and Recess),

- Recess - Ballynahinch (Facilities at Ballynahinch), and

- Ballynahinch – Clifden (Facilities at each location).

ALTERNATIVES AND SITE JUSTIFICATION

Chapter 7 of the EIS sets out need for the project and the alternatives to the project considered.

The proposed Greenway was deemed necessary in order to benefit local communities by providing a secure and safe environment for walkers and cyclists, leading to an increased opportunity for physical exercise. It was also envisaged that the proposed Greenway would provide a unique and novel experience for visitors to the area.

As part of **Fáilte Ireland's West Tourism Development Plan 2008-2010** the relevant planned action included as part of their first strategic goal is to develop the region as Ireland's primary outdoor and adventure destination while focusing on environmental sustainability. A specific key action included in this plan which specifies the need for the proposed Greenway is to 'Support the feasibility of re-opening the Galway-Clifden railway line as a Greenway for walking and cycling'. Within this plan the environment is considered core to Ireland's tourism with 80% of visitors rating Ireland's scenery as an important reason for visiting Ireland and 74% attracted by the natural unspoilt environment.

The provision of the proposed Greenway will serve as an important amenity in providing traffic-free safe access to the west of Ireland's natural unspoiled environment. Given its location in a highly scenic, lake-rich, mountainous area it is likely the Greenway will provide local, domestic and overseas visitors with good access to this scenic landscape, which is an important reason for people visiting the area.

Further need for additional cycling routes in Ireland is identified in the Fáilte Ireland document **A Strategy for the Development of Irish Cycle Tourism.** Within this strategy document a recent decline in the number of overseas cycling tourists has been recognised. As part of a wider cycling tourism strategy the development of a number of Greenway routes throughout the country is seen as an important part in increasing cycling tourism in the country.

Other government priorities can also be addressed through the promotion of cycling by the provision of Greenway routes. These include: sustainable transport; improved mental and physical health of the population; improved quality of life in urban and town environments; regional and small local economic development.

Further benefits of cycling tourism as outlined in the aforementioned Fáilte Ireland document include: cycle tourists represent a growing and valuable market segment, particularly for rural areas. Cycle tourists will spend at least as much as other visitors in a rural area; cycle tourism is good at generating local trade and offers particular opportunities for rural businesses and services.

Spending by cycle tourists helps to support rural pubs, village shops, small-scale rural attractions and rurally based providers of accommodation; it offers opportunities for the development of cycle hire and cycling holiday operations in rural areas; as cycle tourists will use local businesses there is a greater likelihood that the money they spend will stay in the local economy; cycle tourism is an environmentally sustainable form of tourism with minimal impact on the environment and host communities. This is increasingly important as we aim to reduce CO_2 emissions and reduce global warming; it makes good use of existing, often under-utilised resources for example country lanes and by–roads; it can provide an alternative use for redundant or derelict resources, for example disused railway lines; cycle tourism can provide new incentives for people to visit an area and can help to attract new types of visitor; cycling can provide an added attraction and activity as part of a multiactivity holiday for visitors, which will help to extend length of stay and encourage repeat visits; encouraging cycle tourism can help to encourage utility cycling as people may rediscover cycling while on holiday and may then be encouraged to cycle more frequently for other purposes; cycle tourism enhances personal health, fitness and well-being.

Alternatives must be considered as part of the EIA process in accordance with the Planning and Development Regulations 2001 (SI 600), Schedule 6 (1) (d) which states that the following needs to be considered: “An outline of the main alternatives studied by the developer and indication of the main reasons for his or her choice, taking into account the effects on the environment”.

Furthermore the EPA Publication “Advice Notes on Current Practice (in the preparation of Environmental Impact Statements)” suggests that when assessing alternatives they should be described where relevant in three main ways: alternative locations, designs and processes.

The alternatives considered as part of this project include the ‘do-nothing’ scenario and a number of alternative routes.

Do-nothing: If the proposed Greenway is not constructed any additional economic benefit which might be derived from the project will not be realised. Fáilte Ireland’s target of re-opening the Galway-Clifden line as a Greenway for walking and cycling will not be realised.

Alternative Routes: The entire length of the disused Oughterard-Clifden railway line has been the primary route under consideration for the location of the proposed Greenway. In certain locations however it has been necessary to provide an alternative path. Alternative site locations will be required where the route deviates from the existing roads and railway (alternate routes in the townlands of Gowlan West, Garroman, Lurgan and Glengowla West).

HYDROLOGY AND DRAINAGE

Chapter 8 of the EIS assess the potential impacts of the proposed development on the existing hydrological and drainage environment in the study area. The assessment was based on a desk study of available information and site visits carried out within the study area in 2011. The following three hydrological attributes are considered to be affected by the proposed development:

- Flood Hydrology,
- Drainage, and
- Low Flows.

The proposed Greenway passes through six principal river catchments, namely the Owenglin, the Derryehorraun, the Owenmore, the Screebe, the Owenree and the Owenriff and falls within the Western River Basin District. The proposed Greenway crosses 45 no. surface waterbodies from small drains to reasonably large rivers and lakes. These existing watercrossing structures will be largely retained, with some modifications and some replacements.

Along the entire scheme the watercourses generally rise to the north of the proposed Greenway flowing southwards with a few exceptions (including the causeway crossings of lakes, crossing of lake outlets and a small number of crossings that rise to the south of the proposed Greenway). The watercourses, in general, rise in steep upland / mountainous areas which drain the adjacent valley floor bog lands. Smaller streams are generally flashy i.e. respond quickly to rainfall, while large streams and rivers as slower to respond generally draining from the lake system.

Hundreds of lakes have been identified within the six river catchments associated with the proposed development. Of these 25 no. lakes / ponds are located immediately adjacent (upstream and downstream) of the proposed Greenway alignment.

There are no filling works proposed within river floodplains. Therefore, no impact is foreseen on river floodplains as a result of the proposed development.

Significant sections of the proposed Greenway alignment are located at the base of steep mountain slopes, including Lettershea, Emlaghdauroe, and Derryerglinna and would be potentially prone to temporary pluvial flooding from sheet flow directly from the hillside.

Potential impacts during the construction and operational phases were identified. During the construction phase of the works, the potential causes of flooding could include:

- Increase in surface runoff as a result of the increased impermeable areas within the site, ,
- Flooding of adjacent lands caused by blockage to the surface runoff flow-path due to collapsing of unstable temporary on-site stockpiles during construction, and
- Flooding caused by the blockage of downstream river/stream channels from exported silts or sediment transported by flash flooding as a result of intense localised rainfall events.

The existing land drainage system located in the study area is likely to be affected slightly during the construction period of the works. Potential impacts on the existing drainage systems might include the following;

- The pattern of surface runoff could change with some existing drains and ditches receiving significantly more or less flow than they currently receive,
- Rainfall on elevated areas could wash peat and silt into the surrounding watercourses. Localised erosion and scouring could occur while reduced flow may result in stagnation in some drains and ditches, and
- Obstruction of upland flow paths could cause localised water logging upstream of the site works.

During the operational phase of the works, the potential causes of flooding could include:

- Increases in flood flows in the downstream watercourses caused by increased impermeable areas (roads and hardstanding areas), and
- Any inadequately sized culverts crossings could cause water logging or flooding upstream.
- Changes in surface water flow paths over the existing conditions on site may result from the presence of elevated paths and hardstanding areas. This could have an effect on the existing hydrological regime of the adjacent natural surface watercourses.
- Some degree of changes in infiltration of surface runoff (groundwater recharge) will occur due to the increased hardstanding areas and also from any reduction in soil permeability during the construction period. This has the potential to reduce the stream baseflow (dry weather flow) on the site.

It is predicted that impacts on the existing hydrological environment will be minimised as a result of appropriate mitigation measures proposed. These mitigation measures include:

- Existing surface water flow paths will be maintained by maintaining culvert crossings under the Greenway ditch crossing.
- Runoff from the site will be drained through existing drains. These drains will discharge to the adjacent natural watercourses. This will reduce the likelihood of water logging on site.
- The existing interceptor ditches will also provide attenuation for any increased surface runoff resulting from the proposed development.
- Filter drains along the perimeter of the Greenway should be provided to increase the groundwater recharge thus maintaining the existing baseflow into the adjacent stream/river channels.

SOILS, GEOLOGY AND HYDROGEOLOGY

Chapter 9 of the EIS sets out the soils, geology and hydrogeology aspects in relation to the EIA of the project.

The subsoils in the study area of the proposed Greenway are predominantly thin blanket peat deposits with much of the dismantled rail line itself classified as made ground.

The proposed Greenway will be completed in a variable bedrock environment which constitutes a poor aquifer. The main rock types encountered along the route are Precambrian Marbles and Precambrian Quartzite's, Gneisses and Schist's. Late-Silurian, Mid-Devonian Granites are also present along the route. The majority of the proposed Greenway route will not run through karstified landscape. There is some karstification in proximity to Oughterard but the karst database indicates only two karst features in proximity to the site. There are no protected groundwater dependant terrestrial ecosystems located within the study area. The study area is located within the following Groundwater Bodies (GWBs): Clifden Marbles, Clifden-Castlebar, Recess Marbles, Spiddal, Recess, Maam-Clonbur, Oughterard Marbles and Ross Lake. GWBs are the management unit for the purposes of the Water Framework Directive (WFD). All but one GWB which the proposed Greenway runs through are classified as having Good Status under the WFD. Ross Lake GWB is classified as having Poor Status under the WFD. The groundwater bodies within the the study area are shown in **Table 1** below.

Table 1 Groundwater Bodies within the Study Area

Groundwater Body Name	Code	Status
Clifden Marbles	IE_WE_G_0013	Good
Clifden-Castlebar	IE_WE_G_0017	Good
Recess Marbles	IE_WE_G_0012	Good
Spiddal	IE_WE_G_0004	Good
Recess	IE_WE_G_0011	Good
Maam-Clonbur	IE_WE_G_0006	Good
Oughterard Marbles	IE_WE_G_0009	Good
Ross Lake	IE_WE_G_0010	Poor

The project has been designed to minimise the impacts on the geology and hydrogeology of the area. The proposed work including construction and operation phases of the project have been assessed to determine their potential impact on the soils, geology and hydrogeology. There are slight to imperceptible impacts expected on the soils, geology and hydrogeology as a result of the proposed works. Mitigation measures have been recommended in relation to the control of water pollution and preservation of soil properties.

TERRESTRIAL AND AQUATIC ECOLOGY

Chapter 10 of the EIS sets out the Terrestrial and Aquatic Ecology aspects of the EIA.

The assessment is based primarily upon the EPA document *Guidelines on Information to be contained in Environmental Impact Statements* (EPA, 2002) and the Institute of Ecology and Environmental Management *Draft Guidelines for Ecological Impact Assessment* (IEEM 2005).

Multidisciplinary site surveys were carried for terrestrial and aquatic flora and fauna, during the optimum seasons for the habitats and species. The surveys were carried out in accordance with best practice guidelines and National Parks and Wildlife Service Irish Wildlife Manuals.

The field survey comprised of an assessment of the range of habitats within the study area based on desktop and vegetation surveys. The habitats on site were classified in accordance with The Heritage Councils '*A Guide to Habitats in Ireland'* (Fossitt, 2000) which classifies habitats based on the vegetation present and management history. The habitats were mapped in accordance with The Heritage Councils '*Best Practice Guidance for Habitat Survey and Mapping*' (Smith *et al.*, 2011).

The designated sites which may be impacted by the proposed Greenway are listed in **Table 2** below.

Table 2 Designated Sites which may be impacted by the Scheme

Site Name	Code	Status
Lough Corrib	004042/ 000297	SPA / cSAC / pNHA
Maumturk Mountains	002008	cSAC/pNHA
Twelve Bens/Garraun Complex	002031	cSAC/pNHA
Connemara Bog Complex	004181/002034	SPA / cSAC / pNHA

A total of nineteen Ecological Receptors were recorded within the study area (see **Table 3** below). The Ecological Receptor valuation system follows the NRA Geographic Context for Determining Value set out in the *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009). In the context of this project, ecological receptors of below 'Local Importance (higher value)' should not be selected as 'Key Ecological Receptors', for which detailed assessment is required. All of the nineteen Ecological Receptors were selected as Key Ecological Receptors on this basis.

Table 3 Key Ecological Receptors within the Study Area

Key Ecological Receptor	Principal elements of ecological value
ER1: Lough Corrib cSAC/pNHA (Site Code: 000297) and Lough Corrib SPA (Site Code: 004042)	Land-take
	Annex I Habitats
	Annex I aquatic habitats which are qualifying interests of Lough Corrib cSAC are considered- Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) (3110) and Hard oligo-mesotrophic waters with benthic vegetation of Chara spp. (3140)
	7150 Depressions on peat substrates of the Rhynchosporion.
	Annex II Species
	HH3 Wet Heath
	GS4 Wet Grassland
ER2: Maumturk Mountains cSAC/pNHA (Site Code: 002008),	Land-take
	Annex I Habitats
	7130 Blanket bog (*active only)
	3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*),
	4010 Northern Atlantic wet heaths with Erica tetralix

Key Ecological Receptor	Principal elements of ecological value
	7150 Depressions on peat substrates of the Rhynchosporion
	Annex II Species
	PB4 Cutover Bog
ER3: Twelve Bens/Garraun Complex cSAC/pNHA (Site Code: 002031),	Land-take
	Annex I Habitats
	Qualifying habitat – 7130 Blanket bog habitat within the designated site affected by the proposed Greenway.
	Qualifying habitat – 3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*), Derryclare Lough
	Qualifying habitat - 7150 Depressions on peat substrates of the Rhynchosporion
	Annex II Species
	HH1 Dry Siliceous Heath
ER4: Connemara Bog Complex cSAC/pNHA (Site Code: 002034), and Connemara Bog Complex SPA (Site Code: 004181).	Land-take
	Annex I Habitats
	7130 Blanket bog
	3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*),
	4030 European Dry Heaths.
	7150 Depressions on peat substrates of the Rhynchosporion
	Annex II Species
ER5: Watercourses within the study area	ER5a - Water quality
	ER5b - Aquatic species within the watercourse (including the Annex II species Atlantic Salmon, otter and Freshwater Pearl Mussel – discussed in below)
ER6: Annex I habitats within the study area	ER6a – 7130 Blanket Bog
	ER6b – 7150 Depressions on peat substrates of the Rhyncosporion
	ER6c - 4010 Northern Atlantic Wet Heaths with *Erica tetralix*
	ER6d – 4030 European Dry Heaths
	ER6e - Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)
	ER6f - 91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles.
	ER6g - 91E0 Alluvial Forests with *Alnus glutinosa* and *Fraxinus excelsior*
	ER6h - 7210 Calcareous fens with Cladium mariscus and species of the Caricion davallianae
ER7: Annex II species (EU Habitats Directive) and Annex I species (EU Birds Directive)	ER7a – Freshwater Pearl Mussel
	ER7b - Otter
	ER7c - Atlantic Salmon
	ER7d - Lesser Horseshoe Bat
	ER7e - Marsh Fritillary
	ER7f - Kerry Slug
	ER7g - Kingfisher
	ER7h - Merlin:
	ER7i **–** Golden Plover
ER8: Faunal Species protected under the Irish Wildlife Acts.	ER8a - Badger
	ER8b - Bat Species
	ER8c - Deer species
	ER8d - Irish Hare
	ER8e - Pine Marten
	ER8f - Red Squirrel
	ER8g - Stoat
	ER8h - Hedgehog
	ER8i - Pygmy Shrew
	ER8j - Common Lizard
	ER8k - Common Frog

Key Ecological Receptor	Principal elements of ecological value
	ER8k - Smooth Newt
ER9: Flora Protection Order (FPO) Species	ER9a - Bog Hair-grass
	ER9b - Slender Cottongrass
	ER9c - Bog Orchid
ER10: BoCCI Bird Species	Snipe, Swallow, Whooper Swan and Chaffinch
ER11: Hedgerow Network	• General floristic value • Bird nesting potential • Value as 'wildlife corridors' Value as foraging and navigational routes for bats
ER12: Treelines	• General floristic value • Bird nesting potential • Value as 'wildlife corridors' • Value as foraging and navigational routes for bats
ER13: Wet Grassland GS4	General floristic value
ER14: Acid Grassland GS3	General floristic value
ER15: Mesotrophic Lake FL4	Water Quality and Aquatic species within the lake
ER16: Wet Willow Alder Ash WN6 woodland	General floristic value, Bat roosting and Bird nesting potential
ER17: Dry Calcareous / Neutral Grassland	General floristic value
ER18: Cutover Bog PB4	General floristic value
ER19: Reed and Large Sedge Swamps FS1	General floristic value

Mitigation measures for both the construction phase and the operational phase of the proposed Greenway have been developed, in conjunction with the other environmental and engineering specialists, and have been incorporated in the project's Schedule of Commitments or Mitigation Measures.

A Natura Impact Statement (NIS) has been completed for the project to facilitate the Appropriate Assessment of the project by the Competent Authority. The conclusion of the Natura Impact Statement was that, with the implementation of best practice and when the recommended mitigation measures are taken into consideration, it is considered that the Connemara Greenway Project - Clifden to Oughterard will not have a significant effect either individually or in combination with other plans or projects on the conservation objectives of any of the Natura 2000 sites under consideration.

AIR QUALITY AND CLIMATE

Chapter 11 of the EIS assesses the impacts to air quality and climate associated as a result of the proposed Greenway project.

The assessment identifies the existing ambient air quality and climate in the region of the proposed study area and further assesses potential changes to this aspect of the environment resulting from the proposed Greenway project. Particular attention is given to sensitive receptors, i.e. local houses in close proximity to the proposed Greenway study area.

The methodology to assess the impacts on air quality and climate involved a site visit and desktop assessment.

Site visits were conducted in 2011 to determine the nearest sensitive receptors, the existing land use within the proposed study areal, the surrounding land uses, land topography and any existing sources of air pollution.

A desktop assessment was also carried out to determine the potential impacts of the proposed project on the local and regional air quality and on the climate.

There are no existing sources of air pollution in the study areal and typical air pollutant levels would be expected to be under the required limits.

The machinery used for site preparation and works was identified as having potential to release emissions to the air at a local level. However given the size of the study area, the low population density of the area with the exception of Oughterard and Clifden, low traffic levels and the implementation of mitigation measures, it is not considered that this aspect of the proposed project will have a negative impact on air quality or climate.

Potential greenhouse gas emissions from the existing environment and resulting from the proposed Greenway as it progresses were considered and quantified using standard procedures. The total estimated greenhouse gas emissions associated with the proposed Greenway is calculated at 1,375 tonnes of CO_{2eq} compared to the National Kyoto Target of 63 million tonnes of $CO_{2eq.}$ This increase is considered to be negligible (0.002%) in the context of the National Kyoto Target.

NOISE AND VIBRATION

Chapter 12 of the EIS assesses the noise and vibration impacts associated with the proposed Greenway.

The assessment identifies potential sensitive receptors and identifies the existing noise environment for these receptors. The extent of exposure of these receptors to noise generated in association with the proposed Greenway has also been assessed.

The methodology to assess the impacts on the existing noise environment involved a site visit and desktop assessment.

During site visits conducted in 2011 the nearest sensitive receptors, the existing land use of the proposed study area, the surrounding land uses, land topography and any existing sources of noise pollution were determined.

The existing (ambient) noise environment in the vicinity of the proposed study area was dominated by noise sources typical of the rural environs (i.e. rustling foliage, birdsong and light winds), and in proximity to towns typical of a moderately sized Irish town like Oughterard (i.e. traffic noise associated with the N59 etc.). Intermittent traffic noise from passing vehicles was audible when positioned close to the local public roads that intersect the study areal. There are no point sources of noise in the existing environment.

The machinery used for site preparation and Greenway construction was identified as having potential to make noise emissions which may be perceptible to the noise sensitive receptors identified. However given the size of the study area, the low population density of the area, the existing ambient noise levels in the study area, and the implementation of mitigation measures, it is not considered that this aspect of the proposed Greenway will have a negative impact on these noise sensitive receptors.

ARCHAEOLOGY, ARCHITECTURAL AND CULTURAL HERITAGE

Chapter 13 of the EIS sets out the archaeology, architectural and cultural heritage aspects in relation to this EIA and the proposed Greenway.

The relatively marginal landscape which dominates the route of the proposed Greenway, whilst attractive to tourists today was not as attractive for settlement in past centuries. Agriculture usage was limited, as it is today. During the 1890s the Clifden to Galway Railway was constructed, which facilitated a growing tourist trade. The proposed scheme will, for the most part, follow the route of this major piece of Victorian infrastructure.

A total of 32 individual or groups of sites of archaeological significance are recorded within 300m of the proposed route way and recognised within the Galway County Development Plan. None of these are listed as National Monuments, or subject to preservation orders. The closest recorded site consists of a possible late 18th century burial. This is located c. 30m south of the proposed route within the townland of Killymongaun. The remaining sites vary in type and date, ranging from early medieval through to post medieval garden features. Several of the recorded sites have been deemed to be 'non-antiquities'.

A field inspection of the proposed scheme was carried out during February 2012. The route of the greenway and its immediate environs were subject to inspection. With the exception of the railway embankment/cut and the generic archaeological potential associated with waterways, lakes and bog land, no specific features of archaeological potential were identified.

The built heritage within the receiving environment is dominated by the Victorian architectural associated with the construction of the railway from Clifden to Oughterard. Of the 123 built heritage sites that have been identified during this assessment, 85 are directly associated with the railway consisting of several stations and numerous bridges and culverts.

The proposed Greenway will follow the path of a significant built heritage feature, namely the route of The Midland Great Western Railway. This section of railway opened on 1 July 1895 but due to the inland route chosen it did not service the bulk of the area's population and it was closed in 1935. The total length of the line from Clifden to Galway was 48 miles (www.maamcrossmart.com) and it was only open for 40 years. The architectural field inspection sought to assess the proposed route of the Greenway and identify any structures of architectural merit. Due to the past use of the proposed route as a railway, many of the structures (85 out of 123) relate directly to its former use.

A review of the County Galway Development Plan (2009–2015), the Clifden Local Area Plan (2009–2015) and the Oughterard Local Area Plan (2006-2012) revealed that there are a total of eight protected structures located within c. 300m of the proposed route. The closest structure to the scheme is Ardbear Old Bridge, which is located at the beginning of the route

A total of 20 individual or groups of buildings were identified within the survey in proximity of the proposed Greenway. Of these, eight are already listed within the register of protected structures. Several of the structures are located along the scheme. These include Ardbear Old Bridge, a railway bridge at Ballynahinch, a road bridge at Cloonbeg, a railway bridge at Letterfore and the 'Quiet Man' bridge.

The proposed Greenway development will not impact on any of the recorded archaeological sites located within the receiving environment. Due to the fact that the existing communications network is likely to have removed any previously existing archaeological resource, it is anticipated that the likelihood of a direct impact on the same resource is very low. However, at certain locations the proposed route will travel 'offline' from the existing roads and railway (in the townlands of Gowlan West, Garroman, Lurgan and Glengowla West). It is possible that ground disturbances at these

locations, which are associated with the development of the scheme, may have a direct significant negative impact on previously unrecorded archaeological features or deposits that have the potential to survive beneath the current ground surface.

It is proposed to retain the drainage culverts that are located along the path of the railway and the proposed route. It is possible that inappropriate repairs will result in a direct significant impact on these features. It is proposed to retain or replace the existing railway bridges. Replacement of the bridge will be in the form of a wooden decking structure across existing stone abutments. The removal of any of the iron girder frames from the bridges will result in a direct significant negative impact on the structures. The use of wooden decking spans at bridges that have already had their iron frames removed will result in a direct moderate negative impact on the character of the structure. Built Heritage Site No. 1 (BH1), the path of the railway itself, is formed by embankment or cut. The development of the greenway may result in a direct significant negative impact on the feature due to any potential re-grading of the embankment that may take place. No direct or indirect impacts are anticipated for the remaining built heritage resource, which is located within the receiving environment of the proposed scheme. It is not anticipated that overall, development of the greenway will impact negatively on the architectural heritage resource. Indeed, the scheme will open up the landscape and associated architecture to the public, resulting in a greater awareness and appreciation of the resource. Therefore an overall direct moderate positive impact is predicted with regards to the architectural and built heritage resource.

No direct or indirect impacts are anticipated for the cultural heritage resource, which is located within the receiving environment of the proposed scheme. If the proposed development were not to proceed, there would be no direct negative impact on the archaeological resource. However, there may be a direct negative impact on the architecture associated with the railway, due to its gradual dereliction, which will result in the collapse of bridges and culverts and degrading of the railway bed. Under a worst case scenario, the proposed development would disturb previously unrecorded and unidentified deposits, artefacts and structures, without proper excavation and recording being undertaken.

It is recommended that all ground disturbances, such as topsoil removal, which take place in areas that are undisturbed (alternate routes in the townlands of Gowlan West, Garroman, Lurgan and Glengowla West) be monitored by a suitably qualified archaeologist. Full provision should be made available for the resolution of any features or deposits that may be identified, should that be deemed the most appropriate manner in which to proceed.

It is recommended that all drainage culverts and existing railway bridges be retained and incorporated into the scheme, however if this is not possible a full written and photographic record be made of the feature (with measurements), by a suitably qualified archaeologist or historic buildings expert prior to alterations being carried out. If features are retained and repairs are required these should include building materials, finishing and style. With any replacement bridge structure an effort should be made to replicate the character of the existing railway bridge architecture.

It is recommended that the railway embankment/cut is left intact and re-grading does not take place. However, should regarding be required it is recommended that any sections to be directly impacted upon are subject to topographical survey in order to fully record the feature. Whilst direct/indirect impacts are not anticipated for the remaining built heritage along the scheme (due to the low impact nature of the development) the design element may be changed in the future, resulting in a change of impacts (especially along the N59 section, where extent of widening has not been defined). As such it is recommended that direct impacts on all 123 Built Heritage sites be avoided. Should impacts alter then further advice should be sought on appropriate mitigation measures.

LANDSCAPE AND VISUAL

Chapter 14 of the EIS sets out the landscape and visual environment assessment of the scheme.

The purpose of this assessment is to make an assessment of the landscape and visual impacts associated with the proposed Greenway. The assessment begins with a description of the existing landscape setting and visual resources to establish baseline conditions. The proposal is then applied to the baseline and the impacts of the proposed Greenway upon the existing landscape setting and visual resources are then predicted.

The proposed Greenway is located within the Landscape Character Areas 14, 10, 19 and 22 as identified in County Galway Development Plan (2009–2015). These landscape character areas have been identified as having the higher range of sensitivities to change, i.e. Class 3 – High to Class 5 - Unique. The predicted impact on landscape character is slight and temporary due to the limited influence the proposed Greenway will have over this wide landscape character area.

There will no significant loss of existing views to dwellings in proximity to the proposed Greenway. The Connemara Greenway Project – Clifden to Oughterard will not be a prominent feature in the landscape due its low-lying nature and design mitigation measures and no significant visual impacts are predicted.

Overall no significant landscape or visual impacts have been predicted for the proposed scheme.

HUMAN BEINGS & MATERIAL ASSETS

Chapter 15 of the EIS sets out the human beings and material assets considerations in relation to the proposed Greenway.

Human beings and their associated material assets (physical resources in the environment, which may be either of human or natural origin) are an important element of the environment. Any potential impact on the status of human beings by the proposed Greenway must therefore be comprehensively assessed. The principal concern is that human beings within the study area experience no significant unacceptable diminution in aspects of quality of life as a consequence of the scheme. Relevant components of this chapter of the EIS include land use, demography, employment, amenity/community aspects and services/utilities.

This chapter also describes the potential impacts on material assets as a result of the proposed project. For the purposes of this assessment, material assets include:

- Economic Assets of Natural and Human Origin, and
- Cultural Assets of a Physical and Social Type.

The proposed Greenway will have significant positive impacts for the local human environment in terms of provisions of local cycling and walking amenity.

It is anticipated that there may be some minor temporary disturbances to local farmers and noise sensitive receptors during scheme construction. However if proposed mitigation measures are put in place as recommended these impacts should remain minor or insignificant in nature.

TRAFFIC

Chapter 16 of the EIS sets out the traffic assessment in order to address the impact of the proposed Greenway on the receiving environment with respect to traffic conditions, transport routes and general traffic safety. The assessment identifies the existing road network in the study area, potential impacts of the Greenway construction phase on the transport infrastructure and its users and proposes where required suitable mitigation measures.

The scope of this assessment is to assess existing conditions from a traffic perspective relative to the proposed Greenway. It is not intended to undertake detailed junction geometry surveys, detailed traffic forecasting or traffic flow modelling.

A review of the existing transport network, both public and internally in the proposed study area, was completed as part of this assessment. The potential for impact on traffic and transport was considered at the construction and operational stages of the proposed Greenway. Some potential impacts including temporary inconvenience to road users when machinery is being delivered or where road traffic restrictions, closures and diversions were identified.

It is noted that details of public road traffic management, closures and diversions at the time of Greenway construction will need to be discussed further at the appropriate time between Galway County Council and the Roads Department of Galway County Council.

It is concluded that if proposed mitigation measures are fully implemented and if the relevant public road traffic management issues are fully considered by Galway County Council at the appropriate times over the lifespan of the proposed Greenway construction and operation, then traffic and transport will not be significantly impacted upon as a result of this scheme.

IMPACT INTERACTIONS AND CUMULATIVE IMPACTS

Chapter 17 of the EIS sets out impact interactions and cumulative impacts associated with the Connemara Greenway Project - Clifden to Oughterard.

Interactions

The potential impacts of the proposed Greenway have been discussed in detail with respect to all aspects of the environment. This section summarises these likely significant effects together with their consequent interaction. Schedule 2 of the EIA 1999 Regulations (S.I. No. 93 of 1999) requires consideration of the interactions between the various environmental factors:

"a description of the aspects of the environment likely to be significantly affected by the proposed development, including in particular; human beings, fauna, flora,

- *soil, water, air, climatic factors and the landscape,*
- *material assets, including the architectural; archaeological, and cultural heritage, and*
- *the inter-relationship between the above factors".*

The environmental factors of the proposed Greenway have been assessed individually and mitigation measures recommended where required. It is also important to analyse any interactions that could result in impacts having a knock on effect on other elements of the environment.

As a result each impact identified in this EIS was analysed to determine if it had an interaction or knock on effect on any other aspect of the environment.

It demonstrated that impacts resulting from one aspect of the environment can have a direct effect on other elements of the environment. The analysis demonstrated that the interactions identified are mainly between aquatic ecology, terrestrial ecology, soils, archaeology and the human environment. However, as suitable mitigation measures will eliminate and or reduce the possibility of these effects, the above interactions will be avoided or significantly reduced.

Cumulative Impacts

A cumulative impact can be considered as an impact on the environment that results from incremental changes to environmental parameters when added to changes brought about by other past, present or reasonably foreseeable actions (European Commission, 1999). Cumulative impacts can result from individually minor but collectively significant actions taking place over the same period of time or/and within the same geographical area. Cumulative impacts therefore can cover all aspects of the environment.

Taking all of this into account the main considerations in this particular instance are developments within the study area such as the proposed N59 upgrade. Chapter 17 of the EIS summaries the potential cumulative impacts resulting from other developments within and in close proximity to the study area.

It is concluded that if proposed mitigation measures are fully implemented and if the relevant mitigation measures are fully adhered to with regard to the N59 upgrade and other developments in the area, then the proposed Greenway will not give rise to significant cumulative impacts on the environment.

SUMMARY OF SIGNIFICANT IMPACTS AND MITIGATION MEASURES

Mitigation measures have been identified as part of this EIA process for the proposed Connemara Greenway Project - Clifden to Oughterard. Mitigation measures are proposed to address any potential adverse effect on the environmental aspects of the study area. These measures will allow any potential impacts arising as a result of the scheme to be avoided or mitigated for.

An over-arching mitigation measure will be for Galway County Council to draw up a Method Statement that includes detailed mitigation measures as outlined in this chapter in relation to the implementation of all measures proposed. This method statement will be strictly adhered to by Galway County Council staff and contractors involved in the works and will be overseen by the Galway County Council's site representative/foreman. The method statement will detail how these mitigation measures will be monitored for effectiveness by Galway County Council. There will be ongoing consultation by Galway County Council and the relevant stakeholders as required.

CONCLUSIONS

An EIS has been completed for the proposed Connemara Greenway Project – Clifden to Oughterard. The EIS was scoped and completed in line with the requirements of The European Communities (Environmental Impact Assessment) (Amendment) Regulations, 2001 (Statutory Instrument 538/2001).

Having completed the EIS in line with all required legislation and relevant guidelines pertaining to the nature of the proposal the EIA process concludes the following:

- Potential impacts on both the natural and socio-economic environments have been identified;
- Where necessary, suitable mitigation measures to reduce negative impacts have been recommended. This will ensure elimination and reduction of any significant environmental risks;
- The majority of the Greenway route is along the dismantled Great Western Railway between Clifden and Oughterard where a trackway has previously or is currently in operation. This was an important factor that was taken into consideration in the assessment; and
- The proposed Greenway will have an affect on aspects of the environment particularly terrestrial and aquatic ecology, and water quality. Mitigation measures have been recommended in order to lessen or eliminate such impacts.

Overall the scheme will have significant positive benefits for the community within the study area and the wider community, through the addition of a valuable local amenity and potential increased economic activity through increased cycling and walking tourism in the area.

1 INTRODUCTION

In May 2011 Galway County Council appointed RPS as environmental consultants for the Connemara Greenway Project – Clifden to Oughterard. The Project will consist of developing a walking/cycle track (Greenway) along the dismantled Galway to Clifden railway line from Oughterard to Clifden. The purpose of the project is to provide all members of the local community and visitors alike with a safe and accessible way of using the dismantled railway line for walking and cycling. This will also benefit the local economy.

The proposed Greenway is being developed by local community groups in Clifden, Recess and Oughterard with support from Fáilte Ireland, Galway County Council and Forum Connemara Ltd.

The Greenway will form part of the Bord Fáilte National Cycle Network. The National Cycle Network, as promoted in '*A Strategy for the Development of Irish Cycle Tourism*' (2007) sets out a plan of long-distance cycle routes across the country.

Galway County Council is now progressing the Connemara Greenway Project – Clifden to Oughterard Project to planning and design stage and the required environmental outputs associated with the Project can be set out in four distinct stages as follows:

Stage 1

- Environmental Constraints Study
- Screening for Appropriate Assessment

Stage 2

- Environmental Assessment of the Project
- Appropriate Assessment

Stage 3

- Environmental Impact Statement (EIS)
- Public Consultation

Stage 4

- Statutory Planning Process

This report fulfils one required element of Stage 3, to complete an Environmental Impact Statement for the Connemara Greenway Project – Clifden to Oughterard.

1.1 LEGISLATIVE REQUIREMENTS

Taking into consideration the nature of the proposed works and the fact that Connemara Greenway Project – Clifden to Oughterard route corridor runs through a number of Natura 2000 sites, Galway County Council consider that an EIS should be completed in order to comply with Article 120 (sub-threshold EIS) of the Regulations.

The Planning and Development Regulations 2001-2011 list the types and sizes of developments that require an Environmental Impact Statement. The prescribed thresholds and classes of development are set out in Article 93, Schedule 5 of the Regulations. The proposed works are not listed under Schedule 5 and are identified as a sub-threshold development. In the regulations a sub-threshold development can be defined as the following:

‘ “*sub-threshold development” means development of a type set out in Schedule 5 which does not exceed a quantity, area or other limit specified in that Schedule in respect of the relevant class of development*.’

Part 10, Chapter 4 of the legislation refers to Local Authority developments. Article 120 relates to sub-threshold EIS, as follows;

120 (1) ‘Where a local authority proposes to carry out a subthreshold development and the likelihood of significant effects on the environment cannot be excluded by the authority, the authority shall make a determination as to whether the development would be likely to have significant effects on the environment, and where it determines that the development would be likely to have such significant effects it shall prepare, or cause to be prepared, an EIS in respect thereof..’

Due to the environmental sensitivity of the area, the proposed development may have significant effects on the environment due to the potential impacts on designated nature conservation areas.

Article 120 (2) of the Regulations states:

120 (2) Where the development referred to in sub-article (1) would be located on, or in, or have the potential to impact on—

(a) a European site,

(b) an area the subject of a notice under section 16(2) (b) of the Wildlife (Amendment) Act 2000 (No. 38 of 2000),

(c) an area designated as a natural heritage area under section 18 of the Wildlife (Amendment) Act 2000,

(d) land established or recognised as a nature reserve within the meaning of section 15 or 16 of the Wildlife Act 1976 (No. 39 of 1976) as amended by sections 26 and 27 of the Wildlife (Amendment) Act 2000,

(e) land designated as a refuge for flora or as a refuge for fauna under section 17 of the Wildlife Act 1976 as amended by section 28 of the Wildlife (Amendment) Act 2000,

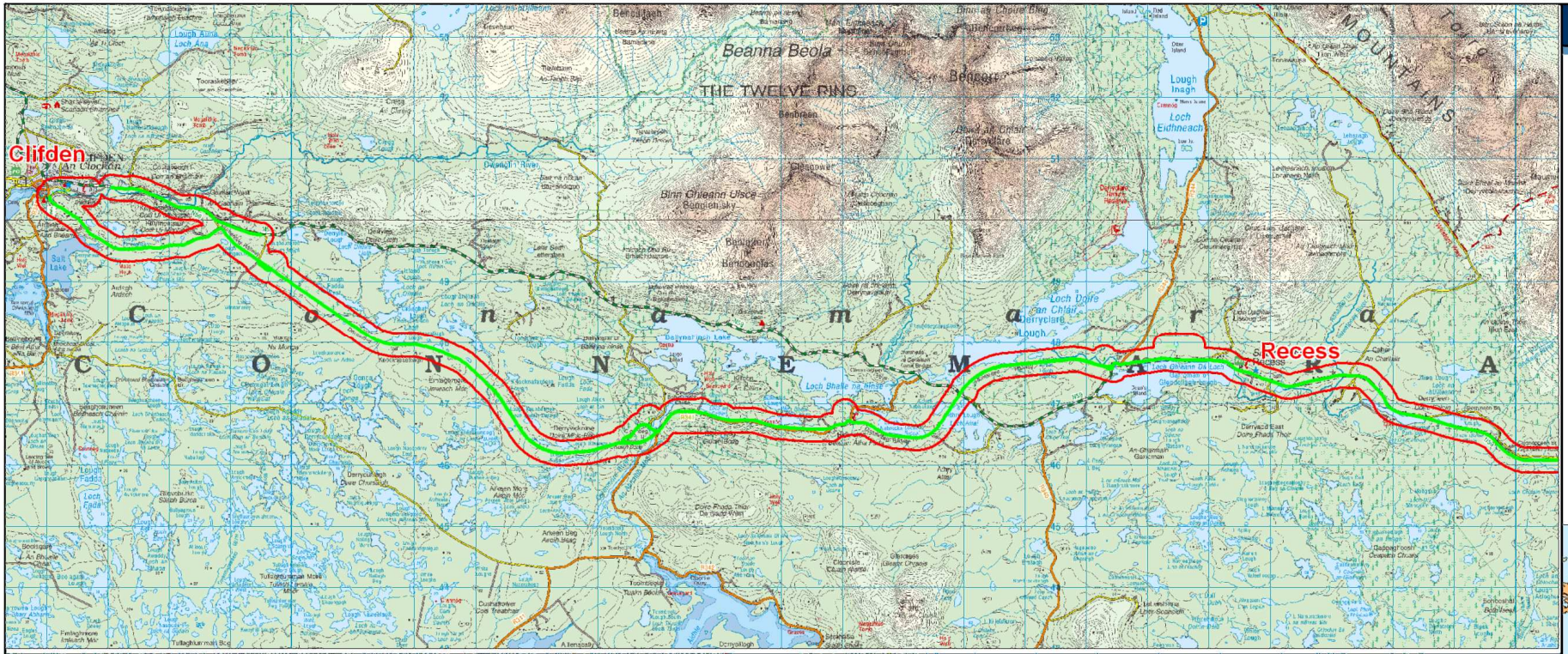
(f) a place, site or feature of ecological interest, the preservation, conservation or protection of which is an objective of a development plan or local area plan, draft development plan or draft local area plan, or proposed variation of a development plan, for the area in which the development is proposed,

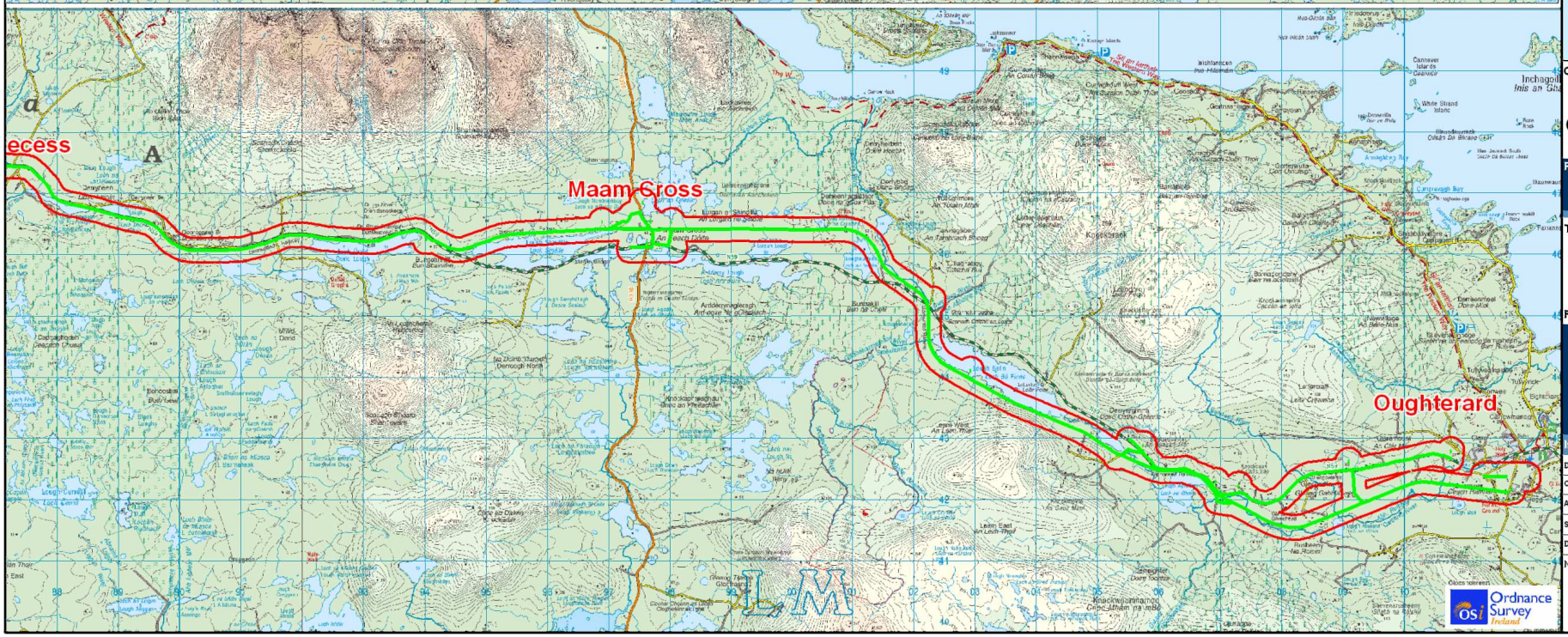
(g) a place or site which has been included by the Minister for Arts, Heritage and the Gaeltacht in a list of proposed Natural Heritage Areas published on the National Parks and Wildlife Service website,

the local authority shall, in determining whether the development would or would not be likely to have significant effects on the environment, have regard to the likely significant effects of the development on such site, area, land, place or feature as appropriate.

Taking into consideration the nature of the proposed works and the fact that the proposed Greenway is located within European Sites, Galway County Council considers that an EIS should be completed in order to comply with Article 120 (sub-threshold EIS) of the Regulations.

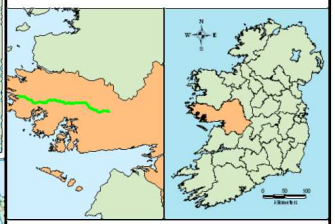
Figure 1.1 shows the extent of the Connemara Greenway Project – Clifden to Oughterard study area (discussed further in **Chapter 5**).





Legend

- Proposed Greenway
- Study Area



Client

Galway County Council

Project

Connemara Greenway

Title

Connemara Greenway Project - Clifden to Oughterard Study Area

Figure 1.1

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Notes

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2 ENVIRONMENTAL IMPACT ASSESSMENT

2.1 LEGISLATIVE CONTEXT

Environmental Impact Assessment (EIA) can be described as "the process for anticipating the effects on the environment caused by a development. An Environmental Impact Statement (EIS) is the document produced as a result of that process" (EPA, 2002)[2].

The purpose of producing an EIS for the Connemara Greenway Project - Clifden to Oughterard is to identify the potential environmental impacts of the proposed works and to examine how these impacts can be avoided or reduced during the implementation and operation of the project measures.

This EIS is prepared having regard to all relevant EU Directives and National legislation including:

- The Council Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment as amended,
- The EU Directive implemented in Ireland through S.I. No. 349 of 1989 entitled European Communities (Environmental Impact Assessment) Regulations, as amended,
- The Planning and Development Regulations, 2001 (Statutory Instrument 600/2001), as amended, and
- The Planning and Development Act 2000 - 2011.

This EIS has been completed in accordance with the requirements of Article 94 of the Planning and Development Regulations 2001, as amended.

The following guidance documents were also consulted in the preparation of this EIS:

- '*Guidelines on the Information to be contained in Environmental Impact Statements'*, EPA, 2002, and
- *'Advice Notes on Current Practice in the preparation of Environmental Impact Statements', EPA,* 2003.

2.2 ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The main purpose of the EIA process is to identify the likely significant impacts on the human environment, the natural environment and on cultural heritage associated with the proposed Greenway Project and to determine how to eliminate or minimise such impacts. The EIS summarises the environmental information collected during the impact assessment.

Several interacting steps typify the early stages of the EIA process and include:

[2] Guidelines on the Information to be Contained in Environmental Impact Statements, EPA, 2002

- Screening,
- Scoping and Consultation,
- Assessing Alternatives, and
- Assessing and Evaluating.

Screening: This stage establishes if an EIS is required. Galway County Council has already determined that, in accordance with the Planning and Development Regulations 2001 -2011, Part 10, Chapter 4, Article 120 relating to Local Authority developments an EIS is required.

Scoping and Consultation: This stage identifies the issues likely to be important and the likely significant impacts of the Greenway Project through consulting with various parties. Details of the various methods of scoping and consultation completed as part of the EIA process are further set out in **Chapter 4**.

Assessing Alternatives: This stage outlines the possible alternative approaches to the project including do nothing and providing alternative routes on the Greenway. This stage of the EIA process is set out in **Chapter 7**.

Assessing and Evaluating: The central steps of the EIA process include baseline assessment (desk study and field surveys) to determine the status of the existing environment, impact prediction and evaluation, and determining appropriate mitigation measures where necessary. This stage of the EIS is presented in **Chapters 8 to 16**.

2.3 STRUCTURE OF THIS EIS

This EIS has been prepared in the following format:

Non-Technical Summary: This section provides a summary description of the existing environment, the application process, and describes the main potential impacts associated with the proposed Greenway Project using non-technical terminology.

Background and Scope: This section addresses the legislative, planning and policy context of construction of the proposed Greenway. Alternatives to the proposed measures are considered and the scoping and consultation process which has been undertaken is described. Finally, any technical difficulties encountered during the assessment process are detailed.

Study Area Description and Proposed Connemara Greenway Project – Clifden to Oughterard: This section describes the study area in the context of its setting and surrounding land use. It also provides a description of the proposed Connemara Greenway Project – Clifden to Oughterard.

Environmental Impact Assessment: This section examines the individual environmental aspects of the study area as required under Article 94 of the Planning and Development Regulations 2001, as amended. Each of the environmental aspects as listed below are examined in terms of the existing or baseline environment, identification of potential impacts during the implementation and operation of the proposed project and where necessary mitigation measures are identified. The interaction of the environmental aspects with each other is also examined in this section as is the cumulative impact of the proposed project with surrounding land uses.

Environmental aspects considered include:

- Terrestrial and Aquatic Ecology,
- Hydrology and Drainage,
- Soils, Geology and Hydrogeology,
- Air Quality and Climate,
- Noise and Vibration,
- Archaeology, Architectural and Cultural Heritage,
- Landscape and Visual,
- Human Beings and Material Assets,
- Traffic, and
- Interaction of the Foregoing.

The assessment follows the "*Grouped Format Structure"* as set out in '*Guidelines on the Information to be contained in Environmental Impact Statements'* (EPA, 2002). This method of assessment examines each environmental topic as a separate section making reference in each section to the existing environment, the potential impacts of the proposed project and proposed mitigation measures. As a result each environmental topic is presented in the following format:

- Introduction,
- Methodology,
- Existing Environment,
- Potential Impacts,
- Proposed Mitigation Measures,
- Residual Impacts, and
- Conclusions.

Summary and Conclusions: This section summarises the findings of the assessments and includes conclusions on the impacts of the proposed Connemara Greenway Project – Clifden to Oughterard on the existing environment.

2.4 EIS STUDY TEAM

This EIS has been prepared by RPS on behalf of Galway County Council. Input was obtained from specialists who contributed to the EIS. Contributions are outlined in **Table 2.1.**

Table 2.1 EIS Study Team

Chapter	Topic	Specialists
	Non-Technical Summary	RPS
1	Introduction	RPS
2	Environmental Impact Assessment	RPS
3	Policy, Planning and Legislation	RPS
4	Consultation	RPS
5	Study Area	RPS
6	Project Description	RPS
7	Need for the Proposed Project and Alternatives Considered	RPS
8	Hydrology and Drainage	RPS
9	Soils, Geology and Hydrogeology	RPS
10	Terrestrial and Aquatic Ecology	RPS and Aardwolf Wildlife Surveys
11	Air Quality And Climate	RPS
12	Noise and Vibration	RPS
13	Archaeology, Architectural and Cultural Heritage	Irish Archaeological Consultancy Services Ltd.
14	Landscape and Visuals	RPS
15	Human Beings and Material Assets	RPS
16	Traffic	RPS
17	Impact Interactions Cumulative Impacts	RPS
18	Summary Mitigation Measures	RPS

2.5 TECHNICAL DIFFICULTIES

There were no technical difficulties encountered during the preparation of this EIS.

3 POLICY, PLANNING AND LEGISLATION

This Chapter of the EIS sets out current EU, national, regional and where relevant, local policy and legislation relating to this type of construction project and its place within the planning and development system. The purpose of this Chapter is to consider the Connemara Greenway Project - Clifden to Oughterard in the context of this policy and legislation.

3.1 POLICY, PLANNING AND LEGISLATION

Consideration of relevant policy and legal issues at EU, national, regional and local level may influence the development of the Connemara Greenway Project – Clifden to Oughterard. It is prudent to consider such issues at an early stage and ensure the project is progressing in line with such polices and legislation where relevant. On this basis relevant legal, planning and policy related requirements are set out in **Table 3.1.**

Table 3.1 Policy, Planning and Legislation Requirements with Potential to Influence the Proposed Connemara Greenway Project – Clifden to Oughterard

Policy/Plan/Legislation	Constraints/Requirements of the Connemara Greenway Project
EU Level	
Water Framework Directive (2000/60/EC)	All works during the development and operation of the project must aim to protect surface and groundwater.
Habitats Directive (92/43/EEC)	All works during the development and operation of the project must aim to maintain/conserve habitats and species of community interest within the study area. The project will be screened for Appropriate Assessment.
Birds Directive (2009/147/EC)	All works during the development and operation of the project must aim to maintain/conserve wild bird species occurring in the study area.
National Level	
European Communities (Planning and Development Regulations 2001 (SI 600 of 2001), as amended.	The project must undergo Environmental Impact Assessment in accordance with Article 120 of these regulations and as amended by – Sub-Threshold Developments.
European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477 of 2011)	Enforces the requirement to undergo screening for Appropriate Assessment for plans or projects in order to satisfy Articles 6(3) and 6(4) of the Directive.
Wildlife Act 1976 (as amended)	Under the Wildlife Act 1976 (as amended) certain species are afforded statutory protection and as such there is a requirement that any proposed development assesses the likelihood of impacting such species.
The Fisheries (Amendment) Act 1999 The Fisheries (Consolidation) Act 1959 (as amended)	All works during development and operation of the project must aim to conserve fish and other species of fauna and flora habitat; biodiversity of inland fisheries and ecosystems and protect spawning salmon and trout.
The National Monuments Acts 1930-2004	All works during development and operation of the project must aim to ensure the satisfactory protection of archaeological remains, which are held to include all man-made structures and to protect and where

Policy/Plan/Legislation	Constraints/Requirements of the Connemara Greenway Project
The Heritage Act 1995, The Architectural Heritage (National Inventory) The Historic Monuments (Miscellaneous Provisions) Act, 1999.	possible preserve architectural heritage which "*includes railways and related buildings and structures and any place comprising the remains or traces of any such railway, building or structure".*
Regional and Local Level	
Regional Planning Guidelines for the West 2012-2022	The project should comply with Policy IP23: "Pedestrian and cycling routes must be designed to minimise impact on habitats and species and should not adversely impact on the conservation objectives or site integrity of SAC, SPA or other ecologically sensitive sites".
Galway County Development Plan, 2009-2015	The project should comply with Policy ED20: "Positively support and promote sustainable Tourism Infrastructure development related to the enhancement of the County's tourism profile, ...ensure that all such developments are built to a high environmental standard to protect the County's most significant tourism asset – its natural environment and landscape"; and Policy HL95: "Preserve the status of traditionally open/unfenced landscape. The merits of each case will be considered in light of landscape Sensitivity Ratings and views of amenity importance".
Western River Basin Management Plan, 2009-2015	The project should comply with the environmental objectives of the WRBMP which are to be achieved generally by 2015: • prevent deterioration; • restore good status; • reduce chemical pollution: • achieve water related protected areas objectives.
Clifden Local Area Plan 2009-2015	The project should comply with Policy 3.12.8: "Co-operate with Fáilte Ireland West and the local community and other stakeholders in the development of sustainable tourism products".
Oughterard Local Area Plan 2003-2009	The project should comply with Policy 3.12.3: "Co-operate with Ireland West Tourism, the local community and other stakeholders in the development of sustainable tourism products".

The Planning and Development Regulations 2001-2011 list the types and sizes of developments that require an Environmental Impact Statement. The prescribed thresholds and classes of development are set out in Article 93, Schedule 5 of the Regulations. The proposed works are not listed under Schedule 5 and are identified as a sub-threshold development. In the regulations a sub-threshold development can be defined as the following:

' "*sub-threshold development" means development of a type set out in Schedule 5 which does not exceed a quantity, area or other limit specified in that Schedule in respect of the relevant class of development*.'

Part 10, Chapter 4 of the legislation refers to Local Authority developments. Article 120 relates to sub-threshold EIS, as follows;

120 (1) 'Where a local authority proposes to carry out a subthreshold development and the likelihood of significant effects on the environment cannot be excluded by the authority, the authority shall make a determination as to whether the development would be likely to have significant effects on the environment, and where it determines that the development would be likely to have such significant effects it shall prepare, or cause to be prepared, an EIS in respect thereof..'

Due to the environmental sensitivity of the area, the proposed development may have significant effects on the environment due to the potential impacts on designated nature conservation areas.

Article 120 (2) of the Regulations states:

120 (2) Where the development referred to in sub-article (1) would be located on, or in, or have the potential to impact on—

(a) a European site,

(b) an area the subject of a notice under section 16(2) (b) of the Wildlife (Amendment) Act 2000 (No. 38 of 2000),

(c) an area designated as a natural heritage area under section 18 of the Wildlife (Amendment) Act 2000,

(d) land established or recognised as a nature reserve within the meaning of section 15 or 16 of the Wildlife Act 1976 (No. 39 of 1976) as amended by sections 26 and 27 of the Wildlife (Amendment) Act 2000,

(e) land designated as a refuge for flora or as a refuge for fauna under section 17 of the Wildlife Act 1976 as amended by section 28 of the Wildlife (Amendment) Act 2000,

(f) a place, site or feature of ecological interest, the preservation, conservation or protection of which is an objective of a development plan or local area plan, draft development plan or draft local area plan, or proposed variation of a development plan, for the area in which the development is proposed,

(g) a place or site which has been included by the Minister for Arts, Heritage and the Gaeltacht in a list of proposed Natural Heritage Areas published on the National Parks and Wildlife Service website,

the local authority shall, in determining whether the development would or would not be likely to have significant effects on the environment, have regard to the likely significant effects of the development on such site, area, land, place or feature as appropriate.

Taking into consideration the nature of the proposed works and the fact that the proposed Greenway is located within European Sites, Galway County Council considers that an EIS should be completed in order to comply with Article 120 (sub-threshold EIS) of the Regulations.

4 CONSULTATION

4.1 INTRODUCTION

This chapter describes the consultations carried out in relation to the Environmental Impact Statement (EIS) for the Connemara Greenway Project - Clifden to Oughterard with the purpose of outlining the key issues raised by stakeholders, both statutory and non statutory (including the general public).

Consultation forms an essential part of the EIA process. In this case, the early involvement of stakeholders has helped to ensure that the views of various groups or individuals were taken into consideration from the constraints stage through choosing a preferred viable Greenway Project and to the preparation of this EIS.

Consultation was carried out through written communication and the holding of public information events throughout the course of the EIS process. These are further outlined in the following sections.

4.2 STATUTORY AND NON-GOVERNMENTAL ORGANISATION CONSULTATION

In August 2011, when the environmental impact assessment work commenced, a letter was issued to twenty-four statutory and non-statutory stakeholders informing them of the commencement of the environmental assessment of the proposed Greenway Project. The letter set out a brief background to the proposed project and the environmental steps that would be completed during the planning process. The correspondence further invited stakeholders for comment on what should be included in the scope of this environmental work. **Table 4.1** sets out the stakeholders that were consulted and the responses received. The full text of responses received is presented in **Appendix A.1**.

Table 4.1 Stakeholders Consulted during EIS

Stakeholder	Response Received
Development Applications Unit, Department of the Environment, Heritage and Local Government	No response to date
Regional Ecologist, NPWS Office	No response to date
An Taisce	No response to date
Birdwatch Ireland	No response to date
Bat Conservation Ireland	No response to date
Fáilte Ireland - West	No response to date
Inland Fisheries Ireland	No response to date
Western River Basin District Project Office	No response to date
Geological Survey of Ireland	No response to date
Department of Agriculture, Fisheries and Food	Acknowledged by e-mail 07th September 2011
Heritage Officer, Galway County Council	No response to date
Environment Department, Galway County Council	Response received on the 18th August, 2011, stating they do not wish to comment at this stage.
Water Services Unit, Galway County Council	No response to date

Stakeholder	Response Received
Planning Department, Galway County Council	No response to date
Galway County Development Board	No response to date
Roads & Transportation Unit, Galway County Council	No response to date
EPA Headquarters, Wexford	No response to date
EPA Regional Inspectorate	No response to date
Irish Farmers Association (Galway Branch)	No response to date
Teagasc	No response to date
Galway Rural Development Company Ltd	No response to date
Western Development Commission	No response to date
Galway Archaeological and Historical Society	No response to date
National Roads Authority	Letter received 15th September 2011 – main concerns: impacts of development on national roads, assessment of visual impacts, regard to N59 Clifden to Oughterard Road Project, have regard for NRA EACG, Noise, Traffic – consult Knars Road Safety Audit and maintain safety standards.

4.3 SUMMARY OF CONSULTATIONS UNDERTAKEN

Table 4.2 summarises the various types of consultation that were undertaken throughout the course of completing the EIS for the Connemara Greenway Project - Clifden to Oughterard. All comments and correspondence were analysed as part of the delivery of this EIS.

Table 4.2 Summary of Consultation associated with the EIS for the Connemara Greenway Project - Clifden to Oughterard

Consultation Method	Details	Comments/Findings
Written Consultation	EIS Scoping letter issued to 24 stakeholders on 15th August 2011	Response received from 3 stakeholders.
Other Consultation	Meeting with NPWS on 19th January 2012	Agreed scope of surveys required for an EIS and Natura Impact Statement (NIS).
	Email from NPWS Galway Ranger 10th April 2012	No issues with the proposed project in relation to breeding birds and in particular to Merlin

5 STUDY AREA

The Connemara Greenway Project – Clifden to Oughterard proposes to develop the dismantled Galway to Clifden railway line into a walking/cycling track (Greenway) between Oughterard and Clifden, over an approximate distance of 52.4km.

The Galway to Clifden railway line ceased operations in 1935 and was subsequently dismantled. The remnants of the railway line between Oughterard and Clifden are the focus of this Project. There is a well defined corridor for much of the length of the dismantled railway line, with some of the original rail bridges still intact. At a number of locations along its corridor, the dismantled railway line merges and crosses over existing local roads and the main Galway to Clifden road (N59).

The landscape across which the dismantled railway corridor crosses, varies along its length with extensive areas of bog, scrub, forestry, bog woodland, mountains, rivers, numerous small and some large lakes, improved grassland and farmland being encountered.

The study area contains several environmental designations (Natura 2000 Sites) and as a result an Appropriate Assessment is required to be completed in order to comply with the Habitats Directives (92/43/EEC). The route runs through or lies adjacent to four candidate Special Areas of Conservation (cSACs), including the Twelve Bens/ Garraun Complex, Maumturk Mountains, Connemara Bog Complex and Lough Corrib, and to two Special Protection Areas (SPAs), including Connemara Bog Complex and Lough Corrib. The study area is shown in **Figure 1.1**.

5.1 LAND USE IN THE STUDY AREA

The greenway route is located, within or adjacent to a number of designated sites including the Twelve Bens/ Garraun Complex, Maumturk Mountains and Lough Corrib and Connemara Bog Complex. All of these sites are designated as proposed Natural Heritage Areas (pNHA) and candidate Special Areas of Conservation (cSAC). Lough Corrib and some lands within Connemara Bog Complex cSAC are designated as Special Protection Areas (SPA), see **Table 5.1** below.

Table 5.1 Environmental Sites Adjacent to Proposed Development

Site Code	Site Name	Designation
000297, 004042	Lough Corrib	cSAC, pNHA SPA
002034 004181	Connemara Bog Complex	cSAC, pNHA, SPA
002008	Maumturk Mountains	cSAC, pNHA
002031	The Twelve Bens/Garraun Complex	cSAC, pNHA

Land use along the route of the proposed Greenway is confined to dispersed pockets of agricultural land and forestry within the expanse of peat bog-lands that contains an abundance of small lakes. This rugged landscape, consisting of rock outcrops and bogs, extends westwards from Oughterard to Clifden and beyond.

Clifden is a coastal town and is characterised by several areas of highly scenic landscape, including panoramic views of the Atlantic Ocean, the Twelve Bens and the surrounding countryside. Clifden has developed around the small inlet at Clifden Bay into which the River Owenglin flows and is heavily influenced by the physical constraints of steep slopes, difficult terrain, Clifden Bay and Ardbear Bay.

The town of Oughterard has an extremely picturesque natural setting at the confluence of the Owenriff River and Lough Corrib with the backdrop of the higher ground to the south and west. Stonewalls, woodlands and hedgerows all form distinctive features in the landscape.

In the Galway County Development Plan 2009 – 2015 (GCDP 2009-2015) the Landscape Sensitivity between Oughterard and Clifden is rated from Class 3 (High) to Class 5 (Unique), predominately the latter.

Recent population growth at national and regional levels had been faster than envisaged in either the National Spatial Strategy or the West Regional Authority Regional Planning Guidelines 2004 – 2016. Both Oughterard and Clifden have seen substantial population growth in the inter-census period 2002-2006 of 7.9% and 10.5% respectively. The recent 2011 Census has shown a slow down in population growth in the inter-census period 2007-2011 to 1.6% in Oughterard however Clifden has shown a 23.2% increase (CSO, 2012). Outside of town environs a typically rural settlement pattern is evident with relatively sparse development on the local road network and a greater, though still low development density, along the existing N59.

6 PROJECT DESCRIPTION

6.1 INTRODUCTION

This Chapter of the EIS details the proposed Connemara Greenway Project – Clifden to Oughterard. In completing this chapter Schedule 6(2) (a) of the Planning and Development Regulations 2001, as amended, (setting out the elements to be included when describing the proposed development) has been considered, as outlined below:

"(i) a description of the **physical characteristics** of the whole proposed development and the **land-use requirements** during the construction and operational phases;

(ii) a description of the main characteristics of the production processes, for instance, **nature and quantity of the materials used**;

(iii) an estimate, by type and quantity, of **expected residues and emissions** (including water, air and soil pollution, noise, vibration, light, heat and radiation) resulting from the operation of the proposed development;".

The proposed project is described in terms of design rationale, detailed measures, construction stage activities, spoil management, and operational or maintenance requirements.

It is proposed to upgrade the existing corridor to accommodate walkers and cyclists along its length. This will require the upgrading of the surface to provide safe and secure walking and cycling, appropriate fencing and access points, and upgrading of water crossings and bridges as deemed necessary. **Image 6.1** shows examples of bridge structures, gates and fencing from a similar Greenway project developed in County Mayo between Mulranny and Westport.

It is proposed to develop the Greenway walking/cycle track along the existing dismantled Galway to Clifden railway. This Greenway development is a community driven project by local community groups in Clifden, Recess and Oughterard with support from Fáilte Ireland, Galway County Council and Forum Connemara Ltd. It is hoped that this development would benefit local communities by providing a secure and safe environment for walkers, and cyclists leading to an increased opportunity for physical exercise. It would also provide a unique and novel experience for visitors to the area.

The full extent of the proposed Greenway is shown in the location maps in **Figures 6.1 (Sheet 1-15)**. The proposed Greenway route is delineated by chainages from 0 to 51+300. Sections in the proposed Greenway are referenced as being between two chainage points. Corresponding townlands and section lengths have been provided in **Table 6.1**. There are a number of offline sections which add approximately 3km to the overall length of the proposed Greenway.

The existing route for walkers and cyclists is via the N59 National Secondary Road and the National Roads Authority plan to upgrade the existing N59 National Secondary Road to a Type 3 Single Carriageway (S2). The upgrade will comprise of predominantly on-line widening with some off-line sections. The overall length of proposed N59 road development is approximately 47.8km. It runs from the eastern end of Clifden town in Tullyvoheen Townland to the west of Oughterard in Claremount Townland, County Galway.

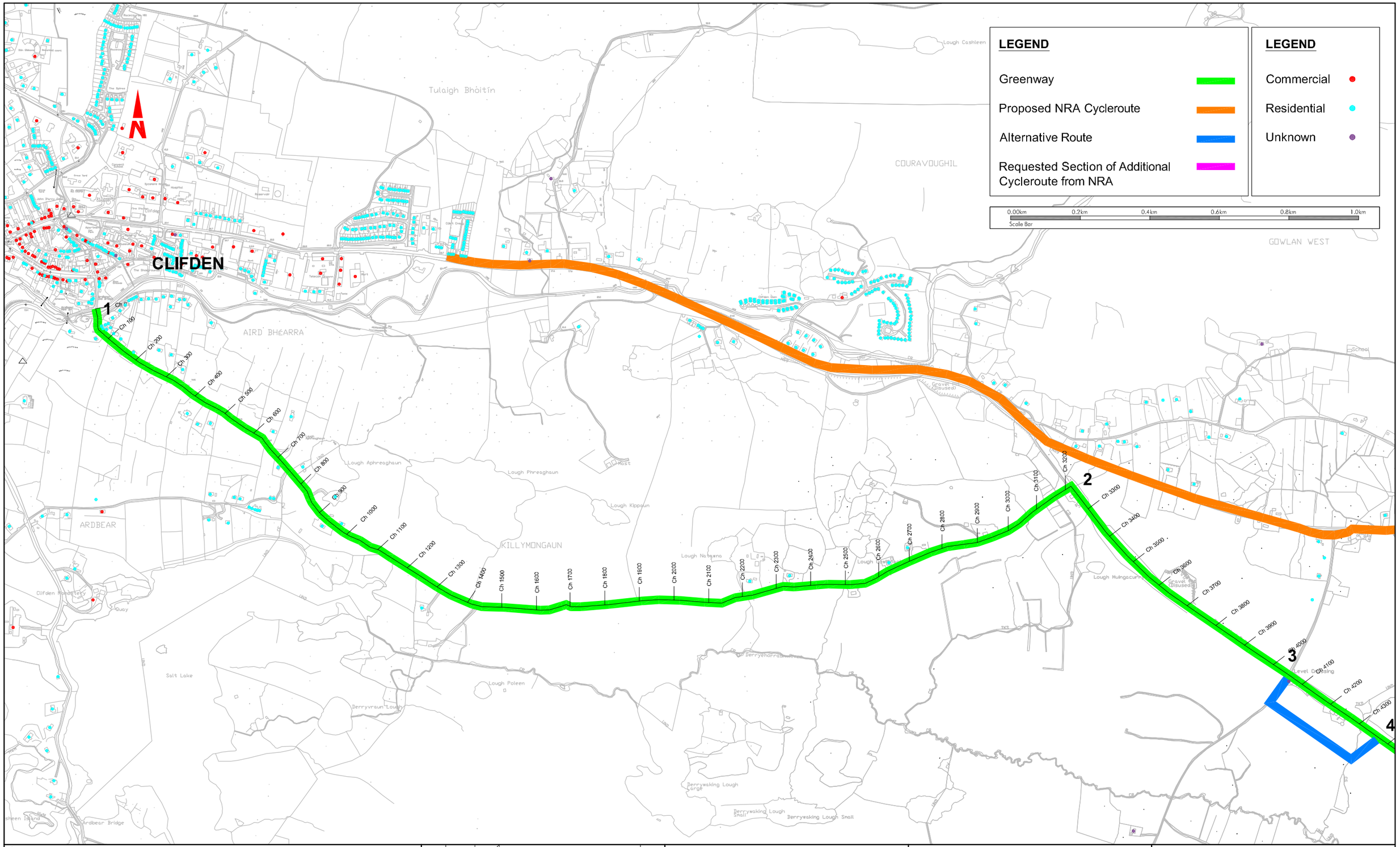
The proposed N59 will have a segregated 2.5m wide shared footway/cycleway. The section of the shared footway/cycleway between Recess and Maam Cross will form part of the Connemara Greenway Project – Clifden to Oughterard. The N59 on-line section of the Greenway is approximately 11.47km in length.

Table 6.1 Connemara Greenway – Clifden to Oughterard Route Sections

From Chainage (Townland)	To Chainage (Townland)	Section Length (km)	Section Description
Ch 0 (Ardbear)	Ch3200 (Gowlan West)	3.2	On existing roadway.
Ch 3200 (Gowlan West)	Ch 4050 (Gowlan West)	0.85	On dismantled railway.
Ch 4050 (Gowlan West)	Ch 4300 (Gowlan West)	0.25	Alternative route on existing track.
Ch 4300 (Gowlan West)	Ch 11150 (Derryvickrune)	6.85	On dismantled railway.
Ch 11150 (Derryvickrune)	Ch 11700 (Ballynahinch)	0.55	Runs over the Cloonbeg River Bridge onto local road L-5137-0. The section marked in blue is an alternative route on a forestry road which also leads onto the same local road. (L-5137-0).
Ch 11700 (Ballynahinch)	Ch 11750 (Cloonbeg)	0.05	Offline section on forestry road.
Ch 11750 (Cloonbeg)	Ch 12700 (Cloonbeg)	0.85	On the R-341.
Ch 12700 (Cloonbeg)	Ch 14800 (Ballinafad)	2.2	At Ch12700 the Greenway reverts back onto the dismantled railway line as far as Ch14800.
Ch 14800 (Ballinafad)	Ch 15150 (Ballinafad)	0.35	Between Ch14800 and Ch15150 the Greenway route is on the R341.
Ch 15150 (Ballinafad)	Ch 17380 (Athry)	2.25	Between Ch15150 and Ch17380 the Greenway follows the dismantled railway line until it crosses the N59 at Athry Ballinafad.
Ch 17380(Athry)	Ch 19950 (Garroman)	2.55	The section marked Ch17380- Ch19950 again follows the dismantled railway line.
Ch 19950 (Garroman)	Ch 20050 (Garroman)	0.1	At Ch19950 there is no access to the N59 as a dwelling has been constructed on the line. So it is proposed to take an alternative route marked in blue south of the cottage to join the proposed Cycleway to be constructed by the National Roads Authority (NRA).
Ch 20050 (Garroman)	Ch 31500 (Bunscanniff)	11.45 (N59)	From Ch20030 – Ch31500 Cycleway is to be constructed by National Roads authority as part of the proposed N59 upgrade project.
Ch 31500 (Bunscanniff)	Ch 34480 (Shannaunnafeola)	3	The proposed National Roads Authority cycleway ends at Ch31500 on the South side of the N59. The greenway at this point will then follow the existing dismantled railway on the North side of the existing N59.
Ch 34480 (Shannaunnafeola)	Ch 34950 (Shannaunnafeola)	0.45	Here the section of railway from Ch31500– Ch34480 where

From Chainage (Townland)	To Chainage (Townland)	Section Length (km)	Section Description
Ch 34950 (Shannaunnafeola)	Ch 35100 (Lurgan (Shindilla))	0.15	the Greenway takes an alternative route at Ch34480. This alternative route is used as the dismantled railway runs adjacent to an existing occupied dwelling. The alternative route is shown in Blue from Ch34480 and joins the Greenway again at Ch35450. The route between Ch35100 – Ch35400 follows the dismantled railway and would be our preferred route.
Ch 35100 (Lurgan (Shindilla))	Ch 35150 (Lurgan (Shindilla))	0.05	
Ch 35150 (Lurgan (Shindilla))	Ch 35450 (Lurgan (Shindilla))	0.3	
Ch 35450 (Lurgan (Shindilla))	Ch 35450 (Lurgan (Shindilla))	0.3 (Offline)	
Ch 35450 (Lurgan (Shindilla))	Ch 40200 (Lurgan (Shindilla))	0.75	This map shows the greenway follow the track from Ch35400 – Ch40200.
Ch 40200 (Lurgan (Shindilla))	Ch 41700 (Leam West)	1.65	Ch40200 – Ch41700 follows the dismantled railway line. 90% of the route between these two points is used as a bog road and access to commonage.
Ch 41700 (Leam West)	Ch 44510 (Leam East)	2.65	From Ch41700 – Ch44510 the Greenway follows the railway line. This section is now in use as a local road (L-53281). At Ch44510 the dismantled railway continues east. This section at the moment is not an option as the route runs adjacent to an existing dwelling. We are proposing to use the local road (L-53281) shown in blue over the Quiet man bridge and join in with the National Roads Authorities proposed Cycleway shown in yellow.
Ch 44510 (Leam East)	Ch 44800 (Derryerglinna)	0.3	Alternative route on local road to join up with N59.
Ch 44800 (Derryerglinna)	Ch 46200 (Glengowla West)	1.4	Section on N59.
Ch 46200 (Glengowla West)	Ch 46550 (Glengowla West)	0.35	At Ch46200 we plan to use an alternative route to avoid the dwellings that are on the dismantled railway. We propose to rejoin the track at Ch46550.
Ch 46550 (Glengowla West)	Ch 48840 (Glengowla East)	2.3	On dismantled railway
Ch 48840 (Glengowla East)	Ch 48800 (Glengowla East)	0.6 (Offline)	Marked in blue is an alternative route using a bog road at Ch48840.
Ch 48850 (Glengowla East)	Ch 51300 (Cregg)	2.45	On dismantled railway. The Greenway terminates at Ch51300 in Oughterard.
Ch 48800 (Glengowla East)	Ch 48800 (Claremount)	1.6 (N59)	Is on a section of Cycleway that we have asked the NRA to construct along their proposed N59 realignment project.
	Total	**52.4**	

Image 6.1 Selection of Images from the Mulranny to Westport Greenway



Notes:

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5. Datum: Ordnance Survey Datum, Malin Head

No.	Date	Drn. / Chk.	Amendment / Issue	App
F01	16.05.12	AN / PK	FINAL ISSUE	WM
D02	20.04.12	AN / DM	DRAFT ISSUE	WM
D01	14.03.12	MC / PK	DRAFT ISSUE	WM

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Project
CONNEMARA GREENWAY PROJECT

Drawing Number
MGE0269/DG0001-01

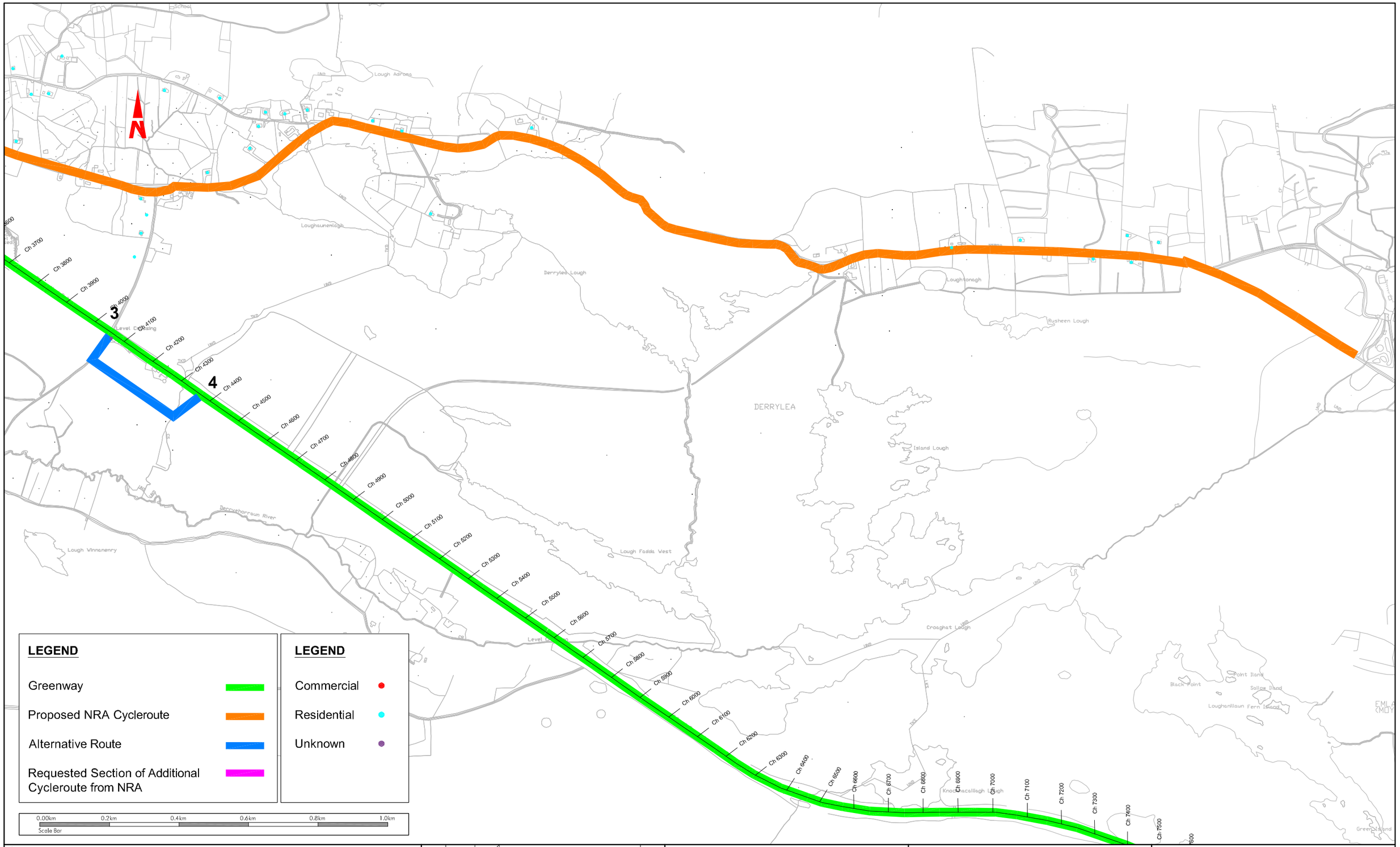
Rev
F01

Title
FIGURE 6.1
LOCATION MAP

Sheet 1 of 15

Scale	Drawn By	Checked By	Approved By	Date
1:10,000 @ A3	MC	PK	WM	March 2012

MGE0269DG0001 Location Maps.dwg



LEGEND

- Greenway
- Proposed NRA Cycleroute
- Alternative Route
- Requested Section of Additional Cycleroute from NRA

LEGEND

- Commercial
- Residential
- Unknown

0.00km 0.2km 0.4km 0.6km 0.8km 1.0km
Scale Bar

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Project
CONNEMARA GREENWAY PROJECT

Drawing Number
MGE0269/DG0001-02

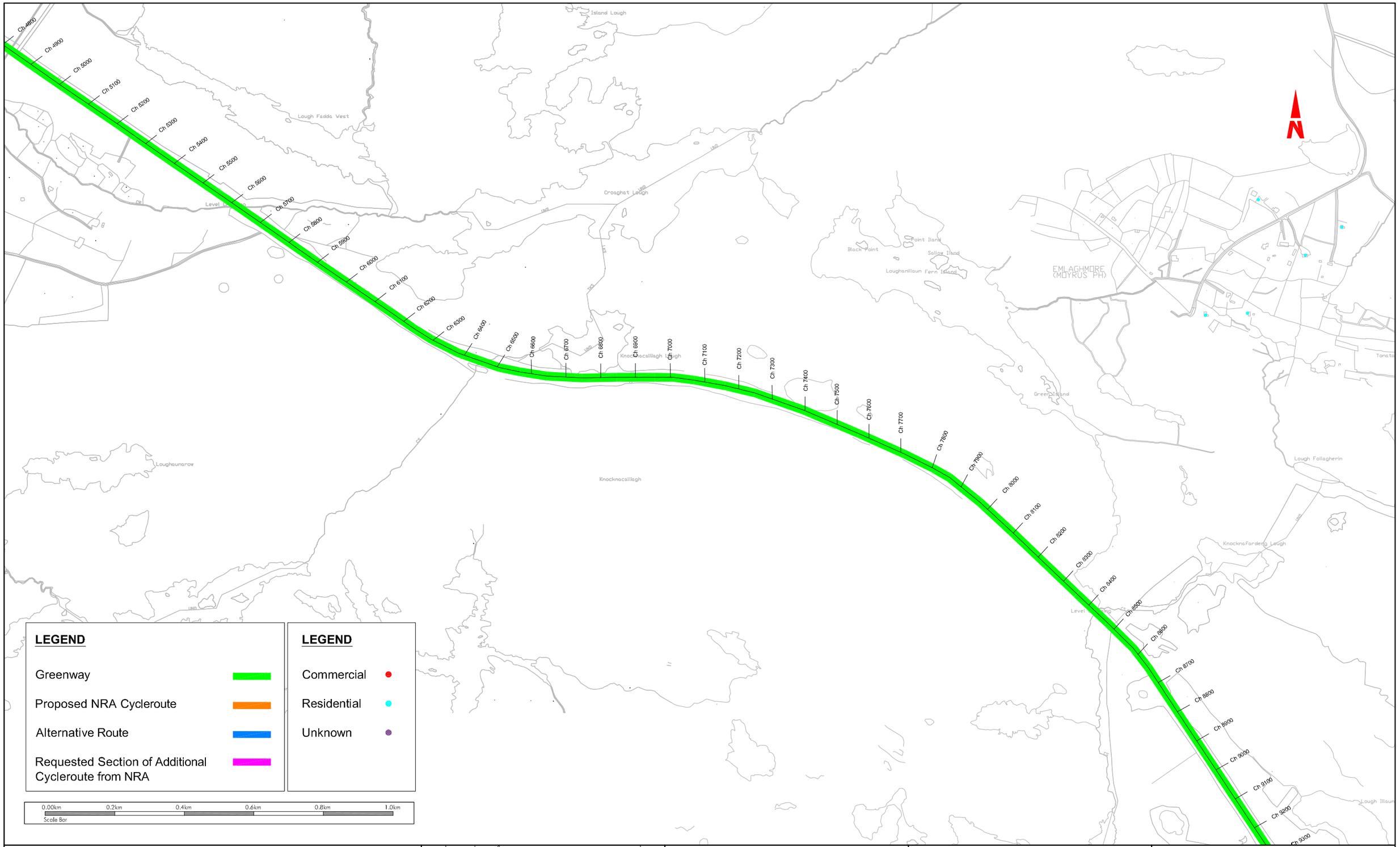
Rev
F01

Title
FIGURE 6.1
LOCATION MAP

Scale: 1:10,000 @ A3
Drawn By: MC
Checked By: PK
Approved By: WM
Date: March 2012

Sheet 2 of 15

MGE0269DG0001 Location Maps.dwg



LEGEND

- Greenway
- Proposed NRA Cycleroute
- Alternative Route
- Requested Section of Additional Cycleroute from NRA

LEGEND

- Commercial
- Residential
- Unknown

0.00km 0.2km 0.4km 0.6km 0.8km 1.0km
Scale Bar

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Drawing Number: MGE0269/DG0001-03
Rev: F01

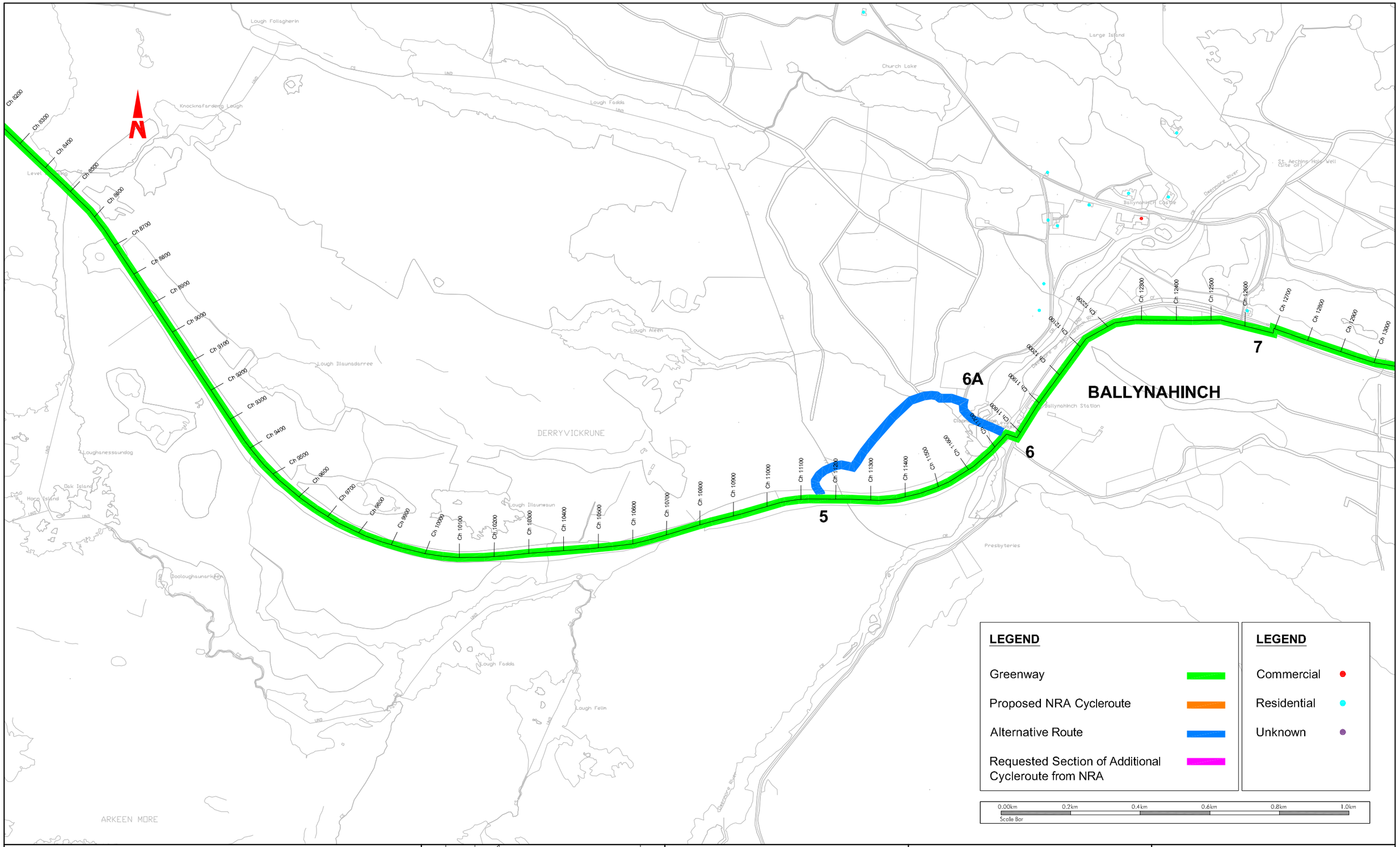
Project: CONNEMARA GREENWAY PROJECT

Title: FIGURE 6.1 LOCATION MAP

Sheet 3 of 15

Scale	Drawn By	Checked By	Approved By	Date
1:10,000 @ A3	MC	PK	WM	March 2012

MGE0269DG0001 Location Maps.dwg



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Drawing Number: MGE0269/DG0001-04
Rev: **F01**

Title: **FIGURE 6.1 LOCATION MAP**

Sheet 4 of 15

Scale	Drawn By	Checked By	Approved By	Date
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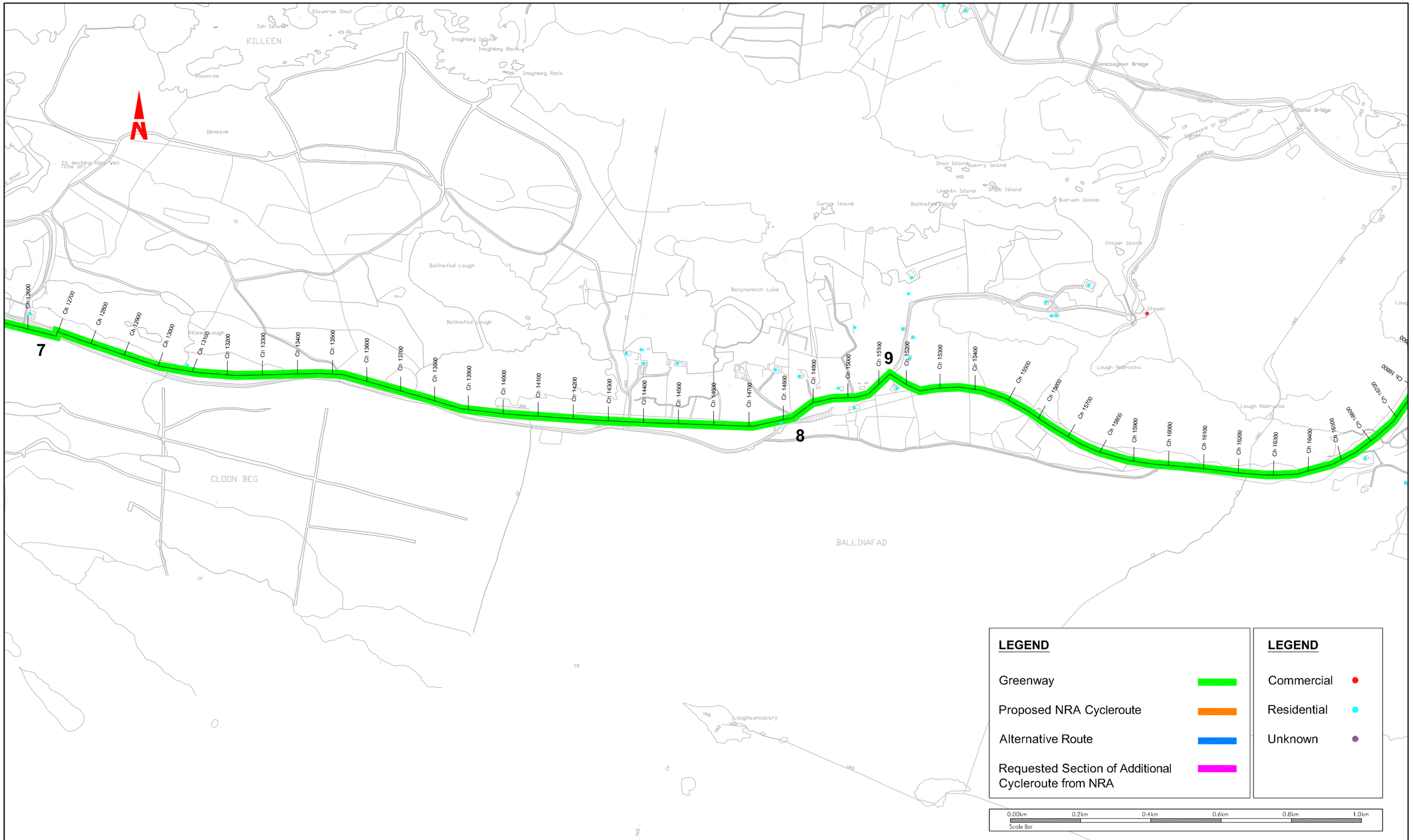
MGE0269DG0001 Location Maps.dwg



LEGEND

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LEGEND

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- Residential
- Unknown

0.00km 0.2km 0.4km 0.6km 0.8km 1.0km
Scale Bar

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Drawing Number
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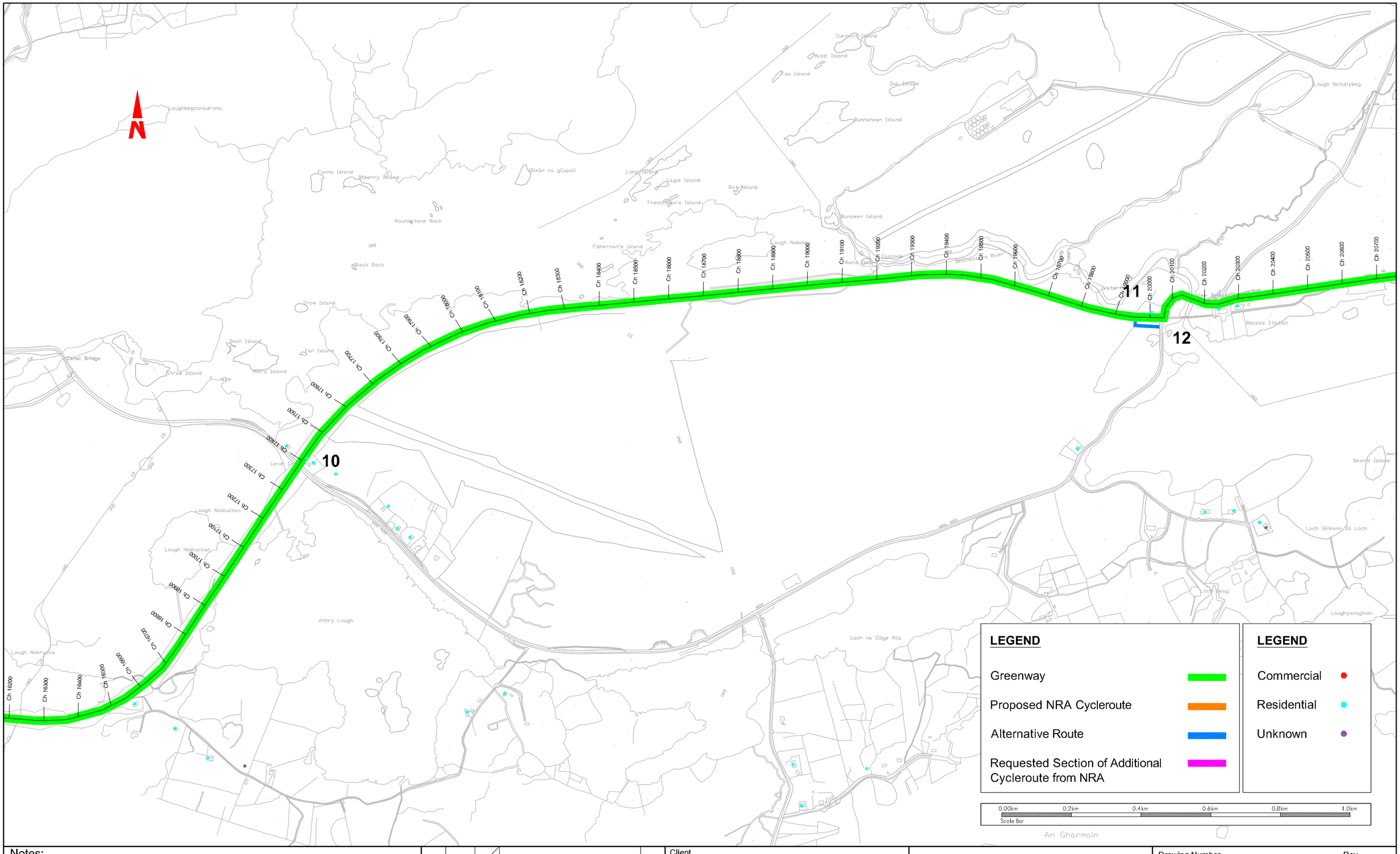
Title
FIGURE 6.1
LOCATION MAP

Sheet 5 of 15

Scale	Drawn By	Checked By	Approved By	Date
1:10,000 @ A3	MC	PK	WM	March 2012

MGE0269DG0001 Location Maps.dwg



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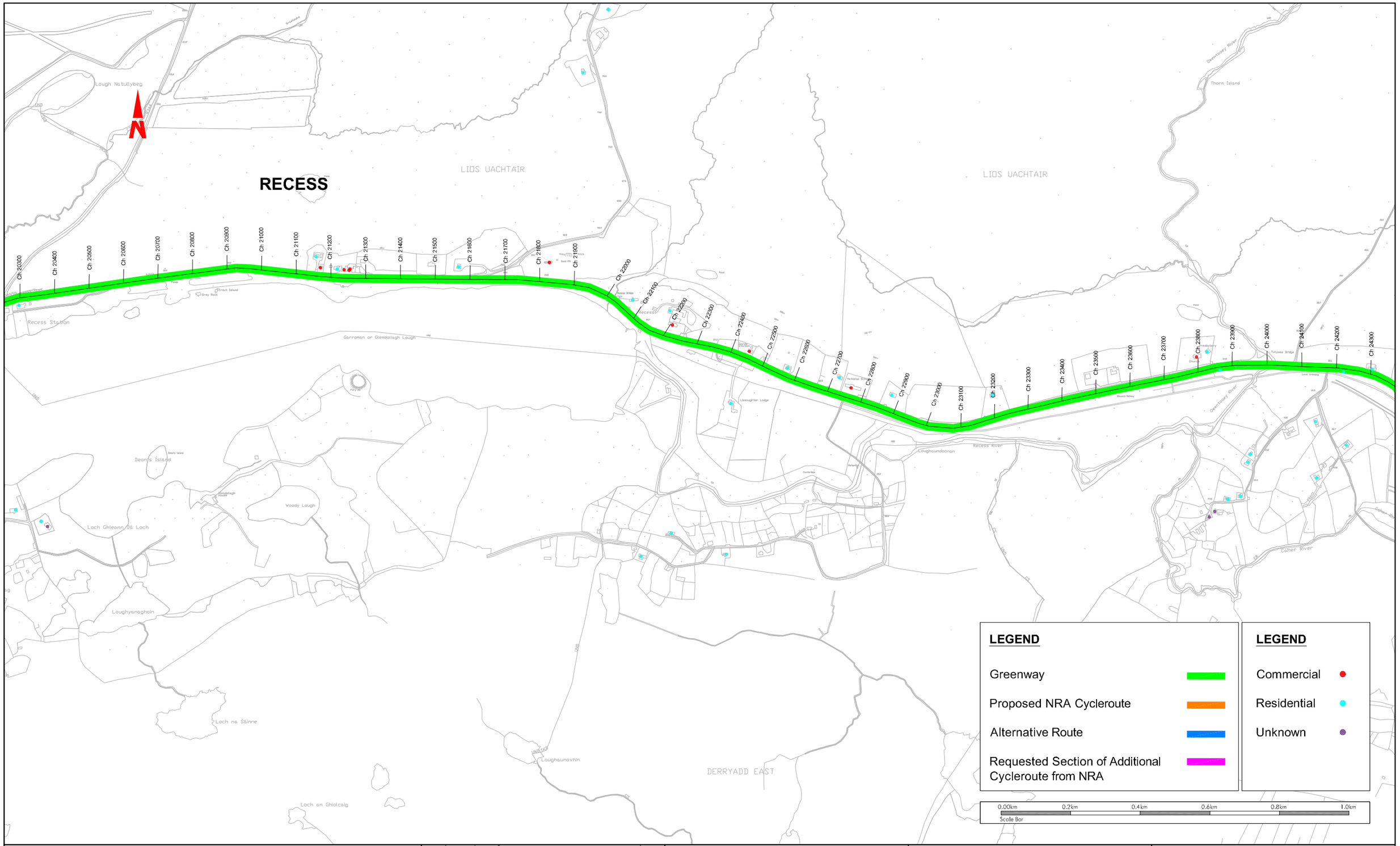
Title
FIGURE 6.1
LOCATION MAP

Sheet 6 of 15

Scale	Drawn By	Checked By	Approved By	Date
1:10,000 @ A3	MC	PK	WM	March 2012

MGE0269DG0001 Location Maps.dwg



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Drawing Number: MGE0269/DG0001-07
Rev: **F01**

Title: **FIGURE 6.1 LOCATION MAP**

Sheet 7 of 15

Scale	Drawn By	Checked By	Approved By	Date
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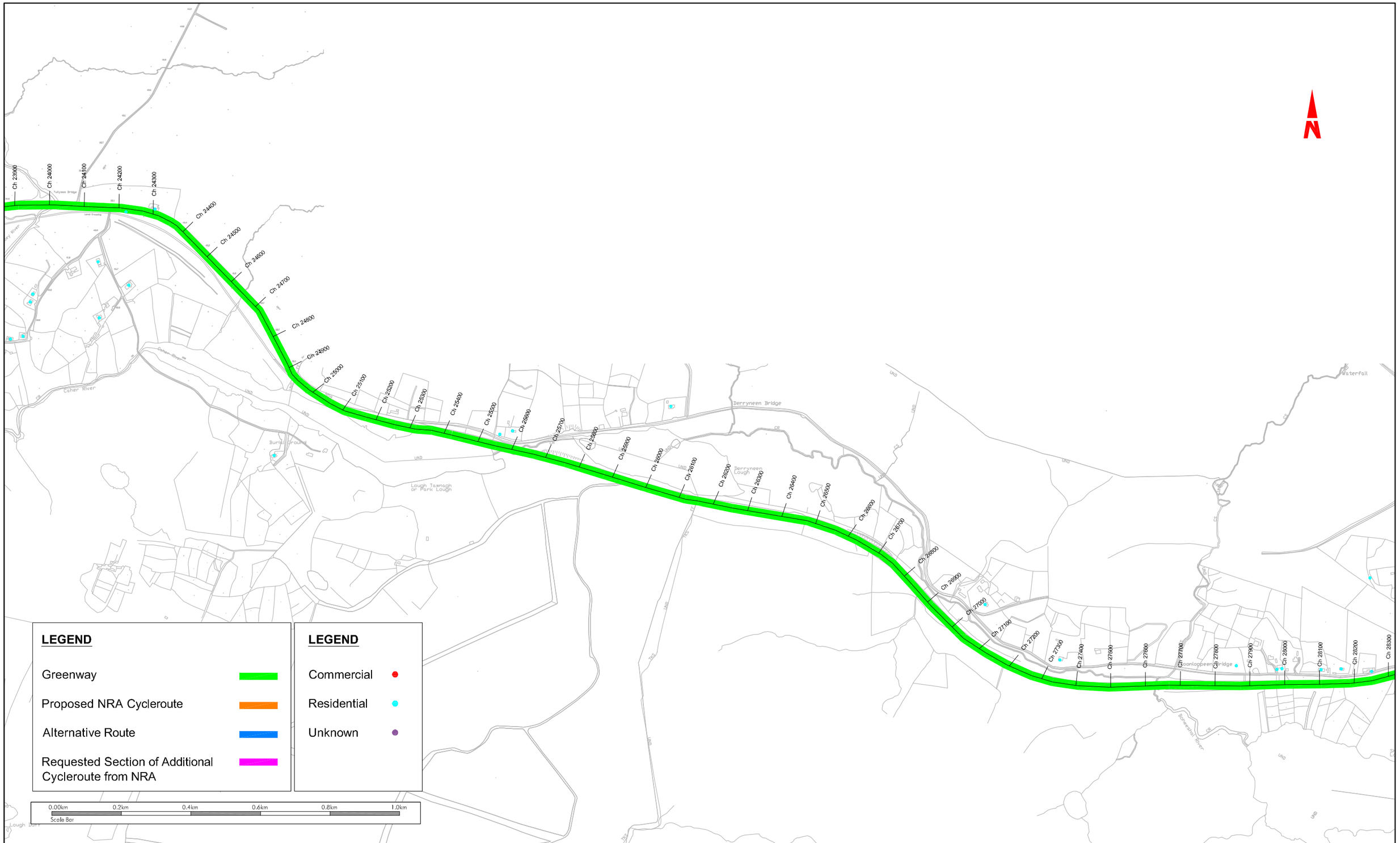
MGE0269DG0001 Location Maps.dwg



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D01	14.03.12	MC / PK	DRAFT ISSUE	WM

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Drawing Number
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Rev
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Title
FIGURE 6.1
LOCATION MAP

Scale
1:10,000 @ A3

Drawn By
MC

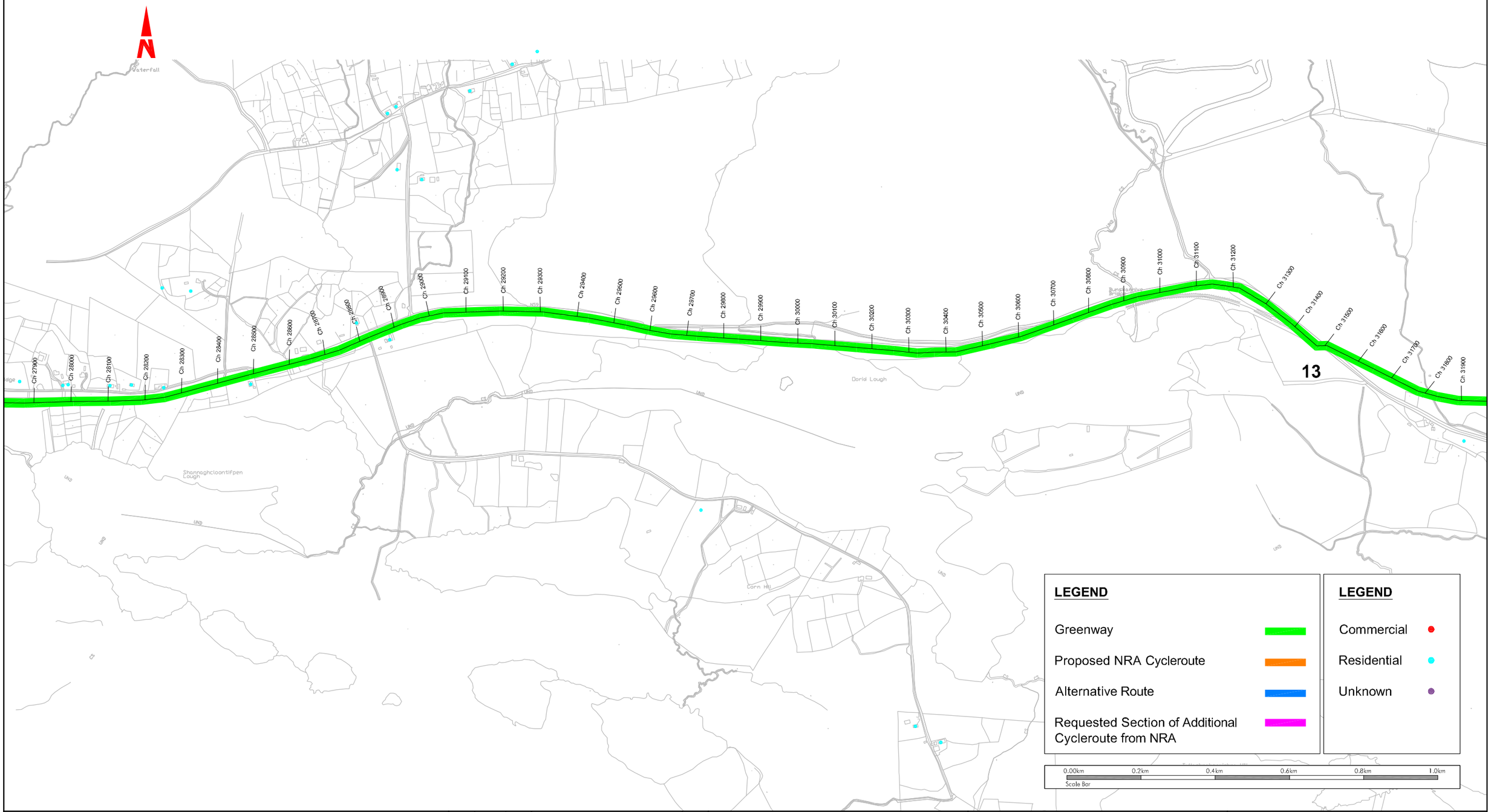
Checked By
PK

Approved By
WM

Date
March 2012

Sheet 8 of 15

MGE0269DG0001 Location Maps.dwg



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Title
FIGURE 6.1
LOCATION MAP

Sheet 9 of 15

Scale	Drawn By	Checked By	Approved By	Date
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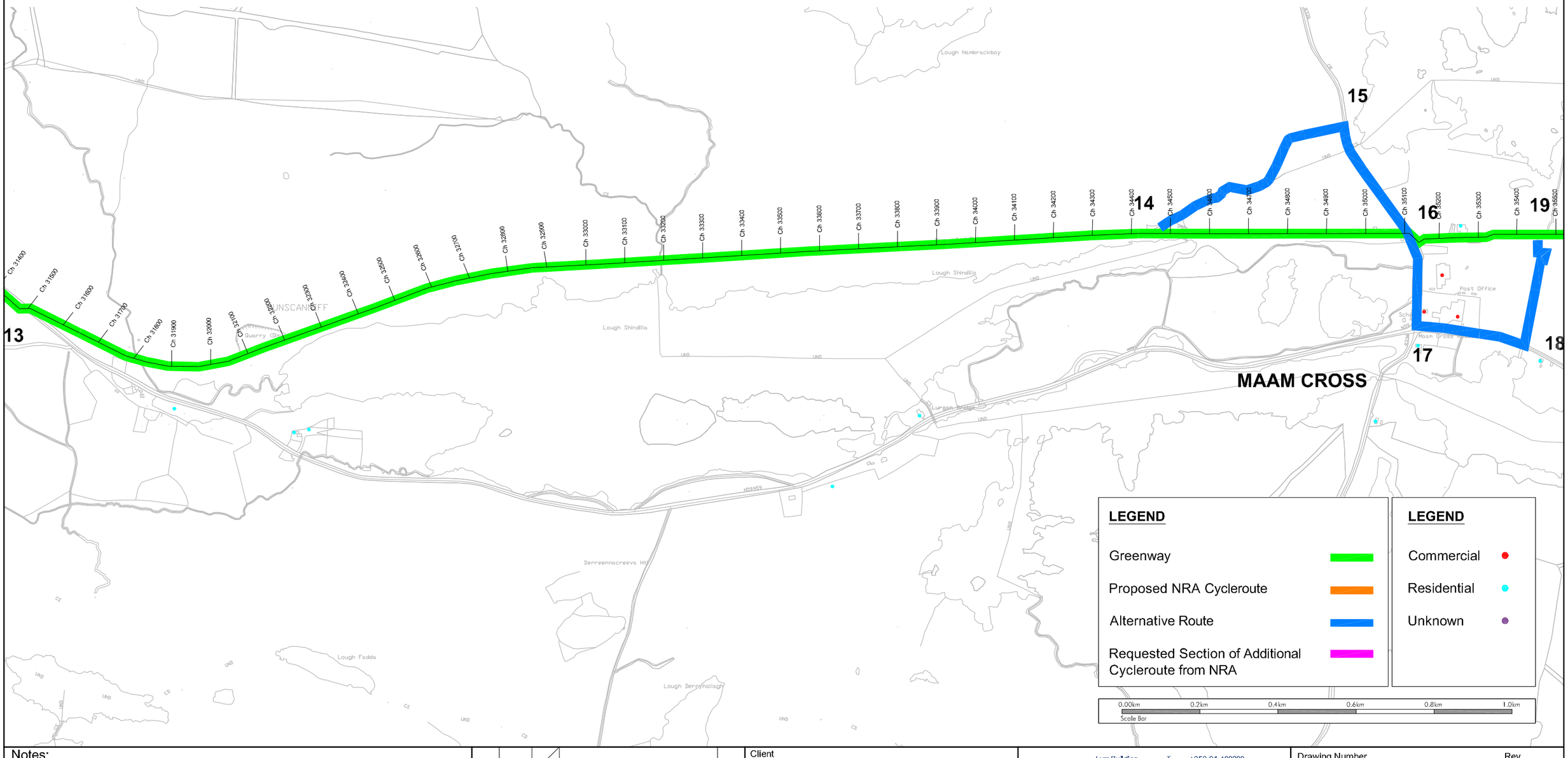
MGE0269DG0001 Location Maps.dwg



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CONNEMARA GREENWAY PROJECT

Drawing Number
MGE0269/DG0001-10

Rev
F01

Title
FIGURE 6.1
LOCATION MAP

Scale
1:10,000 @ A3

Drawn By
MC

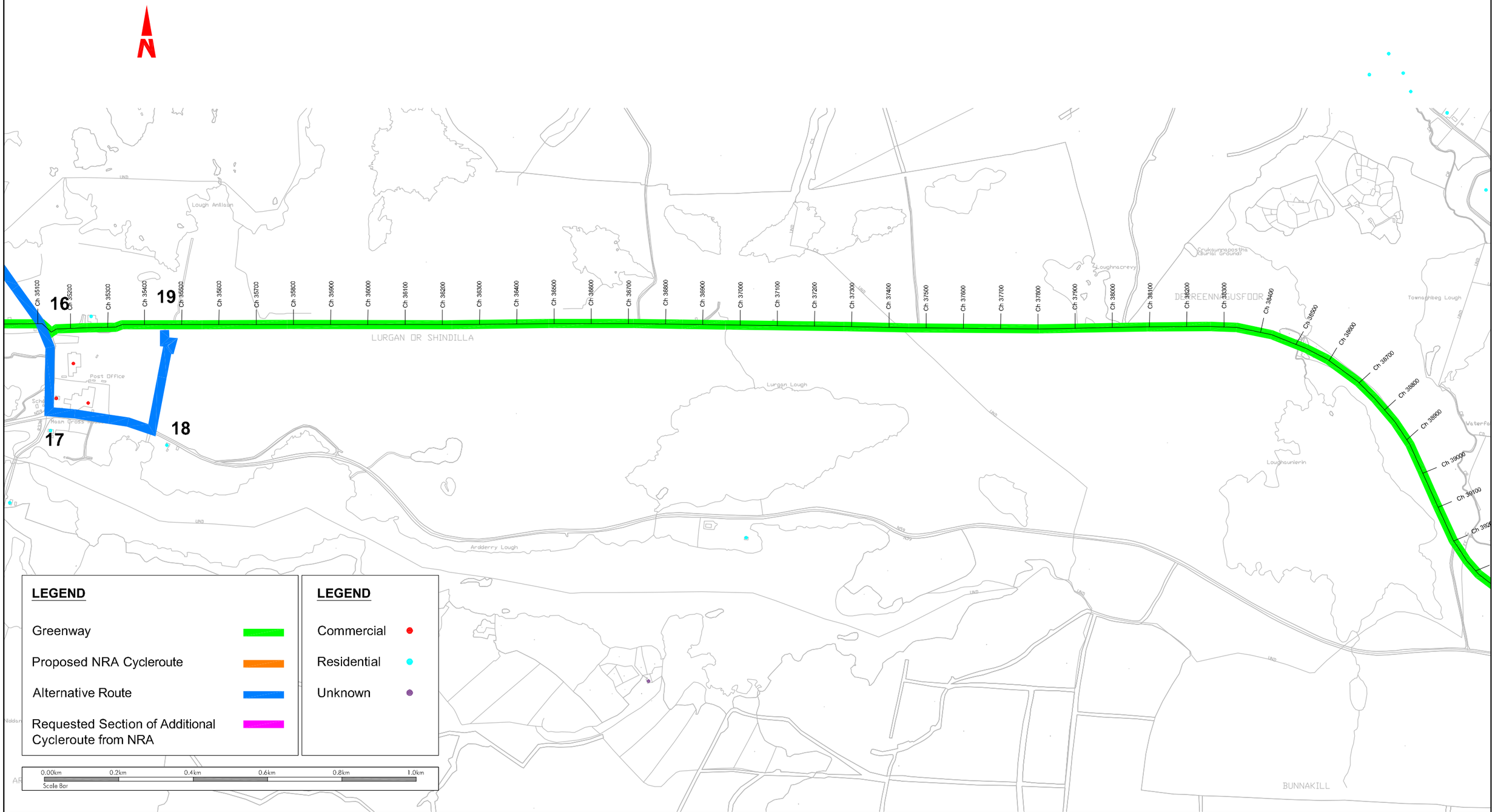
Checked By
PK

Approved By
WM

Date
March 2012

Sheet 10 of 15

MGE0269DG0001 Location Maps.dwg



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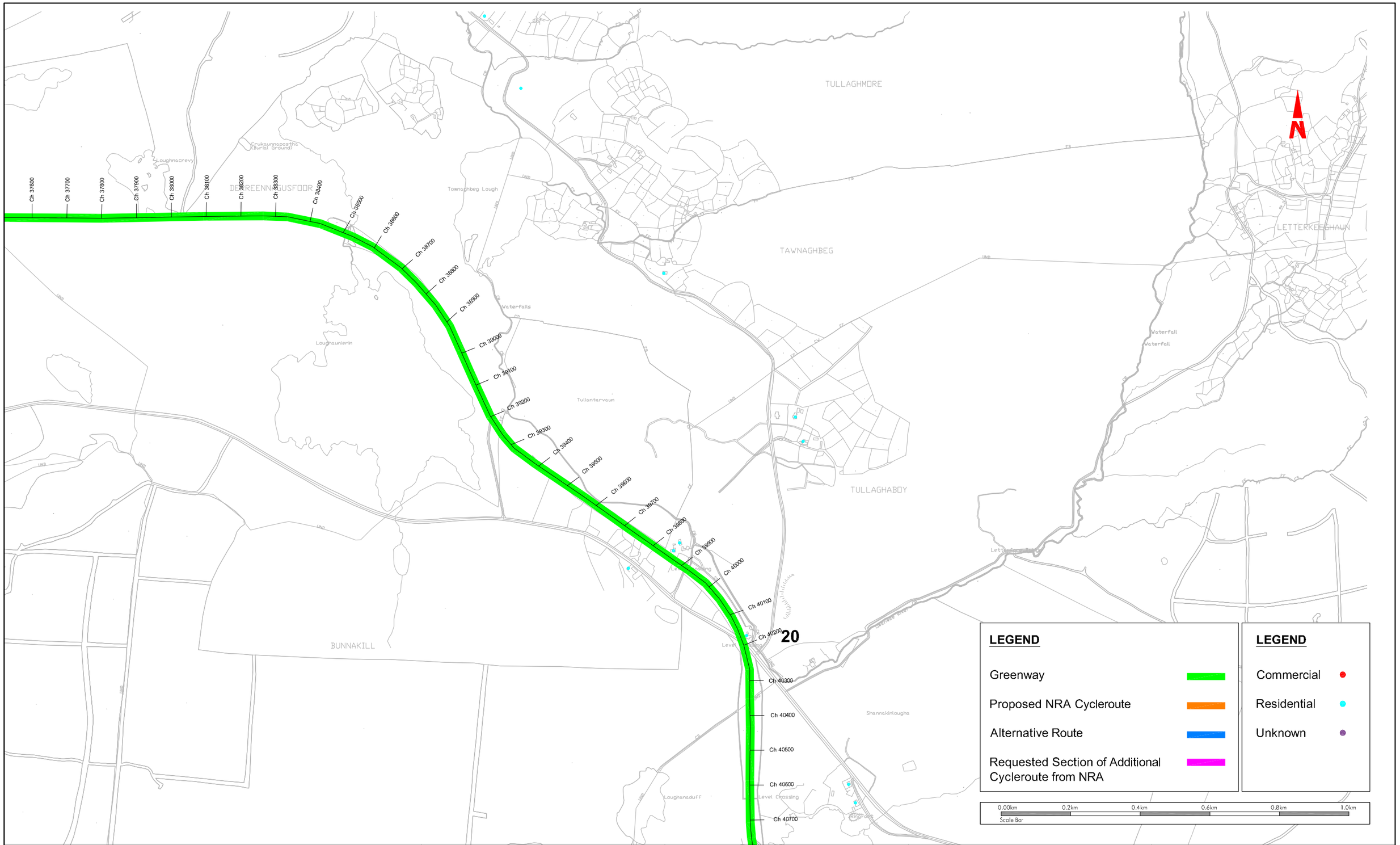
Title
FIGURE 6.1
LOCATION MAP

Sheet 11 of 15

Scale	Drawn By	Checked By	Approved By	Date
1:10,000 @ A3	MC	PK	WM	March 2012

MGE0269DG0001 Location Maps.dwg



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Project: **CONNEMARA GREENWAY PROJECT**

Drawing Number: MGE0269/DG0001-12
Rev: **F01**

Title: **FIGURE 6.1 LOCATION MAP**

Sheet 12 of 15

Scale	Drawn By	Checked By	Approved By	Date
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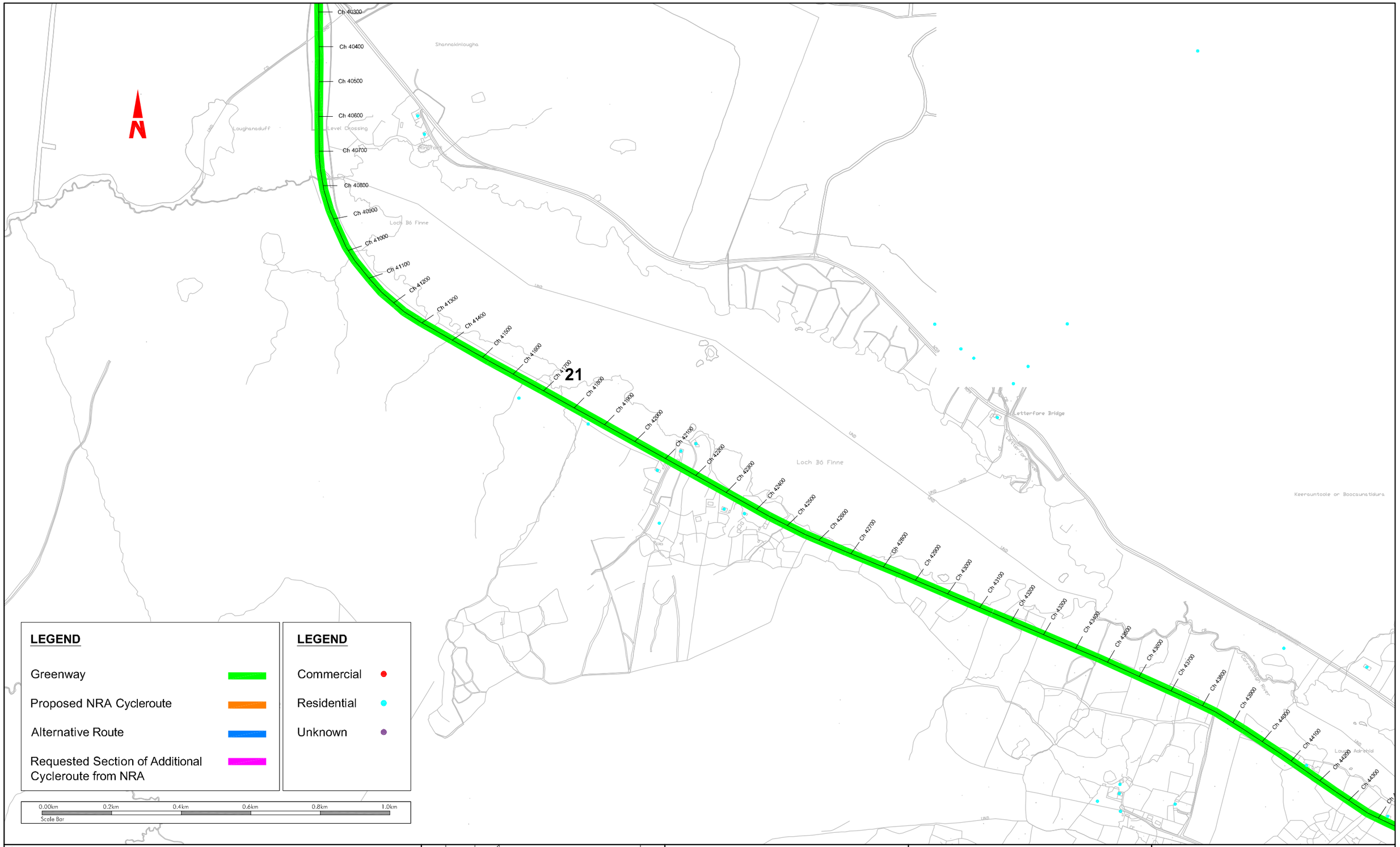
MGE0269DG0001 Location Maps.dwg



LEGEND

- Greenway
- Proposed NRA Cycleroute
- Alternative Route
- Requested Section of Additional Cycleroute from NRA

LEGEND

- Commercial
- Residential
- Unknown

0.00km 0.2km 0.4km 0.6km 0.8km 1.0km
Scale Bar

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D02	20.04.12	AN / DM	DRAFT ISSUE	WM
D01	14.03.12	MC / PK	DRAFT ISSUE	WM

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Title
FIGURE 6.1
LOCATION MAP

Sheet 13 of 15

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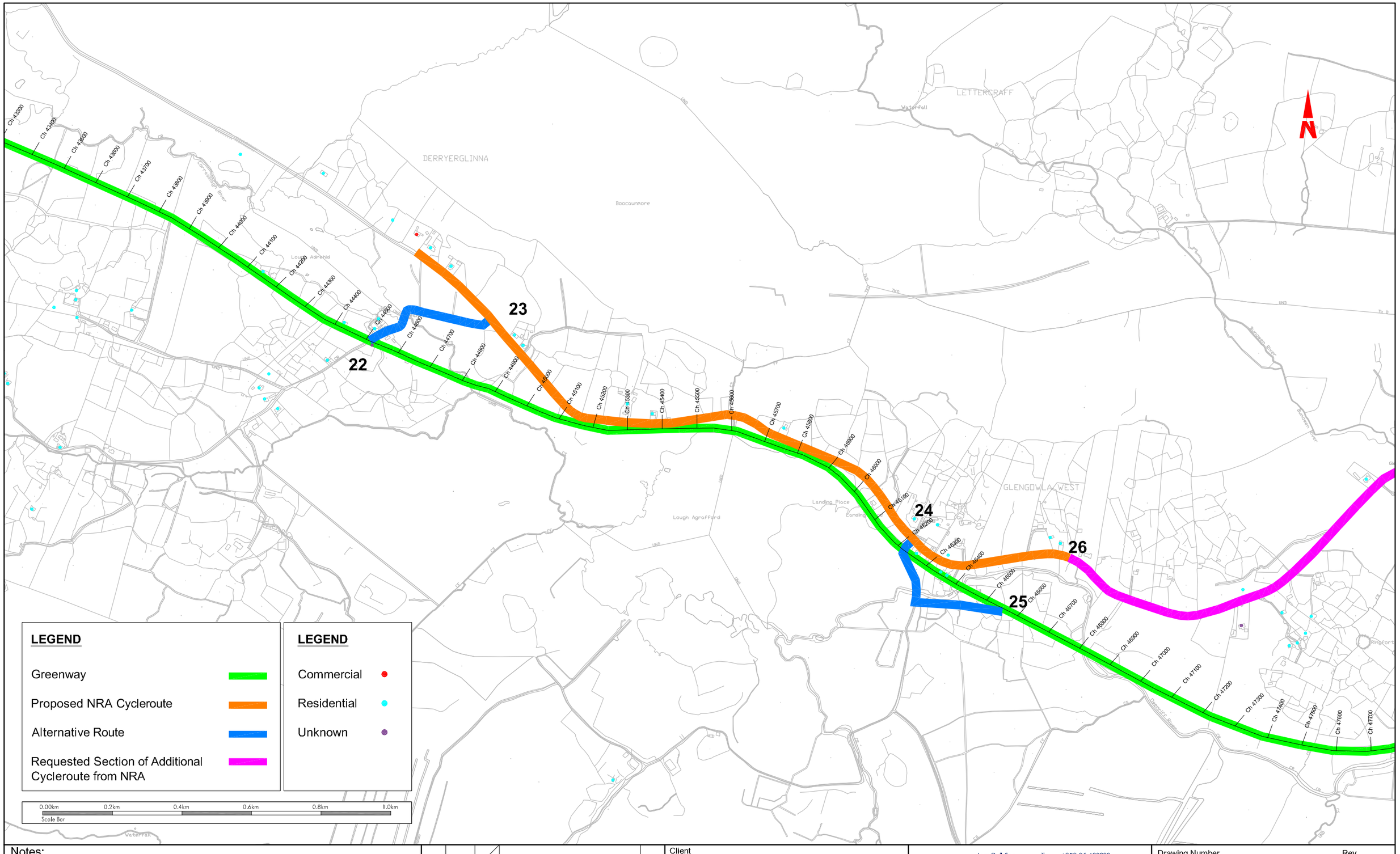

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Title
FIGURE 6.1
LOCATION MAP

Sheet 14 of 15

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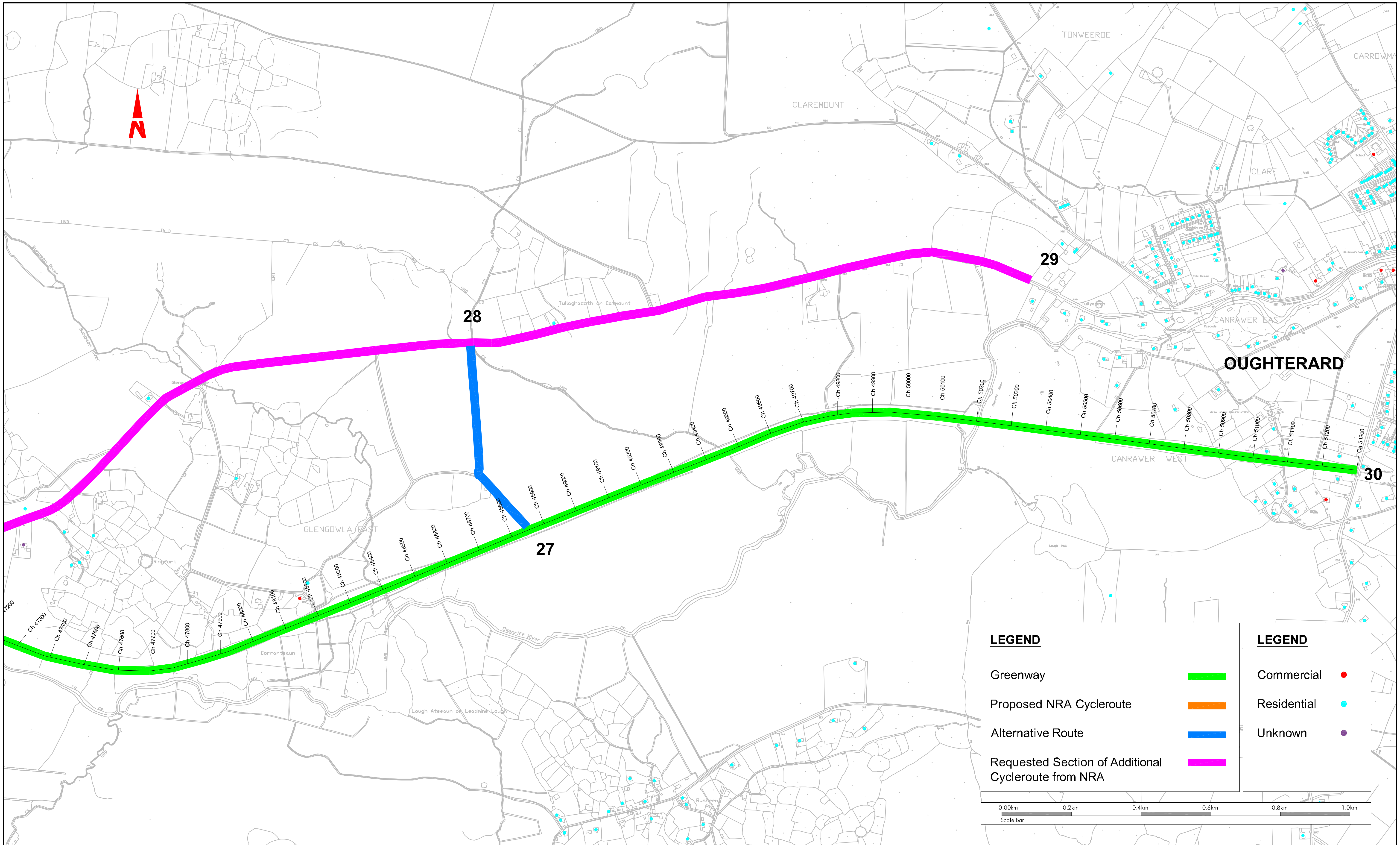

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Project: **CONNEMARA GREENWAY PROJECT**

Drawing Number: MGE0269/DG0001-15 — Rev: F01

Title: **FIGURE 6.1 LOCATION MAP**

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1:10,000 @ A3	MC	PK	WM	March 2012

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6.2 CONNEMARA GREENWAY PROJECT – CLIFDEN TO OUGHTERARD DESIGN PHILOSOPHY

6.2.1 PREFERRED DESIGN STANDARDS

In the design of the proposed Greenway the following publications have been consulted:

- The National Transport Authority's *National Cycle Manual* (NTA, 2011);
- The National Roads Authority's *Design Manual for Roads and Bridges* (NRA, 2001); and
- The jointly published *Traffic Management Guidelines* (DTO et al., 2003).

6.3 DETAILED DESCRIPTION OF THE PROPOSED GREENWAY PROJECT

6.3.1 Laying Base Course and Compaction

- The Greenway base will consist of 150mm of crushed stone to Clause 804, rolled and compacted.
- Geotextile will be used to separate earthworks materials. The geotextile required as part of the works shall be manufactured from synthetic or other fibres as required therein and shall be in the form of thin permeable membranes.
- The ground conditions will vary immensely. Greenways are generally designed for relatively light loadings and it is entirely possible that the most arduous conditions they are subject to will be the construction process itself. Greenways are not roads but at the same time they will have to take the occasional loading of maintenance vehicles and similar.
- The sub-base will generally be wider than the finished surface of the path in order to give support to the edges of the path and will be constructed of whatever materials are available locally. The function of the sub-base is to spread the load evenly over the subgrade. It needs to be sufficiently thick so that it will not deform under the wheels of maintenance vehicles, cracking or damaging the finished surface.

6.3.2 Final Surface

The final surface will consist of Polymer Modified Stone Mastic Asphalt surface courses which shall conform to IS EN 13108-5. This is defined as an application of a polymer modified bitumen emulsion bond coat overlaid by a polymer modified hot bituminous mixture. This specification is for hot laid surfacing with a compacted thickness of 20mm to 40mm, in which the aggregate particles are necessarily gap-graded to form a stone to stone contact and to provide an open surface texture.

The mixture designation shall be SMA 14 Surf PMB 65/105 – 60 des, 30mm thick, as per CL942 of series 900 of the NRA 'Specifications for Road Works'. **Image 6.2** below provides an example of a comparable surface being laid. A typical cross section detail of the Greenway is shown in **Figure 6.21** and a typical design detail of the proposed cycleway is provided in **Figure 6.22.**

Image 6.2 Example of a similar final surface being laid

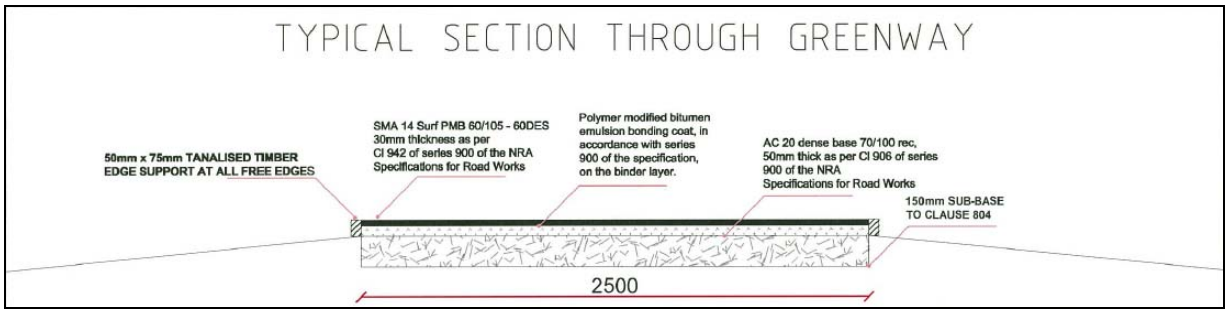


Figure 6.2 Typical Section through Greenway (Source: Galway County Council, 2012)

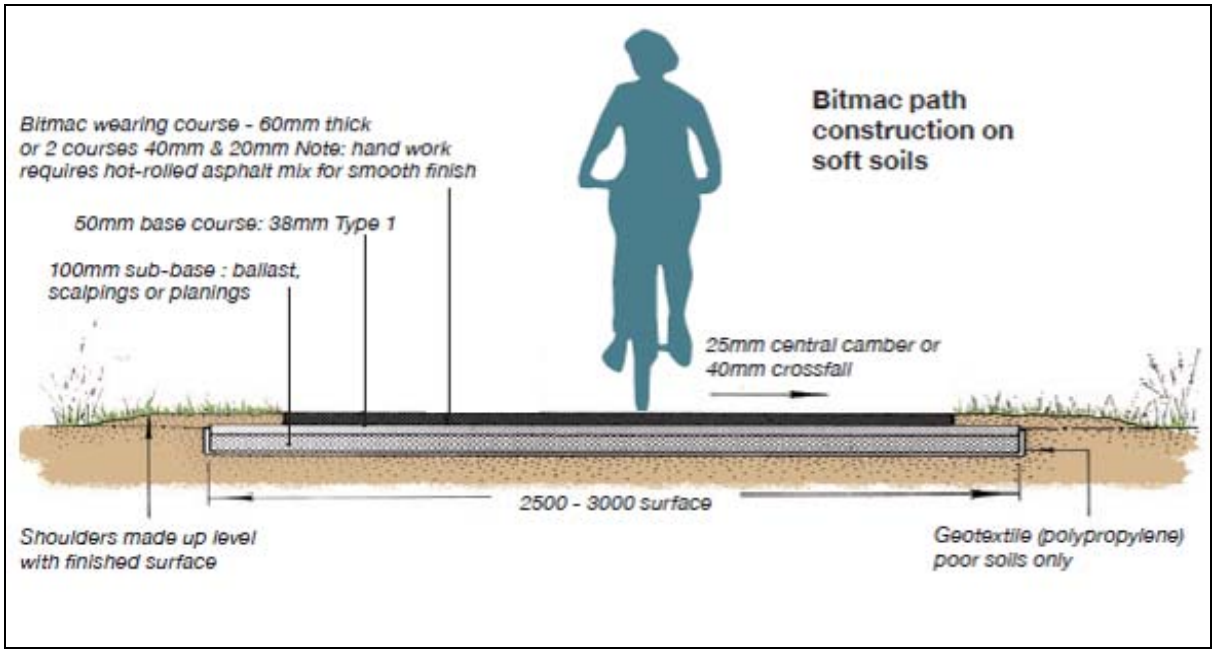


Figure 6.3 Typical Design Detail of the Proposed Greenway (Source: Sustrans, 2012)

6.3.3 Fencing, Gates and Cattle stops

It will be necessary to fence both sides of the Greenway where landowners require it. Fencing will not be provided where the landowner specifically requests this to be the case. At areas where livestock need to be moved there are a number of different options to enable farmers to move livestock in a safe manner both for the stock and for Greenway users. Below are a number of different options for cattle stops (**Image 6.3** and **6.4**), fencing (**Figures 6.4** and **6.5**) and cattle grid detail (**Figure 6.6**) which is dependent on the different needs of each farmer.

It is envisaged that fencing where required alongside the proposed Greenway will be the first item to be dealt with by a contractor to establish the site boundaries.

Image 6.3 Example of Greenway Section with Cattle Stops

These gates close across the path to allow the movement of stock as shown here. Note the concrete section to prevent heavy vehicles or cattle damaging the path surface. Gates are left open for path users most of the time

Image 6.4 Example of Greenway Section with Cattle Stops

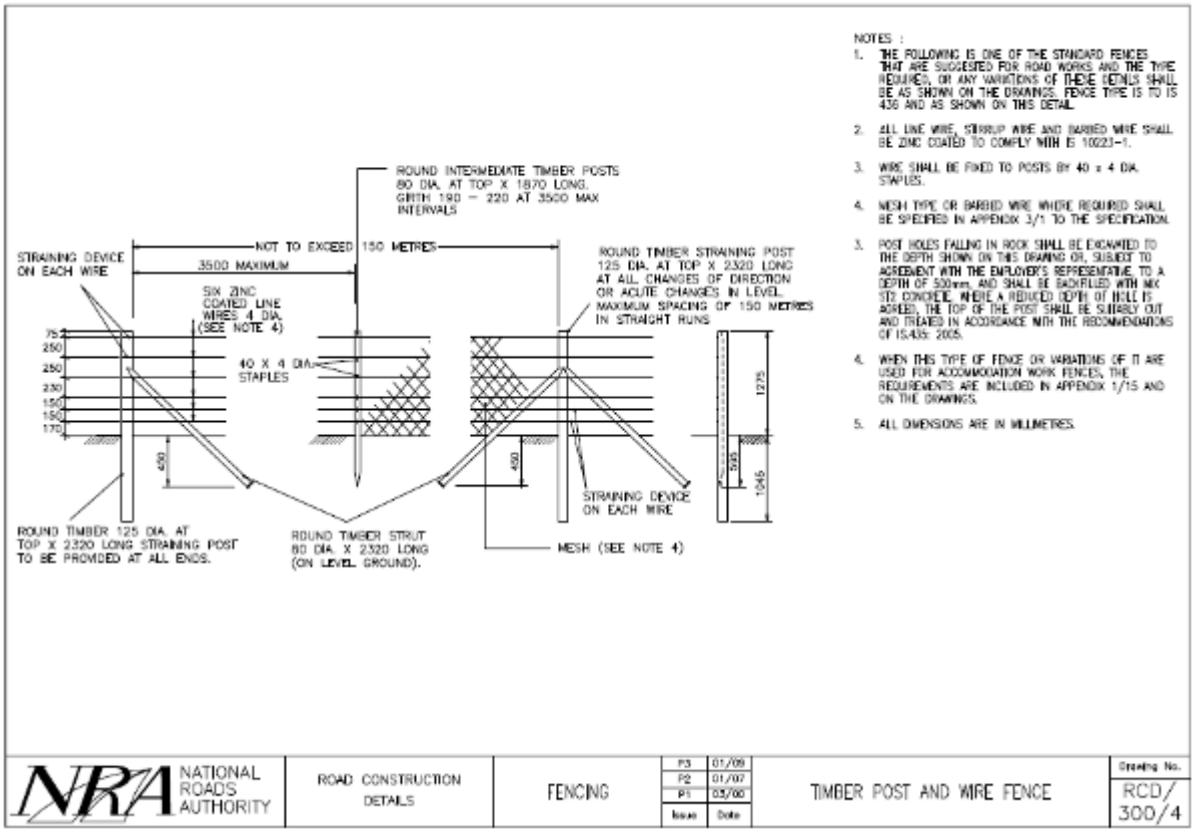


Figure 6.4 Proposed Fencing Detail (Source: NRA, 2012)

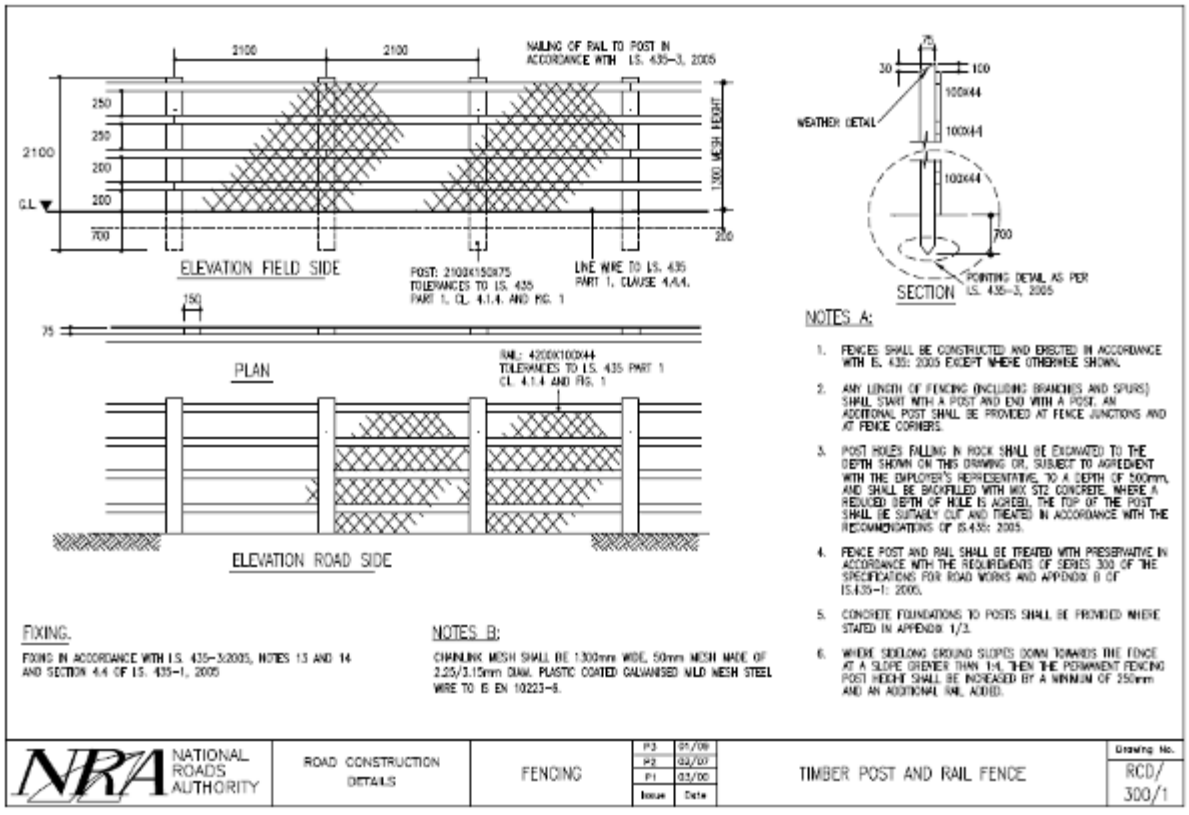


Figure 6.5 Proposed Fencing Detail (Source: NRA, 2012)

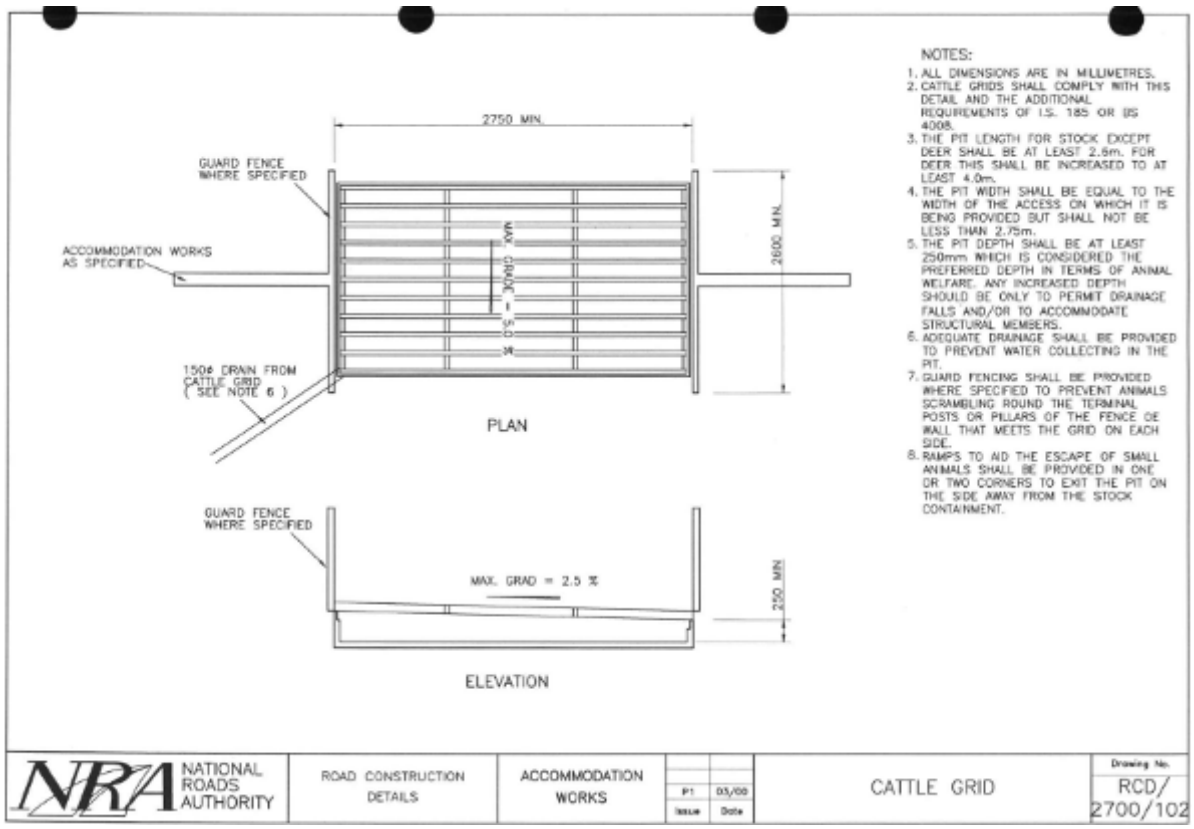


Figure 6.6 Proposed Cattle Grid Detail (Source: NRA, 2012)

6.3.4 Bridges and Structures

It will be necessary to construct seven new timber or steel bridges. The bridges currently in place are dilapidated and in need of replacement. Images of three existing bridges are provided below, **Images 6.5** to **6.7**. Details of bridges to be replaced, their spans and locations are provided in **Table 6.2**.

Table 6.2 Bridges to be Replaced throughout the Route

Bridge No.	Bridge Name	Span	Chainage
1	Cloonbeg River Bridge	2 No. 50 Foot Spans	11+700
2	Athry River Bridge	1 No. 20 Foot Span	16+620
3	Bunscanniff Bridge	1 No. 23 Foot Span	30+920
4	Letterfore River Bridge	1 No. 20 Foot Span	44+800
5	Glengowla River Bridge	1 No. 40 Foot Span	46+800
6	Leadmines Bridge	1 No. 20 Foot Span	48+400
7	Oughterard River Bridge	1 No. 40 Foot Span	50+200

New Bridge Structures at Athry Bridge, Bunscannif Bridge, Letterfore River Bridge and Leadmines Bridge

After inspection by engineering contractors employed by Galway County Council the existing bridge structure at Athry Bridge was considered unreliable. It is proposed to erect a new lightweight steel and timber structure over the existing structure as shown in Sketch 02 of **Bridge Assessment, Appendix B.1**. The design takes account of live loading from pedestrians and cyclists (5kN/m^2) and no vehicular access is to be allowed onto the bridge. The existing bridge structure is to be retained and maintained. Apart from the historical significance of the bridge, the dead weight is necessary to limit pedestrian generated vibrations to acceptable levels. All debris must be removed from the existing deck. The

existing bridge will act as a temporary platform for the construction of the new structure. Because of the restricted access to the bridge, it is likely that the main beams will arrive in sections and be spliced together in-situ. A similar design and construction method will be employed at Bunscannif Bridge, Letterfore River Bridge and Leadmines Bridge.

New Bridge Structures at Cloonbeg River Bridge, Glengowla River Bridge and the Oughterard River Bridge.

The bridge span is short at these locations, at approximately 6m, and so the bridge design solution will involve the erection of a steel structure (with 3 no beams and metal decking) to act as a permanent shutter for an in-situ concrete deck (details shown in Sketch 03 of **Bridge Assessment**, **Appendix B.1**). The outline design is based on a single gross weight vehicle of 7.5 tonnes giving rise to axel loads as set out in Annex D of BD21/01 (*Assessment of Highway Bridges and Structures, Vol. 3, Section 4*). If a heavier vehicle is considered appropriate then the design will need to be altered. A similar design and construction method will be employed at Cloonbeg River Bridge, Glengowla River Bridge and the Oughterard River Bridge.

Image 6.5 Oughterard River Bridge currently in place

Image 6.6 Letterfore River Bridge currently in place

Image 6.7 Cloonbeg River Bridge currently in place

The design for Cloonbeg River Bridge will be replicated for the Glengowla River Bridge and the Oughterard River Bridge while the design for the Athry River Bridge will be replicated for the Bunscannif Bridge, Letterfore River Bridge and the Leadmines Bridge. Examples of possible bridge designs are included in **Image 6.8** and **Figure 6.7**.

Image 6.8 Example of possible bridge design

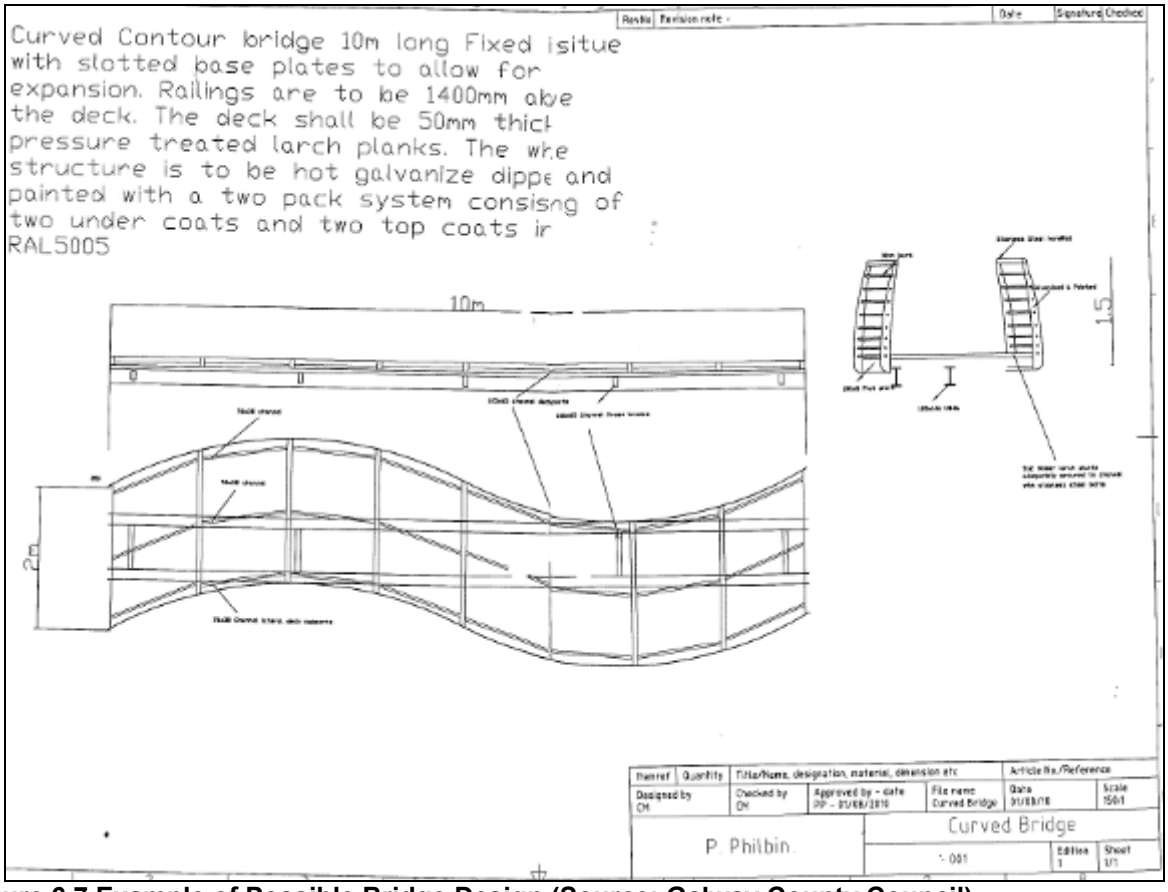


Figure 6.7 Example of Possible Bridge Design (Source: Galway County Council)

6.3.5 Cycle Crossings

Where the Greenway will cross a roadway it is proposed that combined cyclist and pedestrian crossings be installed as in **Figure 6.8** below.

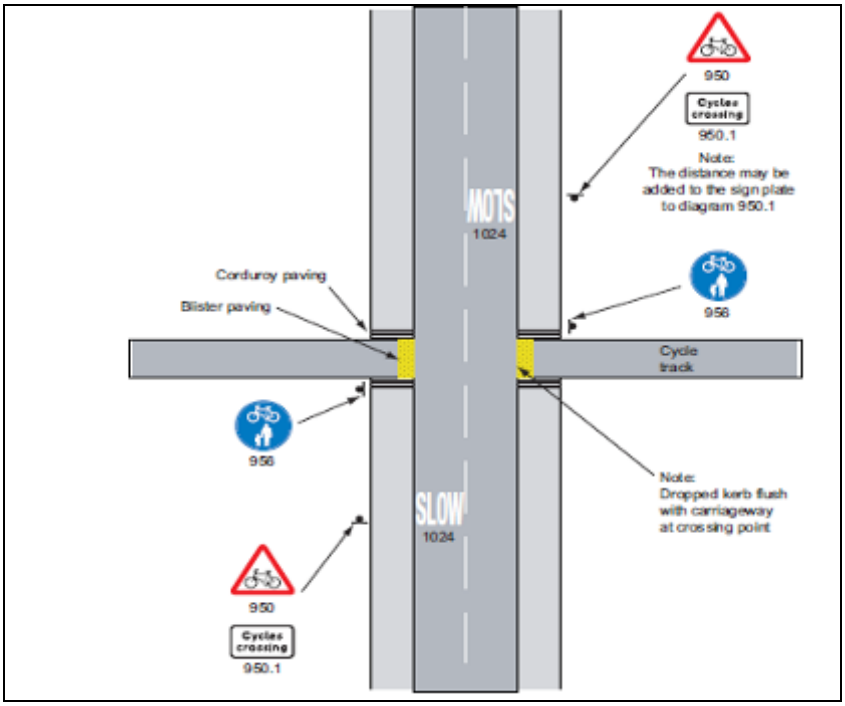


Figure 6.8 Example of Typical Combined Pedestrian and Cyclist Crossing at Roadway

These combined crossings will be uncontrolled and road traffic will have priority. A variety of uncontrolled crossings will allow cyclists and pedestrians to stop and cross the main traffic safely. These include solutions that passively reduce traffic speeds and/or address the crossing as a two-stage process (example shown in **Figure 6.9**). It is proposed that cyclists and pedestrians must wait for a suitable gap in the traffic before crossing. The volume and speed of traffic on the main road will influence the choice of these solutions. Heavier traffic and higher speeds will generally require controlled crossings.

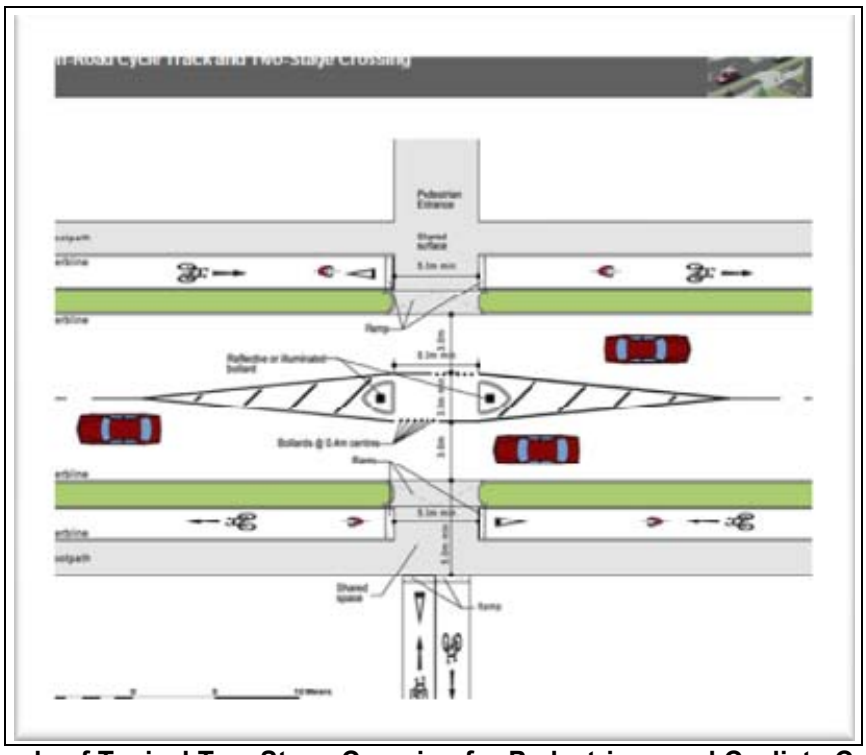


Figure 6.9 Example of Typical Two-Stage Crossing for Pedestrians and Cyclists Crossing at Busy Roadway Sections

6.3.6 Erection of Signage and Information Boards and Mapping

Signs will be required for:

- Identifying the start of the trail,
- Directions to off-trail facilities such as toilets, huts or carparks,
- Directions when the trail changes direction or changes terrain sharply (e.g. cross-country trail joins road for short distance and then resumes),
- Road crossings,
- Warning and cautions about the trail or features (e.g. slip prone area; narrow, winding trail; single file track or structure),
- Occasional route markers (especially in remote areas) to advise riders that they are still on the trail,
- Town names and features/facilities within the towns (cafes, toilets etc), and
- Advance information signage (such as “next toilet – 11 km”).

Examples of signs which will be used throughout the proposed Greenway route are outlined in **Figure 6.10** below.

Figure 6.10 Example of Typical Signs for Pedestrians and Cyclists throughout the Greenway Route

Cycle network signs will have a white background with blue symbols and text. All the signs shall display the Cycle Network symbol, Symbol C 01. They shall also include one or more Numeral Tiles, Symbol C 02, which contain green or red numerals within borders of the same colour to denote the route numbers of local (green) and longer distance (red) cycle routes.

Information Board

Basic information about trails must be available on an information board at the trail head and on longer trails, at popular access points along the trail. Information should include:

- A map showing a clearly defined route with a start and finish point and a 'you are here' pointer.
- Information on the trail grading (difficulty rating) including a definition of the grades.
- The length of the trail from the start to finish, the total ascent in meters and the estimated time to complete the trail for the average user.
- Details of waymarking used on the trail.
- Where a trail traverses open/ exposed terrain a warning about the risks involved should there be a change of weather.
- A contact email for users to provide feedback and/or report incidents or issues on the trail.
- Contact details for the nearest emergency services.
- Information on whether dogs are permitted on the trail.
- The "Leave No Trace" principles.

6.4 PROGRAMME AND PHASING OF WORKS FOR THE GREENWAY PROJECT

It is proposed that works will be carried out over a period of 24 months. Construction of the proposed Greenway will be linear i.e. construction will start at the Clifden end of the project and proceed progressively along the disused rail eastwards finishing at a point close to Oughterard.

It is proposed to carry out the work using two teams working in tandem and the machinery will comprise 360 degree track machines, dumpers, vibrating rollers, cranes, road graders and road pavers.

6.5 EXCAVATIONS AND EXCAVATED MATERIALS

The majority of the proposed Greenway will be located on the existing disused railway line between Clifden and Oughterard. There will also be ground disturbances, such as topsoil removal carried out in areas that are undisturbed (alternate routes in the townlands of Gowlan West, Garroman, Lurgan and Glengowla West). It is proposed that the existing topsoil and scrub will be removed from the railway line in preparation for the laying down of the Greenway route surface materials. Any material which will be removed during site preparation will be used to form embankments along the path. It is anticipated that a maximum of 127,500m³ of overburden (predominantly topsoil) will be removed from the proposed route in preparation for the laying of the Greenway track surface. It is not envisaged that rock breaking will be required.

6.6 SITE ACCESS AND COMPOUNDS

Construction materials and machinery will be stored at one of seven compounds located along the route. These site compounds will also serve as access points to the route. As the construction of the Greenway is a linear project there will be no need for new access areas.

As noted above it is envisaged that there will be seven site compounds which include short term staff welfare facilities and plant and materials storage for the proposed works. These locations are outlined in **Figures 6.1 (Sheet 1-15)** above.

6.7 OPERATION OF THE PROPOSED GREENWAY PROJECT

It is expected that the proposed Greenway Project will cater for approximately 160,000 cyclists and walkers per annum.

There will be ongoing Greenway maintenance after the initial track clearing, formation and development. The following maintenance activities will be required as part of the Greenway upkeep:

- It will be necessary to carry out annual weed spraying of the Greenway surface and preventative measures to ensure the eradication of noxious and nuisance weeds.
- After storm conditions, there will be a need to make storm repairs to both the Greenway surface and the clearing of any debris left on the track from broken tree branches or fallen trees. Track wash outs, surface damage, etc. will require repair or redressing to provide a suitable surface again.
- Fences, gates, cattle stops and signage will also require maintenance effort with age, weather, stock, vehicle and vandalism damage.

As part of Fáilte Ireland's 'Leave no trace' initiative it is intended that there will be no litter bins provided along the Greenway. It is also intended that there will only be seating furniture along the route as the provision of picnic tables is seen to encourage litter issues. There will however, be welfare facilities provided every 10km along the route, in particular at the following locations:

- Oughterard - Maam Cross (Facilities at each location),
- Maam Cross – Recess (Facilities in Maam Cross only),
- Recess - Ballynahinch (Facilities at Ballynahinch only),
- Ballynahinch – Clifden (Facilities at each location).

7 NEED FOR THE PROPOSED PROJECT AND ALTERNATIVES CONSIDERED

7.1 BACKGROUND AND NEED FOR THE PROPOSED PROJECT

It is proposed to develop a walking/cycle track (Greenway) along the existing dismantled Galway to Clifden railway where possible. This Greenway development is a community driven project by local community groups in Clifden, Recess and Oughterard with support from Fáilte Ireland, Galway County Council and Forum Connemara Ltd.

It is hoped that this development would benefit local communities by providing a secure and safe environment for walkers and cyclists, leading to an increased opportunity for physical exercise. It would also provide a unique and novel experience for visitors to the area.

As part of Fáilte Ireland's West Tourism Development Plan 2008-2010 the four strategic goals are to:

1) Develop the region as Ireland's primary outdoor and adventure destination while focusing on environmental sustainability.

2) Enhance the cultural experience for visitors.

3) Continue to develop tourism hubs in order to exploit synergies.

4) Improve access to and within the region.

The relevant planned action included as part of the first strategic goal above is to develop the region as Ireland's primary outdoor and adventure destination while focusing on environmental sustainability. Specific key actions within this strategic goal which specify the need for the proposed Greenway include:

- Support the feasibility of re-opening the Galway-Clifden railway line as a Greenway for walking and cycling

Within the West Tourism Development Plan 2008-2010 the environment is considered core to Ireland's tourism with:

- 80% of visitors rating Ireland's scenery as an important reason for visiting Ireland;

- 74% attracted by the natural unspoilt environment.

The provision of the Connemara Greenway Project – Clifden to Oughterard will serve as an important amenity in providing traffic-free safe access to the west of Ireland's natural unspoiled environment. Given its location in a highly scenic, lake-rich, mountainous area it is likely the Greenway will provide local, domestic and overseas visitors with good access to this scenic landscape, which is an important reason for people visiting the area.

As part of the document '*A Strategy for the Development of Irish Cycle Tourism'* (Fáilte Ireland, 2007) a recent decline in the number of overseas cycling tourists has been recognised. As part of a wider cycling tourism strategy the development of a number of Greenway routes throughout the country is seen as an important part in increasing cycling tourism in the country.

It should be recognised that other government priorities can also be addressed through the promotion of cycling by the provision of Greenway routes. These include:

- Sustainable transport – cycling can reduce the number of trips made by cars, thereby improving local air quality, decreasing the amount of greenhouse gas (GHG) emissions, and decreasing the use of finite fossils fuels;

- Improved mental and physical health of the populations – regular physical exercise is required in order to maintain a healthy weight and properly functioning body. Cycling commuting / leisure riding are now recognized as an important element in strategies to improve public health. UK and continental based studies indicate that health benefits of cycling far outweigh the associated risks;

- Improved quality of life in urban and town environments – transferring commuters from cars to bicycles improves the urban / town environment in terms of noise, road safety, and general atmosphere, i.e. the environment becomes less threatening and therefore a more attractive place in which citizens can relax, chat, shop and spend time;

- Regional and small local economic development – cycle tourists stay longer and have more time to spend their money in the local community which is of particular advantage to the rural community.

Further benefits of cycling tourism as outlined in the aforementioned Fáilte Ireland document are:

- Cycle tourists represent a growing and valuable market segment, particularly for rural areas. Cycle tourists will spend at least as much as other visitors in a rural area;

- Cycle tourism is good at generating local trade and offers particular opportunities for rural businesses and services. Spending by cycle tourists helps to support rural pubs, village shops, small-scale rural attractions and rurally based providers of accommodation;

- It offers opportunities for the development of cycle hire and cycling holiday operations in rural areas;

- As cycle tourists will use local businesses there is a greater likelihood that the money they spend will stay in the local economy;

- Cycle tourism is an environmentally sustainable form of tourism with minimal impact on the environment and host communities. This is increasingly important as we aim to reduce CO_2 emissions and reduce global warming;

- It makes good use of existing, often under-utilised resources for example country lanes and by–roads;

- It can provide an alternative use for redundant or derelict resources, for example disused railway lines;

- Cycle tourism can provide new incentives for people to visit an area and can help to attract new types of visitor;

- Cycling can provide an added attraction and activity as part of a multiactivity holiday for visitors, which will help to extend length of stay and encourage repeat visits;

- Encouraging cycle tourism can help to encourage utility cycling as people may rediscover cycling while on holiday and may then be encouraged to cycle more frequently for other purposes;

- Cycle tourism enhances personal health, fitness and well-being.

7.2 ALTERNATIVES CONSIDERED

Alternatives must be considered as part of the EIA process in accordance with the Planning and Development Regulations 2001 (SI 600), Schedule 6 (1) (d) which states that the following needs to be considered: "*An outline of the main alternatives studied by the developer and indication of the main reasons for his or her choice, taking into account the effects on the environment".*

Furthermore the EPA Publication "*Advice Notes on Current Practice (in the preparation of Environmental Impact Statements)*" suggests that when assessing alternatives they should be described where relevant in three main ways: alternative locations, designs and processes.

The alternatives considered as part of this project include the 'do-nothing' scenario and a number of alternative routes proposed as outlined in **Figures 6.1** to **6.20**.

7.2.1 Do-nothing Scenario

If the Greenway is not constructed any additional economic benefit which might be derived from the project will not be realised. Fáilte Ireland's target of re-opening the Galway-Clifden line as a Greenway for walking and cycling will not be realised.

In the absence of the proposed Greenway being constructed the most viable option for cyclists who wish to travel from Oughterard to Clifden will be along the existing N59 or along the proposed N59 upgrade which will contain sections of cycleway. While the N59 is also an attractive route from a landscape perspective, it will not provide a similar wilderness experience and level of safety when it is compared to the proposed Greenway.

7.2.2 Alternatives Considered

The entire length of the disused Oughterard-Clifden railway line has been the primary route under consideration for the location of the proposed Greenway. In certain locations however (where the Greenway runs immediately adjacent to an existing occupied dwelling) it has been necessary to provide an alternative path. These alternative site locations are where the route deviates from the existing roads and disused railway (alternate routes in the townlands of Gowlan West, Garroman, Lurgan and Glengowla West) as outlined in **Figures 6.1** to **6.20.**

8 HYDROLOGY AND DRAINAGE

8.1 INTRODUCTION

This chapter assess the potential impacts of the proposed development on the existing hydrological and drainage environment in the study area. The principal scope of the assessment is to:

- Identify, describe and evaluate sites of known or potential hydrological interest,
- Assess the significance of the likely impacts of the proposed project on the existing hydrological and drainage including residual impact, and
- To propose mitigation measures required to minimise the likely impacts.

8.2 METHODOLOGY

This assessment was based on a desk study of available information and site visits carried out within the study area in July 2011, and was prepared having regard to:

- Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Projects (National Road Authority (NRA), 2007),
- Environmental Impact Assessment Guidelines of National Road Projects – A Practical Guide (NRA, 2004),
- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (EPA, 2003),
- Guidelines on the Information to be contained in Environmental Impact Statements (EPA, 2002),
- Guidelines for the Crossing of Watercourses during the Construction of National Road Projects (NRA),
- Control of Water Pollution from Linear Construction Projects, CIRIA Report No. C648, 2006, and
- Fisheries Protection Guidelines – requirements for the protection of Fisheries Habitats during Construction and Development Works at River Sites, Eastern Regional Fisheries Board.

The following sources of information were used in order to complete the assessment:

- Flood data was obtained from OPW and EPA (www.opw.ie , www.floodmaps.ie, www.epa.ie),
- Western River Basin District (WRBD) – River Basin Management Plan, and WaterMaps (www.wfdireland.ie),

- Other relevant websites consulted were those of the Met Éireann (www.meteireann.ie), and
- Ordnance Survey 1:50,000 Discovery Series.

The following three hydrological attributes are considered to be affected by the proposed development:

- Flood Hydrology,
- Drainage, and
- Low Flows.

The importance of the hydrological attributes (rating criteria) is defined in accordance with the Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Project, NRA, 2007. These are presented in **Table 8.1**.

Table 8.1 Rating Criteria for the Hydrological Attributes

Importance	Criteria	Typical Examples
Extremely high	Attribute has a high quality or value on an international scale	River, wetland or surface water body ecosystem protected by EU legislation.
Very high	Attribute has a high quality or value on a regional scale	Floodplain protecting more than 50 residential or commercial properties from flooding.
High	Attribute has a high quality or value on a local scale	Floodplain protecting between 5 and 50 residential or commercial properties from flooding.
Medium	Attribute has a medium quality or value on a local scale	Floodplain protecting between 1 and 5 residential or commercial properties.
Low	Attribute has a low quality or value on a local scale	Floodplain protecting 1 residential or commercial property from flooding.

The magnitudes of the impacts on the existing environment of the attributes were defined in accordance with the criteria provided in the EPA publication - *Guideline on the Information to be contained in Environmental Impact Statements (2002).* These are presented in **Table 8.2**.

Table 8.2 Impact Assessment Criteria

Magnitude of Impact	Description
Imperceptible	An impact capable of measurement but without noticeable consequences
Slight	An impact that alters the character of the environment without affecting its sensitivities
Moderate	An impact that alters the character of the environment in a manner that is consistent with existing or emerging trends
Significant	An impact, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
Profound	An impact which obliterates all previous sensitive characteristics

All relevant information including, catchment soil type, topography of the lands and the land drainage systems adjacent to the proposed development have been collected through a walkover survey during the site visits, topographical maps and OSI 1:50,000 Discovery Series mapping.

8.3 EXISTING ENVIRONMENT

8.3.1.1 Topography and Soils

8.3.1.2 Topography

The proposed Greenway corridor between Clifden and Oughterard passes through the scenic and internationally renowned Connemara lake lands and blanket bog areas with occasional farmsteads and forestry at the foot of the Twelve Bens and Maumturk mountains (which consist of bare quartz and granite rock peaks rising to heights of 600 to 700mOD).

Between Clifden and Recess the Greenway meanders through the open moorland and lakelands crossing the Owenglin River, Owenmore River and Recess River systems.

From Weir Bridge at Recess to Bunskannive Bridge the proposed Greenway runs adjacent to the N59 and is dominated by the steep slopes of the Maumturk Mountains to the north and Ballynahinch Lough to the south.

From Bunskannive Bridge the proposed route diverges north from the N59 to pass along the northern shores of Lough Shindilla, where it continues parallel to the N59 north Maam Cross. The route continues on an easterly path along an existing track near Lurgan Lough and Loughaunierin. The proposed Greenway alignment crosses numerous hillside streams arising from the southern slopes of the Maam Turks along this section.

The route takes a southern trajectory between Loughaunierin and Tawnaghbeg Lough, adjacent to the Owenwee River. The route continues south and crosses the N59 at Bunnakill, then crosses the Glashanasmearany River and continues along the path of the dismantled railway south of Lough Bofin and Lough Adrehid to rejoin the N59 north of Lough Agraffard.

In Glengowla, the route deviates once more from the N59 and continues eastwards towards Oughterard along the banks of the Owenriff River.

8.3.1.3 Soils

The proposed Greenway corridor crosses three principal soil and subsoil types namely peat (blanket peat / peat topsoil), alluvium and glacial till. These soil types in general are of low permeability and thus have very high surface runoff properties. Many of the peat bog areas (active blanket bog, cutover bogs, wet heaths etc.) are included in the designated sites within the study area and are to be deemed of national and international importance. Elements of the proposed Greenway including drainage and excavation may impact upon these peat bog lands.

8.3.2 Meteorology

The Connemara area is noted as being amongst the wettest parts of Ireland with annual rainfall amounts generally in excess of 2000mm/annum. **Table 8.3** presents the annual average rainfall data recorded at eleven EPA / Galway County Council rain gauges associated with river and lake gauges in the area (between the years 1971 and 2000).

Table 8.3 Annual Average Rainfall fall data from EPA river stations in Connemara

Station No.	Monitored Waterbody	Catchment	Annual Average Rainfall 71-00 (mm)
30018	Joyce	Corrib	2413
30019	Owenriff	Corrib	1704
30044	Owenriff	Corrib	1703
30058	Failmore	Corrib	2359
31001	Ballynahinch	Ballynahinch	2141
31003	Owenmore	Ballynahinch	2073
31005	Lough Inagh	Ballynahinch	2215
31072	Derryclare Lough	Ballynahinch	2142
32004	Owenglin	Owenglin	1933
32018	Stream	Owenglin	1933
32078	Lough Nahillion	Owenglin	1933

(Source: EPA)

8.3.3 Regional Hydrology

The proposed Greenway crosses 45 no. surface waterbodies from small drains to reasonably large rivers and lakes. These existing watercrossing structures will be largely retained, with some modifications and some replacements.

Along the entire scheme the watercourses generally rise to the north of the greenway flowing southwards with a few exceptions (including the causeway crossings of lakes, crossing of lake outlets and a small number of crossings that rise to the south of the proposed Greenway).

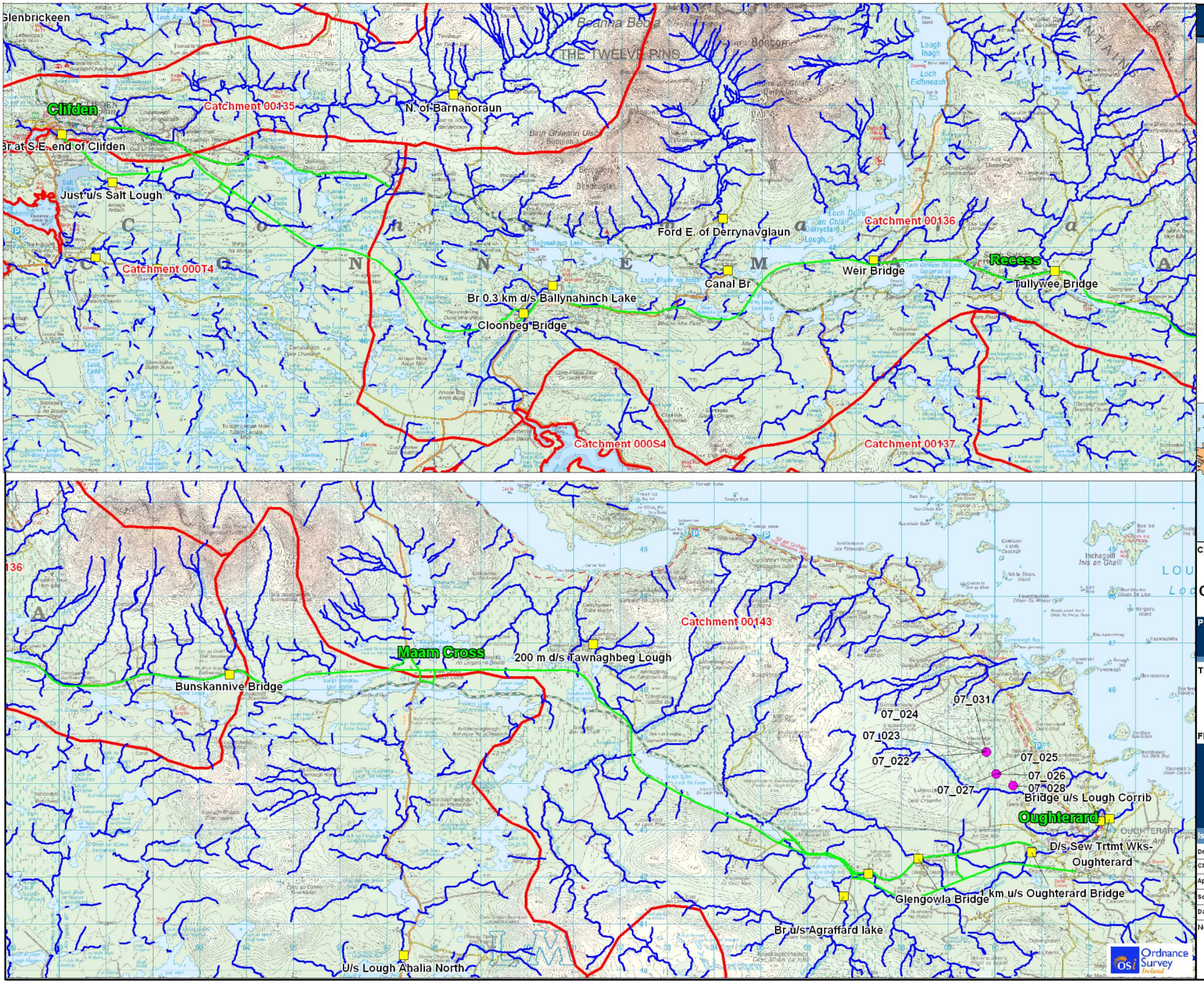
The Greenway project passes through six principal river catchments as summarised in **Table 8.4** and presented in **Figure 8.1**.

Table 8.4 Principal Catchments in the Study Area

Principal River Catchments	Catchment Code	Western River Basin Hydrometric Area	Outlet
Owenglin	00135	32	Clifden Bay
Derryehorraun	000T4	31	Clifden Bay
Owenmore	00135	31	Cloonile Bay
Screebe	000R4	31	Camus Bay
Owenree	00143	30	Lough Corrib
Owenriff	00143	30	Lough Corrib

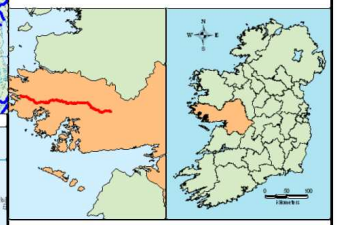
Many of the watercourses crossed outfall to one of the numerous lakes that characterise the proposed Greenway between Clifden and Oughterard (i.e. Ballynahinch Lough, Garroman Lough, Oorid Lough and Lough Bofin). The watercourses, in general, rise in steep upland / mountainous areas which drain the adjacent valley floor bog lands.

A principal characteristic of the smaller streams that are crossed by the proposed Greenway is that they are flashy (i.e. a river which responds very quickly to rainfall, the flow of water rising rapidly to a high peak before receding similarly) due to the steep catchment and high run-off, while the large streams and rivers crossed are characterised as being slower to respond as they are generally draining from the lake system which tends to attenuate flows and dampen peak flows of storm events.



Legend

- Proposed Route Layout
- Catchment boundary
- Groundwater Monitoring Sites
- WFD Surface Water Monitoring Sites



Client
Galway County Council

Project
Connemara Greenway

Title
River Catchments

Figure 8.1

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Issue Details

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Date: March 2012			

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8.3.4 Principal River Catchments

8.3.4.1 Owenglin

The Owenglin River, which has an overall catchment area of 36km^2, rises in the south western slopes of the Twelve Bens mountain range and flows westward through a broad valley before turning south westwards to flow through a gorge between the hills at Couravoughil and Gowlan West. It crosses under the proposed Greenway at Ardbear Bridge to the south of Clifden town where it outfalls into Clifden Bay, see **Image 8.1**.

There are a number of lakes in the catchment with the largest being Lough Nahillion (area = 0.42km^{2,} level <70 mOD) and Lough Nambrackkeagh (area = 0.08km^{2,} level <150 mOD). The Owenglin is noted as being a flashy river due to its mountainous catchment and steep channel gradient. The EPA maintains a river gauge (Stn[3]. No. 32O030300) immediately upstream of Ardbear Bridge.

Refer to **Figure 8.1** for the extents of the Owenglin River Catchment.

Image 8.1 Ardbear Bridge

8.3.4.2 Derryehorraun

The Derryehorraun River, which has an overall catchment area of 13.5km^2, rises in the southern slopes of the hilly area located between the Twelve Bens and Clifden. The river flows westward through lakelands to outfall into Salt Lake and ultimately to Ardbear Bay and Clifden Bay. There are numerous lakes in the catchment including Croaghat Lough, Derrylea Lough, Loughaunarow, Island Lough and Derrywaking Lough. The Greenway crosses several tributaries of the Derryhoran River. The only major river crossing in this catchment, associated with the Greenway project, is at Munga.

Refer to **Figure 8.1** for the extents and principal watercourses of the Derryehorraun River Catchment.

[3] Station

8.3.4.3 Owenmore

The Owenmore River rises in the Twelve Bens and Maam Turk mountain ranges and comprises of an extensive mountain stream network discharging to large valley rivers and lakes. The river catchment has an area of 171.5km^2 (see **Table 8.5**) which includes the tributaries of the Owenmore River and the Glencoaghan River, Ballynahinch River, Recess River and Derrynavglaun River. The Greenway crosses the Owenmore River at the Cloonbeg Bridge, see **Image 8.2.**

Table 8.5 Lakes Encountered within the Owenmore Catchment

Lough Name	Area, km^2	Mean Water Level, mOD
Lough Inagh	3.1	Circa (c) 16
Derryclare Lough	2.3	10.5
Ballynahinch Lake	1.65	9.0
Oorid Lough	0.6	46.0
Cloonoppeen Lough	0.17	45.5
Glendollagh Lough	0.83	16.6
Loch na Cúige Rua (Upper and Lower)	0.11 and 0.10	16.5
Illion Lough	0.09	c.50
Derryneen Lough	0.05	33.3
Park Lough	0.09	30.3
Athry Lough	0.35	14.2
Lough Emlaghatleve	0.02	c.45

Image 8.2 Cloonbeg Bridge

8.3.4.4 Recess River Sub-Catchment

The Recess River has two principal tributaries, namely the Caher and Owentooey Rivers.

Oorid Lough, at the head of the Caher River system, has numerous hillside stream tributaries which rise in the southern Maam Turks Mountains and Cnoc Uraid hill area, the largest of these being

Owenanookerea. The Caher River drains Lough Oorid into Cloonoppeen Lough via a short channel, en route intercepting streams from Loch ó Dheas from the south and the Shannekealla from the north. The Caher River drains from Cloonoppeen Lough via a channel known as the Boheeshal River, and flows under the proposed Greenway at Cloonoppeen Bridge after which it intercepts the Abhainn Bhuí and Sruffan na bhFraochóg streams before discharging into Derryneen Lough. Derryneen Lough drains via a short channel under the proposed Greenway at Derryneen Bridge into Tawnagh Lough from where the Caher River drains and, a short distance downstream, intercepts the Owentooey River.

The Owentooey River drains the western slopes of the central Maam Turks and the eastern slopes of Cnoc Lios Uachtair and includes the Lehanaghbeg and Lehanagh Loughs within its catchment. The Owentooey flows under the proposed Greenway via Tullywee Bridge or Caher Bridge before joining the Caher River to become the Recess River.

The Recess River drains into Glendollagh Lough (also known as Garroman Lough) which in turn drains via the Bealnacarra River channel under the proposed Greenway at Weir Bridge before ultimately discharging in Derryclare Lough.

The Boheeshal / Derryneen River in turn drain Cloonoppeen Lough via a bridge under the proposed Greenway (Cloonoppeen Bridge) to Derryneen Lough and then into Lough Tawnagh Lough via Derryneen Bridge (another proposed Greenway crossing point). The Caher River drains from Lough Tawnagh and joins the Owentooey River immediately downstream of Tullywee / Caher Bridge (a proposed Greenway crossing point) to become the Recess River. The Owentooey River drains the slopes of the central Maam Turks and Lissoughter Hill. The Recess River discharges into Garroman Lough which outfalls via Weir Bridge (a proposed Greenway crossing) to Bealnacarra River and ultimately to Derryclare Lough.

The hillside tributaries in this catchment are flashy streams and rivers (including Owentooey and Owenanookera) due to steep gradient and high surface water runoff. The flatter low-lying river sections are less flashy and respond more slowly to rainfall due to the available attenuation provided by the large lakes.

8.3.4.5 Ballynahinch River Sub-Catchment

The Tooreenacoona and Gleninagh River which flow into Lough Inagh, drain the slopes of the western Maam Turks and eastern Twelve Bens and the northern area of Inagh Valley. Lough Inagh, which is 4.6km long and over 1km across at its widest point, drains into Derryclare Lough via a short channel. Derryclare, which is 5.1km long and also over 1km across at its widest point, intercepts streams from Derryclare Mountain and Recess River. The Lough in turn is drained via the short channel of Ballynahinch River.

The Glencoaghan River, which is known to be a flashy river, drains much of the southern Twelve Bens mountain range before crossing under the proposed Greenway at Glencoaghan Bridge and joining the Ballynahinch River.

Ballynahinch Lough is over 4.2km long and is over 1km across at its widest point. Ballynahinch Lough is drained by the Owenmore River which ultimately discharges to the Cloonile Bay after 4km at Tombeola Bridge. Refer to **Figure 8.1** for the extents and principal watercourses of the Owenmore River Catchment.

8.3.4.6 Screebe

The Screebe River System has an overall catchment area of 46.5km^2, rising in the southern Maam Turk Mountains as Shannaunnafeola Stream which discharges into Lough Shindilla at Bunscanniff. A second stream, known as Sruthán Mór, drains Loch Coill Bheag in Halfcarton and crosses under the proposed Greenway before also discharging in Lough Shindilla. Lough Shindilla discharges via Lurgan Bridge into Ardderry Lough Lower. Ardderry Lough is divided by the R336 at Maam Cross into the lower and upper Lough. Two small lakes drain into the upper Lough Lurgan Lough and Ardderry Pond, the Greenway crosses to the north of these lakes. Lough Ardderry Lower in turn drains into the Screebe River which ultimately discharges to Camus Bay at Screebe Bridge.

Refer to **Figure 8.1** for the extents and principal watercourses of the Screebe River Catchment.

8.3.4.7 Owenree

The Owenree River, which has an overall catchment area of 23.5km^2, rises in the western Derroura hills and flows as the Owenwee in a south-westward direction before turning north-westward along the proposed Greenway at Shannakinloughra. It continues in a north-westerly direction and discharges into Tawnaghbeg Lough which in turn is drained by the Owenree River.

A second tributary, namely the Derreenagusfoor Stream rises in Bunnakill and flows into a small pond before crossing under the Greenway and discharges into Loughaunierin, see **Image 8.3**. From Loughaunierin the stream flows northwards under the proposed Greenway at chainage Ch38500 and discharges into the Owenree River 0.7km downstream of Tawnaghbeg Lough. The Owenree continues northwards joining with Folore (Falamer) River (which includes Loughanillaun and Maumwee Lough in its catchment) before outfalling to Lough Corrib. The lakes within the Owneree Catchment within the study area are shown in **Table 8.6**.

Table 8.6 Lakes Within the Owenree Catchment

Lough Name	Area, km^2	Mean Water Level, mOD
Loughaunierin	0.21	43.0
Tawnaghbeg Lough	0.07	28.0
Maumwee	0.28	46.0
Loughanillaun	0.67	40.0

Refer to **Figure 8.1** for the extents and principal watercourses of the Owenree River Catchment.

Image 8.3 Loughaunierin

8.3.4.8 Owenriff

The Owenriff River, which has an overall catchment area of 67.2km^2 rises in the hills at Shannawona to the south of the proposed Greenway and flows as the Derrygauna (Sruffaunboy) River into Loughaphreaghaun. This lake is drained by the Glashanasmearany River into Lough Bofin. Lough Bofin, which is 2.5km long and circa 0.4km across at its widest point, intercepts Shannakinlougha Stream and Letterfore along its northern shore, both of which cross under the proposed Greenway and rise in the Derroura hills. See **Table 8.7** for details of lakes within the study area.

Lough Bofin is drained by a short channel known as Corrasillagh River into Lough Adrehid. Derryerglinna Stream, which rises on Knockletterfore hill, discharges into this Lough via a crossing of the proposed Greenway. Lough Adrehid in turn is drained by the Owenriff River via Leam Bridge into Lough Agraffard. The Owenriff intercepts the Glengawbeg River (which includes Lettercraffroe Lough in its catchment) immediately downstream of its outfall from Lough Agraffard and continues eastward to Lough Ateaenn intercepting other tributaries from the south en route.

The Bunowen River is crossed by the proposed Greenway at Glengowla Railway River Bridge, flows into the Owenriff immediately downstream. From this confluence the Owenriff flows north eastwards to Oughterard intercepting the Claremount Stream. The Claremount Stream flows parallel to the Greenway before its confluence with the Owenriff. The Owenriff flows through Oughterard before ultimately discharging into Lough Corrib. The Greenway crosses the Owenriff, via the Oughterard River Bridge at chainage Ch50200, see **Image 8.4** below.

Image 8.4 Oughterard River Bridge

Galway County Council maintains two river gauges (Stn. No.'s 30019 and 30044) upstream of Oughterard on the Owenriff River.

Table 8.7 Lakes Within the Owenriff Catchment

Lough Name	Area, km^2	Mean Water Level, mOD
Loughaphreaghaun	0.66	48.0
Lough Bofin	0.9	40.2
Lough Adrehid	0.07	40.0
Lough Agraffard	0.30	38.4
Lough Ateeann	0.04	28.0

Refer to **Figure 8.1** for the extents and principal watercourses of the Owenree River Catchment (Catchment 6.0).

8.3.5 Lakes

Hundreds of lakes have been identified within the six river catchments associated with the proposed development. Of these 25 no. lakes / ponds are located immediately adjacent (upstream and downstream) of the proposed Greenway alignment.

Table 8.8 below presents the lakes located adjacent to the scheme, the approximate chainage extents and distance and surface area.

Table 8.8 Lakes Adjacent to the Proposed Greenway Scheme

Name	Chainage Extents	Distance from Greenway (km)	Area (Ha)
Lough Phreaghaun	850-900	0.2	5.5
Derrywaking Lough	1900-2100	0.17	6.2
Lough Muingacurry	3400-3500	0.05	0.9
Lough Fadda West	4900-5900	0.2	6.9
Croaghat Lough	6000-7200	0.05	18.26
Ballynahinch Lake	12200-15300	4.3	166.02
Nabrucka (Lough)	15300-16500	0.75	18.26
Athry Lough	16800-17400	0.85	35.27
Derryclare Lough	17500-20100	0.75	223.5
Garroman or Glendollagh Lough	20100-22100	2.65	83.39
Loughaundoonan	22900-23000	0.1	0.91
Tawnagh or Park Lough	24600-25600	1.05	9.41
Derryneen Lough	25800-26300	0.55	5.41
Chluain Toipin (Loch)	27900-28600	0.65	16.66
Oorid Lough	29200-31200	2.1	60.53
Shindilla (Lough)	32100-34500	2.6	65.61
Ardderry Lough	33900-37700	1.325	81.06
Ardderry Pond	37800-37900	0.125	0.98
Maam Cross Pond 1	34700-34800	0.1	1.09
Maam Cross Pond 2	34900-35100	0.15	1.74
Lurgan Lough	36800-37400	0.75	15.51
Loughaunierin	39300-38600	0.75	21.24
Bofin Lough	43400-40700	2.55	92.49
Adrehid Lough	44000-44500	0.55	7.5
Agraffard Lough	45400-46000	0.8	30.11
Ateaenn Lough	48250-48400	0.2	3.81
Lough Mall	50400-50600	0.2	3.5

8.3.6 Drainage and Runoff

8.3.6.1 General

The proposed Greenway, for the most part, is located between hilly and mountainous areas to the north (i.e. Twelve Bens, Maumturks and Derroura Hills) and an almost continuous band of lakes and adjoining rivers to the south. The drainage of the region is such that the proposed Greenway crosses a high concentration of watercourses in a general north to south direction.

The study area has a very high runoff rate due to the impervious nature of the predominant peat and rock ground conditions, and steep mountainous terrain immediately. This, coupled with the high annual rainfall in the region, has given rise to a morphology of deep cut stream channels characteristic of flash flooding. The comparative large size and frequency of the existing bridges and culverts along

the proposed Greenway relative to catchment sizes confirm the exceptional high runoff regime of the study area. The bridges at the outfalls of the lakes, on the other hand, are comparatively small relative to their catchment area demonstrating how effectively the storage volumes available in the lake systems attenuate the high peak run-off / flash floods in their tributaries (e.g. Cloonoppeen Bridge, Weir Bridge).

The sections below outline the flood risk areas along the proposed Greenway alignment, the location and character of the watercourses crossed and the proposed Greenway drainage system.

8.3.6.2 Flood Risk

This section considers the existing and potential flood risk associated with the proposed Greenway. Much of the lands adjacent to the proposed Greenway are prone to flash flooding due to the high run-off from steep mountainous terrain arising in the hillside streams and valley / Lowland Rivers and low permeability of surrounding peat. However, based on the OPW database (www.floodmaps.ie), the reported incidences of regular extensive road flooding instances are relatively few.

A review of the regions topography and morphology has identified the following sources of flood risk to the proposed Greenway:

- Watercourse crossings at bridges and culverts,
- River reaches and floodplain areas,
- Lakes,
- Runoff from local hillside slopes, and
- Groundwater.

There are no filling works proposed within river floodplains. Therefore no impact is foreseen on river floodplains as a result of the proposed development.

Significant sections of the proposed Greenway alignment are located at the base of steep mountain slopes, including Lettershea, Emlaghdauroe, and Derryerglinna and would be potentially prone to temporary pluvial flooding from sheet flow directly from the hillside.

The flood events recorded in proximity to the Greenway are illustrated in **Figure 8.2.** In all circumstances the flood events reoccur where rivers overflow their banks after extremely heavy rain.

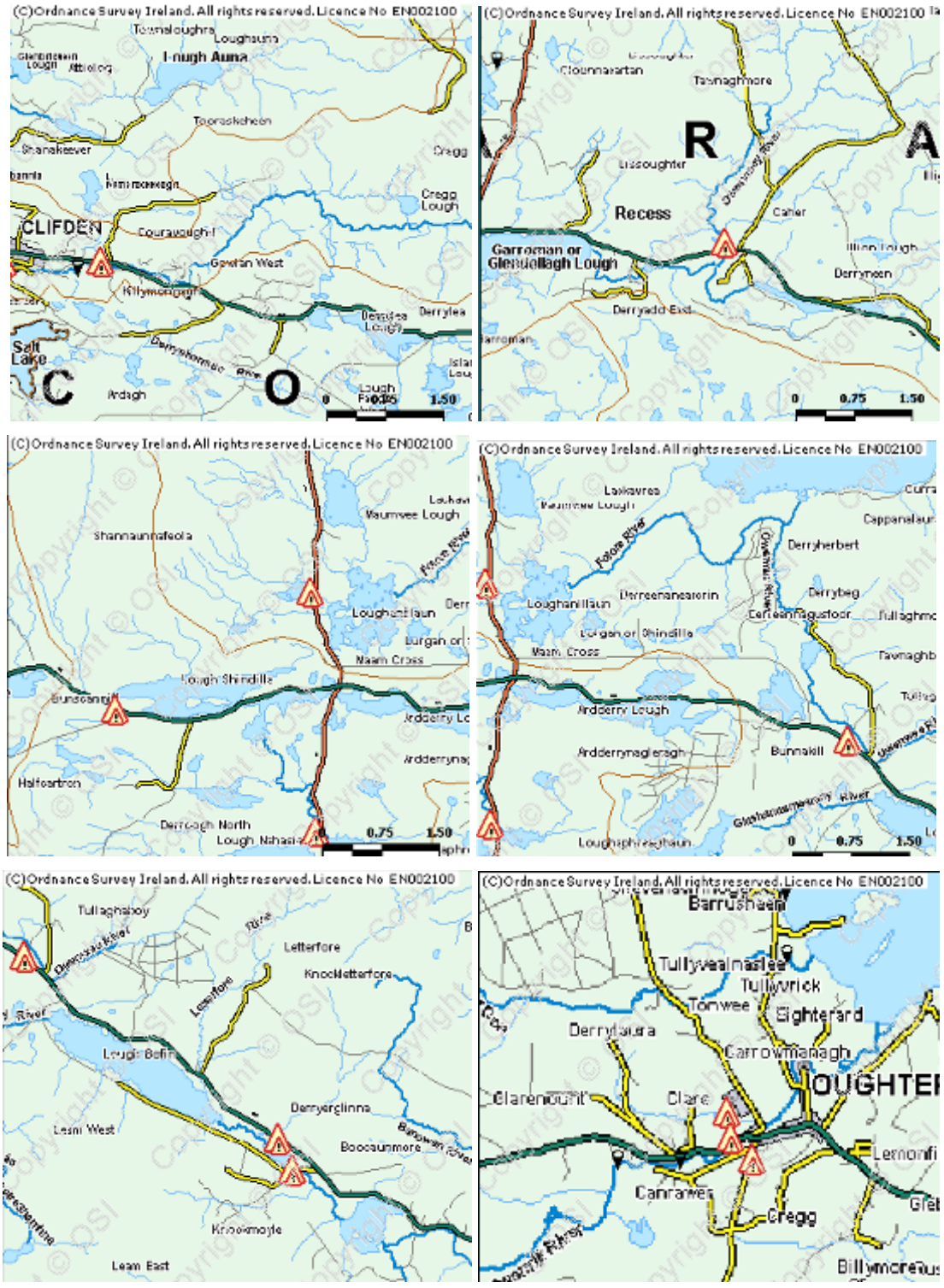


Figure 8.2 Locations of Flood Events within Study Area (www.opw.ie)

8.3.6.3 Low Flow Hydrology

The study area watercourses are characterised as either steep hillside streams, large valley / lowland rivers or rivers out-flowing from the large lakes each with different low flow regimes. Steep hill side streams in the region have been observed to run dry following short term dry periods. Flows in the large valley rivers which drain the hill side streams in turn can be greatly reduced with baseline flows

arising from the slow ground water drainage from the adjoining mountain and valley bog lands. The lake out-flows rivers are less susceptible to short term dry periods with the lake slowly discharging the vast stored volumes while also receiving baseline flows from adjacent bog land areas and valley rivers.

The 95%ile low flows for the streams and rivers have been either estimated using catchment area and a typical low flow rate of 1 to 1.5 l/s per km^2 or compiled from the EPA Hydrotool.ie database. **Table 8.9** below summarises the low flow information for 10 no. watercourses taken from the EPA database. The average low flow rate based on EPA database for the larger rivers, independent of the type of watercourse, is 4.0 l/s/km^2.

Table 8.9 Low Flow Data for Connemara Rivers from EPA Database

Ref	River	Location	Catchment Area, km^2	Type of Watercourse	95%ile low flow cumec*	Calculated Rate l/s/km^2
1	Owenglin River	Kilmongaun Bridge	32.1	Valley River	0.15	4.68
2	Glencoaghan River	Glencoaghan Bridge	12.1	Valley / Lowland River	0.05	4.14
3	Ballynahinch River	Canal Bridge	111.3	Lake Out flow	0.45	4.04
4	Bealnacarra (Recess) River	Weir Bridge	49.1	Lake Out flow	0.2	4.08
5	Owentooey	Tullywee Bridge	20.8	Valley / Lowland River	0.08	3.84
6	Caher River	Derryneen Bridge	20.7	Lake Out flow / Valley River	0.08	3.87
7	Boheeshal (Caher) River	Cloonoppeen Bridge	12.9	Lake Out flow	0.05	3.87
8	Lough Lurgan Channel	Lurgan Bridge	9.6	Lake Out flow	0.05	5.22
9	Owenwee	Shannakinlougha	4.8	Hillside Stream / Valley River	0.015	3.11
10	Bunowen	Glengowla Bridge	5.0	Hillside Stream / Valley River	0.008	1.61

*cumec = cubic metre per second

8.3.7 Physico-Chemical Water Quality

8.3.7.1 EPA River and Lake Water Quality

EPA Monitoring River Programme

The EPA carries out water quality assessments of river water quality as part of a nationwide monitoring programme. Data is collected from physico-chemical and biological surveys, sampling both river water and the benthic substrate (sediment) in contact with the water.

Water sampling is carried out throughout the year with the main parameters that are usually analysed for including: conductivity, pH, colour, alkalinity, hardness, dissolved oxygen, biochemical oxygen demand (BOD), ammonia, chloride, ortho-phosphate, oxidised nitrogen and temperature. Biological surveys are normally carried out between the months of June and October. These look at the

relationship between water quality and the relative abundance and composition of the macro-invertebrate communities in the sediment of rivers and streams. The macro-invertebrates include the aquatic stages of insects, shrimps, snails and bivalves, worms and leeches. Water quality is generally better at locations where diversity is greater.

The EPA assess the water quality of rivers and streams across Ireland using a biological assessment method, which is regarded as a representative indicator of the status of such waters and reflects the overall trend in conditions of the watercourse. The collated information relating the water quality and macro-invertebrate community composition is condensed to a numerical scale of Q-values or Biotic Index. The indices are grouped into four classes based on the lake/river's suitability for beneficial uses such as water abstraction, fishery potential, amenity value, etc.

The biological indicators range from Q5 - Q1. Q5 denotes a watercourse with good water quality and high community diversity, whereas Q1 denotes very low community diversity and a bad water quality. **Table 8.10** below provides a summary of the classification system. Biological water quality data for the watercourses in the study area was sourced from the EPA.

Table 8.10 Biological River Water Quality Classification System

Biotic Index (Q value)	Quality Status	Quality Class	Condition
Q5, Q4-5, Q4	Unpolluted	Class A	Satisfactory
Q3-4	Slightly Polluted / Eutrophic	Class B	Transitional
Q3, Q2-3	Moderately Polluted	Class C	Unsatisfactory
Q2, Q1-2, Q1	Seriously Polluted	Class D	Unsatisfactory

River Water Quality

The Greenway traverses a number of watercourses that are monitored varied in quality from being polluted (Q2) to unpolluted (Q4-5) (Classified during the aquatic ecological survey for the scheme). Generally the river reaches downstream of forested / recently deforested areas have a lower quality status than the remainder of the river systems. There are 24 no. EPA water quality monitoring stations within the study area river catchments. **Table 8.11** below summarises the data for the 15 no. stations located adjacent or downstream of the Greenway scheme. The water quality at these stations is generally classified as unpolluted.

Table 8.11 River Water Quality at 15 No. EPA Monitoring Stations

Ref	River Catchment	River Name	Station_ID	Location	Q-value	Relevance
1	Owenglin	Owenglin	32O030200	Bridge S.W. of Clifden Lodge	4-5	Adjacent to Scheme
1	Owenglin	Owenglin	32O030300	Br at S.E. end of Clifden	4	Downstream of Scheme
2	Derryehorraun	Derryehorraun	32D040200	Just u/s Salt Lough	4-5	Downstream of Scheme
3	Owenmore	Recess	31R010300	D/s Owentooey River confluence	4	Adjacent to Scheme
3	Owenmore	Recess	31R010100	Bunskannive Bridge	4-5	Adjacent to Scheme
3	Owenmore	Recess	31R010400	Weir Bridge	4	Adjacent to Scheme
3	Owenmore	Recess	31R010700	Cloonbeg Bridge	5	Downstream of Scheme

Ref	River Catchment	River Name	Station_ID	Location	Q-value	Relevance
3	Owenmore	Recess	31R010200	Cloonloppeen Bridge	4	Adjacent to Scheme
3	Owenmore	Owentooey	31O030100	Tullywee Bridge	4-5	Adjacent to Scheme
3	Owenmore	Glencoaghan	31G010200	Glencoaghan Bridge	4-5	Adjacent to Scheme
4	Screebe	Screebe	31S010100	Old Railway Br u/s L. Shindilla	4-5	Adjacent to Scheme
5	Owenree	Owenwee (Corrib)	30O030100	Bridge S.E. of Bofin Lodge	4-5	Adjacent to Scheme
6	Owenriff	Owenriff (Corrib)	30O020190	Bridge u/s Lough Corrib	4	Downstream of Scheme
6	Owenriff	Owenriff (Corrib)	30O020100	1 km u/s Oughterard Bridge	4-5	Adjacent to Scheme
6	Owenriff	Owenriff (Corrib)	30O020070	1 km d/s Lough Agraffard	4-5	Adjacent to Scheme

Lake Water Quality

As part of a national water quality monitoring programme a number of lakes throughout the country are sampled and the trophic status assessed. Lake water quality is most commonly assessed by reference to a scheme proposed by the Organisation for Economic Cooperation and Development (OECD) (OECD, 1982). This scheme defines the traditional trophic categories by setting boundaries for the annual average values for total phosphorus, chlorophyll and water transparency, and for the maximum and minimum values of the latter two parameters.

As insufficient data is available to allow a full assessment based on these criteria, a modified version is used in which annual maximum chlorophyll a concentration is the only parameter used. This has been further subdivided into six water quality categories by reference to the maximum levels of planktonic algae measured during the period **(Table 8.12**). Indicators relating to water quality and the probability of pollution are also shown in the table below.

Table 8.12 Trophic Classification Scheme for Lake Waters

Classification Scheme		Category Description				
Lake Trophic Category		**Annual Maximum Chlorophyll (mg/m^3)**	**Algal Growth**	**Degree of Deoxygenation in Hypolimnion**	**Level of Pollution**	**Impairment of Use of Lake**
Oligotrophic (O)		<8	Low	Low	Very low	Probably none
Mesotrophic (M)		8 – 25	Moderate	Moderate	Low	Very little
Eutrophic	Moderately (m-E)	25 – 35	Substantial	May be high	Significant	May be appreciable
	Strongly (s-E)	35 – 55	High	High	Strong	Appreciable
	Highly (h-E)	55 – 75	High	Probably total	High	High
Hypertrophic (H)		>75	Very high	Probably total	Very high	Very high

The trophic status provides an indication as to what degree the lake is enriched by the presence of nutrients such as phosphorus and to a lesser extent nitrogen in the form of nitrate. Excessive nutrient presence in lakes will promote the growth of algae which in overabundance cause serious environmental problems e.g. 'algal blooms, where significant accumulations of cyanobacteria that can be swept by winds along the lake shore seriously disrupting the dissolved oxygen regime. Cyanobacteria and algal material can release trace organic components which can impair the amenity value of a lake and render it unfit for drinking water where a supply is sourced.

The lakes monitored by the EPA within the study area are provided in **Table 8.13**. The trophic and ecological status of these lakes is provided in **Tables 8.14 and 8.15**.

Table 8.13 Lakes Monitored by the EPA for Trophic and Ecological Status in the Study area

Lake	River Catchment	SEG_CD	Location Relative to Greenway
Derryclare	Owenmore	WE_31_227	Adjacent to Greenway
Ballynahinch	Owenmore	WE_31_228	Upstream of Greenway
Shindilla	Screebe	WE_31_171	Adjacent to Greenway
Nahasleam	Screebe	WE_31_208	Downstream of Greenway
Ardderry	Screebe	WE_31_76	Downstream of Greenway
Maumwee	Owenree	WE_30_343	Upstream of Greenway
Anillaun	Owenree	WE_30_348	Upstream of Greenway
Bofin	Owenriff	WE_30_335	Adjacent to Greenway
Lettercraffoe	Owenriff	WE_30_344	Upstream of Greenway

Table 8.14 EPA Trophic Status of Lakes with the Study Area*

Lake	SEG_CD	Year of Sampling	Surface Area (ha)	Sampling Agency	Sampling Frequency pa	Chlorophyll Mean µg/l	Chlorophyll Max. µg/l	Trophic	Water Transp Min. m	Water Transp Mean	Tot.-P mg/l	Trophic Status	Ecological Status	Beneficial Uses
Bofin	WE_30_335	2007	487.87	LA	Four		15.0	M						FPM
	WE_30_335	2008			Four		1.0	O						SAC
	WE_30_335	2009			Four		3.2	O				O	M	Game fishery
Maumwee	WE_30_343	2007	27.52	EPA	Ten	2.7	4.5	O	7.1	7.1	0.010			
	WE_30_343	2008			Four		3.1	O						SAC
	WE_30_343	2009			Four		3.0	O				O	H	Game fishery
Lettercraffoe	WE_30_344	2007	82.04	EPA	Eight		15.0	M						
	WE_30_344	2008			Four		11.4	M						SAC, FPM
	WE_30_344	2009			Four		10.4	M				M	G	Game fishery
Anillaun	WE_30_348	2007	67.01	LA	Four		17.0	M						
	WE_30_348	2008			Four		2.4	O						SAC
	WE_30_348	2009			Four		10.0	M				M	H	Game fishery
Shindilla	WE_31_171	2007	65.33	EPA	Nine		6.3	O						
	WE_31_171	2008			Four		3.1	O						SAC
	WE_31_171	2009			Four		3.4	O				O	G	Game fishery
Nahasleam	WE_31_208	2007	27.97	LA	Four		5.1	O						
	WE_31_208	2008			Four		2.4	O						SAC
	WE_31_208	2009			Four		2.8	O				O	H	Game fishery
Derryclare	WE_31_227	2007	222.53	LA	Four		9.8	M						
	WE_31_227	2008			Four		1.0	O						SAC
	WE_31_227	2009			Four		2.8	O				O	H	Game fishery
Ballynahinch Lake	WE_31_228	2007	165.30	LA	Four		7.3	O						
	WE_31_228	2008			Four		1.0	O						SAC
	WE_31_228	2009			Four		1.5	O				O	G	Game fishery
Ardderry	WE_31_76	2007	80.72	EPA	Nine		4.2	O						
	WE_31_76	2008			Four		3.2	O						SAC
	WE_31_76	2009			Four		2.7	O				O	G	Game fishery

*Abbreviations defined:
O: Oligotrophic, M: Mesotrophic, m-E: Moderately eutrophic, s-E: strongly eutrophic, h-E: highly eutrophic, H: Hypertrophic
H: High, G: Good, M: Moderate, P: Poor, B: Bad
FPM: Freshwater Pearl Mussel
SAC: Special Area of Conservation

Table 8.15 EPA Ecological Status of Lakes within the Study Area

Lake	SEG_CD	Year	General Conditions							Biological Quality Element - Enrichment						
			Oxygenation Status	Ammonia Status	TP Status	Nutrient Conditions Status	Acidi-fication Status	Thermal Status	Overall Status for GC	Macro-phyte Status	Chlorophyll Status	Fish Status	Overall Status for BQE	Hydro-morph-ology Status	Alien Invasives Introduct-ions artificial	Ecological Status 2007-2009
Bofin	WE_30_335	2007-09	High/good	High	High	High	Pass	Pass	High	High	High		High			High
Maumwee	WE_30_343	'07-09	High/good	High	High	High	Pass	Pass	High	High	High	High	High	High		High
Lettercraffoe	WE_30_344	2007-09	High/good	High	Good	Good	Pass	Pass	Good	Good	Good	Good	Good		High to Good	Good
Anillaun	WE_30_348	2007-09	High/good	High	High	High	Pass	Pass	High	High	High		High			High
Shindilla	WE_31_171	2007-09	High/good	High	Good	Good	Pass	Pass	Good	High	High	High	High	Good		Good
Nahasleam	WE_31_208	2007-09	High/good	High	High	High	Pass	Pass	High	High	High		High	High		High
Derryclare	WE_31_227	2007-09	High/good	High	High	High	Pass	Pass	High	High	High		High			High
Ballynahinch	WE_31_228	2007-09	High/good	High	High	High	Pass	Pass	High	Good	High		Good			Good
Ardderry	WE_31_76	2007-09	High/good	High	Good	Good	Pass	Pass	Good	High	High	Good	Good		High to Good	Good

8.3.7.2 Water Framework Directive

The Water Framework Directive (WFD) provides for the protection, improvement and sustainable use of waters, including rivers, lakes, coastal waters, estuaries and groundwater within the EU Member States. It aims to prevent deterioration of these water bodies and enhance the status of aquatic ecosystems, promote sustainable water use, reduce pollution and contribute to the mitigation of floods and droughts. Member States must aim to achieve 'good' status in all waters by 2015, and must ensure that the status does not deteriorate in any waters.

Assessments made as part of the RBD projects in 2005 assigned all sizeable streams and rivers an environmental objective score based on the likelihood of them achieving an objective of good status by 2015 (**Table 8.16**).

Table 8.16 WFD Rating System for Waterbodies

Score	Description
1a	At risk of failing to meet the objective of good status in 2015
1b	At risk of failing to meet the objective of good status in 2015 pending further investigation
2a	Expected to meet the objective of good status in 2015 pending further investigation
2b	Expected to meet the objective of good status in 2015

The WFD 'Water Matters' website mapping section provides details on the assessments, with a total of fifteen water bodies / sub catchments being traversed by the proposed Greenway alignment. **Table 8.17** below illustrates the WFD ecological classification for the waterbodies in the study area.

Table 8.17 WFD Ecological Classification For The Waterbodies In The Study Area.

Code	Name	Status	Objective
WE_30_1096	Corrib_Owenwee	Good	Protect
WE_30_1531	Corrib_Letterfore	Moderate	Restore_2021
WE_30_296	Corrib_Glashanasmearany	High	Protect
WE_31_1483	Coastalr4_Screeb_Ardderrynagleragh	Moderate	Restore_2015
WE_31_1600	Ballynahinch_Caher_DerryaddEast	Moderate	Restore_2015
WE_31_1617	Ballynahinch_Owenmore	High	Protect
WE_31_1978	Ballynahinch_Caher_Boheeshal	Good	Protect
WE_31_2091	Ballynahinch__AthryLough	Moderate	Restore_2015
WE_31_2139	Ballynahinch_Owenanookera	High	Protect
WE_31_2291	Coastalr4_Screeb_Shannaunnafeola	High	Protect
WE_31_268	Ballynahinch_Owentooey_Caher(BallynahinchyBy)	High	Protect
WE_31_302	Ballynahinch_Recess_DerryclareLough	Good	Protect
WE_32_3028	Owenglin_Owenglin_Cregg(BallynahinchBy)	Poor	Restore_2021
WE_31_343	Ballynahinch__Derryvickrune	High	Protect
WE_32_3035	Coastalt4_32_Derryehorraun	High	Protect

8.4 POTENTIAL IMPACTS

The potential impacts of the proposed Greenway works on the existing hydrological environment have been examined / assessed in accordance with the "*Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Project" (NRA, 2007)*. The assessments were carried out for both the construction and operational phases of the project.

All relevant authorities including the Office of Public Works (OPW), the Environmental Protection Agency (EPA), Inland Fisheries Ireland (IFI) and the Western River Basin District (WRBD) Office were contacted in order to obtain feedback on any likely adverse impacts that the proposed works might have on the existing hydrological and drainage environment.

A summary of the likely impacts of the proposed developed on each of the hydrological attributes are presented below for both the construction and operational stages of the proposed Greenway.

8.4.1 Construction Stage

This section is further divided into potential impacts resulting from flooding, drainage and low flows.

8.4.1.1 Flooding

During the construction stage of the works, the potential causes of flooding could include:

- Increase in surface runoff as a result of the increased impermeable areas within the site, when peat is removed,
- Flooding of adjacent lands caused by blockage to the surface runoff flow-path due to collapsing of unstable temporary on-site stockpiles during construction, and
- Flooding caused by the blockage of downstream river/stream channels from exported silts or sediment transported by flash flooding as a result of intense localised rainfall events.

8.4.1.2 Drainage

The existing land drainage system located in the study area is likely to be affected slightly during the construction period of the works. Potential impacts on the existing drainage systems might include the following;

- The pattern of surface runoff could change with some existing drains and ditches receiving significantly more or less flow than they currently receive,
- Rainfall on elevated areas could wash peat and silt into the surrounding watercourses. Localised erosion and scouring could occur while reduced flow may result in stagnation in some drains and ditches, and
- Obstruction of upland flow paths could cause localised water logging upstream of the site works.

8.4.1.3 Low-flow

- Any blockage to normal flow rates in the adjacent stream channels during the implementation of the works could reduce the flow rates in the downstream watercourses, which could have an impact on the aquatic ecology (refer to **Chapter 10**). This could be caused as a result of the temporary storage of excavation materials along the existing natural flow paths or from collapsing of unstable soil stockpiles, and

- Due to the removal of vegetated surface during construction, infiltration of surface runoff could increase, which could result in reduction of flow rate in the adjacent natural watercourses.

8.4.2 Operational Stage

This section is further divided into potential impacts resulting from flooding, drainage and low flows.

8.4.2.1 Flooding

During Operation

- There is potential for increases in flood flows in the downstream watercourses caused by increased impermeable areas (roads and hardstanding areas), and

- Any inadequately sized culverts crossings could cause water logging or flooding upstream.

8.4.2.2 Drainage

- Changes in surface water flow paths over the existing conditions on site may result from the presence of elevated paths and hardstanding areas. This could have an effect on the existing hydrological regime of the adjacent natural surface watercourses.

8.4.2.3 Low-flow

- Some degree of changes in infiltration of surface runoff (groundwater recharge) will occur due to the increased hardstanding areas and also from any reduction in soil permeability during the construction period. This has the potential to reduce the stream baseflow (dry weather flow) on the site.

8.5 MITIGATION MEASURES

Appropriate mitigation measures have been proposed in order to minimise each of the above identified impacts both during the construction and operational stages of the development. The following documents were referenced during the preparation of these mitigation measures:

- Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites. North Western Regional Fisheries Board (2006),
- CIRIA (Construction Industry Research and Information Association) guidance on '*Control of Water Pollution from Linear Construction Projects*' (CIRIA Report No. C648, 2006), and
- Developing Your Stormwater Pollution Prevention Plan: A Guide for Construction Sites. EPA 833-R-060-04 May 2007.

8.5.1 Construction Stage

8.5.1.1 Surface Water Drainage and Flooding

The following mitigation measures are proposed to manage flooding and storm water drainage during the construction stage of the works:

- To avoid any water logging in the adjacent lands, it is proposed to maintain the existing surface water flow paths by providing regular breaks in any temporary stockpiles during the construction of Greenway to ensure overland surface water flow is not restricted.
- Any temporary stockpiles must be stabilised through seeding to prevent collapsing during high rainfall events. It is recommended that the works be undertaken when flooding risks are low (dry period).
- Any impact of the proposed works on river water quality should be kept minimal. Any likely increase in sediment exports during the preparation stage of the lands will be minimised by implementing a number of mitigation measures. This would include installation of silt fence along the perimeter of the site boundary, reseeding of the exposed surface of the excavated material etc. Due to presence of adequate grassed buffer zone between the proposed site and the adjacent natural drainage system, the expected risk to existing river water quality will be minimal, because any silt or sediment washed off by the surface runoff will be intercepted before it reaches the natural surface watercourses.
- The disturbance of existing soil vegetation surface and soil permeability should be kept to a minimum during construction.

8.5.1.2 Low - Flows

- During the construction stage of the works any reduction of normal surface water runoff rate caused by any obstruction to flow path and also from the increased infiltration through the exposed ground surface should be minimised. However the expected impact on low-flow during the construction stage of the works is expected to be minimal in any case.

8.5.2 Operational Stage

8.5.2.1 Surface Water Drainage and Flooding

The following mitigation measures are proposed to manage flooding and storm water drainage during the operational stage of the works:

- Existing surface water flow paths will be maintained by maintaining culvert crossings under the greenway ditch crossing.
- Runoff from the site will be drained through existing drains. These drains will discharge to the adjacent natural watercourses. This will reduce the likelihood of water logging on site.
- The existing interceptor ditches will also provide attenuation for any increased surface runoff resulting from the proposed development.

8.5.2.2 Low - Flows

- Filter drains along the perimeter of the greenway should be provided to increase the groundwater recharge thus maintaining the existing baseflow into the adjacent stream/river channels.

8.6 RESIDUAL IMPACTS

It is predicted that impacts on the existing hydrological environment will be minimised as a result of the above mitigation measures.

Table 8.18 summarises the hydrological impact assessment results and proposed mitigation measures. A summary of the likely impacts of the proposed developed on each of the hydrological attributes are presented below for both the construction and operational phases of the proposed works.

Table 8.18 Summary of Hydrological Impacts of the Proposed Greenway Development

Attribute	Attribute Importance	Potential Impact	Level of Impact	Mitigation Measures	Residual Impact
Flooding Risk	Medium	There may be medium flooding risk in the upstream vicinity of the proposed works, which can be caused from the blockage of conveyance capacity by excavated construction material during the construction period. During the operation period any inadequately sized culvert crossings under Greenway could cause flooding in the upstream vicinity.	Slight Negative	Any temporary stockpiles must be stabilised with geogrid to prevent collapsing during high rainfall events. It is proposed to undertake the proposed works during dry weather periods where possible and reinstate stockpiles soon after excavation. No new drains will be provided. Existing drains will be cleaned out to ensure conveyance runoff from the Greenway surface and any hardstanding areas.	Imperceptible
Drainage	Medium	Some degree of obstruction (medium) to lateral surface water flow paths is expected from the temporary storage of excavated materials along the greenway both during and after construction. Some slight changes in the surface water drainage patterns, such as obstruction to flows path caused greenway surface, hardstanding areas, reduction of infiltration etc.	Slight Negative	To avoid any water logging in the lands adjacent to the Greenway, all existing culverts and bridges will be maintained to ensure continued flows under the Greenway.	Imperceptible
Low-flows	Low	The expected impact on the low-flow rates in the adjacent surface water courses from the proposed development would be minimal both during construction and operation periods of the works.	Imperceptible	To avoid any reduction of surface water flow to the river during the construction stage of the works, it is proposed to maintain the existing surface water flow paths by minimising any risk of likely obstruction to flow paths to be caused from the excavated materials. All existing filter drains will be maintained along the perimeter of the Greenway thus maintaining the existing baseflow into the adjacent stream/river channels during the operation period of the development.	Imperceptible

8.7 CONCLUSIONS

The proposed Connemara Greenway Project – Clifden to Oughterard will not pose any additional flooding risk in the area upstream and downstream of the study area. The proposed works will therefore not have residual impacts on the existing hydrological regime of the river catchment.

9 SOILS, GEOLOGY AND HYDROGEOLOGY

9.1 INTRODUCTION

This chapter of the EIS examines the baseline environment in terms of soils, geology and hydrogeology and assesses the potential impact of the proposed works associated with the Connemara Greenway Project – Clifden to Oughterard on these environmental attributes. Mitigation measures are recommended to minimise any adverse impacts.

This section should be read in conjunction with the site layout plans, drawings and project description provided and hydrological assessment in **Chapters 6 and 8**.

9.2 METHODOLOGY

The soils, geology and hydrogeology of the study area were assessed by means of a desk study of literature pertinent to the site and the surrounding area.

The following sources of information were used in order to complete the assessment:

- Geological Survey of Ireland (G.S.I.) 1:100,000 Geology of Galway Bay (Sheet 10),
- G.S.I. Well Record Database,
- G.S.I. National Vulnerability Map,
- Teagasc Subsoils Map,
- Aerial Photographs,
- Clifden Marbles Groundwater Body Description (G.S.I. 2004),
- Water Framework Directive (WFD) Water Body Reports http://watermaps.wfdireland.ie,
- Ordnance Survey of Ireland (O.S.I.) 1:50,000 Map Discovery Series and Historical Mapping,
- Guidelines on the Information to be contained in Environmental Impact Statements, EPA 1995 and 2002,
- Geology and the EIS process, IGI, 2002,
- *Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Scheme, NRA (National Roads Authority), 2009,* and
- Soils, Geology and Hydrogeology Chapter of the Environmental Impact Statement for the N59 Clifden to Oughterard Road Project, Roughan and O' Donovan 2011 (unpublished).

The methodology for impact assessment is defined by the EPA *Guidelines to be contained in Environmental Impact Statements* (1995 & 2005). An application of these guidelines to Soils, Geology and Hydrogeology is outlined in the NRA document *Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Scheme* (2009).

In this methodology the significance of an impact is defined by considering the importance of the attribute impacted and the magnitude of the impact. The importance of geological and hydrogeological attributes (rating criteria) is defined in accordance with the NRA Guidelines which are presented in **Table 9.1**.

Table 9.1 Rating Criteria for the Geological and Hydrogeological Attributes

Importance	Criteria	Typical Examples	
		Geology	Hydrogeology
Extremely high	Attribute has a high quality or value on an international scale	-	Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation e.g. cSAC or SPA status
Very high	Attribute has a high quality or value on a regional scale	Geological feature rare on a regional or national scale (NHA)	Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – NHA status
High	Attribute has a high quality or value on a local scale	Geological feature of high value on a local scale (County Geological Site)	Groundwater provides large proportion of baseflow to local rivers Locally important potable water source supplying >1000 homes
Medium	Attribute has a medium quality or value on a local scale	Small existing quarry or pit Sub-economic extractable mineral resource	Locally Important Aquifer Potable water source supplying >50 homes Outer source protection area for locally important water source
Low	Attribute has a low quality or value on a local scale	Poorly drained and/or low fertility soils	Poor Bedrock Aquifer Potable water source supplying <50 homes

The magnitude of the impacts on the existing environment of the attributes was defined in accordance with the criteria provided in the EPA publication - *Guideline on the Information to be Contained in Environmental Impact Statements* (2002). These are presented in **Table 9.2**.

Table 9.2 Impact Assessment Criteria

Magnitude of Impact	Description
Imperceptible	An impact capable of measurement but without noticeable consequences
Slight	An impact that alters the character of the environment without affecting its sensitivities
Moderate	An impact that alters the character of the environment in a manner that is consistent with existing or emerging trends
Significant	An impact, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
Profound	An impact which obliterates all previous sensitive characteristics

9.3 EXISTING ENVIRONMENT

9.3.1 Soils and Subsoils

Teagasc subsoils mapping shows the area to be comprised predominantly of thin blanket peat deposits. Made ground is present along the route associated with the N59 road between Oughterard and Clifden. Made ground is most apparent in the more inhabited parts of the study area but also close to the dismantled railway line and other areas where materials have been sourced for abstraction or moved for construction (residential/civil). There are significant areas of made ground in both Oughterard and Clifden. Much of the disused railway line is now covered in topsoil, which in drier areas is maintained as a track (Examples shown in **Images 9.1 and 9.2**) and in wetter areas has been colonised by hydrophilic plants. A high percentage of the disused railway line is now used as a track connecting agricultural lands.

Image 9.1 An example of the proposed route and former railway within townland of Emlaghmore, facing west, with improved topsoil raised above the surrounding bog.

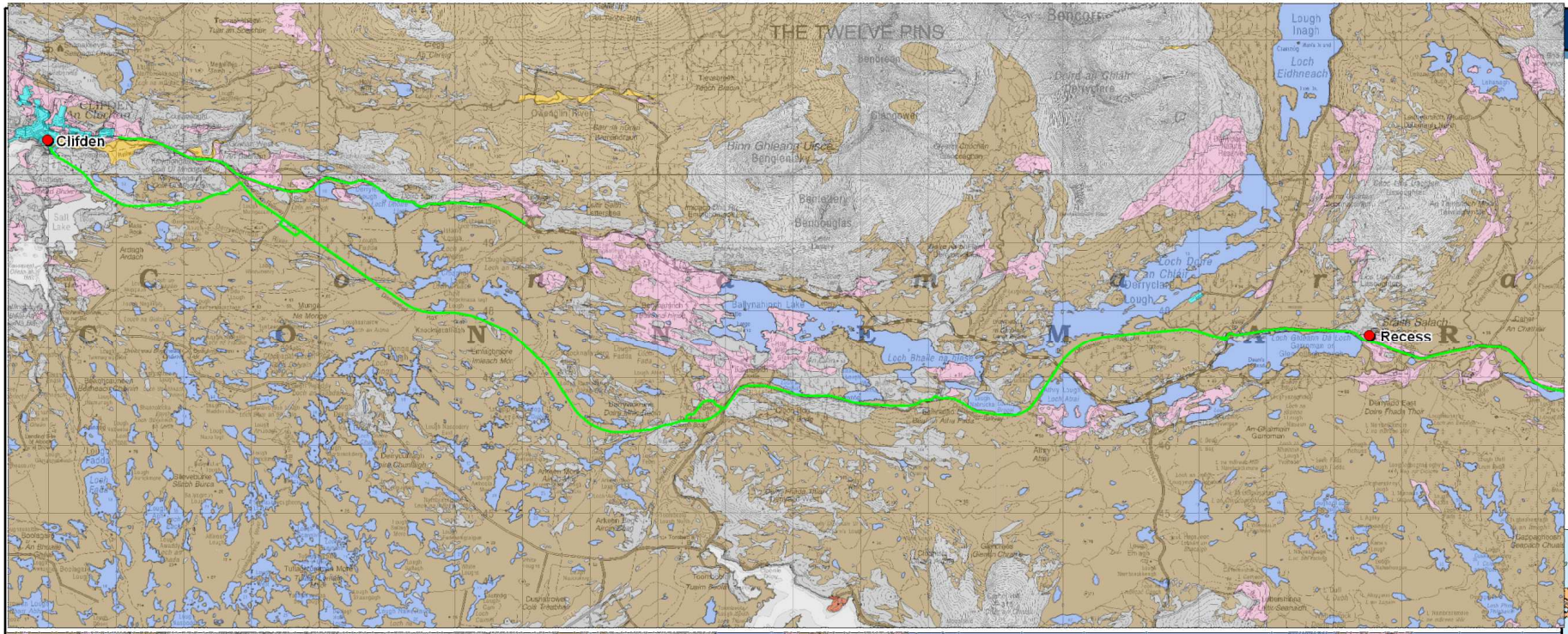
Image 9.2 An example of the proposed route and railway to the immediate north of Lough Shindilla, facing west southwest, where it is being used as a farm track.

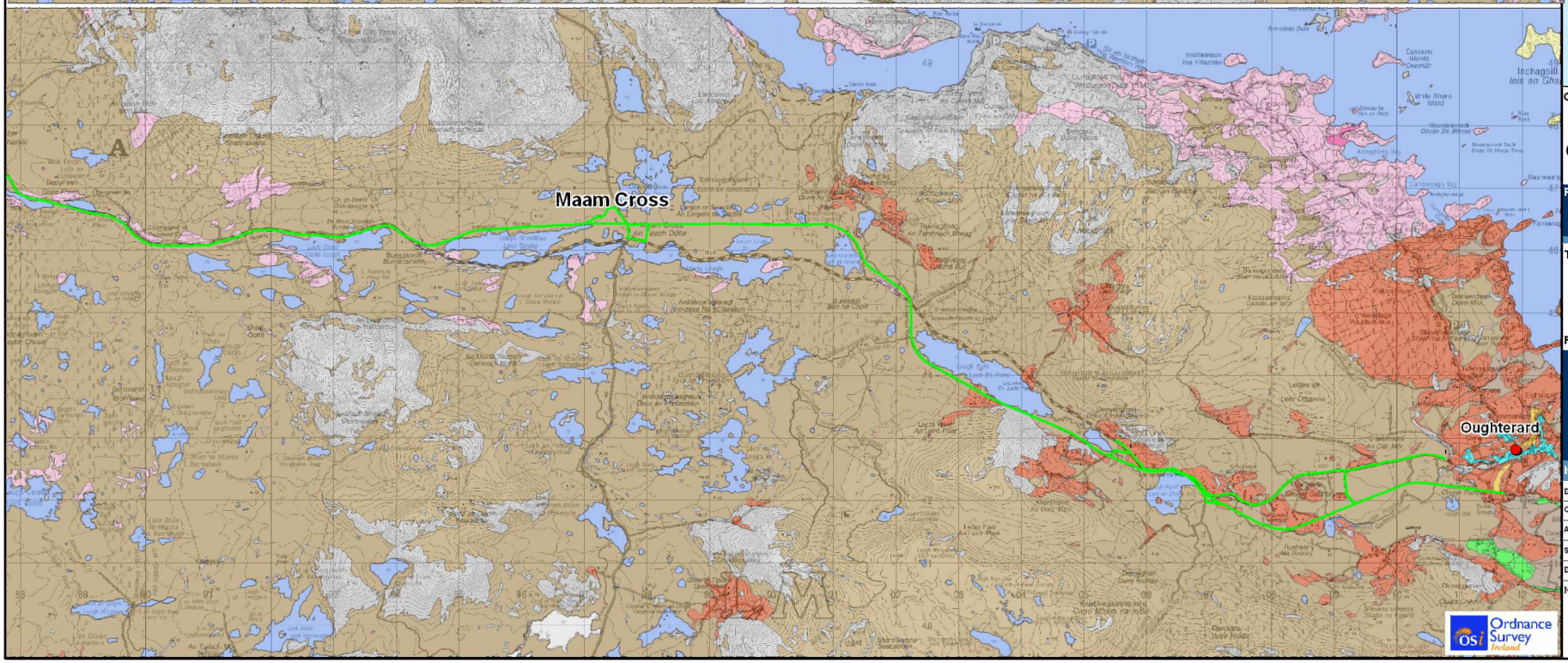
There is a varying presence of till derived chiefly from granite along the proposed route between the village of Oughterard and Lough Bofin. Sporadic areas of till, derived chiefly from metamorphic rock, are evident within the study area between Lough Shindilla and Ballynahinch Lake, where it begins to become more prevalent. Bedrock outcrops and subcrops are evident at various points along the study area and are mostly apparent along the proposed route between Recess and Clifden. Details on soils in the study area are shown on **Figure 9.1**.

9.3.2 Bedrock Geology

The main rock types encountered along the route are Precambrian Marbles and Precambrian Quartzite's, Gneisses and Schist's. Late-Silurian, Mid-Devonian Granites are also present along the route. The study area between Clifden to Maam Cross is underlain by both the Cashel Schist Formation Marbles with Quartzite's, Gneisses and Schists, and the Lakes Marble Formation with Marbles, metavolcanics, schists and grits also underlying the area. From Maam Cross to Oughterard the route passes over the metamorphic rocks described above, but the predominant rock type is Oughterard granite. The granite is present in two distinct areas, east of Maam Cross and around Lough Bofin as well as from Lough Agraffard to just west of Oughterard. The Streamstown Schist Formation, with Psammitic pelitic and semi-pelitic schists, is present around Maam Cross and south of Derryclare Lough. Details on bedrock geology are shown on **Figure 9.2**.

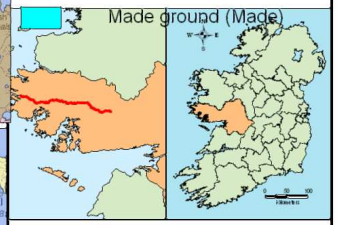
The location of mineral sites and quarries in the area are shown in **Figure 9.3** and are detailed in **Tables 9.3 and 9.4**.





Legend

- Proposed Route Layout
- Blanket Peat (BktPt)
- Till derived chiefly from Granite (TGr)
- Bedrock outcrop & subcrop (Rck)
- Till derived chiefly from Metamorphic Rocks (TMp)
- Made ground (Made)
- Alluvium (A)
- Water



Client

Galway County Council

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Connemara Greenway

Title

Soils Map

Figure 9.1

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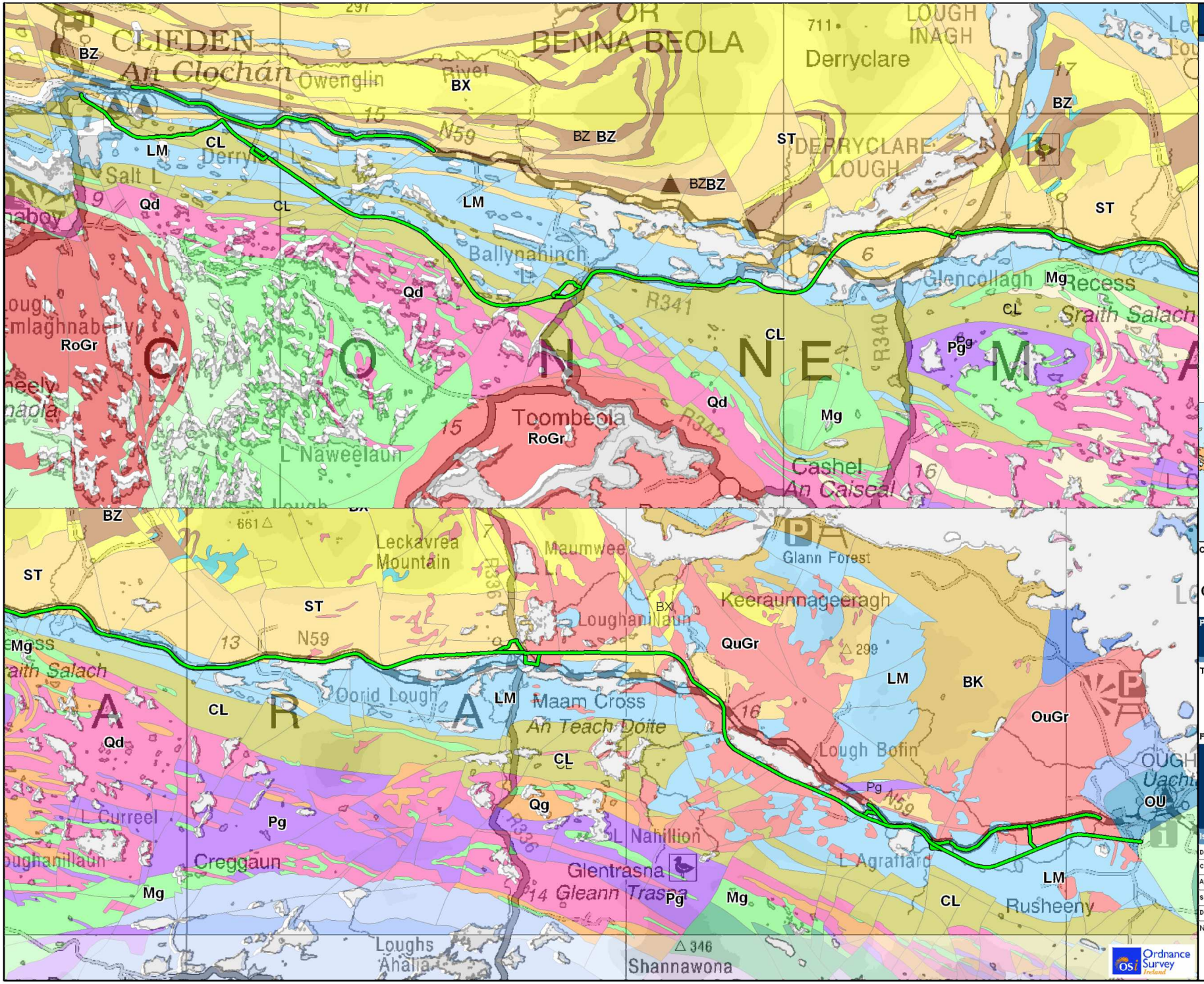
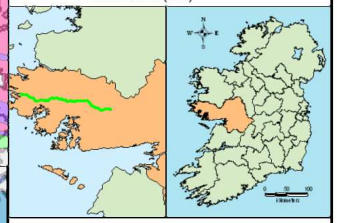


Legend

- Proposed Route Layout
- Oughterard Granite (OuGr)
- Roundstone Granite (RoGr)
- Ballynakill Schist Formation (BK)
- Streamstown Schist Formation (ST)
- Lakes Marble Formation (LM)
- Cashel Schist Formation (CL)
- Oughterard Limestone Formation (OU)
- Quartz Diorite Gneiss & Granitic Gneiss (Qg)
- Metagabbro & Related Lithologies (Mg)
- Paragneiss, Migmatite Hornfels (Pg)
- Bennabeola Quartzite Formation (BX)
- Barnanoraun Schist Formation (BZ)



Client

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Bedrock Map

Figure 9.2

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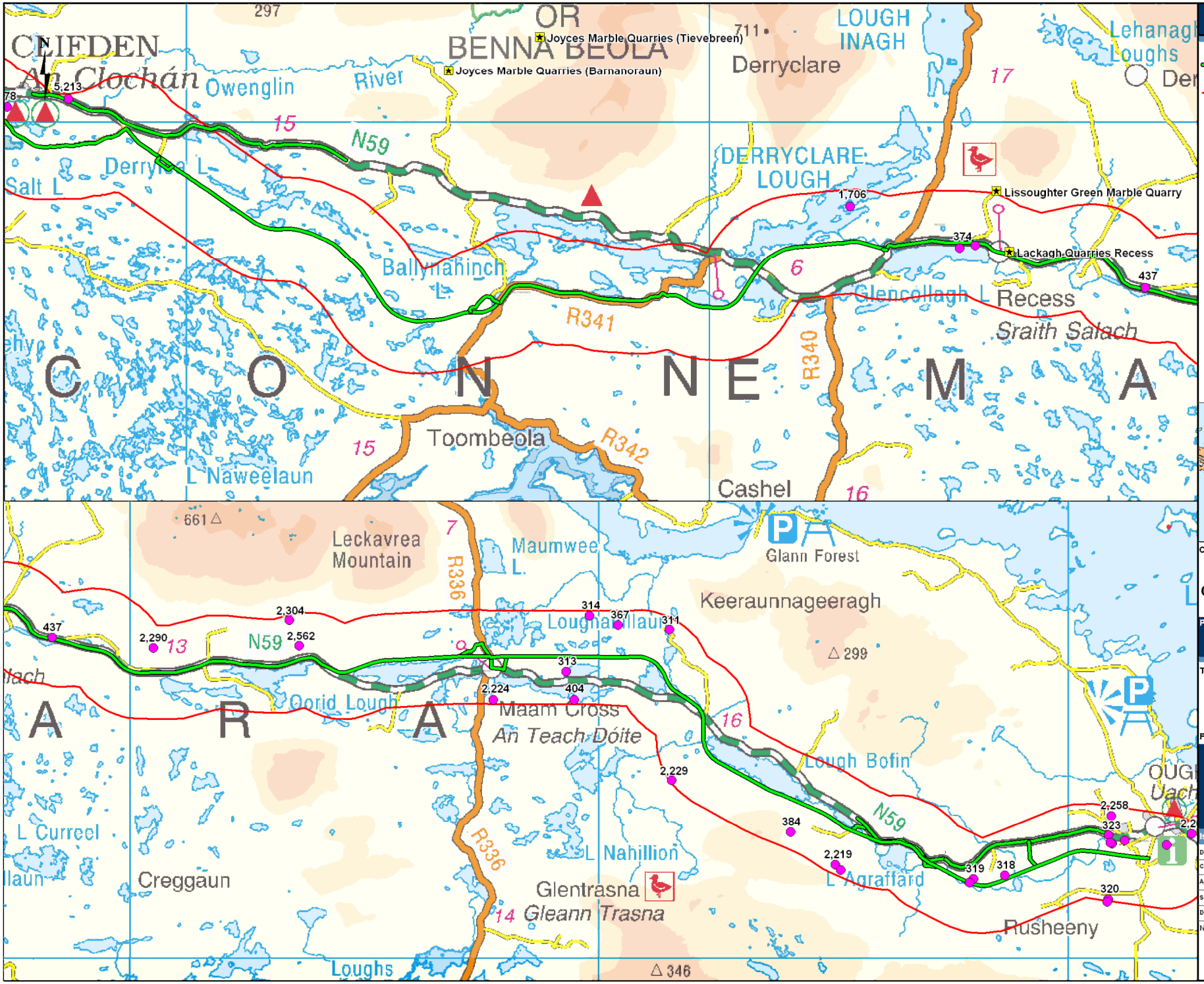
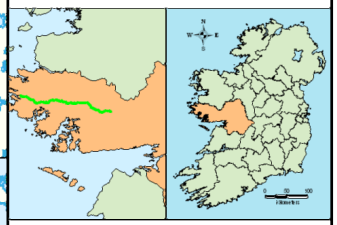


Legend

- Proposed Route Layout
- 1km boundary
- GSI Mineral Sites
- Quarries



Client
Galway County Council

Project
Connemara Greenway

Title
GSI Mineral Sites & Quarries

Figure 9.3

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Table 9.3 Mineral Sites Located in the Study Area

Location No.	Mineral	Townland	Notes
311	Chalcopyrite	Derrybeg	Pyrite and chalcopyrite noted in skarn here.
313	Sulphur	Lurgan	Pyrite and chalcopyrite noted in skarn here.
314	Sulphur	Derreennagusfoor	Pyrite and chalcopyrite noted in skarn here.
318	Barytes	Glengowla East	Significant disused lead mine with spahlerite and a gangue of barytes
319	Barytes	Glengowla West	Disused lead mine, some zinc output, with gangue of barytes and purple fluorite. Operated in the 1850's and 1860's.
320	Barytes	Cregg	Disused lead mine with copper, zinc and a gangue of barytes
322	Barytes	Clooshgereen	Disused lead mine with pyrite and barytes.
323	Copper	Claremount	Significant lodes of galena and chalcopyrite in granite and dolomite here.
324	Barytes	Canrawer West	Pyrite noted in fault rock here.
367	Sulphur	Derreenagusfoor	Chalcopyrite mined for copper ore here. Noted on old GSI 6in. map and in GSI Memoirs
374	Iron	Lissoughter	Pyrite and chalcopyrite noted in amphibolites here by IBM (1973).
384	No mineral recorded	Leam East	Trial pits shown on the old GSI 6in. map. No mineral recorded.
404	Asbestos	Arderrynagleragh	Asbestos noted in hornblende rocks here on old GSI 6in. Map.
435	Psammite	Lissoughter	Large quarry in Streamstown schist formation producing road metal (operating sep 94 supplying aggregate to much of Connemara)
437	Psammite	Derryneen	Roadstone quarry in metasediments noted here.
1706	Marble (in general)	Cloonacartan	Green 'Connemara marble' out crops on this peninsula and includes bands of jewellery grade stone.
2209	Calcite	Lemonfield	Shaft driven in N-S trending lode of lead and calcite.
2219	Pyrite	Leam East	Occurrence of pyrite in this locality.
2220	Pyrite	Leam East	Pyrite noted at this locality.
2224	Pyrite	Derrynagleragh	Occurrence of pyrite in this locality on old 6in. map.
2229	Pyrite	Leam West	Pyrite noted at this locality on old 6in. map.
2249	Barytes	Canrawer West	Copper and lead trending NW worked in two shafts.
2253	Pyrite	Claremount	Pyrite occurring in a fault trending NW downthrowing to the east
2258	Lead	Tonweeroe	Site of old lead shaft.

Table 9.4 Quarries Located in the Study Area

Quarry Name	Address	Operation Name	Operation Address
Lackagh Quarries	Lissoughter Recess, Galway	Lackagh Quarries Ltd.	Recess, Galway
Lissoughter Green Marble Quarry	Lissoughter Recess, Galway	J.C Walsh & Sons Ltd.	Recess, Galway

9.3.3 Hydrogeology

The bedrock underlying the majority of the study area is classified by the Geological Survey of Ireland (GSI) as a 'Poor Aquifer'. Outside the village of Oughterard the proposed route is underlain by small segments of rock which are classified by the GSI as 'Regionally Important Aquifer – Karstified', 'Locally Important Aquifer (bedrock which is moderately productive only in local zones)' and 'Locally Important Aquifer (bedrock which is generally moderately productive)'. The aquifer classification in the study area is shown on **Figure 9.4**.

The study area is located within a number of Groundwater Bodies (GWBs) which are outlined in **Table 9.5**. A GWB is the management unit for the purposes of the Water Framework Directive (WFD). All but one GWB through which the proposed Greenway will traverse is classified under the WFD as being of Good status. Ross Lake GWB is located with a karstified region and is classified as being of Poor status with an objective set for this water body to restore Good status by 2021.

Table 9.5 Groundwater Bodies in Study Area

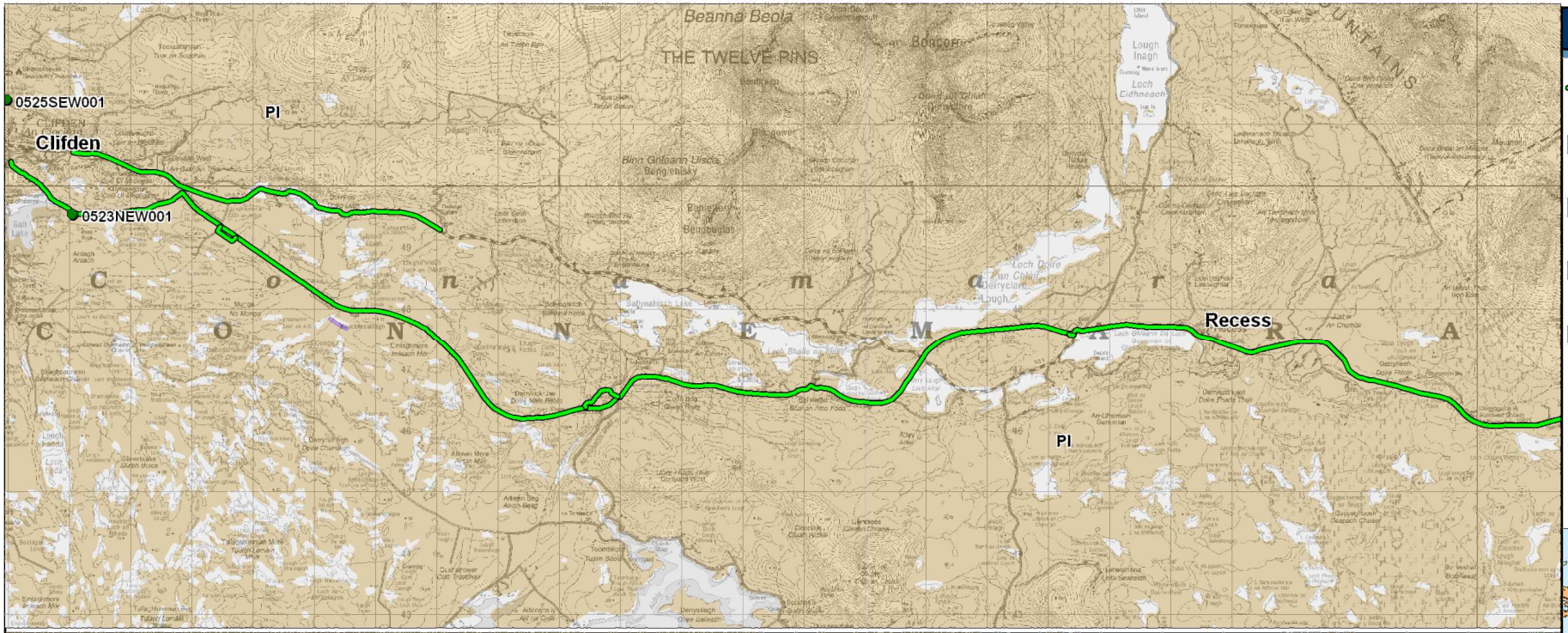
Groundwater Body Name	WFD Code	WFD Status	Aquifer Classifications
Clifden Marbles	IE_WE_G_0013	Good	Poor
Clifden-Castlebar	IE_WE_G_0017	Good	Poor, Locally Important
Recess Marbles	IE_WE_G_0012	Good	Poor
Spiddal	IE_WE_G_0004	Good	Poor
Recess	IE_WE_G_0011	Good	Poor
Maam-Clonbur	IE_WE_G_0006	Good	Poor
Oughterard Marbles	IE_WE_G_0009	Good	Poor
Ross Lake	IE_WE_G_0010	Poor	Regionally Important, Karstified

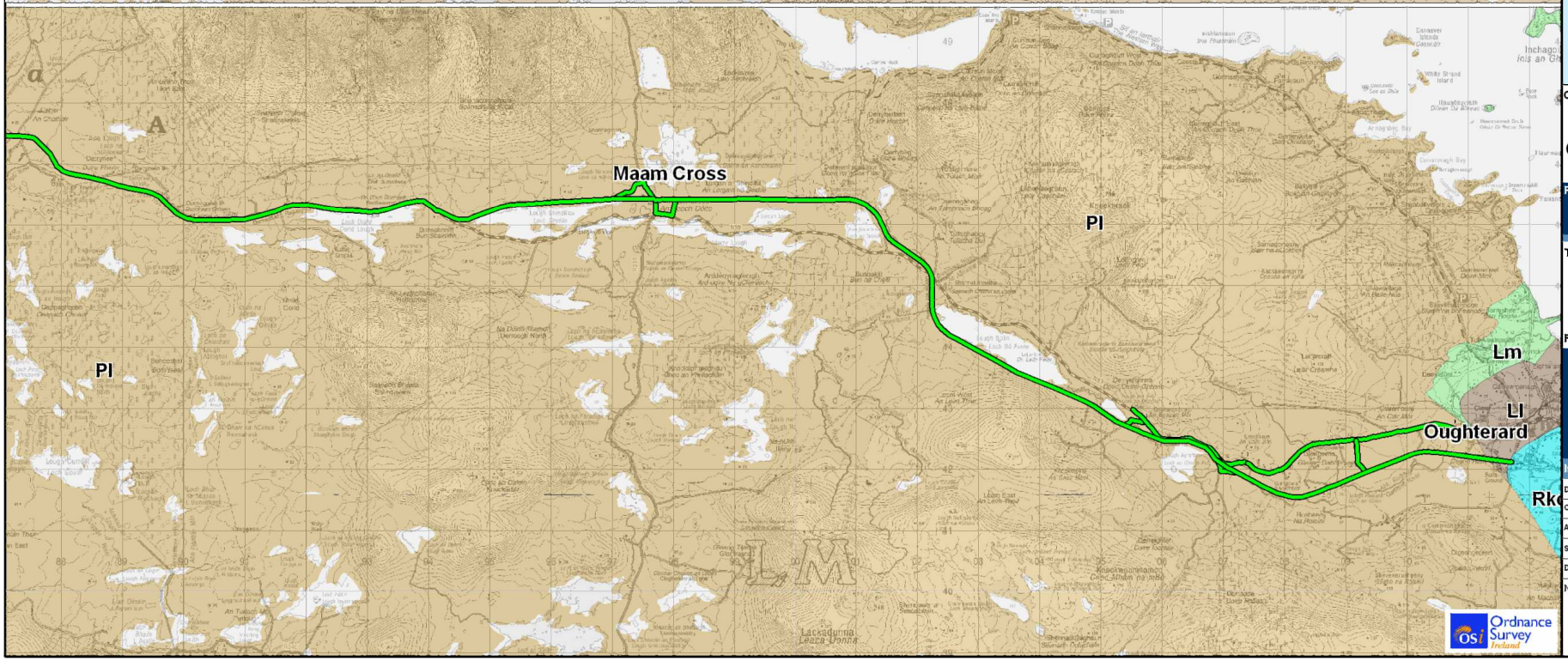
The GSI records show that there is one well located in the 1km buffer zone, details of which is shown in **Table 9.6**. This well is used for domestic and agricultural purposes. One well was also identified 1km outside of Clifden.

Table 9.6 GSI Well Data

No.	GSI Name	Type	Depth (m)	Townland	Source Use	Yield Class	Yield m^3/day	Comments
1	0525SEW001	Borehole	35.3	Clifden	Agri & domestic use	Poor	21.8	Unknown
2	0523NEW001	Borehole	27.4	Killymongaun	Unknown	Poor	21.8	Unknown

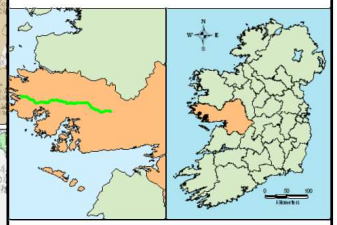
The GSI maintains a database of karst features in Ireland. The majority of the proposed Greenway route will not run through karstified landscape. There is some karstification in proximity to Oughterard but the karst database indicates only two karst features in proximity to the site. These are two boreholes north of Oughterard, 1123NWK001 and 1123NWK002, both of which are located approximately 1.1km from the nearest point of the Greenway.





Legend

- Proposed Route Layout
- Pl - Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones
- Lm - Locally Important Aquifer Bedrock which is Generally Moderately Productive
- Ll - Locally Important Aquifer Bedrock which is Moderately Productive only in local zones
- Rkc - Regionally Important Aquifer - Karstified (conduit)
- GSI Wells



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Aquifer Map

Figure 9.4

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Groundwater Flow

Diffuse groundwater recharge occurs via rainfall percolating through the subsoil and rock outcrops. Due to the low permeability of some subsoil deposits and the aquifers, a high proportion of the effective rainfall will quickly discharge to the streams. The stream density is relatively high, reflecting the high proportion of surface runoff.

Shallow groundwater is likely to discharge to most streams in the GWB, but the limited bedrock transmissivity means that the baseflow component of the total streamflow will be low. Small springs and seeps are likely to issue at the stream heads and along their course.

In the absence of inter-granular permeability, groundwater flow is expected to be concentrated in upper fractured and weathered zones and in the vicinity of fault zones, which may have some degree of karstification. Flow paths are likely to be up to 150 m with groundwater discharging rapidly to nearby streams and small springs. Flow directions are expected to be in general to the west, toward the coast.

Groundwater will discharge locally to streams and rivers crossing the aquifer and also to small springs and seeps. Owing to the poor productivity of the aquifers in this body it is unlikely that any major groundwater - surface water interactions occur. Baseflow to rivers and streams is likely to be relatively low.

9.3.4 Geological Heritage

The Geological Survey of Ireland and the Irish Geological Heritage programme (IGH) are in partnership with the National Parks and Wildlife Service (NPWS) of the Department of Arts, Heritage and the Gaeltacht to identify and select important geological and geomorphological sites throughout the country for designation as NHAs (Natural Heritage Areas). There are no geological heritage areas within the study area.

9.4 POTENTIAL IMPACTS

The full scope of works is described in **Section 6**. The objective of the proposed development is to provide a Greenway route for use by cyclist and walkers. The potential impact of the individual works items are outlined below.

The majority of the earthworks impacts relate to moving topsoil to allow the construction of the proposed Greenway, requiring excavation of usually soft but possibly hard materials, replacement, deposition and compaction of acceptable fill materials and disposal to embankments adjacent to the route of unacceptable materials.

The removal of overburden material during the construction of the proposed Greenway will not give rise to an increase in aquifer vulnerability. There is very little karst geology in the study area which will help reduce the likelihood of contaminant reaching aquifers. There is an area of karst geology to the Southeast of Oughterard which may be vulnerable to contaminants reaching aquifers.

The proposed construction works would alter the existing surface water flow patterns and recharge to the aquifer. However, given the limited width of the required corridor for the Greenway, it is unlikely that there would be any great influence on the existing groundwater regime which is generally unproductive except for local zones.

The proposed works will not impact on any areas of national geological importance. They will not impact on any areas currently recorded by the GSI as having mining, quarrying or water resource development.

9.4.1 Construction Stage

Construction of the proposed Greenway will include the removal of overburden (predominantly topsoil and scrub) and construction of approximately 52km of cycle and walkway. It will also involve laying a base consisting of 150mm of crushed stone to Clause 804, rolled and compacted, and a finished surface layer of 'SMA 14 Surf PMB 65/105 – 60 des.' 30mm thick, as per CL942 of series 900 of the NRA 'Specifications for Road Works' material. An imperceptible impact on soils and geology can be expected due to the disturbance and loss of soils during works. There is no impact expected on hydrogeology.

Proposed works will also include drainage of surface waters from the proposed Greenway via existing drains running adjacent to the track. It is proposed that these drains will be opened up during the construction phase. This may lead to sediment disturbance with subsequent siltation and deposition downstream of the location which is considered a slight impact on soils and geology.

Any excavated material within the proposed route will be a mixture of topsoil and scrub. It is not envisaged that rock breaking will be necessary as part of the proposed Greenway construction. Teagasc soil mapping indicates the soil type along the proposed Greenway where excavation may occur is mostly Blanket Peat deposits and made ground. The disused rail track itself consists of made ground or topsoil, which will be removed and replaced with Clause 804 crushed stone and a bituminous bound material.

There may be some disturbance to soils adjacent to the proposed track, the majority of which are thin Blanket Peat deposits. Where the soil cannot be returned to a similar quality this would constitute a 'Permanent Negative Impact' on the soils and geology of the area. The attribute importance of the soils is considered to be extremely high as they are generally poorly drained with low fertility. A permanent impact on a significant proportion of the soil in the area would constitute an extremely high impact on soils and geology.

It is not anticipated that there will a need for export of earthworks material and so it is considered there will be no impacts in this regard.

There will be a requirement to import approximately 19,125m^3 of aggregate. With abundant sources of rock and numerous quarries operating in the region, the availability and demands of such resources of import fill will have a "**Permanent Moderate Adverse**" impact. The transportation requirements and related impacts of bringing these materials to site are detailed in Chapter 16: Traffic, Chapter 11: Air Quality and Climate and Chapter 12: Noise and Vibration.

The quantity of soft ground along the proposed Greenway route which would need to be excavated and added to embankments along the route edge would be approximately 127,500m^3. Removal of this material outside of the project limits would constitute a '**Permanent Significant Adverse**' impact. However it is proposed to retain this material to create embankments along the proposed route therefore the impact would be minimal.

Peat soil, when considered as a fuel or a commercial resource, is of widespread availability in the locality, however, the importance of the peat soils which are to be excavated and replaced as part of the proposed Greenway is low. The overall worst case impact is therefore a "**Permanent Moderate Adverse**" impact if all the peat materials excavated on site are disposed of off site.

Economic Geology and Mining Heritage

No impact on economic geology is foreseen. No impact on the Glengowla Mines located immediately adjacent to the proposed Greenway route is foreseen.

Soil Disturbance and Greenhouses Gases

The impact of soil disturbance on greenhouse gases is detailed in **Chapter 11 Air Quality and Climate.**

Loss of Residential Seedbank/Mycorrhizae of Soils

The removal of soil as part of initial site clearance and proposed Greenway construction works will result in the removal of the residential seed bank within the soil. Where the upper layers of soil support a semi-natural grassland, woodland or hedgerow plant community the seed contained within the soil can form an important source of seed for the recreation of habitats which will be lost during the proposed Greenway construction. However, the majority of the route will be along the disused railway line which it is likely will not have a diverse seed bank. It is expected that impacts on the residential seedbank of soils under the railway line will be "**Imperceptible**" with the exception of the "flush" of weeds associated with the disturbance of such nutrient rich soils which can impact on surrounding land-uses.

In contrast, impacts on the residential seedbank of semi-natural habitats can range from "**Permanent Slight to Significant Adverse**" impact depending on the importance of the habitat as identified in Chapter 10 – Terrestrial and Aquatic Ecology. Where "**Permanent Significant Adverse**" impacts are expected, avoidance or mitigation measures in the form of 'specialised works' can be deployed as per the NRA guidelines on the Implementation of Landscape Treatments on National Road Schemes' (NRA, 2011, in draft).

Soil Structure and Soil Compaction

Soil excavation and movement associated with construction can cause a decline in soil structure as a result of the mechanical mixing of the soil, compaction and sheering of aggregates and filling of pore spaces - organic matter is also exposed to a greater rate of decay and oxidation (Young & Young, 2001). Soil structure is essential to soil health and fertility – soil structure decline has a direct impact on soil and surface food chain and biodiversity as a consequence. Biological activity helps in the maintenance of relatively open soil structure as well as facilitating decomposition and the transportation and transformation of soil nutrients. Changes in soil structure can lead to reduced accessibility by plants to necessary substances.

If any soils are required for the establishment of landscape treatments it is important that the structure of soils be maintained such that the soils can support the growth of plants. A worst case scenario in relation to inappropriate soil storage can lead to a from "**Permanent Slight to Significant Adverse**" impact on soil structure.

Soil Sealing

The covering of the soil surface with impervious materials as a result of urban development and infrastructure construction is known as soil sealing. The term is also used to describe a change in the nature of the soil leading to impermeability (e.g. compaction by agricultural machinery). Sealed areas are lost to uses such as agriculture or forestry while the ecological soil functions are severely impaired or even prevented (e.g. soil working as a buffer and filter system or as a carbon sink). In addition, surrounding soils may be influenced by change in water flow patterns or the fragmentation of habitats. Current studies suggest that soil sealing is nearly irreversible.

The majority of the proposed Greenway will be constructed along the existing disused railway line. Much of this line is currently being used a track allowing access through agricultural lands. Therefore the replacement of the existing topsoil and track surface with the proposed cycle and pedestrian path will not result in a significant change in the soil properties of the existing track. A worst case scenario in relation to soil sealing in this case may lead to a "**Permanent Slight**" impact.

Soil Storage

It is important to maintain the physical structure of soils. Soil pores, which are maximised in a well-structured soil, allow oxygen and moisture to infiltrate to depths and plant roots to penetrate to obtain moisture and nutrients (Aplin 1998). During construction works there may be a requirement to store soil in temporary soil disposal areas and in permanent soil disposal areas. The temporary storage of soils can lead to impacts on soil structure where soil heaps are piled excessively high.

The worst case scenario in relation to inappropriate soil storage can lead to a "**Permanent Significant Adverse"** impact on soils in the absence of avoidance and mitigation measures.

Soil Contamination

There is potential for the contamination of soils from accidental fuel spillages and the disposal of contaminated waste during the construction phase.

There is a potential for accidental soil and groundwater contamination due to spills and leaks of oils and other contaminants during the construction stage of the proposed works. The potential impact on the soils, geology and hydrogeology is considered to be "**Slight**". The potential for these impacts to occur is minimised by adhering to the relevant construction guidelines (CIRIA C532 and C648).

9.4.2 Operational Stage

There are no potential impacts expected on soils, geology and hydrogeology.

9.5 MITIGATION MEASURES

9.5.1 Construction Stage

The potential negative impacts on geology and hydrogeology at construction stage are considered to be **Slight** to **Imperceptible**. The existing design contains a number of mitigating measures which will ensure minimisation of impacts on the geology and hydrogeology including soil and water management.

9.5.1.1 Avoidance Measures

Greenway Design

The proposed Greenway has been designed so as to require minimal removal of topsoil in preparation for the subsurface and final surface. A maximum excavation of 0.5m topsoil will be required. The design incorporates geogrids or woven geotextiles placed at the base of a thickened granular capping below the cycle lane pavement. This serves to increase short term stability and locally reduce differential settlements.

Optimisation of Greenway Alignment, Reuse of Disused Railway Line.

To reduce the overall impact of the proposed Greenway on earthworks requirements, it has largely been restricted to the existing disused railway line or along existing roads or tracks. Only where it was not possible to reach agreements with the relevant landowners is it deemed necessary to construct the Greenway offline.

Soil Structure and Soil Compaction

Impacts on soil structure will be minimised through the reduction in movement and compaction of soils.

Soil Sealing

Impacts on soil from soil sealing have been avoided and minimised through the online upgrade of the existing railway which will reduce the extent of soil sealing as part of the proposed greenway development.

Soil Storage

Soil storage impacts will be minimised by maintaining a maximum height of 2.0m for all soil storage heaps. If areas of soil are to be stored compaction of stored soils should be minimised through fencing off of storage areas.

Soil Contamination

All construction works should be completed in line with the following best practice guidelines to ensure the potential for accidental soil and groundwater contamination is minimised:

- CIRIA (Construction Industry Research and Information Association) guidance on '*Control of Water Pollution from Construction Sites' (CIRIA Report No C532, 2001),* and

- CIRIA (Construction Industry Research and Information Association) guidance on '*Control of Water Pollution from Linear Construction Projects*' (CIRIA Report No. C648, 2006)

9.5.2 Operational Stage

There are no operational mitigation measures with regards to soils, geology and hydrogeology.

9.6 RESIDUAL IMPACTS

There are no significant residual negative impacts expected to the soils, geology and hydrogeology. Slight negative impacts on the geology and hydrogeology are expected.

9.7 CONCLUSIONS

The proposed Connemara Greenway Project – Clifden to Oughterard will be completed in a Precambrian Marbles and Precambrian Quartzite's, Gneisses and Schist's bedrock environment which constitutes a poor aquifer. The Greenway construction activities will be contained within the footprint of an existing disused rail line and measures have been designed to minimise the impacts on the geology and hydrogeology of the area.

The proposed work which includes the removal of existing track material, predominantly topsoil, has been assessed to determine their potential impact on the soils, geology and hydrogeology.

There are slight to imperceptible impacts expected on the soils, geology and hydrogeology as a result of the proposed works.

Table 9.7 Summary of Soils, Geology and Hydrogeology Impacts of the Proposed Greenway Development

Attribute	Potential Impact	Level of Impact	Mitigation Measures	Residual Impact
Soils	Loss of Residential Seedbank/Mycorrhizae of Soils	Permanent Slight to Significant Adverse	Mitigation not necessary along the majority of the route where impacts are slight. In semi-natural habitats the topsoil layer is to be retained along the banks of the proposed Greenway thereby maintaining the seedbank.	Slight
	Damage to Soil Structure	Permanent Slight to Significant Adverse	Minimising movement of soil throughout the site and minimising soil compaction activities.	Slight
	Soil Sealing	Permanent Slight	Minimised through online upgrade of Greenway. Width of the Greenway has been limited to 2.5m.	Slight
	Inappropriate Soil Storage	Permanent Significant Adverse	Maximum soil heaps height of 2m. Areas of stored soil to be fenced off to avoid compaction	Imperceptible
	Soil Contamination	Slight	Works to be carried out in line with CIRIA guidance	Imperceptible
	Soil Disturbance and Greenhouses Gases	Slight	Detailed in Chapter 11 Air Quality and Climate.	Imperceptible
Geology	Degradation of Economic Geology and Mining Heritage	No impact	N/A	N/A
Hydrogeology	Alter the existing surface water flow patterns and recharge to the aquifer	Imperceptible	N/A	N/A

10 TERRESTRIAL AND AQUATIC ECOLOGY

10.1 INTRODUCTION

10.1.1 Scope and Objectives

This section of the EIS assesses the ecological value of the study area, assesses the potential impacts on the terrestrial and aquatic ecology of the surrounding area and recommends mitigation measures in order to alleviate potential impacts. This assessment has been carried out in accordance with the EPA document *Guidelines on Information to be contained in Environmental Impact Statements* (EPA, 2002).

The principal objectives of this assessment are to:

- Complete a desk study and to obtain relevant terrestrial and aquatic ecological data for the zone of influence (ZOI) of the proposed works;
- Identify and describe sites of known or potential ecological interest, and
- Assess the significance of the likely significant impacts of the proposed Greenway Project on each of these environmental aspects.

10.1.2 Description of the Project

Chapter 6 of this EIS outlines the Project Description.

10.2 METHODOLOGY

10.2.1 General

This assessment has been prepared in accordance with the following guidelines;

- DOE (2009) Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities. Department of the Environment,
- EC (2000) Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg. European Commission,
- EC (2002) Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg. European Commission,

- EC (2007) Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the commission. European Commission,

- EC (2007) Interpretation Manual of European Union Habitats. Version EUR 27. European Commission,

- EPA (2002) Guidelines on the information to be contained in Environmental Impact Statements. Environmental Protection Agency,

- EPA (2003), Advice Notes on current practice in the preparation of Environmental Impact Statements. Environmental Protection Agency

- HA (2001) DMRB Volume 10 Section 4 Part 4 - Ha 81/99 - Nature Conservation Advice In Relation To Otters. The Highways Agency,

- IEEM (2005) Institute of Ecology and Environmental Management Draft Guidelines for Ecological Impact Assessment

- NPWS (2008) The Status of EU Protected Habitats and Species in Ireland. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland,

- NRA (2008) Environmental Impact Assessment of National Road Schemes – A Practical Guide Rev. 1. National Roads Authority,

- NRA (2009) Guidelines for the Assessment of Ecological Impacts of National Road Schemes Rev. 2. National Roads Authority, and

- (NRA, 2008) NRA *Guidelines on Ecological Surveying Techniques for Protected Flora and Fauna on National Road Schemes*). National Roads Authority.

The methodology comprises the following elements: Desk Study, Consultation and Field Assessments. These elements are used to identify, describe and map areas of known or potential ecological value.

A review of aerial photographs of the study area was carried out prior to field visits. This exercise aimed to identify areas of low ecological value, such as; urban areas, areas under arable cultivation or areas under intensive pasture. Conversely, the review of aerial photographs was also used to identify areas of potentially high ecological value such as woodlands and wetlands, so that field survey work was targeted to focus upon these.

Multi-disciplinary site walkover surveys were undertaken by RPS ecologists along the proposed Greenway route from August to September 2011. Specific surveys for targeted plant community groups, birds and mammals including Bats (carried out by Aardwolf Wildlife Studies) were conducted during the optimum seasons. The surveys were carried out in accordance with best practice and the NRA'S *Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes* (2009).

10.2.2 Desk Study

The sources of published material that were consulted as part of the desk study for the purposes of the EIS are as follows;

- A review of the National Parks & Wildlife Service (NPWS) natural heritage database for designated areas of ecological interest and sites of nature conservation importance within and adjacent to the study area,

- Preston, C.D., Pearman, D.A., & Dines, T.D. 2002 New Atlas of the British & Irish Flora Oxford University Press,

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

- Lack P. 1986. *The Atlas of Wintering Birds in Britain and Ireland.* T&AD Poyser.

- Literature review to identify and collate relevant published information on both ecological aspects of the study area and relevant ecological studies conducted in other areas, and

- Review of Ordnance Survey maps and orthophotography.

The Site Synopses for the designated conservation areas within the study area produced by the NPWS contain a description of the scientific interest and conservation importance of each designated site. The Natura 2000 Data Form contains relevant background information on each of the designated sites, while the Conservation Objectives summarise the aims and objectives of the designation awarded to a particular site. All of these documents were referenced for each of the designated conservation areas.

A full desktop review was conducted of the higher plant species recorded within the Ordinance Survey (OS) National Grid Squares (10 km x 10km) within which the proposed Greenway Project works are located. The principal source of information regarding the distribution of flora in Ireland is the *New Atlas of the British & Irish Flora* (Preston *et al.*, 2002). The data included in this Atlas is from the 1987-1999 Atlas survey. The Atlas shows data for vascular plants in individual 10 km Grid Squares or 'hectads'. The records for the relevant Grid Squares were consulted and a search was carried out to investigate if any rare or protected plant species had been recorded in the squares during the 1987-1999 atlas survey (and previous surveys) carried out by the Botanical Society of the British Isles (BSBI).

The NPWS were consulted for records of rare and protected species within the study area. The NPWS Maps and Data Database and the NPWS Rare Plants Database for all rare and protected species for the relevant Grid Squares were consulted in order to identify any legally protected or rare plant species known to be present within the study area. The desktop review also included the identification of vascular plants that are listed in Annex II of the EU Habitats Directive, Flora Protection Order (FPO) of 1999, the Wildlife Act 1976, the Irish Red Data Book (IRDB) and the NPWS Site Synopsis for designated conservation areas.

A full desktop review of bird and mammal species and populations of conservation concern within the relevant Grid Squares which are traversed or are adjacent to the proposed Greenway Project was undertaken.

'*The New Atlas of Breeding Birds in Britain and Ireland: 1988-1991*' (Gibbons *et al*., 1993) was consulted for information regarding the distribution of birds recorded in the relevant Grid Squares. However, it should be noted that for some species at least, more recent work has been carried out. The birds listed under Annex I which are offered special protection by the EU Birds Directive and on the Birds of Conservation Concern in Ireland (BoCCI) red list were also identified.

Those listed on the BoCCI red list meet one or more of the following criteria:

- Their breeding population or range has declined by more than 50% in the last 25 years,
- Their breeding population has undergone significant decline since 1900, or
- They are of global conservation concern.

The Butterfly Ireland website (www.butterflyireland.com) and Irish Butterflies website (www.irishbutterflies.com) were consulted to identify the presence of any rare species within the study area including; Marsh Fritillary, Small Blue, Green Hairstreak, Purple Hairstreak, Dingy Skipper, Large Heath and Brimstone.

10.2.3 Walkover Surveys and Site Visits

Following a full desktop study of available biological information pertaining to the study area, RPS ecologists carried out ecological assessments from the 23rd to the 26th August 2011 and on the 29th August and 5th of September 2011.

These studies included;

- Habitat Surveys and Mapping,
- Mammal Surveys,
- Aquatic Surveys.

The data collected during these surveys provided detailed information on the existing environment. The habitat mapping information is used for assessing the impacts of the proposed works on the terrestrial and aquatic environment.

The multi-disciplinary walkovers and habitat mapping were carried out by RPS Ecologists from the 23rd to the 26th of August, 29th August and 05th of September 2011, 13th and 15th January, and 13th to 15th March.

Aquatic ecology and fisheries habitat surveys were also carried out by RPS Ecologists on the 25th and 26th August 2011, and 13 and 14th of March 2012.

10.2.4 Habitat Mapping and Classification

The habitats on site were classified in accordance with The Heritage Councils '*A Guide to Habitats in Ireland'* (Fossitt, 2000) and mapped in accordance with the '*Best Practice Guidance for Habitat Survey and Mapping*' (Smith *et al.,* 2011).

The habitats are classified habitats based on the vegetation present and management history. The classification is a standard scheme for identifying, describing and classifying wildlife habitats in Ireland. The classification is hierarchical and operates at three levels, outlining the correlation between its habitat categories and the phytosociological units (plant communities) of botanical classifications. The classification of semi-natural woodlands and scrub are also considered under the Native Woodland Scheme under the National Development Plan 2007-2013.

The habitats found along the route corridor of the proposed Greenway are evaluated based on their naturalness, value and vulnerability as well as their inclusion within the Natura 2000 network. Habitats that are assessed to be good examples of Annex I and Priority habitats are considered to be of International or National Importance. Semi-natural habitats with high biodiversity in a county context and that are vulnerable, are considered to be of County Importance. Habitats that are considered semi-natural habitat or locally important for wildlife are considered to be of Local Importance (higher value) and sites containing small areas of semi-natural habitat or are of some importance in maintaining connectivity between habitats are considered to be of Local Importance (lower value). Seasonal factors that affect distribution patterns and habitats or species were taken into account when conducting the surveys and the potential of the site to support certain populations.

As the proposed Greenway development is located within or in close proximity to designated sites (cSAC, SPA, pNHAs), these habitats are also described in terms of their links to Annex I habitats as per the Interpretation Manual of European Union Habitats - EUR27. The Interpretation Manual is a scientific reference document published by the European Commission for the interpretation of Priority and Non-Priority Annex I habitat types of the Habitats Directive. This manual incorporates descriptive sheets for Annex I Priority and Non-Priority Habitats, which establishes clear, operational scientific definitions of habitats, using pragmatic descriptive elements (e.g. characteristic plants) and taking into consideration regional variations. The descriptive sheets for Priority or Non-Priority Annex I Habitats are provided where corresponding habitats were identified within the route corridor of the Greenway development. The *Status of EU Protected Habitats and Species in Ireland* (NPWS 2008) was also consulted which provides details on the status of listed habitats and species and also provides lists of typical species for these habitats in Irish context.

The locations of the habitats which are found within the Zone of Influence of the proposed Greenway are provided for each habitat type.

10.2.5 Botanical Surveys

Common, dominant and noteworthy plant species were recorded as part of the multidisciplinary surveys. The impact of the proposed Greenway development on flora species of conservation value was assessed.

10.2.6 Birds and Mammals

During the course of the Habitat Surveys, birds and mammals encountered were recorded, and any bird or mammal species of conservation concern that were encountered were investigated and noted.

Mammal signs were actively searched for in any areas that are of potential importance to protected mammal species such as woodlands (badgers, bats, red squirrel and others), watercourses (otter) etc.

Any buildings or other structures that have potential to hold roosting bats, and that may have to be removed for the construction of the Greenway, were noted and mapped. A full desktop review of bird and mammal species and populations of conservation concern within OS 10km National Grid Squares within which the proposed Greenway is located, was conducted. Potential impacts of the proposed development on birds of high conservation concern and legally protected mammals were assessed.

10.2.7 Aquatic Ecology

The current study was undertaken as a desk study and walkover study of the area. The current assessment did not include any sampling; but is supported by aquatic sampling undertaken by RPS of

the 45 watercourse crossings in the study area. Surveys undertaken by Ecofact staff on the Owenglin and Derryhorraun Rivers and recent surveys by Inland Fisheries Ireland on the Ballynahinch and Owenriff catchments were also accessed and utilised in the current assessment. The assessment furthermore draws on the detailed descriptions of the lakes and rivers in the area presented in Peter O'Reilly's books "Rivers of Ireland - a fly fisher's guide' (O'Reilly, 2004) and 'Loughs of Ireland - a fly fisher's guide' (O'Reilly, 2001) along with a series of other reports and literature available for the study area; including the National Parks and Wildlife Service's site descriptions for the Special Areas of Conservations within the study area.

The purpose of the water quality and fisheries study is to assess the proposed Greenway development in relation to its potential environmental impact on the watercourses present within the study area. This study defines the catchments/sub-catchments, which may be affected by the proposed Greenway and also includes a review of all existing water quality/fisheries information available from the Environmental Protection Agency (EPA), Inland Fisheries Ireland and aquatic assessments conducted by RPS and **Chapter 8 Hydrology and Drainage** of the EIS.

10.2.8 Amphibians and Reptile

Three species of amphibians are found in Ireland: the smooth newt (*Triturus* (*Lissotriton) vulgaris*), the common frog *(Rana temporaria)* and the natterjack toad (*Bufo* (*Epidalea) calamita*). Suitable habitats for the natterjack toad are not found within the study area and therefore the surveys did not include for this species. The surveys for amphibians were undertaken as part of the multi-disciplinary site surveys during the breeding season (January to May). Potential breeding sites, i.e. ponds, drains, edges of lakes were the targeted habitats for the species surveys.

10.2.9 Terrestrial Invertebrates

During the course of the multidisciplinary surveys the presence of rare invertebrates such as butterfly species and the Kerry Slug was investigated and noted within the study area.

10.2.10 Impact Assessment Criteria

All ecological sites were assessed according to the criteria for site evaluation outlined in the NRA '*Guidelines for Ecological Impact Assessment of National Road Projects*' (NRA, 2009). The geographic frame of reference which is used to determine value is provided in **Table 10.1**.

Table 10.1 Ecological Site Assessment Project

Ratings for Ecological Sites
International Importance: - 'European Site' including candidate Special Area of Conservation (cSAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation. - Proposed Special Protection Area (pSPA). - Site that fulfils the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended). - Features essential to maintaining the coherence of the Natura 2000 Network. - Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive. - Resident or regularly occurring populations (assessed to be important at the national level) of the following: o Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or

Ratings for Ecological Sites
o Species of animal and plants listed in Annex II and/or IV of the Habitats Directive. - Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971). - World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972). - Biosphere Reserve (UNESCO Man & the Biosphere Programme). - Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979). - Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979). - Biogenetic Reserve under the Council of Europe. - European Diploma Site under the Council of Europe. - Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).
National Importance: - Site designated or proposed as a Natural Heritage Area (NHA). - Statutory Nature Reserve. - Refuge for Fauna and Flora protected under the Wildlife Acts. - National Park. - Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park. - Resident or regularly occurring populations (assessed to be important at the national level) of the following: o Species protected under the Wildlife Acts; and/or o Species listed on the relevant Red Data list. - Site containing 'viable areas' of the habitat types listed in Annex I of the Habitats Directive.
County Importance: - Area of Special Amenity. - Area subject to a Tree Preservation Order. - Area of High Amenity, or equivalent, designated under the County Development Plan. - Resident or regularly occurring populations (assessed to be important at the County level) of the following: o Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; o Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; o Species protected under the Wildlife Acts; and/or o Species listed on the relevant Red Data list. - Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance. - County important populations of species or viable areas of semi-natural habitats or natural heritage features identified in the National or Local BAP, if this has been prepared. - Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county. - Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.
Local Importance (higher value): - Locally important populations of Priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared; - Resident or regularly occurring populations (assessed to be important at the Local level) of the following: o Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; o Species of animal and plants listed in Annex II and/or IV of the Habitats

Ratings for Ecological Sites
Directive; o Species protected under the Wildlife Acts; and/or o Species listed on the relevant Red Data list. - Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality; - Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.
Local Importance (lower value): - Sites containing small areas of semi-natural habitat that are of some local importance for wildlife; - Sites or features containing non-native species that are of some importance in maintaining habitat links.

10.2.11 Characterising Impacts

The methodology for the assessment of impacts is derived from the Guidelines for Ecological Impact Assessment (IEEM, 2006). When describing changes/activities and impacts on ecosystem structure and function, reference should be made to the parameters, which are discussed below.

Positive or negative: Is the impact likely to be positive or negative? Positive impacts merit just as much consideration as negative ones, as international, national and local policies increasingly press for projects to deliver positive biodiversity outcomes.

Magnitude: 'Magnitude' should be predicted in a quantified manner wherever possible and relates to the quantum of an impact, for example the number of individuals affected by an activity.

Extent: 'Extent' should also be predicted in a quantified manner and relates to the area over which the impact occurs. Where the receptor is in an area of a particular plant community for example, Extent=Magnitude.

Duration: 'Duration' is intended to refer to the time during which the impact is predicted to continue, until recovery or re-instatement (which may be longer than the impact-causing activity). This should be quantified wherever possible, and interpreted in relation to the ecological processes involved rather than on a human timescale.

Reversibility: 'Reversibility' should be addressed by identifying whether an impact is ecologically reversible (either spontaneously or through specific action) and whether such an outcome is likely.

Timing and frequency: The timing of impacts in relation to important seasonal and/or life-cycle constraints should be evaluated. Similarly, the frequency with which activities (and concomitant impacts) would take place can be an important determinant of the impact on receptors and should also be assessed and described.

10.2.12 Integration of impact characteristics

An informed integration, for each potentially significant impact, of each of these impact characteristics is necessary in order to underpin the determination of impact significance set out below. In each case, it is important to assess the likelihood that the change will occur as anticipated and that the impact on

ecological structure and function will manifest as predicted. The following scale should be applied (adapted from IEEM 2006):

- Near-certain: >95% chance of occurring as predicted,
- Probable: 50-95% chance of occurring as predicted,
- Unlikely: 5-50% chance of occurring as predicted, or
- Extremely unlikely: <5% chance of occurring as predicted.

10.3 EXISTING ENVIRONMENT

10.3.1 Designated Areas

The site synopses produced by the NPWS contains a description of the scientific interest and conservation importance of each designated site. Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) are designated under the EU Habitats Directive (92/43/EEC) and the EU Birds Directive (79/409/EEC), respectively, and as such form part of the Natura 2000 network of sites. The study area contains several environmental designations (Natura 2000 Sites) and the route of the proposed Greenway is within 15km of 23 Special Areas of Conservation (cSACs), many of which are designated as pNHAs, and seven Special Protection Areas (SPAs) as follows:

1. Lough Corrib cSAC/pNHA (Site Code: 000297)
2. Lough Corrib SPA (Site Code: 004042),
3. Maumturk Mountains cSAC/pNHA (Site Code: 002008),
4. Twelve Bens/Garraun Complex cSAC/pNHA (Site Code: 002031),
5. Connemara Bog Complex cSAC/pNHA (Site Code: 002034), and
6. Connemara Bog Complex SPA (Site Code: 004181).
7. Rusheenduff Lough cSAC/pNHA 001311
8. Tully Mountain cSAC/pNHA 000330
9. Aughrusbeg Machair and Lake cSAC/pNHA (Site Code: 001228).
10. Omey Island Machair cSAC/pNHA (Site Code: 001309).
11. Barnahallia Lough cSAC/pNHA (Site Code: 002118).
12. Kingstown Bay cSAC/pNHA (Site Code: 002265).
13. Slyne Head Peninsula cSAC/pNHA (Site Code: 002074).
14. Slyne Head Islands cSAC/pNHA (Site Code: 000328).
15. Slyne Head Islands SPA (Site Code: 004123).
16. Dog's Bay cSAC/pNHA (Site Code: 001257).
17. Cregduff Lough cSAC/pNHA (Site Code: 001251).
18. Murvey Machair cSAC/pNHA (Site Code: 002129).
19. Rosroe Bog cSAC/pNHA (Site Code: 000324).
20. Kilkieran Bay and Islands cSAC/pNHA (Site Code: 002111).
21. Lough Nageeron cSAC/pNHA (Site Code: 002119).
22. Ross Lake and Woods cSAC/pNHA (Site Code: 001312).
23. Gortnandarragh Limestone Pavement cSAC/pNHA (Site Code: 001271).
24. Lough Carra/Mask Complex cSAC/pNHA (Site Code: 001774).
25. Lough Mask SPA (Site Code: 004062).
26. Cloughmoyne cSAC/pNHA (Site Code: 000479).
27. Ballymaglancy Cave, Cong cSAC/pNHA (Site Code: 000474).
28. Illaunnanoon SPA (Site Code: 004221).
29. Inishbofin, Omey Island and Turbot Island SPA (Site Code: 004231).
30. Cruagh Island SPA (Site Code: 004170).

Sites 7 to 30 are not considered further in this report as all other sites are located either further than 1km from the proposed Greenway or outside of the catchments through which the proposed Greenway traverses. It is considered highly unlikely that there will be any impacts on sites 7 to 30 Natura 2000 sites listed above.

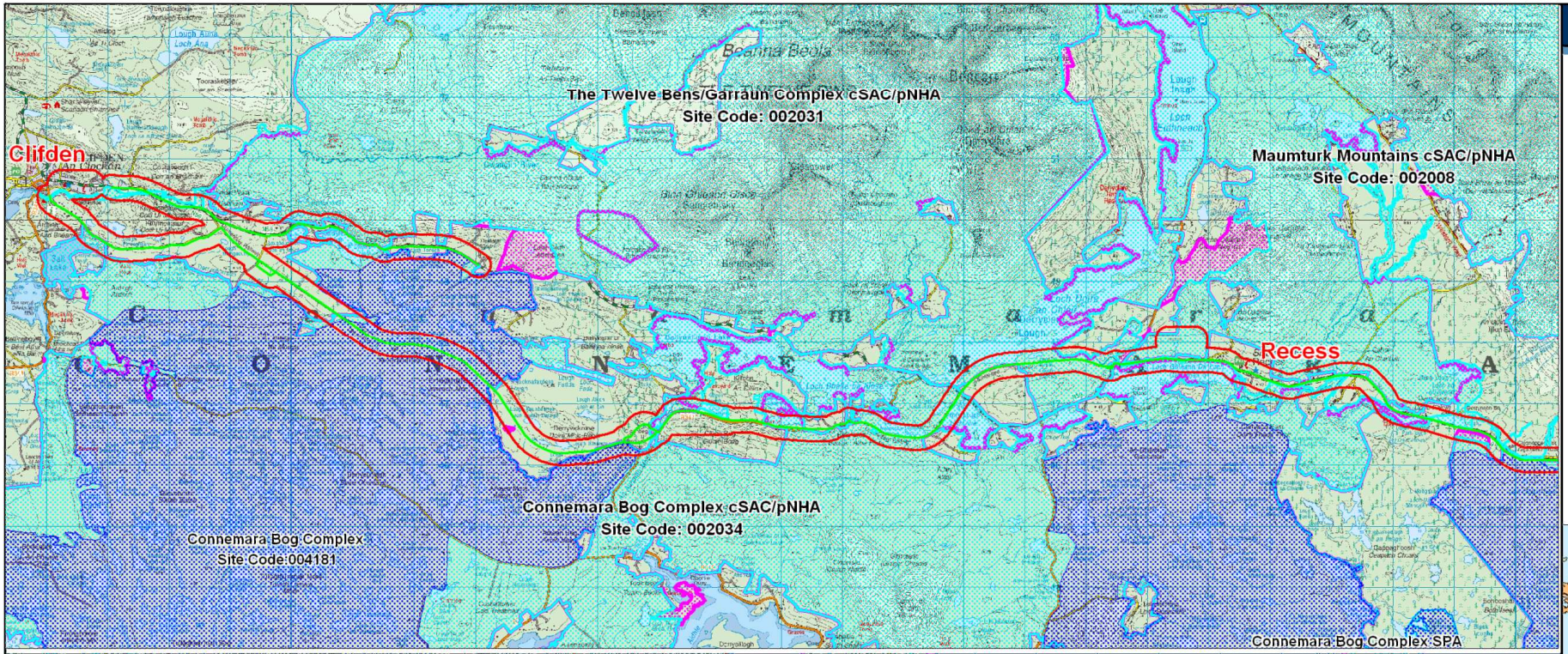
The proposed Greenway lies within 15km of six Natural Heritage Areas (NHAs) and 19 additional proposed Natural Heritage Areas (pNHAs). NHAs are legally protected from damage from the date they are formally proposed for designation under the Wildlife (Amendment) Act 2000 and pNHAs have not been statutorily proposed or designated, but do have some protection under REPS, Coillte and Planning and Licensing Authorities. NHAs and pNHAs within 15km of the proposed Greenway are:

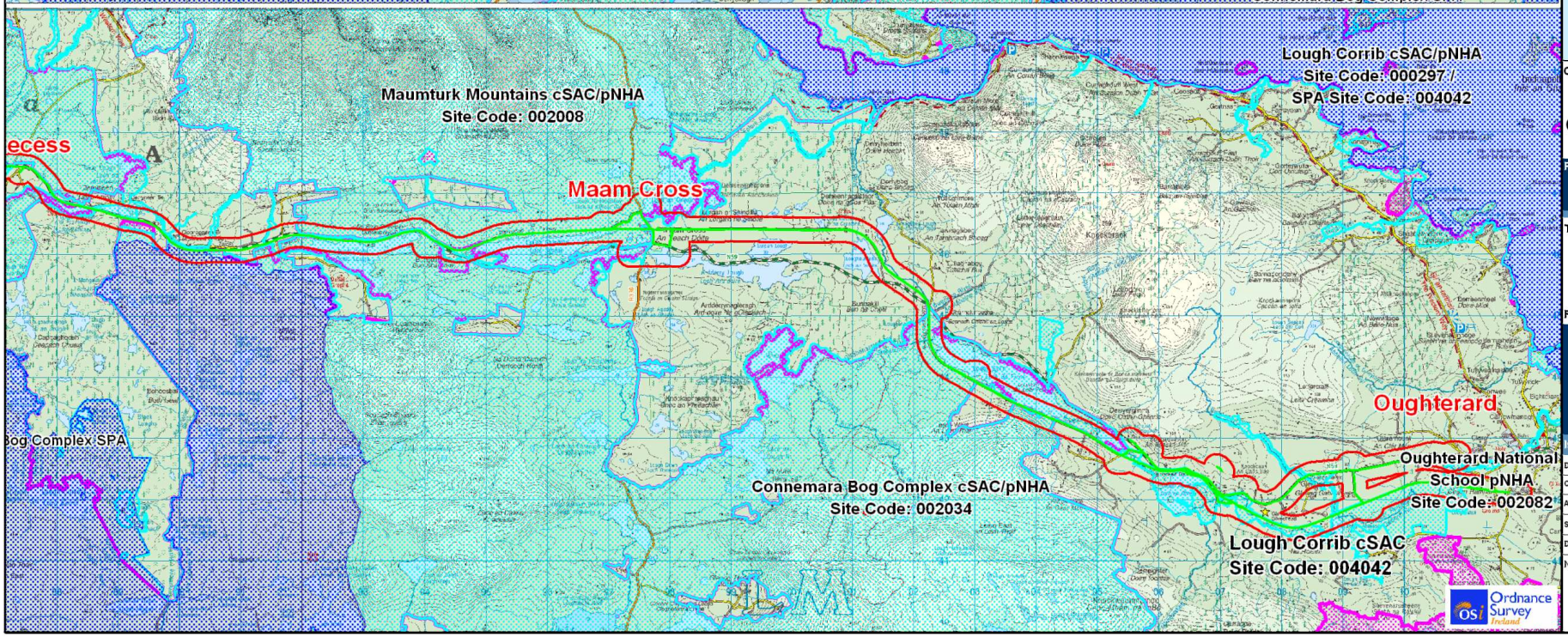
1. Oughterard District Bog NHA (Site Code: 002431)
2. Oughterard National School pNHA (Site Code: 002082)
3. Eeshal Island NHA (Site Code: 000265)
4. Cloon And Laghtanabba Bog NHA (Site Code: 002374)
5. Tooreen Bog NHA (Site Code: 002436)
6. Carna Heath And Bog NHA (Site Code: 001241)
7. Moycullen Bogs NHA (Site Code: 002364)
8. Cruagh Island pNHA (Site Code: 001973).
9. Leagaun Machair pNHA (Site Code: 001289)
10. Ballynakill Bay And Lamb's Island pNHA (Site Code: 001233)
11. Crump Island Complex pNHA (Site Code: 001917)
12. Letterfrack Hostel pNHA (Site Code: 002080)
13. Ballyconneely Bay pNHA (Site Code: 001231)
14. Hen Island pNHA (Site Code: 000274)
15. Horse Island Complex pNHA (Site Code: 000276)
16. Mace Head Islands pNHA (Site Code: 001300)
17. Bertraghboy Bay pNHA (Site Code: 001234)
18. Oilean Na Ngeabhrog (Glencoh Rock) pNHA (Site Code: 000315)
19. Kinvarra Saltmarsh pNHA (Site Code: 002075)
20. Ballycuirke Lough pNHA (Site Code: 000228)
21. Killarainy Lodge, Moycullen pNHA (Site Code: 002083)
22. Drimcong Wood pNHA (Site Code: 001260)
23. Maumtrasna Mountain Complex pNHA (Site Code: 000735)
24. Dernasliggaun Wood pNHA (Site Code: 002364)
25. Old Domestic Building, Heath Island, Tully Lough pNHA (Site Code: 002062)

Sites 3 to 24 are located more than 1km from the proposed Greenway route and are not within a catchment through which the proposed Greenway runs, so it is considered extremely unlikely that the proposed Greenway will impact these sites. Oughterard District Bog NHA (Site Code: 002431) is located approximately 800m from the proposed route and any effects are considered extremely unlikely, so this site is not considered further in this report. Oughterard National School pNHA (Site Code: 002082) is located approximately 0.5km from the proposed Greenway and is designated for a large colony of Leisler's bats. However no works are proposed close to this location and so this pNHA is not considered further in the assessment.

The location of the proposed Greenway with regard to the designated sites is provided in **Figure 10.1**. The full site synopses for the designated sites within the zone of influence of the proposed Greenway are included as **Appendix C.1** to this report. The Natura 2000 Standard Data Form prepared by the NPWS for Natura 2000 sites (SPAs and cSACs) are also consulted for details of the Percentage Cover and Representativity of the qualifying habitats. The percentage cover for each habitat within the Natura 2000 site is described and the degree of Representativity gives a measure of 'how typical' a habitat type is. Representivity is ranked on a scale from A to D as follows; A - Excellent, B -Good, C – Significant and D - Non-significant. For species, the population significance is based on the relative size or density of the population in the site with that of the national population. Population Significance (p) is ranked on a scale from A to D as follows; A - 100>=p>15%, B - 15>=p>2%, C - 2>=p>0% and D - Non-significant population.

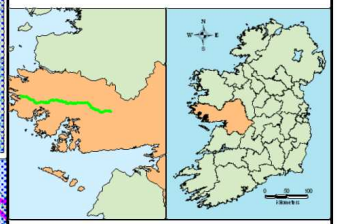
A brief description of all the protected sites, and their qualifying interests, which may be affected by the proposed development is given in the following section.





Legend

- Proposed Greenway
- Study Area
- Special Area of Conservation (SAC)
- Natural Heritage Area (NHA)
- Special Protection Area (SPA)



Client

Galway County Council

Project

Connemara Greenway

Title

Environmental Designations

Figure 10.1

RPS
Lynr Building,
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Ordnance Survey Ireland

- **Lough Corrib cSAC/pNHA (Site Code 000297)**

Lough Corrib cSAC is of major conservation importance due to the presence of fourteen habitats listed in Annex I of the EU Habitats Directive, six of which are given priority status. The lake is host to internationally important populations of wildfowl listed on Annex I of the EU Birds Directive and so is designated as a Special Protection Area under the same directive. The qualifying habitats and species found within Lough Corrib cSAC are provided in **Table 10.2** and **Table 10.3** respectively.

Table 10.2 Lough Corrib cSAC Habitats

Habitat code	Habitat name (cSAC Qualifying Interest)	% Cover (approx.)	Representivity**
3140	Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.	85	A
3110	Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)	3	A
7110	***Active raised bogs**	**1**	**B**
91A0	Old sessile oak woods with Ilex and Blechnum in British Isles	1	A
6410	Molinia meadows on calcareous, peaty or clavey-silt-laden soils (Molinion caeruleae)	1	B
7230	Alkaline fens	1	A
7210	***Calcareous fens with Cladium mariscus and species of the Caricion davallianae**	**1**	**A**
8240	***Limestone pavements**	**1**	**A**
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco Brometalia)(*important orchid sites)	1	B
91D0	***Bog woodland**	**1**	**A**
3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	1	C
7220	***Petrifying springs with tufa formation (Cratoneurion)**	**1**	**C**
7120	Degraded raised bogs still capable of natural regeneration	1	B
7150	Depressions on peat substrates of the Rhynchosporion	1	A

*Habitats highlighted in **Bold** are Priority Annex I Habitats

Table 10.3 Lough Corrib cSAC Species

Species code	Species name	Population significance*
1095	Sea Lamprey (*Petromyzon marinus*)	C
1106	Atlantic Salmon (*Salmo salar*)	C
1096	Brook Lamprey (*Lampetra planeri*)	C
1303	Lesser Horseshoe Bat (*Rhinolophus hipposideros*)	C
1355	Otter (*Lutra lutra*)	C
1092	Freshwater Crayfish (*Austropotamobius pallipes*)	C
1029	Freshwater Pearl Mussel (*Margaritifera margaritifera*)	C
1833	Slender Naiad (*Najas flexilis*)	B
1393	Green Feathermoss (*Drepanocladus vernicosus*)	C

- **Lough Corrib SPA (Site Code 004042)**

Lough Corrib is one of the most important ornithological sites in the country. It is one of the top five sites in the country for wintering waterfowl and also qualifies for international importance because it regularly supports well in excess of 20,000 waterfowl. It is the most important site in the country for Pochard, Tufted Duck and Coot. It also has nationally important populations of wintering Mute Swan, Gadwall, Shoveler, Golden Plover and Lapwing. The lake is a traditional site for Greenland White-fronted Geese. Relatively small numbers of Whooper Swan occur, along with Wigeon, Teal, Mallard, Goldeneye, Curlew and Cormorant. Lough Corrib is a traditional breeding site for gulls and terns, with various islands being used for nesting each year. The breeding colonies of Common Tern, Sandwich Tern and Cormorant are also of national importance. Also of note is that five of the species which regularly visit the site are listed on Annex I of the E.U. Birds Directive, i.e. Whooper Swan, Greenland White-fronted Goose, Golden Plover, Common Tern and Arctic Tern. The qualifying species found within Lough Corrib SPA are provided in **Table 10.4,** and the regularly occurring migratory birds not listed on Annex I are provided in **Table 10.5**.

Table 10.4 Lough Corrib Annex I Bird Species

Species Code	Species Name	Population significance
A193	Common Tern (*Sterna hirundo*)	C
A194	Arctic Tern (*Sterna paradisaea*)	B
A395	Greenland White-fronted Goose *(Anser albifrons flavirostris)*	C
A140	Golden Plover *(Pluvialis apricaria)*	C
A038	Whooper Swan *(Cygnus cygnus)*	C

Table 10.5 Lough Corrib SPA Regularly Occurring Migratory Birds Not Listed on Annex I

Species code	Species name	Population significance
A065	Common Scoter *(Melanitta nigra)*	A
A179	Black-headed Gull *(Larus ridibundus)*	B
A182	Common Gull *(Larus canus)*	A
A183	Lesser Black-backed Gull *(Larus fuscus)*	C
A050	Widgeon *(Anas penelope)*	C
A051	Gadwall *(Anas strepera)*	B
A052	Teal *(Anas crecca)*	C
A053	Mallard (*Anas platyrhynchos)*	C
A056	Shoveler *(Anas clypeata)*	B
A059	Pochard *(Aythya ferina)*	A
A061	Tufted duck *(Aythya fuligula)*	B
A067	Goldeneye *(Bucephala clangula)*	C
A125	Coot *(Fulica atra)*	A
A142	Lapwing*(Vanellus vanellus)*	C
A160	Curlew *(Numenius arquata)*	C
A017	Cormorant *(Phalacrocorax carbo)*	C

- **Maumturk Mountains cSAC/pNHA (Site Code: 002008)**

The Maumturk Mountains cSAC is one of the largest and most diverse sites of conservation importance in Ireland, with a wide range of habitats and species. The site is of interest as it is a good example of an extensive mountain landscape, containing blanket bog, large areas of heath, siliceous rocky vegetation, oligotrophic lakes and upland grassland. The main feature of conservation value within the Maumturk Mountains cSAC is the blanket bog habitat and associated oligotrophic waters. The blanket bog is present across the cSAC area. The active blanket bog extends over much of the

area. The qualifying habitats and species found within Maumturk Mountains cSAC are provided in **Table 10.6** and **Table 10.7** respectively.

Table 10.6 Maumturk Mountains cSAC Habitats

Habitat code	Habitat name (cSAC Qualifying Feature)	% Cover (approx.)	Representivity**
4060	Alpine and Boreal heaths	11	C
8220	Siliceous rocky slopes with chasmophytic vegetation	1	C
7130	**Blanket bog (*active only)**	10	B
3110	Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)	2	A
4010	Northern Atlantic wet heaths with *Erica tetralix*	5	B
7150	Depressions on peat substrates of the Rhynchosporion	1	B

*Habitats highlighted in **Bold** are Priority Annex I Habitats

Table 10.7 Maumturk Mountains cSAC Species

Species code	Species name	Population significance
1106	Atlantic Salmon (*Salmo salar*)	C
1833	Slender Naiad (*Najas flexilis*)	B

- **Twelve Bens/Garraun Complex cSAC/pNHA (Site Code: 002031)**

The Twelve Bens/Garraun Complex cSAC is one of the largest and most diverse sites of conservation importance in Ireland, with a wide range of habitats and species.

The main feature of conservation value within the Twelve Bens/Garraun Complex is the blanket bog habitat and associated oligotrophic waters, between them these make up 50% of the cSAC. The Non-Priority Annex I habitat blanket bog contains areas of the priority Annex I habitat active blanket bog, which extends over 44% the entire cSAC area.

The qualifying habitats and species found within The Twelve Bens/Garraun Complex cSAC are provided in **Table 10.8** and **Table 10.9,** respectively.

Table 10.8 The Twelve Bens/Garraun Complex cSAC Habitats

Habitat code	Habitat name (cSAC Qualifying Feature)	% Cover (approx.)	Representivity
7130	**Blanket bog (*active only)**	44	B
8220	Siliceous rocky slopes with chasmophytic vegetation	2	A
8210	Calcareous rocky slopes with chasmophytic vegetation	1	A
8110	Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*)	1	A
4060	Alpine and Boreal heaths	1	B
3110	Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)	6	A

Habitat code	Habitat name (cSAC Qualifying Feature)	% Cover (approx.)	Representivity
91A0	Old sessile oak woods with Ilex and Blechnum in British Isles	1	A
7150	Depressions on peat substrates of the Rhynchosporion	1	A

*Habitats highlighted in **Bold** are Priority Annex I Habitats

Table 10.9 The Twelve Bens/Garraun Complex cSAC Species

Species code	Species name	Population significance
1106	Atlantic Salmon (*Salmo salar*)	C
1355	Otter (*Lutra lutra*)	C
1029	Freshwater Pearl Mussel (*Margaritifera margaritifera*)	B
1833	Slender Naiad (*Najas flexilis*)	B

- **Connemara Bog Complex cSAC/pNHA (Site Code: 002034)**

The main feature of conservation value within the Connemara Bog complex is the blanket bog habitat and associated oligotrophic waters, between them these make up 79% of the cSAC. The blanket bog is present across the cSAC area. The active blanket bog extends over much of the area.

The qualifying habitats and species found within Connemara Bog Complex cSAC are provided in **Table 10.10** and **Table 10.11,** respectively.

Table 10.10 Connemara Bog Complex cSAC Habitats

Habitat code	Habitat name (cSAC Qualifying Feature)	% Cover (approx.)	Representivity
3110	Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)	13	A
3160	Natural dystrophic lakes and ponds	2	A
3260	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	1	C
4010	Northern Atlantic wet heaths with Erica tetralix	2	B
4030	European dry heaths	2	B
6410	Molinia meadows on calcareous, peaty or clavey-silt-laden soils (*Molinion caeruleae*)	1	C
7130	**Blanket bog (*active only)**	66	A
91A0	Old sessile oak woods with Ilex and Blechnum in British Isles	1	B
7230	Alkaline fens	1	B
1150	Coastal lagoons	1	A
7140	Transition mires and quaking bogs	1	A
7150	Depressions on peat substrates of the *Rhynchosporion*	1	A
1170	Reefs	1	C

*Habitats highlighted in **Bold** and are Priority Habitats

Table 10.11 Connemara Bog Complex cSAC Species

Species code	Species name	Population significance
1106	Atlantic Salmon (*Salmo salar*)	C
1355	Otter (*Lutra lutra*)	C
1065	Marsh Fritillary (*Euphydryas aurinia*)	C
1833	Slender Naiad (*Najas flexilis*)	B

- **Connemara Bog Complex SPA (Site Code: 004181)**

The qualifying birds including Annex I Species and Migratory Birds not listed on Annex I found within Connemara Bog Complex SPA are provided in **Table 10.12** and **Table 10.13,** respectively.

Table 10.12 Connemara Bog Complex SPA Annex I Bird Species

Species Code	Species Name	Population significance
A098	Merlin (*Falco columbarius*)	B
A140	Golden Plover *(Pluvialis apricaria)*	A
A395	Greenland White-fronted Goose *(Anser albifrons flavirostris)*	C

Table 10.13 Connemara Bog Complex SPA Regularly Occurring Migratory Birds Not Listed On Annex I

Species code	Species name	Population significance
A017	Cormorant *(Phalacrocorax carbo)*	B
A182	Common Gull (*Larus canus*)	B

10.3.2 NPWS Rare and Protected Species Records

The NPWS Rare and Protected Species database was consulted for records on species of conservation importance in the area. The site for the proposed development lies within the 10km Grid squares (hectads) L65, L74, L75, L84, L94, M04 and M14. According to this database, there are records for twenty-eight rare and protected species within the three grid squares. However, the NPWS dataset is known to be incomplete, particularly for fish, bats and birds, and so the absence of records for a species does not necessarily mean that the species does not occur in the area.

The relevant hectads are shown in **Figure 10.2**. Rare and protected species recorded within these squares are shown in **Table 10.14.**

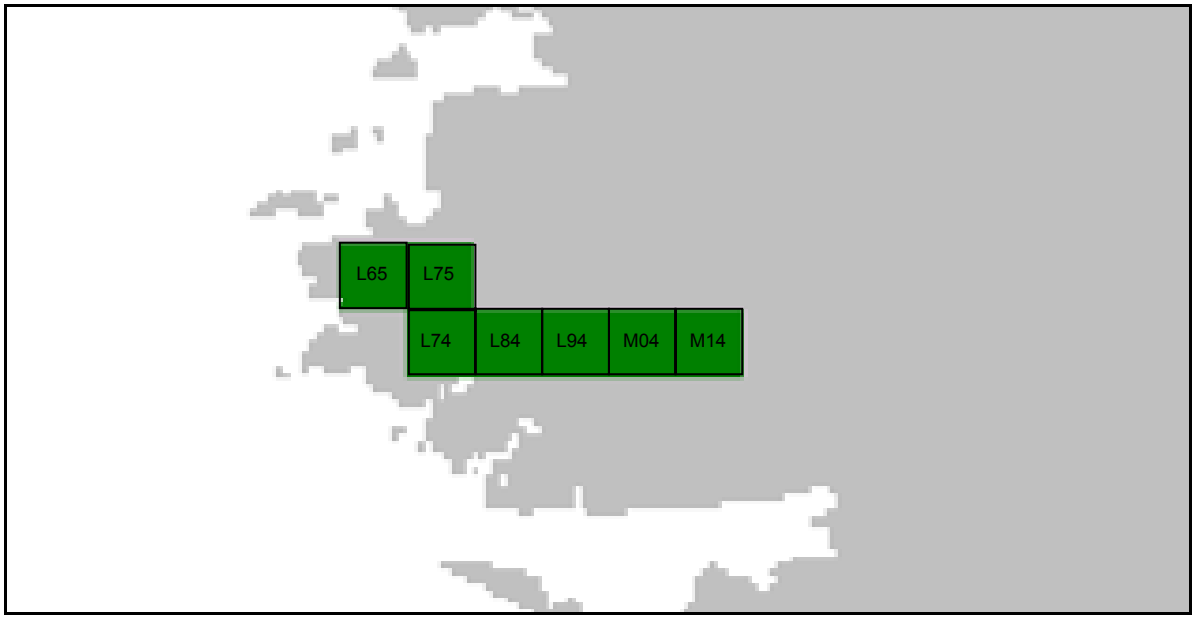


Figure 10.2 10km Squares L65, L75, L74, L84, L94, M04 and M14

Table 10.14 NPWS Rare and Protected Species Records

Scientific Name	Common Name	Location
Cervus elaphus	Red Deer	All Grid Squares
Cryptogramma crispa	Parsley Fern	Ballynahinch (Grid Square L74)
Dama dama	Fallow Deer	Grid Square M14
Deschampsia setacea	Bog Hair-grass	Oorid Lough (Grid Square L94), Owenwee River (Grid Square M04)
Eriophorum gracile	Slender Cottongrass	Maam Cross
Gnaphalium sylvaticum	Heath Cudweed	Ballynahinch (Grid Square L74)
Zootica vivipara	Common Lizard	Maam Cross, E Clifden, the Twelve Pins (Grid Square L75, L74, L84, L94, M04)
Lepus timidus subsp. hibernicus	Irish Hare	Grid Squares L65, L75, L84, L94, M14
Lutra lutra	Otter	Grid Squares L65, L75, L74, L84, M04, M14
Lycopodiella inundata	Marsh Clubmoss	Oorid Lough (Grid Square L94), Owenwee River (Grid Square M04)
Margaritifera margaritifera	Freshwater Pearl Mussel	Owenriff River, Derryneen, Owentooey, Ballynahinch Lake, Recess, Glengawbeg / Ghleann Gabh
Martes martes	Pine Marten	Grid Squares L65, L75, L74, L84, M14
Meles meles	Badger	Grid Squares L75, L84, L94
Mustela erminea subsp. hibernica	Irish Stoat	Clifden
Najas flexilis	Slender Naiad	Lough Bofin
Papaver hybridum	Rough Poppy	Ben Lettery
Pilularia globulifera	Pillwort	Ballynahinch Lake, Glendollagh
Rana temporaria	Common Frog	All Grid Squares
Scleranthus annuus	Annual Knawel	Oughterard
Vicia orobus	Wood Bitter-vetch	Maam Cross
Viola lactaea	Pale Dog-violet	Clifden Road (Grid Square M04)

Flora Atlas

Details of the rare and protected plant species found within the relevant hectads L65, L74, L75, L84, L94, M04 and M14 traversed or adjacent to the proposed Greenway development as per the Flora Atlas are shown in **Figure 10.2** and the results are displayed in **Table 10.15**.

Table 10.15 Flora Atlas Data

Scientific Name	Common Name	L64	L65	L75	L74	L84	L94	M04	M14
Agrostemma githago	Corncockle	-	-	-	-	-	-	-	§
Bromus racemosus	Smooth Brome	*	*	-	-	-	-	-	-
Deschampsia setacea	Bog Hair-grass	-	-	-	+	+	+	*	§
Erica ciliaris	Dorset Heath	-	-	-	+	-	-	-	+
Erica mackaiana	Mackay's Heath	-	-	-	+	-	-	-	-
Eriophorum gracile	Slender Cottongrass	-	-	-	+	+	+	-	+
Frangula alnus	Alder Buckthorn	-	-	-	-	-	-	§	+
Gnaphalium sylvaticum	Heath Cudweed	-	-	-	-	-	-	-	-
Hammarbya paludosa	Bog Orchid	-	-	-	-	-	-	§	-
Najas flexilis	Slender Naiad	-	-	+	-	-	-	+	-
Orchis morio	Green-winged orchid	-	-	-	+	-	-	-	-
Papaver hybridum	Rough Poppy	-	-	-	-	-	-	-	-
Potentilla fruticosa	Shrubby Cinquefoil	-	-	-	-	-	-	-	§
Saussurea alpina	Alpine Saw-wort	-	-	+	-	-	-	-	-
Saxifraga oppositifolia	Purple Saxifrage	-	-	+	-	+	-	-	-
Scleranthus annuus	Annual Knawel	-	-	-	-	-	-	-	§
Spiranthes romanzoffiana	Irish Lady's-tresses	-	-	-	-	-	-	§	-
Vicia orobus	Wood Bitter-vetch	-	-	-	-	-	§	-	+
Viola lactaea	Pale Dog-violet	-	-	-	-	-	-	-	-

+ Plant species recorded in 10 km squares during the 1987-1999 BSBI Flora Atlas Survey.
** Plant species recorded in 10 km squares during the 1970-1986 BSBI Flora Atlas Survey.*
§ Pre-1970 Flora Atlas Survey record.
- Plant species not recorded in 10 km squares during Flora Atlas Survey.

Corncockle, while it is a rare species it is a non-native species and therefore is not noteworthy for conservation purposes. It was recorded in Grid Square M14 during a pre-1970 BSBI Flora Atlas Survey but has not been recorded in subsequent surveys. It is therefore assumed that the species has since disappeared from the area and so is unlikely to occur within the study area.

Smooth Brome is a native species that was recorded in Grid Square L65 in the 1970-1986 Flora Atlas Survey but was not recorded in the 1987-1999 survey. There are no other records for this species in the area. It is therefore assumed that the species has since disappeared from the area and so is unlikely to occur within the study area.

Bog Hair-grass is a native species that has been recorded in five of the seven relevant hectads, including three records from the most recent survey (Grid Squares L74, L84 and L94). This species is

mentioned in the Site Synopsis for the Connemara Bog Complex. The NPWS Rare and Protected Species database contains records for this species from Oorid Lough and the Owenwee River, which are both within the study area. This species is listed in the Irish Red Data Book for Vascular Plants, and is afforded legal protection under the Flora Protection Order, 1999. It is a tufted, slender perennial grass of wet bogs and lake sides and is restricted in Ireland to west Galway. It has been recorded in a total of sixteen sites in the Flora Atlas, but recently has only been seen in nine of these. The main threats to this species are small and large-scale peatland reclamation and development, principally afforestation. It likely that this species occurs within the study area however, it was not recorded during botanical surveys conducted by RPS in 2010 and 2011.

Dorset Heath a non-native species was recorded in Grid Squares L74 and M14 during the 1987-1999 Flora Atlas Survey. However, it is now known to only occur at one site in Ireland, in Roundstone Bog. Here it occurs at the side of the road, suggesting that it may have been planted there[4]. It is highly unlikely that this species occurs within the study area. In Britain, this plant occurs abundantly on heaths in Cornwall, Devon and Dorset but has suffered a major decline in recent years. In Ireland, this plant is considered to be a non-native species and is therefore not noteworthy for conservation purposes. This species is listed as 'Vulnerable' in the Irish Red Data Book, but is not protected under the Flora Protection Order, 1999.

Mackay's Heath, a native species and part of Ireland's 'Lusitanian' flora, is a compact, bushy heather which is listed as 'Rare' in the Irish Red Data Book, but is not protected under the Flora Protection Order, 1999. It is confined to two counties in the west of Ireland (Galway and Donegal), and northern Spain. Its Galway site extends from the south-east of Clifden to the lower slopes of Errisbeg Mountain; therefore it may occur in tracts of bog in the western section of the study area. This species is very similar to Cross-leaved Heath (*Erica tetralix*), and often hybridises with it. Mackay's Heath was recorded in Grid Square L74 during the 1987-1999 Flora Atlas Survey, the species was not recorded during recent botanical surveys.

Slender Cottongrass is a native slender perennial which grows by lake margins and in wet acid bogs. This plant is listed as 'Rare' in the Irish Red Data Book, and is afforded legal protection in Ireland under the Flora Protection Order, 1999. It has been recorded from four of the relevant Grid Squares including L74, L84, L94 and M14. The NPWS Rare and Protected Species database has a record for this Slender Cottongrass from Maam Cross. The species was recorded on the shores of the small lake at Maam Cross. This confirmed the NPWS record for the species at this location. This species was not recorded at any other location.

Alder Buckthorn, a native shrub or small tree found in scrub, woodlands on calcareous soils and on fen peat, was recorded in Grid Square M14 during the 1987-1999 Flora Atlas Survey. There is also a pre-1970 record for this species from M04, but it has not been recorded in this Grid Square during subsequent surveys. This species is listed as 'Rare' in the Irish Red Data Book, but is not afforded legal protection in Ireland.

Heath Cudweed a native species is listed as 'Rare' in the Irish Red Data Book and is legally protected under the Flora Protection Order, 1999. This species is mentioned in the Site Synopsis for the Connemara Bog Complex cSAC. There are two pre-1970 BSBI records for this species from Grid Squares in the area (L74 and M04). However, it has not been recorded during the subsequent BSBI surveys for the relevant Grid Squares. There is a record for this species from Ballynahinch from 1802. There are no more recent records for this species in the area. This species has undergone a dramatic decline in recent years, and has recently been recorded from only 8 sites; Carlow, Tyrone, Down, Donegal, and four sites in Derry. It is therefore assumed that this species has disappeared from the area and it is therefore highly unlikely to occur within the study area.

[4] The Irish Red Data Book 1: Vascular Plants, T.G.F.Curtis & H.N.McGough (1988)

Bog Orchid, a native Red Data Book species, is afforded legal protection in Ireland under the Flora Protection Order, 1999. It is mentioned in the Site Synopsis for the Connemara Bog Complex cSAC. There is a pre-1970 BSBI record for this species from Grid Square M04, but it has not been recorded in any of the subsequent BSBI surveys. However, the large tracts of bog within the study area provide ideal habitat for this species. It is also easily overlooked and is seldom seen in the same site subsequently[5]. It may therefore be present within the study area; however it was not recorded during recent botanical surveys.

Slender Naiad, a native submerged aquatic herb found in acid to mildly base-rich lakes, was recorded in Grid Squares L75 and M04 during the 1987-1999 Flora Atlas Survey. This species is listed as a qualifying feature for all of the cSACs in the study area. Slender Naiad is listed under the Flora Protection Order, 1999 and is an Annex II species under the EU Habitats Directive. It is therefore of **major conservation importance on an international level**. The NPWS Rare and Protected Species database has a record for this species from Lough Bofin, which borders the study area. This species was not recorded during the botanical surveys for the project.

Green-winged Orchid a native species was recorded in Grid Square L74 during the 1987-1999 Flora Atlas Survey. This species is listed as 'Vulnerable' in the Irish Red Data Book, but is not protected under the Flora Protection Order, 1999 (it was formerly protected under the previous FPO of 1987). The Green-winged Orchid occurs in pastures, meadows and sand hills. It has been recorded from 19 Irish counties and it was formerly present in local abundance in eastern and central Ireland. It has suffered a major decline in recent years, however, and has been recorded from only seven sites since 1970, three of which are in Galway. It is thought that this decline has been caused by land reclamation and agricultural improvement at the old pasture sites in which it was once abundant.

There is a record for **Rough Poppy** a native species from Ben Lettery in the NPWS Rare and Protected Species database. However, this record is from 1895. This species has not been recorded in any of the BSBI Flora Atlas Surveys, and so it is highly unlikely to occur within the study area.

There is a pre-1970 record for the Red Data Book Species **Shrubby Cinquefoil,** a native species, from Grid Square M14. It has not been recorded in subsequent surveys, however, and it is therefore highly unlikely to occur within the study area.

Alpine Saw-wort, a native species was recorded in Grid Square L75 during the 1987-1999 Flora Atlas Survey. This species is listed as 'Rare' in the Irish Red Data Book, and is mentioned in the Site Synopsis for the Twelve Bens/Garraun Complex cSAC. However, this is a montane herb of mountain cliffs and ledges above 300 metres; therefore, it is highly unlikely to occur within the low-lying lands of the study area.

Purple Saxifrage, a native tufted or loosely matted, purple-flowered, arctic-alpine saxifrage was recorded from Grid Squares L75 and L84 during the 1987-1999 Flora Atlas Survey. This species is listed as 'Rare' in the Irish Red Data Book but is not afforded legal protection in Ireland. Again, this montane species is unlikely to occur within the low-lying lands of the study area.

There is a pre-1970 record for **Annual Knawel,** a native species, from Grid Square M14, but this species was not recorded in any subsequent Flora Atlas Survey. The NPWS Rare and Protected Species database has a record of this species from 1899 in Oughterard. It is therefore assumed that this species is no longer present in the study area.

There is a pre-1970 record for the native orchid species **Irish Lady's-tresses** from Grid Square M04. However, it has not been recorded in any subsequent surveys, and so it is assumed that it is no longer present in the study area.

[5] The Irish Red Data Book 1: Vascular Plants, T.G.F.Curtis & H.N.McGough (1988)

Wood Bitter-vetch, a native bushy perennial of meadows, scrub and rocks in hilly districts, is listed as 'Vulnerable' in the Irish Red Data Book and is afforded legal protection in Ireland under the Flora Protection Order, 1999. It was recorded in Grid Square M14 during the 1987-1999 Flora Atlas Survey. There is also a pre-1970 record for this species from Grid Square L94, but it has not been recorded in this Grid Square in subsequent surveys. The NPWS Rare and Protected Species database has a record for this species from Maam Cross dating from 1845, but it hasn't been recorded in this Grid Square since. The NPWS Rare and Protected Species database has several records for this species from the islands of Lough Corrib, which all lie within Grid Square M14. It is probable that the BSBI flora atlas records for this species are also from Lough Corrib, and so it is unlikely to occur within the study area.

There is a record for the native **Pale Dog-violet** in the NPWS database for Grid Square M04 from 1976. This species is also mentioned in the Site Synopsis for the Connemara Bog Complex, however, this species has not been recorded in any of the relevant Grid Squares in any of the BSBI Flora Atlas Surveys, and so it is unlikely to occur within the area.

Bats

The review of existing records of bat species in the area of the proposed greenway showed that seven of the ten known Irish bat species have been observed within or immediately adjacent to the study site. These are common *Pipistrellus pipistrellus* and soprano *P. pygmaeus* pipistrelle, Leisler's *Nyctalus leisleri*, brown long-eared *Plecotus auritus*, Daubenton's *Myotis daubentonii*, Natterer's *M. Nattereri* and lesser horseshoe *Rhinolophus hipposideros* bats. There are known roosts for three of these species in the general area. No known roosts occur within the route corridor at present however. A description of the known roosts, and their distance from the route corridor, is given in **Table 10.16** below.

Table 10.16 Known Bat Roosts in the Area and Distance from Proposed Works

Bat species	Roost description	Roost category	Numbers	Distance
Lesser horseshoe	Gatehouse, Ross	Maternity	49	9km southeast
Lesser horseshoe	Ice house, Ross	Hibernation	30	9km southeast
Lesser horseshoe	House, Knockbane	Satellite/ Maternity	10	6km east
Lesser horseshoe	House, Oughterard	Maternity	32	3km east
Lesser horseshoe	Cave/mine, Moycullen	Night/ Hibernation	1	10km southeast
Daubenton's	Eamonn King's Bridge, Clifden	Night/ Hibernation	1	3km south
Unidentified	Riverside Bridge, Clifden	Night/ Hibernation	1	Greenway commences at this bridge
Unidentified	Tonwee Bridge, Oughterard	Night/ Hibernation	1	0.5km northeast

10.3.3 Terrestrial Invertebrate Data

10.3.3.1 Lepidoptera

There is a record of 2-9 individuals of Marsh Fritillary from M14 from a 2000-2009 survey as detailed on the Butterfly Ireland website. The NPWS have no records in the area although there has been a recent sighting of this species from a location near Maam Cross (NPWS pers. comm.). The Marsh Fritillary is the only species which is afforded legal protection, as part of Annex II of the EU Habitats Directive. This species, whose food plant is Devil's Bit Scabious (*Succisa pratensis*), has become endangered due to the destruction of its boggy habitat.

10.3.4 Bird Atlas Data

The New Atlas of Breeding Birds in Britain and Ireland: 1988-1991 (Gibbons et. al., 1993) was consulted for information on breeding birds recorded in 10km grid squares L65, L74, L75, L84, L94, M04 and M14, within which the study area is located. **Table 10.17** presents details of bird species of high conservation concern recorded as breeding within 10km Grid Squares L65, L74, L75, L84, L94, M04 and M14 and during the 1988-1991 survey. The following sources of information were consulted in order to determine the conservation status of bird species:

- Annex I of the EU 'Birds Directive',
- The 'Red List' of Birds of Conservation Concern in Ireland (BoCCI) (Lynas et. al. 2007), and,
- The Irish Red Data Book (RDB) (Whilde 1993).

Table 10.17 Bird Species of High Conservation Concern Recorded by Gibbons *et. al*. (1993) From 10km National Grid Squares L65, L74, L75, L84, L94, M04 and M14.

Common Name	L65	L75	L74	L84	L94	M04	M14	Annex I	BoCCI red list
Hen Harrier (*Circus ayaneus*)		Poss/ Prob						Yes	No
Common Scoter (*Melanitta nigra*)							Conf	No	Yes
Golden Plover (*Pluvialis apricaria*)			Poss/ Prob	Conf				Yes	Yes
Lapwing (*Vanellus vanellus*)		Poss/ Prob					Poss/ Prob	No	Yes
Chough (*Pyrrhocorax pyrrhocorax*)	Conf							Yes	No
Yellow Hammer (*Emberiza citrinella*)		Poss/ Prob				Poss/ Prob	Conf	No	Yes
Merlin (*Falco colombarius*)	Poss/ Prob	Conf	Poss/ Prob	Poss/ Prob	Conf			Yes	No
Black-headed Gull (*Chroicocephalus ridibundus*)						Conf	Conf	No	Yes
Corncrake (*Crex crex*)		Poss/ Prob		Poss/ Prob				Yes	Yes
Curlew (*Numenius arquata*)	Poss/ Prob	Poss/ Prob	Poss/ Prob		Conf		Poss/ Prob	No	Yes
Redshank (*Tringa totanus*)							Poss/ Prob	No	Yes
Sandwich Tern (*Sterna sandvicensis*)	Conf							Yes	No
Common Tern (*Sterna hirundo*)	Conf		Conf	Conf			Conf	Yes	No
Arctic Tern (*Sterna paradisaea*)			Conf				Conf	Yes	No
Red Grouse (*Lagopus lagopus scoticus*)		Conf	Conf				Poss/ Prob	No	Yes
Peregrine (*Falco peregrinus*)	Un-known*	Un-known*	Un-known*	Un-known*	Un-known*	Un-known*	Un-known*	Yes	No

Eight species listed under Annex I of the EU Birds Directive were recorded as breeding within the relevant hectads in the 1988-1991 Bird Atlas Survey. These are Hen Harrier, Golden Plover, Chough, Merlin, Corncrake, Sandwich Tern, Common Tern and Arctic Tern. Peregrine may also occur within the hectads, as Peregrine is present as a confirmed breeding species in both 100km squares 'L' and 'M' (*no information is available on individual hectads for this species).

Hen Harrier in Ireland breeds mainly in areas dominated by heather and in young conifer plantations. Hen Harrier was recorded as possibly/probably breeding in Grid Square L75 during the 1988-1991 Bird Atlas Survey. The large tracts of heather and presence of conifer plantations in the western section of the study area provide suitable habitat for this species.

Golden Plover is known to breed in blanket bogs, heather moors and acidic grasslands. It has been confirmed as breeding within Grid Square L84 and recorded as possibly/probably breeding in Grid Square L74.

Chough, also known as the 'Sea Crow' has been confirmed as breeding in Grid Square L65. Choughs build their nests on ledges in crevices and caves of coastal cliffs, although some pairs use inland crags and cliffs. Some Choughs in Ireland are also known to nest in ruined buildings along the coast. It is unlikely that this species occurs within the study area, as it is too far inland.

Merlin is known to breed on large areas of bog, moorland and in coastal areas. Merlin was confirmed as breeding in Grid Squares L75 and L84 in the 1988-1991 Bird Atlas Survey and was recorded as possibly/probably breeding in Grid Squares L65, L74 and L84.

Corncrake in Ireland is under severe threat. Corncrake was recorded in L75 and L84 during the 1988-1991 Bird Atlas Survey. The Corncrake population in Ireland has suffered a marked decline in recent times, largely due to changes in farming practices. This bird is known to breed in damp hay meadows (with tall grasses) and wet marshland. It is possible that this species occurs in the study area.

Sandwich Tern was confirmed as breeding in Grid Square L65. These birds are known to nest on islands, shingle spits and sand dunes. It is unlikely that this species occurs within the study area due to lack of suitable habitat. It is more likely that the L65 record is from west of Clifden, on the coast.

Common Tern was confirmed as breeding in Grid Squares L65, L75, L84 and M14. Common Terns nest colonially on the ground generally on the coast, but also inland on islets in freshwater lakes. This species may occur on the islets in the freshwater lakes in the study area.

Arctic Tern was confirmed as breeding in Grid Squares L74 and M14 during the 1988-1991 Bird Atlas Survey. Arctic Tern is mainly a coastal breeding bird, but in Ireland the species is also known to breed on the fresh water lakes of Lough Corrib. This species is unlikely to occur within the study area, as it is too far inland.

Peregrine was confirmed as breeding within the 100km squares L and M during the 1988-1991 Bird Atlas Survey. Peregrine breeds on coastal and inland cliffs. It is unlikely that this species occurs within the study area, due to lack of suitable habitat.

Eight bird species included on the BoCCI red list have been recorded for the relevant hectads in the Atlas of Breeding Birds, namely Common Scoter, Golden Plover (discussed above), Lapwing, Yellowhammer, Black-headed Gull, Corncrake (discussed above), Curlew, Redshank and Red Grouse.

Common Scoter was confirmed as breeding within Grid Square M14 in the 1988-1991 Bird Atlas survey. This species is known to occur on Lough Corrib, which accounts for this record.

Lapwing was recorded as possibly/probably breeding within Grid Squares L75 and M14 during the 1988-1991 Bird Atlas Survey. This species breeds on grassland habitats which offer some cover, such as arable fields or rough grassland. The study area contains pockets of suitable habitat for Lapwing.

The habitat preferences of the **Yellowhammer** include arable habitats with some scrub or hedgerow. Yellowhammer was confirmed breeding in Grid Square M14, and recorded as possibly/probably breeding in Grid Squares L75 and M04. The study area contains pockets of suitable breeding habitat for this species.

Black-headed Gulls breed in large colonies in marshes, reedbeds or on islands in lakes. This species was confirmed breeding in Grid Squares M04 and M14 during the breeding birds' survey. The study area contains pockets of suitable breeding habitat for this species.

Curlews tend to breed in a variety of habitats including arable fields, bogs and maritime grassland. Curlew was confirmed as breeding in Grid Square L94 during the last survey, and was recorded as possibly breeding in four other Grid Squares – L65, L75, L74 and M14. The habitats within the study area provide suitable breeding ground for this species.

Redshank was recorded as possibly/probably breeding in Grid Square M14 during the breeding birds' survey. This species breeds on wet meadows, marshland and heath. The habitats within the study area provide suitable breeding ground for this species.

Red Grouse was confirmed as breeding in Grid Squares L74 and L75 during the 1988-1991 Bird Atlas Survey. This species is found on mountains, moorland and lowland raised bogs. The large tracts of bog and heath within the study area provide suitable habitat for this species.

'The Atlas of Wintering Birds in Britain and Ireland (Lack, 1986) was consulted for information on wintering birds recorded within 10km grid squares L65, L74, L75, L84, L94, M04 and M14 within which the study area is located. **Table 10.18** presents details of bird species of high conservation concern recorded as wintering within the aforementioned grid squares.

Table 10.18 Wintering Birds by Lack (1986) from 10km National Grid Squares L65, L74, L75, L84, L94, M04 and M14.

Common Name	L65	L75	L74	L84	L94	M04	M14	Annex I	BoCCI red list
Black Guillemot (*Cepphus grylle*)			Conf					No	No
Black-legged Kittiwake (*Rissa tridactyla)*	Conf	Conf						No	No
Brambling *(Fringilla montifringilla)*							Conf	No	No
Common Bullfinch *(Pyrrhula pyrrhula)*					Conf			No	No
Common Coot (*Fulica atra*)	Conf	Conf			Conf			No	No
Common Guillemot (*Uria aalge*)	Conf	Conf						No	No
Common Pochard (*Aythya ferina*)	Conf	Conf			Conf	Conf		No	No
Common Scoter (*Melanitta nigra*)	Conf	Conf						No	Yes
Dunlin (*Calidris alpina*)			Conf					Yes	No
Eurasian Jay *(Garrulus glandarius)*							Conf	No	No
Eurasian Siskin *(Carduelis spinus)*							Conf	No	No
Eurasian Sparrowhawk (*Accipiter nisus*)	Conf	Conf						No	No
Eurasian Treecreeper *(Certhia familiaris)*				Conf				No	No
Eurasian Wigeon *(Anas penelope)*							Conf	No	No

Common Name	L65	L75	L74	L84	L94	M04	M14	Annex I	BoCCI red list
Eurasian Woodcock (*Scolopax rusticola*)	Conf	Conf						No	No
Eurasian Woodcock *(Scolopax rusticola)*					Conf			No	No
European Goldfinch *(Carduelis carduelis)*				Conf	Conf			No	No
European Greenfinch *(Carduelis chloris)*				Conf	Conf	Conf		No	No
Fieldfare (*Turdus pilaris*)	Conf	Conf				Conf	Conf	No	No
Gadwall (*Anas strepera*)					Conf	Conf		No	No
Golden Plover *(Pluvialis apricaria)*							Conf	Yes	No
Goldeneye *(Bucephala clangula)*					Conf	Conf	Conf	No	No
Great Black-backed Gull (*Larus marinus*)						Conf		No	No
Great Cormorant *(Phalacrocorax carbo)*						Conf	Conf	No	No
Great Crested Grebe (*Podiceps cristatus*)					Conf		Conf	No	No
Great Northern Diver (*Gavia immer*)	Conf	Conf						Yes	No
Great Skua *(Stercorarius skua)*							Conf	No	No
Greater Scaup (*Aythya marila*)	Conf	Conf						No	No
Greater White-fronted Goose *(Anser albifrons)*						Conf		Yes	No
Greenland White-fronted Goose *(Anser albifrons flavirostris)*				Conf	Conf			Yes	No
Grey Heron (*Ardea cinerea*)					Conf			No	No
Herring Gull *(Larus argentatus)*							Conf	No	Yes
House Sparrow (*Passer domesticus*)					Conf	Conf		No	No
Kingfisher (*Alcedo atthis*)	Conf	Conf					Conf	Yes	No
Little Gull (*Larus minutus*)	Conf	Conf						Yes	No
Long-tailed Tit *(Aegithalos caudatus)*							Conf	No	No
Mallard (*Anas platyrhynchos)*				Conf				No	No
Merlin (*Falco colombarius*)							Conf	Yes	No
Mistle Thrush (*Turdus viscivorus*)	Conf	Conf						No	No
Northern Lapwing (*Vanellus vanellus*)	Poss/ Prob	Poss/ Prob						No	Yes
Peregrine Falcon (*Falco peregrinus*)					Conf		Conf	Yes	No
Red Grouse *(Lagopus lagopus)*					Conf			No	Yes
Red-throated Diver (*Gavia stellata*)	Conf	Conf						Yes	No
Redwing *(Turdus iliacus)*					Conf	Conf	Conf	No	No
Ringed Plover			Conf					No	No

Common Name	L65	L75	L74	L84	L94	M04	M14	Annex I	BoCCI red list
(*Charadrius hiaticula*)									
Rock Pipit (*Anthus spinoletta/petrosus agg.*)			Conf					No	No
Rook (Corvus frugilegus)			Conf		Conf			No	No
Short-eared Owl (*Asio flammeus*)			Conf					Yes	No
Snipe *(Gallinago gallinago)*					Conf	Conf		No	No
Stock Pigeon *(Columba oenas)*							Conf	No	No
Teal *(Anas crecca)*					Conf	Conf	Conf	No	No
White-throated Dipper *(Cinclus cinclus)*				Conf		Conf		No	No
Whopper Swan (*Cygnus cygnus*)				Conf	Conf			Yes	No
Widgeon *(Anas penelope)*			Conf					No	No
Wood Pigeon *(Columba palumbus)*					Conf			No	No

10.3.5 Habitats in the Existing Environment

Habitats within the study area were classified according to the Guidelines set out in *'A Guide to Habitats in Ireland*' (Fossitt, 2000), which classifies habitats based on the vegetation present and management history. A description of each habitat type, its ecological value and its links to EU Habitats Directive Annex I habitats is given below.

The distribution of these habitats within the study area is illustrated in **Figure 10.3 Habitat Map**.

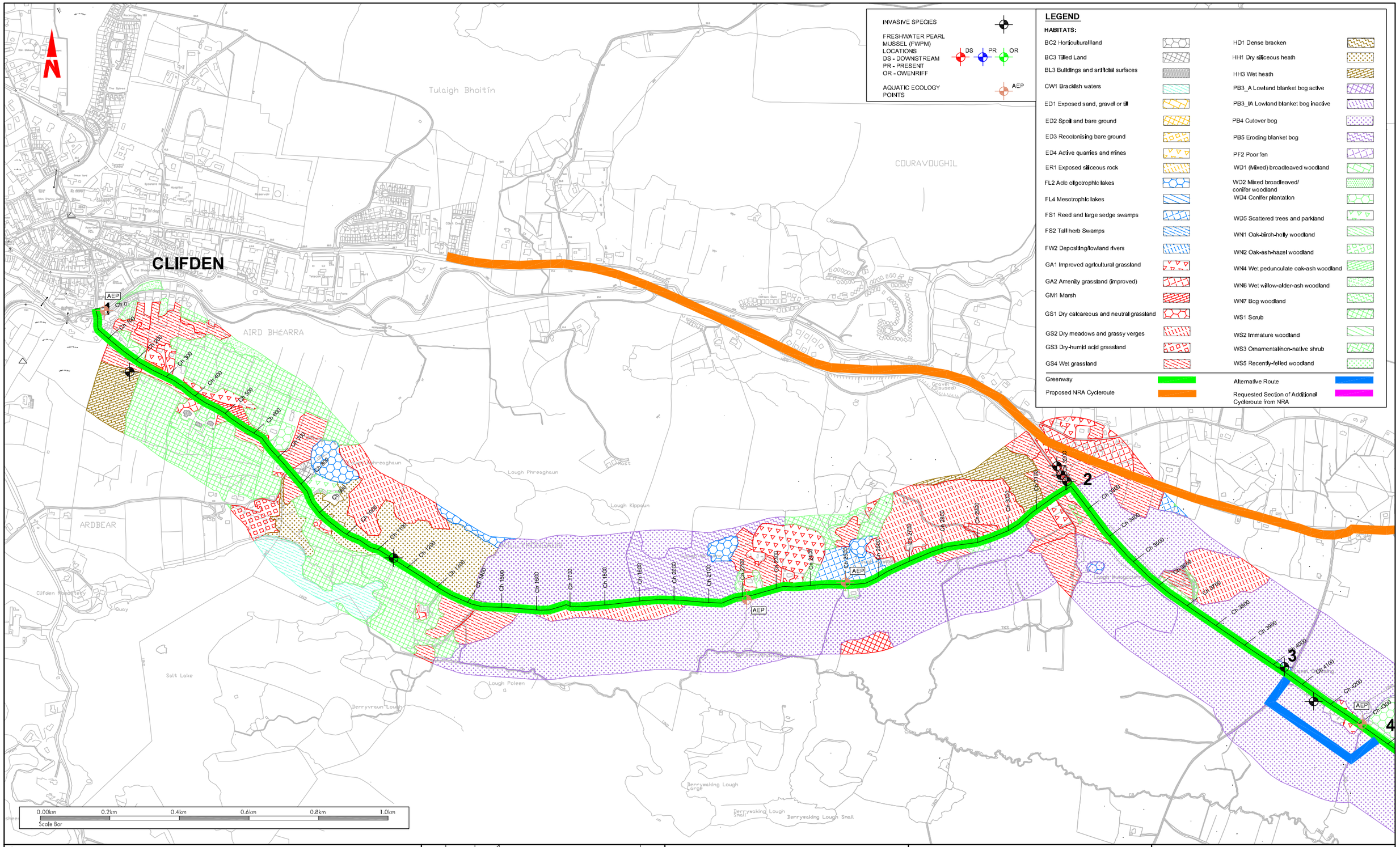
Habitats recorded within the study area are given in **Table 10.19**; they are followed by their corresponding habitat reference codes:

Table 10.19 Habitats Recorded within the Study Area

Habitat Type	Reference Code	Located within Study Area
Acid Oligotrophic Lakes	FL2	Lough Bofin, Lough Shindilla, Oorid Lough, Glendollagh (Garroman) Lough, Athry Lough, Ballynahinch Lake.
Mesotrophic Lakes	FL4	Lough Tawnagh (Park Lough), Lough Adrehid and Derryneen Lough
Eroding/Upland Rivers	FW1	Bunowen River (a tributary of the Owenriff), Letterfore River, Owentooey River, and the Owenglinn River.
Depositing Lowland River	FW2	Channel connecting Derryclare Lough to Glendollagh Lough.
Drainage Ditches	FW4	Throughout the study area.
Reed and Large Sedge Swamps	FS1	Derryvickrune
Improved Agricultural Grassland	GA1	Throughout the study area.
Amenity Grassland	GA2	Claremount

Habitat Type	Reference Code	Located within Study Area
Dry Calcareous & Neutral Grassland	GS1	Knockcallíagh, Derryneen, Glengowla
Dry Meadows & Grassy Verges	GS2	Cloonoppeen, Derryeyglinna, Glengowla
Dry Humid Acid Grassland	GS3	Leam West, Derryeyglinna, Knockmoyle, Claremount, Claremount, Canrawer
Wet Grassland	GS4	Derryneen, Knockmoyle, Canrawer
Marsh	GM1	Aird Bhéarra, Derryeyglinna
Dry Siliceous Heath	HH1	Derryvickrune
Wet Heath	HH3	Leam West, Derryeyglinna, Glengowla, Canrawer, Canrawer
Lowland Blanket Bog	PB3	Emlaghmore (Moyrus ph), Bunscanniff, Maam Cross, Shannakinlougha, Leam West, Knockmoyle, Claremount, Canrawer
Cutover Bog	PB4	Derryvickrune, Athry, Emlaghmore (Moyrus ph), Maam Cross, Bunscanniff, Shannakinlougha, Claremount, Canrawer
Eroding Blanket Bog	PB5	Recess
Rich Fen and Flush	PF1	Maam Cross
Poor Fen and Flush	PF2	North shore of Lough Ateeann and Lough Mall
Oak-Birch-Holly Woodland	WN1	Ballinafad, Lios Uachtair
Oak-Ash-Hazel Woodland	WN2	Athry, Canrawer
Wet Willow Alder Ash Woodland	WN6	Cloonoppeen, Knockbaun, Glengowla
Mixed Broadleaved Woodland	WD2	Derryvickrune
Mixed Broadleaved/Conifer Woodland	WD2	Cloon Beg
Conifer Plantation	WD4	Derryvickrune
Scrub	WS1	Derryvickrune, Derryvickrune, Maam Cross, Claremount
Hedgerows	WL1	Throughout the study area.
Treelines	WL2	Throughout the study area.
Exposed Siliceous Rock	ER1	Maam Cross, Derryeyglinna
Stone Walls and Other Stone Work	BL1	Throughout the study area.
Buildings and Artificial Surfaces	BL3	Claremount

The proposed Greenway runs for the most part along the Connemara dismantled railway line. The habitats described below are therefore, typically, habitats either side of the railway line. The line itself is often covered in either dry calcareous or neutral grassland, or improved grassland, or scrub, depending on the level of maintenance on the track.



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Title
FIGURE 10.1
HABITAT MAP

Sheet 1 of 15

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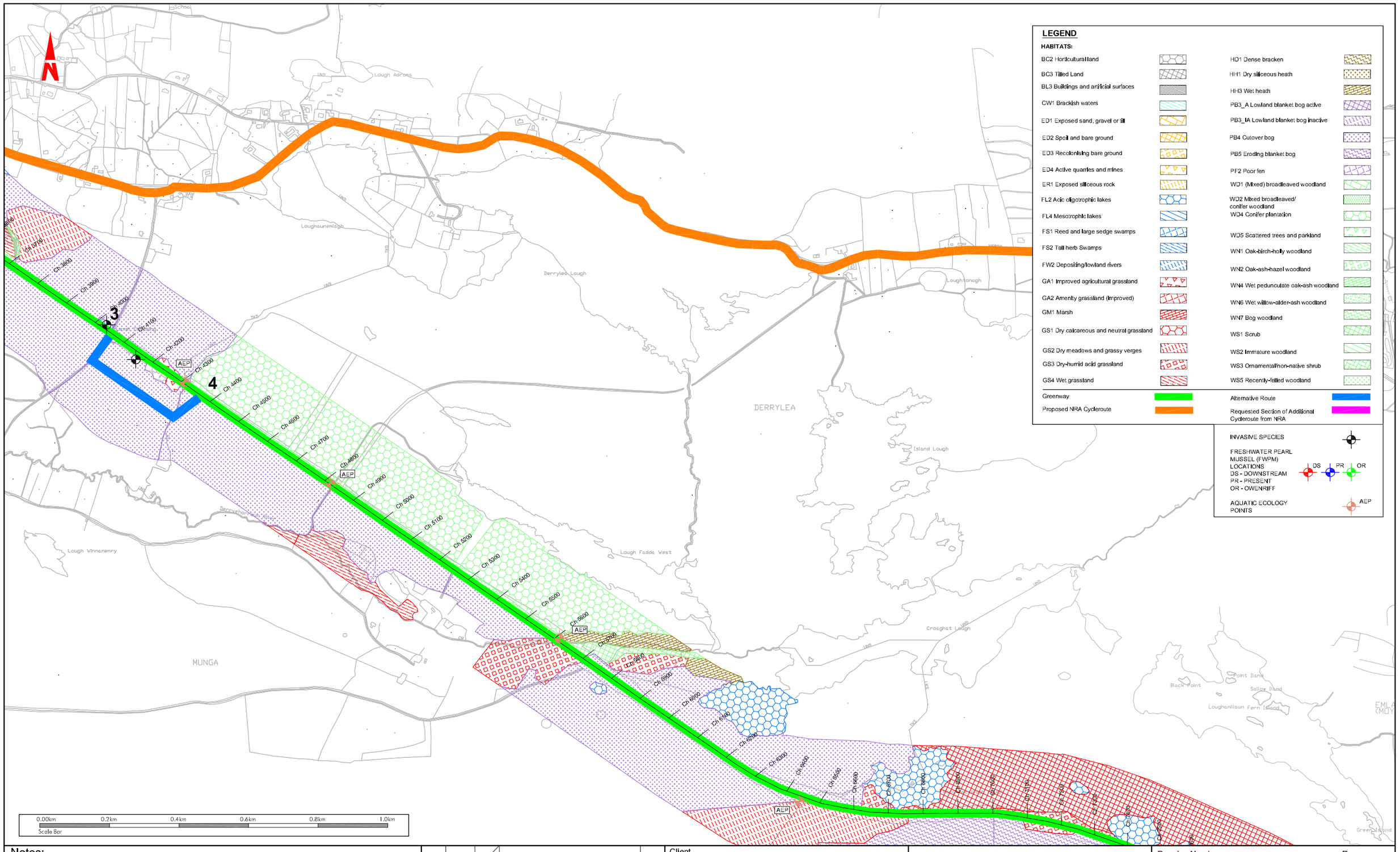

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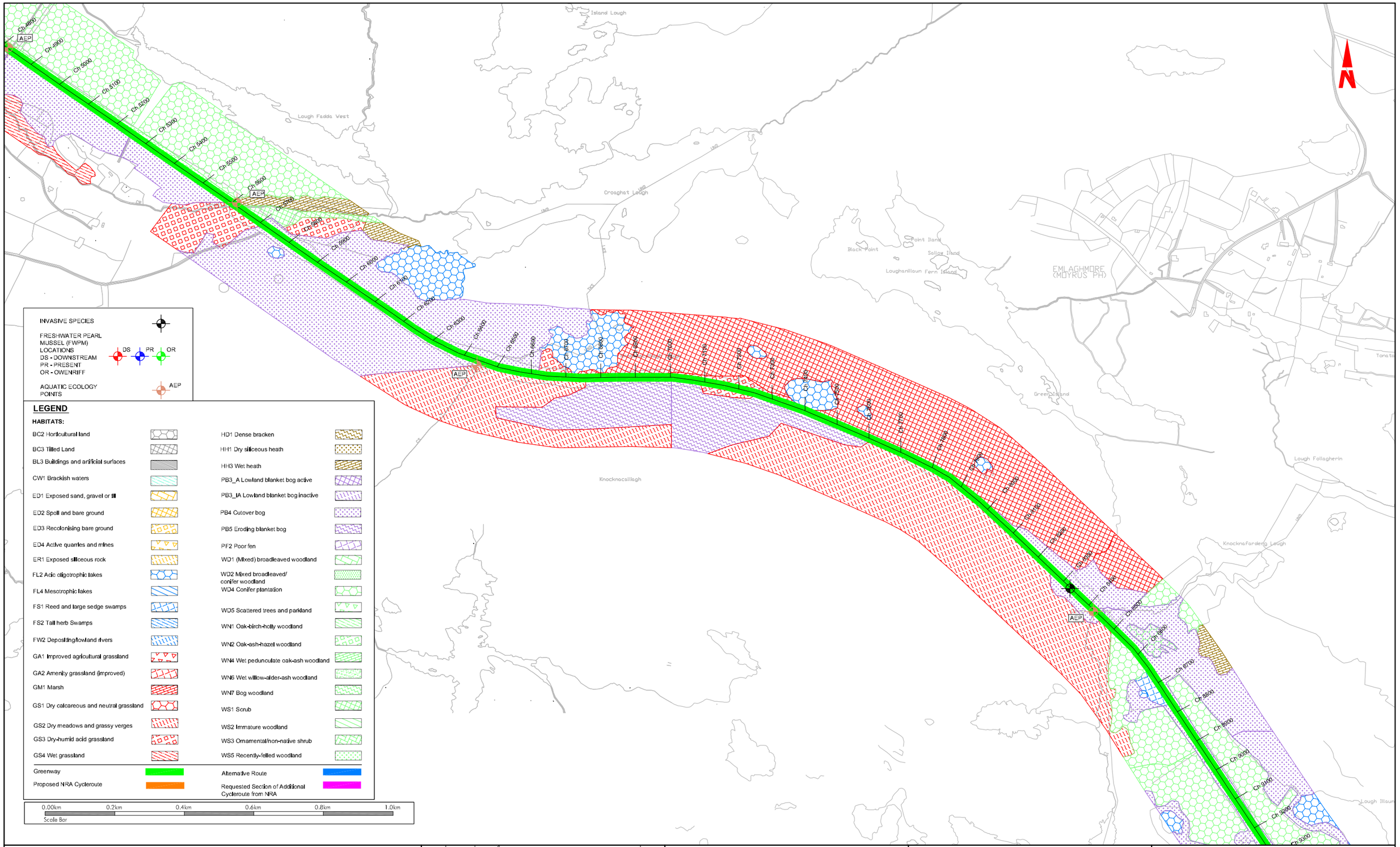

INVASIVE SPECIES

FRESHWATER PEARL MUSSEL (FWPM) LOCATIONS
DS - DOWNSTREAM
PR - PRESENT
OR - OWENRIFF

DS PR OR

AQUATIC ECOLOGY POINTS

AEP

LEGEND

HABITATS:

- BC2 Horticultural land
- BC3 Tilled Land
- BL3 Buildings and artificial surfaces
- CW1 Brackish waters
- ED1 Exposed sand, gravel or silt
- ED2 Spoil and bare ground
- ED3 Recolonising bare ground
- ED4 Active quarries and mines
- ER1 Exposed siliceous rock
- FL2 Acic oligotrophic lakes
- FL4 Mesotrophic lakes
- FS1 Reed and large sedge swamps
- FS2 Tall herb Swamps
- FW2 Depositing/lowland rivers
- GA1 Improved agricultural grassland
- GA2 Amenity grassland (improved)
- GM1 Marsh
- GS1 Dry calcareous and neutral grassland
- GS2 Dry meadows and grassy verges
- GS3 Dry-humid acid grassland
- GS4 Wet grassland
- HD1 Dense bracken
- HH1 Dry siliceous heath
- HH3 Wet heath
- PB3_A Lowland blanket bog active
- PB3_IA Lowland blanket bog inactive
- PB4 Cutover bog
- PB5 Eroding blanket bog
- PF2 Poor fen
- WD1 (Mixed) broadleaved woodland
- WD2 Mixed broadleaved/ conifer woodland
- WD4 Conifer plantation
- WD5 Scattered trees and parkland
- WN1 Oak-birch-holly woodland
- WN2 Oak-ash-hazel woodland
- WN4 Wet pedunculate oak-ash woodland
- WN6 Wet willow-alder-ash woodland
- WN7 Bog woodland
- WS1 Scrub
- WS2 Immature woodland
- WS3 Ornamental/non-native shrub
- WS5 Recently-felled woodland

- Greenway
- Proposed NRA Cycleroute
- Alternative Route
- Requested Section of Additional Cycleroute from NRA

0.00km 0.2km 0.4km 0.6km 0.8km 1.0km
Scale Bar

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FIGURE 10.3
HABITAT MAP

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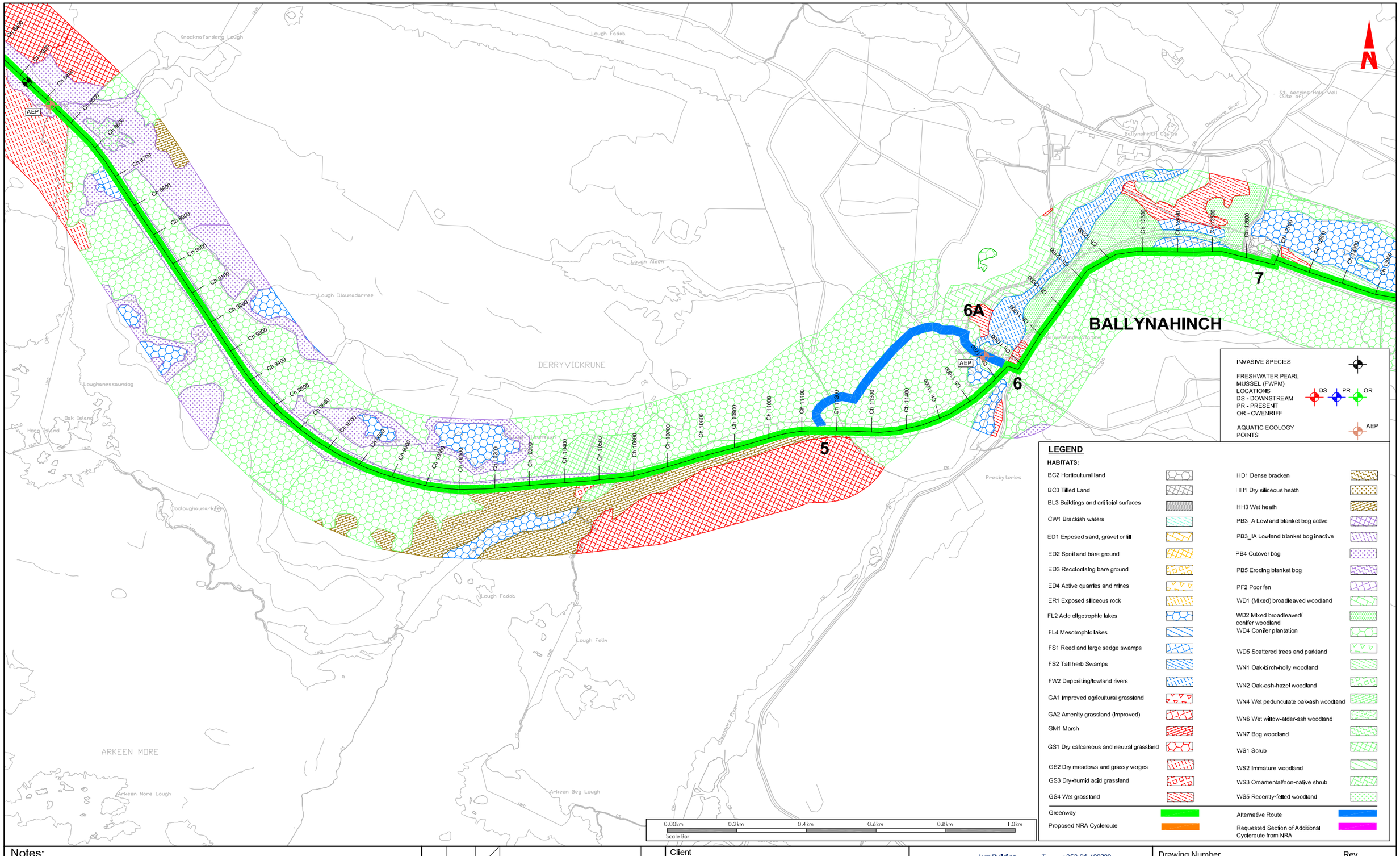

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Project: **CONNEMARA GREENWAY PROJECT**

Drawing Number: **MGE0269/DG0003-04**

Rev: **F01**

Title: **FIGURE 10.4 HABITAT MAP**

Sheet 4 of 15

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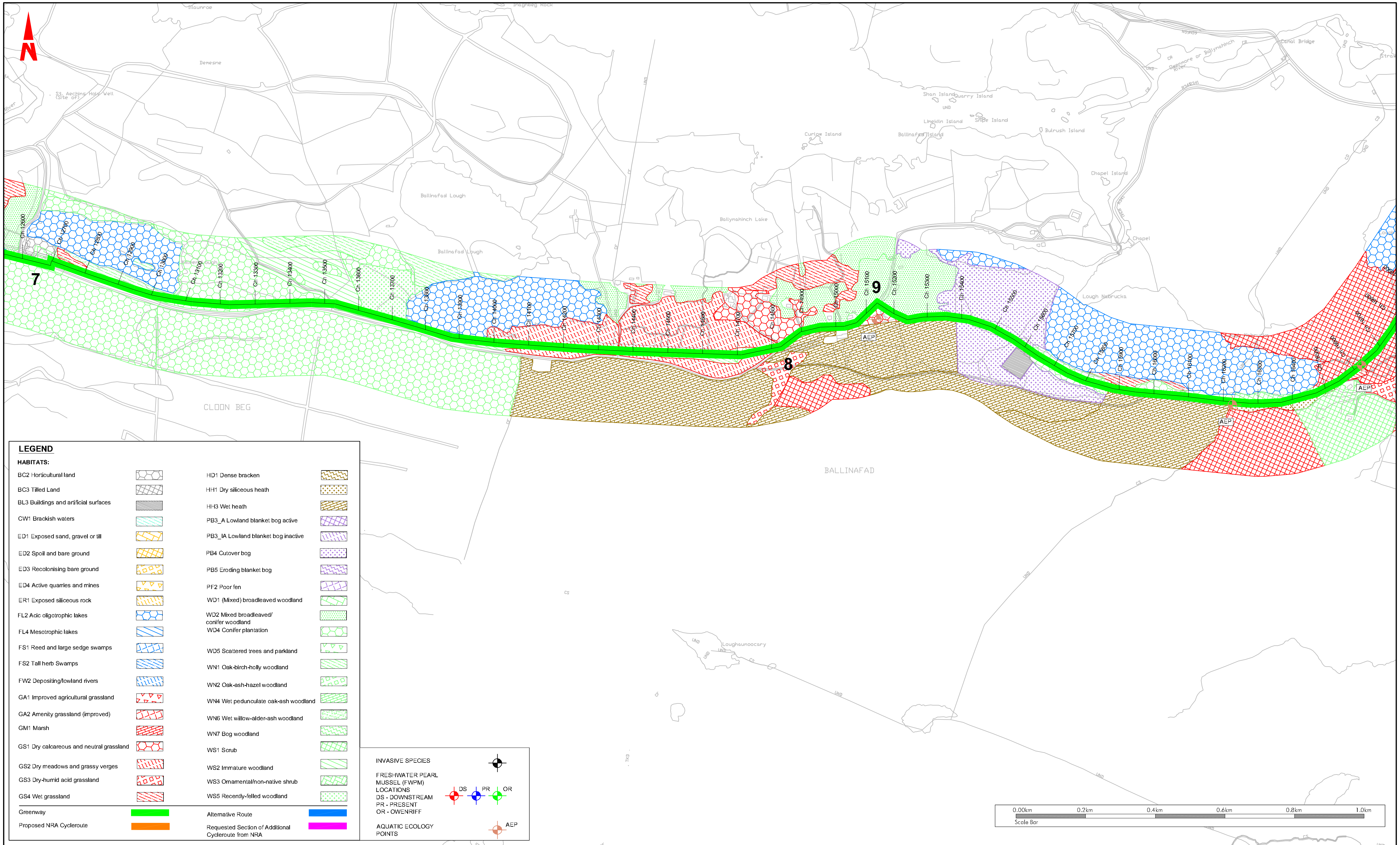

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Drawing Number: MGE0269/DG0003-05

Rev: F01

Project: **CONNEMARA GREENWAY PROJECT**

Title: **FIGURE 10.5 HABITAT MAP**

Sheet 5 of 15

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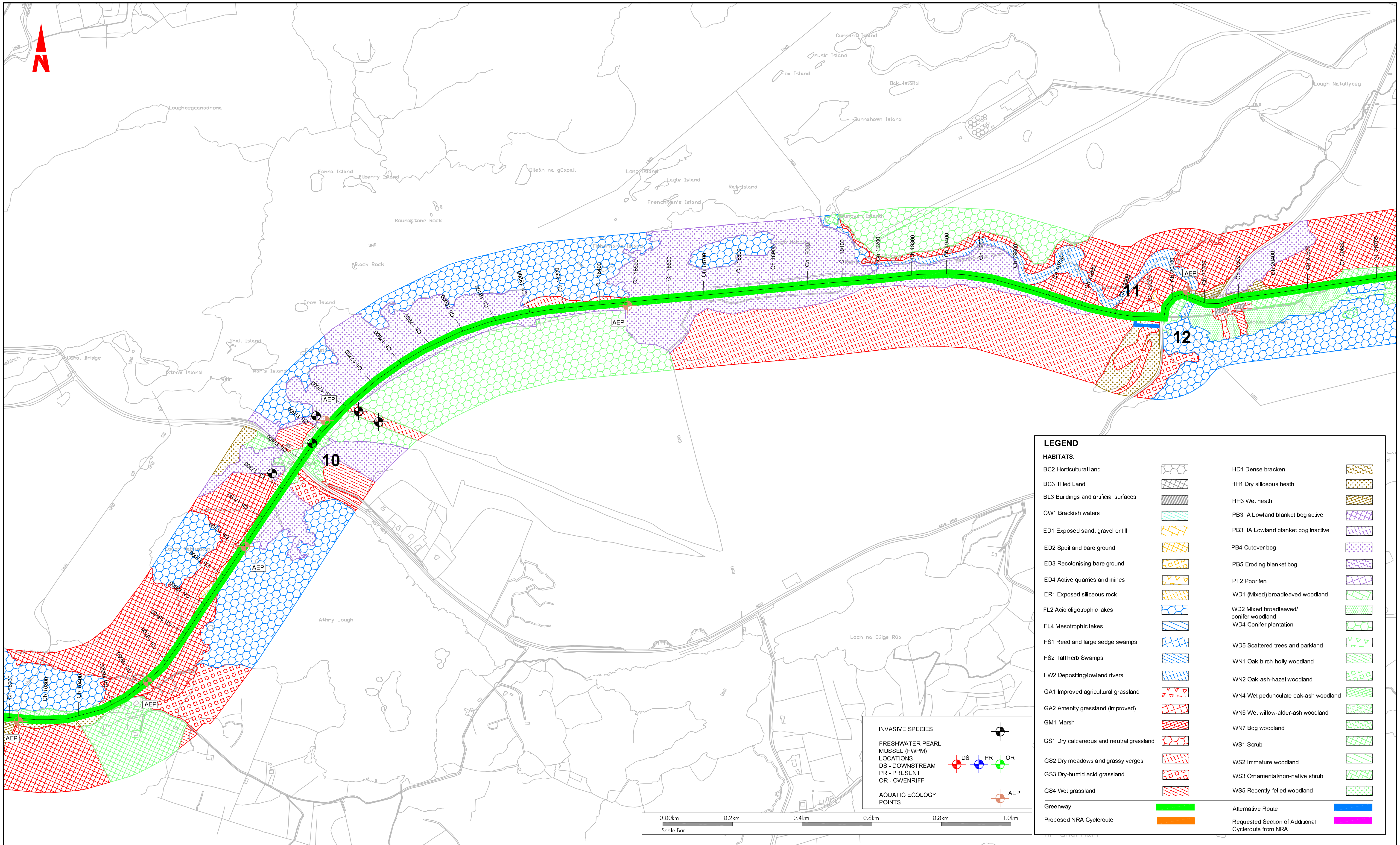

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Drawing Number: MGE0269/DG0003-06

Rev: F01

Project: CONNEMARA GREENWAY PROJECT

Title: FIGURE 10.6 HABITAT MAP

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Sheet 6 of 15

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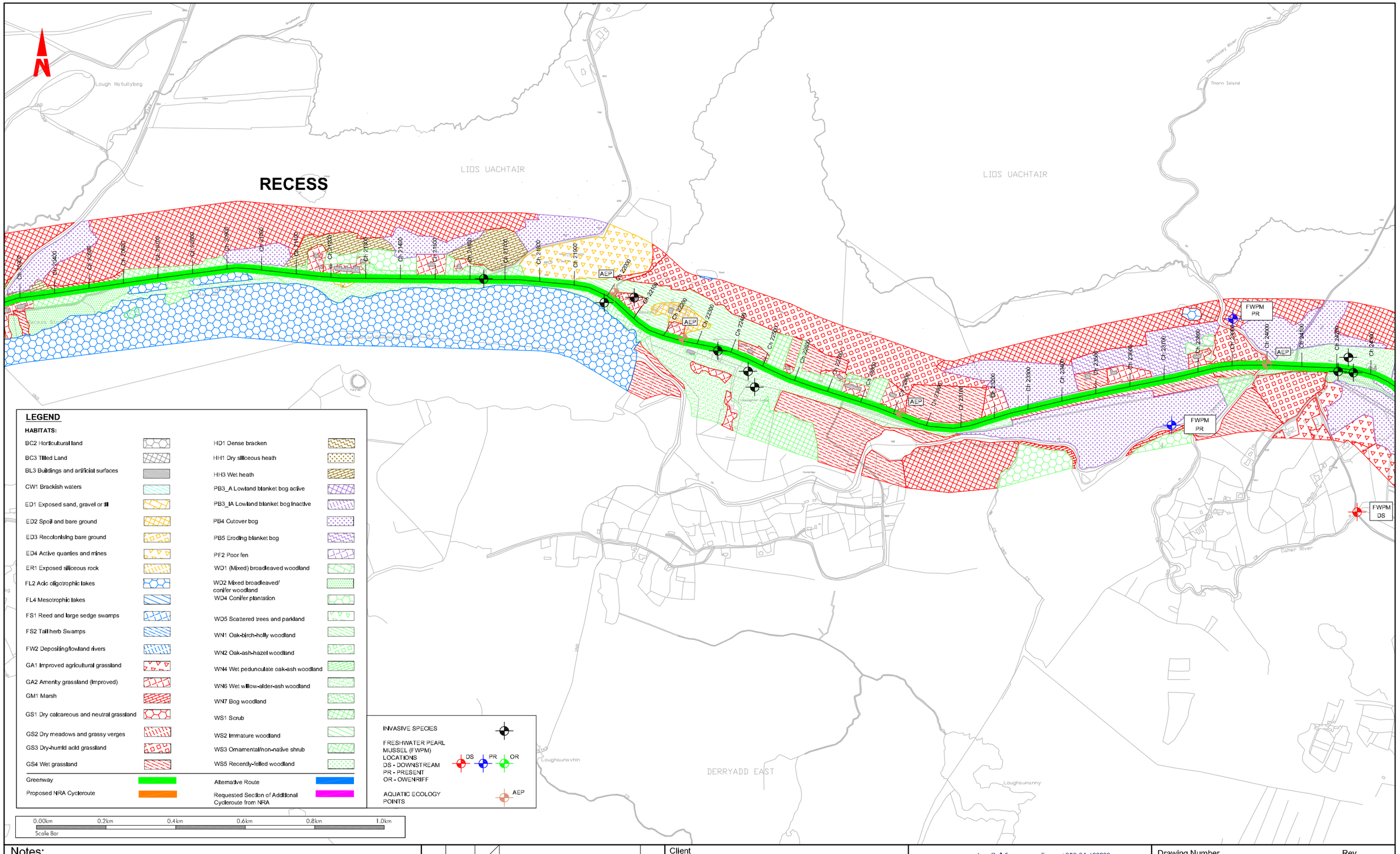

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Project: **CONNEMARA GREENWAY PROJECT**

Drawing Number: MGE0269/DG0003-07
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Title: **FIGURE 10.7 HABITAT MAP**

Sheet 7 of 15

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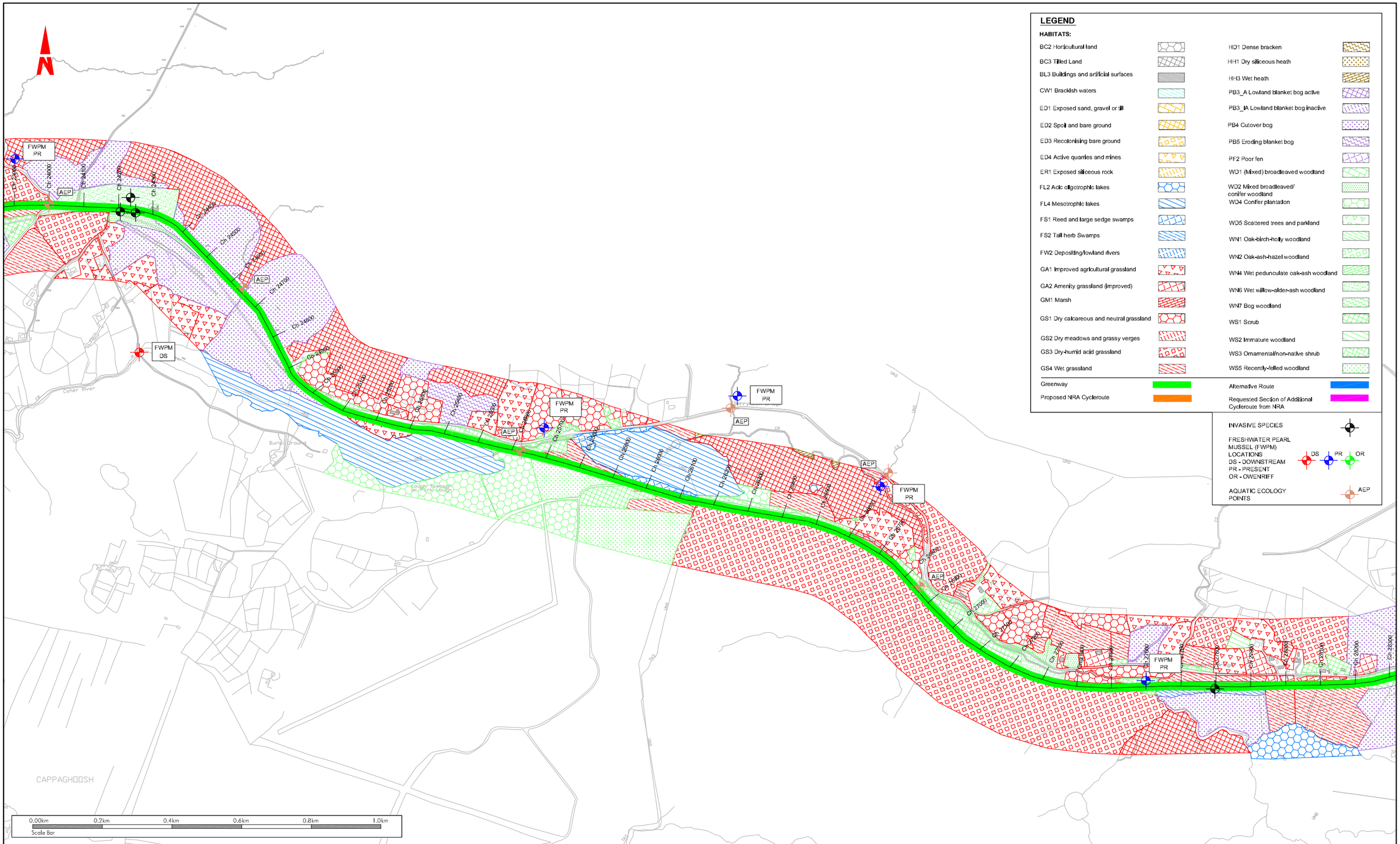

LEGEND

HABITATS:

- BC2 Horticultural land
- BC3 Tilled Land
- BL3 Buildings and artificial surfaces
- CW1 Brackish waters
- ED1 Exposed sand, gravel or till
- ED2 Spoil and bare ground
- ED3 Recolonising bare ground
- ED4 Active quarries and mines
- ER1 Exposed siliceous rock
- FL2 Acic oligotrophic lakes
- FL4 Mesotrophic lakes
- FS1 Reed and large sedge swamps
- FS2 Tall herb Swamps
- FW2 Depositing/lowland rivers
- GA1 Improved agricultural grassland
- GA2 Amenity grassland (improved)
- GM1 Marsh
- GS1 Dry calcareous and neutral grassland
- GS2 Dry meadows and grassy verges
- GS3 Dry-humid acid grassland
- GS4 Wet grassland
- HD1 Dense bracken
- HH1 Dry siliceous heath
- HH3 Wet heath
- PB3_A Lowland blanket bog active
- PB3_IA Lowland blanket bog inactive
- PB4 Cutover bog
- PB5 Eroding blanket bog
- PF2 Poor fen
- WD1 (Mixed) broadleaved woodland
- WD2 Mixed broadleaved/ conifer woodland
- WD4 Conifer plantation
- WD5 Scattered trees and parkland
- WN1 Oak-birch-holly woodland
- WN2 Oak-ash-hazel woodland
- WN4 Wet pedunculate oak-ash woodland
- WN6 Wet willow-alder-ash woodland
- WN7 Bog woodland
- WS1 Scrub
- WS2 Immature woodland
- WS3 Ornamental/non-native shrub
- WS5 Recently-felled woodland

- Greenway
- Proposed NRA Cycleroute
- Alternative Route
- Requested Section of Additional Cycleroute from NRA

INVASIVE SPECIES

FRESHWATER PEARL MUSSEL (FWPM) LOCATIONS
DS - DOWNSTREAM
PR - PRESENT
OR - OWENRIFF

DS PR OR

AQUATIC ECOLOGY POINTS

AEP

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Drawing Number: MGE0269/DG0003-08
Rev: **F01**

Title: **FIGURE 10.8 HABITAT MAP**

Sheet 8 of 15

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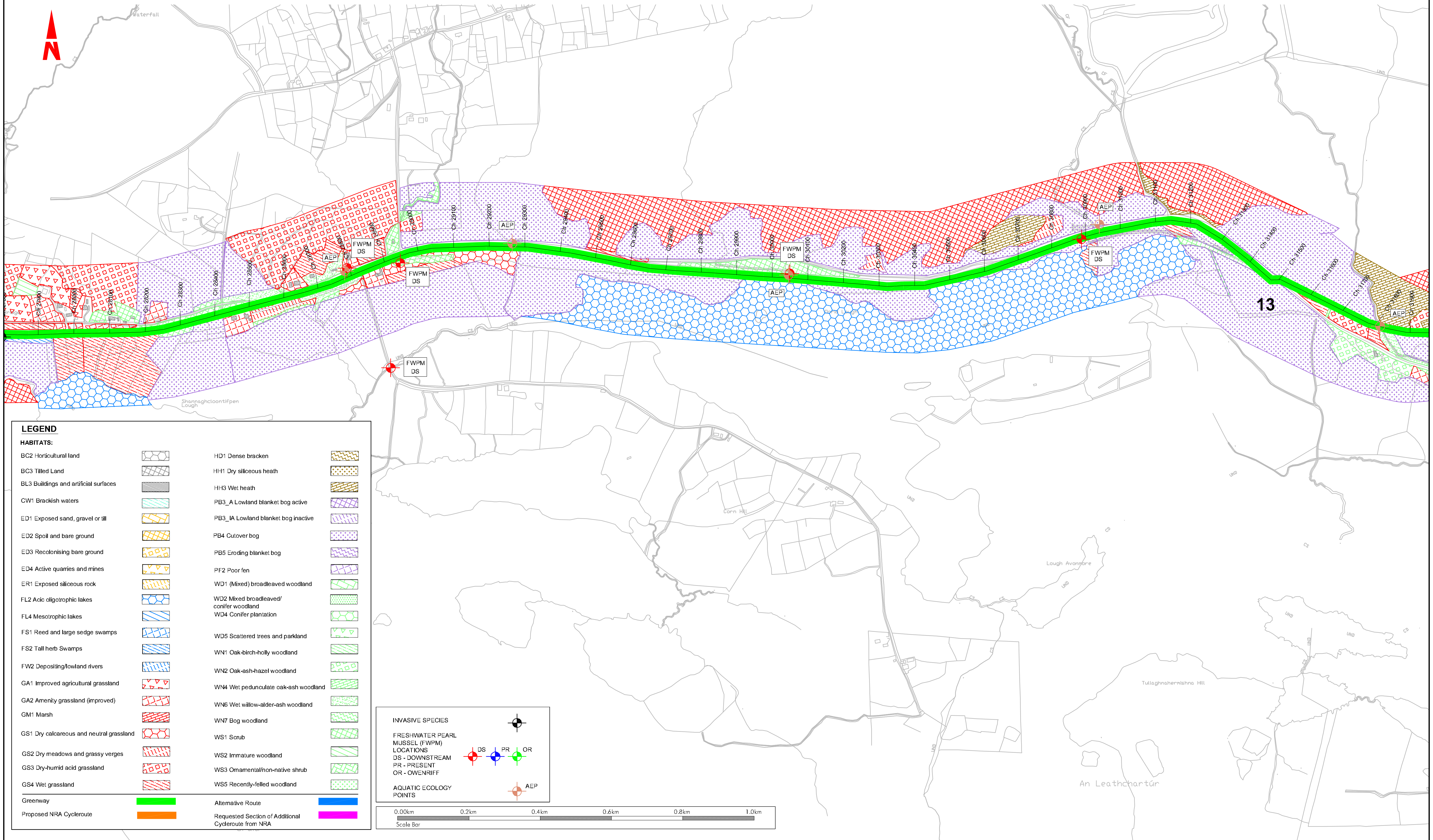

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Drawing Number: MGE0269/DG0003-09
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Project: CONNEMARA GREENWAY PROJECT

Title: **FIGURE 10.9 HABITAT MAP**

Sheet 9 of 15

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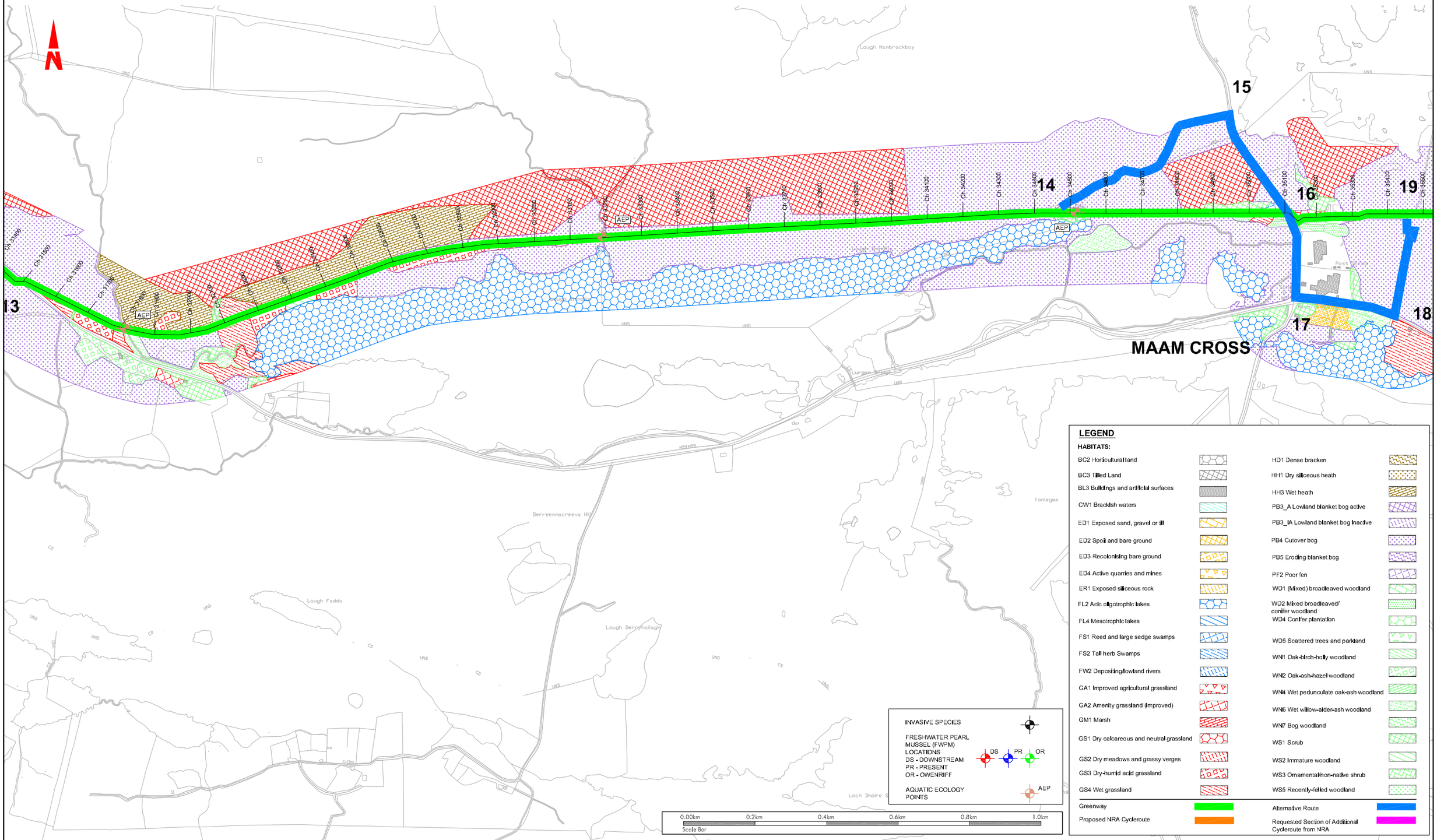

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Title: **FIGURE 10.10 HABITAT MAP**

Sheet 10 of 15

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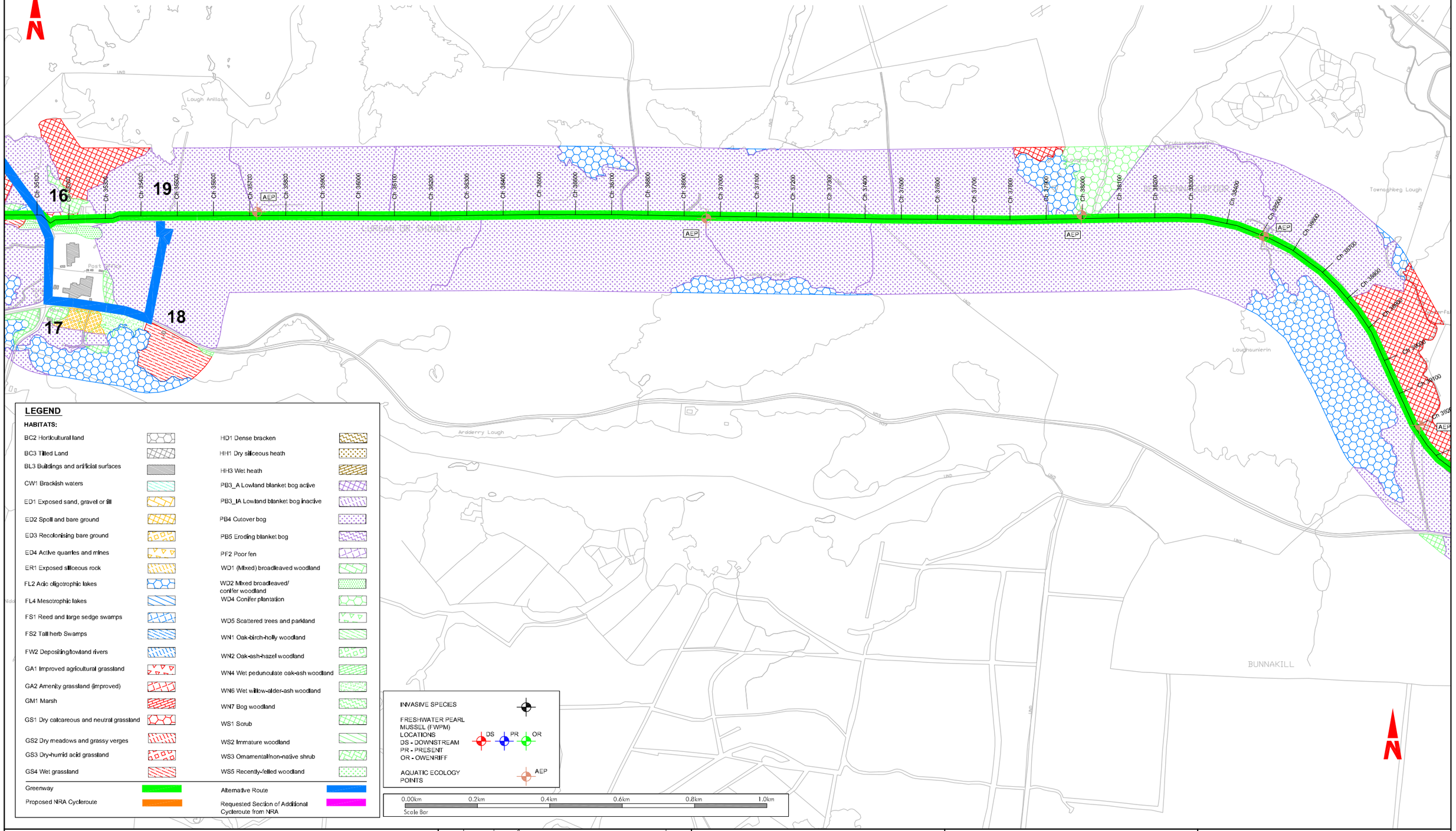

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Title: **FIGURE 10.11 HABITAT MAP**

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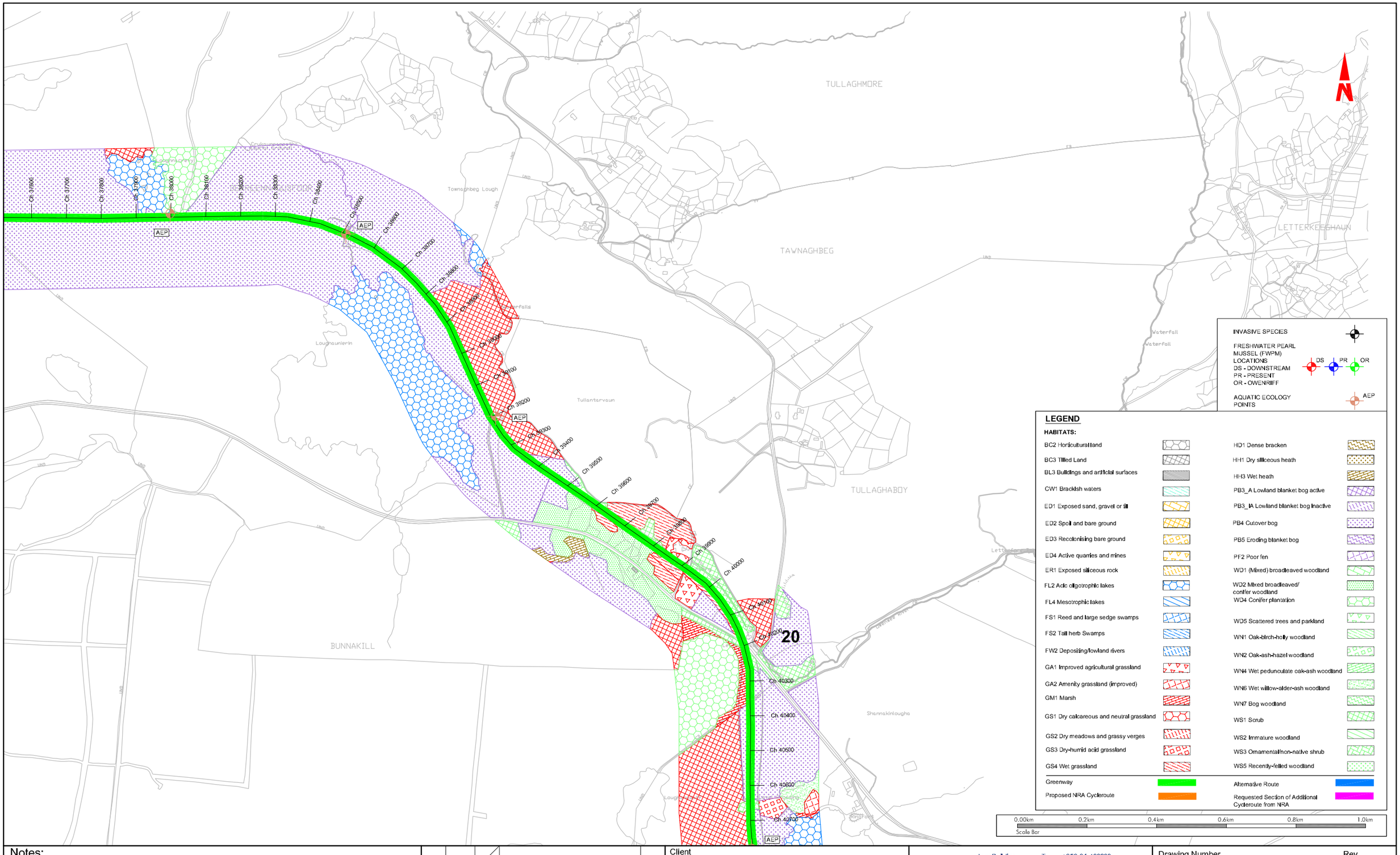

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Title: **FIGURE 10.12 HABITAT MAP**

Sheet 12 of 15

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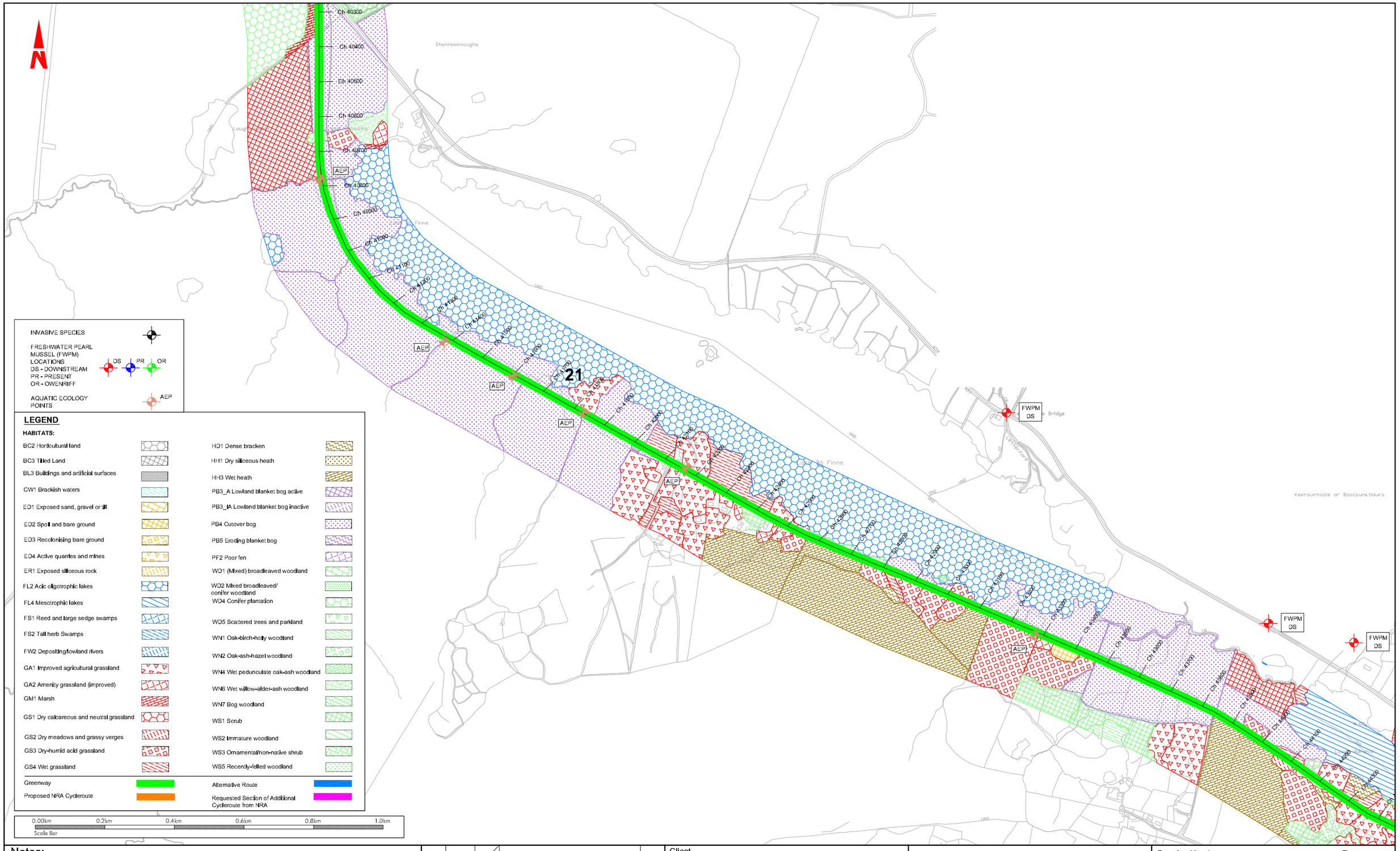

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Drawing Number: MGE0269/DG0003-13 | Rev: **F01**

Title: **FIGURE 10.13 HABITAT MAP**

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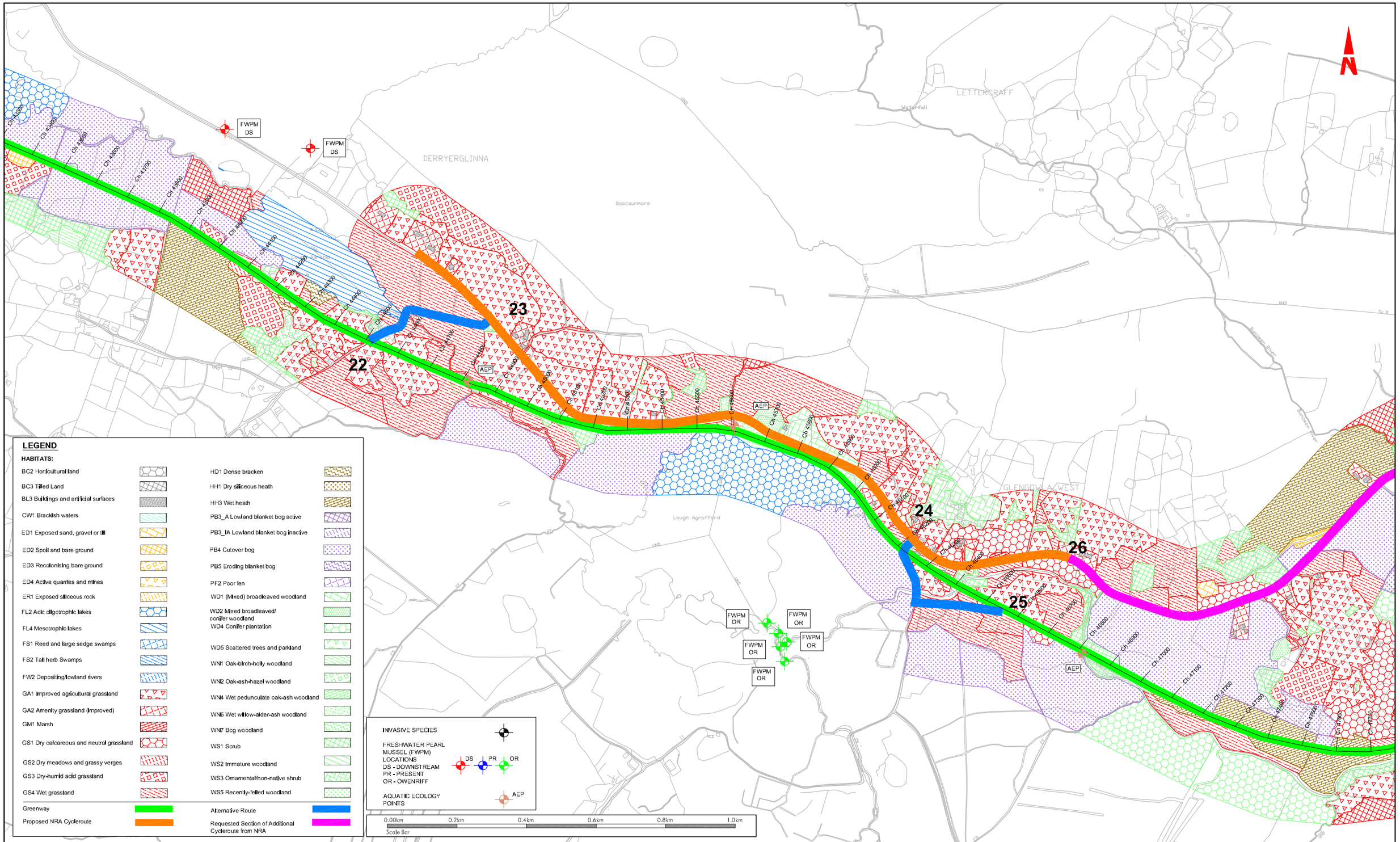

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Project: CONNEMARA GREENWAY PROJECT

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Title: FIGURE 10.14 HABITAT MAP

Sheet 14 of 15

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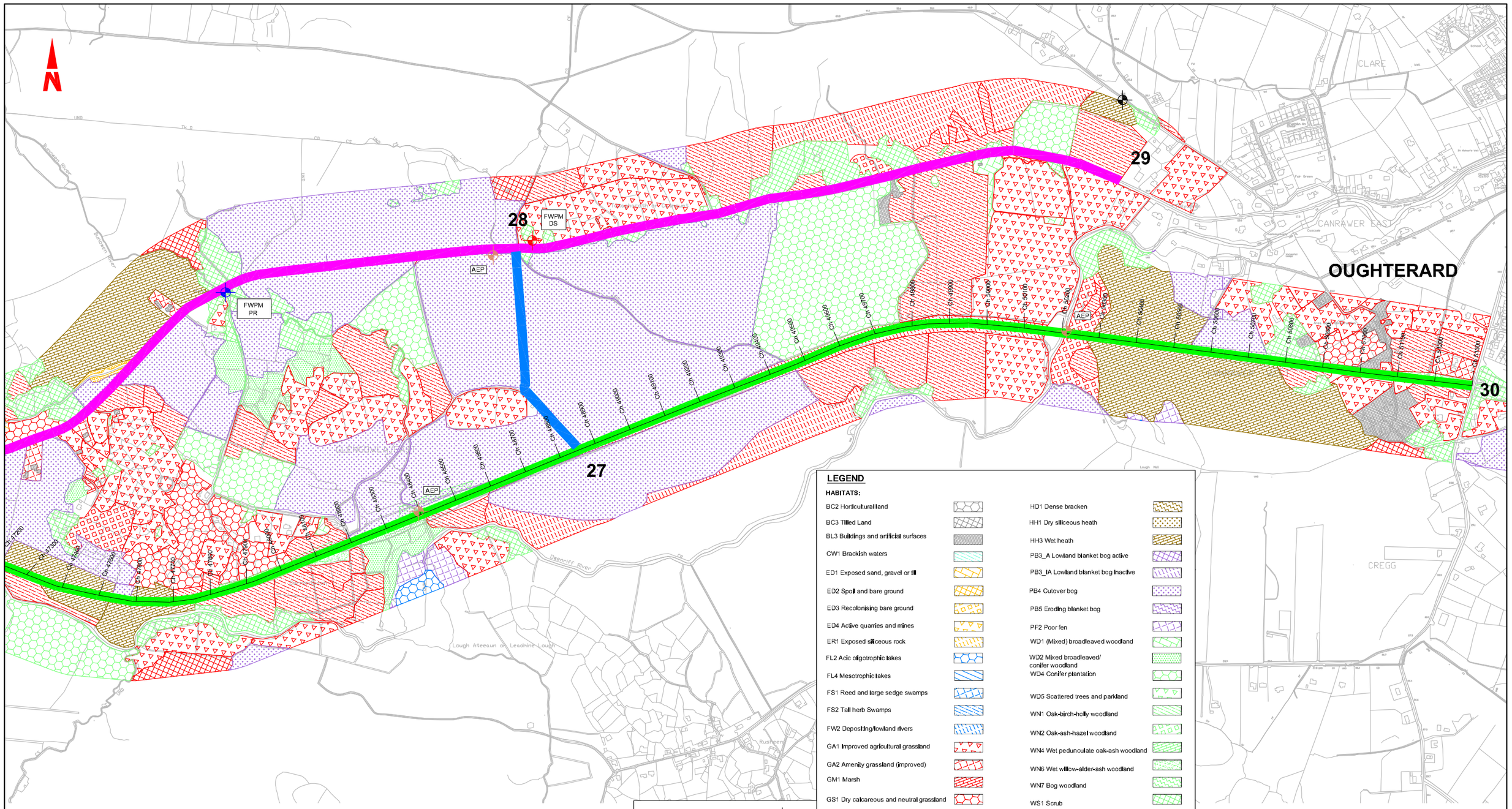

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5. Datum: Ordnance Survey Datum, Malin Head

No.	Date	Drn. / Chk.	Amendment / Issue	App
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Project
CONNEMARA GREENWAY PROJECT

Drawing Number
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Rev
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Title
FIGURE 10.15
HABITAT MAP

Sheet 15 of 15

Scale	Drawn By	Checked By	Approved By	Date
1:10,000 @ A3	MC	PK	WM	April 2012

MGE0269DG0003 Habitat.dwg

- **Acid Oligotrophic Lakes FL2**

The proposed Connemara Greenway Project – Clifden to Oughterard runs adjacent to numerous lakes which have been classified as Acid Oligotrophic Lakes FL2, including Lough Bofin, Lough Shindilla, Oorid Lough, Glendollagh (Garroman) Lough, Athry Lough and Ballynahinch Lake, an example is shown in **Image 10.1**.

These lakes are host to several species of conservation interest including Arctic char (*Salvelinus alpinus*) which represents an arctic-alpine element in the Irish fauna. In Ireland the Arctic char occurs only in a few cold, stony, oligotrophic lakes. Arctic char have been recorded in a number of lakes within the zone of influence of the greenway, including Ballynahinch Lake, Arderry Lake and Lough Shindilla (IFI and NPWS records). The species has also been reported from Lough Oorid and Lough Glendollagh in the past, but has not been recorded from these lakes in recent years. Lough Bofin also has Arctic char potential. Arctic char are listed in the Irish Red Data Book as being threatened in Ireland.

Several of the lakes in the area are part of catchments for Freshwater Pearl Mussel (*Margaritifera margaritifera*), including Lough Bofin, which is part of the Owenriff Catchment. There is also a record for this species from Ballynahinch Lake (NPWS records); however this was not confirmed during recent surveys for the species (Moorkens, 2010). The Freshwater Pearl Mussel is protected under Annex II of the EU Habitats Directive.

The NPWS Rare and Protected Species Database has records for two species of conservation importance at Oorid Lough, an acid oligotrophic lake in the study area, including Bog Hair-grass (*Deschampsia setacea*) and Marsh Clubmoss (*Lycopodiella inundata*). Slender Naiad (*Najas flexilis*), an EU Annex II species, has also been recorded from Lough Bofin.

Very little aquatic vegetation was noted at the lakes. White Water Lily (*Nymphaea alba*) was noted at several of the lakes, and many had fringing vegetation of reed and sedge swamp, with such species as Common Reed (*Phragmites australis*), Bulrush (*Schoenoplectus lacustris*) and Great Fen-sedge (*Cladium mariscus*). Some of the lakes, including Shindilla Lough, have wooded islands comprising Scot's Pine, Willow, Alder and Ash.

Acid Oligotrophic FL2 Waters are linked to the following Annex I habitats under the EU Habitats Directive: 'oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) (3110)' and 'oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* (3130)'. The oligotrophic lakes within the study area correspond to the former. This Annex I habitat is described below.

This corresponding Annex I habitat is represented in a number of lakes within the study area. These are therefore considered to be of International Importance.

Ecological Interest	Links to Annex I Habitats	Locations within THE ZOI
International Importance	The Acid oligotrophic lakes within the study area correspond to the Annex I habitats, 'oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) (3110)'.	Lough Bofin, Lough Shindilla, Oorid Lough, Glendollagh (Garroman) Lough, Athry Lough, Ballynahinch Lake.

Image 10.1 View from south of Lough Oorid an Acidic Oligotrophic Lake FL2

- **Mesotrophic Lakes FL4**

Several mesotrophic lakes occur within the study area, including Lough Tawnagh (Park Lough), Lough Adrehid and Derryneen Lough with an example shown in **Image 10.2**. Mesotrophic lakes are moderately rich in nutrients, and may have a large amount of algae. Within the study area, several lakes were noted that had an abundance of Pondweed (*Potamogeton* spp.). These correspond to the Mesotrophic Lakes category. Other aquatic macrophytes recorded at these water bodies include Water Lily (*Nuphar* spp.) and Bogbean (*Menyanthes trifoliata*). Fringing vegetation includes Bulrush (*Schoenoplectus lacustris*), Common Reed (*Phragmites australis*).

Derryneen Lough is known to support Atlantic Salmon (*Salmo salar*), a species listed on Annex II of the EU Habitat Directive. Arctic char have also been recorded in the lake in the past (Ecofact, 2010). Lough Adrehid, at the eastern end of the Project is part of the Owenriff catchment and is upstream of the Owenriff River which supports an internationally important population of Freshwater Pearl Mussel.

This habitat category is not linked to any EU Annex I habitat types. However, due to the presence of several species of conservation importance in the lakes, including two which are listed under Annex II of the EU Habitats Directive, these lakes are considered to be of conservation importance.

Ecological Interest	Links to Annex I Habitats	Locations within the Z01
International Importance	Not linked to any Annex I habitats, but these lakes contain species listed under Annex II of the EU Habitats Directive, and so are considered to be of major conservation importance.	Lough Tawnagh (Park Lough), Lough Adrehid and Derryneen Lough

Image 10.2 Lough Adrehid, a Mesotrophic Lake FL4

- **Eroding/Upland Rivers FW1**

The route corridor of the proposed Connemara Greenway Project – Clifden to Oughterard traverses a number of rivers which at the point of crossing are best classified as Eroding Upland Rivers FW1, including the Bunowen River (a tributary of the Owenriff), the Letterfore River, the Owentooey River, and the Owenglin River. An example is shown in **Image 10.3**. These rivers are characterised by steep gradients, rapid and turbulent water flows and little or no deposition of fine sediment. The substrate of these watercourses generally comprises a mixture of exposed bedrock, boulders, cobble and pockets of coarse sand. Within the study area, many of these rivers flow through blanket bog which is heavily grazed, which gives the water a somewhat brownish colour.

Several of the eroding upland rivers in the study area have been designated for nature conservation. The Bunowen River, which is crossed by the proposed Connemara Greenway Project – Clifden to Oughterard approximately 4km west of Oughterard and 70m north of Lough Ateeann, is upstream of a known population of Freshwater Pearl Mussel (*Margaritifera margaritifera*). Both the Bunowen and Owenriff rivers are included in the Lough Corrib cSAC. Likewise the Letterfore River which is also upstream of a population of Freshwater Pearl Mussel is also included in the Lough Corrib cSAC.

The Owenglin River is of major ecological importance due to the presence of Atlantic Salmon (*Salmo salar*), an EU Annex II species, and as such is included in the Twelve Bens/Garraun Complex cSAC (Ecofact, 2010). The Owentooey River is included within the Maumturk Mountain SAC to the north of the proposed Greenway and within the Connemara Bog Complex SAC to the south of the proposed Greenway. The Owentooey River is also upstream of a Freshwater Pearl Mussel population.

Ecological Interest	Links to Annex I Habitats	Locations within the ZOI
International Importance	This habitat type does not correspond to any EU Annex I habitats. However, many of these rivers are included within cSACs and several contain Annex II species, and are of major conservation significance.	Bunowen River (a tributary of the Owenriff), Letterfore River, Owentooey River, and the Owenglinn River.

Image 10.3 The Owentooey River, classified as an Eroding Upland River FW1

- **Depositing Lowland Rivers FW2**

Rivers, or sections of these, which deposit fine sediments on the river bed, are classified as Lowland Depositing Rivers FW2. These watercourses are generally found in lowland areas with low gradients where water flow is sluggish.

The proposed Connemara Greenway Project – Clifden to Oughterard crosses only one watercourse which is classified as a Lowland Depositing River FW2 at the point of crossing i.e. the river channel connecting Derryclare Lough to Glendollagh Lough shown in **Image 10.4**. This river flows through an area of Lowland Blanket Bog of uneven topography and rocky outcrops. Species noted in the river included Common Water Plantain (*Alisma plantago aquatica*), Bogbean (*Menyanthes trifoliata*), White Water Lilly (*Nymphaea alba*), Common Reed (*Phragmites australis*) and Pondweed (*Potamogeton* sp.).

This watercourse is included within the Twelve Bens/Garraun Complex cSAC to the north of the road and the Connemara Bog Complex cSAC to the south of the road, and so is considered to be of major ecological significance.

Ecological Interest	Links to Annex I Habitats	Locations within the ZOI
International Importance	This habitat type does not correspond to any EU Annex I habitats.	Channel connecting Derryclare Lough to Glendollagh Lough.

Image 10.4 Depositing Lowland River FW2, the channel connecting Derryclare Lough and Glendollagh Lough

- **Drainage Ditches FW4**

Drainage Ditches occur throughout the study area. These drains contain species such as Common Reed (*Phragmites australis*), Reedmace (*Typha latifolia*), Fool's Water-cress *(Apium nodiflorum)*, Duckweeds (*Lemna* spp.), Water Mint *(Mentha aquatica)* and Meadowsweet *(Filipendula ulmaria).* Where the old railway line is situated in a cut, impeded drainage has led to some sections becoming quite wet. One such section of the disused railway line with steep escarpment walls occurs to the south-west of the N59 in the townland of Athry shown in **Images 10.5a** and **10.5b**. There is standing water and aquatic vegetation such as Branched Bur-reed *(Sparganium erectum)*, Pondweed (*Potamogeton* sp.), Lesser spearwort (*Ranunculus flammula*) and Marsh St. John's wort (*Hypericum elodes*) on the edges. This habitat does not correspond to any Annex I habitat.

Ecological Interest	Links to Annex I Habitats	Locations within Study Area
Local Importance (Lower Value).	This habitat type does not correspond to any EU Annex I habitats	Throughout study area

Image 10.5a and 10.5b Standing water with Branched Burweed abundant Marsh St. John's wort, Lesser Spearwort and Sphagnum moss.

- **Reed and Large Sedge Swamps FS1**

Reed and Large Sedge Swamp FS1 habitat occurs as fringing vegetation around lakes and in drainage ditches throughout the study area. Common Reed (*Phragmites australis*) is generally the dominant species with occasional Great Fen Sedge (*Cladium mariscus*), Bulrush (*Schoenoplectus lacustris*) and Reedmace (*Typha latifolia*). This habitat does not correspond to any Annex I Habitat Type but is part of semi-natural wetland habitat matrix and therefore considered to be of Local Importance (Higher Value).

Ecological Interest	Links to Annex I Habitats	Locations within the ZOI
Local Importance (Higher Value)	Reed and Large Sedge Swamps FS1 habitat does not correspond to EU Annex I habitats.	Throughout the study area, in drains and as fringing vegetation around lakes.

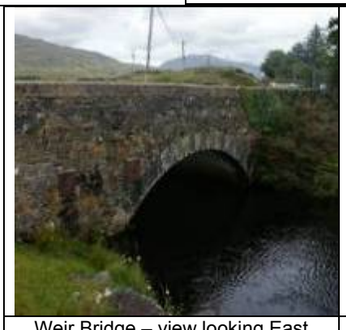
Table 10.20 Provides a summary of the ecological features at each of the water crossings.

Table 10.20 Summary of the Ecological Features at Each of the Watercrossings

Crossing No.	Bridge No. NRA Ref. & Chainage	River	Designation	Annex I Habitat	Annex II Species	Bat Roosts	Q Rating	Notes & Site Evaluation	Photographs
WC00.0	Greenway commences just beyond Ardbear Old Bridge **Chainage:** CH00	Owenglin River	Twelve Bens/Garraun Complex cSAC	N/A	Otter, Atlantic Salmon (A very sensitive receptor as all areas of the main channel comprise of potential angling water for salmon and sea trout. The entire stretch is also utilised to some degree as a salmonid spawning and nursery area)	Limited bat roost potential some crevices present. There is a record from Bat Conservation Ireland of a night hibernation roost at this bridge, one unidentified bat recorded.	Q4-Unpolluted Good Status	A diverse aquatic macroinvertebrate assemblage was recorded comprising 15 groups. The sensitive mayfly species *Ecdyonurus dispar* and *Rhithrogena semicolorata* along with the Class A stonefly larvae *Isoperla grammatica*. Habitats include improved agricultural grassland, wet grassland and Wet Willow Alder Ash Woodland. The invasive species Giant Rhubarb (*Gunnera tinctoria*), Japanese Knotweed (*Fallopia japonica*), Giant Hogweed (*Heracleum mantegazzianum*) and Himalayan Balsam (*Impatiens glandulifera*) were recorded on the banks of the River near this location. No submerged macrophytes or macroalgae were noted. Site Evaluation: A International Importance	 View Upstream
WC01.0	Culvert **Chainage:** Ch2200	Tributary of Derryehorraun River Drains Lough Natawna	Connemara Bog Complex	N/A	not suitable fisheries habitat	No bat roost potential	The site was not suitable for Q monitoring as it lacked adequate riffle habitat.	Habitats on the banks of stream include cutover bog, eroding bog, and conifer woodland. No submerged macrophytes or macroalgae were noted. Site Evaluation: A International Importance	 View downstream of road
WC02.0	Culvert **Chainage:** Ch2500	Tributary of Derryehorraun River Drains Lough Gowlanlanaglanna	Connemara Bog Complex	N/A	Otter, Atlantic Salmon	No bat roost potential	The site was not suitable for Q monitoring as it lacked adequate riffle habitat.	Habitats on the banks of stream include improved agricultural grassland, cutover bog, Reed and Large Sedge, and conifer woodland. No submerged macrophytes or macroalgae were noted. Site Evaluation: A International Importance	 View downstream of road
WC03.0	Culvert **Chainage:** Ch4300	Tributary of Derryehorraun River	Connemara Bog Complex	N/A	Limited potential to support Annex II species.	No bat roosts potential	The site was not suitable for Q monitoring as it lacked adequate riffle habitat.	Habitats on the banks of stream include conifer woodland and cutover bog. The invasive species Rhubarb (*Gunnera tinctoria*) was found on the banks of the stream. No submerged macrophytes or macroalgae were noted. Site Evaluation: A International Importance	 View East upstream of crossing

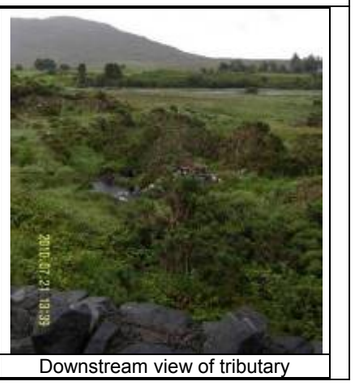
Crossing No.	Bridge No. NRA Ref. & Chainage	River	Designation	Annex I Habitat	Annex II Species	Bat Roosts	Q Rating	Notes & Site Evaluation	Photographs
WC04.0	Culvert **Chainage:** Ch4800	Tributary of Derryehorraun River, drains Lough Fadda	Connemara Bog Complex	N/A	Limited potential to support Annex II species.	No bat roosts potential	Q3-4 slightly polluted	Habitats on the banks of stream include conifer woodland and cutover bog. Private peat extraction activities have resulted in alternation of hydrology and there is currently no stream or river crossing anymore at this point. Site Evaluation: D Local Importance (Higher Value).	 View East upstream of crossing
WC05.0	Culvert **Chainage:** Ch5600	Tributary of Derryehorraun River, drains Croaght Lough and Lough Fadda	Connemara Bog Complex	Northern Atlantic wet heaths with Erica tetralix (4010)	Limited potential to support Annex II species.	No bat roosts found. No crevices	Dry, no flow under route.	Habitats on the banks of stream include Dry Humid Acid Grassland, Wet Heath, Cutover Bog and Conifer Woodland. Extensive peat cutting on both sides of route at this location. Substrate gravelly indicating drainage in the past. Local hydrology seems to have been altered. Site Evaluation: A International Importance	 Eastern elevation of bridge, facing WNW
WC06.0	Culvert **Chainage:** Ch6450	Tributary of Derryehorraun River, drains Knocknacalliagh Lough	Connemara Bog Complex	Blanket bogs (*if active bog) (7130)	Limited potential to support Annex II species.	No bat roosts potential	The site was not suitable for Q monitoring as it lacked adequate riffle habitat.	Habitats on the banks of stream include Lowland Blanket Bog downstream and cutover bog upstream, stream substrate peaty. Site Evaluation: A International Importance	 View of North side of Culvert  View of overgrown culvert
WC07.0	Culvert **Chainage:** Ch8420	Tributary of Derryehorraun River, drains Knocknafarderg Lough	Connemara Bog Complex	Blanket bogs (*if active bog) (7130)	Limited potential to support Annex II species.	No bat roosts found	Q4-5 Unpolluted High Status	Habitats on the banks of stream include Lowland Blanket Bog downstream and cutover bog upstream. No submerged macrophytes or macroalgae were noted. Substrate gravely. Site Evaluation: A International Importance	 View of south side of Culvert

Crossing No.	Bridge No. NRA Ref. & Chainage	River	Designation	Annex I Habitat	Annex II Species	Bat Roosts	Q Rating	Notes & Site Evaluation	Photographs
WC08.0	Recess Cloonbeg Bridge **Chainage:** Ch11700	Owenmore River	Connemara Bog Complex	N/A	Otter, Atlantic Salmon	Potential bat roosts	Q4-5 Unpolluted High Status	Habitats on the banks of stream include mixed broadleaved woodland and conifer woodland. Good Salmonids, Brown Trout habitat. The Owenmore River is part of the Ballynahinch fishery and is one of the most prestigious fisheries in Ireland and is well known internationally. Site Evaluation: A International Importance	 View of Cloobeg River Bridge and view from bridge
WC09.0	Culvert Ch15150	Small tributary of Killeen Lough	Connemara Bog Complex cSAC	Northern Atlantic wet heaths with Erica tetralix (4010)	Limited potential to support Annex II species.	No bat roosts found	The site was not suitable for Q monitoring as it lacked adequate riffle habitat	Habitats on the banks of stream include Dry Calcareous & Neutral Grassland, Wet Heath and, Mixed Broadleaved/Conifer Woodland. Lough Nabrucka is part of the Ballynahinch fishery and is one of the most prestigious fisheries in Ireland. It is a major salmonid fishery with Arctic Char, Sea Trout, Brown Trout and Salmon. Site Evaluation: A International Importance	 Small culvert under forestry track
WC10.0	Culvert **Chainage:** Ch16220	Small tributary of Lough Nabrucka (Ballynahinch Lake)	Connemara Bog Complex cSAC	Northern Atlantic wet heaths with Erica tetralix (4010) Blanket bogs (*if active bog) (7130) Alluvial Forests with *Alnus glutinosa* and *Fraxinus excelsior* (91E0).	Otter, limited potential to support Annex II species, not suitable fisheries habitat	No bat roosts found	The site was not suitable for Q monitoring as it lacked adequate riffle habitat	Habitats on the banks of stream include Wet Heath, Lowland Blanket Bog and Wet Pendunculate Oak Ash Woodland. Lough Nabrucka is part of the Ballynahinch fishery and is one of the most prestigious fisheries in Ireland and is well known internationally. Site Evaluation: A International Importance	 Small culvert
WC11.0	Culvert **Chainage:** Ch16620	Tributary between Athry Lough and Lough Nabrucka	Connemara Bog Complex cSAC	Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) Blanket bogs (*if active bog) (7130)	Otter, Atlantic Salmon	No bat roosts found, cracks and crevices sealed	Q4-5 Unpolluted High Status	Habitats on the banks of stream include Exposed Siliceous Rock Lowland Blanket Bog, Cutover Bog and borders Athry Lough, an Acid Oligotrophic Lake. Lough Nabrucka is part of the Ballynahinch fishery and is one of the most prestigious fisheries in Ireland and is well known internationally. Site Evaluation: A International Importance	 View of dismantled railway bridge

Crossing No.	Bridge No. NRA Ref. & Chainage	River	Designation	Annex I Habitat	Annex II Species	Bat Roosts	Q Rating	Notes & Site Evaluation	Photographs
WC12.0	Culvert **Chainage:** Ch17100	Small tributary between Lough Nabluckan and Athry Lake	Connemara Bog Complex cSAC	Blanket bogs (*if active bog) (7130)	Otter, limited potential to support Annex II species, not suitable fisheries habitat	No bat roosts found	The site was not suitable for Q monitoring as it lacked adequate riffle habitat	Habitats on the banks of stream include Wet Grassland and Lowland Blanket Bog. Athry Lough is part of the Ballynahinch fishery and is one of the most prestigious fisheries in Ireland and is well known internationally. Site Evaluation: A International Importance	 Small culvert under track
WC13.0	Culvert **Chainage:** Ch17530	Tributary at south western end of Derryclare not illustrated on OS map.	Connemara Bog Complex cSAC	N/A	Otter, limited potential to support Annex II species, not suitable fisheries habitat	No bat roosts found	The site was not suitable for Q monitoring as it lacked adequate riffle habitat	Habitats on the banks of stream include Bog Woodland, Wet Grassland and Cutover Bog. Derryclare Lough is part of the Ballynahinch fishery and is one of the most prestigious fisheries in Ireland and is well known internationally. Site Evaluation: A International Importance	 Iron pan visible on stream bed
WC14.0	Culverts Ch18500	Tributary of Derryclare Lough	Connemara Bog Complex cSAC	N/A	Otter, limited potential to support Annex II species, not suitable fisheries habitat	No bat roosts found	The site was not suitable for Q monitoring due to its small nature and lack of suitable habitat for Q sampling	Habitats on the banks of stream include Lowland Blanket Bog and Cutover Bog. Derryclare Lough is part of the Ballynahinch fishery and is one of the most prestigious fisheries in Ireland and is well known internationally. Site Evaluation: A International Importance	 View of Culvert
WC15.0	GC-N59-027.00 Weir Bridge **Chainage:** Ch20150	Recess River	Connemara Bog Complex cSAC	N/A	Otter, Atlantic Salmon	No bat roost potential, no suitable bat access, crevices sealed	EPA Q4-Unpolluted Good Status (Unsuitable for Q monitoring due to safety reason)	Recess River is a major salmon fishery with extensive salmonid spawning and nursery grounds. Habitats on the banks of stream include wet grassland, cut over bog, lowland blanket bog (upstream) and scrub. No submerged macrophytes or macroalgae were noted. Site Evaluation: A International Importance	 Weir Bridge – view looking East  Weir Bridge – view South from Bridge to railway bridge

Crossing No.	Bridge No. NRA Ref. & Chainage	River	Designation	Annex I Habitat	Annex II Species	Bat Roosts	Q Rating	Notes & Site Evaluation	Photographs
WC16.0	GC-N59-028.00 Recess Bridge **Chainage:** Ch22000	Tributary north of Glendollagh Lough	Connemara Bog Complex cSAC	N/A	Otter	No suitable bat access – heavily vegetated	The site was unsuitable for Q assessment due to the bedrock dominated substrate upstream and was obscured by vegetation downstream.	This stream is too small to be of any significance in terms of aquatic ecology and fisheries, but drains into a very important lake. Habitats on banks of stream include, Oak Ash Hazel Woodland, Wet Woodland and improved grasslands. No submerged macrophytes or macroalgae were noted. Site Evaluation: A International Importance	 Upstream view of stream – not bedrock falls  View of stone bridge downstream & N59 road
WC17	Culvert **Chainage:** Ch22250	Tributary at eastern end of Glendollagh Lough	Connemara Bog Complex cSAC	N/A	Limited potential to support Annex I species	N/A	The site was not suitable for Q monitoring due to its small nature and lack of suitable habitat for Q sampling.	This stream is too small to be of any significance in terms of aquatic ecology and fisheries, but drains into a very important lake. Habitats on banks of stream include, Oak Ash Hazel Woodland, Wet Woodland and improved grasslands. No submerged macrophytes or macroalgae were noted. Site Evaluation: A International Importance	 View of stream downstream of the N59  View of concrete pipe culvert
WC18	Culvert **Chainage:** Ch22900	Tributary east of Recess near primary school, flows into Loughaun-doonan on the Recess River	Connemara Bog Complex cSAC	N/A	Limited potential to support Annex I species	No Bat roost potential, no suitable bat access	The site was not suitable for Q monitoring due to its small nature and lack of suitable habitat for Q sampling.	This stream is too small to be of any significance in terms of aquatic ecology and fisheries, but drains into a very important River. The Recess River is a major salmon fishery with extensive salmonid spawning and nursery grounds. Habitats on the banks of stream include wet grassland and wet willow alder ash woodland. No submerged macrophytes or macroalgae were noted. Site Evaluation: A International Importance	 View of stream through undergrowth

Crossing No.	Bridge No. NRA Ref. & Chainage	River	Designation	Annex I Habitat	Annex II Species	Bat Roosts	Q Rating	Notes & Site Evaluation	Photographs
WC19	GC-N59-029.00 Tullywee bridge **Chainage:** Ch24000	Owentooey River	Maumturk Mountains cSAC Connemara Bog Complex cSAC	Blanket bogs (*if active bog) (7130)	Otter, Atlantic Salmon, Freshwater Pearl Mussel (130m upstream and 300m downstream of bridge)	No suitable bat access – all crevices sealed. No bat roost found	Q4-5: Unpolluted High Status	Good habitat for Freshwater Pearl Mussel upstream and downstream of the road crossing. Good salmonid spawning and nursery area. Habitats on the banks of stream include wet grassland, lowland blanket bog (upstream), Wet Woodland, mixed deciduous/ conifer woodland and scrub. No submerged macrophytes or macroalgae were noted. Site Evaluation: A International Importance	 View downstream  View upstream
WC20	Culvert **Chainage:** Ch24650	Tributary N of Lough Tawnagh at western end	Maumturk Mountains cSAC	N/A	Otter, Atlantic Salmon	No suitable bat access – all crevices sealed. No bat roost found	The site was unsuitable for Q assessment, as it lacked adequate riffle habitat	The small stream flows into Lough Tawnagh. Freshwater Pearl Mussel can be found in the out flowing stream of the Lough. The habitats on the bank of the stream comprise cutover bog. No submerged macrophytes or macroalgae were noted. Site Evaluation: A International Importance	 View upstream  View of culvert
WC21	GC-N59-030.00 Derryneen Bridge **Chainage:** Ch2562	Caher River between Loughs Tawnagh and Derryneen	Connemara Bog Complex cSAC	N/A	Otter, Atlantic Salmon, Freshwater Pearl Mussel (60m upstream and ~1km downstream of bridge)	No suitable bat access. No bat roost found	Q4-Unpolluted Good Status	Caher River is a major salmon and sea trout fishery with extensive salmonid spawning and nursery grounds. It is also a very important migratory corridor for Atlantic Salmon, Sea Trout and Eels accessing this headwater area of the Ballynahinch catchment. Habitats on the banks of stream include conifer plantation and scrub. No submerged macrophytes or macroalgae were noted Site Evaluation: A International Importance	 Upstream view from bridge  View downstream towards Lough Tawnagh
WC22.1	Old Derryneen Bridge **Chainage:** Ch26200	Sruffaun River	Connemara Bog Complex cSAC	N/A	Otter, Atlantic Salmon, Freshwater Pearl Mussel 800m downstream of bridge	Some crevices on outside of bridge. No bat roost found. Potential for predation	Q4-Unpolluted Good Status	The Sruffaun River is a tributary of the Caher River is a major salmon and sea trout fishery with extensive salmonid spawning and nursery grounds. It is also a very important migratory corridor for Atlantic Salmon, Sea Trout and Eels accessing this headwater area of the Ballynahinch catchment. No submerged macrophytes or macroalgae were noted Site Evaluation: A International Importance	 Downstream view at bridge

Crossing No.	Bridge No. NRA Ref. & Chainage	River	Designation	Annex I Habitat	Annex II Species	Bat Roosts	Q Rating	Notes & Site Evaluation	Photographs
WC22.2	GC-N59-030.00 Derryneen Bridge **Chainage:** Ch26600	Caher River between Loughs Tawnagh and Derryneen	Connemara Bog Complex cSAC	N/A	Otter, Atlantic Salmon, Freshwater Pearl Mussel ~1km downstream of bridge	No suitable bat access. No bat roost found	Q4-Unpolluted Good Status	Tributary of Caher River is a major salmon and sea trout fishery with extensive salmonid spawning and nursery grounds. It is also a very important migratory corridor for Atlantic Salmon, Sea Trout and Eels accessing this headwater area of the Ballynahinch catchment. Habitats include conifer plantation and scrub. No submerged macrophytes or macroalgae were noted Site Evaluation: A International Importance	 Downstream view of bridge
WC23	GC-N59-031.00 Cloonopeen Bridge **Chainage:** Ch26900	Caher River	Maumturk Mountains cSAC Connemara Bog Complex cSAC	N/A	Otter, Atlantic Salmon, Freshwater Pearl Mussel (10m upstream)	Unsuitable bat roosting habitat low bridge, prone to predation and flooding. No bat roost found	Q4-Unpolluted Good Status (Q rating undertaken 200m downstream of Freshwater Pearl Mussel habitat)	Caher River is a major salmon and sea trout fishery with extensive salmonid spawning and nursery grounds. This location site was suitable for Q assessment. It is noted that Freshwater Pearl Mussels are located near the bridge itself, therefore sampling was undertaken in an area approximately 200 meters downstream of the population as per good practice in order to avoid disturbance of the pearl mussel or its habitat. No submerged macrophytes or macroalgae were noted. Site Evaluation: A International Importance	 Upstream of bridge  Downstream of bridge
WC24	GC-N59-032.00/ GC-N59-033.00 **Chainage:** Ch28800	Tributary West of Lough Oorid	Maumturk Mountains cSAC Connemara Bog Complex cSAC	N/A	Otter, Atlantic Salmon, Freshwater Pearl Mussel (500m downstream)	Unsuitable bat roosting habitat low bridges, prone to predation and flooding. No bat roost found	Q3 – Q4 Slightly Polluted. Moderate Status.	This stream drains into the main Loch Chluain Toipin inflow and Oorid Lough, part of the headwaters of this important salmonid catchment. Arctic Char may also be present. Habitats on the banks of stream include wet grassland, cutover bog, Wet Woodland and scrub. No submerged macrophytes or macroalgae were noted. Site Evaluation: A International Importance	 Upstream view  Downstream view
WC25	GC-N59-034.00 **Chainage:** Ch29300	Tributary West of Lough Oorid	Maumturk Mountains cSAC Connemara Bog Complex cSAC	Blanket bogs (*if active bog) (7130)	Otter, Atlantic Salmon, Freshwater Pearl Mussel (240m downstream)	Unsuitable bat roosting habitat low bridges, prone to predation and flooding. No bat roost found	The site was un-suitable for Q assessment it did not contain sufficient riffle habitat.	Oorid Lough is an internationally important salmonid catchment. Important as a Sea Trout fishery. Arctic Char may also be present. Habitats on the banks of stream include wet grassland, lowland blanket bog, cutover bog and scrub. No submerged macrophytes or macroalgae were noted. Site Evaluation: A International Importance	 Upstream view of tributary  Downstream view of tributary

Crossing No.	Bridge No. NRA Ref. & Chainage	River	Designation	Annex I Habitat	Annex II Species	Bat Roosts	Q Rating	Notes & Site Evaluation	Photographs
WC26	Culvert **Chainage:** Ch30050	Tributary west of Bunskannive bridge, north of Lough Oorid	Maumturk Mountains cSAC Connemara Bog Complex cSAC	N/A	Otter, Atlantic Salmon, Freshwater Pearl Mussel (500m downstream)	Unsuitable bat roosting habitat	The site was un-suitable for Q assessment as upstream did not contain sufficient riffle habitat and downstream was significantly influenced by Lough Oorid.	Oorid Lough is an internationally important salmonid catchment. Important as a Sea Trout fishery. Arctic Char may also be present. Habitats on the banks of stream include cutover bog and scrub. No submerged macrophytes or macroalgae were noted. Site Evaluation: A International Importance	 Upstream view  Downstream view
WC27	GC-N59-035.00 Bunskannive Bridge **Chainage:** Ch30950	Owenanookera River	Maumturk Mountains cSAC Connemara Bog Complex cSAC	Blanket bogs (*if active bog) (7130)	Otter, Atlantic Salmon Freshwater Pearl Mussel (100m downstream)	Bat Tubes present in N59 bridge, no bats found within tubes. No bat roost found in railway bridge.	Q4-Unpolluted Good Status	Oorid Lough is an internationally important salmonid catchment. Important as a Sea Trout fishery. Arctic Char may also be present. Habitats on the banks of stream include wet grassland, lowland blanket bog, cutover bog and scrub. In-stream vegetation comprised Macrophytes - Mosses <5%. Macroalgae/diatom biofilm - Filamentous green algae <5%. Site Evaluation: A International Importance	 View upstream  View downstream to railway masonry bridge and Lough Oorid
WC28	Culvert **Chainage:** Ch31800	Tributary of Shindilla	Maumturk Mountains cSAC	N/A	Otter Moderate Salmonids habitat	Limited bat use potential but some crevices present. No bat roost found.	Q4-5: Unpolluted High Status	Lough Shindilla is an important lake for Salmon, Brown/Sea Trout and Arctic Char which require passage under the crossing with the proposed greenway at this location. Habitats include cutover bog and scrub on the bank of the watercourse. No submerged macrophytes or macroalgae were noted. Site Evaluation: A International Importance	 View of railway bridge
WC29	Culvert **Chainage:** Ch33200	Tributary of Shindilla	Maumturk Mountains cSAC	N/A	Otter Moderate Salmonids habitat	Unsuitable bat roosting habitat	Q2-3: Polluted	Lough Shindilla is an important lake for Salmon, Brown/Sea Trout and Arctic Char which require passage under the crossing with the proposed greenway development at this location. Habitats include cutover bog and scrub on the bank of the watercourse. In-stream vegetation comprised Macrophytes - Mosses <5%. Macroalgae/diatom biofilm - Filamentous green algae <5%. Site Evaluation: A International Importance	 View of old railway bridge

Crossing No.	Bridge No. NRA Ref. & Chainage	River	Designation	Annex I Habitat	Annex II Species	Bat Roosts	Q Rating	Notes & Site Evaluation	Photographs
WC30	Culvert **Chainage:** Ch34500	Tributary of Shindilla	Maumturk Mountains cSAC	N/A	Limited potential to support Annex I species	Unsuitable bat roosting habitat	The site was un-suitable for Q assessment as upstream did not contain sufficient riffle habitat	Lough Shindilla is an important lake for Salmon, Brown/Sea Trout and Arctic Char which require passage under the crossing with the proposed greenway development at this location. Habitats include cutover bog and scrub on the bank of the watercourse. Site Evaluation: A International Importance	 View of culvert , scrub and lake
WC31	Culvert **Chainage:** Ch35700	Tributary of Loughanillaun	Maumturk Mountains cSAC	N/A	Limited potential to support Annex I species	Unsuitable bat roosting habitat	The site was un-suitable for Q assessment as upstream did not contain sufficient riffle habitat	Lough Loughanillaun is an important lake for Salmon and trout. Habitats include cutover bog on the bank of the watercourse. No submerged macrophytes or macroalgae were noted, very peaty substrate. Site Evaluation: D Local Importance (Higher Value).	 View of culvert and cutover bog to lake
WC32	Culvert **Chainage:** Ch37000	Tributary of Lurgan Lough	N/A	N/A	Limited potential to support Annex I species	Unsuitable bat roosting habitat	The site was unsuitable for Q assessment as upstream did not contain sufficient riffle habitat.	The small stream flows into Lurgan Lough which is stocked with Rainbow Trout with some wild brown trout. Lurgan Lough flows into Lough Ardderry which is an important salmon fishery and Arctic char populations. Habitats include cutover bog on the bank of the watercourse. No submerged macrophytes or macroalgae were noted. Site Evaluation: D Local Importance (Higher Value).	 View of Lurgan Lough and small stream
WC33	Culvert **Chainage:** Ch38000	Trib of Loughnacrevy	N/A	N/A	Limited potential to support Annex I species	Unsuitable bat roosting habitat	The site was unsuitable for Q assessment as upstream did not contain sufficient riffle habitat.	The small stream flows into Lough Loughnacrevy. Habitats include cutover bog on the bank of the watercourse. No submerged macrophytes or macroalgae were noted. Site Evaluation: D Local Importance (Higher Value).	 View of culvert
WC34	Culvert **Chainage:** Ch38500	Tributary of Loughaunierin	N/A	N/A	Limited potential to support Annex I species	No evidence of bat roosting	The site was unsuitable for Q monitoring.	Stream is a tributary of Loughaunierin. This minor stream has little potential to support fish. Habitats include wet grassland, cutover bog and scrub. No submerged macrophytes or macroalgae were noted. Site Evaluation: D Local Importance (Higher Value).	 View of Loughaunierin and bridge

Crossing No.	Bridge No. NRA Ref. & Chainage	River	Designation	Annex I Habitat	Annex II Species	Bat Roosts	Q Rating	Notes & Site Evaluation	Photographs
WC35	Culvert **Chainage:** Ch39200	Owenwee River	Connemara Bog Complex cSAC	N/A	Limited potential to support Annex I species	Unsuitable bat roosting habitat	Q3 – 4 Slightly Polluted. Moderate Status.	The Owenwee River which runs along the north of the proposed Greenway route in this section. This is an important salmonid spawning and nursery area. All the main channels of the Owenriff River and its lakes are key ecological receptors in the study area. Habitats include cutover bog and scrub. No submerged macrophytes or macroalgae were noted. Site Evaluation: B National Importance	 View upstream from side-road in the direction of Tullaghaboy House  View downstream standing on side-road to Tullaghaboy house
WC36	Glashanasmearany River Bridge **Chainage:** Ch40800	Glashanasmearany River	Connemara Bog Complex cSAC	Blanket bogs (*if active bog) (7130)	Otter, Atlantic Salmon, Freshwater Pearl Mussel (~2.5km downstream)	Limited bat use potential but some crevices present. No bat roost found.	Q3 – 4 Slightly Polluted. Moderate Status.	The Glashanasmearany River flows into Lough Bofin, which is an important salmonid lake with Arctic Char potential. The Glashanasmearany River Owenriff Freshwater Pearl Mussel catchment. All the main channels of the Owenriff River and its lakes are key ecological receptors in the study area. Habitats include lowland blanket bog, cutover bog and scrub. No submerged macrophytes or macroalgae were noted. Site Evaluation: B National Importance	 View toward Lough Bofin  View of Bridge
WC37-41	Culverts **Chainage:** Ch41400 **Chainage:** Ch41500 **Chainage:** Ch41600 **Chainage:** Ch41800 **Chainage:** Ch41500 **Chainage:** Ch41600 **Chainage:** Ch42200 **Chainage:** Ch43300	Small Tributary flowing into the south of Lough Bofin	Connemara Bog Complex cSAC	N/A	Limited potential to support Otter, Atlantic Salmon, Pearl Mussel (~2.5-1.5km downstream)	Unsuitable bat roosting habitat	The site was unsuitable for Q monitoring.	These are minor tributaries of Lough Bofin, a salmonid lake with Arctic char potential. Lough Bofin is located within the Owenriff Freshwater Pearl Mussel catchment. Habitats include wet grassland, cutover bog and scrub. No submerged macrophytes or macroalgae were noted. Site Evaluation: A International Importance	 View southwards to stream  View south towards Lough Bofin

Crossing No.	Bridge No. NRA Ref. & Chainage	River	Designation	Annex I Habitat	Annex II Species	Bat Roosts	Q Rating	Notes & Site Evaluation	Photographs
WC42	Leam Railway Bridge **Chainage:** Ch44800	Owenriff River between Lough Adrehid and Lough Agraffard	Connemara Bog Complex cSAC	N/A	Otter, Atlantic Salmon, Pearl Mussel (~1km downstream)	Limited bat use potential but some crevices present. No bat roost found.	Q4- Unpolluted. Good Status.	All the main channels of the Owenriff River and its lakes are key ecological receptors in the study area. Freshwater pearl mussels can be found at the outlet of Lough Agraffard. The Owenriff is also an important salmon fishery. Habitats include wet grassland and scrub. No submerged macrophytes or macroalgae were noted. Site Evaluation: A International Importance	 View southwards
WC43	Culvert **Chainage:** Ch45600	Tributary North of Lough Agraffard	Connemara Bog Complex cSAC	N/A	Limited potential to support Annex I species, however Freshwater Pearl Mussel downstream	Unsuitable bat roosting habitat	The site was unsuitable for Q monitoring.	Lough Agraffard is located within the Owenriff Freshwater Pearl Mussel catchment. Habitats include wet grassland, cutover bog and scrub. Submerged vegetation including *Potamogeton* sp. Site Evaluation: A International Importance	 Small channel
WC44	Bridge **Chainage:** Ch46800	Owenriff River	Lough Corrib cSAC	N/A	Otter, Atlantic Salmon, Freshwater Pearl Mussel (down-stream in Owenriff)	Unsuitable bat roosting habitat	Q4- Unpolluted. Good Status.	This site is located within the Owenriff Freshwater Pearl Mussel catchment which holds an internationally important population of the Freshwater Pearl Mussel. This River is a very important salmonid spawning and nursery area in the Owenriff catchment. Habitats include wet grassland and scrub. *Potamogeton* sp. observed submerged in the River. Site Evaluation: A International Importance	 Railway bridge dismantled, abutments remain

Crossing No.	Bridge No. NRA Ref. & Chainage	River	Designation	Annex I Habitat	Annex II Species	Bat Roosts	Q Rating	Notes & Site Evaluation	Photographs
WC46	Glengowla Bridge **Chainage:** Ch48400	Bunowen River (Tributary of the Owenriff River)	Lough Corrib cSAC	N/A	Otter, Atlantic Salmon, Freshwater Pearl Mussel (down-stream in Owenriff)	No suitable bat access. No bat roost found.	Q4- Unpolluted. Good Status.	This site is located within the Owenriff Freshwater Pearl Mussel catchment. This River is a very important salmonid spawning and nursery area in the Owenriff catchment Habitats include wet grassland, cutover bog and scrub. In-stream vegetation comprised, Macroalgae/ diatom biofilm - Filamentous green algae <5% Site Evaluation: A International Importance	 Glengowla Bridge upstream view,  Glengowla Bridge downstream view
WC47	Oughterard River Bridge **Chainage:** Ch50200	Owenriff River East of Glengowla	Lough Corrib cSAC	N/A	Otter, Atlantic Salmon, Freshwater Pearl Mussel (down-stream in Owenriff)	No suitable bat access. No bat roost found.	Q4- Unpolluted. Good Status.	This site is located within the Owenriff Freshwater Pearl Mussel catchment. This River is a very important salmonid spawning and nursery area in the Owenriff catchment Habitats include wet grassland, cutover bog and scrub. Site Evaluation: A International Importance	 

- **Improved Agricultural Grassland GA1**

Improved Agricultural Grassland GA1 is widespread throughout the study area, concentrated mainly around population centres, particularly at the eastern and western extremities of the project. An example is shown in **Image 10.6**. This habitat type comprises primarily a grassy sward of typical agricultural grassland cultivars, including a dominance of Perennial Rye-grass (*Lolium perenne*) with Cock's-foot (*Dactylis glomerata*), Fescues (*Festuca* spp.), Yorkshire Fog (*Holcus lanatus*) and Meadow species (*Poa* spp.) occurring, particularly in the field margins.

The herbs, Ribwort Plantain (*Plantago lanceolata*), White Clover (*Trifolium pratense)* and Daisy (*Bellis perennis*) occur abundantly. Herbs occurring less frequently include Thistles (*Cirsium* spp.), Dandelion (*Taraxacum* spp.), Creeping Cinquefoil (*Potentilla reptans*), Silverweed (*Potentilla anserina*), Chickweed (*Cerastium glomeratum*), Common mouse-ear (*Cerastium fontanum*) and Common Nettle (*Urtica dioica*). This habitat does not correspond to any Annex I Habitat Type.

Ecological Interest	Links to Annex I Habitats	Locations
Local Importance (Lower Value)	This habitat type does not correspond to EU Annex I Habitats	Throughout the study area

Image 10.6 Improved Agricultural Grassland GA1 with Abundant Rushes

- **Dry Calcareous and Neutral Grassland GS1**

Several small pockets of semi improved Dry Calcareous and Neutral Grasslands GS1 were found in the townlands of Derryerglinna, Glengowla and Knockbaun. These grasslands are generally found in areas with free-draining soils with low intensity agriculture. The grassland found in Knockbaun, shown in **Image 10.7**, appears to have some calcareous influence as Quaking-grass (*Briza media*), a species indicative of strongly calcareous soils, was frequent within the sward. However, some species are typical of more acidic environments, such as Sneezewort (*Achillea ptarmica) a*nd Bog Asphodel (*Narthecium ossifragum*), were also recorded.

Some rocky outcrops were also present within the field. The bedrock is Limestone, which contributes to the calcareous nature of the habitat, while the subsoils have been classified as blanket peat BkPt, which explains the presence of acidic or bog species in the sward. Other grass species recorded in the sward were bents (*Agrostis* spp.), Sweet Vernal-grass (*Anthoxanthum odoratum*) and Crested Dog's-tail (*Cynosurus cristatus*). Sedges, including Glaucous Sedge (*Carex flacca*), and fescues, including Red Fescue (*Festuca rubra*) were also frequent. Common broadleaved herbs include Selfheal (*Prunella vulgaris*), Yellow Rattle (*Rhinanthus minor*), Common Knapweed (*Centaurea nigra*), Ox-eye Daisy (*Leucanthemum vulgare*), Common Cat's-ear (*Hypochaeris radicata*) and Eyebright (*Euphrasia* sp.). As the grasslands in this area are more neutral than calcareous they do not correspond to any of the Annex I Habitats.

Ecological Interest	Links to Annex I Habitats	Locations
Local Importance (Higher Value)	Calcareous grasslands with either high numbers or diversity of orchids correspond to the priority habitat, 'semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometea) (*important orchid sites) (6210)'. None of the grasslands recorded correspond to this habitat type.	Knockcallíagh Derryneen Glengowla

Image 10.7 Dry Calcareous and Neutral Grassland GS1 on the track in the townland of Knockcallíagh

- **Dry Meadows and Grassy Verges GS2**

Examples of this type of grassland habitat were found in small pockets throughout the study area, on the old railway line and embankments, see **Image 10.8**. As these areas are rarely fertilised and occasionally mown they can develop a good diversity of grassland species including; frequent Yorkshire Fog (*Holcus lanatus*), Smooth Meadow-grass (*Poa pratensis*) and False Oat-grass (*Arrhenatherum elatius*), with occasional Quaking Grass (*Briza media)* and Cock's Foot (*Dactylis glomerata*), Meadow Foxtail (*Alopecurus pratensis*) and There is also a good diversity of herbaceous species, including Common Knapweed (*Centaurea nigra),* frequent Ladies bedstraw (*Galium verum)* and Ox-eye daisy *(Leucanthemum vulgare),* with more occasional (Wild Carrot *Daucus carota),* Eyebright *(Euphrasia spp.),* Fairy Flax *(Linum catharticum),* Tormentil *(Potentilla erecta)* and Common Bird's-foot Trefoil (*Lotus corniculatus)* and infrequent Field Scabious (*Knautia arvensis).*

This type of grassland found within the study area does not support the botanical species or vegetation communities which correspond to the Annex I Habitat, as per the Interpretation Manual of European Union Habitats - EUR27 but is relatively species-rich in places.

Ecological Interest	Links to Annex I Habitats	Locations
Local Importance (Higher Value)	Annex I habitat, 'Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*)'. No examples of this habitat type were found within the Study Area however.	Cloonoppeen Derryeyglinna Glengowla

Image 10.8 Dry Calcareous and Neutral Grassland GS1 on the track in the townland of Knockcallíagh

- **Dry Humid Acid Grassland (GS3)**

This habitat type was found in numerous locations throughout the study area, mostly on areas of cutover or highly modified bog that has been drained and reclaimed for agriculture, but which is not intensively managed. An example of this type of habitat from the townland of Claremount is shown in **Image 10.9**. This type of grassland is characterised by dense low swards of narrow-leaved grasses such as bents (*Agrostis capillaris, A. tenuis*), fescues (*Festuca* spp.), Sweet Vernal-grass (*Anthoxanthum odoratum*), Wavy Hair-grass (*Deschampsia flexuosa*) and Mat-grass (*Nardus stricta*). Common broadleaved herbs include Tormentil (*Potentilla erecta*), White Clover (*Trifolium repens*), Devil's-bit Scabious (*Succisa pratensis*), Lousewort (*Pedicularis sylvatica*) and Yarrow (*Achillea millefolium*). As this habitat was mainly found on areas of cutover or highly modified bog, many bog species were also present in the sward, including Purple Moor-grass (*Molinia caerulea*) and Cross-leaved Heath (*Erica tetralix*).

This type of grassland found within the study area does not support the botanical species or vegetation communities which correspond to the Annex I Habitat, as per the Interpretation Manual of European Union Habitats - EUR27.

Ecological Interest	Links to Annex I Habitats	Locations
Local Importance (Higher Value)	EU Habitats Directive Annex I Habitat: Dry-humid Acid Grassland includes the priority habitat 'species-rich Nardus grasslands on siliceous substrates in mountain areas (6230)'. The Dry-humid Acid Grassland GS3 found within the study area does not correspond to this Annex I priority habitat.	Leam West Derryeyglinna Knockmoyle Claremount Canrawer

Image 10.9 Dry Humid Acid Grassland GS3 in the townland of Claremount

- **Wet Grassland GS4**

This habitat type occurs throughout the study area, generally on the lower slopes where drainage is impeded. An example is shown **Image 10.10**. This habitat is characterised by rushes (*Juncus articulatus/acutiflorus),* sedges (*Carex spp*)*,* Purple Moor-grass (*Molinia caerulea*), Tormentil (*Potentilla erecta*), Devil's-bit Scabious (*Succisa pratensis*) and Heath Milkwort (*Polygala serpyllifolia*). This habitat often forms mosaics with wet heath and improved grasslands.

This type of wet grassland communities found within the study area do not correspond to the Annex I Habitat, as per the Interpretation Manual of European Union Habitats - EUR27.

Ecological Interest	Links to Annex I Habitats	Locations
Local Importance (Higher Value)	None of the GS4 habitats within the study site correspond to the EU Habitats Directive Annex I Habitat: 'Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)' (6410).	Derryneen Knockmoyle Canrawer

Image 10.10 Wet Grassland GS4 in the townland of Claremount

- **Marsh GM1**

Marsh GM1 occurs in small pockets within the study area, predominantly in the margins of lakes and rivers and in mosaics with other habitats such as Rich Fen and Flush PF1, Reed and Large Sedge Swamps FS1 and Wet Grassland GS4. Areas of this habitat are found in the townlands of Aird Bhéarra and Derryeyglinna, see **Image 10.11.**

Marsh GM1 habitat comprises a predominance of herbs including Yellow Iris (*Iris pseudacorus*), Meadowsweet (*Filipendula ulmaria*), Ragged Robin (*Lychnis flos-cuculi*) and Marsh Woundwort (*Stachys palustris*), with horsetails (*Equisetum* spp) and Reedmace (*Typha latifolia*) occurring.

The Marsh habitat found within the study area does not correspond to any Annex I Habitat, as per the Interpretation Manual of European Union Habitats - EUR27.

Ecological Interest	Links to Annex I Habitats	Locations
Local Importance (Higher Value)	Marsh may sometimes contain pockets of the Annex I habitat, 'hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430)'. No examples of this particular habitat were found during the survey however.	Aird Bhéarra Derryeyglinna

Image 10.11 Marsh GM1 with broadleaved herbs dominant, such as Meadowsweet, Purple loose-strife and Wild angelica, in the townland of Aird Bhearra.

- **Dry Siliceous Heath HH1**

This habitat type occurs is numerous locations within the study area, often in areas with shallow peat on steep slopes. An example is shown in **Image 10.12**. This habitat type has also recolonised some areas of Cutover Bog. The dominant species are Ling (*Calluna vulgaris*), Bell Heather (*Erica cinerea*) and occasional low-growing Western Gorse (*Ulex gallii*). This habitat supports the botanical species and vegetation communities which correspond to an Annex I Habitat as per the Interpretation Manual of European Union Habitats - EUR27.

Ecological Interest	Links to Annex I Habitats	Locations
International/National Importance	Corresponds to the EU Annex I habitat 'European dry heaths (4030).	Athry Derryvickrune

Image 10.12 Example of Dry Siliceous Heath HH1 habitat with Western Gorse (Ulex gallii) at the side of the proposed Greenway Route

- **Wet Heath HH3**

Areas of Wet Heath habitat are common throughout the study area, particularly on Cutover and Degraded Bog. An example of this habitat in the townland of Derryerglinna is shown in **Image 10.13**. Some extensive areas of this habitat type occur in the townland of Emlaghdauroe. This habitat type is usually dominated by Ling (*Calluna vulgaris*) and Cross-leaved Heath (*Erica tetralix*). Other common species are Purple Moor-grass (*Molinia caerulea*), Deergrass (*Trichophorum cespitosum*) and Crowberry (*Empetrum nigrum*). Areas of this habitat type were found in Leam West, Derryerglinna, Glengowla and Canrawer.

The Wet Heath habitat found within the study area comprises botanical species and vegetation communities which correspond to an Annex I Habitat as per the Interpretation Manual of European Union Habitats - EUR27.

Ecological Interest	Links to Annex I Habitats	Locations
International/ National Importance	Wet heath corresponds to the Annex 1 habitat 'northern Atlantic wet heaths with Erica tetralix (4010)'.	Leam West Derryerglinna Glengowla Canrawer Canrawer

Image 10.13 Wet Heath HH3 habitat in the townland of Derryerglinna

- **Lowland Blanket Bog PB3**

Lowland Blanket Bog is widespread in Connemara. This habitat is a qualifying feature of Connemara Bog Complex cSAC, The Twelve Pins/Garraun Complex cSAC and the Maumturk Mountains Complex cSAC, all of which contain extensive areas of Lowland Blanket Bog.

Lowland Blanket Bog corresponds to the EU Habitats Directive Annex 1 Blanket bogs (7130) and Active Blanket bogs that are still capable of peat formation and are considered a Priority Habitat. 'Active' bog is defined in the directive as still supporting a significant area of vegetation that is normally peat forming. To determine whether a bog is 'Active', the British Ecological Society Uplands Conference in 1997, agreed that the presence of bog mosses (*Sphagnum* spp.) is the most reliable indication that a bog is currently accumulating peat. Mosses lack roots, being adapted to source atmospheric and surface nutrients, so they are particularly susceptible to hydrological and chemical changes[6].

Lowland Blanket Bog has a characteristic 'grassy' appearance and an abundance of species typical to this habitat type, including Black Bog-rush (*Schoenus nigricans*), Purple Moor-grass (*Molinia caerulea*), Deergrass (*Trichophorum cespitosum*) and Cottongrasses (*Eriophorum* spp.). Heathers such as Ling (*Calluna vulgaris*) and Cross-leaved Heath (*Erica tetralix*) are frequent but are not as extensive as in Upland Blanket Bog PB2.

There are a number of areas of lowland blanket bog adjacent to the proposed Greenway, outlined in the townlands mentioned below with an example in **Image 10.14**.

[6] Burt-Smith, G. and O'Reilly, C. (2007) Building on Bog? Some Issues for Ecologists Evaluating Development Proposals Impacting on a European Protected Habitat. Entec UK

Ecological Interest	Links to Annex I Habitats	Locations
International Importance	Lowland Blanket Bog corresponds to the priority habitat Blanket Bogs (*if active bog) (7130)'. All intact areas of Lowland Blanket Bog within the study area correspond to this Annex I habitat, and areas which contain a large amount of peat-forming species correspond to the Priority Habitat.	Aird Bhéarra Bunscanniff Ardagh Maam Cross Claremount, Canrawer Shannakinlougha Knockmoyle

Image 10.14 Dismantled Railway Track running through degraded Lowland Blanket Bog in the townland of Bunscanniff

- **Cutover Bog (PB4)**

The blanket bog in the area has been subject to extensive turbary cutting. Areas of active or abandoned cutover are classified as Cutover Bog (PB4). Examples of Cutover Bog in the townlands of Claremount and Maam Cross are shown in **Image 10.15** and **Image 10.16**. In some areas the cutover has become recolonised with other vegetation types such as Acid Grassland GS3, Wet Grassland GS4, and Wet Heath HH3 vegetation. In areas where the successive habitat covers a large area and easily fits in to another habitat type, it is categorised as such. Where peat cutting has ceased and where the hydrological conditions are suitable some areas of Cutover Bog PB4 have recolonised with generally the same species as intact Lowland Blanket Bog PB3 but linear pool features and old peat banks gives this habitat type a greater diversity of species and micro-habitats.

There is often a greater abundance of *Sphagnum* mosses and White Beak-sedge (*Rhynchospora alba*) in the cut drains depressions. Oblong-leaved Sundew (*Drosera intermedia*) is also quite common in areas of cutover. Where this vegetation assemblage occurs, for example in the townland of Claremount, it corresponds to the Annex 1 habitat 'depressions on peat substrates of the Rhyncosporion (7150)', **Image 10.16**. This species assemblage within Cutover Bog PB4 indicates permanent saturation of the surface of the bog and is therefore sensitive to hydrological changes.

Slender Cottongrass (*Eriophorum gracile*) was found on an area of cutover bog on the shores of a small lake in Maam Cross. This plant is listed as 'Rare' in the Irish Red Data Book, and is afforded legal protection in Ireland under the Flora Protection Order, 1999. Cutover bog is widespread within the study area.

Ecological Interest	Links to Annex I Habitats	Locations
Local to International Importance	Cutover Bog is linked to the EU Annex I Habitat 'depressions on peat substrates of the Rhyncosporion (7150)'.	This habitat type is widespread throughout the study area.

Image 10.15 Area of cutover bog PB4 beside the track in the townland of Derryvickrune

Image 10.16 Area of Cutover bog in Claremount, with depression in between peat banks with Sphagnum 'lawns' and frequent White beak sedge, Sundew and Purple moor-grass.

- **Eroding Blanket Bog PB5**

Eroded Blanket Bog PB5 occurs on the edges of Upland Blanket Bog PB3 throughout the study area. Erosion can be caused by extensive grazing, burning or drainage, where the original bog surface has been eroded below the rooting zone of the surface vegetation. Ling (*Calluna vulgaris*) is the dominant species and there is an abundance of Black Bog-rush (*Schoenus nigricans*) and mosses. Purple Moor-grass (*Molinia caerulea*) is also frequent. Large areas of this habitat were found at Derryneen and Knocknacailligh.

Ecological Interest	Links to Annex I Habitats	Locations
Local Importance (Higher Value)	This habitat type does not correspond to EU Annex I Habitats.	Derryneen Knocknacailligh

- **Rich Fen and Flush PF1**

There is one lake within the study area are under transition to Rich Fen and Flush PF1 habitat, see **Image 10.17**. It is situated approximately 130m west of Maam Cross south of the proposed greenway and north of the existing N59 road. The underlying bedrock at this location is the Lakes Marble Formation, which is a metamorphosed limestone, and contributes a calcareous influence. This site has dense stands of Great Fen Sedge (*Cladium mariscus*). Other common species were Common Reed (*Phragmites australis*), Bulrush (*Schoenoplectus lacustris*), Bogbean (*Menyanthes trifoliata*), White Water Lily (*Nymphaea alba*) and Pondweeds (*Potamogeton* spp.). This habitat type corresponds to the Annex I '*calcareous fens with Cladium mariscus and species of the Caricion davallianae (7210)'. Where this habitat is found in Maam Cross, it is included in the Maumturk Mountains cSAC; however this Annex I Priority Habitat is not a qualifying feature of the designated site.

Slender Cottongrass (*Eriophorum gracile*) was recorded on the shores of the small lake in Maam Cross. This confirmed the NPWS Rare and Protected Species Database record for the species at this location.

Ecological Interest	Links to Annex I Habitats	Locations
International Importance	This habitat type is linked to the annexed habitat 'Alkaline Fens (7230)' and '*calcareous fens with Cladium mariscus and species of the Caricion davallianae (7210)'. The fen habitat on the shore of Ballyquirke Lough corresponds to the latter category.	Maam Cross

Image 10.17 Mesotrophic Lake under transition to Rich Fen and Flush PF1 Habitat at Maam Cross

- **Poor Fen and Flush PF2**

Mineral enrichment in stream valleys and at the edges of bogs can result in fen vegetation with small sedges such as *Carex panacea* and *C. nigra*, Meadow thistle (*Cirsium dissectum*) and Butterwort (*Pinguicula vulgaris*) occurring. There is an area corresponding to Poor Fen and Flush PF2 in on the north shore of Lough Mall and Lough Ateeann, approximately 2km and 3km respectively west of Oughterard. Small flushes may be found within the adjacent bog habitats. This habitat does not correspond to an Annex I habitat. Its distribution is, however, limited and should be considered of conservation interest.

Ecological Interest	Links to Annex I Habitats	Locations
Local Importance (Higher Value)	This habitat type does not correspond to EU Annex I Habitats	North shore of Lough Ateeann and Lough Mall

- **Oak-Birch-Holly Woodland WN1**

Small examples of this woodland type can be found throughout the study area, mainly on the islands and shores of Killeen Lough, Ballinafad Lough, Recess and Killymongaun, see **Image 10.18**. This semi-natural woodland comprises native woodland dominated by Rowan (*Sorbus aucuparia*), Ash (*Fraxinus excelsior*), Alder (*Alnus glutinosa*), Birch (*Betula* sp.) and Oak (*Quercus petraea*). The field layer is rich in ferns, bryophytes, grasses and broad-leaved herbs. This habitat is a qualifying feature of Connemara Bog Complex cSAC, The Twelve Bens/Garraun Complex and Lough Corrib cSAC.

Ecological Interest	Links to Annex I Habitats	Locations
International Importance	This habitat corresponds to the Annex I habitats Old sessile oak woods with Ilex and Blechnum in British Isles (91A0). These woodlands also provide feeding habitat for bats.	Ballinafad Killymongaun Recess

Image 10.18 Oak-Birch-Holly Woodland WN1 in the townland of Ballinafad

- **Oak-Ash-Hazel Woodland WN2**

Two small areas of Oak-Ash-Hazel woodland were recorded in the townlands of Recess and Bunscannive, see **Image 10.19**. The majority of the sites are underlain by the Lakes Marble Formation. Subsoils comprise Metamorphic tills (Tmp) to the south and Bedrock at surface (Rck). Semi-natural woodlands are a rarity in a landscape otherwise dominated by agricultural grassland, peatlands and conifer plantations. This habitat does not correspond to Annex I habitats, however the habitat is undergoing consistent decline nationally and is considered to be of high conservation value. This woodland is also a feeding area for bats.

Ecological Interest	Links to Annex I Habitats	Locations
County Importance	This habitat does not correspond to Annex I habitats. However is a habitat undergoing consistent decline nationally, therefore of County Importance.	Knockmoyle Canrawer Bunscanniff

Image 10.19 Oak-Ash-Hazel Woodland WN2 either side of the track in the townland of Canrawer

- **Wet Pendunculate Oak Ash Woodland WN4**

Small pockets of Wet Pendunculate Oak-Ash Woodland WN4 can be found on either side of the old railway line, on lake shores and river banks, see **Image 10.20**. The woodland type is found on the banks of the Owenwee River, South of Lough Nabrucka and North east of Garroman Lough.

The woodland stands comprise frequent mature Hawthorn (*Crataegus monogyna),* Alder (*Alnus glutinosa*) and Willow (*Salix spp).,* on embankments, with a ground flora comprising frequent Scaly Male Fern (*Dryopteris affinis)* and occasional Tormentil (*Potentilla erecta),* Soft Rush *(Juncus effusus),* Herb Robert (*Geranium robertianum)* and Violet (*Viola sp).* Further along the track the trees mature and include occasional Pendunculate Oak (*Quercus robur),* Sycamore *(Acer pseudoplatanus)* and Rowan (*Sorbus aucuparia)* with coppiced Hazel (*Corylus avellana).* Rushes and tussocky grasses are dominant in the field layer with occasional Meadowsweet (*Filipendula ulmaria*), Brambles (*Rubus fruticosus* agg.) and Rhododendron (*Rhododendron ponticum*).

Ecological Interest	Links to Annex I Habitats	Locations
International Importance	This habitat corresponds to the Annex I habitat Alluvial Forests with *Alnus glutinosa* and *Fraxinus excelsior* (91E0). These woodlands also provide feeding areas for bats.	Banks of the Owenwee River, South of Lough Nabrucka and North east of Garroman Lough

Image 10.20 Wet Pendunculate Oak Ash Woodland WN4 on either side of the old Railway line near Lough Nabrucka

- **Wet Willow Alder Ash Woodland WN6**

Within the study area, this habitat type is common as fringing vegetation around lakes and rivers see **Image 10.21**. It also occurs on some wooded islands within Lough Shindilla. The canopy layer in this woodland is composed of Alder (*Alnus glutinosa*), Ash (*Fraxinus excelsior*) Willows (*Salix* spp.) and Downy Birch (*Betula pubescens*), with an understory of Hazel (*Corylus avellana*), Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*) and Holly (*Ilex aquifolium*). The field layer is dominated by Brambles (*Rubus fruticosus* agg.) and ferns such as Male Fern (*Dryopteris filix-mas*).

Ecological Interest	Links to Annex I Habitats	Locations
International Importance	This habitat corresponds to the Annex I habitat Alluvial Forests with *Alnus glutinosa* and *Fraxinus excelsior* (91E0). These woodlands also provide feeding areas for bats.	Numerous locations within the study area, generally as fringing vegetation around lakes and rivers. Several wooded islands within Lough Shindilla.

Image 10.21 Wet Willow Alder Ash Woodland WN6 in the townland of Knockbaun

- **Bog Woodland WN7**

Within the study area, this habitat type is found along the edges of the track bordered by bog and often conifer plantations see **Image 10.22.** The canopy layer in this woodland is most often composed of Willows (*Salix* spp.), Downy Birch (*Betula pubescens*), Rowan (*Sorbus acuparia*), Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*) and Holly (*Ilex aquifolium*). The field layer is often rich in Sphagnum mosses, Ling (*Calluna vulgaris*), and some Purple Moorgrass (*Molinia caerulea*).

Ecological Interest	Links to Annex I Habitats	Locations
County Importance	This habitat does not correspond to the Annex I priority habitat *Bog Woodland (91D0), however the habitat is considered to be of moderate to high conservation value in a local context.	Derrylea Athry Maam Cross Claremount Canrawer.

Image 10.22 Bog Woodland WN7 adjacent to the track in the townland of Derrylea

- **Mixed Broadleaved Woodland WD1**

Several small patches of this woodland type were found scattered throughout the study area. This woodland type comprises all woodlands with 75-100% broadleaved trees that do not correspond to any of the 'Semi-natural' woodland categories. These woodlands may include both native and non-native tree species. Two relatively large areas (approximately 1.3ha and 2.6ha) were found in the townland of Boocaunmore. This habitat type does not correspond to any Annex I habitats.

Ecological Interest	Links to Annex I Habitats	Locations within Study Area
Local Importance (Higher Value)	This habitat does not correspond to Annex I habitats, however the habitat is limited within the study area and is therefore considered to be of high conservation value in a local context.	Several small areas scattered throughout the study area.

- **Mixed Broadleaved/Conifer Plantation WD2**

This category comprises woodlands with a mixture of broadleaved and coniferous trees, where both types have between 25% and 75% cover. Tree species in these woodlands may be native or non-native species. Several small stands of this woodland type were found within the study area. This habitat type does not correspond to any Annex I habitats. However, they can be of importance to local wildlife, particularly Red Squirrel (*Sciurus vulgaris*) and Pine Marten (*Martes martes*), which prefer woodlands with some coniferous component, and so are considered to be of local importance (higher value).

Ecological Interest	Links to Annex I Habitats	Locations within Study Area
Local Importance (Higher Value)	This habitat does not correspond to Annex I habitats.	Throughout the study area

- **Scattered Trees and Parkland WD5**

This category is used where scattered trees, standing alone or in small clusters, cover less than 30% of the total area under consideration but are a prominent structural or visual feature of the habitat. The proportion of non-native trees can be particularly high.

One stand of this woodland type was found within the study area in the townland of Aird Bhéarra, see **Image 10.23**. An old farmhouse with out-houses (Buildings and artificial surfaces BL3) surrounded by Scattered trees and Parkland WD5. Conifers and broadleaved trees have been planted here, species include Holly (*Ilex aquifolium*), Ash (*Fraxinus excelsior*), Sycamore (*Acer pseudoplatanus*), Spruce (*Picea* spp.), Elder (*Sambucus nigra*), Alder (*Alnus glutinosa*) and Oak (*Quercus* spp.). Rushes are abundant, as is Perennial rye grass (*Lolium perenne*) with frequent Marsh thistle (*Cirsium palustre*), Creeping buttercup (*Ranunculus repens*), Clovers (*Trifolium* spp.), Crested dog's-tail (*Cynosurus cristatus*), and occasional Common mouse-ear (*Cerastium fontanum*), Bent grasses (*Agrostis* spp.) and Sweet vernal-grass (*Anthoxanthum odoratum*). This habitat type does not correspond to any Annex I habitats but can provide habitat for birds and bats and so is considered to be of local importance (higher value).

Ecological Interest	Links to Annex I Habitats	Locations within Study Area
Local Importance (Higher Value)	This habitat does not correspond to Annex I habitats.	Aird Bhéarra

Image 10.23 Scattered trees – Oak, Holly, Willow and Spruce – with abundant Rushes.

- **Conifer Plantation WD4**

Many areas in Connemara have been planted with large stands of commercially-grown, non-native conifer tree species. These plantations generally comprise of a monocrop of coniferous species such as Norway Spruce (*Picea abies*), Sitka Spruce (*Picea sitchensis*) and Lodgepole Pine (*Pinus contorta*). The closed canopies of these woodlands deprive the ground layers of light; therefore a species poor woodland ground flora layer is generally present. This habitat does not correspond to any Annex I habitat.

Ecological Interest	Links to Annex I Habitats	Locations within Study Area
Local Importance (Lower Value)	This habitat does not correspond to Annex I habitats.	Ballynahinch, Recess, Derryneen, Bunnakill, Glengowla, Claremount.

- **Scrub WS1**

Areas of scrub are widespread throughout the study area. To be considered scrub, the habitat must comprise 50% of shrubs, low trees and/or brambles with a canopy height of less than 5m, see **Image 10.24**. Scrub habitats occur on a variety of habitats including Improved Agricultural Grassland GA1, Wet Grassland GS1, Marsh GM1, Reed and Large Sedge Swamp FS1. Under the native woodland project the different types of scrub which can be found within the study area include, **H1. Birch scrub, I. Willow scrub** and **J. Ash/hawthorn scrub.** The H1 category can be found encroaching on the edges of cutover bogs and the species comprise Downy Birch (*Betula pubescens*) Sessile Oak (*Quercus petraea*), Gorse (*Ulex europaeus*), Grey Willow (*Salix cinerea* spp.), with Bramble (*Rubus fruticosus* agg.), Hawthorn (*Crataegus monogyna*), and on the drier edges of the bog. In Cutover Bog areas, scrub habitat also develop occurs on elevated rocky mounds, often with Gorse species dominant, forming an intimate mosaic with Dry Heath.

Category I can be found in lake and flush margins. Species comprise Eared Willow (*Salix aurita*) and Grey Willow, with a ground flora of Marsh GM1 or Swamp FS1 vegetation. Scrub category J occurs on thin soils where agricultural practices have been abandoned and scrub has encroached. The species composition of this habitat varies between sites. Species such as Gorse (*Ulex europaeus*) are a common component, with Bramble (*Rubus fruticosus* agg.), Hawthorn (*Crataegus monogyna*), Hazel (*Corylus avellana*), Holly (*Ilex aquifolium*) and Blackthorn (*Prunus spinosa*) also frequent. This habitat does not correspond to any Annex I habitat.

Ecological Interest	Links to Annex I Habitats	Locations within Study Area
Local Importance (Lower Value)	This habitat does not correspond to Annex I habitats, however it can be important for wildlife, particularly insects and birds.	Throughout study area

Image 10.24 Mosaic of Wet Grassland GS4 and Gorse-dominated Scrub WS1 in the townland of Claremount

- **Recently-felled Woodland WS5**

Three areas of recently-felled woodland within Conifer Plantations WD4 were recorded within the route corridor of the proposed Greenway, near Lough Tawnagh and in the townlands of Derryneen and Bunnakill. These areas have been colonised with pioneering species such as Willowherb (*Epilobium* spp.), Foxglove (*Digitalis purpurea*) and ferns. This habitat does not correspond to any Annex I habitats.

Ecological Interest	Links to Annex I Habitats	Locations within Study Area
Local Importance (Lower Value)	This habitat does not correspond to Annex I habitats.	Near Lough Tawnagh and in the townlands of Derryneen and Bunnakill.

- **Hedgerows WL1**

Hedgerows are uncommon within the study area, with most field boundaries composed of stone walls built in the vernacular style. However, some hedgerows occur in association with these stone walls. The majority of these hedgerows are dominated by Ash (*Fraxinus excelsior*) and Hawthorn (Crataegus *monogyna*). Other species noted in hedgerows were Holly (*Ilex aquifolium*), Gorse (*Ulex europaeus*), Hazel (*Corylus avellana*) and Bramble (*Rubus fruticosus* agg.). The hedgerows are generally well-maintained and stock-proof. This habitat does not correspond to any Annex I habitat.

Ecological Interest	Links to Annex I Habitats	Locations within Study Area
Local Importance (Higher Value)	This habitat does not correspond to Annex I habitats.	Limited and scattered distribution within the study area.

- **Treelines WL2**

Field boundaries with trees over 5 metres are rare in the study area. Ash (*Fraxinus excelsior*) is the most common species in these treelines, but Oak (*Quercus petraea* and *Q. robur*) and conifers were also noted, see **Image 10.25**. This habitat does not correspond to any Annex I habitat.

Ecological Interest	Links to Annex I Habitats	Locations within Study Area
Local Importance (Higher Value).	This habitat does not correspond to Annex I habitats.	Occasional, scattered distribution.

Image 10.25 Treeline WL2 composed of non-native conifers in a cutover bog

- **Exposed Siliceous Rock ER1**

Much of the study area is underlain by the Streamstown Schist Formation, which is described as Psammitic pelitic and semi-pelitic schists. The eastern end of the route corridor of the proposed Greenway is underlain by Oughterard Granite, see **Image 10.26**. Granite is a siliceous rock while schists may contain both siliceous and calcareous elements. Soils are quite shallow throughout the study area, and siliceous rock is exposed at a number of locations. These exposed rocks are often found on hillocks in areas of blanket and cutover bog, forming an intimate mosaic with Dry Siliceous Heath HH1 vegetation. Lichen cover on these rocks is extensive and diverse. Plants are often found growing within cracks in the rock where soils persist. Mosses predominate, but some higher plants are also found, including Ling (*Calluna vulgaris*), Tormentil (*Potentilla erecta*) and grasses.

Ecological Interest	Links to Annex I Habitats	Locations within Study Area
Local Importance (Lower Value).	This habitat type is linked to the Annex I habitat 'siliceous rocky slopes with chasmophytic vegetation (8220)', but this particular vegetation type was not recorded in any of the Exposed Siliceous Rock habitats within the study area.	Occasional and scattered distribution throughout the study area.

Image 10.26 Exposed Siliceous Rock (Granite) in the townland of Claremount

- **Exposed Sand, Gravel or Till ED1**

A disused quarry in the townland of Glengowla is classified as Exposed Sand, Gravel or Till ED1. This habitat type does not correspond to any Annex I habitat. Further areas of EDI may become exposed as a result of cutting along the project.

Ecological Interest	Links to Annex I Habitats	Locations within Study Area
Local Importance (Lower Value)	This habitat type is not linked to any EU Annex I habitats.	Glengowla townland

- **Spoil and Bare Ground ED2**

Two areas of Spoil and Bare Ground were found within the study area. These are mainly areas that have been previously cleared in preparation for construction, and contain little or no vegetation. This habitat type is of very low ecological value. Areas of exposed ground are susceptible to encroachment of non-native invasive species such as Gunnera, Giant Hogweed and Japanese Knotweed, which are found in the surrounding landscape. Mitigation measures for the control of invasive species are discussed in **Section 10.5**.

Ecological Interest	Links to Annex I Habitats	Locations within Study Area
Local Importance (Lower Value)	This habitat type is not linked to any EU Annex I habitats.	Knockmoyle, Recess.

- **Recolonising Bare Ground ED3**

This habitat classification is used to describe areas of bare ground or derelict sites that have been colonised by herbaceous plants. The vegetation cover must exceed 50% to be considered under this classification. This habitat can support a diversity of early pioneer plants and ruderal species including Nettle (*Urtica dioica*), Dandelion (*Taraxacum* spp.), Colts Foot (*Tussilago farfara*), Teasel (*Dipsacus fullonum)*, Willowherbs (*Epilobium* spp.) and grasses favouring disturbed ground such Annual Meadow Grass (*Poa annua*) may also occur. Several areas of Recolonising Bare Ground were found within the study area. This habitat does not correspond to any Annex I habitat.

Ecological Interest	Links to Annex I Habitats	Locations within Study Area
Local Importance (Lower Value)	This habitat does not correspond to Annex I habitats.	Glendollagh Lough Maam Cross, Glengowla

- **Active Quarries and Mines ED4**

There are two active quarries within the study area in Recess. The underlying bedrock at these areas is predominantly composed of schists. It is assumed that it is the material which is being quarried. This habitat does not correspond to any Annex I habitats.

Ecological Interest	Links to Annex I Habitats	Locations within Study Area
Local Importance (Lower Value)	This habitat does not correspond to Annex I habitats.	Recess.

- **Stone Walls and Other Stonework BL1**

Stone walls are widespread forming field boundaries within the study area. These stone walls generally comprise dry stone constructions built in the vernacular style. Generally, they are in good repair, with an average height of 1m. Stone walls, as linear features, provide a potential link between habitats of higher value. These stone walls contain an abundance of lichen and moss species. This habitat does not correspond to any Annex I habitat.

Ecological Interest	Links to Annex I Habitats	Locations within Study Area
Local Importance (Lower Value).	This habitat does not correspond to any Annex I habitats.	Throughout the study area.

- **Buildings and Artificial Surfaces BL3**

The proposed Connemara Greenway Project – Clifden to Oughterard follows sections of the existing N59, which falls into this habitat category. There are a number of dwellings close to the proposed route. Buildings and Artificial Surfaces are generally extremely species-poor and of low ecological value, but in some cases can be host to populations of bats, which greatly enhances their ecological significance. This habitat does not correspond to any Annex I habitat. Further details of bat activity within the study area are provided in **Section 10.3.8**.

Ecological Interest	Links to Annex I Habitats	Locations within Study Area
Local Importance (Lower Value).	This habitat does not correspond to Annex I habitats.	Buildings are scattered throughout the study area.

10.3.6 FAUNA IN THE EXISTING ENVIRONMENT

The likelihood of faunal species occurring in the existing environment is discussed in this section. Species which are afforded statutory protection, whether under International, European or National legislation, are considered in detail. Relevant legislation is as follows: -

- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Habitats Directive) and Directive 2009/147/EC (codified version of Directive 79/409/EEC as amended) (Birds Directive) – transposed into Irish law as European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477/2011); and

- Wildlife Act 1976 and Wildlife (Amendment) Act 2000.

- **EU Habitats Directive (as transposed)**

Species protected under the EU Habitats Directive can be separated into two categories: Annex II of the directive lists species that require protection of their habitats, for which Special Areas of Conservation (cSACs) are designated, while Annex IV of the directive lists species which are afforded strict protection, wherever they occur in the country (inside or outside cSACs).

- **EU Birds Directive (as transposed)**

The EU Birds Directive requires member states to identify and classify Special Protection Areas (SPAs) for rare or vulnerable species listed in Annex I of the Directive, as well as for all regularly occurring migratory species, paying particular attention to the protection of wetlands of international importance (Article 4).

- **Irish Wildlife Act**

Under the Wildlife Act 1976 (as amended) certain species are afforded statutory protection and as such there is a requirement that any proposed development assesses the likelihood of impacting such species. Under Schedule 5 of the Act it is an offence for any person to intentionally: -

- kill, injure or take any wild animal listed;

- damage or destroy, or obstruct access to, any structure or place which any wild animal uses for shelter or protection;

- damage or destroy anything which conceals or protects any such structure; or

- disturb any such animal while it is occupying a structure or place which it uses for shelter or protection.

Surveys were completed in Summer/Autumn 2010 and in Spring/Summer 2011. Surveys were undertaken to identify those species listed under Schedule 5 of the Wildlife Act 1976 and which could, bearing in mind the habitats found, occur on the site. All surveys met with standard recommended methodologies (subject to seasonal constraints). Specifically those species identified were:-

- **Bats**

All Irish bat species are protected under the Wildlife Act (1976) and Wildlife Amendment Act (2000). Also, the EU Habitats Directive, seeks to protect rare species, including bats, and their habitats and requires that appropriate monitoring of populations be undertaken. Across Europe, they are further protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), which, in relation to bats, exists to conserve all species and their habitats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983) was instigated to protect migrant species across all European boundaries. The Irish government has ratified both these conventions.

Bat fauna studies were carried out by Conor Kelleher (Aardwolf Wildlife Surveys) in 2011 and 2012 as part of studies for the proposed N59 upgrade. This study is of relevance due to the extent of study area covered, which included sections of the proposed Greenway. The relevant results are discussed briefly below. Bridges crossed by the Greenway were also assessed for bat roost potential by RPS ecologists.

A survey of bat fauna along the proposed Greenway was carried out by means of a thorough search within each structure using a powerful torch, 6-cell *Maglite*. Bat surveys at the affected bridges were carried out through a visual inspection survey aimed to establish presence/absence of bats and rate the affected bridges in terms of bat potential. Crevices > 100mm deep, and sheltered from the elements, were regarded as potential bat roosts.

All suitable buildings were inspected both internally (where possible) and externally. The presence of bats is assessed with reference to their signs, principally staining, droppings, urine marks; corpses, invertebrate prey remains and/or the presence of bat fly *Nycteribiidae* pupae, although direct observations are also occasionally made. The nature and type of habitats present in the immediate environs of buildings are also indicative of the species likely to be present.

During the detector surveys within the study area, five bat species including Common and Soprano Pipistrelle, Leisler's, Daubenton's and Brown Long-eared bats were recorded.

The pipistrelles were widespread throughout the study area especially along rivers and within the deciduous woodland areas although they also occurred along the edges of coniferous plantations. They were especially active in wooded areas adjacent to water bodies.

Brown Long-eared bat was noted hunting to the east of Recess village near the Owentooey River and at Lettershea within the wooded area south of the proposed Greenway route. This species roosts in trees and buildings; it is a very quiet bat which produces very weak echolocation pulses and sometimes hunts without emitting sounds and so can be missed by detector. It is a common species throughout Ireland and is expected to be widespread in the local area even where undetected.

Leisler's bat, which forages over agricultural landscapes, scrub and woodland as well as urban areas, was detected flying over Clifden, Ballynahinch Lake, Recess, Maam Cross and Oughterard.

Daubenton's bat, which forages over open water, was present over the Owenglin, Owentooey and Owenriff Rivers and Derryclare, Glendollagh and Ardderry Loughs. This species travels over considerable distances along watercourses and, given the expanse of watercourses and water bodies in the local area, it is expected to be widespread.

Although not observed during the present surveys, Natterer's bat is known to occur locally and Whiskered/Brandt's (*M. mystacinus/M.brandtii*) bats are expected to occur occasionally but there are no extant records for these two species. The whiskered bat is an uncommon but widespread species in Ireland. Brandt's bat is the most recent bat species to be found in Ireland being only discovered in

2003 (Mullen, 2007). Records of the species are few to date and, since it cannot be distinguished from the whiskered bat by detector, it is probably often misidentified or overlooked.

The Lesser Horseshoe bat was not observed but it is known to occur at the east of the route near Oughterard where the habitat is more favourable for the species. The distribution range of this species is restricted to the west of Ireland and it is only known from Counties Mayo, Galway, Clare, Limerick, Kerry and Cork (Kelleher, 2004). The species is difficult to detect because of its highly directional and weak echolocation so its presence may go unnoticed.

The remaining Irish bat species, Nathusius' pipistrelle, may occur in the area occasionally, however, to date, its known roosts are restricted to north-east Ireland. It is, however, being recorded more often, probably as a result of climate change, with more animals of this highly migratory species arriving from the continent, and with increased use of bat detectors in Ireland. The species has yet to be recorded in the area of the proposed Greenway but the potential exists for its occasional occurrence.

A summary of the bat roost potential for bridge structures in bridge structures potentially impacted within the zone of influence of the road is provided in **Table 10.21**.

Table 10.21 Bat Roost Potential in Bridge Structures

Crossing No.	Chainage	Structure	Bat roost potential
WC00.0	Ch00	Greenway commences just beyond Ardbear Old Bridge	Limited bat roost potential some crevices present. There is a record from Bat Conservation Ireland of a night hibernation roost at this bridge, one unidentified bat recorded
WC01.0	Ch2200	Culvert	Small stone culvert, No bat roosts found
WC02.0	Ch2500	Culvert	Small stone culvert, No bat roosts found
WC03.0	Ch4300	Culvert	Small stone culvert, No bat roosts found
WC04.0	Ch4800	Culvert	Small stone culvert, No bat roosts found
WC05.0	Ch5600	Culvert	Small stone culvert, No bat roosts found
WC06.0	Ch6450	Culvert	Small stone culvert, No bat roosts found
WC07.0	Ch8450	Culvert	Potential bat roosts
WC08.0	Ch10400	Recess Cloonbeg Bridge	Small stone culvert, No bat roosts found
WC09.0	Ch11700	Culvert	Small stone culvert, No bat roosts found
WC10.0	Ch15100	Culvert	
WC11.0	Ch16250	Culvert	Small stone culvert, No bat roosts found
WC12.0	Ch16650	Culvert	Small stone culvert, No bat roosts found
WC13.0	Ch177100	Culvert	Small stone culvert, No bat roosts found
	Ch18500	Culvert	Small stone culvert, No bat roosts found
WC16.0	Ch20150	Weir Bridge GC-N59-027-00	Nil – sealed
WC17.0	Ch22000	Bridge GC-N59-028-00	Nil – no suitable bat access - vegetated
WC18	Ch22250	Culvert	Small stone culvert, No bat roosts found
WC19	Ch22900	Culvert	No suitable bat access – all crevices sealed. No bat roost found
WC20	Ch24000	Bridge GC-N59-029-00	No suitable bat access – all crevices sealed. No bat roost found
WC21	Ch24650	Culvert	No suitable bat access. No bat roost found
WC22	Ch25600	Bridge GC-N59-030-00	Unsuitable bat roosting habitat low bridge, prone to predation and flooding. No bat roost found
WC23	Ch26900	Cloonoppeen Bridge GC-N59-031-00	Unsuitable bat roosting habitat low bridges, prone to predation and flooding. No bat roost found

Crossing No.	Chainage	Structure	Bat roost potential
WC24	Ch28800	Bridge GC-N59-032-00	Unsuitable bat roosting habitat low bridges, prone to predation and flooding. No bat roost found
WC25	Ch29300	Bridge GC-N59-034-00	Unsuitable bat roosting habitat
WC26	Ch30050	Culvert	Unsuitable bat roosting habitat prone to predation and flooding. No bat roost found
WC27	Ch30900	Bunskannive Bridge GC-N59-035-00	Bat Tubes present, no bats found within tubes. No bat roost found.
WC28	Ch31800	Culvert	Unsuitable bat roosting habitat
WC29	Ch34500	Culvert	Unsuitable bat roosting habitat
WC30	Ch35000	Culvert	Unsuitable bat roosting habitat
WC31	Ch35700	Culvert	Unsuitable bat roosting habitat
WC32	Ch37000	Culvert	Unsuitable bat roosting habitat
WC33	Ch38000	Culvert	Unsuitable bat roosting habitat
WC34	Ch38500	Culvert	Unsuitable bat roosting habitat
WC35	Ch39200	Culvert	Limited bat use potential but some crevices present. No bat roost found.
WC36	Ch40800	Glashanasmearany River Bridge	Unsuitable bat roosting habitat
WC37-42	Ch41400 - Ch43300	Culverts	Potential bat roost
WC42	Ch44800	Leam Railway Bridge	Unsuitable bat roosting habitat
WC43	Ch45600	Culvert	Unsuitable bat roosting habitat
WC44	Ch46800	Bridge	No suitable bat access. No bat roost found.
WC45	Ch48400	Glengowla Bridge GC-N59-039-00	No suitable bat access. No bat roost found.
WC46	Ch50200	Oughterard River Bridge	No suitable bat access. No bat roost found.

- **Hares (*Lepus timidus hibernicus*)**

The Irish Hare is listed as an 'animal species of community interest whose taking in the wild and exploitation may be subject to management measures' in Annex V of the EU Habitats Directive and as a 'protected fauna species' in Annex III of Bern Convention. The Irish population is also listed in the 'Irish Red Data Book 2: Vertebrates' (Whilde, 1993) as being of international importance. The Irish Hare is present in all counties both in lowland and upland habitats. It is generally found in open habitats including upland heath and pasture. The habitats on site would provide local hare populations with suitable habitat, and there are numerous records for this species in the NPWS Rare and Protected Species Records for this area. Although no evidence of hares were found during the site survey, droppings and individuals were recorded during field surveys for the proposed Greenway.

- **Red squirrel (*Sciurus vulgaris*)**

The Red squirrel is listed in Appendix III (protected fauna) of the Bern Convention, and is afforded legal protection in Ireland under the Irish Wildlife Act, 1976. They are found in mixed coniferous forests composed of Pine, particularly Scots pine, and where grey squirrels are absent. The abundant Conifer Plantation WD4 habitat found within and adjacent to the study area may provide suitable habitat for Red Squirrel. The species was not recorded during site visits, and there are no records for this species in the NPWS Rare and Protected Species records for the area.

- **Pine marten (*Martes martes*)**

The Pine marten has in recent times begun to colonise coniferous and mixed forest, particularly in the west of Ireland. They also like to hunt in areas of clear felled conifer plantation. The Pine marten is listed in Annex IV of the Habitats Directive as a species of European interest. This requires a system of strict protection of the species. It is also listed in Appendix III of the Bern convention. According to the NPWS Rare and Protected Species Records, Pine Marten has been recorded in Recess. There are several areas of coniferous and mixed forest within the study area, as well as areas of clear felled conifer plantation. These areas provide suitable habitat for Pine Marten. No signs or individuals were recorded during site visits.

- **Badgers (*Meles meles*)**

Badgers are listed in the 'Irish Red Data Book 2: Vertebrates' (Whilde, 1993) as being of international importance. Badgers prefer farmland/woodland mosaics but are sometimes found in upland areas up to 500m in elevation and solitary badgers can occupy territory in open upland, which is dry and not susceptible to flooding. No Badger setts were found within the study area. However, prints, latrines and Badger mortalities were recorded on the existing N59. There are records for Badgers from three of the seven Grid Squares which the route corridor of the proposed Greenway traverses: L75, L84 and L94.

- **Otter (*Lutra lutra*)**

Otter are listed on Annex II and Annex IV of the EU Habitats Directive and also on the Wildlife Act (1976, amendment 2000). Annex II species require the designation of protected areas by Member States (Special Areas of Conservation) as set out in Article 3, 4 and 6 of the Directive. Annex IV species require strict protection measures by Member States in accordance with Article 12 of the Directive, the Eurasian Otter is also listed on Appendix 1 of CITES and Appendix II of the Bern Convention. The Irish population is also listed in the '*Irish Red Data Book 2: Vertebrates*' (Whilde, 1993) as being of international importance. The NPWS online database contains records of otters within all but one of the relevant 10km Grid Squares, including records from Arderry Lough, the Owenglin River, the Owenriff River, and Cloonbeg Bridge and the Bridge downstream of the Owentooey confluence in Recess. Otter favour habitats such as old tree roots leading into the water, boulder shoreline or dense vegetation at the bank. Signs of otter activity were noted at many of the watercourses in the study area during the site surveys.

- **Stoat (*Mustela erminea*)**

The Irish stoat can be found in a number of habitats, including; woodlands, heathlands and farmlands. The stoat is the smallest of our flesh-eating mammals, is about a foot long, and like the badger, is nocturnal. The NPWS has one record for stoat within the study area - from Clifden. This species is known to be widespread throughout the country, though no specific studies have been carried out to date. It is likely that this species occurs within the study area, due to the presence of suitable habitat.

- **Deer**

All deer species are protected under the Irish Wildlife Act. The Red Deer (*Cervus elaphus*) is Ireland's only native deer species. However, most of the Red Deer in Ireland today is descended from introduced animals, and some are thought to be hybrids of red deer and Japanese Sika Deer. The only fully native herd is in Killarney National Park, Co. Kerry. Some animals from this herd have been transplanted to Connemara National Park, in an effort to increase the native population in Ireland. Red deer are known to be widespread within Connemara and the NPWS Rare and Protected Species database has records for this species within all the relevant Grid Squares. The NPWS Rare and Protected Species database has one record for Fallow Deer (*Dama dama*) in the area from Grid Square M14 though no specific location is given.

- **Hedgehog (*Erinaceus europaeus*)**

The Hedgehog is listed in Appendix III (protected fauna) of the Bern Convention, and is afforded legal protection in Ireland under the Irish Wildlife Act, 1976. Hedgehogs are found in woodlands, hedgerows, gardens, and meadows. Hedgehogs are mostly nocturnal, but juvenile or sick animals can sometimes be seen during the day. It is quite likely that this species occurs within the study area. The NPWS Rare and Protected Species Database have two records for Hedgehog in the wider area from Cashel and Oughterard.

- **Pygmy Shrew (*Sorex minutus*)**

The Pygmy Shrew is Ireland's smallest mammal, ranging in weight from 3g in winter when food sources are low, to 6g for breeding adults in the summer. The pygmy shrew is common throughout the country where there is good ground cover in grassland, woodlands, hedgerows, and bogs. They build spherical nests from dried grass under ground cover, dead wood or rocks. The Pygmy Shrew is listed in Appendix III (protected fauna) of the Bern Convention, and is afforded legal protection in Ireland under the Irish Wildlife Act, 1976. The habitats on site would provide this species with suitable habitat.

- **Reptiles and Amphibians**

Frog (*Rana temporaria*) spawn was noted in a wet area of a field in the townland of Claremount, in the vicinity of the proposed Greenway and adjacent to the existing N59 road. It is highly likely that this species occurs throughout the study area.

Common Lizard (*Zootica vivipara*) was noted in a bog in the townland of Derryneen. The NPWS has numerous other records for this species in the wider area.

The habitat of the Smooth Newt (*Triturus vulgaris*) ranges from large lakes to densely weeded ditches. Although newts were not detected at the time of survey the lakes, ditches and lower lying habitats may provide newts with some suitable habitat.

- **Terrestrial Invertebrates**

Marsh Fritillary (*Euphydryas aurinia*), considered one of the most threatened species in Europe and the only Irish butterfly species protected under Annex II of the EU Habitats Directive and has been recorded in the 10X10km square M14. In surveys conducted on behalf of Butterfly Ireland, a group of 2-9 individuals was sighted in Grid Square M14. There is also a record for this species from Maam Cross (NPWS pers. comm.) This species was not recorded during the site surveys for the species, however, and suitable habitat was not found.

The Kerry Slug (G*eomalacus maculosus*), a species listed on Annex IV (a) of the Habitats Directive, has recently been recorded Lettercraffroe, Co. Galway (Kearney 2010). This species, which prefers moorlands or woodlands with acidic soils, is normally only found in Co. Kerry and so may have been accidental introduction to the area or it may represent a distinct population. The Kerry Slug was not recorded during site surveys.

- **Fish**

The lakes and rivers within the study area are host to several species of conservation interest. Arctic char (*Salvelinus alpinus*) have been recorded from Arderry Lake and Oorid Lough. This species is listed in the Irish Red Data Book as threatened in Ireland. Arctic char represent an arctic-alpine element in the Irish fauna. In Ireland the Arctic char occurs only in a few cold, stony, oligotrophic lakes.

Atlantic Salmon (*Salmo salar*), a species listed on Annex II of the EU Habitat Directive, is known to occur within Derryneen Lough and the Owenglin River. All areas of the main channel of the Owenglin River within the study area comprise of potential angling water for Atlantic Salmon and Sea Trout. The entire stretch is also all utilised to some degree as a salmonid spawning and nursery area.

A summary of the fisheries potential within the zone of influence of the Greenway is provided in **Table 10.20.**

- **Aquatic Invertebrates**

The Freshwater Pearl Mussel (*Margaritifera margaritifera*) is listed under Annex II (species whose conservation requires the designation of special conservation areas) and Annex V (species whose taking in the wild and exploitation may be subject to management measures) of the EU Habitats Directive.

A freshwater pearl mussel survey was carried out by Dr Evelyn Moorkens in 2011 on 32 No. watercourses within the study area were surveyed. The results were as follows, 6 No. were found to have pearl mussels present, and 11 No. were found to have pearl mussels downstream. There is therefore very high potential for this species to be impacted on as a result of the proposed development works. Impacts and mitigation measures are discussed in detail in **Sections 10.7** and **10.8**. The report on the Freshwater Pearl Mussel survey carried out by Dr. Moorkens is included in full as **Appendix C.2**. The populations of this species within the study area are shown in **Figure 10.3 (1-14).** A summary of the Freshwater Pearl Mussel locations within the zone of influence of the proposed Greenway road is provided in **Table 10.20.**

- **Birds**

Bird species recorded during field surveys conducted during spring/summer 2011 are shown in **Table 10.22**. The conservation status of these birds is also provided, whether the species is on the BoCCI List or listed on Annex I of the birds Directive. Birdwatch Ireland (BWI) and the Royal Society for the Protection of Birds (RSPB), have compiled a list of bird species suffering decline in the Irish/European and global context. These Birds of Conservation Concern in Ireland are published in a list known as the BoCCI List. In this BoCCI List, birds are classified into three separate lists (Red, Amber and Green), based on the conservation status of the bird and hence conservation priority. The Red List birds are of high conservation concern, the Amber List birds are of medium conservation concern and the Green List birds are not considered threatened.

Table 10.22 Bird Species Recorded within the Study Area

Common Name	Scientific Name	Conservation Status
Blackbird	*Turdus merula*	Green-listed
Hooded Crow	*Corvus cornix*	Green-listed
Magpie	*Pica pica*	Green-listed
Pied Wagtail	*Motacilla alba*	Green-listed
Robin	*Erithacus rubecula*	Green-listed
Song Thrush	*Turdus philomelos*	Green-listed
Swallow	*Hirundo rustica*	Amber-listed
Wood Pigeon	*Columba palumbus*	Green-listed
Wren	*Troglodytes troglodytes*	Green-listed
Snipe	*Gallinago gallinago*	Amber-listed
Chaffinch	*Fringilla coelebs*	Amber-listed
Brambling	*Fringilla montifringilla*	Green-listed
Whopper Swan	*Cygnus Cygnus*	Amber-listed
Meadow Pippit	*Anthus pratensis*	Green-listed
White-throated Dipper	*Cinclus cinclus*	Green-listed
Red Grouse	*Lagopus lagopus scoticus*	Red-listed

Snipe, Chaffinch, Whopper Swan and Swallow, are species listed on the BoCCI amber list and were recorded within the study area during site surveys. Bird species on the amber list are considered to be of medium conservation concern. Whooper Swans are also listed under Annex I of the EU Birds Directive. Red grouse is listed on the BoCCI red list and feathers were recorded in the townland of Claremount during site surveys.

10.3.7 Ecological Importance of Habitats

The route corridor of the proposed Greenway passes through a wide variety of habitats, ranging from lake and fen through to intact blanket bog, cutover bog, heath, woodlands and a range of grasslands. This range of habitats reflects the wide variation in topography, hydrology, bedrock and soil types throughout the study area.

There are numerous lakes within the route corridor for the proposed Connemara Greenway Project – Clifden to Oughterard, including both Acid Oligotrophic Lakes e.g. Lough Bofin and Lough Shindilla, and Mesotrophic Lakes e.g. Lough Tawnagh and Lough Adrehid. The acid oligotrophic lakes within the study area correspond to the Annex I habitats, 'oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) (3110)' while the mesotrophic lakes within the study area, although not linked to any Annex I habitats, do contain species listed under Annex II of the EU Habitats Directive. Therefore both of these lake habitats are considered to be of **International Importance**.

Both Eroding/Upland Rivers and Depositing Lowland Rivers are found throughout the study area. Where each occur they are often included within cSAC boundaries and many contain Annex II species such as Freshwater Pearl Mussel or Salmon, therefore these habitats are of significant conservation interests and are considered of **International Importance.**

Reed and Large Sedge Swamps occur around the fringes of lakes and drainage ditches throughout the study area, while Wet Grassland occurs on lower impeded slopes also throughout the area. Marsh also occurs throughout the study area, often within a semi-natural matrix of the aforementioned wet habitats and therefore all of these habitats are considered to be of **Local Importance (Higher value).**

Dry Calcareous & Neutral Grassland, Dry Meadows & Grassy Verges and Dry Humid Acid Grassland all occur throughout the study area and can be considered part of a semi-natural grassland matrix within the area. Although none of these habitats within the site correspond to Annex I habitat, they are relatively species-rich and as already mentioned are part of a semi-natural grassland matrix and are all therefore considered to be of **Local Importance (Higher value).**

Dry Siliceous Heath occurs throughout the study area on steep slopes and where it does occur it corresponds to the EU Annex I habitat 'European dry heaths (4030). Therefore it is considered to be of **International/National Importance.**

A number of bog and heath habitats occur throughout the study area including Wet Heath, Lowland Blanket Bog, and Cutover Bog. Wet Heath habitat was identified in a number of locations throughout the study area with some extensive areas in the townland of Emlaghdauroe and where it occurs it corresponds to the Annex 1 habitat 'northern Atlantic wet heaths with Erica tetralix (4010)' and therefore is considered to be of **International/National Importance.** Lowland Blanket Bog and Cutover Bog also occur throughout the study area with much of the land between Maam Cross and Recess dominated by these habitats. Lowland Blanket Bog corresponds to the priority habitat Blanket Bogs (*if active bog) (7130)'. All intact areas of Lowland Blanket Bog within the study area correspond to this Annex I habitat, and areas which contain a large amount of peat-forming species correspond to the Priority Habitat and therefore are considered to be of **International/National Importance.** In areas where Cutover Bog is linked to the EU Annex I Habitat 'depressions on peat substrates of the Rhyncosporion (7150)' it is considered to be of **International Importance** while areas without this habitat are considered to be of **Local Importance (Higher value).** A number of areas of Eroding

Blanket Bog exist within or adjacent to the proposed route which, as part of a larger semi-natural bog matrix is considered to be of **Local Importance (Higher value).**

Both Rich Fen and Flush and Poor Fen and Flush are found within the study area. Rich Fen and Flush on the shore of Ballyquirke Lough is linked to the annexed priority habitat '7210 Calcareous fens with Cladium mariscus and species of the Caricion davallianae' and therefore is considered to be of **International Importance.** The Poor Fen and Flush, although not linked to any Annex I habitat is limited in distribution and therefore considered to be of **Local Importance (Higher value).**

There are a number of woodland habitats throughout the study which vary in their degree of importance. Oak-Birch-Holly Woodland in the study area corresponds to the Annex I habitat 'Old sessile oak woods with Ilex and Blechnum in British Isles (91A0)' and therefore is considered to be of **International Importance.** Wet Willow Alder Ash Woodland and Wet Woodland are both found within the study area, and some small areas correspond to the Annex I habitat '91E0 Alluvial Forests with *Alnus glutinosa* and *Fraxinus excelsior*'. Oak-Ash-Hazel Woodlands is found within the study area, and although does not correspond to any Annex I habitats they are dominated by native species and provide important potential habitat for bats, therefore are considered to be of **County Importance.**

Both Mixed Broadleaved Woodland and Mixed Broadleaved/Conifer Woodland habitat within the study area contain non-native species but can provide valuable potential habitat for mammals, including bats, badgers and red squirrels, therefore these habitats are considered to be of **Local Importance (Higher value)**

The Hedgerows WL1 and Treelines WL2 that make up the field boundaries are of **Local Importance (Higher Value)** as they provide connectivity between habitats and commuting routes and shelter for species of bats, badger and smaller mammals.

Flora listed as requiring protection in either Annex II of the EU Habitats Directive or the Wildlife Act 1976 was not recorded within the study site.

Many of the habitats found within the site provide local mammal species such as Bat, Badger, Hare, Otter and Stoat with suitable foraging habitat. Otter are listed under Annex II of the Habitats Directive.

10.3.8 Non-Native or Invasive Species

A number of non-native invasive species were recorded throughout the study area, the locations of which are outlined in **Table 10.23** and shown in **Figure 10.3.** The Birds and Habitats Regulations 2011 stipulate that any person who, allows or causes to disperse or spread the species below highlighted in bold is guilty of an offence.

Table 10.23 Non-native or Invasive species recorded throughout the study area

Common Name	Scientific Name	Chainages
Giant Rhubarb	*Gunnera tinctoria*	0+200, 3+200, 4+150, 22+000, 22+360, 27+800
Japanese Knotweed	*Fallopia japonica*	4+300, 21+640
Rhododendron	*Rhododendron ponticum*	17+320, 17+520, 17+600, 22+070, 22+460
Himalayan Balsam	*Impatiens glandulifera*	0+200
Dogwood*	*Cornus* sp.	17+450
Cotoneaster	*Cotoneaster* sp.	1+150, 8+330

*Red osier dogwood is named as an 'amber-list' species established on the island of Ireland which may under the right ecological conditions have an impact on the conservation goals of a site or impact in a water body achieving good/high ecological status under the Water Framework Directive.

Giant Rhubarb This species was originally introduced into Ireland as a desirable, architectural, garden plant, *Gunnera tinctoria* is now recognised as an invasive, colony-forming threat to desirable flora. This vigorous plant produces masses of seeds, in excess of 80,000 seeds per seed-head, which are spread by birds. It is also able to reproduce rhizomatically and is therefore extremely difficult to eradicate.

Japanese Knotweed This species was introduced into Europe as an ornamental plant in the early 19th century and it grows most vigorously, with its main and extremely successful method of reproduction being by creeping rhizomes. It is very quick to colonise all types of soil, even sprouting through cracks in concrete. It is extremely difficult to eradicate.

Rhododendron This species was first introduced to parks, gardens, and demesnes in Britain and Ireland in the 1700's. *Rhododendron ponticum* can grow quite tall with specimens regularly attaining eight meters. Rhododendron can from very dense thickets and out-competes native plants for space and resources, especially for sunlight. Other impacts on fish and invertebrate communities have been recorded. Rhododendron can also prevent access to sites by the shear mass of plant material blocking paths and right of way.

Cotoneaster This is a non-native, invasive woody shrub which produces dense stands preventing regeneration of native trees.

Himalayan Balsam This species is native to the Himalayas and thrives along river banks and in damp woodlands. It has spread prolifically in the UK since its introduction in the 19th Century. Each plant produces large numbers of seeds and the seed capsules explode when mature, ensuring its rapid spread in suitable habitats.

10.3.9 Ecological Receptors

Sensitive habitats are identified as 'Ecological Receptors' (ERs), while sensitive habitats of higher importance on a geographical scale are known as 'Key Ecological Receptors'.

Annex I habitats within the study area are evaluated at different geographic scales, depending on whether they are considered to be 'best examples' or 'viable areas'[7]. 'Best examples' of Annex I Priority habitats are considered to be of International Importance, 'viable areas' are of National Importance, while areas of habitat that do not fulfil the criteria for valuation as of International or National Importance are considered to be of County Importance.

A total of nineteen Ecological Receptors were recorded within the study area. **Table 10.24** provides a description and valuation of these ecological sites, intersected by the proposed works. The Ecological Receptor valuation system follows the NRA Geographic Context for Determining Value set out in the Guidelines for Assessment of Ecological Impacts of National Road Projects (NRA, 2009). In the context of the proposed works, ecological resources of below 'Local Importance (Higher value)' should not be selected as 'Key Ecological Receptors', for which detailed assessment is required. A total of nineteen of these Ecological Receptors were selected as Key Ecological Receptors on this basis.

[7] The *Guidelines for Assessment of Ecological Impacts of National Road Projects* state that *'A 'viable area is defined as an area of habitat that, given the particular characteristics of that habitat, was of sufficient size and shape, such that its integrity (in terms of species composition, and ecological processes and function) would be maintained in the face of stochastic change (for example, as a result of climatic variation).*

Table 10.24 Ecological Receptors Potentially Subject to Impacts from the Proposed Project

Ecological receptors subject to impacts associated with the proposed Greenway Project	Summary descriptions of ecological receptors	Ecological Receptor Valuation	Selection as key ecological receptors	Locations
ER1: Lough Corrib cSAC/pNHA (Site Code: 000297) and Lough Corrib SPA (Site Code: 004042)	This is a large site that encompasses not only the Lough Corrib itself but also many rivers. Lough Corrib cSAC/pNHA is designated for the presence of fourteen habitats listed under Annex I of the EU habitats directive and nine species listed under Annex II of the same directive. Habitats and species for which the site is designated are outlined in **Tables 10.1 and 10.2**. Lough Corrib itself is designated as an SPA, supporting internationally important numbers of wintering birds such as Pochard and also of note is that five of the species which regularly visit the site are listed on Annex I of the E.U. Birds Directive (see **Table 10.3 and Table 10.4**).	Lough Corrib is designated under the EU Habitats Directive, and as such it is of **International Importance.**	Yes	There will be some works carried out where Lough Corrib cSAC extends along the Owenriff River. The cSAC extends along the Owenriff River as far as Lough Agraffard. Works will be carried out either within or adjacent to the cSAC/pNHA for approximately 4.2km.
ER2: Maumturk Mountains cSAC/pNHA (Site Code: 002008),	This is one of the largest and most diverse sites of conservation importance in Ireland, with a wide range of habitats and species. The Maumturk Mountains cSAC/pNHA is designated for the presence of six habitats listed under Annex I of the EU habitats directive and two species listed under Annex II of the same directive. Habitats and species for which the site is designated are outlined in **Tables 10.5 and 10.6**.	Maumturk Mountains is designated under the EU Habitats Directive, and as such it is of **International Importance.**	Yes	Works to be carried out within cSAC/pNHA boundary, west of Maam Cross as far as the Weir Bridge at the west end of Glendollagh Lough.
ER3: Twelve Bens/Garraun Complex cSAC/pNHA (Site Code: 002031),	This is one of the largest and most diverse sites of conservation importance in Ireland, with a wide range of habitats and species. Twelve Bens/Garraun Complex cSAC/pNHA is designated for the presence of eight habitats listed under Annex I of the EU habitats directive and four species listed under Annex II of the same directive. Habitats and species for which the site is designated are outlined in **Tables 10.7 and 10.8.**	Twelve Bens/Garraun Complex is designated under the EU Habitats Directive, and as such it is of **International Importance.**	Yes	Works to be carried out within cSAC/pNHA boundary, west of Glendollagh Lough.
ER4: Connemara Bog Complex	This is a large site encompassing the majority of the	Connemara Bog Complex	Yes	Connemara Bog Complex

Ecological receptors subject to impacts associated with the proposed Greenway Project	Summary descriptions of ecological receptors	Ecological Receptor Valuation	Selection as key ecological receptors	Locations
cSAC/pNHA (Site Code: 002034), and Connemara Bog Complex SPA (Site Code: 004181).	south Connemara lowlands with the main habitat, lowland blanket bog. Connemara Bog Complex cSAC/pNHA is designated for the presence of thirteen habitats listed under Annex I of the EU habitats directive and four species listed under Annex II of the same directive. Habitats and species for which the site is designated are outlined in **Tables 10.9 and 10.10.** This SPA supports three species which regularly visit the site an area on Annex I of the E.U. Birds Directive (see **Table 10.11 and Table 10.12**).	is designated under the EU Habitats Directive, and as such it is of **International Importance.**		cSAC/pNHA is mostly located south of the proposed Greenway for its entire route. Works to be carried out within cSAC/pNHA boundary, in Leam West, Derryerglinna, Ballinafad, Enlaghmore, Knocknacailligh. Works to be carried out at northern boundary of SPA 1.5km west of Oorid Lough and within SPA at Emlaghmore.
ER5: Watercourses within the study area	The watercourses and drainage ditches within the study area are all hydrologically linked to the designated sites, and some are located within these designated sites. In addition, some of these watercourses contain species of conservation concern such as Atlantic Salmon or Freshwater Pearl Mussel.	As all watercourses within the study area are linked to EU designated sites, and some contain EU Annex I species, they are considered to be of **International Importance**. It should also be noted that drainage ditches in the study area can act as conduits of silt and other pollutants to watercourse and EU designated sites.	Yes	Throughout the study area. There are significant crossings at old railway bridge sites. Bridge crossings at: Canrawer - Owenriff River Glengowla East - Owenriff River Glengowla West - Owenriff River (2 crossings) Derryerglinna – Stream feeding Lough Agraffard
ER6: Annex I habitats within the study area	Numerous habitats listed on Annex I of the EU Habitats Directive occur within the study area, including;	All of these habitats are protected under EU law. **International**	Yes	Throughout the study area, on either side of the existing disused rail track.

Ecological receptors subject to impacts associated with the proposed Greenway Project	Summary descriptions of ecological receptors	Ecological Receptor Valuation	Selection as key ecological receptors	Locations
	7130 Blanket Bog (* if active Bog) 7150 Depressions on peat substrates of the Rhyncosporion 4010 Northern Atlantic Wet Heaths with *Erica tetralix* 4030 European Dry Heaths 3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*), 91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles 91E0 Alluvial Forests with *Alnus glutinosa* and *Fraxinus excelsior* 7210 Calcareous fens with Cladium mariscus and species of the Caricion davallianae Therefore ER6 has been subdivided to adequately assess each of these habitats separately.	**Importance.**		
	ER6a – 7130 Blanket Bog: Much of the land either side of the proposed Greenway, throughout its route, is blanket bog. These are some areas which correspond to the Priority habitat Active Blanket Bog. Areas of bog which are intact but inactive correspond to the EU Annex I habitat Blanket Bog, but these are not considered as 'Priority' habitats. See **Figure 10.3** for locations of active and inactive blanket bog within the study area.	**International Importance.**	Yes	
	ER6b – 7150 Depressions on peat substrates of the Rhyncosporion: Pockets of this habitat type occurred within cut drains and small areas of Cutover Bog in the study area. **Figure 10.3** shows locations of Cutover Bog within the study area. This Annex I habitat type was not found within all areas of Cutover Bog, however, and in most cases the areas were too small to	**International Importance.**	Yes	

Ecological receptors subject to impacts associated with the proposed Greenway Project	Summary descriptions of ecological receptors	Ecological Receptor Valuation	Selection as key ecological receptors	Locations
	be considered 'viable'.			
	ER6c – 4010 Northern Atlantic Wet Heaths with *Erica tetralix*: Several areas of Wet Heath HH3 which correspond to this Annex I habitat were found within the study area (see **Figure 10.3**).	**International Importance.**	Yes	
	ER6d – 4030 European Dry Heaths: Several small areas of Dry Siliceous Heath HH1 which correspond to this Annex I habitat type were found within the study area (see **Figure 10.3**).	**International Importance.**	No	
	ER6e – 3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*): The proposed Greenway runs adjacent to numerous lakes which have been classified as Acid Oligotrophic Lakes FL2, including Lough Bofin, Lough Shindilla, Oorid Lough, Glendollagh (Garroman) Lough, Athry Lough and Ballynahinch Lake. All of these lakes correspond to the EU Annex I habitat 3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*).	These lakes are considered to be 'best examples' of this habitat type, and are therefore considered to be of **International Importance**.	Yes	
	ER6f - 91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles. Small areas of woodland which correspond to the Annex I habitat are found fringing lakes and on islands within the study area.	**International Importance.**	Yes	
	ER6g - 91E0 Alluvial Forests with *Alnus glutinosa* and *Fraxinus excelsior* Small areas of woodland which correspond to the Annex I habitat are found fringing lakes and rivers within the study area.	**International Importance.**	Yes	
	ER6h -7210 Calcareous fens with Cladium mariscus and species of the Caricion davallianae Two lakes which appear to be under transition from	**International Importance.**	Yes	

Ecological receptors subject to impacts associated with the proposed Greenway Project	Summary descriptions of ecological receptors	Ecological Receptor Valuation	Selection as key ecological receptors	Locations
	Lake to Fen were found within the study area, one in Maam Cross and the other in Lurgan. The habitats are best classified as Rich Fen and Flush PF1. This habitat is linked to the Annex I Priority Habitat 7210 Calcareous fens with Cladium mariscus and species of the Caricion davallianae. Slender Cotton Grass was also recorded on the shores of the lake in Maam Cross.			
ER7: Annex II species (EU Habitats Directive) and Annex I species (EU Birds Directive)	Numerous species listed on Annex II of the EU Habitats Directive occur within the study area, including; Freshwater Pearl Mussel (*Margaritifera margaritifera*), Lesser Horseshoe Bat (*Rhinolophus hipposideros*), Otter (*Lutra lutra*), Atlantic Salmon (*Salmo salar*) and White-clawed Crayfish (*Austropotamobius pallipes*). Therefore ER7 has been subdivided to adequately assess each of these species separately.	All of these species are protected under EU law. They are considered to be of **International Importance**[8].	Yes	
	ER7a – Freshwater Pearl Mussel: The Freshwater Pearl Mussel is known to occur in several watercourses within, or downstream of, the study area, most notably a nationally-important population within the Owenriff River just west of Oughterard. A report on the species is included in **Appendix C.2**.			Owenriff River
	ER7b - Otter: Although no otter signs were noted during the survey for the proposed Greenway, signs of otter activity were noted at many of the watercourses in the study area during site surveys for the N59 upgrade.			Records from watercourses throughout the study area.
	ER7c - Atlantic Salmon: Atlantic Salmon is known to occur within Derryneen Lough and the Owenglin River.			Derryneen Lough and the Owenglin River

[8]The Guidelines for Assessment of Ecological Impacts of National Road Schemes state that 'It is suggested that, in general, 1% of the national population of such species qualifies as an internationally important population. However, a smaller population may qualify as internationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.' Given that relatively little is known about the local populations of these species within the study area, however, all populations are considered to be of International Importance, as per the Precautionary Principle.

Ecological receptors subject to impacts associated with the proposed Greenway Project	Summary descriptions of ecological receptors	Ecological Receptor Valuation	Selection as key ecological receptors	Locations
	The latter has been confirmed as a salmonid spawning and nursery area.			
	ER7d - Lesser Horseshoe Bat: The lesser horseshoe bat, although not encountered during site surveys, is known to occur in the area. Several roosts are present to the south east of the study area. The nearest known roost to the study area is a maternity roost in Oughterard, approximately 3km east of the study area.			No records in study area.
	ER7e – Marsh Fritillary: This species has been recorded from Grid Square M14. It has also been sighted recently at Maam Cross (NPWS pers. comm.). This species was not recorded during the site surveys.			Grid Square M14 and Maam Cross.
	ER7f – Kerry Slug: The Kerry Slug has recently been recorded in the Oughterard area. This species was not found during site surveys, but it may occur within the study area. The blanket bog provides suitable habitat for this species.			No records in study area.
	ER7g - Kingfisher: This species has been recorded along the Owenriff in the past; however, the species was not seen during the recent site surveys.			No records in study area.
	ER7h - Whooper Swans: Have been recorded in the lakes in Connemara Bog Complex.			Connemara Bog Complex
ER8: Faunal Species protected under the Irish Wildlife Acts.	Species protected under Schedule 5 Wildlife Act 1976 (as amended), include Badger, Bat species, Deer species, Hare, Hedgehog, Otter, Pine Marten, Red Squirrel AND Smooth Newt. Therefore, ER8 has been subdivided to adequately assess each of these species	All of these species are protected under Irish Law. Where they occur they are considered to be of **National Importance**[9].	Yes	

[9] The *Guidelines for Assessment of Ecological Impacts of National Road Schemes* state that *'It is suggested that, in general, 1% of the national population of such species qualifies as a nationally important population. However, a smaller population may qualify as internationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.'* Given that relatively little is known about the local populations of these species within the study area, however, all populations are considered to be of International Importance, as per the Precautionary Principle.

Ecological receptors subject to impacts associated with the proposed Greenway Project	Summary descriptions of ecological receptors	Ecological Receptor Valuation	Selection as key ecological receptors	Locations
	separately.			
	ER8a - **Badger:** No signs of badger activity or setts were noted along the proposed Greenway. However, a number of carcasses of the species have been found on or in the verge of the existing N59.			No records in study area.
	ER8b - Bat Species: All of the ten known Irish species have been recorded within or in the vicinity of the study area. Eight known roosts were found immediately adjacent to the study area, four of which are Lesser Horseshoe Bat. The key locations of importance for bats for commuting and foraging along the proposed Greenway include water bodies, watercourses, woodlands, tree lines and hedgerows. Additional habitats include areas of scrub and scattered trees. Older, mature trees in the area also offer roosting opportunities for bats. Some of these and indeed younger trees which have ivy cover may be used for roosting by bats on occasion. Older buildings and structures such as bridges offer potential for summer and winter roosts.			No records in study area.
	ER8c - Deer species: All deer species in Ireland are protected under the Irish Wildlife Act. Red Deer are known to be widespread within Connemara and the NPWS Rare and Protected Species database has records for this species within all the relevant Grid Squares. The NPWS Rare and Protected Species database has one record for Fallow Deer (*Dama dama*) in the area, from Grid Square M14, though no specific location is given.			Grid Square M14
	ER8d - Irish Hare: The habitats within the study area would provide local hare populations with suitable			No records in study area

Ecological receptors subject to impacts associated with the proposed Greenway Project	Summary descriptions of ecological receptors	Ecological Receptor Valuation	Selection as key ecological receptors	Locations
	habitat, and there are numerous records for this species in the NPWS Rare and Protected Species Records for this area. It is therefore likely that hares may occur within the study area. No hares were, however, sighted during field surveys.			
	ER8e - Pine Marten: According to the NPWS Rare and Protected Species Records, Pine Marten has been recorded from Recess. There are several areas of coniferous and mixed forest within the study area, as well as three areas of clear felled conifer plantation. These areas provide suitable habitat for Pine Marten.			Recess
	ER8f - Red Squirrel: Forests composed of Pine, particularly Scots Pine, provide suitable habitat for Red Squirrel. The mixed coniferous forest found within and adjacent to the study area may provide suitable habitat for Red Squirrel. The species was not recorded during site visits, however, and there are no records for this species in the NPWS Rare and Protected Species records for the area.			No records in study area
	ER8g - Stoat: The NPWS has one record for Stoat within the study area - from Clifden. This species is known to be widespread throughout the country, though no specific studies have been carried out to date. It is likely that this species occurs within the study area, due to the presence of suitable habitat.			Clifden
	ER8h - Hedgehog: It is quite likely that this species occurs within the study area. The NPWS Rare and Protected Species Database have two records for Hedgehog in the wider area – from Cashel and Oughterard.			Cashel and Oughterard.
	ER8i - Pygmy Shrew: The habitats recorded within the			No records in study area.

Ecological receptors subject to impacts associated with the proposed Greenway Project	Summary descriptions of ecological receptors	Ecological Receptor Valuation	Selection as key ecological receptors	Locations
	study area would provide Pygmy Shrew with suitable habitat. The species was, however, not recorded during site visits.			
	ER8j – Common Lizard: The Common Lizard was noted in a bog adjacent to the existing N59 during site surveys. The large areas of bog and heath provide suitable habitat for this species.			Recorded from bog adjacent to the N59.
	ER8k – Common Frog: Frog Spawn was noted in a field adjacent to the existing N59 road during site surveys for the upgrade of that road. It is likely that this species occurs in water bodies throughout the study area.			Recorded from a field adjacent to the N59.
	ER8k – Smooth Newt: It is likely that this species occurs in water bodies throughout the study area.			No records in study area.
ER9: Flora Protection Order (FPO) Species	Species protected under the Flora Protection Order, 1999 which may occur within the study area include Bog Hair-grass, Slender Cottongrass and Bog Orchid. Therefore, ER66 has been subdivided to adequately assess each of these species separately.	All of these species are protected under Irish Law. Where they occur they are considered to be of **National Importance**[10].	Yes	
	ER9a – Bog Hair-grass: The NPWS Rare and Protected Species database contains records for this species from Oorid Lough and the Owenwee River, which are both within the study area. However, it was not recorded during site surveys.			Oorid Lough and the Owenwee River.
	ER9b - Slender Cottongrass: It has been recorded			Maam Cross

[10] The *Guidelines for Assessment of Ecological Impacts of National Road Schemes* state that *'It is suggested that, in general, 1% of the national population of such species qualifies as a nationally important population. However, a smaller population may qualify as internationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.'* Given that relatively little is known about the local populations of these species within the study area, however, all populations are considered to be of International Importance, as per the Precautionary Principle.

Ecological receptors subject to impacts associated with the proposed Greenway Project	Summary descriptions of ecological receptors	Ecological Receptor Valuation	Selection as key ecological receptors	Locations
	from four of the relevant Grid Squares – L74, L84, L94 and M14. The NPWS Rare and Protected Species database has a record for this Slender Cottongrass from Maam Cross; this location was confirmed during botanical surveys.			
	ER9c – Bog Orchid: This species has not been recently recorded in the area, but the large tracts of bog within the study area provide ideal habitat. It may therefore occur within the study area. However, it was not recorded during site surveys.			No records, not found during surveys
ER10: BoCCI Bird Species	Snipe, Chaffinch and Swallow, are species listed on the BoCCI amber list and were recorded within the study area during site surveys. Bird species on the amber list are considered to be of medium conservation concern.	As these species are all considered to be of conservation concern in Ireland, they are of **National Importance**	Yes	Throughout the study area
ER11: Hedgerow Network	Hedgerows are uncommon within the study area, and not generally very species-rich. However, where they occur they are of ecological importance.	These hedgerows provide links between habitats of higher ecological value, such as the woodlands within the site. They may also act as navigation routes for bat species in the locality. They are therefore considered to be of **Local Importance (Higher Value)**.	Yes	Throughout the study area
ER12: Treelines	Treelines have a scattered distribution within the study area, occurring mainly as field and property boundaries. Treelines are generally dominated by Ash, with some Oak and conifers.	Treelines within the study area are moderately species-rich, and provide links between habitats of higher ecological value,	Yes	Throughout the study area

Ecological receptors subject to impacts associated with the proposed Greenway Project	Summary descriptions of ecological receptors	Ecological Receptor Valuation	Selection as key ecological receptors	Locations
		such as the woodlands within the site. They may also act as navigation routes for bat species in the locality. They are therefore considered to be of **Local Importance (Higher Value)**.		
ER13: Wet Grassland GS4	This habitat occurs in numerous locations throughout the study area often in a matrix with other semi-natural wetland habitats included bog and marsh areas. Areas of this habitat vary from species-rich to species-poor.	This habitat is often located adjacent to wet Annex I habitats and provide semi-natural habitat and therefore considered to be of **Local Importance (Higher Value)**.	Yes	Throughout the study area
ER14: Acid Grassland GS3	This habitat occurs in numerous locations throughout the study area mostly on areas of cutover or highly modified bog that has been drained and reclaimed for agriculture, but which is not intensively managed.	This site does not correspond to any Annex I habitats but is of a high degree of naturalness and is of high biodiversity value in a local context. It is therefore considered to be of **Local Importance (Higher Value)**.	Yes	Throughout the study area
ER15: Mesotrophic Lake FL4	These lakes contain plant species such Water Lily (*Nuphar* spp.) and Bogbean (*Menyanthes trifoliata*) and either support Annex II species, such as Salmon in Derryneen Lough, or are upstream in catchment which supports Annex II species, such Lough Adrehid upstream of Freshwater Pearl-mussel populations.	These sites either support, or are upstream of Annex II species and therefore are considered to be of **International Importance.**	Yes	Lough Adrehid, Derryneen Lough, Lough Tawnagh

Ecological receptors subject to impacts associated with the proposed Greenway Project	Summary descriptions of ecological receptors	Ecological Receptor Valuation	Selection as key ecological receptors	Locations
ER16: Wet Willow Alder Ash WN6 woodland	There are numerous areas of Wet Willow Alder Ash WN6 woodland either side of the existing track throughout the study area.	This site does not correspond to any EU Annex I habitats, but is a semi-natural habitat with a high degree of naturalness and high biodiversity value in a local context, and is therefore considered to be of **Local Importance (Higher Value)**.	Yes	Throughout the study area
ER17: Dry Calcareous / Neutral Grassland throughout the study area and at Knockcallíagh townland	At Knockcallíagh townland there is an area of this habitat which has a relatively high species richness occurring along the existing track for approximately 340m. This habitat is best classified as Dry Calcareous Neutral Grassland GS1.	This habitat/site does not correspond to any EU Annex I habitats, but it is a semi-natural habitat with a high degree of naturalness and high biodiversity value in a local context. It is therefore considered to be of **Local Importance (Higher Value)**.	Yes	Throughout the study area and the dismantled railway track in Knockcallíagh.
ER18: Cutover Bog PB4	This habitat is found throughout the study area often in close proximity to intact areas of blanket bog or sometimes afforested. Dominant vegetation includes small pockets of Annex I habitat **Depressions on peat substrates of the Rhyncosporion** can found within this habitat. The proposed Greenway runs offline from the dismantled railway, through an area of Cutover Bog, between Ch. 4+050 and Ch. 4+300, in the townland of Gowlan West, approximately 3km west of	This habitat/site does not correspond to any EU Annex I habitats, but it may contain pockets of Annex I habitat and may contain rare species. It is therefore considered to be of **Local Importance (Higher Value)**.	Yes	Either side of the existing rail line throughout the study area. Offline section at Gowlan West.

Ecological receptors subject to impacts associated with the proposed Greenway Project	Summary descriptions of ecological receptors	Ecological Receptor Valuation	Selection as key ecological receptors	Locations
	Clifden. The proposed Greenway runs offline from the dismantled railway, along the R336, at the edge of an area of Cutover Bog, between Ch. 35+000 and Ch. 35+100, in the townland of Lurgan, north of Maam Cross. The proposed Greenway runs north offline from the N59, through an area of Cutover Bog, along an old trackway, approximately 270m east of Maam Cross approximately at Ch.35+450, in the townland of Lurgan. The Greenway will extend for approximately 300m through this area of Cutover Bog.			
ER19: Reed and Large Sedge Swamps FS1	This habitat is found in a number of locations throughout the study area in drains and as fringing vegetation around lakes.	This habitat/site does not correspond to any EU Annex I habitats, but it is a semi-natural habitat with a high degree of naturalness and high biodiversity value in a local context. It is therefore considered to be of **Local Importance (Higher Value)**.	Yes	Either side of the existing rail line throughout the study area.

10.4 POTENTIAL IMPACTS

Impacts have been assessed according to the methodology outlined in **Section 10.2**. The study area of the proposed Greenway Project comprises a mosaic of terrestrial and aquatic habitats, including rivers, streams and drains, lowland bog, cutover bog, wet and dry heath, semi-natural grassland communities, marsh, woodlands, and improved agricultural grassland. Areas of lake, bog, wet and dry heath, rich fen and oak woodland have been identified which correspond to Annex I habitats. Some of these habitats occur outside the Natura 2000 sites and the nationally protected NHAs. Under the Environmental Liability Directive (2004/35/EC) undermining the maintenance and long-term viability of the relevant protected biodiversity amounts to biodiversity damage, irrespective of whether the protected biodiversity, be it habitats or species, is within or outside a designated site.

In addition, Article 10 of the Habitats Directive refers to features of the landscape which are of major importance for wild flora and fauna, by virtue of their linear and continuous structures (such as rivers with their banks or the traditional systems for marking field boundaries), or their function as stepping stones (such as ponds or small woods). These features are essential for the migration, dispersal and genetic exchange of wild species. Member States are required to endeavour, where they consider it necessary, in their land use planning and development policies, to encourage the management of these features of the landscape, with a view to improving the ecological coherence of the Natura 2000 network.

The precautionary principle is used if there is any reasonable doubt as to whether an impact on a Natura 2000 site is likely.

The majority of the proposed works will be carried out along the existing disused rail route and therefore direct impacts on species diversity and loss of feeding habitat for local animal populations will be minimal. However, the Zone of Influence in ecological terms may extend beyond the works proposed, particularly where works are to be carried out in or adjacent to watercourses and in relation to water dependant habitats. The proposed project has the potential to pollute watercourses which may impact on Annex II species. The proposed project also has the potential to disrupt the hydrological regime of wetlands and peat bogs, such as drying out the peat which affects the vegetation composition, primarily the peat forming *Sphagnum* moss species. If soil conditions are not adequate this may lead to the eventual loss of vegetation cover, change in floristic habitat and even loss of floristic habitat.

A number of terrestrial non-native invasive species were recorded within the study area, including Japanese Knotweed, Giant Rhubarb and Rhododendron. These species are considered to be amongst the most unwanted invasive terrestrial species in Ireland and control of their spread during construction is required under the Birds and Habitats Regulations, 2011. General construction impacts are provided in **Table 10.25**.

Table 10.25 Key Construction Activities and Potential Ecological Impacts

Construction Activity	Potential Ecological Impacts
Vegetation and soil stripping	Loss of habitat; loss of rare or protected species; destruction of bird's nests, bat roosts, badger setts, otter holts, etc. containing live animals, spread of invasive and noxious weeds species. Loss of residential seed banks within the soil supporting semi-natural habitats. Loss of soil mycorrhizae, soil profile layers and structure. During periods of heavy rainfall silt laden surface waters from exposed soils can enter watercourses.
Other earthworks	Loss of habitat (e.g. Blanket Bog); potential pollution or loss of habitats/species as a result of deposition of materials. Drainage of habitats. Spread of invasive species. Disturbance of local hydrological regimes.
Blasting and other	Disturbance of animals, especially significant during breeding

Construction Activity	Potential Ecological Impacts
excavations causing high levels of noise and vibration	season; destruction of Badger setts or Otter holts in the extended area due to the high level of vibration.
Construction of structures and hard surfaces	Loss of habitat; creation of an impermeable layer which will alter drainage patterns in the immediate vicinity and may lead to flooding.
Construction of barriers to wildlife movements such as berms, fences and median barriers	Impede access to or movement within wildlife territories.
Construction site drainage	Run-off of pollutants may have an indirect impact on habitats and species, especially those which are water-dependent.
Demolition operations	Loss of bat roosts or birds nests within buildings.
Air pollution and dust deposition	May have a negative effect on any habitats or species of conservation value in the area.
Work associated with site compounds and storage areas	Site compounds and storage areas used during construction operations may lead to loss of or damage to habitats outside the land-take which may not have been accounted for within the Environmental Impact Assessment.
Temporary access routes and crossings	Access routes used during construction works may lead to loss of or damage to habitats inside and outside the land-take which may not have been accounted for within the Environmental Impact Assessment. The installation of undersized temporary crossings may cause flooding and impede fish passage.
Lighting	Lighting used during night working at the construction stage may cause disturbance to bats in the area. Lighting installed for the operation of the road scheme may permanently affect the bat population in the area.
Movement of plant and vehicles	May cause disturbance to wildlife through noise and vibration pollution, may destroy habitats or species of conservation value especially where plant machinery is utilised to traverse watercourses.
Disturbance associated with the presence of construction staff	A general increase in human activity in the area may cause disturbance to wildlife.
New planting	Poor choice of species or locations for planting as part of landscape design and execution of landscaping works, e.g. planting of non-native, foreign provenance and or/invasive species or planting of trees/shrubs etc in an environmentally sensitive area may lead to habitat damage or destruction.
Environmental incidents and accidents	A major environmental accident e.g. a large scale spillage of a contaminant such as diesel or cement which would have major negative and far-reaching impacts, especially on the aquatic environment.

The Key Ecological Receptors affected by the proposed Greenway, and the significance of these impacts, are summarised in **Table 10.26**. Full details of the Characterisation of Potential Impacts to Key Ecological Receptors are provided in **Appendix C.4**. Each of the Key Ecological Receptors is assessed in terms of impacts upon the 'principal elements of ecological value' within the site, in the absence of mitigation measures.

10.4.1 Do Nothing' Impact

If current management practices are continued throughout the study area, the terrestrial features are likely to remain much as they are.

Table 10.26 Summary of Impacts on Key Ecological Receptors

Key Ecological Receptor	Principal elements of ecological value	Ecological Receptor Valuation	Impacts	Likelihood	Significance (unmitigated)
ER1: Lough Corrib cSAC/pNHA (Site Code: 000297) and Lough Corrib SPA (Site Code: 004042)	Land-take	International Importance	Direct	Certain	Temporary Significant Negative
	Annex I Habitats				
	Annex I aquatic habitats which are qualifying interests of Lough Corrib cSAC are considered- Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) (3110) and Hard oligo-mesotrophic waters with benthic vegetation of Chara spp. (3140)	International Importance	Indirect	Extremely Unlikely	Temporary Significant Negative
	7150 Depressions on peat substrates of the Rhynchosporion.	International Importance	Indirect	Extremely Unlikely	Permanent Slight Negative
	Annex II Species	Discussed separately below			
	HH3 Wet Heath		Indirect	Extremely Unlikely	Permanent Moderate Negative
	GS4 Wet Grassland		Direct	Near Certain	Permanent Significant Negative
ER2: Maumturk Mountains cSAC/pNHA (Site Code: 002008),	Land-take	International Importance	Direct	Near Certain	Permanent Slight Negative' or 'Imperceptible' impact
	Annex I Habitats				
	7130 Blanket bog (*active only)	International Importance	Indirect	Extremely Unlikely	Permanent Moderate Negative
	3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*),	International Importance	Indirect	Probable	Short-term Significant Negative
	4010 Northern Atlantic wet heaths with Erica tetralix	International Importance	Indirect	Extremely Unlikely	Permanent Moderate Negative

Key Ecological Receptor	Principal elements of ecological value	Ecological Receptor Valuation	Impacts	Likelihood	Significance (unmitigated)
	7150 Depressions on peat substrates of the Rhynchosporion	International Importance	Indirect	Extremely Unlikely	Permanent Slight Negative
	Annex II Species	Discussed separately below			
	PB4 Cutover Bog		Direct Indirect	Near Certain Extremely Unlikely	Permanent Significant Negative Permanent Slight Negative
ER3: Twelve Bens/Garraun Complex cSAC/pNHA (Site Code: 002031),	Land-take	International Importance	Direct	Near Certain	Permanent Slight Negative' or 'Imperceptible' impact
	Annex I Habitats				
	Qualifying habitat – 7130 Blanket bog habitat within the designated site affected by the proposed Greenway.	International Importance	Indirect	Extremely Unlikely	Permanent Slight Negative
	Qualifying habitat – 3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*), Derryclare Lough	International Importance	Indirect	Probable	Short-term Significant Negative
	Qualifying habitat - 7150 Depressions on peat substrates of the Rhynchosporion	International Importance	Indirect	Extremely Unlikely	Permanent Slight Negative
	Annex II Species	Discussed separately below			
	HH1 Dry Siliceous Heath		Indirect	Near Certain	Permanent Significant Negative
ER4: Connemara Bog Complex cSAC/pNHA (Site Code: 002034), and Connemara Bog Complex SPA (Site Code: 004181).	Land-take	International Importance	Direct	Near Certain	Permanent Slight Negative' or 'Imperceptible' impact
	Annex I Habitats				
	7130 Blanket bog	International Importance	Indirect	Extremely Unlikely	Permanent Moderate Negative
	3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia*	International Importance	Indirect	Probable	Short-term Significant Negative

Key Ecological Receptor	Principal elements of ecological value	Ecological Receptor Valuation	Impacts	Likelihood	Significance (unmitigated)
	uniflorae),				
	4030 European Dry Heaths.	International Importance	No Impacts	No Impacts	No Impacts
	7150 Depressions on peat substrates of the Rhynchosporion	International Importance	No Impacts	No Impacts	No Impacts
	Annex II Species	Discussed separately below			
ER5: Watercourses within the study area	ER5a - Water quality	International Importance	Indirect	Probable	Short-term Major Negative
	ER5b - Aquatic species within the watercourse (including the Annex II species Atlantic Salmon, otter and Freshwater Pearl Mussel – discussed in below)	Discussed separately below			
ER6: Annex I habitats within the study area	ER6a – 7130 Blanket Bog:	International Importance	Indirect	Extremely Unlikely	Permanent Significant Negative
	ER6b – 7150 Depressions on peat substrates of the Rhyncosporion:	International Importance	Indirect	Extremely Unlikely	Permanent Slight Negative
	ER6c - 4010 Northern Atlantic Wet Heaths with *Erica tetralix*:	International Importance	Indirect	Extremely Unlikely	Permanent Significant Negative
	ER6d – 4030 European Dry Heaths	International Importance	Indirect	National Importance	Permanent Slight Negative
	ER6e - Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*):	International Importance	Indirect	Probable	Short-term Significant Negative
	ER6f - 91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles.	International Importance	Indirect	Extremely Unlikely	Permanent Slight Negative
	ER6g - 91E0 Alluvial Forests with *Alnus glutinosa* and	International Importance	Indirect	Extremely Unlikely	Permanent Slight Negative

Key Ecological Receptor	Principal elements of ecological value	Ecological Receptor Valuation	Impacts	Likelihood	Significance (unmitigated)
	Fraxinus excelsior				
	ER6h - 7210 Calcareous fens with Cladium mariscus and species of the Caricion davallianae	International Importance	Indirect	Unlikely	Temporary, Significant Negative
ER7: Annex II species (EU Habitats Directive) and Annex I species (EU Birds Directive)	ER7a – Freshwater Pearl Mussel:	International Importance	Indirect	Probable	Short-term Significant Negative
	ER7b - Otter:	International Importance	Indirect	Probable	Temporary Significant Negative
	ER7c - Atlantic Salmon	International Importance	Indirect	Near Certain	Temporary Major Negative
	ER7d - Lesser Horseshoe Bat:	International Importance	Indirect	Unlikely	Temporary Slight Negative
	ER7e – Marsh Fritillary:	International Importance	No impact		
	ER7f – Kerry Slug:	International Importance	No impact		
	ER7g - Kingfisher:	International Importance	Indirect	Probable	Temporary Slight Negative
	ER7h - Merlin:	International Importance	Indirect	Probable	Temporary Slight Negative
	ER7i **–** Golden Plover	International Importance	Indirect	Probable	Temporary Slight Negative
ER8: Faunal Species protected under the Irish Wildlife Acts.	ER8a - Badger	National Importance	No Impacts		
	ER8b - Bat Species	National Importance	Indirect	Near Certain	Permanent Significant Negative
	ER8c - Deer species	National Importance	No Impacts		
	ER8d - Irish Hare	National Importance	No Impacts		
	ER8e - Pine Marten	National Importance	No Impacts		
	ER8f - Red Squirrel	National Importance	No Impacts		
	ER8g - Stoat	National Importance	No Impacts		
	ER8h - Hedgehog	National Importance	No Impacts		

Key Ecological Receptor	Principal elements of ecological value	Ecological Receptor Valuation	Impacts	Likelihood	Significance (unmitigated)
	ER8i - Pygmy Shrew	National Importance	No Impacts		
	ER8j – Common Lizard	National Importance	No Impacts		
	ER8k – Common Frog	National Importance	Indirect	Probable	Temporary Significant Negative
	ER8k – Smooth Newt	National Importance	Indirect	Probable	Temporary Significant Negative
ER9: Flora Protection Order (FPO) Species	ER9a – Bog Hair-grass	National Importance	No Impacts		
	ER9b - Slender Cottongrass	National Importance	No Impacts		
	ER9c – Bog Orchid	National Importance	No Impacts		
ER10: BoCCI Bird Species	Snipe, Swallow, Whooper Swan and Chaffinch	National Importance	Indirect	Probable	Temporary Slight Negative
ER11: Hedgerow Network	• General floristic value • Bird nesting potential • Value as 'wildlife corridors' Value as foraging and navigational routes for bats	Local Importance (Higher Level).	Direct	Near Certain	Permanent Slight Negative
ER12: Treelines	• General floristic value • Bird nesting potential • Value as 'wildlife corridors' • Value as foraging and navigational routes for bats	Local Importance (Higher Level).	Direct	Near Certain	Permanent Slight Negative
ER13: Wet Grassland GS4	General floristic value	Local Importance (Higher Level).	Direct	Near Certain	Permanent Slight Negative
ER14: Acid Grassland GS3	General floristic value	Local Importance (Higher Level).	Direct	Near Certain	Permanent Slight Negative
ER15: Mesotrophic Lake FL4	Water Quality and Aquatic species within the lake	International Importance	Indirect	Near Certain	Temporary Significant Negative
ER16: Wet Willow Alder Ash WN6 woodland	General floristic value, Bat roosting and Bird nesting potential	Local Importance (Higher Level).	Direct/ Indirect	Near Certain	Permanent Significant Negative
ER17: Dry Calcareous /	General floristic value	Local Importance (Higher Level).	Direct	Near Certain	Permanent Moderate Negative

Key Ecological Receptor	Principal elements of ecological value	Ecological Receptor Valuation	Impacts	Likelihood	Significance (unmitigated)
Neutral Grassland					
ER18: Cutover Bog PB4	General floristic value	Local Importance (Higher Level).	Direct	Near Certain	Permanent Significant Negative
ER19: Reed and Large Sedge Swamps FS1	General floristic value	Local Importance (Higher Level).	Direct	Near Certain	Permanent Moderate Negative

10.5 MITIGATION MEASURES

10.5.1 General

Mitigation measures are proposed to address the adverse effect on the ecological receptors identified within the zone of influence of the works. These measures will allow any potential impacts affecting the conservation status of the Natura 2000 sites and other sensitive ecological receptors to be minimised and avoided where possible. General mitigation measures are outlined below. Specific measures for each of the ecological receptors are detailed in the following sections.

An over-arching mitigation measure will be for the Galway County Council to draw up a **Method Statement** that includes detailed mitigation measures as outlined below in relation to the implementation of all measures proposed. This method statement will be strictly adhered to by Galway County Council staff and contractors involved in the works and will be overseen by the Galway County Council's site representative/foreman. The NRA documents - '*Guidelines For The Crossing Of Watercourses During The Construction Of National Road Schemes'*, '*Guidelines for the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads (Revision December 2010)*', '*Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub Prior to, during and Post Construction of National Road Schemes*', and '*Environmental Impact Assessment of National Road Schemes, A Practical Guide*' and the CIRIA documents - will form the backbone of the method statement supplemented by specific additional measures proposed below. The method statement will detail how these mitigation measures will be monitored for effectiveness by both Galway County Council themselves and independently by NPWS and IFI. There will be ongoing consultation by Galway County Council with NPWS and IFI throughout all phases of the works which will include attendance at progress meetings at stages agreed in advance by Galway County Council and designated NPWS and IFI representatives. A mechanism for reporting of pollution incidents will be agreed in advance between the contractor(s) and NPWS IFI.

10.5.1.1.1 Mitigation Measures for the Control of Airborne Pollutants during Construction Activities

To protect sensitive receptors in the vicinity of the proposed Greenway works the following measures are proposed. Measures to mitigate the emission of dust due to construction activities include;

- control of vehicle access,
- vehicle speed restrictions,
- bed of gravel at site exit points to remove caked on dirt from tyres and tracks,
- washing of equipment at the end of each work day, if they are to be moved off site,
- prevention of on-site burning,
- hard surface roads should be wet swept to remove any deposited materials,
- unsurfaced roads should be restricted to essential site traffic only, and
- wheel-washing facilities should be located at all exits from the construction site.

10.5.1.2 Mitigation Measures for Protection of Waterbodies

The proposed project has been identified as potentially giving rise to adverse effects on water quality within all Natura 2000 sites considered in this report. This has further potential for indirect impacts on the water-dependant Annex I habitats or Annex II species (salmon and otter) adjacent to, or downstream of, the works. The effective protection of water quality within the proposed project during construction and operation phases will minimise the risk to the qualifying interests of this site. Water quality mitigation measures for avoidance, reduction and remediation of impacts are prescribed below.

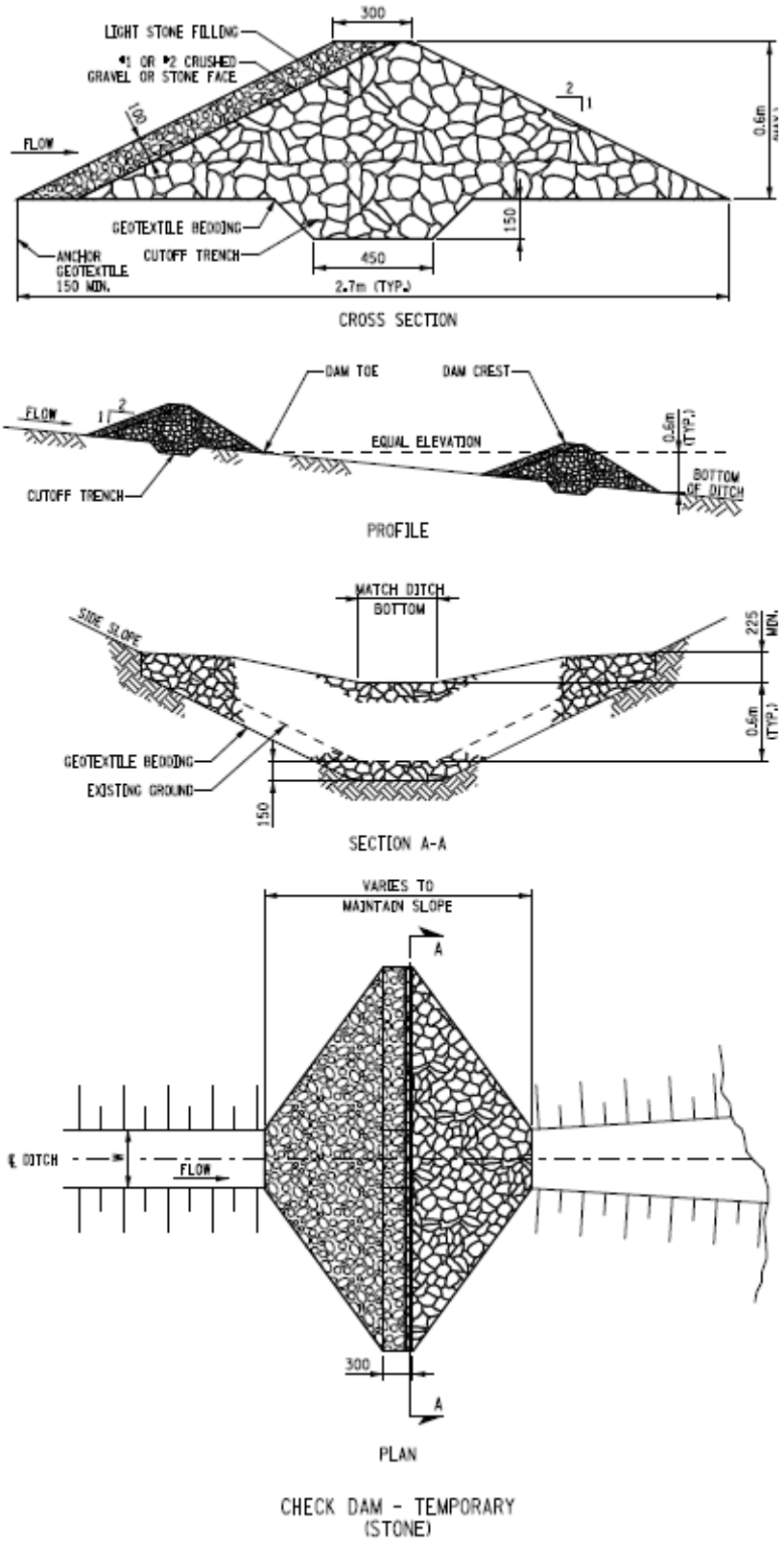
Standard pollution prevention control measures, as outlined in **Table 10.27** below, will be employed where relevant when working in and near the watercourse affected by the proposed works to prevent the transport of deleterious substances to any Natura 2000 sites and their associated water-dependent habitats and species. The method statement will detail how these mitigation measures will be monitored for effectiveness by both Galway County Council themselves and independently by NPWS (IFI). The NPWS or IFI will undertake a programme of water quality monitoring, for suspended solids and colour, as agreed with Galway County Council.

Table 10.27 Standard Pollution Prevention Control Measures

Potential Impact	Mitigation Measure
General	Prior to any works, all personnel involved with the Greenway will receive an on-site induction relating to operations within and adjacent to watercourses and the environmentally sensitive nature of the proximity of the Natura 2000 sites and re-emphasise the precautions that are required as well as the mitigation to be implemented. Galway County Council will ensure that the engineer setting out the works is fully aware of the ecological constraints and mitigation requirements. All matters relating to the Greenway construction works within the vicinity of the Natura 2000 sites or the vicinity of watercourses connected to Natura 2000 sites will be reported on a regular basis to Galway County Council for ongoing review. Any incident or observation of anything that may be considered as causing or likely to cause disturbance or damage to the cSAC will be reported to the Galway County Council immediately. Galway County Council will take immediate action to prevent or limit the impact and will notify the Client contact of the incident and the actions taken. The amount of bare ground created by excavation and vegetation removal will be minimised. In-stream works will be carried out outside of the salmonid spawning season and the times that early life stages of salmonid fish will be present. In-stream work within the period 1st October to 1st May (inclusive) will only be undertaken with advanced approval of Inland Fisheries Ireland and the NPWS.
Pollution of watercourses	The Contractor shall prevent any silting/erosion of water courses and pollution of the water that may adversely affect the quality or appearance of the water or cause obstruction or interference with the flow. The works area either side of the drainage channels will be fenced with Terram or equivalent geo-textile fencing, secured to the ground to prevent the wash-out of suspended solids from the site to the watercourse. Where possible, this will be set back from the riparian corridor of the watercourse to allow the retention of a buffer-zone of riparian vegetation along the drainage channels. Temporary check dams should be placed within drainage ditches adjacent to the proposed Greenway at frequencies which will depend on ditch slope (as per **Table 10.28**) e.g. a ditch with a sope of 1% will have a check dam every 60m Establish site boundary markings to safeguard features of interest/value. Tools and equipment are not to be cleaned in watercourses.

Potential Impact	Mitigation Measure
	Chemicals used shall be stored in sealed containers in the site lockup prior to use. The chemicals shall be applied in such a way as to avoid any spillage or leakage. Any and all excavated material is **NOT** to be temporarily stored adjacent to watercourses. Temporary gangways should be erected if required between river banks and working platforms to avoid the need for walking through watercourses.
Fuel/Lubricant spillage from equipment	Fuelling and lubrication will not be conducted within 50m of any watercourse. Storage areas, machinery depots and site offices will be located at least 50m from any watercourse. Foul drainage from the site offices and facilities will be properly treated and removed to a suitable treatment facility. Spill kits will be made available close to streams and all staff will be properly trained on correct use. All fuels, lubricants and hydraulic fluids will be kept in secure bunded areas at a minimum of 50m from all watercourses. The bunded area will accommodate 110% of the total capacity of the containers within it. Containers will be properly secured to prevent unauthorised access and misuse. An effective spillage procedure will be put in place with all staff properly briefed. Any waste oils or hydraulic fluids will be collected, stored in appropriate containers and disposed of offsite in an appropriate manner. All plant shall be well maintained with any fuel or oil drips attended to on an ongoing basis. Any minor spillage during this process will be cleaned up immediately. Should any incident occur, the situation will be dealt with and coordinated by the nearest supervisor who will be responsible for instructions by Galway County Council.
Concrete	Wet concrete and cement are very alkaline and corrosive and can cause serious pollution to watercourses. Disposal of raw or uncured waste concrete will be controlled to ensure that the watercourse or karst features will not be impacted. Best practice in bulk-liquid concrete management addressing pouring and handling, secure shuttering / form-work, adequate curing times. Where shuttering is used, measures should be put in place to prevent against shutter failure and control storage, handling and disposal of shutter oils. Wash water from cleaning ready mix concrete lorries and mixers may be contaminated with cement and is therefore highly alkaline. Due to the size of the site and the proximity of sensitive watercourses, it is recommended that lorries and mixers are washed out of off site. Cement dust must be controlled as it is alkaline and harmful to the surrounding ecology. Activities which result in the creation of cement dust will be controlled by dampening down areas. The timing of the works must be specified and agreed with the IFI in relation to fish migration and spawning periods
Culvert Installation (if required)	The pollution prevention controls to be adopted during the installation of culverts for the Greenway, are critical. If temporary or permanent diversions of any watercourses are required, this should be carried out prior to the removal of bankside vegetation. Temporary stream diversions should be made on geotextile surfaces with a surface layer of coarse aggregate to hold it in place. Operation of machinery instream should be kept to an absolute minimum. All construction machinery operating instream should be mechanically sound to avoid leaks of oils, hydraulic fluid, etc. Machinery should be steam-cleaned and checked prior to commencement of instream works. Such works would preferentially be done during the dry period of the year when flows are low and the risk of suspended solids release is minimal. All dewatering flow should be passed through settlement ponds as detailed

Potential Impact	Mitigation Measure
	above, to remove sediments.
Noise and vibration from use of equipment	All works at any watercourse should make a 'short-start' to activities to allow salmon and other fish to move away before the full intensity of works begins. Work will be undertaken during daylight hours, starting no earlier than two hours after dawn and finishing no later than two hours before dusk, between March and October; and to start no earlier than one hour after dawn and finish one hour before dusk from November to February; and shall not continue for periods of more than 12 hours, to prevent disturbance to nocturnal species. Specific measures in relation to protected species or habitats where they occur within the proposed works are detailed below.
Exhaust emissions from equipment	Vehicles and plant shall be properly maintained and shall not be left idling when not in use.
Contaminated surface and/or groundwater	Excess surface water runoff will be treated prior to entering any drains or watercourses adjacent to Greenway works. See **Pollution of watercourses** above.
Vegetation and soil protection measures	These measures are discussed in greater detail below
Invasive Species	Zebra Mussel has been recorded in the Lough Corrib catchment, therefore all necessary measures and precautions should be undertaken to prevent further spread, the following measure must be implemented; All access scaffolding used within watercourses and all footwear/ waders, etc used within watercourses must be steam cleaned prior to arrival on site to prevent the spread of invasive aquatic species such as Zebra Mussel. A sign off sheet must be maintained to confirm cleaning, - The use of machinery and equipment that has been used in waters infested with Zebra Mussel should be avoided in order to prevent the further spread of this alien species. Should vehicles that have previously been used in Zebra Mussel infested waters be used on-site, they will be steam-cleaned according to Inland Fisheries Ireland guidelines and steam cleaned after use.



Notes

- Maximum drainage area contributing to temporary stone check dam shall be 0.8 ha.
- Measures shall be inspected every (7) calendar days or after each rainfall of 12mm or more within a 24 hour period. Measures shall be cleaned and repaired as required.
- Sediment shall be removed when accumulation reaches one-half of the measure height. Sediment shall be disposed of as unsuitable material
- Coarse aggregate facing material for the stone check dam shall meet the requirement of coarse aggregate filling, and
- Stone filling core material for the stone check dam shall meet the gradation requirements of light stone filling.

Stone Check Dam Placement Interval

Ditch Slope	Temporary Check Dam Placement Interval (Based on 0.6m Height)
1%	60m
2%	30m
3%	20m
4%	15m
5%	12m
6%	10m
8%	7.5m
10%	6m

***I =H/S**
Where
I = Check Dam Spacing Interval
H= Check Dam Height
S= Channel Slope

TEMPORARY CHECK DAM VOLUMES	
DITCH SIDE SLOPE	VOLUME (m^3)
1:2	1.0 m^3 ±
1:3	1.5 m^3 ±
1:4	2.0 m^3 ±
1:6	3.0 m^3 ±

BASED ON V SHAPED DITCH SECTION
FOR TRAPEZOIDAL DITCH, ADD
1 CUBIC METER / METER OF DITCH WIDTH

Figure 10.4 Structural Measures for Erosion and Sediment Control - Temporary Check Dams in Interceptor Ditches

10.5.1.3 Invasive Plant Species Management

Mitigation measures are also required for invasive species management which occur along the proposed Greenway. The following National Roads Authority (NRA) guidelines will be followed in relation to all non-native invasive plant species along the route and in particular the locations outlined in **Table 10.23**.

Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads (NRA, 2008).

A method statement in relation to biosecurity measures for non-native invasive species within the site will also be agreed in advance with NPWS and IFI.

A summary of the Physical and Chemical Control Measures for Japanese Knotweed is provided below:

Physical Control Measures for Japanese Knotweed

Method	Season	Follow-up
Mowing or cutting (only in conjunction with herbicide treatment)	Four cuts required within a single season. Last cut by **mid-September**.	Requires follow-up in following year.
Excavation	**Any season** but soil must be suitably dry.	Requires monitoring to ensure complete control.

Chemical Control Measures for Japanese Knotweed

Chemical	Season	Follow-up
Glyphosate	**May-June** or **October to November**.	Foliar spray or stem injection.
2,4-D	**May-June** with follow-up in **October to November**.	Wiper applicator or spot treatment.
Picloram	As for 2-4,D	

A summary of the Physical and Chemical Control Measures for Giant Rhubarb is provided below:

Physical Control Measures for Giant Rhubarb

Method	Season	Follow-up
Grubbing	Pre-flowering following recent rain. Only suitable for recently established infestations.	Regular follow-up to deal with seedlings or re-sprouting.
Removal of flower heads	**Before flowering in June.**	Only effective in preventing seed dispersal.

Chemical Control Measures for Giant Rhubarb

Chemical	Season	Follow-up
Glyphosate	During active growth late in the growing season – **late August / early September.**	Foliar spray, wiper applicator or spot treatment.
2,4-D amine	During active growth late in the growing season – **late August / early September.**	Foliar spray, wiper applicator or spot treatment.
Triclopyr	Late in the growing season – **late August / early September.** Not when hot or during drought.	Foliar spray or spot treatment.

A summary of the Physical and Chemical Control Measures for Rhododendron is provided below:

Physical Control Measures for Rhododendron

Method	Season	Follow-up
Cutting	**Anytime of the year.**	Very labour intensive and does not kill plant. Regular follow-up to deal with re-growth required.
Uprooting	**Anytime of the year.**	Small plants can be pulled by hand. Large stems cut and roots grubbed out by winch or machine.
Mulch matting	**Anytime of the year.**	Labour intensive. Requires maintenance and follow up treatment.
Bud-rubbing	**Spring to autumn.**	Labour intensive. Requires regular follow-up.

Chemical Control Measures for Rhododendron

Chemical	Season	Follow-up
Glyphosate	During active growth in **late spring or summer (June to September)**. May require follow-up for 2–3 years.	Foliar spray, wiper applicator or spot treatment. Also as stem injection or cut-stump.
Triclopyr	During active growth in **late spring or summer (June to September)**. May require follow-up for 2–3 years.	As for glyphosate. Do not apply if very hot or during drought.

A summary of the Physical and Chemical Control Measures for Himalayan Balsam is provided below:

Physical Control Measures for Himalayan Balsam

Method	Season	Follow-up
Hand pulling	Pre-flowering following recent rain.	Regular follow-up to deal with seedlings.
Mowing or cutting	Before flowering in **June**. Mowing required regularly for control.	Regular follow-up to deal with seedlings.

Chemical Control Measures for Himalayan Balsam

Chemical	Season	Follow-up
Glyphosate	During active growth in late spring **(Late April to May)**.	Foliar spray, wiper applicator or spot treatment.
2,4-D amine	During active growth in late spring **(Late April to May)**.	Foliar spray, wiper applicator or spot treatment.

Note: where Non-Native Invasive Plant Species are found within designated sites only physical methods of eradication are to be applied.

10.5.2 Avoidance and Mitigation Measures specific to each Ecological Receptor

Table 10.28 Avoidance/Mitigation Measures and Residual Impact Assessment for Lough Corrib cSAC/SPA/pNHA (ER1)

ER1: Lough Corrib cSAC/SPA/pNHA: principal elements of ecological value	Avoidance/Mitigation Measures	Residual Impact
Land-take	Land-take within the cSAC will be limited to the existing rail line. This has a 'high' likelihood of success of minimisation of land-take impact.	The impact(s) on this ecological receptor is considered to be '**Significant on an International Level**'. Post implementation of avoidance and mitigation measures impact on Lough Corrib cSAC/SPA/pNHA would no longer be significant, even on a local level, as: • Construction of the proposed Greenway shall take place entirely within the existing disused rail line. There will be some minor land-take within the cSAC but this will be of habitats of low ecological value. • Detailed mitigation measures on pollution prevention in watercourses outlined in **Section 10.5.1.2** of this report have a 'probable' chance of success. Therefore the likelihood of impacts to the aquatic habitats of the site is significantly decreased. Once avoidance and mitigation measures are implemented, the residual impact will also be highly localised. Therefore the impact level will be reduced from '**Permanent, Significant on an International Level'** to '**Permanent, Significant on a Local Level'.** The residual impact is therefore considered to be '**Permanent, Significant on a Local Level'**.
Qualifying Habitat - Depressions on peat substrates of the Rhynchosporion.	Avoidance: as above, construction of the proposed Greenway will take place within the existing disused rail line. Therefore direct damage to bog habitats will be avoided where possible. This has a 'high' likelihood of success. The Zone of (ecological) Influence will be minimised through the lining and blocking of drains to prevent drying of bog adjacent to the Greenway. This will have a 'probable' likelihood of success.	
Lough Corrib, which corresponds to two Annex I habitats - Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) (3110) and Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. (3140)	Detailed mitigation measures on pollution prevention are outlined in **Section 10.5.1.2**.	
Qualifying Species of the Site (Annex II Species): Several species listed on Annex II of the EU Habitats Directive are mentioned in the Site Synopsis for Lough Corrib cSAC including; Freshwater Pearl Mussel (*Margaritifera margaritifera*) (1029), White-clawed crayfish (*Austropotamobius pallipes*) (1092), Sea lamprey (*Petromyzon marinus*) (1095), Brook lamprey (*Lampetra planeri*) (1096), Salmon (*Salmo salar*) (1106), Lesser horseshoe bat (*Rhinolophus hipposideros*) (1303), Otter (*Lutra lutra*) (1355), Shining sickle moss (*Drepanocladus vernicosus*) (1393), Slender naiad (*Najas flexilis*) (1833). These species are discussed individually in **Table 10.34**.	Mitigation measures for these species are outlined in **Table 10.34**.	

Table 10.29 Avoidance/Mitigation Measures and Residual Impact Assessment for the Maumturk Mountains cSAC/pNHA (ER2)

ER2: Maumturk Mountains cSAC: principal elements of ecological value	Avoidance/Mitigation Measures	Residual Impact
Land-take	Land-take within the cSAC will in most locations be limited to the existing rail line. This has a 'high' likelihood of success.	The impact(s) on this ecological receptor is considered to be '**Significant on an International Level**'. Post implementation of avoidance and mitigation measures the impact on the Maumturk Mountains cSAC would no longer be significant on an international level, as: • The majority of the proposed Greenway shall be constructed within the existing disused rail line. Adjacent to roads the Greenway will be located on the side of the road with least sensitive habitats. There will be some minor land-take within the cSAC but this will be of habitats of low ecological value. • Detailed mitigation measures on pollution prevention in watercourses outlined in **Section 10.5.1.2** of this report have a 'probable' chance of success, and so the likelihood of impacts to the aquatic habitats of the site is significantly decreased. Mitigation measures outlined in **Table 10.34** will significantly reduce the potential impacts to the qualifying species of the site. Once avoidance and mitigation measures
Qualifying Habitat – **7130 Blanket bog**	Avoidance: The majority of the land-take within the cSAC will be limited to the existing rail line. However where the Greenway is constructed off the rail line, Blanket Bog habitat will be avoided. The area of Active Blanket Bog, in the townland of Lurgan, between Ch.35+000 and Ch.35+100 adjacent to R336 will be avoided by construction of the Greenway on the other side of the R336. Therefore direct damage to bog habitats will be avoided where possible. This has a 'high' likelihood of success. The Zone of (ecological) Influence will be minimised through the lining and blocking of drains to prevent drying of bog adjacent to the Greenway. This will have a 'probable' likelihood of success.	
Qualifying Habitat – **3110 Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae),** including Illion Lough and Lough Shindilla.	Detailed mitigation measures on pollution prevention are outlined in **Section 10.5.1.2**.	
Qualifying Habitat – **4010 Northern Atlantic Wet Heaths with *Erica tetralix***.	Avoidance: Land-take within the cSAC will be limited to the existing rail line. Therefore damage to Wet Heath habitat will be avoided. This has a 'high' likelihood of success. The Zone of (ecological) Influence will be minimised through the lining and blocking of drains to prevent drying of bog adjacent to the Greenway. This will have a 'probable' likelihood of success.	
Qualifying Habitat – **7150 Depressions on peat substrates of the Rhynchosporion.**	Avoidance: as above, Land-take within the cSAC will be limited to the existing rail line. Therefore damage to this habitat will be avoided. This has a 'high' likelihood of success. The Zone of (ecological) Influence will be minimised through the lining and blocking of drains to prevent drying of bog adjacent to the Greenway. This will have a 'probable' likelihood of success.	

ER2: Maumturk Mountains cSAC: principal elements of ecological value	Avoidance/Mitigation Measures	Residual Impact
Qualifying Species of the Site (Annex II Species): Several species listed on Annex II of the EU Habitats Directive are mentioned in the Site Synopsis for Maumturk Mountains cSAC including; Atlantic Salmon (*Salmo salar*), Otter (*Lutra lutra*), Marsh Fritillary (*Euphydryas aurinia*) and Slender Naiad (*Najas flexilis*). These species are discussed individually in **Table 10.34.**	Mitigation measures for these species are outlined in **Table 10.34**.	are implemented, the residual impact will also be highly localised. Therefore the impact level will be reduced from **'Permanent, Significant on an International Level'** to '**Permanent, Significant on a Local Level'.** The residual impact is therefore considered to be '**Permanent, Significant on a Local Level'**.

Table 10.30 Avoidance/Mitigation Measures and Residual Impact Assessment for the Twelve Bens/Garraun Complex cSAC (ER3)

ER3: The Twelve Bens/Garraun Complex cSAC -principal elements of ecological value	Avoidance/Mitigation Measures	Residual Impact
Land-take	Land-take within the cSAC will be limited to the existing rail line. This has a 'high' likelihood of success of minimisation of land-take impact.	The impact(s) on this ecological receptor is considered to be '**Significant on an International Level**'. Post implementation of avoidance and mitigation measures the residual impact on the Twelve Bens/Garraun Complex cSAC would no longer be significant on an international level, as: • Construction of the proposed Greenway shall take place entirely within the existing disused rail line. There will be some minor land-take within the cSAC but this will be of habitats of low ecological value. • Detailed mitigation measures on pollution prevention of watercourses outlined in **Section 10.5.1.2** of this report have a 'probable' chance of success. Therefore the likelihood of
Qualifying Habitat – **7130 Blanket bog** habitat within the designated site affected by the road scheme	Avoidance: as above, Land-take within the cSAC will be limited to the existing rail line. Therefore damage to intact blanket bog will be avoided. This has a 'high' likelihood of success. The Zone of (ecological) Influence will be minimised through the lining and blocking of drains to prevent drying of bog adjacent to the Greenway. This will have a 'probable' likelihood of success.	
Qualifying Habitat – **7150 Depressions on peat substrates of the Rhynchosporion**	Avoidance: as above, Land-take within the cSAC will be limited to the existing rail line. Therefore damage to this bog habitat will be avoided. This has a 'high' likelihood of success. The Zone of (ecological) Influence will be minimised through blocking of drains to prevent drying of bog adjacent to the Greenway. This has a 'probable' likelihood of success.	
Qualifying Habitat - **3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) –** including Derryclare Lough.	Detailed mitigation measures on pollution prevention outlined in **Section 10.5.1.2**. These have a 'probable' likelihood of success.	

ER3: The Twelve Bens/Garraun Complex cSAC -principal elements of ecological value	Avoidance/Mitigation Measures	Residual Impact
Areas of Wet Heath HH3 habitat within the cSAC which correspond to Annex I habitat **4010 Northern Atlantic Wet Heaths with *Erica tetralix*** (This is not listed as a qualifying habitat of the cSAC).	Avoidance: as above, land-take within the cSAC will be limited to the existing rail line. Therefore damage to wet heath habitat bog will be avoided. This has a 'high' likelihood of success. The zone of ecological influence will be minimised through blocking of drains to prevent drying of wet heath habitat adjacent to the Greenway. This has a 'probable' likelihood of success.	significant impacts to the aquatic habitats of the site is decreased. • Mitigation measures outlined in **Table 10.45** will significantly reduce the potential impacts to the qualifying species of the site. Once avoidance and mitigation measures are implemented, the residual impact will also be highly localised. Therefore the impact level will be reduced from '**Permanent, Significant on an International Level'** to '**Permanent Significant on a Local Level'.** The residual impact is therefore considered to be '**Permanent, Significant on a Local Level'**.
Rivers within the cSAC, including the Owenglin River, the Glencoaghan River and the channel connecting Derryclare Lough to Glendollagh Lough.	Detailed mitigation measures on pollution prevention are outlined in **Section 10.5.1.2**.	
Qualifying Species of the Site (Annex II Species): Several species listed on Annex II of the EU Habitats Directive are mentioned in the Site Synopsis for Twelve Bens/Garraun Complex cSAC including; Atlantic Salmon (*Salmo salar*), Otter (*Lutra lutra*), Freshwater Pearl Mussel (*Margaritifera margaritifera*) and Slender Naiad (*Najas flexilis*). These species are discussed individually in **Table 10.34**.	Detailed mitigation measures for these species are outlined in **Table 10.45**.	Residual Impacts for these species are outlined in **Table 10.45**.

Table 10.31 Avoidance/Mitigation Measures and Residual Impact Assessment for Connemara Bog Complex cSAC (ER4)

ER4: Connemara Bog Complex cSAC: principal elements of ecological value	Avoidance/Mitigation Measures	Residual Impact
Land-take	Land-take within the cSAC will be limited to the existing rail line. Therefore damage to intact blanket bog will be avoided. This has a 'high' likelihood of success. The Zone of (ecological) Influence will be minimised through the lining and blocking of drains to prevent drying of bog adjacent to the Greenway. This will have a 'probable' likelihood of success.	The impact(s) on this ecological receptor is considered to be '**Significant on an International Level**'. Post implementation of avoidance and mitigation measures the impact on the Connemara Bog Complex cSAC would no longer be significant on an international level, as: • Widening of the existing carriageway shall be carried out on the least ecologically sensitive side of the road, thus reducing the land-take within the cSAC and within areas of qualifying habitats. • Detailed mitigation measures on pollution prevention in watercourses outlined in **Section 10.5.1.2** of this report have a 'probable' chance of success. Therefore the likelihood of impacts to the aquatic habitats of the site is significantly decreased. Mitigation measures outlined in **Table 10.45** will significantly reduce the potential impacts to the qualifying species of the site.
Qualifying Habitat – **7130 Blanket bog**	Avoidance: as above, Land-take within the cSAC will be limited to the existing rail line. Therefore damage to this bog habitat will be avoided. This has a 'high' likelihood of success. The Zone of (ecological) Influence will be minimised through blocking of drains to prevent drying of bog adjacent to the Greenway. This has a 'probable' likelihood of success.	
Qualifying Habitat – **3110 Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae),** including Ballynahinch Lake, Athry Lough, Lough na Cúige Rua, Glendollagh Lough, Oorid Lough, Arderry Lough and Lough Bofin.	Detailed mitigation measures on pollution prevention are outlined in **Section 10.5.1.2**.	
Qualifying Habitat – **4030 European Dry Heaths**.	Avoidance: as above, widening of the existing carriageway shall be carried out on the least ecologically sensitive side of the road. Therefore damage to this habitat will be avoided where possible. This has a 'high' likelihood of success.	
Qualifying Habitat - **7150 Depressions on peat substrates of the Rhynchosporion**	Land-take within the cSAC will be limited to the existing rail line. Therefore damage to intact blanket bog will be avoided. This has a 'high' likelihood of success.	

ER4: Connemara Bog Complex cSAC: principal elements of ecological value	Avoidance/Mitigation Measures	Residual Impact
Qualifying Species of the Site (Annex II Species): Several species listed on Annex II of the EU Habitats Directive are mentioned in the Site Synopsis for Connemara Bog Complex cSAC including; Atlantic Salmon (*Salmo salar*), Otter (*Lutra lutra*), Marsh Fritillary (*Euphydryas aurinia*) and Slender Naiad (*Najas flexilis*). These species are discussed individually in **Table 10.34**.	Detailed Mitigation measures for these species are outlined in **Table 10.45**.	Once avoidance and mitigation measures are implemented, the residual impact will also be highly localised. Therefore the impact level will be reduced from '**Permanent, Significant on an International Level'** to '**Permanent, Significant on a Local Level'.** The residual impact is therefore considered to be '**Permanent, Significant on a Local Level'**.

Table 10.32 Avoidance/Mitigation Measures and Residual Impact Assessment for Watercourses within the Study Area (ER5)

ER5: Watercourses within the Study Area: principal elements of ecological value	Avoidance/Mitigation Measures	Residual Impact
Water Quality	Detailed mitigation measures on pollution prevention are outlined in **Section 10.5.1.2**.	The impact(s) on this ecological receptor is considered to be '**Significant on an Local Level**'. the impact on watercourses in the study area would no longer be significant, even on a local level, as: • Detailed mitigation measures on pollution prevention in watercourses outlined in **Section 10.5.1.2** of this report have a 'probable' chance of success. Therefore the likelihood of impacts to the aquatic environment of these watercourses is decreased from '**Permanent, Significant on a Local Level'** to **'Not Significant'**. The residual impact is therefore considered to be '**Not Significant'.**
Aquatic species within the watercourses (including the Annex II species Atlantic Salmon and Freshwater Pearl Mussel – discussed in **Table 10.34.**)	Detailed mitigation measures on pollution prevention are outlined in **Section 10.5.1.2**.	

Table 10.33 Avoidance/Mitigation Measures and Residual Impact Assessment for Annex I Habitats within the Study Area (ER6)

ER6: Annex I habitats: principal elements of ecological value	Avoidance/Mitigation Measures	Residual Impact
ER6a – Blanket Bog (Active* and Inactive)	Avoidance: Land-take will be limited to the existing rail line. Therefore damage to active and inactive blanket bog will be avoided. Therefore direct damage to this habitat will be avoided. This has a 'high' likelihood of success.	The impact(s) on this ecological receptor is considered to be '**Significant on a National and County Level**'. Post implementation of avoidance measures, disturbance to this habitat will be minimised. Therefore, this impact is will reduce from a '**Permanent, Significant Impact on a National and County Level'** to '**Not Significant'.** The residual impact is therefore considered to be '**Not Significant'.**
ER6b - Depressions on peat substrates of the Rhyncosporion (within Cutover Bog habitat)	Avoidance: as above, land-take will be limited to the existing rail line. Therefore direct damage to Depressions on peat substrates of the Rhyncosporion will be avoided. This has a 'high' likelihood of success.	The impact(s) on this ecological receptor is considered to be '**Significant on an County Level**'. Post-implementation of avoidance measures, disturbance to this habitat will be minimised. Therefore, this impact is will reduce from a '**Permanent, Significant Impact on a County Level'** to a '**Permanent, Significant Impact on a Local Level'.** The residual impact is therefore regarded as being '**Permanent, Significant on a Local Level'.**
ER6c - Northern Atlantic Wet Heaths with *Erica tetralix*	Avoidance: as above, land-take will be limited to the existing rail line. Therefore direct damage to Northern Atlantic Wet Heaths will be avoided. This has a 'high' likelihood of success.	The impact(s) on this ecological receptor is considered to be '**Significant on an County Level**'. Avoidance measures will minimise disturbance to this habitat. Therefore this impact is no longer

ER6: Annex I habitats: principal elements of ecological value	Avoidance/Mitigation Measures	Residual Impact
		considered to be significant on a county level. Therefore, this impact is will reduce from a '**Permanent, Significant Impact on a County Level'** to a '**Permanent, Significant Impact on a Local Level'.** The residual impact is therefore regarded as being '**Significant on a Local Level'.**
ER6d - European Dry Heaths	Avoidance: as above, land-take will be limited to the existing rail line. Therefore direct damage to European Dry Heaths will be avoided. This has a 'high' likelihood of success.	The impact(s) on this ecological receptor is considered to be '**Significant on an County Level**'. Avoidance measures will minimise disturbance to this habitat, however, and so this impact is not considered to be significant on a county level. Therefore, this impact is will reduce from a '**Permanent, Significant Impact on a County Level'** to a '**Permanent, Significant Impact on a Local Level'.** The residual impact is therefore regarded as being '**Significant on a Local Level'.**
ER6e - Oligotrophic waters containing very few minerals of Sandy plains (Littorelletalia uniflorae)	Detailed mitigation measures on pollution prevention are outlined in **Section 10.5.1.2**.	The impact(s) on this ecological receptor is considered to be '**Significant on an County Level**'. Pollution prevention mitigation measures will significantly reduce the likelihood of impacts on this habitat. Therefore, this impact is will reduce from a '**Permanent, Significant Impact on a County Level'** to **'Not Significant'.** The residual impact is no longer

ER6: Annex I habitats: principal elements of ecological value	Avoidance/Mitigation Measures	Residual Impact
		considered to be significant, even on a local level – '**Not Significant**'.
ER6f - Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (*important orchid sites)	Avoidance: Where this habitat occurs within the existing rail line, damage to this habitat will be avoided where possible. This has a 'high' likelihood of success.	The impact(s) on this ecological receptor is considered to be '**Significant on an Local Level**'. Pollution prevention mitigation measures will significantly reduce the likelihood of impacts on this habitat. Therefore, this impact is will reduce from a '**Permanent, Significant Impact on a Local Level'** to a '**Not Significant'.** The residual impact is no longer considered to be significant, even on a local level – '**Not Significant**'.
ER6g - Calcareous Fens with Cladium mariscus and species of the Caricion davallianae	Detailed mitigation measures on pollution prevention are outlined in **Section 10.5.1.2**.	The impact(s) on this ecological receptor is considered to be '**Significant on an County Level**'. Pollution prevention mitigation measures will significantly reduce the likelihood of impacts on this habitat. Therefore, this impact is will reduce from a '**Permanent, Significant Impact on a County Level'** to a '**Not Significant'.** The residual impact is no longer considered to be significant, even on a local level – '**Not Significant**'.
ER6h - 7210 Calcareous fens with Cladium mariscus and species of the Caricion davallianae	Detailed mitigation measures on pollution prevention are outlined in **Section 10.5.1.2**.	The impact(s) on this ecological receptor is considered to be '**Significant on an County Level**'. Pollution prevention mitigation measures will significantly reduce the likelihood of impacts on this habitat. Therefore, this impact is will reduce from a '**Permanent, Significant**

ER6: Annex I habitats: principal elements of ecological value	Avoidance/Mitigation Measures	Residual Impact
		Impact on a County Level' to a '**Not Significant'.** The residual impact is no longer considered to be significant, even on a local level – '**Not Significant**'.

Table 10.34 Avoidance/Mitigation Measures and Residual Impact Assessment for Annex II Species (EU Habitats Directive) and Annex I species (EU Birds Directive) Within the Study Area (ER7) and Determination of Significance of Impacts (ER7)

ER7: Annex II Species (EU Habitats Directive) and Annex I species (EU Birds Directive): principal elements of ecological value	Avoidance/Mitigation Measures	Residual Impact
ER7a – Freshwater Pearl Mussel	Detailed mitigation measures on pollution prevention outlined in **Section 10.5.1.2**. All works at water crossings where Freshwater Pearl Mussel is present or is downstream of the works will be supervised by a suitably qualified ecologist, to ensure the protection of the species. This has a 'high' likelihood of success.	The impact(s) on this ecological receptor is considered to be '**Significant on an County Level**'. Provided these mitigation measures are implemented, no residual impact on this species is expected – '**No Impact**'.
ER7b - Otter	▪ Mitigation measures outlined in **Section 10.5.1.2** of this EIS will significantly reduce the possibility of contamination of the aquatic environment, which in turn will reduce the potential impacts on Otters. ▪ Ledges will be required at all watercourse crossings. Where ledges cannot be provided, other mammal underpasses might be substituted. ▪ As the alignment will not be timber post a rail fenced, an alternative approach to mammal fencing may be appropriate. Typically, mammal-proof fencing should be provided at either side of the watercourse crossings and should stretch to 50m or more either side of the crossings. To be discussed with the NPWS. ▪ The use of cylindrical culverts on smaller watercourses in use by otters will be avoided where possible. Cylindrical culverts or	Provided these mitigation measures are implemented, no residual impact on this species is expected – '**No Impact**'.

ER7: Annex II Species (EU Habitats Directive) and Annex I species (EU Birds Directive): principal elements of ecological value	Avoidance/Mitigation Measures	Residual Impact
	boxed culverts will be oversized to allow for the provision of ledges. All mitigation in relation to otters will be conducted in line with the NRA Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes. These have a 'high' likelihood of success.	
ER7c - Atlantic Salmon	Detailed mitigation measures on pollution prevention are outlined in **Section 10.5.1.2**.	Provided these mitigation measures are implemented, no residual impact on this species is expected – '**No Impact'**.

Table 10.35 Avoidance/Mitigation Measures and Residual Impact Assessment for Faunal Species protected under the Irish Wildlife Acts (ER8)

ER8 - Faunal Species protected under the Irish Wildlife Acts: principal elements of ecological value	Avoidance/Mitigation Measures	Residual Impact
ER8a - Badger	All works should be carried out in accordance with the NRA *Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes* (NRA, 2006). Provisions for Otters at water crossings (as outlined in **Table 10.34** above) will also serve for Badgers. These have a 'high' likelihood of success.	This ecological receptor is deemed to be of National Importance. Provided these mitigation measures are implemented, the residual impact to badgers is not expected to be significant, even on a local level – '**Not Significant'**.
ER8b - Bat Species	**Avoidance:** Construction of the proposed Greenway shall be carried out on the least ecologically sensitive side of the road i.e. woodlands and mature trees adjacent to the carriageway shall be avoided where possible. **Buildings:** Should any buildings on or adjacent to the route require removal, they shall first be surveyed for bat presence. If bats are found, the following measures will be implemented: • Any work or demolition of buildings or structures identified as bat roosts or having the greatest potential for bat use shall preferably be undertaken within the winter months - November to March – as bat numbers are then known to be fewer in buildings. This would reduce impact to bats present on-site. • A sufficient number of *Schwegler* bat boxes shall be erected at	This ecological receptor is deemed to be of International Importance. Provided these mitigation measures are implemented, the residual impact to bats is not expected to be significant, even on a local level – '**No Significant'**.

ER8 - Faunal Species protected under the Irish Wildlife Acts: principal elements of ecological value	Avoidance/Mitigation Measures	Residual Impact
	a suitable nearby location one month prior to demolition to provide an alternative roosting site for the bats. • Demolition of structures where bat signs are observed shall be done carefully with the expectation that bats may be found. The roof of such structures shall be carefully removed by hand to protect any animals which may be beneath. If discovered, bats shall be retained in a box until dusk then released on site. **Bridges:** • Any re-pointing or pressure grouting of existing bridges identified as having potential for bat use shall only proceed after a further inspection of the structure for bats and measures taken to protect any animals found to be present. • Some crevices beneath existing bridges shall be retained for bat use during such works according to best practice bat mitigation measures for bridge works **Potential bat roosts in trees:** <u>Avoidance:</u> • Where possible, tree lines and mature trees that are located immediately adjacent to the line of the proposed route or are not directly impacted shall be avoided and retained intact. • Any existing mature trees adjacent to the corridor and any construction sites to be retained shall be protected from root damage by machinery by an exclusion zone of at least 7 metres or equivalent to canopy height. Such protected trees shall be fenced off by adequate temporary fencing prior to other works commencing. <u>Mitigation:</u> • Mature trees, which are to be removed, shall ideally be felled in the period late August to late October, or early November, in order to avoid the disturbance of any roosting bats as per NRA guidelines and also to avoid the bird nesting seasons.* • Tree felling shall be completed by Mid-November at the latest because bats roosting in trees are very vulnerable to disturbance during their hibernation period (November – April).* • Ivy covered trees, once felled, shall be left intact on-site for 24	

ER8 - Faunal Species protected under the Irish Wildlife Acts: principal elements of ecological value	Avoidance/Mitigation Measures	Residual Impact
	hours to allow any bats beneath the foliage to escape prior to disposal.* **Lighting restrictions:** • Lighting shall be minimised along the proposed Greenway especially at areas of interest for bat species. Lighting shall especially be avoided at bridges as this would impact on foraging and commuting Daubenton's bats and may also prevent use of installed bat tubes. • Where lighting is required, directional lighting (i.e. lighting which only shines on the Greenway and not nearby countryside) shall be used to prevent overspill. This shall be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvers and shields to direct the light to the intended area only. **Compensation for loss of commuting routes:** Linear features such as hedgerows and tree lines shall be retained and/or replaced where possible. Any bank side vegetation along watercourses requiring removal shall be replaced with native shrubs/trees after works. Native plant species attract more insects then non-native species. This is especially important adjacent to bridges identified as having bat roosting potential. This has a 'high' likelihood of success.	
ER8k – Common Frog	Detailed mitigation measures on pollution prevention outlined in **Section 10.5.1.2** will reduce the likelihood of impacts to this species. These have a 'probable' likelihood of success.	This ecological element has been deemed to be of National Importance. Pollution prevention mitigation measures will significantly reduce the likelihood of impacts on this habitat. Therefore the residual impact is no longer considered to be significant, even on a local level – '**Not Significant**'
ER8l – Smooth Newt	Detailed mitigation measures on pollution prevention outlined in **Section 10.5.1.2** will reduce the likelihood of impacts to this species. These have a 'probable' likelihood of success.	This ecological element has been deemed to be of National Importance. Pollution prevention mitigation measures will significantly reduce the likelihood of impacts on this habitat. Therefore the residual impact is no longer considered to

ER8 - Faunal Species protected under the Irish Wildlife Acts: principal elements of ecological value	Avoidance/Mitigation Measures	Residual Impact
		be significant, even on a local level – '**Not Significant**'

*These mitigation measures should be conducted in line with the NRA Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub Prior to, During the Construction of National Road Schemes.

Table 10.36 Avoidance/Mitigation Measures and Residual Impact Assessment for Flora Protection Order (FPO) Species (ER9)

ER9 - Flora Protection Order (FPO) Species: principal elements of ecological value	Avoidance/Mitigation Measures	Residual Impact
ER9a – Bog Hair-grass	Species not recorded during botanical assessments. Mitigation measures apply to retain optimum habitat for the species, i.e. blanket bog.	There will be no residual impact on these species – '**No Impact'**
ER9b - Slender Cottongrass	Slender Cottongrass was recorded in Maam Cross. Avoidance: construction of the proposed Greenway shall be carried out on the least ecologically sensitive side of the road when it is off the line of the disused rail track. Therefore damage to this habitat will be avoided where possible. This has a 'high' likelihood of success. The road widening at this location is on the opposite side of the road. Therefore there should be no impacts to the plant species. All measures to prevent the drying of the supporting bog habitat should be adopted. No disposal of excavated material should be undertaken at this location. These measures have a 'high' likelihood of success.	
ER9c – Bog Orchid	Species not recorded during botanical assessments. Mitigation measures apply to retain optimum habitat for the species, i.e. blanket bog	

Table 10.37 Avoidance/Mitigation Measures and Residual Impact Assessment for the Hedgerow Network (ER12) within the Study Area

ER11 – Hedgerow Network: principal elements of ecological value	Avoidance/Mitigation Measures	Residual Impact
General floristic value.	Clearance of any hedgerows within the land-take of the proposed Greenway will be compensated for by the provision of planting as part of the landscaping scheme. A species-rich selection of native trees and shrubs will be used. Species assemblages will reflect those of the existing hedgerows. Where possible, salvaged plants, cuttings or seedlings from the existing hedgerows will be used, in order to minimise the introduction of plant genotypes not local to the area. These measures have a 'high' likelihood of success.	Provided mitigation measures are implemented correctly, there should be no residual impacts on the hedgerow network in the area. Any hedgerows destroyed will be compensated for by the planting of new hedgerows with species compositions that reflect the existing hedgerows. Irish provenance plant material will be utilised. Where possible, local provenance will be utilised. This will minimise the impacts on the general floristic and biodiversity value of the hedgerows – '**Not Significant**'. All hedgerow clearance will take place outside the bird-nesting season. Therefore no residual effects on bird populations are expected – '**No Impact'**. Particular attention will be paid to bat commuting routes and mitigation measures outlined in **Table 10.35** will be implemented at these sites. Provided site clearance and planting of new hedgerows are carried in an appropriate manner, the residual impact of the proposed Greenway on the hedgerow network in the area will not be significant, even on a local level – '**Not Significant**'.
Bird Nesting potential.	All hedgerow clearance will be carried out outside the bird nesting season (1st March to the 31st August), in order to avoid damage to nests and young. This measure has a 'high' likelihood of success.	
Value as 'wildlife corridors'	Planting of tree and shrub whips of Irish provenance as part of the landscaping scheme will provide alternative corridors for wildlife. This measure has a 'high' likelihood of success.	
Value as foraging and navigational routes for bats	Planting of tree and shrub saplings of local progeny as part of the landscaping scheme will provide alternative corridors for wildlife. At known bat commuting routes, close planting of tall vegetation will be used to encourage a higher flight plane and avoid road traffic-related mortalities. Specific mitigation measures in relation to bats are outlined in **Table 10.35** above. All bat mitigation will be conducted in line with the NRA Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes. These measures have a 'high' likelihood of success.	

Table 10.38 Avoidance/Mitigation Measures and Residual Impact Assessment for Treelines within the Study Area (ER12)

ER12 – Treelines within the Study Area: principal elements of ecological value	Avoidance/Mitigation Measures	Residual Impact
General floristic value	Clearance of treelines within the land-take of the proposed Greenway will be compensated for by the provision of planting as part of the landscaping scheme. A species-rich selection of native trees and shrubs will be selected. The species assemblages will reflect that of the existing treelines. Where possible, salvaged plants, cuttings or seedlings from the existing treelines will be used, in order to minimise the introduction of plant genotypes not local to the area. These measures have a 'high' likelihood of success.	Any treeline destroyed during site clearance will be compensated for by the planting of new treelines with species compositions that reflect the existing treelines. Irish provenance plant material will be utilised. Where possible, local provenance will be utilised. This will minimise the impacts on the general floristic and biodiversity value of the treelines – '**Not Significant**'. All tree-felling will take place outside the bird-nesting season, and so no residual effects on bird populations are expected – '**No Impacts**'. Particular attention will be paid to bat commuting routes and mitigation measures outlined in **Table 10.35** will be implemented at these sites. Provided the mitigation measures outlined for trees with bat roosts or bat roost-potential are implemented correctly, no residual impact on the bat population in the area is expected – '**No Impact'**.
Bird Nesting potential.	All tree felling will be carried out outside the bird nesting season (1st March to the 31st August), in order to avoid damage to nests and young. These measures have a 'high' likelihood of success.	
Value as 'wildlife corridors'	Planting of tree and shrub 'whips' of Irish provenance as part of the landscaping scheme will provide alternative corridors for wildlife. These measures have a 'high' likelihood of success.	
Value as foraging and navigational routes for bats	Planting of tree and shrub whips of Irish provenance as part of the landscaping scheme will provide alternative corridors for wildlife. At known bat commuting routes, close planting of tall vegetation will be used to encourage a higher flight plane and avoid road traffic-related mortalities. Specific mitigation measures in relation to bats are outlined in **Table 10.35** above. All bat mitigation will be conducted in line with the NRA Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes. These measures have a 'high' likelihood of success.	

ER12 – Treelines within the Study Area: principal elements of ecological value	Avoidance/Mitigation Measures	Residual Impact
Potential as bat roosts.	• All trees will be inspected for roosts prior to felling. Any roosts within the land-take will be removed under licence from the NPWS by a bat specialist. • Bat boxes will be provided to compensate for any trees with roost potential lost. These will be installed prior to site clearance. • Tree-felling will be undertaken in the period late August to late October/early November. During this period bats are capable of flight and may avoid the risks of tree-felling if proper measures are undertaken. • If a tree containing a known bat roost must be felled outside the optimum period (under licence from the NPWS), the bat specialist must endeavour to remove any bats to safety. These mitigation measures will be conducted in accordance with the NRA Guidelines for the Treatment of Bats During the Construction of National Road Schemes. Further mitigation for bat species in the area is outlined in **Table 10.35** above. These measures have a 'probable' likelihood of success.	The residual impact of the road scheme on treelines in the area will no longer be significant, even on a local level – '**Not Significant**'.

Table 10.39 Avoidance/Mitigation Measures and Residual Impact Assessment for Mesotrophic Lake (ER15)

ER15 – Mesotrophic Lake: principal elements of ecological value	Avoidance/Mitigation Measures	Residual Impact
Water quality.	Detailed mitigation measures on pollution prevention outlined in **Section 10.5.1.2** will reduce the likelihood of impacts to water quality in this lake. These measures have a 'probable' likelihood of success.	Provided the pollution prevention measures outlined in **Section 10.5.1.2** are implemented, no residual impact is expected on this receptor/species- '**No Impact'**.
Aquatic species within the lake.	Pollution prevention measures will reduce the likelihood of impacts on this species. These measures have a 'probable' likelihood of success.	

Table 10.40 Avoidance/Mitigation Measures and Residual Impact Assessment for Wet Willow Alder Ash Woodland (ER17)

ER16 – Wet Willow Alder Ash Woodland: principal elements of ecological value	Avoidance/Mitigation Measures	Residual Impact
General floristic value.	Mitigation: • Protective barriers will be put in place prior to felling, in order to avoid damage to adjoining woodland habitat outside the land-take. • In order to mitigate against hydrological (draw-down) effects, a clay seal will be installed along the edge of the land-take parallel to the plantation. • Coppicing of selected trees in advance of site clearance will help to establish a new woodland edge as soon as possible, reducing the likelihood of future windthrow. • The above mitigation measures will be carried out in accordance with NRA Guidelines.* These measures will avoid indirect damage to the woodland outside the landtake of the proposed road scheme. They have a 'probable' likelihood of success. Enhancement: Landscape planting at this section will comprise a species-rich selection of Irish or local provenance trees and shrubs. This will be designed to link in with the remaining woodland habitat, and should also provide a linear extension on either side of the existing woodland, covering an approximate area of 0.8ha (in order to compensate for the area of woodland lost). This measure has a 'high' likelihood of success.	The impact of the proposed Greenway scheme on this ecological receptor will be significantly reduced by these mitigation measures. The area of woodland lost will be compensated for by the provision of a species-rich selection of locally-provenant tree and shrub saplings, in order to recreate the existing woodland. The planting of new woodland will compensate for the loss of foraging habitat for bats. It is unlikely that the remainder of the woodland will be affected. Specific mitigation measures in relation to bat species in the area will reduce impacts to these species. If felling of trees is carried out in an appropriate manner, outside of the bird nesting season, it is highly unlikely that this will result in mortalities to young. Overall, the residual impact on this site is no longer considered to be significant, even on a local level – '**Not Significant**'.
Bird Species in the area.	Felling of trees will be carried out outside the bird nesting season (1st of March to the 31st of August, in order to avoid the risk of mortalities). This measure has a 'high' likelihood of success.	
Bat Species in the area.	The above mitigation measures in relation to the woodland would also serve to minimise impacts on bat species in the area, including Lesser Horseshoe Bat. In particular, provision of a linear extension of the woodland habitat on either side of the road will compensate for foraging habitat lost. These measures have a 'probable' likelihood of success. Other mitigation in relation to bats is discussed in detail in **Table 10.35** above. These measures have a 'probable' likelihood of success.	

*These mitigation measures should be conducted in line with the NRA Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub Prior to, During the Construction of National Road Schemes.

Table 10.41 Avoidance/Mitigation Measures and Residual Impact Assessment for Cutover Bog PB4 (ER18, ER19, ER20)

ER18, ER19, ER20 – Cutover Bog: principal elements of ecological value	Avoidance/Mitigation Measures	Residual Impact
General floristic value.	Mitigation: • Protective barriers will be put in place prior to route construction, in order to avoid damage to adjoining bog habitat outside the land-take. • In order to mitigate against hydrological (draw-down) effects, a clay seal will be installed along the edge of the land-take parallel to the areas of bog. The above mitigation measures will be carried out in accordance with NRA Guidelines.* These measures will avoid indirect damage to the bog outside the landtake of the proposed road scheme. They have a 'probable' likelihood of success.	The impact of the proposed Greenway scheme on this ecological receptor will be significantly reduced by these mitigation measures. The area of bog adjacent to the route impacted will be minimised by installation of clay seals along drainage ditches. Overall, due to the direct removal of this habitat the residual impact is therefore considered to be '**Permanent, Significant on a Local Level'**.

Table 10.42 Avoidance/Mitigation Measures and Residual Impact Assessment for Reed and Large Sedge Swamp FS1 (ER21)

ER21 – Reed and Large Sedge Swamp: principal elements of ecological value	Avoidance/Mitigation Measures	Residual Impact
General floristic value.	Mitigation: • Protective barriers will be put in place prior to construction, in order to avoid damage to adjoining swamp habitat outside the land-take. • In order to mitigate against hydrological (draw-down) effects, a clay seal will be installed along the edge of the land-take parallel to the plantation. • The above mitigation measures will be carried out in accordance with NRA Guidelines.* These measures will avoid indirect damage to the swamp outside the landtake of the proposed road scheme. They have a 'probable' likelihood of success.	The impact of the proposed Greenway scheme on this ecological receptor will be significantly reduced by these mitigation measures. It is unlikely that the reed and large sedge swamp habitat will be indirectly hydrologically impacted if adequate measures are implemented in drains running adjacent to this habitat. Overall, the residual impact on this site is no longer considered to be significant, even on a local level – '**Not Significant**'.

10.5.3 Specific Mitigation Measures

10.5.3.1 Fauna

Bats

Standard mitigation measures, as would apply to any development, should be adopted within the proposed work plan. These include limiting season of disturbance to reduce impacts on breeding species and implementing measures to prevent pollution and sedimentation into watercourses during construction works. No specific mitigation is recommended in regard to bats on site. For advice on general bat mitigation measures see Kelleher & Marnell 2007.

Potential bat roosts in trees

Where possible, treelines, woodland and mature trees that are located immediately adjacent to the line of the proposed route or are not directly impacted shall be avoided and retained intact. Overall impacts on these sites shall be reduced through modified design and sensitivity during construction. Any existing mature trees adjacent to the corridor or construction sites to be retained shall be protected from root damage by machinery by an exclusion zone of at least 7 metres or equivalent to canopy height. Such protected trees shall be fenced off by adequate temporary fencing prior to other works commencing.

Mature trees, which are to be removed, shall ideally be felled in the period late August to late October, or early November, in order to avoid the disturbance of any roosting bats as per NRA guidelines. Tree felling shall be completed by mid-November at the latest because bats roosting in trees are very vulnerable to disturbance during their hibernation period (November – April). Ivy- covered trees, once felled, shall be left intact on-site for 24 hours prior to disposal to allow any bats beneath the foliage to escape overnight.

Landowners shall be advised that the timber from felled trees will remain for their use. This will prevent trees being felled prematurely.

Birds

No scrub clearance, tree felling or other removal of vegetation should occur during the bird breeding season from 1st March to 31st August.

10.6 RESIDUAL IMPACTS

Provided the mitigation measures described in **Section 10.5** are implemented in full then it is not anticipated that there will be any significant negative impacts on terrestrial habitats, flora or fauna as a result of the proposed Greenway.

10.7 CONCLUSIONS

There are a number of mitigation measures proposed for the entire extent of the proposed Connemara Greenway Project - Clifden to Oughterard. Works most likely to cause significant impacts will be located in areas which are offline from the main railway track and in areas which have not been maintained as a track and recolonised with semi-natural vegetation. There is also potential for significant impacts where works are carried out adjacent o watercourses with impacts on aquatic habitats and species.

Potential direct ecological impacts include loss of habitat, morality of individuals, severance of connectivity, physical disturbance to species and noise disturbance to species. The proposed Greenway works will result in the direct loss of woodland, scrub and grassland habitats which have colonised the disused rail line. Mitigation measures have been included to minimise these direct ecological impacts.

Any changes in hydrological conditions adjacent to the proposed Greenway have the potential to ‘dry out’ or degrade small areas of wetland habitats such as Blanket Bog, Wet Heath and Wet Grassland. Mitigation measures such as sealing of drains have been proposed in order to reduce changes in hydrological condition.

Species potentially affected include aquatic ecosystem dependent species such as otter and terrestrial species such as the bat species.

The residual impact of the proposed Greenway will be direct loss of some early successional habitats which are not of high ecological value.

11 AIR QUALITY AND CLIMATE

11.1 INTRODUCTION

This section of the EIS considers and assesses the impacts on air quality and climate from the Connemara Greenway Project - Clifden to Oughterard. This chapter should be read in conjunction with the layout plans for the site and project description sections of this EIS (**Chapter 6**).

The assessment identifies the existing ambient air quality and climate in the region and further assesses potential changes to this aspect of the environment as a result of the Project. Particular attention will be focused on sensitive receptors, such as residential areas and a number of Natura 2000 sites adjacent to the project and the extent of the exposure of these receptors to airborne pollutants derived as a result of the project.

11.2 METHODOLOGY

A desktop assessment was carried out to determine the potential impacts of the Connemara Greenway Project - Clifden to Oughterard on the local and regional air quality and on the environment.

11.2.1 Air Quality

European Union air quality standards are specified to ensure air emissions which can result from certain combustion products do not exceed levels that are designed to protect human health and ecosystems.

The European Commission (EC) has formally adopted the Air Quality Framework Directive (96/62/EC). The first daughter Directive, 99/30/EC (adopted April 1999), set specific limits for four air pollutants: nitrogen dioxide, sulphur dioxide, Particulate Matter (PM_{10}) and lead. In December 2001, the EC adopted the second daughter Directive, 2000/69/EC, relating to limit values for benzene and carbon monoxide (CO) in ambient air. These Directives have been transposed into Irish legislation by the Air Quality Standards Regulations, 2002 (S.I. No. 271 of 2002). Two further daughter Directives have come into force relating to ozone (third daughter Directive) and polyaromatic hydrocarbons, arsenic, nickel, cadmium and mercury (fourth daughter Directive) in ambient air under separate national legislation.

The original Air Quality Framework Directive and first three daughter Directives have since been replaced by one over-riding European Directive (2008/50/EC published in May 2008 and known as the “CAFE Directive”). It has now entered into force and replaces the Framework Directive and the first, second and third Daughter Directives. The CAFE Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011). It replaces the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), the Ozone in Ambient Air Regulations 2004 (S.I. No. 53 of 2004) and S.I. No. 33 of 1999. The 4th Daughter Directive was transposed by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 (S.I. no. 58 of 2009).

The above standards have been set by environmental and health professionals across Europe following extensive worldwide research and are designed to protect the most sensitive of receptors, including for example elderly humans with existing respiratory ailments and areas valued for their flora and fauna.

A number of international initiatives, protocols and Directives also exist to limit and reduce emissions at a national level.

The following criteria were considered in the assessment of impact on air quality:

- Air Quality Standards Regulations (S.I. No. 180 of 2011),
- Directive 2001/81/EC on National Emission Ceilings for certain pollutants (NECs) (S.I. No. 10 of 2004),
- There are no statutory limits for deposition of dusts and industry guidelines are typically employed to determine any impact. The TA Luft (German Government 'Technical Instructions on Air Quality') states a guideline of 350 mg/m^2/day for the deposition of non-hazardous dusts. This value was used to determine the impact of residual dust as an environmental nuisance, and
- The National Roads Authority (NRA) has published guidance for assessing dust impacts from road construction ('Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes'). This has been used to determine the potential impacts from the proposed construction site operations.

11.2.2 Climate

Reference is made to Ireland's commitment to reduce greenhouse gases nationally. The National Kyoto Target for the first commitment period 2008 – 2012 sets the cap on Greenhouse Gas (GHG) Emissions at 13% above 1990 levels, equivalent to 62.837 million tonnes of CO^2eq. The most recent data submitted by Ireland to the UNFCC in April 2010 indicated that National GHG Emissions in 2008 were 67.44 million tonnes (7.3% above the Kyoto target).

In terms of impacts on climate, the assessment aims to identify and assess the sources and describe the measures in place to minimise releases of compounds with global warming potential. Many natural and human activities generate releases that can contribute to global warming. Due to the diverse and diffusive nature of sources, the effect that the proposed Greenway Project might have on global warming cannot be specifically quantified within this assessment.

Having completed the desktop review, potential impacts resulting from the proposed project scheme on existing air quality and greenhouse gas emissions was assessed and where relevant, proposed mitigation measures have been recommended.

In the process of completing this assessment the following publications were consulted:

- Guidelines on the Information to be contained in Environmental Impact Statements', EPA, 2002,
- 'Advice Notes on Current Practice in the preparation of Environmental Impact Statements', EPA, 2003,
- Environmental Protection Agency (EPA) monitoring network assessment, and
- Environment Agency (EA) *Carbon Calculator for Construction Sites*.

The impact of oxides of nitrogen (NO_x) on ecological receptors or sensitive ecosystems (i.e. sensitive designated protected areas for flora and fauna) is a concern in relation to road projects. Although the

proposed Greenway is not designed for motorised traffic its construction will involve aspects associated with road construction activities therefore it was considered relevant to use NRA guidelines. The NRA has developed a mechanism for the assessment of the significance of this impact both during construction and operational phases. The NRA Guidelines state that should the predicted concentrations exceed the annual NO_x limit (30µg/m^3 – **Table 11.2**) then the sensitivity of the relevant species should be assessed by the project ecologist. The impacts of road traffic on all sensitive ecosystems during construction and operation and within 200m of the proposed Greenway have been assessed as per the NRA Guidelines.

11.2.3 Impact Assessment Criteria

During the construction phase, dust is considered the principle pollutant to atmosphere. However, there is no Irish or European Union or Commission guideline or legislative limits for total suspended particles, so the limits provided by the TA Luft guidance '*Technical Instructions on Air Quality Control'* (TA Luft, 2002) are employed. Under this guidance, the Main Contractor will be required to maintain monthly dust levels below the guideline limit of 350mg/m^2/day as an annual average at sensitive receptors.

For the operational phase, the relevant Irish ambient air standards have been adopted from the European Commission (EC) Directives 1996/62/EC, 1999/30/EC and 2000/69/EC and are cited as the Air Quality Standards Regulations, which came into force on 17th June 2002 (Irish Legislation S.I. No. 271 of 2002). In May 2008, these EC Directives on air quality were replaced with a new Directive on ambient air quality and cleaner air for Europe (2008/50/EC), which has been transposed into Irish Legislation through the revised Air Quality Standards Regulations (S.I. 180 of 2011). These regulations are presented in **Table 11.1**. The new legislation specifies limit values in ambient air for sulphur dioxide (SO_2), lead (Pb), benzene (C_6H_6), particulate matter (PM_{10} and $PM_{2.5}$), carbon monoxide (CO), nitrogen dioxide (NO_2) and oxides of nitrogen (NO_x). These limits are mainly for the protection of human health and are largely based on review of epidemiological studies on the health impacts of these pollutants.

In addition, there are limits that apply to the protection of the wider environment and any sensitive ecosystems within 200m of any road development. All predicted concentrations from the operation of the proposed Greenway are compared to the Air Quality Standards Regulations to determine the extent of any impact on residential or ecological receptors.

The NRA Guidelines specifies the significance criteria for determining air quality impacts. Any potential increases or decreases along the route were identified in order to determine the significance of any impact in relation to the NRA Guidelines criteria as presented in **Tables 11.2, 11.3** and **11.4**.

Table 11.1 Revised Air Quality Standards Regulations (Source: S.I. 180 of 2011)

Pollutant	Criteria	Value
Nitrogen Dioxide (NO_2)	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 $\mu g/m^3$ NO_2
	Annual limit for protection of human health	40 $\mu g/m^3$ NO_2
	Annual limit for protection of vegetation	30 $\mu g/m^3$ NO + NO_2
Benzene (C_6H_6)	Annual limit for protection of human health	5 $\mu g/m^3$
Carbon Monoxide (CO)	Maximum daily 8-hour running mean	10 mg/m^3
Lead (Pb)	Annual limit for protection of human health	0.5 $\mu g/m^3$
Sulphur Dioxide (SO_2)	Hourly limit for protection of human health - not to be exceeded more than 24 times/year	350 $\mu g/m^3$
	Daily limit for protection of human health - not to be exceeded more than 3 times/year	125 $\mu g/m^3$
	Annual limit for protection of vegetation	20 $\mu g/m^3$
Particulate Matter (PM_{10})	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 $\mu g/m^3$ PM_{10}
	Annual limit for protection of human health	40 $\mu g/m^3$ PM_{10}
Particulate Matter ($PM_{2.5}$)	Annual target value for the protection of human health (Stage 1 to be achieved by 2015)	25 $\mu g/m^3$ $PM_{2.5}$
	Indicative limit for the protection of human health (Stage 2 to be achieved by 2020)	20 $\mu g/m^3$ $PM_{2.5}$

Table 11.2 Definition of Impact Magnitude for Changes in Ambient Air Pollutant Concentrations (Source: NRA, 2011)

Magnitude of Change	Annual Mean NO_2/PM_{10}	No. of Days with PM_{10} concentration greater than 50$\mu g/m^3$	Annual Mean PM
Large	Increase/decrease ≥4$\mu g/m^3$	Increase/decrease >4 days	Increase/decrease ≥2.5$\mu g/m^3$
Medium	Increase/decrease 2 - <4$\mu g/m^3$	Increase/decrease 3 of 4 days	Increase/decrease 1.25 - <2.5$\mu g/m^3$
Small	Increase/decrease 0.4 - <2$\mu g/m^3$	Increase/decrease 1 or 2 days	Increase/decrease 0.25 - <1.25$\mu g/m^3$
Imperceptible	Increase/decrease <0.4$\mu g/m^3$	Increase/decrease <1 day	Increase/decrease <0.25$\mu g/m^3$

Table 11.3 Air Quality Impact Descriptors for Changes in Annual Mean Nitrogen Dioxide and PM_{10} and $PM_{2.5}$ Concentrations at a Receptor (Source: NRA, 2011)

Absolute Concentration in Relation to Objective/Limit Value	Changes in Concentration		
	Small	Medium	Large
Increase with Scheme			
Above Objective/Limit Value with Scheme (≥40µg/m^3 of NO_2 or PM_{10}) (≥25µg/m^3 of $PM_{2.5}$)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value with Scheme (36-<40µg/m^3 of NO_2 or PM_{10}) (22.5-<25µg/m^3 of $PM_{2.5}$)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value with Scheme (30-<36µg/m^3 of NO_2 or PM_{10}) (18.75-<22.5µg/m^3 of $PM_{2.5}$)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value with Scheme (<30µg/m^3 of NO_2 or PM_{10}) (<18.75µg/m^3 of $PM_{2.5}$)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value with Scheme (≥40µg/m^3 of NO_2 or PM_{10}) (≥25µg/m^3 of $PM_{2.5}$)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value with Scheme (36-<40µg/m^3 of NO_2 or PM_{10}) (22.5-<25µg/m^3 of $PM_{2.5}$)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value with Scheme (30-<36µg/m^3 of NO_2 or PM_{10}) (18.75-<22.5µg/m^3 of $PM_{2.5}$)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value with Scheme (<30µg/m^3 of NO_2 or PM_{10}) (<18.75µg/m^3 of $PM_{2.5}$)	Negligible	Negligible	Slight Beneficial

Table 11.4 Air Quality Impact Descriptors for Changes in Number of Days with PM_{10} Concentrations Greater than 50µg/m^3 at a Receptor (Source: NRA, 2011)

Absolute Concentration in Relation to Objective/Limit Value	Changes in Concentration		
	Small	Medium	Large
Increase with Scheme			
Above Objective/Limit Value with Scheme (≥35days)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value with Scheme (32-<35days)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value with Scheme (26-<32days)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value with Scheme <26 days)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value with Scheme (≥35days)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value with Scheme (32-<35days)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value with Scheme (26-<32days)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value with Scheme <26 days)	Negligible	Negligible	Slight Beneficial

11.3 EXISTING ENVIRONMENT

The proposed Connemara Greenway Project – Clifden to Oughterard is located in a rural setting with no major industrial undertakings of note operating in its vicinity (the study area is described in **Chapter 6** of this EIS). The proposed Greenway is in close proximity to the existing N59, the main traffic route connecting Galway city to Connemara via Oughterard to Clifden and runs through rural lands and often bounding or running through designated protected areas. Given the location of the study area in close proximity to the western coastline and the nature of the prevailing winds, the area is expected to experience clean Atlantic air with only background levels of pollutants. There are no major sources of air pollution in the area, apart from limited agricultural activities and road traffic. There are various types of receptors located along the proposed route e.g. residential, ecosystems. The receptors vary in distance from the centreline of the proposed Greenway.

There are a number of receptors located within 50m of the proposed Greenway. Of particular interest along the route corridor of the proposed Greenway is the number of Natura 2000 sites and the potential impact on any such sensitive ecosystems. There are four designated protected areas or sensitive ecosystems through which the proposed Greenway will run (see **Table 11.5**).

Table 11.5 Sensitive Ecosystems Located Along the Route Corridor

Site Name	Designation	Site Code	Location
Lough Corrib	cSAC, pNHA SPA	000297 004042	In proximity to Oughterard
Connemara Box Complex	cSAC, pNHA	002034	Throughout the route
Maumturk Mountains	cSAC, pNHA	002008	North of route at Maam Cross
The Twelve Bens/Garraun Complex	cSAC, pNHA	002031	North of route, west of Recess

The main source of air pollution in the area is emissions from vehicles using the local and primary road network. Volumes of traffic on the N59 primary route may have an impact on air quality; however as the traffic is relatively free flowing the potential for traffic congestion and elevated levels of pollution is not considered high. The land use is mainly agricultural, which may have effects on the existing air quality in terms of odours, dusts and minor emissions from agricultural plant machinery. There are two quarries noted along the scheme, both located at Recess. These may pose a risk of dust nuisance and vehicular emissions to receptors immediately bounding these properties.

11.3.1 Air Quality

The EPA report Key Indicators of Ambient Air Quality in Ireland, 2009 describes the air quality in Ireland. The EPA carries out ambient air monitoring throughout the Republic of Ireland. The EU Air Framework Directive deals with each EU Member State in terms of Zones and Agglomerations for Air Quality. For Ireland, four zones, A, B, C and D have been defined and are included in the Air Quality Standards (AQS) Regulations (S.I. No 271 of 2002) as can be seen in **Figure 11.1** below. The zones were amended in the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 (DEHLG, 2009) to take account of population changes and updated assessment of air quality. Each zone is detailed as follows:

1. Zone A, Dublin conurbation,

2. Zone B, Cork conurbation,

3. Zone C, Other cities and large towns with a population >15,000, including Galway, Limerick, Waterford, Clonmel, Kilkenny, Sligo, Drogheda, Wexford, Athlone, Ennis, Bray, Naas, Carlow, Tralee, Ennis, Waterford, Letterkenny, Newbridge, Navan, Celbridge, Balbriggan, Mullingar and Dundalk, and

4. Zone D, the remainder of the country.

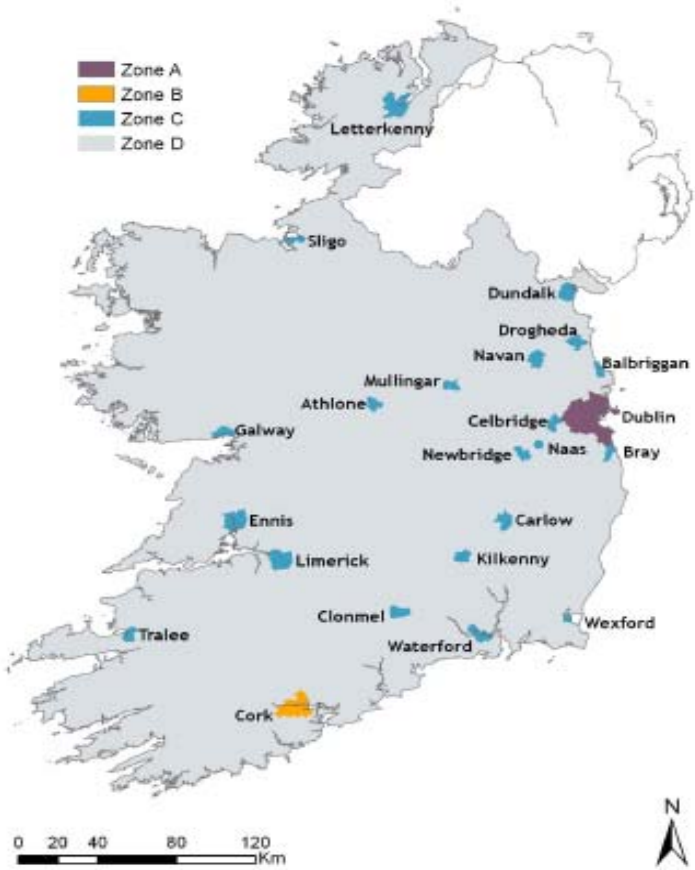


Figure 11.1 Air Quality Zones 2009

The proposed Connemara Greenway Project – Clifden to Oughterard is located within Zone D. Zone D is compliant with the air quality standards in relation to the following air pollutants: particulate matter (PM_{10}), Ozone, NO_X, SO_2, lead, CO, heavy metals, PAHs and benzene. The major source of air emissions in Ireland is road traffic. There are no major sources of potential air pollution in the study area. The towns along the Greenway route, in particular Oughterard, will generate concentrations of traffic derived pollution due to their status as commuting towns. The N59 primary road is located in close proximity to the Greenway for its entire route. There is limited data available from the national air quality monitoring database for air quality specifically in this rural part of County Galway. Monitoring data for nitrogen dioxide (NO_x), sulphur dioxide (SO_2), and particulate matter (PM_{10}) are reported by the EPA on a continuous basis at the rural background Air Quality Monitoring Station at Kilkitt in Co. Monaghan which also provides overall air quality data for Zone D: Rural Ireland. The Kilkitt station is located in the drinking water treatment works at Kilkitt, Co. Monaghan. This is a rural setting with little traffic or other influences on air quality. The results of the EPA monitoring are therefore indicative of rural background levels and may be considered representative of the background levels of the Clifden-Oughterard area.

The residential, working and visiting communities in the region, who would be considered the sensitive air receptors, must be considered when completing the proposed Greenway.

Nitrogen Dioxide

Nitrogen dioxide (NO_2) is classed as both a primary and a secondary pollutant. As a primary pollutant NO_2 is emitted from all combustion processes (such as a gas/oil fired boiler or a car engine). As a secondary pollutant NO_2 is derived from atmospheric reactions of pollutants that are themselves, derived mainly from traffic sources. NO_2 has been shown to reduce the pulmonary function of the lungs. Long term exposure to high concentrations of NO_2 can cause a range of effects, primarily in the

lungs, but also in the liver and blood. The EPA used a continuous chemiluminescent analyser to determine nitrogen dioxide (NO_2) concentrations at the Kilkitt station. The EPA data from 2003 to date are outlined in **Table 11.6**.

Table 11.6 Results of NO_2 Monitoring Carried out by the EPA in a Representative Zone D Site (Kilkitt, Co. Monaghan)

Statistic	Kilkitt 2003	Kilkitt 2004	Kilkitt 2005	Kilkitt 2006	Kilkitt 2007	Kilkitt 2008	Kilkitt 2009	Kilkitt 2010	AQ Limit
Annual Mean ($\mu g/m^3$)	3	3	2	3	2	3	3	3	**40**
Max 1-hour ($\mu g/m^3$)	71	43	33	58	53	80	50	32	**200**
NO_2 Values >200$\mu g/m^3$	0	0	0	0	0	0	0	0	**18**

Air quality data from the Kilkitt station indicate that the levels detected are below the relevant air quality limits for each year. The annual average concentration of 2-3$\mu g/m^3$ is typical of rural background locations and this is considered indicative of the area of the proposed Greenway route.

Nitrogen Oxides (NO_x)

Oxides of nitrogen (NO_x) are the sum of NO_2 and NO and are both a primary and secondary pollutant. NO_x is an atmospheric precursor for acid rain on reaction with water to form nitric acid. NO_x may have a positive or negative impact by acting as a fertiliser or a phytotoxicant. Effects are mainly on growth, photosysthesis and nitrogen assimilation/metabolism. As such, there is an annual limit for the protection of vegetation of 30$\mu g/m^3$ (see **Table 11.1**). The EPA used a continuous chemiluminescent analyser to determine nitrogen oxides (NO_x) concentrations at the Kilkitt station. The results of monitoring from 2003 to date are outlined in **Table 11.7**.

Table 11.7 Results of NO_x Monitoring Carried Out by the EPA in a Representative Zone D Site (Kilkitt, Co. Monaghan)

Statistic	Kilkitt 2003	Kilkitt 2004	Kilkitt 2005	Kilkitt 2006	Kilkitt 2007	Kilkitt 2008	Kilkitt 2009	Kilkitt 2010	AQ Limit
Annual Mean ($\mu g/m^3$)	3	4	4	4	3	4	3	4	**30**

The EPA air quality data from Kilkitt station indicate that the levels detected are below the annual average limit for each year (30$\mu g/m^3$). The annual average concentration of 3-4$\mu g/m^3$ is typical of rural background locations and this is considered indicative of the area of the proposed Greenway route.

Sulphur Dioxide (SO_2)

Sulphur dioxide is classed as a primary pollutant. It is principally emitted from the combustion of fossil fuels (diesel, coal, oil, etc.). As a traffic-based pollutant, SO_2 is mainly emitted from vehicles running on diesel fuel, which will include most light goods vehicles (LGVs) and heavy goods vehicles (HGVs). The "Air Pollution Act 1987 (Environmental Specifications for Petrol and Diesel Fuels) Regulations 2003" (SI No. 541 of 2003) provided for the marketing of petrol and diesel fuels with a maximum sulphur content of 10mg/kg ("sulphur free") from 1st January 2005 and since January 2009 all petrol

and diesel sold in the state is required to be "sulphur-free". As such, sulphur dioxide emissions from diesel powered engines (road vehicles, mobile plant, generators, etc.) are not considered significant. SO_2 emissions from burning of solid fossil fuels are the main cause of "sulphurous smog" in urban areas. The air quality data from Kilkitt show background SO_2 concentrations (annual averages 2-3 $\mu g/m^3$) below the relevant air quality limits for all averaging periods in the years 2003 to 2008. Levels are typical of rural background SO_2 concentrations and represent the annual average concentrations in rural areas in Ireland where there is an absence of major sources of SO_2. Therefore it has been assumed with some confidence that background SO_2 levels in the area are less than $5\mu g/m^3$ compared to the annual limit for the protection of human health of $20\mu g/m^3$.

Particulate Matter (PM_{10})

Particulate matter (PM_{10}) may be emitted as a primary pollutant from road vehicle exhausts, which is the main source in urban areas. In rural areas, sources will include traffic, agricultural activities and natural processes. Also point sources such as combustion, i.e. domestic fires, industrial boilers etc. are primary sources of PM_{10}. PM_{10} may also be formed as secondary pollutants from the condensation or reaction of chemical vapours in the atmosphere. Health effects associated with PM_{10}, in the long term, include chronic effects such as increased rates of bronchitis and reduced lung function.

The EPA measured results for PM_{10} from 2006 to date at the Kilkitt station. These results are presented in **Table 11.8**.

Table 11.8 Results of PM_{10} Monitoring Carried Out by the EPA in a Representative Zone D Site (Kilkitt, Co. Monaghan)

Parameter	Statistic	Kilkitt 2006	Kilkitt 2007	Kilkitt 2008	Kilkitt 2009	Kilkitt 2010	AQ Limit
Particulate Matter (PM_{10})	Annual Mean ($\mu g/m^3$)	10	10	10	8	10	**40**
	Max 24-hour ($\mu g/m^3$)	47	73	57	55	42	**50**
	24-hour Values >$50\mu g/m^3$	0	2	1	1	0	**35**

The concentrations of PM_{10} detected at the Kilkitt station indicate an annual average of 8-$10\mu g/m^3$. This is considered representative of a rural background PM_{10} level typical of the study area for the proposed Greenway route.

Particulate Matter ($PM_{2.5}$) has similar effects on health as PM_{10}; however, $PM_{2.5}$ is a better indicator of anthropogenic (man-made) emissions. Fine particulate matter $PM_{2.5}$ can be responsible for significant negative impacts on human health.

Currently there is no monitoring of $PM_{2.5}$ carried out at Zone D locations in Ireland. However, monitoring is being undertaken at Zones, A, B and C. The EPA published a research report entitled *Nature and Origin of PM_{10} and Smaller Particulate Matter in Urban Air* (EPA, 2006) which examined the relationship between PM_{10} and $PM_{2.5}$ in Ireland. The study found that consistently between urban, rural and coastal locations in Ireland, the $PM_{2.5}$ fraction of PM_{10} is approximately 60%. This approximation is borne out by the $PM_{2.5}$ values recorded in Ireland in 2008, 2009 and 2010 in Zone A, B and C locations.

Applying this fraction to the EPA PM_{10} data for Kilkitt station for 2006-2010/11 would provide an approximate $PM_{2.5}$ annual average of 6 $\mu g/m^3$ compared to the annual target value for the protection of

human health of 25μg/m^3 (see **Table 11.1**). This level is considered indicative of the air quality in the study area of the proposed Greenway route.

Total Suspended Particulates (Dust)

Health effects associated with dusts are typically associated with finer particulates such as PM_{10} discussed above. More commonly, dusts are associated with causing an environmental nuisance to residential, ecological and agricultural receptors. A guideline level for the prevention of dust nuisance is the TA Luft guideline of 350 mg/m^2/day as an annual average of monthly results. Background levels of dust in rural areas would typically demonstrate levels of 50-150 mg/m^2/day, dependent on the weather and agricultural practices in the area (e.g. ploughing, harvest time, etc.). Dust is not a pollutant regulated by national or European legislation and is therefore not included in the national monitoring network.

11.3.2 Climate

This section assesses the potential impacts of the proposed Greenway with respect to climate. The potential impacts of the construction phase of the development are assessed and mitigation measures if needed are outlined further in the chapter to minimise any significant impacts. The nearest meteorological and climatological station to the study area is located at Claremorris, County Galway. Meteorological and climate data from this station was used in assessing the impacts that the proposed Greenway may have on the local climate.

11.3.2.1 Global

The scale of the development is such that it will not have any significant effect on the global climate.

11.3.2.2 Microclimate

The physical nature of the landscape on and immediately surrounding the study area means that the site does not have any distinctive micro-climate in comparison to the larger surrounding area, however, land-sea effects, land to lake effects and the influence of hills on wind direction can be expected.

11.3.2.3 Meteorological Data

The nearest meteorological station to the study area is the Met Eireann Station in Claremorris which lies approximately 30km northeast of Oughterard. The weather in the area is influenced by the Atlantic Ocean, resulting in mild, moist weather. The prevailing wind direction in Ireland is from a quadrant centred on south-southwest. The 30-year averages from the station at Claremorris are presented in **Table 11.9**.

Table 11.9 30-year Average Meteorological Data from Clár Chlainne Mhuiris (Claremorris) (Annual Values from 1961-1990, source: www.met.ie.)

Parameter	30-Year Average
Mean Temperature (°C)	8.9
Mean Relative Humidity at 0900UTC (%)	88
Mean Daily Sunshine Duration (hours)	3.05
Mean Annual Total Rainfall (mm)	1136.4
Mean Wind Speed (knots)	8.8

Wind

The prevailing wind direction for the area is between south to south-west as presented in the windrose for Claremorris Met Station between 1950-2010 in **Figure 11.2**. Northerly and easterly winds tend to be very infrequent. Wind characteristics vary between a moderate breeze to gales (average 5.2 days with gales per annum). Monthly average wind speeds range between 7.3 and 10.2 knots with highest wind speeds occurring between January and March. Lowest wind speeds were recorded in the June, July and August period.

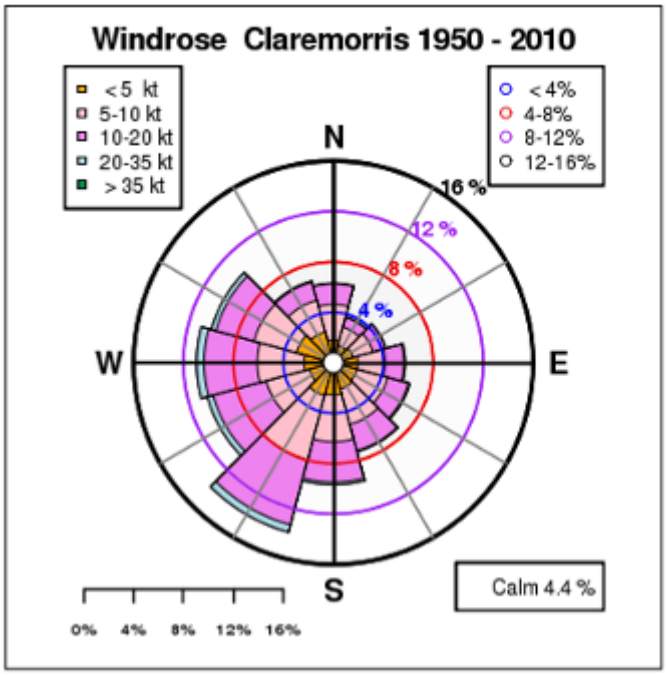


Figure 11.2 Claremorris Windrose 1950-2010

Rainfall

In terms of dust generation, rainfall is a controlling factor i.e. during wet conditions dust generation is inhibited. The precipitation records for Claremorris meteorological station are presented in **Table 11.10**. They show that daily rainfall greater than 1mm occurs for approximately 49% of an average year. The lowest levels of precipitation occur during the months of April and July with higher levels of precipitation occurring during the winter months.

Table 11.10 Mean precipitation (Claremorris Meteorological station 1961-1990)

Rainfall (mm)	*jan*	*feb*	*mar*	*apr*	*may*	*jun*	*jul*	*aug*	*sep*	*oct*	*nov*	*dec*	*year*
Mean Monthly Total	121.1	82.9	95.8	61.7	77.5	71.7	63.4	96.9	104.2	125.9	111.8	123.5	1136.4
Mean no. of Days With ≥ 0.2mm	22	17	21	17	18	16	17	19	19	22	21	22	230
Mean no. of Days With ≥ 1mm	18	14	17	12	14	12	11	14	15	17	17	17	178

The precipitation occurring in the winter period is normally associated with more pro-longed Atlantic frontal weather depressions passing over the region compared to the summer when rainfall is more likely to be associated with heavier showery conditions.

11.3.3 Carbon Balance – Greenhouse Gas Emissions

The proposed Greenway Project study area is predominantly composed of Precambrian Marbles and Precambrian Quartzite's, Gneisses and Schist's overlain with thin blanket peat deposits. Much of this blanket peat has been modified and can be now classified as cutover peat habitat. Drainage and cutting of bogs results in removal of biomass and decay of the drained peat which produces an increase in CO_2 emissions[11].

As a result the current carbon flux of the study area would be expected to include intake through photosynthesis and other biological processes within the ecosystem and its release as CO_2 to the atmosphere resulting from turf cutting.

The rates of carbon uptake and release will generally be influenced by the climate, nutrient availability and water saturation/oxygen availability. An assessment was carried out using the carbon calculator for construction activities developed by the Environment Agency (EA) in the UK. The carbon calculator calculates the embodied carbon dioxide (CO_2) of materials plus CO_2 associated with their transportation. It also considers personal travel, site energy use and waste management.

Detailed figures are presented in **Section 11.4** (Potential Impacts) where estimated greenhouse gas emissions have been calculated.

11.4 POTENTIAL IMPACTS

The potential impacts that the proposed Greenway Project might have on air quality and climate is further assessed under the following headings:

- "Do-Nothing Scenario"
- Operational Phase
- Construction Phase

11.4.1 "Do-Nothing Scenario" Impact

If the proposed Greenway Project does not proceed, the existing air quality in the vicinity of the study area would remain at ambient levels as are currently typical of the area.

11.4.2 Operational Phase

It is anticipated that there will be minimal operational phase impacts on air quality and climate. It is proposed that the Greenway will be used by walkers and cyclists therefore dust, air quality and climate emissions associated with the Greenway will be minimal.

11.4.3 Construction Phase

The following sections describe the potential impacts on air quality resulting from the construction phase of the proposed development. The impacts have been assessed on a local scale to determine impact on human health. An assessment of the emissions in the context of national emission targets has also been carried out.

[11] 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4: Agriculture, Forestry and Other Land Use, Chapter 7 – Wetlands.

The aspects considered include:

- Construction dust and its potential to impact on sensitive receptors and to cause an environmental nuisance;
- Construction plant emissions and their potential to cause significant impact on human health and/or sensitive ecosystems; and
- Construction traffic related emissions and their potential for impacts on sensitive receptors along haul routes.
- Greenhouse gas emissions from construction operations and peat disturbance.

The impacts are assessed in the following sections with respect to the relevant assessment criteria where appropriate.

11.4.3.1 Dust Emissions

Construction activities such as excavation, earth moving and backfilling can generate dust, particularly in dry weather conditions. The extent of dust generation will depend on the nature of the dust (soils, peat, sands, gravels, silts etc.), location of the main site compounds and the construction activity. In addition, the potential for dust dispersion depends on the local meteorological factors such as rainfall, wind speed and wind direction (see **Section 11.3.2.3**). Vehicles transporting material to and from the site also have the potential to cause dust generation along the selected haul routes from the construction areas.

In **Table 11.11** below, a list of distances is presented within which dust could be expected to result in a nuisance from construction sites for impacts such as soiling (dust nuisance), PM_{10} deposition and vegetation effects. This data has been taken from guidance published by the National Roads Authority for roads schemes but is considered applicable to this linear project. These distances present the potential for dust impact with standard mitigation in place. In accordance with the NRA Guidelines, where there are operations at a large construction site there is a risk that dust may cause an impact at sensitive receptors within 100m of the source of the dust generated.

A review of the receptors on the proposed Greenway identified that there are 271 No. receptors located within 100m of the proposed Greenway.

Table 11.11 Assessment criteria for the impact of dust from construction, with standard mitigation in place (Source: National Roads Authority, 2006)

Source		**Potential distance for significant effects (distance from source)**		
Scale	**Description**	**Soiling**	**PM10**	**Vegetation effects**
Major	Large constructions sites, with high use of haul roads.	100m	25m	25m
Moderate	Moderate sized construction sites, with moderate use of haul roads.	50m	15m	15m
Minor	Minor construction sites, with limited use of haul roads.	25m	10m	10m

Using this screening assessment tool, at a large construction site there is a risk that dust may cause an impact at sensitive receptors within 100m of the source of the dust generated. In order to access the impacts of construction activities associated with the proposed Greenway potential dust sources were identified. These include the seven site compounds located adjacent to the proposed Greenway

and construction associated with the Greenway itself. In **Table 11.12**, a list of the provisional site compounds for the proposed construction phase have been presented in conjunction with the scale of each site as outlined in **Table 11.11**. The provisional location of each site compound (SC) is presented in **Figures 6.1-6.20** in **Chapter 6** but described briefly in the table. Also listed in the table are the approximate distances to the nearest sensitive residential and ecological receptor. In **Table 11.13**, a list of each of the Greenway points (1-30), with sections between each point, have been presented in conjunction with the scale for each section as outlined in **Table 11.11** above.

Table 11.12 Provisional Site Compound Locations and Proximity to Receptors

Temporary Source	Scale	Location	Grid References	Approx distance to Residential Receptor	Approx distance to Ecological Receptor
SC 1	Minor	Next to/in a disused gravel pit in Gowlan West.	X:69,133.88 Y:249,587.85	260m	550m from 12 Bens cSAC
SC 2	Minor	In the townland of Cloonbeg.	X: 78,137.39 Y: 246,548.84	320m	Within Connemara Bog cSAC
SC 3	Minor	In the townland of Ballinafad, south of Lough Nabrucka	X: 79,995.60 Y: 246,434.71	450m	Within Connemara Bog cSAC
SC 4	Minor	In the townland of Athry, south of Derryclare Lough.	X: 81,091.89 Y: 247,327.10	350m	30m from 12 Bens cSAC
SC 5	Minor	Next to/in a disused gravel pit, west of Lough Shindilla, in the townland of Bunscanniff.	X: 94,716.84 Y: 246,152.78	260m	Within Maumturk Mts. cSAC
SC 6	Minor	In the townland of Lurgan (Shindilla).	X: 98,011.26 Y: 246,396.77	400m	130m from Maumturk Mts. cSAC
SC 7	Minor	In the townland of Letterfore.	X: 102,244.66 Y: 244,735.38	280m	Within Connemara Bog cSAC

All site compounds and the temporary working area along the route can be considered of minor scale as there will be two teams operating an excavator, dumper and roller on site. Therefore the potential distance of significant effects would be maximum 25m (see **Table 11.11**).

Site compounds 2, 3 and 7 are located within Connemara Bog Complex cSAC/NHA (Site Code: 002034). Site compound 5 is located within Maumturk Mountains cSAC/NHA (Site Code: 002008) Site compound 4 is located 30m from the Twelve Bens cSAC/NHA (Site Code: 002031). Given the proximity of construction in these areas to the designated site, there is a risk of dust impacts on the cSAC. However, stockpiling of materials will be minimised in those compounds located within the cSAC thereby reducing the potential for dust generation at these locations. Additional mitigation measures have been specified for these higher risk construction areas in **Section 11.5**.

All construction site compounds are located at distances sufficient even for major construction sites (i.e. greater than 100 metres) away from residential receptors. Therefore impacts to residential receptors from dust at site compounds will be minimal.

In terms of dust impacts on local agricultural properties, it is predicted that the levels of dust generated by the construction activity will be similar to the existing background levels generated by typical agricultural activities and the impact is considered negligible.

Table 11.13 Route Sections and Proximity to Receptors

Temporary Source		Scale	Approx nearest distance to Residential Receptor	Approx nearest distance to Ecological Receptor
From Chainage (Townland)	To Chainage (Townland)			
Ch 0 (Ardbear)	Ch3200 (Gowlan West)	Minor	Entire route is within: 10m of 18 residential properties; 15m of 34 residential properties; 25m of 77 residential properties; 50m of 156 residential properties; 100m of 267 residential properties; 200m of 437 residential properties.	Runs along Connemara Bog Complex boundary for 480m
Ch 3200 (Gowlan West)	Ch 4050 (Gowlan West)	Minor		230m from Twelve Bens cSAC
Ch 4050 (Gowlan West)	Ch 4300 (Gowlan West)	Minor		315m from Connemara Bog cSAC
Ch 4300 (Gowlan West)	Ch 11150 (Derryvickrune)	Minor		Runs through Connemara Bog cSAC for 3.2km
Ch 11150 (Derryvickrune)	Ch 11700 (Ballynahinch)	Minor		Runs through Connemara Bog cSAC for 15m
Ch 11700 (Ballynahinch)	Ch 11750 (Cloonbeg)	Minor		Runs through Connemara Bog cSAC for 130m
Ch 11750 (Cloonbeg)	Ch 12600 (Cloonbeg)	Minor		Runs through Connemara Bog cSAC for 360m
Ch 12600 (Cloonbeg)	Ch 14800 (Ballinafad)	Minor		Runs through Connemara Bog cSAC for 280m
Ch 14800 (Ballinafad)	Ch 15150 (Ballinafad)	Minor		Runs adjacent to Connemara Bog cSAC for 100m
Ch 15150 (Ballinafad)	Ch 17400 (Athry)	Minor		Runs through Connemara Bog cSAC for 2km
Ch 17400 (Athry)	Ch 19950 (Garroman)	Minor		Runs through Connemara Bog cSAC for 1.4km
Ch 19950 (Garroman)	Ch 20050 (Garroman)	Minor		Runs through Connemara Bog cSAC for 90m
Ch 20050 (Garroman)	Ch 31500 (Bunscanniff)	Minor		Runs through Connemara Bog cSAC for 2km
Ch 31500 (Bunscanniff)	Ch 34500 (Shannaunnafeola)	Minor		Runs through Maumturk Mts. cSAC for 2.6km
Ch 34500 (Shannaunnafeola)	Ch 34950 (Shannaunnafeola)	Minor		Runs through Maumturk Mts. cSAC for 600m

Temporary Source		Scale	Approx nearest distance to Residential Receptor	Approx nearest distance to Ecological Receptor
From Chainage (Townland)	To Chainage (Townland)			
Ch 34950 (Shannaunnafeola)	Ch 35100 (Lurgan (Shindilla))	Minor		Runs through Maumturk Mts. cSAC for 120m
Ch 35100 (Lurgan (Shindilla))	Ch 35150 (Lurgan (Shindilla))	Minor		Runs adjacent to Maumturk Mts. cSAC for 220m
Ch 35150 (Lurgan (Shindilla))	Ch 35450 (Lurgan (Shindilla))	Minor		30m to Maumturk Mts. cSAC
Ch 35450 (Lurgan (Shindilla))	Ch 35450 (Lurgan (Shindilla))	Minor		80m to Maumturk Mts. cSAC
Ch 35450 (Lurgan (Shindilla))	Ch 40200 (Lurgan (Shindilla))	Minor		Adjacent to Connemara Bog cSAC
Ch 40200 (Lurgan (Shindilla))	Ch 41850 (Leam West)	Minor		Runs through Connemara Bog cSAC for 1.7km
Ch 41850 (Leam West)	Ch 44500 (Leam East)	Minor		Runs through Connemara Bog cSAC for 500m
Ch 44500 (Leam East)	Ch 44800 (Derryerglinna)	Minor		Runs through Connemara Bog cSAC for 290m
Ch 44800 (Derryerglinna)	Ch 46200 (Glengowla West)	Minor		Adjacent to Connemara Bog cSAC for 1km
Ch 46200 (Glengowla West)	Ch 46550 (Glengowla West)	Minor		Runs through Lough Corrib cSAC for 90m
Ch 46550 (Glengowla West)	Ch 48850 (Glengowla East)	Minor		Runs within and adjacent to Lough Corrib cSAC for 2km
Ch 48850 (Glengowla East)	Ch 51300 (Cregg)	Minor		Runs through Lough Corrib cSAC for 1.2km
Ch 46200 (Glengowla West)	Ch 46550 (Glengowla West)	Minor		Ch. 48+850 immediately adjacent to Lough Corrib cSAC
Ch 46550 (Glengowla West)	Ch 48800 (Glengowla East)	Minor		Ch. 48+800 75m from Lough Corrib cSAC
Ch 48800 (Glengowla East)	Ch 48800 (Claremount)	Minor		Ch. 51+300 is 1.15km form Lough Corrib cSAC

The entire Connemara Greenway – Clifden to Oughterard route runs in proximity to a number of Natura 2000 sites as outlined in **Table 11.5**. However, mitigation measures as outlined in **Section 11.5** for construction activities will reduce the potential for dust generation at locations close to these sensitive ecological receptors.

There are 77 residential properties located within 25m of the proposed Greenway route. Without mitigation measures in place construction related dust at residential receptors located within 25m of minor construction works is likely to result in a '**Temporary Slight Adverse'** impact. Where dust related impacts are anticipated avoidance and mitigation measures can be put in place to reduce the impact level (see **Section 11.5**).

Air Quality:

The works associated with the construction of the Greenway development will be ground works, involving excavation of the existing topsoil and scrub, which will be used to form embankments along the path, and the laying of a stone sub-base to form the foundation of the Greenway path. Additional works will include the paving of the Greenway, the erection of fencing if required on both sides of the path, the removal of existing dilapidated bridge structures and replacement with new decking and railings. It is proposed to carry out the work using two teams working in tandem and the machinery will comprise 360 degree track machines, dumpers, vibrating rollers, cranes, road graders and road pavers.

It is proposed to construct the Greenway as a linear project, meaning there will be no need to construct new access routes to facilitate works. It is not envisaged that rock breaking will be required. Seven site compounds are proposed, the locations of which are detailed in **Table 11.12** above.

The movement of machinery will generate exhaust fumes and subsequently contribute to potential emissions of the following compounds; oxides of nitrogen, carbon monoxide, sulphur dioxide, particulate matter (including PM_{10}/$PM_{2.5}$), volatile organic compounds (VOCs) and polyaromatic hydrocarbons (PAHs). While concentrations of these pollutants are expected to increase in the immediate vicinity of the machines during site works it is not anticipated that they will have any impact on the air quality of the region or in turn on the sensitive receptors in the area considering the size and nature of the study area and the number of machines proposed.

Climate:

It is not envisaged that the Connemara Greenway Project – Clifden to Oughterard works will have any significant impacts on the climate.

11.4.4 Greenhouse Gas Emissions

All construction activities associated with the proposed Greenway will be undertaken by machinery travelling along the existing disused rail line and existing roads.

It is anticipated that approximately 127,500m³ of overburden (predominantly topsoil); will be removed from the proposed route in preparation for the laying of Greenway track surface.

It is envisaged that excavated material will be used to form embankments along the path undertaken with a view to minimising the transport of material off-site.

The construction phase climate assessment was carried out to identify sources and quantify total greenhouse gas (GHG) emissions generated from the construction activities associated with the proposed Greenway. This assessment was carried out using the carbon calculator for construction activities developed by the Environment Agency (EA) in the UK (http://www.environment-

agency.gov.uk/business/sectors/37543.aspx). The carbon calculator calculates the embodied carbon dioxide (CO_2) of materials plus CO_2 associated with their transportation. It also considers personal travel, site energy use and waste management.

Emissions with the potential to cause climate change include carbon dioxide (the main greenhouse gas), which will arise from the materials used in laying the Greenway surface as well as machinery associated with the works. These emissions have been quantified using the Environment Agency (EA) *Carbon Calculator for Construction Sites.*

The total estimated greenhouse gas emissions associated with the proposed Greenway is calculated at approximately 1500 tonnes of CO_{2eq} compared to the National Kyoto Target of 63 million tonnes of $CO_{2eq.}$ This increase is considered to be negligible (0.002%) in the context of the National Kyoto Target.

11.5 MITIGATION MEASURES

Mitigation measures will be implemented during all stages of the proposed Greenway where necessary, in order to ensure that the existing air quality is not negatively impacted upon by the proposed works.

To ensure that site machinery at the construction stage will not impact on the existing air quality and local sensitive receptors the following measures will be implemented:

- All site preparation and construction machinery will have speed restrictions on unsurfaced roads,
- Regular maintenance of plant and equipment will take place including technical inspection of vehicles to ensure they will perform most efficiently,
- Where possible temporary access roads within the temporary working area will be used to minimise traffic on the local road network, and
- Machinery engines will be turned off when not in use for prolonged periods of time.

Table 11.14 sets out the potential air quality and climate impacts, mitigation measures and residual impacts resulting from the proposed Greenway works.

Table 11.14 Summary of Potential Impacts and Proposed Mitigation Measures Relative to Air Quality and Climate

Potential Impact on Traffic & Transport Environment	Positive/ Negative	Major/ Moderate/ Minor	Area Affected	Duration	Mitigation Measures	Residual Impact
Greenway Contraction Works						
Potential emissions of oxides of nitrogen, carbon monoxide, sulphur dioxide, particulate matter (including PM_{10}/$PM_{2.5}$), volatile organic compounds (VOCs) and polyaromatic hydrocarbons (PAHs) from site machinery during construction phase	Negative	Minor	Proposed Greenway works site	Temporary	• All site preparation and channel widening machinery will have speed restrictions on unsurfaced roads, • Regular maintenance of plant and equipment will take place including technical inspection of vehicles to ensure they will perform most efficiently, • Where possible temporary access roads within the temporary working area will be used to minimise traffic on the local road network, and • Engines will be turned off when not being used for prolonged periods of time	None

11.6 RESIDUAL IMPACTS

There will be no residual impact on air quality as a result of the proposed Greenway.

11.7 CONCLUSIONS

This section describes the potential impacts to ambient air quality and climate from the Greenway project.

The plant and machinery to be used for the proposed Greenway works were identified as having potential to produce emissions to the air at a local level. Traffic associated with employees working on site during the proposed works will also be potential sources of emissions. However given the nature of the construction works, the sparsely populated nature of the majority of the study area and the implementation of mitigation measures, it is not considered that this aspect of the proposal will have a negative impact on air quality or climate. Considering the size and nature of the study area, the location of the nearest sensitive receptors and the implementation of mitigation measures it is not envisaged that the proposed Greenway will have a negative impact on air quality or on the climate.

12 NOISE AND VIBRATION

12.1 INTRODUCTION

This section of the EIS assesses the noise and vibration impacts associated with the Connemara Greenway Project – Clifden to Oughterard. The assessment identifies potential sensitive receptors and identifies the existing noise environment for these receptors. The extent of exposure of these receptors to noise generated in association with the proposed Greenway has also been assessed.

12.2 METHODOLOGY

A desktop assessment was conducted in order to assess the impacts of the proposed Greenway on the existing noise environment. The aim of the desktop assessment was to determine the potential impacts of noise generated on the noise sensitive receptors. The following standards and guidelines were used in completing this assessment:

- ISO (1996-2:1987) *Description and Measurement of Environmental Noise*,
- EPA (2006) *Guidance Note for Noise in Relation to Scheduled Activities*, 2nd Edition, ,
- WHO (1999) *Guidelines for Community Noise*, World Health Organisation,
- NRA (2004) *NRA Guidelines for the Treatment of Noise & Vibration on National Road Schemes*, 2004, National Roads Authority,
- EPA, (2002). *Guidelines on the Information to be contained in Environmental Impact Statements*, Environmental Protection Agency,
- EPA, (2003) *Advice Notes on Current Practice in the Preparation of Environmental Impact Statements*, Environmental Protection Agency,
- *Environmental Noise Regulations* (2006), (S.I. No. 140 of 2006), and
- *Draft Action Noise Plan,* 2008, County Galway Local Authorities.

12.2.1 Noise Assessment Criteria

Noise is typically defined as "unwanted sound"; sound being the human sensation of pressure fluctuations in the air. Sound levels are expressed in decibels (dB) on a logarithmic scale, where 0dB is nominally the "threshold of hearing" and 120dB is nominally the "threshold of pain". Depending upon the circumstances and characteristics of the sound in question, a change in level of 3dB is just perceptible, whereas an increase of 10dB is perceived as a subjective doubling of loudness (*NRA Guidelines for the Treatment of Noise & Vibration on National Road Schemes, 2004*).

The frequency of sound is the rate at which a sound wave oscillates, and is expressed in Hertz (Hz). The sensitivity of the human ear to different frequencies in the audible range is not uniform. For example, hearing sensitivity decreases markedly as frequency falls below 250 Hz. A mechanism known as "A-weighting" has been adopted in order to account for this non-linearity of the human ear.

Sound levels expressed using "A-weighting" are typically denoted dB (A). An indication of the level of common sounds on the dB (A) scale is presented in **Figure 12.1**.

The indices most commonly used for the assessment of noise impact are L_{Aeq}, L_{A10} and L_{A90} which are defined as follows:

$L_{Aeq,T}$, the equivalent continuous noise level for the measurement period. This parameter is very sensitive to local high-level short time sources, e.g. local traffic, etc.

L_{A10}, the sound level equalled or exceeded for 10% of the measurement period, the parameter usually used for traffic noise assessment.

L_{A90}, the sound level equalled or exceeded for 90% of the measurement period. This level is sometimes taken to represent the “background” noise level.

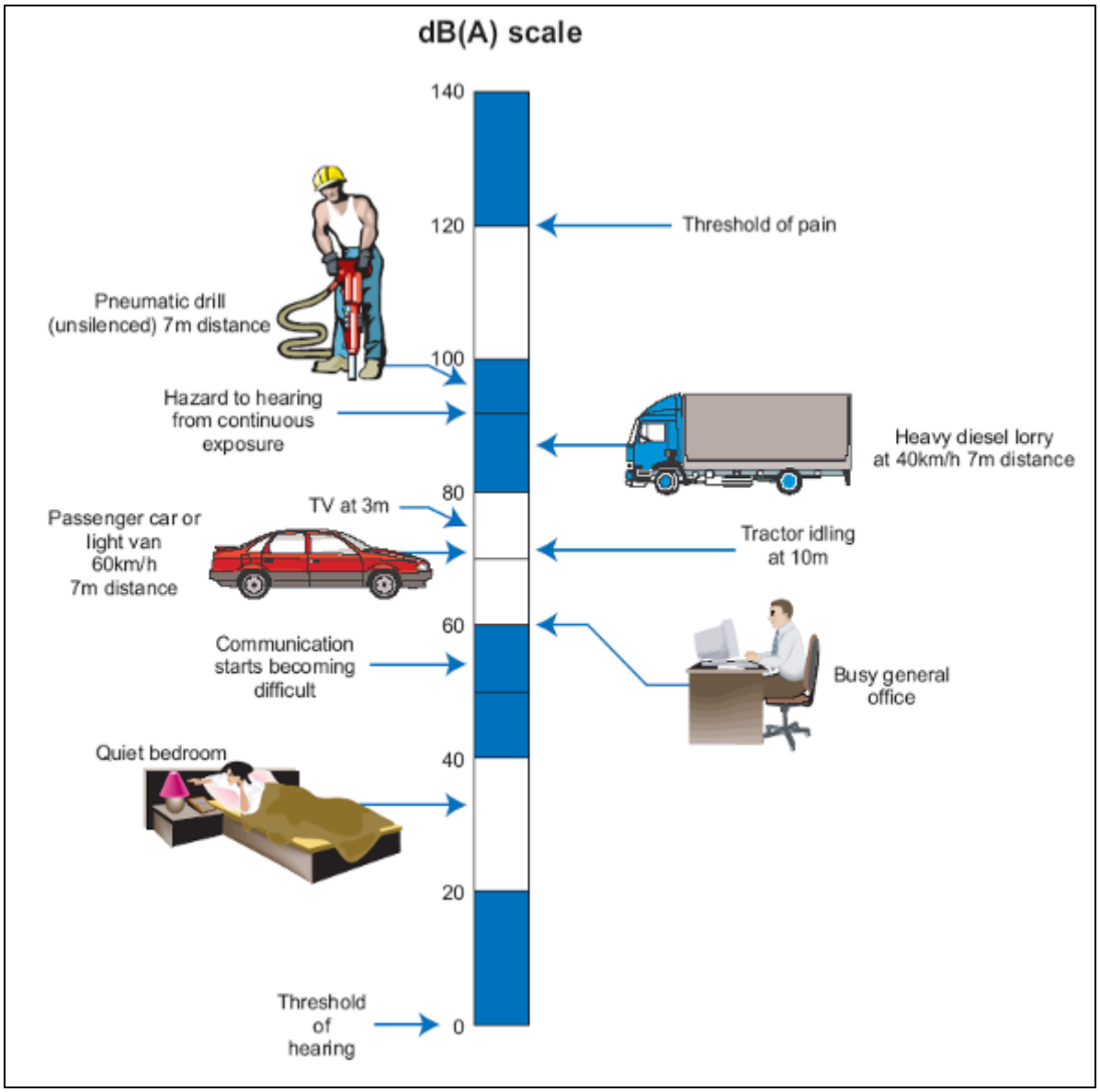


Figure 12.1 Level of Typical Common Sounds on the dB(A) Scale

12.2.2 Site Works Criteria

BS 5228 "*Noise and Vibration Control on Construction and Open Sites*" has been used to predict likely site works noise levels during site preparation and Greenway construction.

The National Roads Authority has outlined construction noise limits in its "*Guidelines for the Treatment of Noise and Vibration in National Roads Schemes*" (NRA, 2004). This is the only published Irish Guidance and relates to National Road Schemes. These limits, which are presented in **Table 12.1**, represent a reasonable compromise between the practical limitations in a construction project, and the need to ensure an acceptable ambient noise level for local residents.

Table 12.1 Maximum Permissible Noise Levels at the Façade of Dwellings during Construction (NRA Guidelines, October 2004)

Days & 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*

Construction activity at these times, other than that required in respect of emergency works will normally require the explicit permission of the relevant local authority.

These noise assessment criteria have been used in this assessment to predict the potential impact of noise from the proposed Greenway construction and operation on noise sensitive receptors.

12.2.3 Rating of Impacts

Subjectively, the significance that can be attached to changes in noise levels (perceptible to human beings) can be described as follows in **Table 12.2**.

Table 12.2 Significance Scale for Changes in Noise Levels (Perceptible to Human Beings)

Change in Noise Level	Impact Rating	EPA Glossary of Impacts	Subjective Reaction	Subjective Change	% Change in Loudness
0	No change	n/a	n/a	No change	0%
<3 dB(A)	Not Significant	Neutral, Imperceptible or Slight Impact	Barely perceptible	Negligible	10%
3 – 5 dB(A)	Minor	Significant Impact: Positive or Negative	Perceptible	Noticeable	30%
6 – 10 dB(A)	Moderate		Up to a doubling of loudness	Clearly Noticeable	70%
11–15 dB(A)	Major		Over a doubling of loudness	Substantial	100%
>15 dB(A)	Severe	Profound Significant Impact: Negative only	---	Very Substantial	>100%

12.3 EXISTING ENVIRONMENT

The study area is located in a rural setting and has a low population with the exception of the towns of Oughterard and Clifden. There are 437 No. receptors within 200m of the proposed route and 267 No. receptors within 100m of the proposed route.

The topography of the study area ranges in elevation from approximately 20 mOD to 45 mOD. Surrounding lands are made up of bog, mountains and lake. Throughout the rural region of the study area the noise environment is dominated by noise sources of typical rural environs (i.e. rustling foliage, birdsong and light winds) with traffic noise also being a contributing factor. In the area within the immediate vicinity of the towns of Oughterard and Clifden and where the Greenway runs along the N59 the noise environment is dominated by traffic noise from passing vehicles and would be typical of either the noise levels experienced in a medium sized Irish town and along a national route.

There are no point sources of noise in the existing environment.

Galway County Council prepared a Draft Action Noise Plan in 2008 in accordance with the Environmental Noise Regulations 2006 to address environmental noise from major roads in the county with more than six million vehicles per annum. The action planning area covers sections of the N6, N17 and N18 national primary roads and R336 regional road and adjoining lands and so the location of the proposed Greenway is not covered by the Draft Action Noise Plan.

Typical ranges of noise levels with examples of activities which might produce these noise levels are presented in **Table 12.3**. Based on activities observed within proximity of the proposed Greenway it is anticipated that the existing noise levels fall within 35-55 dB(A).

Table 12.3 Typical Noise Levels in our Environment

Sound levels in decibels dB(A)	Description of Activity
0	Absolute silence
25	Very quiet room
35	Rural night time setting with no wind
55	Day time, busy roadway 0.5km away
70	Busy restaurant
85	Very busy pub, voice has to be raised to be heard
100	Disco or rock concert
120	Uncomfortably loud, conversation impossible
140	Noise causes pain in ears

Source: Guidance Note for Noise in relation to Scheduled activities, 2nd Edition, EPA 2006.

12.4 POTENTIAL IMPACTS

The potential impacts that the proposed Greenway might have on the existing noise environment is further assessed under the following headings:

- Do-Nothing Scenario, and
- Construction phase and operational phase of the Greenway.

12.4.1 "Do Nothing Scenario" Impact

If the proposed Greenway does not go ahead, the general noise level in the vicinity of the study area would remain unchanged from the current environment.

12.4.2 Operation Phase

It is anticipated that there will be minimal operational phase impacts on noise and vibration. It is proposed that the Greenway will be used by walkers and cyclists therefore noise and vibration levels associated with the operation of the proposed Greenway will be minimal.

12.4.3 Construction Phase

12.4.3.1 Noise

The construction phase of the proposed Greenway will entail the use of different machinery and plant at various locations within the study area, delivery of site machinery and the working of this machinery on the site. One of the main changes to the existing noise environment in the rural section of the study area will be the additional noise generated by the machinery and plant associated with the works to be undertaken. Traffic associated with employees working on site during the proposed works will also be potential sources of noise.

It is envisaged that any works taking place within the town of Clifden, and adjacent to the N59 will not have a significant impact on the existing noise environment as there is already noise generated by traffic on a day to day basis.

Table 12.4 shows the typical levels of noise emitted by machinery that will typically be used on site during the proposed Greenway construction.

Table 12.4 Sound Pressure Levels of Typical Machinery to be used During Construction Phase

Noise Source	A-weighted Sound Pressure Level L_{Aeq} dB
Tracked Excavator	77
Wheeled Loader	80
Dump Truck (Tipping Material)	79
HGV (unloading)	112

Source: Sound Pressure Levels taken from (DEFRA) Update of Noise Database for Prediction of Noise on Construction and Open Sites, 2005.

It is not anticipated there will be any significant negative impacts on the sensitive receptors located in the region of the Connemara Greenway Project - Clifden to Oughterard works in terms of increased noise emissions. This takes into consideration the size and nature of the study area and the density and location of the nearest sensitive receptors.

12.4.3.2 Vibration

The relevant vibration standards can be divided into two categories, those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In the case of continuous sources of vibration, such as traffic, vibration is perceptible at around 0.5mm/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, blasting (an instantaneous activity) and piling (a repetitive/continuous activity), two of the primary sources of vibration during road construction projects, are typically tolerated at vibration levels up to 12mm/s and 2.5mm/s, respectively. However, it is anticipated that events blasting or piling with high vibration levels will not be necessary for construction of the proposed Greenway route.

The NRA Guidelines identify 2.5mm/s as the vibration level that may be considered tolerable during piling works. This limit provides for protection against the vibration nuisance, and is comfortably within the limit for potential cosmetic damage. The potential vibration levels that could be generated by rock breaking works, as required, would be expected to be comparable to the level of vibration that may be generated by piling works. 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 majority of dwelling houses in the vicinity of the proposed Greenway route will comply with modern building regulation standards and in this regard the vibration limit levels outlined above are representative of levels that would be expected to be tolerable by these dwelling houses, without undue concern. In addition, it should be noted that there is a significant safety margin accounted for within the NRA limits, and buildings with slight deviations from modern building regulation standards should not be at significantly increased risk of cosmetic damage. Because there is no piling or blasting activities required as part of the Greenway construction, any sensitive receptors in proximity to the Greenway will not be subject to significant vibration levels.

Guidance relevant to acceptable vibration at the foundation of buildings is contained within BS 7385 (1993): Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground-borne vibration. This guidance states that there should typically be no cosmetic damage to buildings if transient vibration does not exceed 15mm/s at low frequencies rising to 20mm/s at 15Hz and 50mm/s at 40Hz and above. These guidelines refer to relatively modern buildings. Therefore, the guideline values should be reduced to 50% or less for more critical buildings. Critical buildings would include premises with machinery that is highly sensitive to vibration or historic buildings that may be in poor repair, including residential properties.

It is not anticipated there will be any significant negative impacts on the sensitive receptors located in the region of the Connemara Greenway Project - Clifden to Oughterard works in terms of increased vibration. This takes into consideration the size and nature of the study area and the density and location of the nearest sensitive receptors.

12.5 MITIGATION MEASURES

The residential, working and visiting communities in the region, who would be considered the sensitive noise receptors, must be considered when completing all Greenway construction works.

It is not anticipated there will be any significant negative impacts on the sensitive receptors located in the study area in terms of increased noise emissions. To ensure this is the case mitigation measures will be implemented during all stages of the proposal where necessary, in order to ensure that the existing ambient noise environment is not negatively impacted upon by the proposed Greenway construction. Measures will include the following:

- There will be no work outside of normal working hours;
- Where practicable the use of quiet working methods will be selected and the most suitable plant will be selected for each activity, having due regard to the need for noise control;
- All contractors will employ the best practicable means to minimise noise emissions and will be obliged to comply with the general recommendations of BS 5228, 1997. To this end all contractors will use “noise reduced” plant and/or will modify their construction methods so that noisy plant is unnecessary;
- Where possible, position potentially noisy plant or operations as far as possible from a noise sensitive receptor to minimise the transmission of sound;
- All mechanical plant used on site will be fitted with effective exhaust silencers and will be maintained in good working order. Where practicable, machines will be operated at low speeds and will be shut down when not in use;
- Where practicable the number of machines in simultaneous operation will be minimised;
- Plant and machinery used on-site will comply with the EC (Construction Plant and Equipment) Permissible, Noise Levels Regulations, 1988 (S.I. No. 320 of 1988);
- All noise producing equipment will comply with S.I. No 632 of 2001 European Communities (Noise Emission by Equipment for Use Outdoors) Regulations 2001;
- Machines in intermittent use shall be shut down, or throttled down to a minimum, in the intervening period between works;
- Employees working on the construction site will be informed about the requirement to minimise noise and will undergo training on the following aspects:
  - The proper use and maintenance of tools and equipment;
  - The position of machinery on-site to reduce the emission of noise at the nearest noise sensitive receptors;
  - Avoidance of unnecessary noise when carrying out manual operations and when operating plant and equipment;

  - The use and maintenance of sound reduction equipment fitted to power pressure tools and machines, and

  - Reporting defective noise control equipment.

- Cognisance will also be taken from the “Environmental Good Practice Site Guide” 2005 compiled by CIRIA and the UK Environmental Agency. This guide provides useful and practical information regarding the control of noise emissions at construction sites which can be applied to the proposed Greenway construction.

Table 12.5 presents the potential noise impacts, mitigation measures and residual impacts resulting from the proposed Greenway.

Table 12.5 Summary of Potential Impacts and Proposed Mitigation Measures Relative to Noise

Potential Impact on Traffic & Transport Environment	Positive/ Negative	Major/ Moderate/ Minor	Area Affected	Duration	Mitigation Measures	Residual Impact
Greenway construction works						
Potential increase in ambient noise levels for noise sensitive receptors in the vicinity of the proposed Greenway during the construction phase.	Negative	Minor	Noise Sensitive Receptors	Temporary	Put in place measures as listed in **Section 12.5**.	None

12.6 RESIDUAL IMPACTS

The proposed Greenway may temporarily increase the noise and vibration levels in the immediate vicinity of site works during the construction phase. With mitigation measures implemented, construction of the proposed Greenway will not result in a significant increase in noise levels at any of the noise sensitive locations.

12.7 CONCLUSIONS

This section describes the potential impacts to the noise and vibration environment and more particularly to noise sensitive receptors resulting from construction of the proposed Greenway.

The existing noise environment in the rural region of the study area is typical of a sparsely populated rural area and all relevant potential noise sensitive receptors were also identified. In the area in the immediate vicinity of the town of Clifden and the N59 national route, the noise environment is dominated by traffic noise from passing vehicles and would be typical of the noise levels experienced either in a medium sized Irish town or on a national route.

The plant and machinery to be used for construction of the proposed Greenway were identified as having potential to make noise and vibration emissions which may be perceptible to the noise sensitive receptors identified. However, considering the size and nature of the study area, the density and location of the nearest sensitive receptors and the implementation of mitigation measures it is not considered that the construction of the proposed Greenway will have a negative impact on the noise and vibration sensitive receptors identified.

13 ARCHAEOLOGY, ARCHITECTURAL AND CULTURAL HERITAGE

13.1 INTRODUCTION

13.1.1 General

Irish Archaeological Consultancy Ltd has prepared this report on behalf of RPS Group to assess the impact, if any, on the archaeological, architectural and cultural heritage resource of a proposed Greenway development in County Galway. The proposed route runs between Clifden and Oughterard and for the most part will follow the disused railway track.

This study determines, as far as reasonably possible from existing records, the nature of the cultural heritage resource within the area of proposed development using appropriate methods of study. Desk based research is defined as an assessment of the known or potential archaeological resource within a specified area consisting of a collation of existing written and graphic information. The assessment takes place in order to identify the likely character, extent, quality and worth of the known or potential archaeological resource in order to make an assessment of its merit in context, leading to one or more of the following:

- The formulation of a strategy to ensure the recording, preservation or management of the cultural heritage resource;
- The formulation of a strategy for further investigation, whether or not intrusive, where the character and value of the resource is not sufficiently defined to permit a mitigation strategy or other response;
- The formulation of a proposal for further archaeological investigation within a program of research (Institute of Field Archaeologists 2001a)

The study involved detailed interrogation of the archaeological, historical and architectural background of the development area. This included information from the Record of Monuments and Places of County Galway, the County Development Plan, the topographical files of the National Museum of Ireland and cartographic and documentary records. Aerial photographs of the study area held by Ordnance Survey Ireland were also consulted. A field inspection was carried out on during February 2012 in an attempt to identify any known cultural heritage sites and previously unrecorded features, structures and portable finds within the proposed development area.

An impact assessment and a mitigation strategy have been prepared. The impact assessment is undertaken to outline potential adverse impacts that the proposed development may have on the cultural heritage resource, while the mitigation strategy is designed to avoid, reduce or offset such adverse impacts.

13.1.1.1 The Development

Please see **Chapter 6** of this EIS.

13.1.1.2 Definitions

In order to assess, distil and present the findings of this study, the following definitions apply:

'Cultural Heritage' where used generically, is an over-arching term applied to describe any combination of archaeological, architectural and cultural heritage features, where:

- the term 'archaeological heritage' is applied to objects, monuments, buildings or landscapes of an (assumed) age typically older than AD 1700 (and recorded as archaeological sites within the Record of Monuments and Places),
- the term 'architectural heritage' is applied to structures, buildings, their contents and settings of an (assumed) age typically younger than AD 1700, and
- the term 'cultural heritage', where used specifically, is applied to other (often less tangible) aspects of the landscape such as historical events, folklore memories and cultural associations. This designation can also accompany are archaeological or architectural designation.

For the purposes of this report the terms 'architectural heritage' and 'built heritage' have the same intended meaning and are used interchangeably.

13.1.1.3 Impact Definitions

Imperceptible Impact: An impact capable of measurement but without noticeable consequences

Slight Impact: An impact that causes noticeable changes in the character of the environment without affecting its sensitivities.

Moderate Impact: An impact that alters the character of the environment in a manner that is consistent with existing or emerging trends.

Significant Impact: An impact which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.

Profound Impact: An impact that obliterates sensitive characteristics.

Impacts as defined by the EPA 2002 Guidelines (pg 23).

13.1.1.4 Consultations

Following the initial research a number of statutory and voluntary bodies were consulted to gain further insight into the cultural background of the background environment, receiving environment and study area, as follows:

- Department of Arts, Heritage and the Gaeltacht (DAHG) – the Heritage Service, National Monuments and Historic Properties Section: Record of Monuments and Places; Sites and

Monuments Record; Monuments in State Care Database; Preservation Orders; Register of Historic Monuments and the database of current licences (2009–2012);

- National Museum of Ireland, Irish Antiquities Division: topographical files of Ireland,
- National Inventory of Architectural Heritage: County Galway,
- Galway County Council: Planning Section, and
- Trinity College Dublin, Map Library: Historical and Ordnance Survey Maps.

13.2 METHODOLOGY

Research has been undertaken in two phases. The first phase comprised a paper survey of all available archaeological, architectural, historical and cartographic sources. The second phase involved a field inspection of the proposed route.

13.2.1.1 Paper Survey

The following sources were examined and a list of areas of archaeological, architectural and cultural heritage potential was compiled:

- Record of Monuments and Places for County Galway;
- Sites and Monuments Record for County Galway;
- Monuments in State Care Database;
- Preservation Orders;
- Register of Historic Monuments;
- Database of current archaeological investigation licences (2009–2012);
- Topographical files of the National Museum of Ireland;
- Cartographic and written sources relating to the study area;
- Galway County Development Plan (2009–2015);
- Oughterard Local Area Plan (2006-2012);
- Clifden Local Area Plan (2009-2015);
- National Inventory of Architectural Heritage;
- Place name analysis;
- Aerial photographs;
- Excavations Bulletin (1970–2008).

Record of Monuments and Places (RMP) is a list of archaeological sites known to the National Monuments Section, which are afforded legal protection under Section 12 of the 1994 National Monuments Act and are published as a record. Details of all sites located within c. 500m of the proposed greenway development are included within **Appendix D.1**.

Sites and Monuments Record (SMR) holds documentary evidence and field inspections of all known archaeological sites and monuments. Some information is also held about archaeological sites and monuments whose precise location is not known e.g. only a site type and townland are recorded.

These are known to the National Monuments Section as 'un-located sites' and cannot be afforded legal protection due to lack of locational information. As a result these are omitted from the Record of Monuments and Places. SMR sites are also listed on the recently launched website created by the DAHG – www.archaeology.ie.

National Monuments in State Care Database is a list of all the National Monuments in State guardianship or ownership. Each is assigned a National Monument number whether in guardianship or ownership and has a brief description of the remains of each Monument.

The Minister for the Department of Arts, Heritage and the Gaeltacht may acquire national monuments by agreement or by compulsory order. The state or local authority may assume guardianship of any national monument (other than dwellings). The owners of national monuments (other than dwellings) may also appoint the Minister or the local authority as guardian of that monument if the state or local authority agrees. Once the site is in ownership or guardianship of the state, it may not be interfered with without the written consent of the Minister.

Preservation Orders List contains information on Preservation Orders and/or Temporary Preservation Orders, which have been assigned to a site or sites. Sites deemed to be in danger of injury or destruction can be allocated Preservation Orders under the 1930 Act. Preservation Orders make any interference with the site illegal. Temporary Preservation Orders can be attached under the 1954 Act. These perform the same function as a Preservation Order but have a time limit of six months, after which the situation must be reviewed. Work may only be undertaken on or in the vicinity of sites under Preservation Orders with the written consent, and at the discretion, of the Minister.

Register of Historic Monuments was established under Section 5 of the 1987 National Monuments Act, which requires the Minister to establish and maintain such a record. Historic monuments and archaeological areas present on the register are afforded statutory protection under the 1987 Act. The register also includes sites under Preservation Orders and Temporary Preservation Orders. All registered monuments are included in the Record of Monuments and Places.

Database of current archaeological investigation licences is a listed held by the National Monument Section of the DAHG that provides details of licences issued that have yet to appear within the Excavations Bulletin (2009–2012).

Topographical files of the National Museum of Ireland is the national archive of all known finds recorded by the National Museum. This archive relates primarily to artefacts but also includes references to monuments and unique records of previous excavations. The find spots of artefacts are important sources of information on the discovery of sites of archaeological significance. Details of all stray finds recorded within the townlands surrounding the proposed greenway development are included within **Appendix D.2.**

Cartographic sources are important in tracing land use development within the development area as well as providing important topographical information on areas of archaeological potential and the development of buildings. Cartographic analysis of all relevant maps has been made to identify any topographical anomalies or structures that no longer remain within the landscape. Ordnance Survey 6" maps of County Galway (1839, 1898)

Documentary sources were consulted to gain background information on the archaeological, architectural and cultural heritage landscape of the proposed development area.

Aerial photographic coverage is an important source of information regarding the precise location of sites and their extent. It also provides initial information on the terrain and its likely potential for archaeology. A number of sources were consulted including aerial photographs held by the Ordnance Survey and Google Earth.

Place Names are an important part in understanding both the archaeology and history of an area. Place names can be used for generations and in some cases have been found to have their root deep in the historical past.

Development Plans contain a catalogue of all the Protected Structures and archaeological sites within the county. The Galway County Development Plan (2009–2015); Clifden Local Area Plan (2009–2015) and Oughterard Local Area Plan (2006-2012) were consulted to obtain information on cultural heritage sites in and within the immediate vicinity of the proposed route. Details of all RMP sites and Recorded Protected Structures located within c. 300m of the proposed greenway are included within **Appendix D.1** and **Appendix D.3**.

The **National Inventory of Architectural Heritage (NIAH)** is a government based organisation tasked with making a Nation wide record of significant local, regional, national and international structures, which in turn provides county councils with a guide as to what structures to list within the Record of Protected Structures. The architectural survey for County Galway was completed during 2011. The NIAH have also carried out a nation wide desk based survey of historic gardens, including demesnes that surround large houses. This has also been completed for County Galway and was examined in relation to the surviving demesnes within the surrounding area of the proposed development. Details of all NIAH structures located within c. 300m of the proposed greenway are included within **Appendix D.3**.

Excavations Bulletin is a summary publication that has been produced every year since 1970. This summarises every archaeological excavation that has taken place in Ireland during that year up until 2008 and since 1987 has been edited by Isabel Bennett. This information is vital when examining the archaeological content of any area, which may not have been recorded under the SMR and RMP files. This information is also available online (www.excavations.ie) from 1970–2008.

13.2.1.2 Field Inspection

Field inspection is necessary to determine the extent and nature of archaeological and architectural remains, and can also lead to the identification of previously unrecorded or suspected sites and portable finds through topographical observation and local information.

The archaeological and architectural field walking inspection entailed:

- Walking the proposed greenway route and its immediate environs.
- Noting and recording the terrain type and land usage.
- Noting and recording the presence of features of archaeological, architectural or cultural heritage significance.
- Verifying the extent and condition of recorded sites.
- Visually investigating any suspect landscape anomalies to determine the possibility of their being anthropogenic in origin.

Please see **Appendices D.4-D.7** for protective guidelines and legislation that were taken into account during the assessment of the archaeological and architectural heritage of the proposed Greenway development.

13.3 RECEIVING ENVIRONMENT

13.3.1 Results and Analysis – Archaeology

13.3.1.1 Archaeological and Historical Background

General

The proposed Greenway scheme is located between Clifden and Oughterard, within County Galway. It runs through the picturesque region known as Connemara, which is dominated by mountains, lakes and bogs. The relatively marginal landscape, whilst attractive to tourists today, was not as attractive for settlement in past centuries. Agriculture usage was limited, as it is today. During the 1890s the Clifden to Galway Railway was constructed, which facilitated a growing tourist trade. The proposed scheme will, for the most part, follow the route of this major piece of Victorian infrastructure.

Prehistoric Period

Mesolithic Period (c. 7000–4000BC)

The Mesolithic Period is the earliest time for which there is clear evidence of prehistoric activity in Ireland. During this period people hunted, foraged and gathered food and appear to have had a mobile lifestyle. The most common evidence indicative of Mesolithic activity at a site comprises of scatters of worked flint material; a by-product from the production of flint implements or rubbish middens consisting largely of shells (Stout & Stout, 1997). The latter are commonly discovered in coastal regions or at the edge of lakes and a few worked flakes have been found near Oughterard (Robinson 1997, 331). Although it is likely that nearby lakeside and riverine environments were an important element for the Mesolithic populations in this landscape, as a food and travelling resource, there are no recorded Mesolithic sites within proximity of the proposed greenway, despite the proliferation of lakes. The earliest known settled landscape is located along the northwestern coastal fringe from Clifden to Leenaun (*ibid*.).

Neolithic Period (c. 4000–2500BC)

During the Neolithic period communities became less mobile and their economy became based on the rearing of stock and cereal cultivation. This transition was accompanied by major social change. Agriculture demanded an altering of the physical landscape, forests were rapidly cleared and field boundaries constructed. There was a greater concern for territory, which saw the construction of large communal ritual monuments called megalithic tombs, which are characteristic of the period. The proposed greenway travels through relatively marginal land and to date; no Neolithic sites have been recorded in the area. However, two polished stone axes have been recovered within the town of Clifden from unspecified location. These may date to the Neolithic period and indicate the presence of at least a transient population (NMI 2000:1, 2009:212).

Bronze Age Period (c. 2500–800BC)

The most common Bronze Age site within the archaeological record is the burnt mound or *fulacht fiadh*. Over 4500 *fulachta fiadh* have been recorded in the country making them the most common prehistoric monument in Ireland (Waddell 1998, 174). Although burnt mounds of shattered stone occur as a result of various activities that have been practiced from the Mesolithic to the present day, those noted in close proximity to a trough are generally interpreted as Bronze Age cooking/industrial sites. *Fulachta fiadh* generally consist of a low mound of burnt stone, commonly in horseshoe shape, and

are found in low lying marshy areas or close to streams or rivers. Often these sites have been ploughed out and survive as a spread of heat shattered stones in charcoal rich soil with no surface expression in close proximity to a trough.

There are no recorded *fulachta fiadh* within the vicinity of the proposed greenway, despite the frequency of loughs, rivers and small watercourses. It is likely that during summer months, the receiving environment of the proposed scheme was attractive for transient settlement, possibly associated with the summer grazing of livestock.

Standing stones, usually single upright orthostats, are a common feature in the landscape. They are known by various names including *Gallán, dallán, leacht* and long stone (Power *et. al.* 1992, 45). Although it is thought that the standing stones were erected across a wide time span and had multiple functions they are most often associated with the Bronze Age. They are generally unworked stones and often have packing material around their base providing additional support. A large number of standing stones are orientated on a north-east–south-west axis corresponding with those of other megalithic architecture, such as stone rows or circles (Ronan *et. al.* 2009, 22). A wide variety of functions have been attributed to these stones, such as burial markers and route or territorial markers. More recent stones have been erected as scratching posts for cattle.

A standing stone (AH 17) is located within townland of Ballynahinch, c. 280m north of the proposed route. It is suggested however that this stone is more likely to be an 18th or 19th century ornamental feature associated with Ballynahinch Demesne (Gosling 1993, 16). A stone row (AH 28) is also recorded in the townland of Boheeshal, c. 100m north-east of the proposed route.

Iron Age Period (c. 800BC–AD500)

Compared to the rest of Irish prehistory there is very little evidence in Ireland, as a whole, representing the Iron Age. As in Europe, there are two phases of the Iron Age in Ireland; the Hallstatt and the La Tène. The Hallstatt period generally dates from 700BC onwards and spread rapidly from Austria, across Europe, and then into Ireland. The later Iron Age or La Tène culture also originated in Europe during the middle of the 5th century BC. For several centuries the La Tène Celts were the dominant people in Europe, until they were finally overcome by the Roman Empire. There are no known Iron Age sites located within the vicinity of the proposed greenway.

Early Medieval Period (AD500–1100)

During this period Ireland was not a united country but rather a patchwork of minor monarchies all scrambling for dominance, with their borders ever changing as alliances were formed and battles fought. Kingdoms were a conglomerate of clannish principalities with the basic territorial unit known as a *túath*. Byrne (1973) estimates that there were probably at least 150 kings in Ireland at any given time during this period, each ruling over his own *túath*. These kings were distributed strategically throughout the region and ruled over many tribal units.

The most common indicator of settlement during the early medieval period is the ringfort. Ringforts, (also known as rath, *lios*, *caiseal*, *cathair* and *dún*) are a type of defended homestead comprising of a central site enclosed by a number of circular banks and ditches. The number of ditches can vary from one (univallate) to two or three (bivallate or multi-vallate) and is thought to reflect the status and affluence of the inhabitants. Another morphological variation consists of the platform or raised rath – the former resulting from the construction of the rath on a naturally raised area. Ringforts are most commonly located at sites with commanding views of the surrounding environs which provided an element of security. While raths, for the most part, avoid the extreme low and uplands, they also show a preference for the most productive soils (Stout 1997, 107). The most recent study of the ringfort (Stout 1997) has suggested that there is a total of 45,119 potential ringforts or enclosure sites throughout Ireland. While rath and *lios* seem to refer to earthen ringforts, *caiseal* (cashel) and *cathair* refer to their stone-walled equivalents.

Ringforts (raths and cashels) are relatively scarce within the receiving environment of the proposed scheme with one cashel (AH 34) located c. 290m north of the proposed route within the townland of Glengowla East. A further potential ringfort has also been noted within the townland of Letterforce, c. 280m east of the proposed route. It is not recorded in the RMP but is annotated as a ringfort on the modern OS map. The site appears to be shown as a quarry feature on the first edition OS map and a banked feature on the second edition.

The lack of recorded ringforts within the receiving environment is possibly due to the marginal nature of the landscape, which may have only been utilised for seasonal grazing. Robinson (1997, 334) suggests that secular settlement in Connemara may have been largely unenclosed. Whilst this remains a possibility, it is also possible that settlement was transient and seasonal and as a result did not require defended settlements. It should be noted that there are five recorded enclosure sites within the receiving environment, which have the potential to represent ringfort sites. AH 11-13, are located adjacent to one another within the townland of Munga, c. 55-120m south-west of the proposed route. In Killeen (AH 15) is located c. 60m north of the route and in Canrawer West, AH 44 is located c. 215m to the north. These belong to a classification of monument whose precise nature is unclear. Often they may represent ringforts, which have either been damaged to a point where they cannot be positively recognised, or which are smaller or more irregular in plan than the accepted range for a ringfort. An early medieval date is generally likely, though not a certainty.

Two *crannógs* are located within the receiving environment in the townlands of Killeen (AH 21 and AH 23), c. 80m and 165m north of the proposed route respectively. *Crannógs* or lake dwellings are normally associated with the early medieval period, although artefacts found during field walking and excavations have revealed occupation as early as the Bronze Age and as late as the post-medieval period. *Crannógs* are not as numerous as ringforts, but nonetheless represent an important settlement type for this period. It is estimated that there are c. 1200 crannógs recorded, confined largely to parts of the country with a large number of lakes and other stretches of shallow water (Edwards 1996, 37). Although sometimes located on natural islands, *crannógs* are generally constructed on entirely artificial foundations, with the crannóg material kept in place by a ring of close-set vertical piles forming a palisade (*ibid*., 34-5). The site locations are naturally defensive and accessed by boat, causeway or wooden bridge. Some of the *crannógs* on open water survive as small, often wooded islands, while others have been submerged by rising water levels or when the *crannóg* material has compacted and sunk. Drainage operations have often revealed sunken sites, recognisable in older reclaimed land as grassy or tree-grown hummocks. By their very nature, *crannógs* are waterlogged, thus allowing for the preservation of normally perishable organic material, such as wood, leather and environmental evidence.

This period was also characterised by the introduction of Christianity to Ireland. The new religion was a catalyst for many changes, one of the most important being literacy. Irish was written down for the first time using the ogham script. The ogham alphabet is thought to be based on the Latin alphabet of the later Roman Empire and today the majority of the inscriptions that survive are located on pillar stones or boulders.

There are two recorded church sites within the receiving environment, which may possess early origins. AH 14, at Derryadd West located c. 230m SSE of railway and AH 24 at Ballinafad, c. 400m north-east of the proposed route. A small graveyard (AH 18) is also recorded within the townland of Killeen c. 380m north of the proposed route, which contains burials dating to the early 19th century. It is possible that may occupy the position of a medieval friary.

A holy well is located within study area in the townland of Killeen (AH 19) c. 470m north of the proposed greenway. The site is located on the east bank of the Owenmore River c. 70m north of a graveyard (AH 18) and is known as *Tobar Feichín* (Gosling 1993, 125). Most wells have no artificial features associated with them and where such do occur they can usually be shown to be of recent origin. However veneration of wells is a very widespread and ancient tradition in Ireland. A further well is recorded at Canrawer West (AH 42), c. 270m north of the proposed route.

Medieval Period (AD1100–1600)

The beginning of the medieval period was characterised by political unrest that originated from the death of *Brian Borumha* in 1014. *Diarmait MacMurchadha,* deposed King of Leinster, sought the support of mercenaries from England, Wales and Flanders to assist him in his challenge for kingship. Norman involvement in Ireland began in 1169, when Richard de Clare and his followers landed in Wexford to support *MacMurchadha*. Two years later de Clare (Strongbow) inherited the Kingdom of Leinster and by the end of the 12th century the Normans had succeeded in conquering much of the country (Stout & Stout 1997, 53). The first series of castles in Ireland consisted of earth and timber features and began appearing near the start of the Norman invasion of Ireland and lasted steadily until 1225. These castles were built hastily to establish territorial claims and were later replaced by stone castles. There are no medieval castles recorded within the receiving environment of the proposed scheme. However, Ballynahinch Castle (RMP GA036-001) is located *c*. 1.13km north of the route on an island in Ballynahinch Lake. It is said that the castle was built by the O'Flahertys, specifically Donal O'Flaherty husband of Gráinne Ní Mháílle (Granuaile), a member of the most powerful clan in Connaught (Killanin and Duignan 1962, 92).

West Connaught (or Connemara) remained a refuge of the old clan life during the medieval period despite the expanding connections between Galway City and Renaissance Europe. In the late 16th century the 'Country of O'Flaherty's called *Eyre-Conaght*' was divided into four baronies – Moycullen, Ballynahinch, Ross and the Isles of Aran (Robinson 1997, 335).

Post Medieval Period (AD1600–1900)

The O'Flahertys remained in power until the Rebellion of 1641 when they were expropriated and their lands sold off (*ibid*. 336). Two of the main families to benefit from the land upheaval were the D'arcys and the Martins. Ballynahinch became the home of the Martins who constructed a mansion house (AH 16) site overlooking the Owenmore River (Killanin and Duignan 1962, 92). The house is now used as a hotel and is located c. 260m north of the proposed greenway, within its own ornamental demesne lands. The vast Martin estates, mostly comprising mountains and moorland, made the Martins one of the greatest landlords in the West.

The 17th century saw dramatic rise in the establishment of large residential houses around the country. The large country house was only a small part of the overall estate of a large landowner and provided a base to manage land that could be located nationwide. Lands immediately associated with the large houses were generally turned over into a parkland estate (demesne). Although the creation of a parkland landscape involved working with nature, rather than against it, considerable constructional effort went into their creation. Earth was moved, field boundaries disappeared, streams were diverted to form lakes and quite often roads were completely diverted to avoid travelling anywhere near the main house or across the estate. Whilst the designed landscapes possessed an ornamental form, they still retained a valuable function; providing grazing for livestock and habitats for game. A small number of demesnes are shown on the first edition OS mapping within the proximity of the proposed route. These include the large demesne lands in Ballynahinch along with Killeen, Glendollagh, Canrawer East and Claremount. A number of designed landscape features dating to this period are included within the RMP for Co. Galway such as the features present in Killeen Demesne (AH 20 and 22), which are located c. 240m and 115m north of the proposed route respectively.

A total of two sites (AH 27 and AH 31), which are recorded as children's burial grounds, are located within the vicinity of the proposed route. They are located within the townlands of Cappaghoosh (AH 27) and Derreennagusfoor (AH 31), c. 130m south-west and c. 185m north of the proposed route respectively. The practice of burying children and infants in a separately designated place appears to have proliferated in Ireland from the 17th century onwards and continued in some cases into the last century (Donnelly & Murphy 2008, 28). In part this reflects the refusal by church authorities to allow the burial of un-baptised children on consecrated ground, but also perhaps the view that unnamed children had not attained full status within the communities they lived in. Occasionally adults who were viewed as outcasts in one way or another were also buried in such places. Often these places are

known as '*cillín*', or '*ceallúnach*'. In many instances burials are marked by low un-inscribed upright slabs and the deaths were not mourned or waked in the traditional ways.

A mass rock (AH 9) is recorded within the townland of Ardagh, c. 280m south of the proposed route, which would have been used to celebrate mass during Penal times (AD1690s to 1750s). A burial site (AH 10) is recorded in Killymongaun townland c. 30 south of the proposed greenway route. This burial is located in rough pasture to the south of the Dúinín road and is formed by a rectangular grave outlined by small stones, aligned east–west (Gosling 1993, 144). Local lore links this grave with the story of Fr. Myles Prendergast shooting a spy during the 1798 Rebellion (*ibid*.).

A number of mill sites are also recorded within the receiving environment, three of which have been included within the RMP at Ardagh (AH 8) c. 210m south-west of the proposed route; Lissoughter (AH 26) c. 324m SSW and Claremount (AH 41) c. 320m south.

Two lead mines and a copper mine are also located within the receiving environment of the proposed scheme, within the townlands of Glengowla West (AH 33 and 35) and at Claremount (AH 39). Although there is evidence for copper mines in Cork and Kerry dating to the Bronze Age it was not until the 18th century AD that copper was systematically mined in Ireland (Rynne 2006, 141). The Glengowla lead mines (AH 33 and 35) were in operation between 1851 and 1861 and are currently open to the public (*ibid*. 143). They are located c. 100m and 145m north of the proposed route respectively. AH 39 is located c. 415m north of the proposed route, on the western environs of Oughterard town.

The landscape of the receiving environment is characterised by bog and marginal ground. Historic and prehistoric finds and features of an organic nature are often found in bogs; these include track ways, log boats, wooden platforms, objects and implements, bog butter and burials. The custom of burying butter in bogs appears to have been known in early times, possibly as early as the 6th century A.D. An account of Irish food written by Dinely in 1681 contains the following description 'Butter, layered up in wicker baskets, mixed with a sort of garlic and buried for some time in a bog to make a provision of an high taste for Lent'. Burial in a bog would ensure protection from daytime heat and keep the butter as cool as possible, while the exclusion of air and the antiseptic qualities of the turf would prevent mould growth.

It may have been associated with the formerly widespread Booleying System, whereby cattle and sheep were driven to upland pastures for the summer months. The practice may have also been adopted for reasons of security. A widespread weapon of war was the destruction of all foodstuffs, thereby causing famine. In these cases the discovery of bog butter could indicate the sudden destruction or flight of the people who stored it. These containers have been made of a variety of materials, including wood, bark, cloth, wicker work and animal skins. The wooden vessels are sometimes carved out of a solid piece of wood, with a detachable lid or handle. The practice of burying butter in bogs was not confined to Ireland, as examples have been found in Scotland. It is probable that the practice of burying butter in bogs died out in the early 19th century. Several examples of bog butter vessels have been identified within the receiving environment, with a wooden vessel recovered from the townland of Shannakeela (NMI 1941:1418) and a number of examples recovered in the townland of Derreighter (1998:35, 36).

Summary of Previous Archaeological Fieldwork

A review of the Excavations Bulletin (1970–2008) and the database of archaeological licences held by the Department of Arts, Heritage and the Gaeltacht (2009–2012) has revealed that two programs of archaeological investigation have been undertaken within the receiving environment of the proposed scheme. Monitoring of broadband installation was undertaken over a ten-week period from September 2006 in the town and vicinity of Clifden (Fitzpatrick, 2006; Licence Ref.: 06E0735). Nothing of archaeological significance was uncovered in any of the trenches.

A medieval or post-medieval turf-built structure was identified in the townland of Derrylea prior to the realignment of the N59 national secondary road where it skirts the northern shore of Derrylea lake (Hull, 2005; Licence Ref.: 05E0977). The site was located c. 1.2km north of the proposed greenway route. A radiocarbon date of AD1220–1410 was retrieved from vegetation at the site. However the excavator was cautious and suggests that a later date is more likely. The structure has been interpreted as a temporary hut possibly used as a shepherd's bothy or a pen for animals such as sheep.

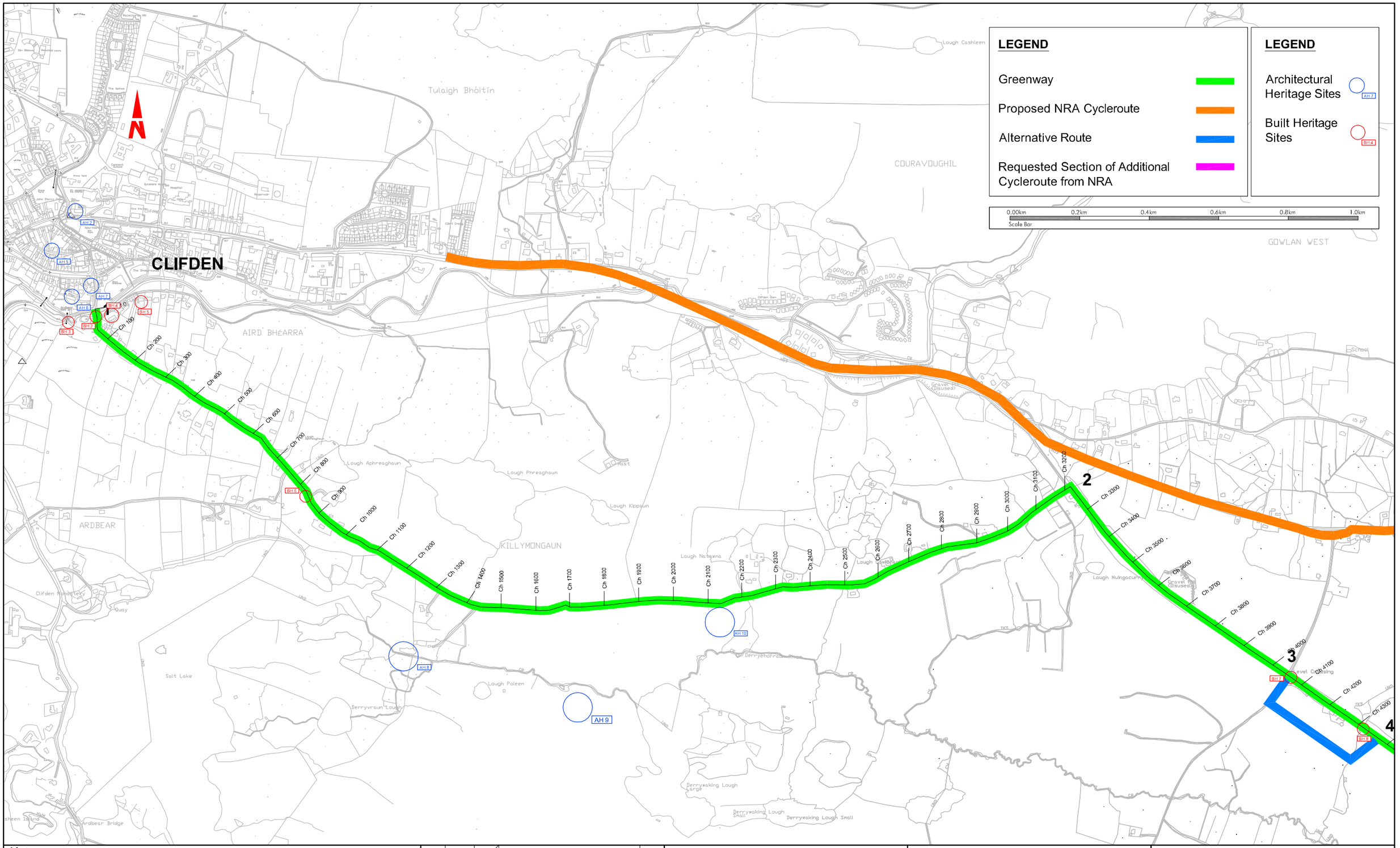
13.3.1.2 Cartographic Analysis

For the purposes of this assessment, the cartographic analysis for the proposed scheme has been divided into sections between chainages (the first section being between Ch. 0 and Ch.3+200, and so on), travelling from Clifden at its western extent, to Oughterard at its eastern extent. These are marked on **Figures 13.1-13.18**. Photographs showing examples of a number of architectural points throughout the route are shown in **Image 13.1 to Image 13.5**. Two Ordnance Survey maps have been used in the analysis; the first edition six inch dating to 1839 and the second edition six inch dating to 1898. As the dominant feature of the landscape is the railway itself, along with associated features, the cartographic analysis in this section describes both archaeological features/potential and built heritage features.

Ch 0 to Ch. 3+200

Here the proposed route commences along a road on the southern edge of Clifden town and proceeds in a roughly easterly direction through the townlands of Ardbear and Killymongaun. The road is marked as a dashed track on the first edition and is still present by the second edition. The first edition shows numerous small structures and a large amount of lime kilns within irregular field systems to the north and south of the road. These have reduced in number by 1898. At Ch. 0, *Ardbear Old Bridge* (BH 2) (**Image 13.1**) is marked on both editions, with the first edition marking a *brewery, in ruins* to the immediate south-west of the bridge. By the time of the second edition the brewery buildings appear to still be present but are no longer annotated. At Ch. 3+200 the railway is marked on the second edition.

Image 13.1 BH 2, Ardbear Old Bridge (Ch 0 to Ch. 3+200), facing west



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Title: FIGURE 13.1 ARCHITECTURAL HERITAGE & BUILT HERITAGE SITES Sheet 1 of 15

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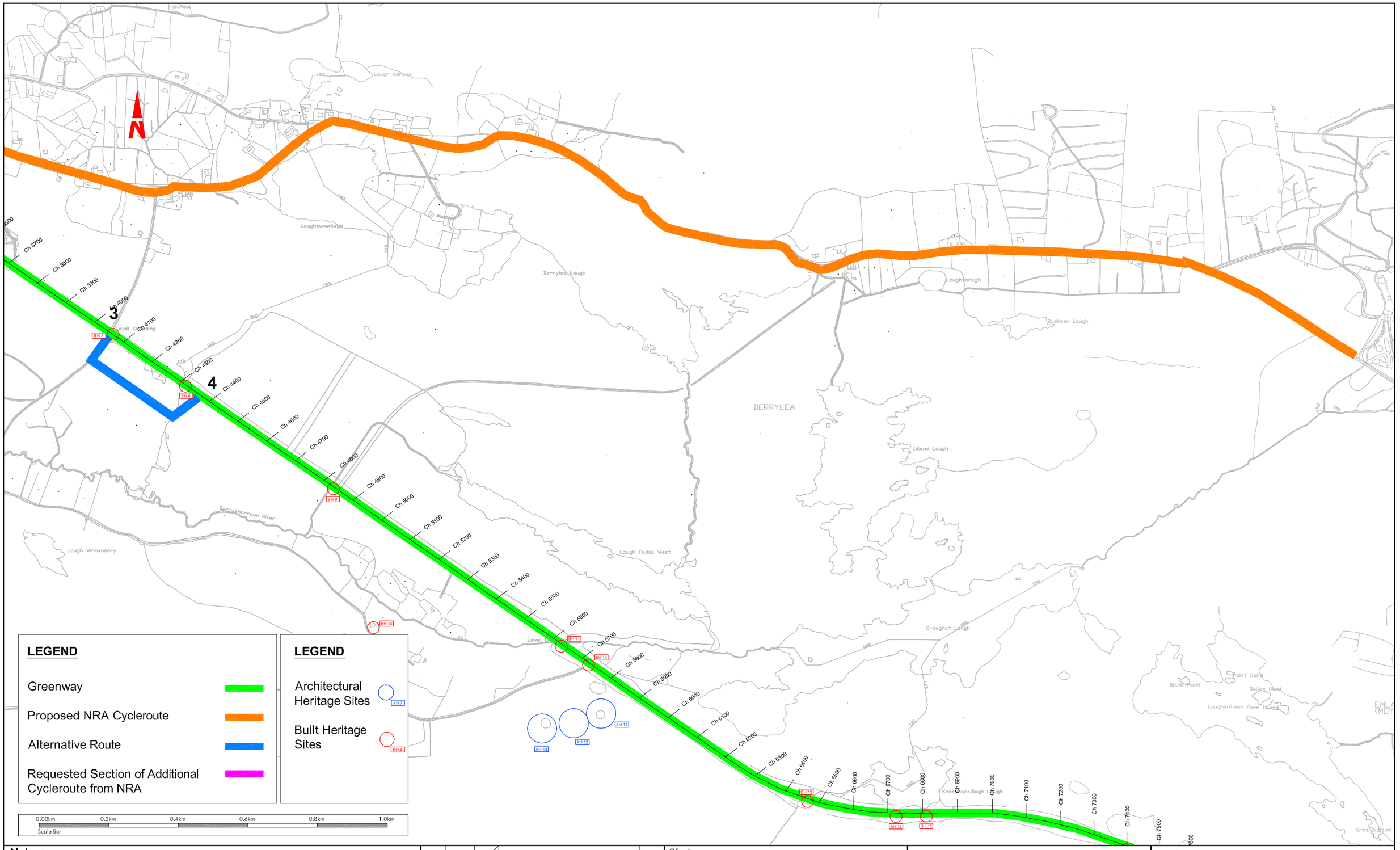

LEGEND

- Greenway
- Proposed NRA Cycleroute
- Alternative Route
- Requested Section of Additional Cycleroute from NRA

LEGEND

- Architectural Heritage Sites
- Built Heritage Sites

0.00km 0.2km 0.4km 0.6km 0.8km 1.0km
Scale Bar

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Title: FIGURE 13.2 ARCHITECTURAL HERITAGE & BUILT HERITAGE SITES Sheet 2 of 15

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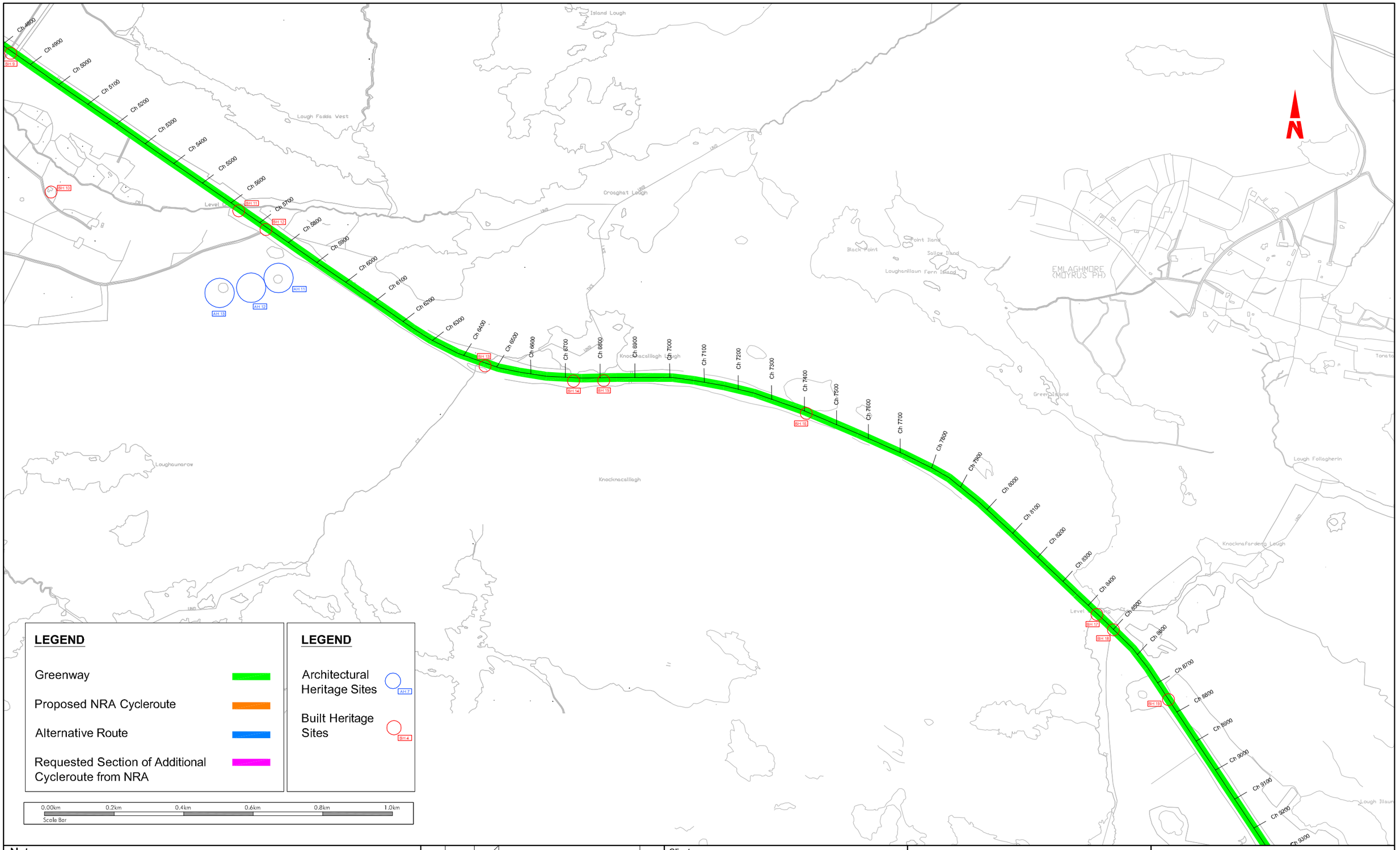

LEGEND

- Greenway
- Proposed NRA Cycleroute
- Alternative Route
- Requested Section of Additional Cycleroute from NRA

LEGEND

- Architectural Heritage Sites (AH 7)
- Built Heritage Sites (BH 4)

0.00km 0.2km 0.4km 0.6km 0.8km 1.0km
Scale Bar

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Title: FIGURE 13.3 ARCHITECTURAL HERITAGE & BUILT HERITAGE SITES Sheet 3 of 15

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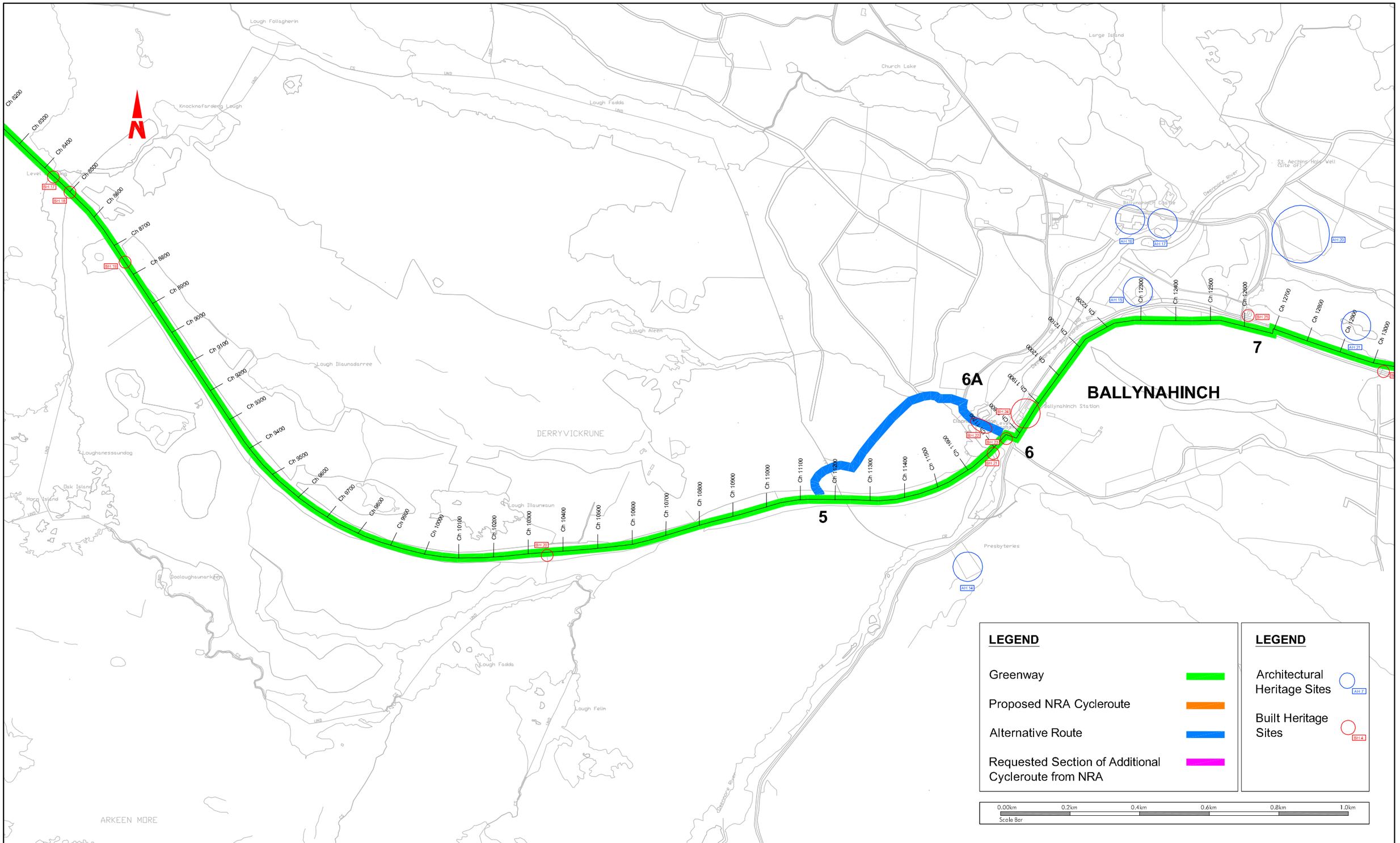

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Title: **FIGURE 13.4 ARCHITECTURAL HERITAGE & BUILT HERITAGE SITES Sheet 4 of 15**

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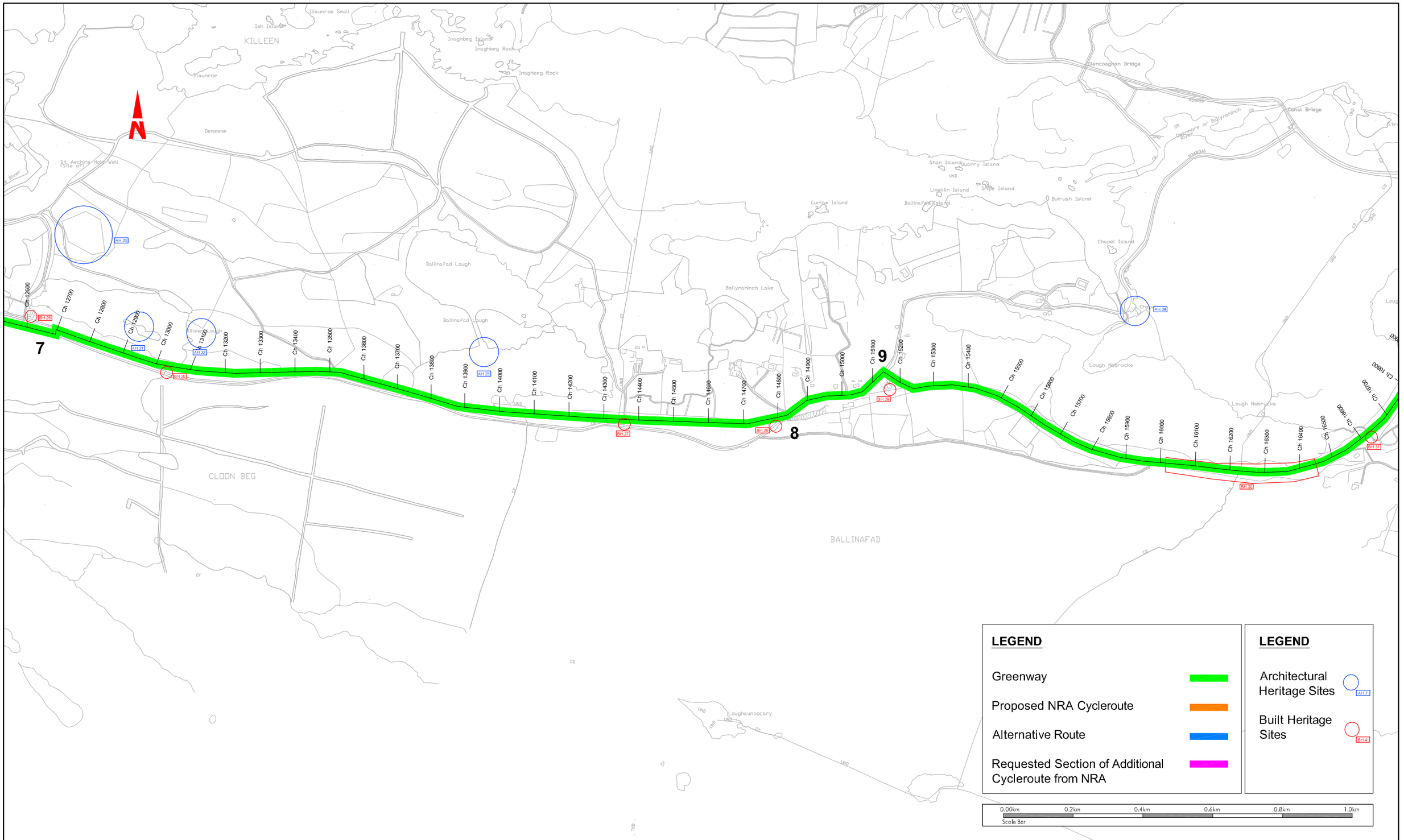

LEGEND

- Greenway
- Proposed NRA Cycleroute
- Alternative Route
- Requested Section of Additional Cycleroute from NRA

LEGEND

- Architectural Heritage Sites (AH 7)
- Built Heritage Sites (BH 4)

0.00km 0.2km 0.4km 0.6km 0.8km 1.0km
Scale Bar

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Title: **FIGURE 13.5 ARCHITECTURAL HERITAGE & BUILT HERITAGE SITES Sheet 5 of 15**

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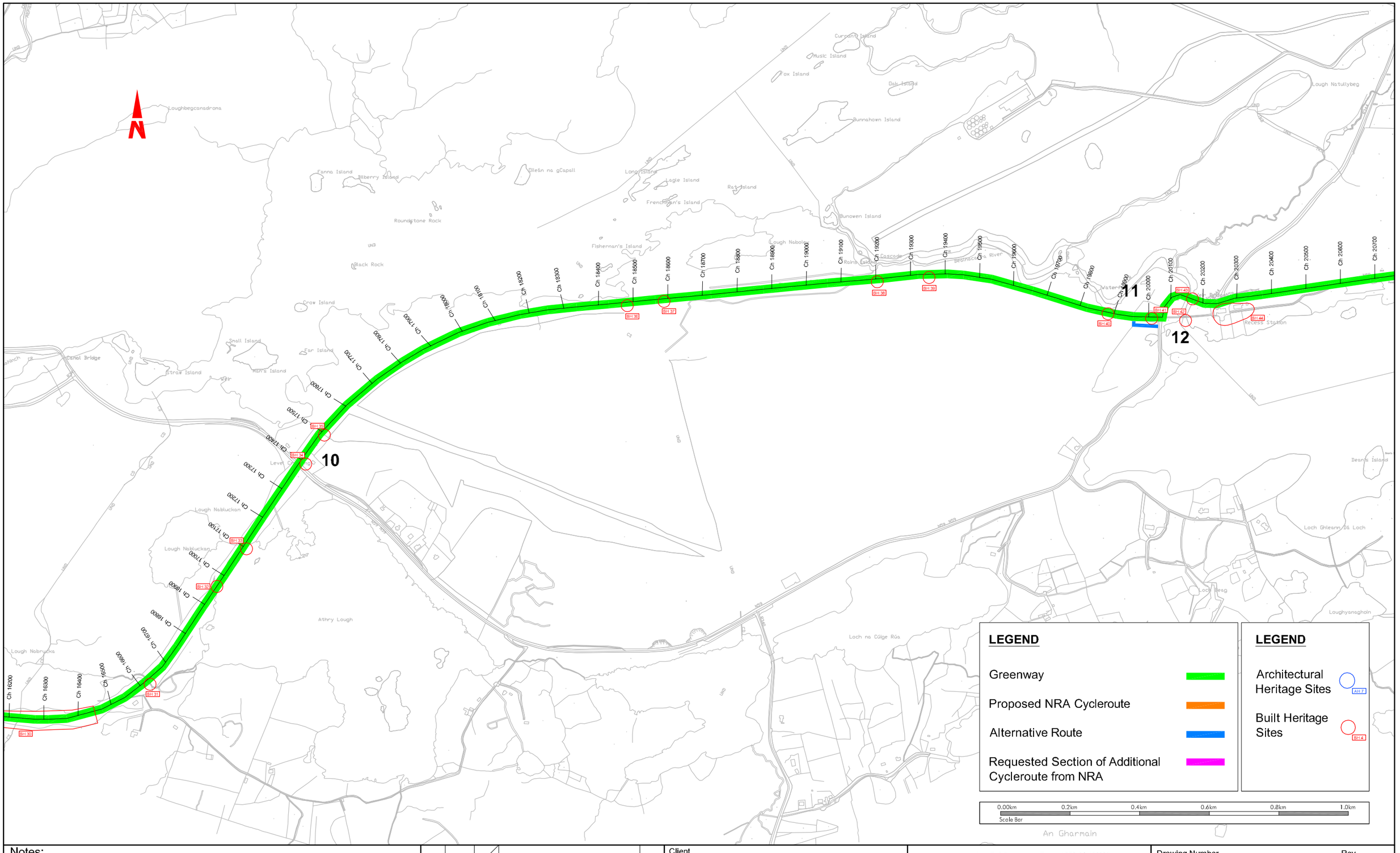

LEGEND

- Greenway
- Proposed NRA Cycleroute
- Alternative Route
- Requested Section of Additional Cycleroute from NRA

LEGEND

- Architectural Heritage Sites (AH 7)
- Built Heritage Sites (BH 4)

0.00km 0.2km 0.4km 0.6km 0.8km 1.0km
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Title
FIGURE 13.6
ARCHITECTURAL HERITAGE & BUILT HERITAGE SITES
Sheet 6 of 15

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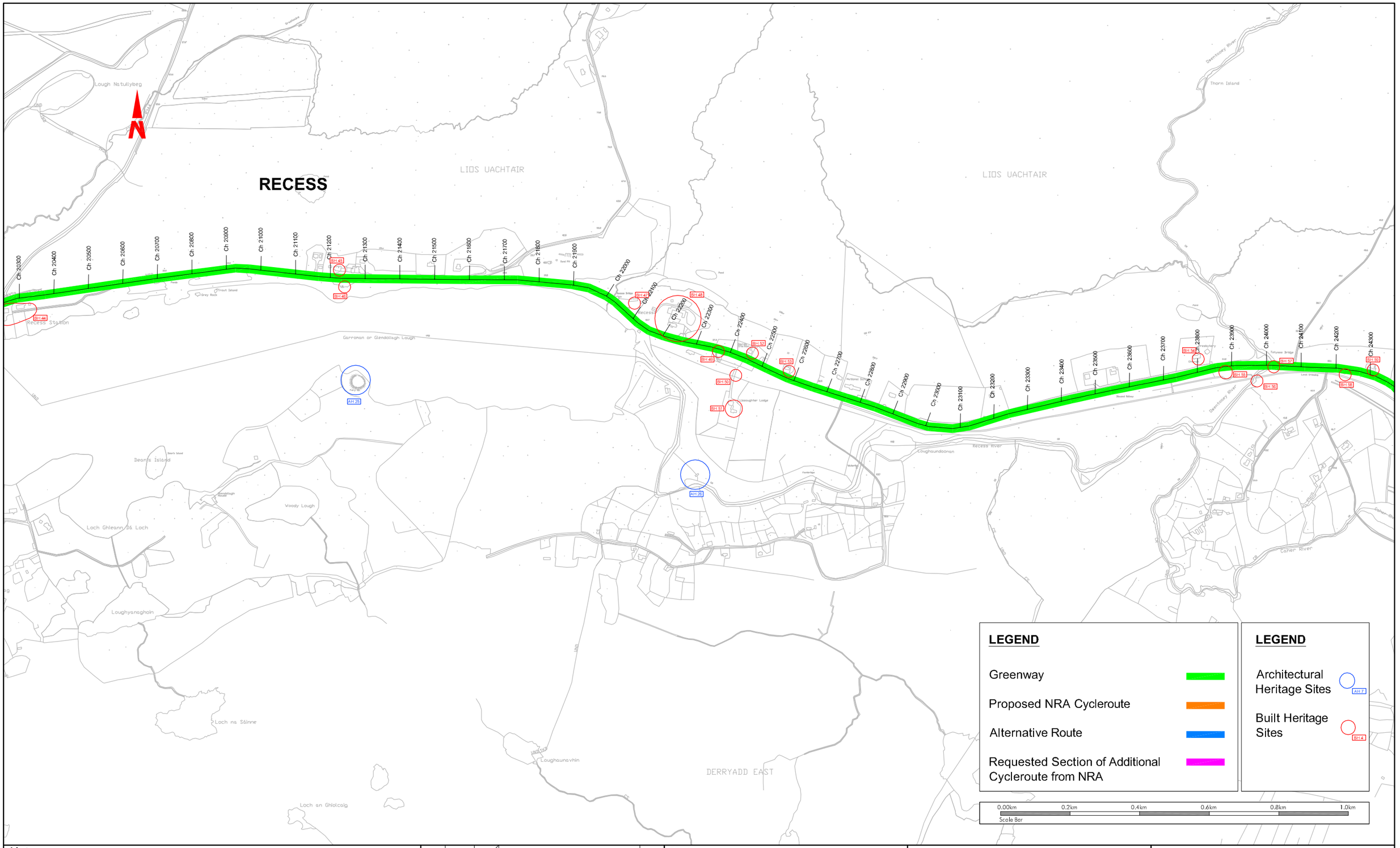

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Title
FIGURE 13.7
ARCHITECTURAL HERITAGE & BUILT HERITAGE SITES
Sheet 7 of 15

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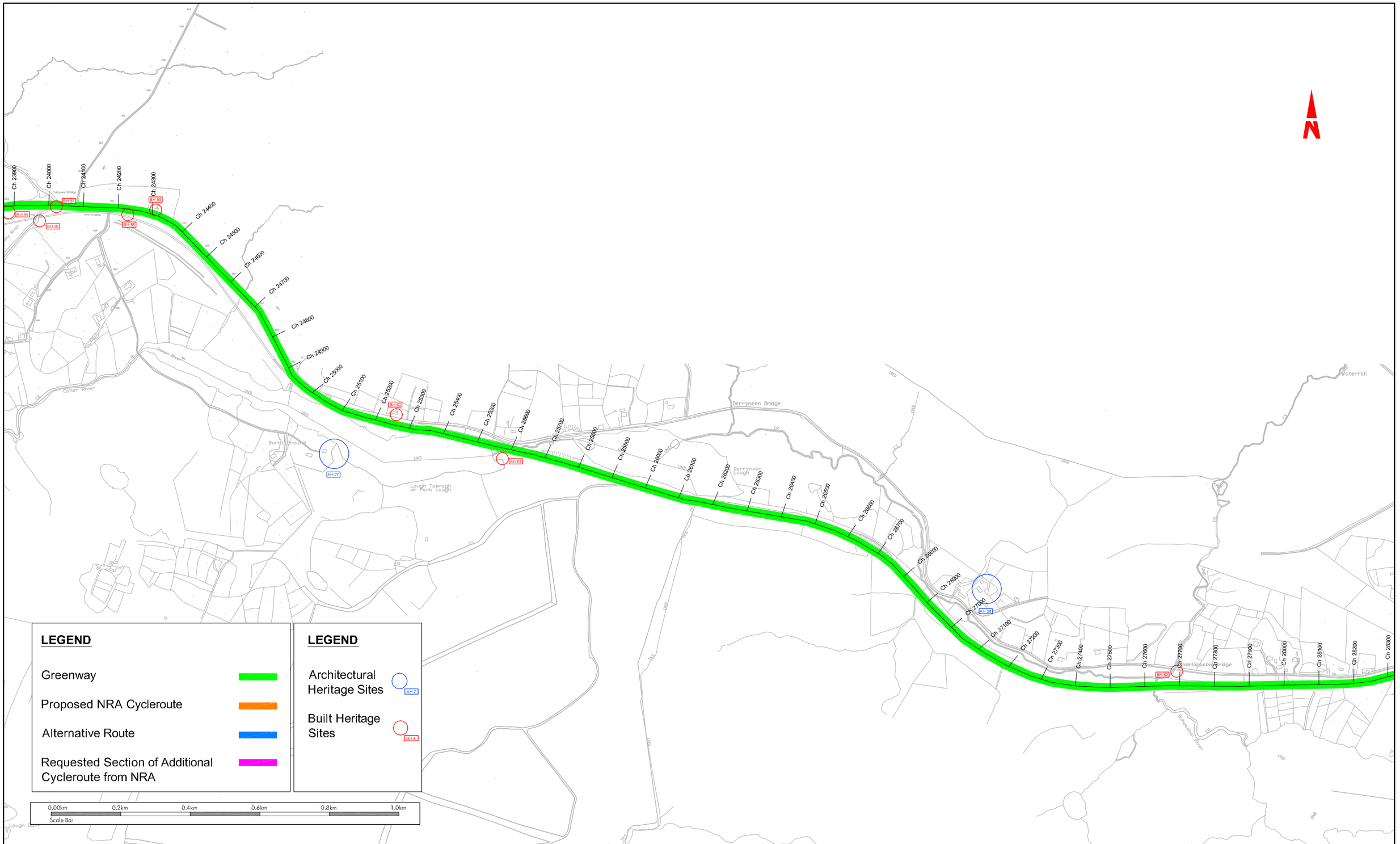

LEGEND

- Greenway
- Proposed NRA Cycleroute
- Alternative Route
- Requested Section of Additional Cycleroute from NRA

LEGEND

- Architectural Heritage Sites (AH 7)
- Built Heritage Sites (BH 4)

0.00km 0.2km 0.4km 0.6km 0.8km 1.0km
Scale Bar

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Rev: **F01**

Title: **FIGURE 13.8 ARCHITECTURAL HERITAGE & BUILT HERITAGE SITES Sheet 8 of 15**

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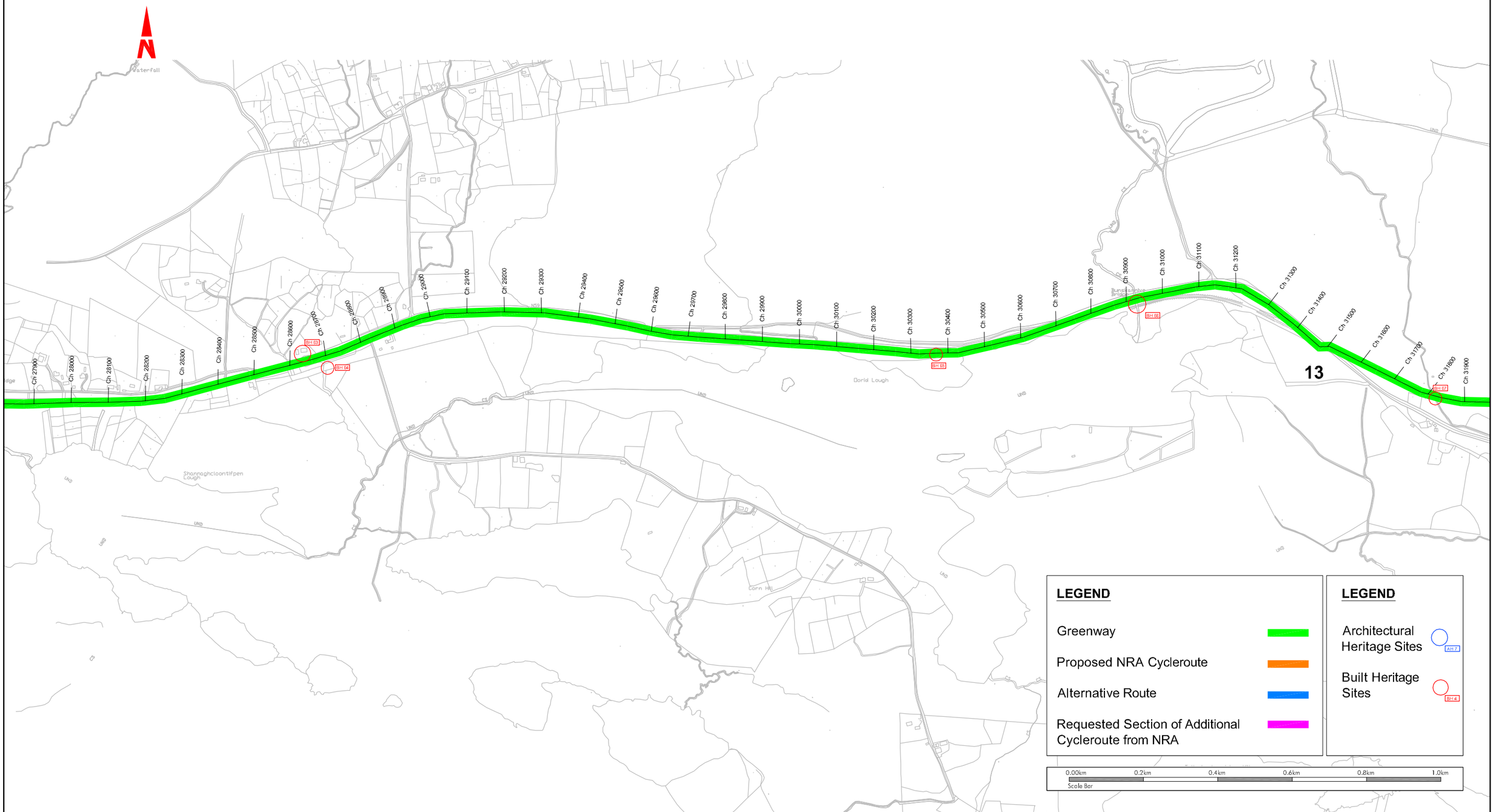

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D01	21.03.12	MC / PK	DRAFT ISSUE	WM

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Drawing Number: MGE0269/DG0002-09

Rev: **F01**

Title: **FIGURE 13.9 ARCHITECTURAL HERITAGE & BUILT HERITAGE SITES Sheet 9 of 15**

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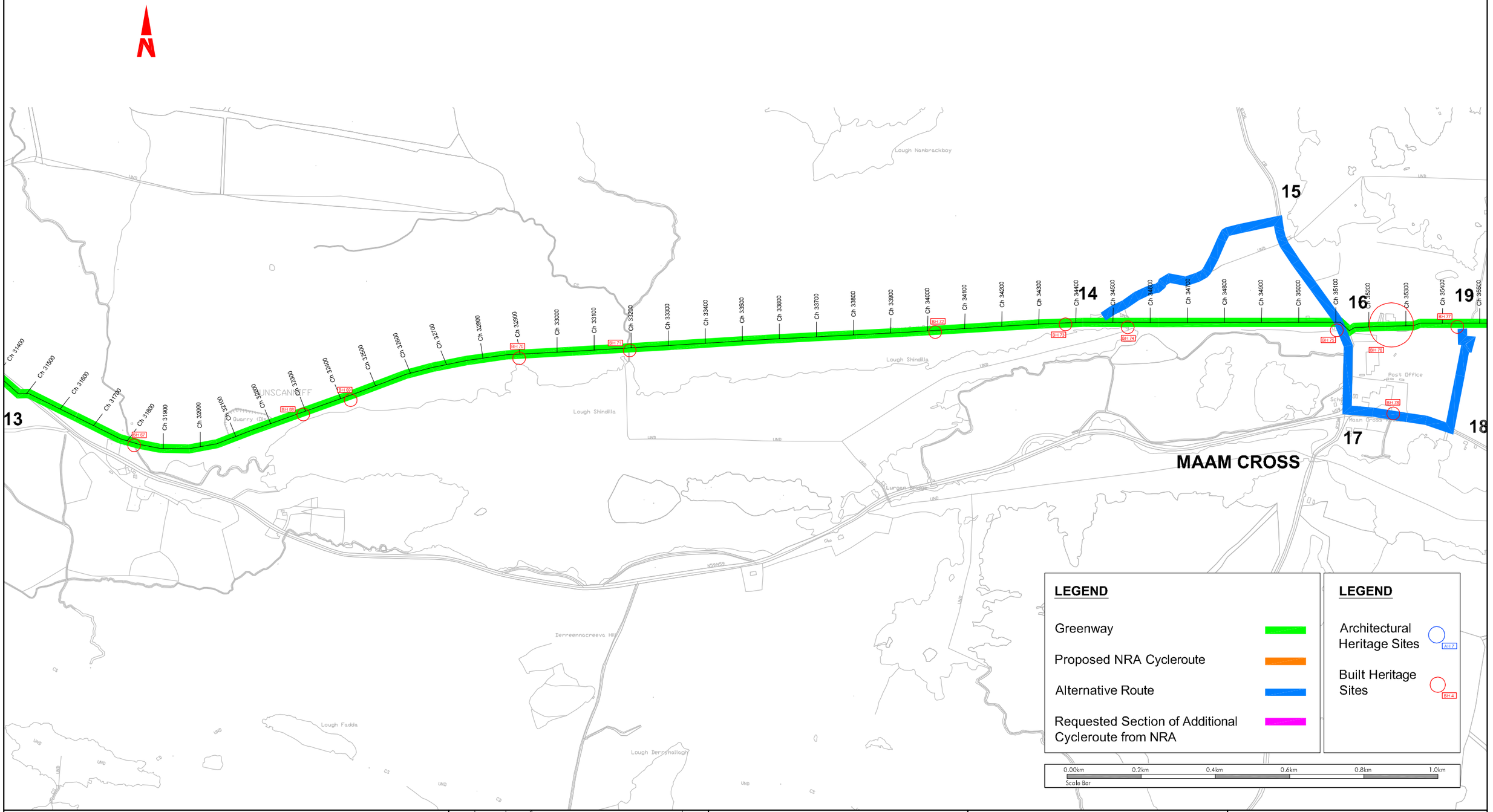

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Project: **CONNEMARA GREENWAY PROJECT**

Drawing Number: MGE0269/DG0002-10

Rev: **F01**

Title: **FIGURE 13.10 ARCHITECTURAL HERITAGE & BUILT HERITAGE SITES Sheet 10 of 15**

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Drawing Number: MGE0269/DG0002-11
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Project: CONNEMARA GREENWAY PROJECT

Title: FIGURE 13.11 ARCHITECTURAL HERITAGE & BUILT HERITAGE SITES Sheet 11 of 15

Scale	Drawn By	Checked By	Approved By	Date
1:10,000 @ A3	MC	PK	WM	March 2012

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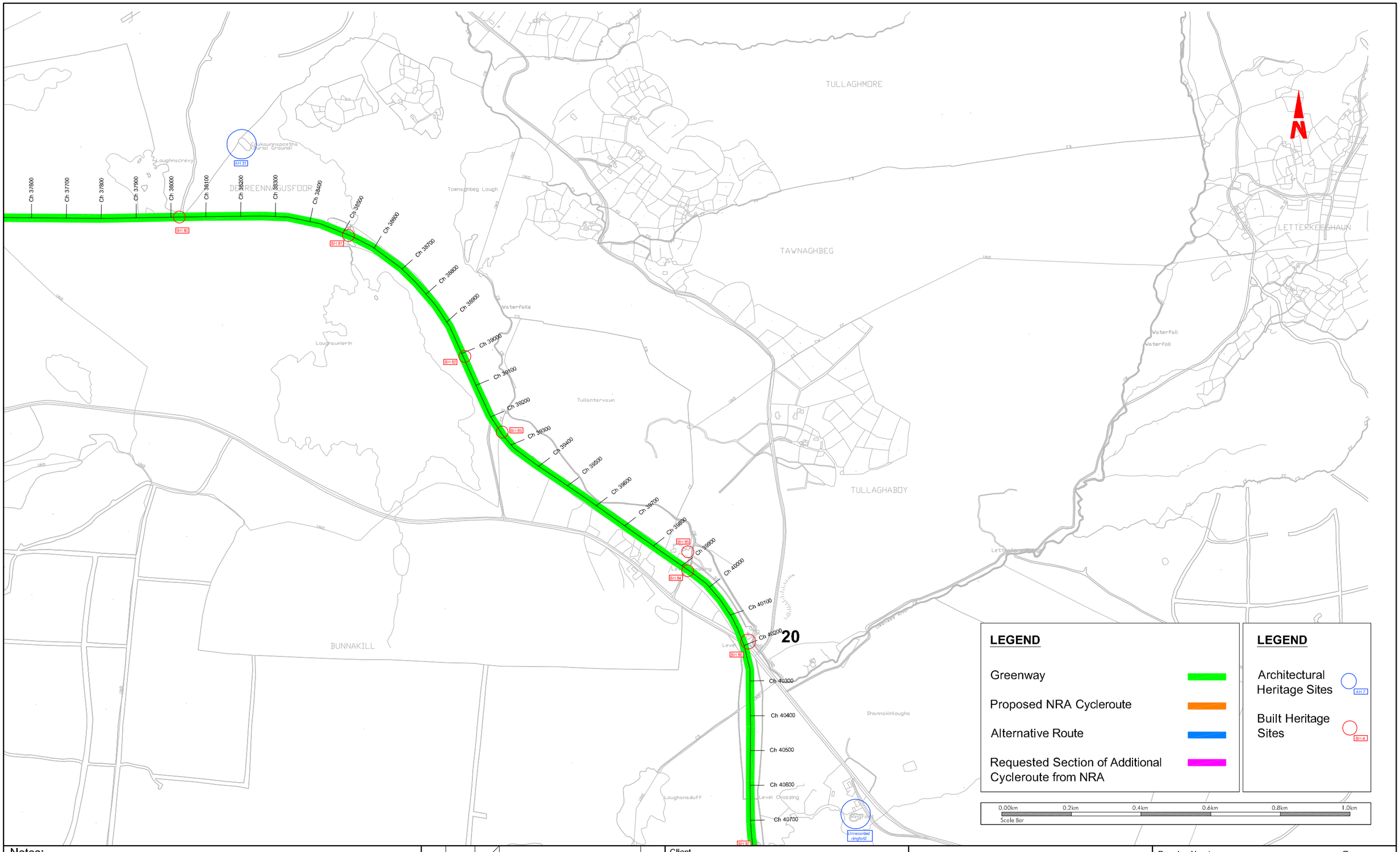

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Drawing Number: MGE0269/DG0002-12

Rev: **F01**

Title: **FIGURE 13.12 ARCHITECTURAL HERITAGE & BUILT HERITAGE SITES**
Sheet 12 of 15

Scale	Drawn By	Checked By	Approved By	Date
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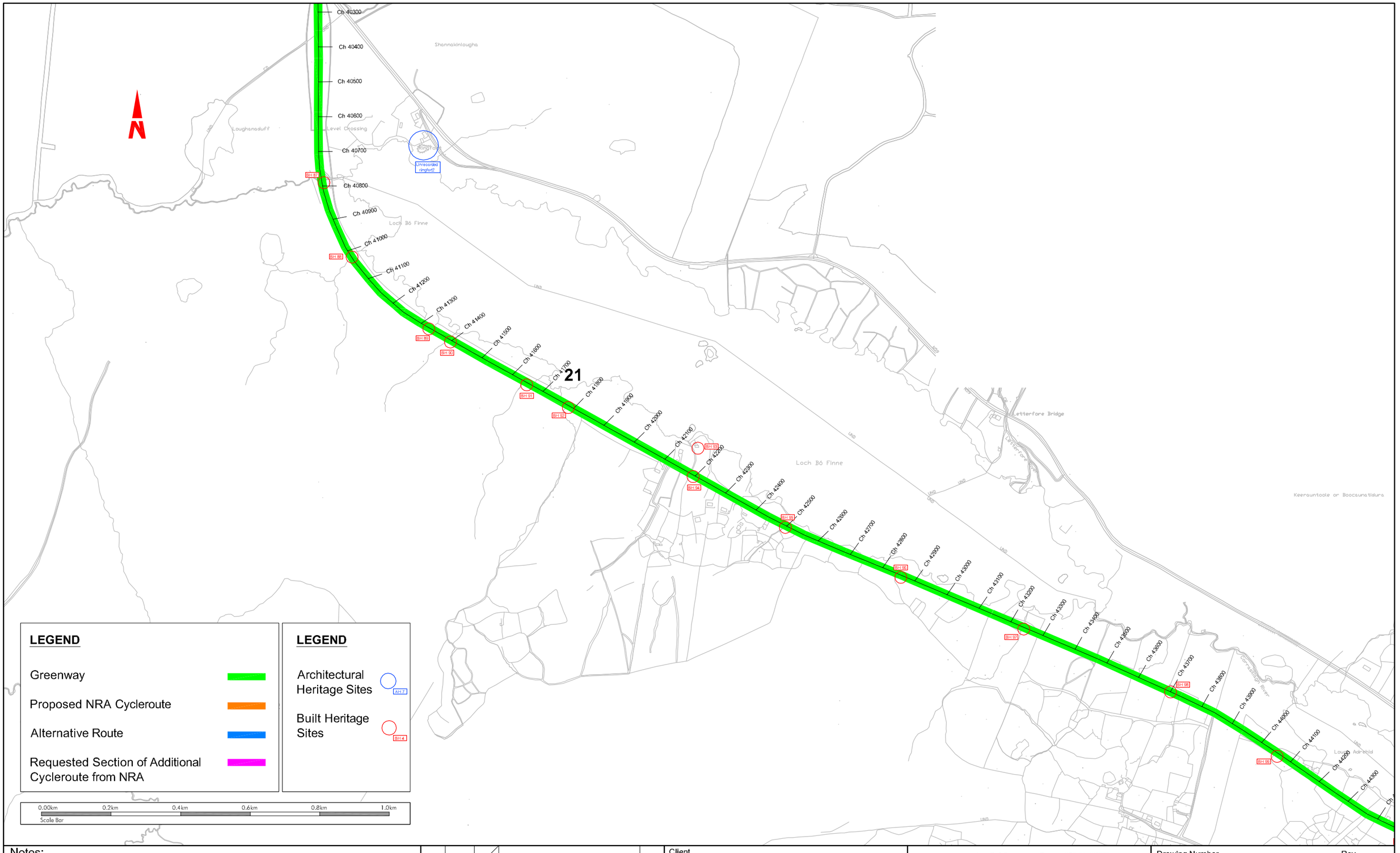

LEGEND

- Greenway
- Proposed NRA Cycleroute
- Alternative Route
- Requested Section of Additional Cycleroute from NRA

LEGEND

- Architectural Heritage Sites (AH 7)
- Built Heritage Sites (BH 4)

0.00km 0.2km 0.4km 0.6km 0.8km 1.0km
Scale Bar

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Drawing Number: MGE0269/DG0002-13
Rev: F01

Title: FIGURE 13.13 ARCHITECTURAL HERITAGE & BUILT HERITAGE SITES Sheet 13 of 15

Scale	Drawn By	Checked By	Approved By	Date
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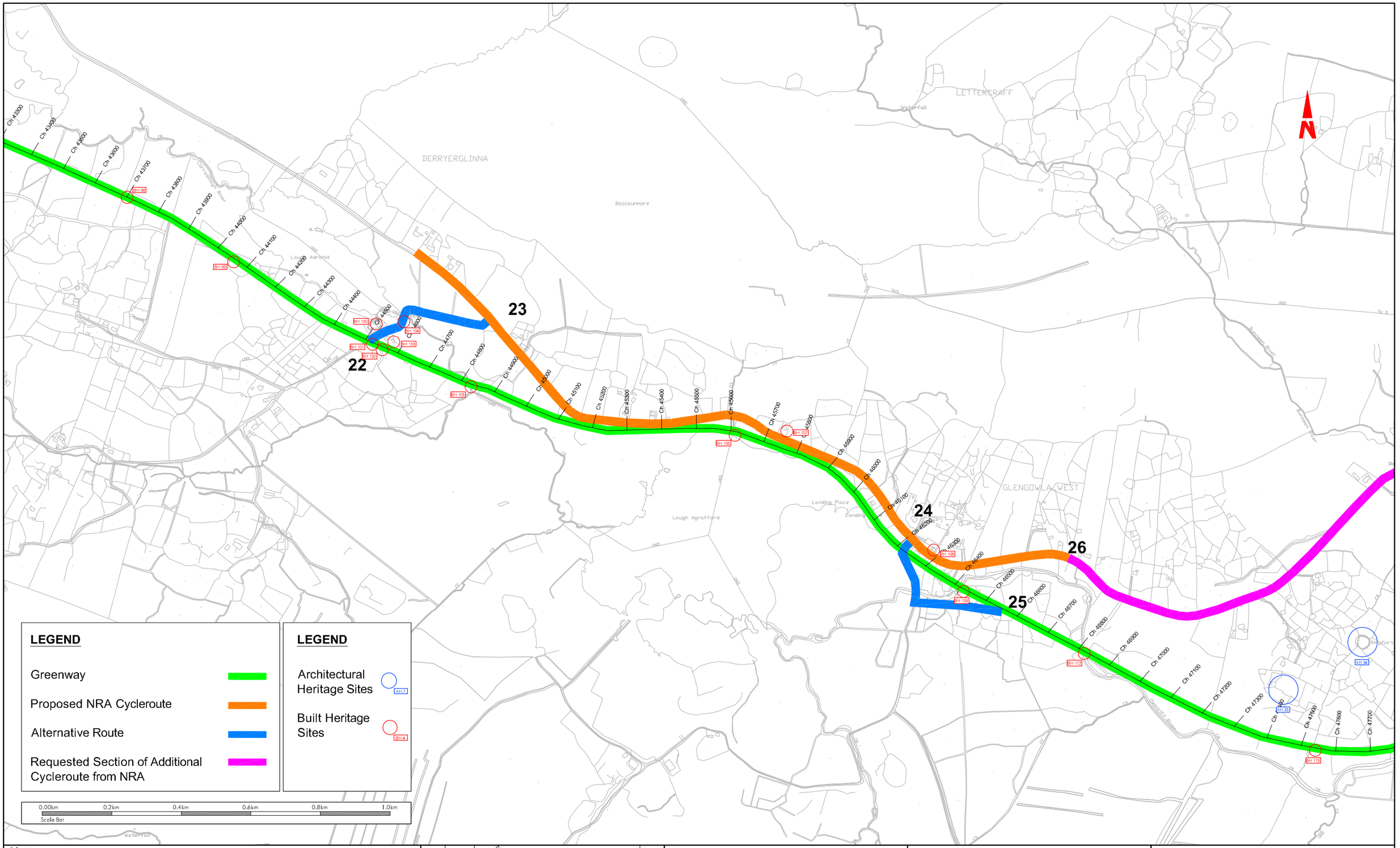

LEGEND

- Greenway
- Proposed NRA Cycleroute
- Alternative Route
- Requested Section of Additional Cycleroute from NRA

LEGEND

- Architectural Heritage Sites (AH 7)
- Built Heritage Sites (BH 4)

0.00km 0.2km 0.4km 0.6km 0.8km 1.0km
Scale Bar

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Project
CONNEMARA GREENWAY PROJECT

Drawing Number
MGE0269/DG0002-14

Rev
F01

Title
FIGURE 13.14 ARCHITECTURAL HERITAGE & BUILT HERITAGE SITES Sheet 14 of 15

Scale	Drawn By	Checked By	Approved By	Date
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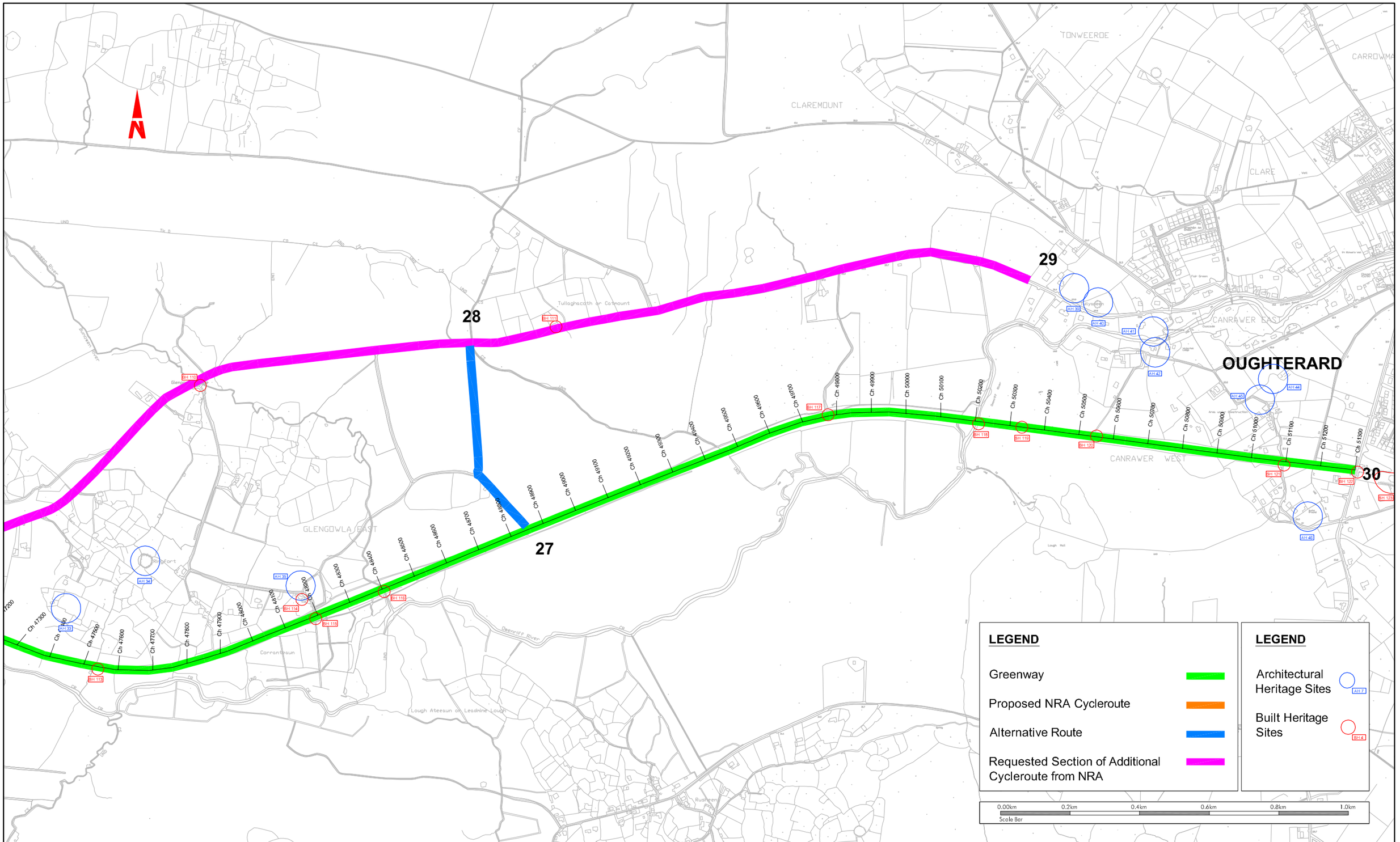

LEGEND

- Greenway
- Proposed NRA Cycleroute
- Alternative Route
- Requested Section of Additional Cycleroute from NRA

LEGEND

- Architectural Heritage Sites (AH 7)
- Built Heritage Sites (BH 4)

0.00km 0.2km 0.4km 0.6km 0.8km 1.0km
Scale Bar

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Drawing Number: MGE0269/DG0002-15 | Rev: **F01**

Title: **FIGURE 13.15 ARCHITECTURAL HERITAGE & BUILT HERITAGE SITES Sheet 15 of 15**

Scale	Drawn By	Checked By	Approved By	Date
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Ch. 3+200 to Ch. 4+050

This section is located within the townland of Gowlan West. The proposed route is confined to the disused railway embankment between Ch. 3+200 to Ch. 4+050, which is marked on the second edition map. The first edition shows this as an empty marginal area. The tertiary road at Ch. 4+050 is not marked until the second edition. The second edition also shows a quarry on the northern side of the railway, as well as a level crossing and cottage at Ch. 4+050 (BH 7). A culvert is indicated to the west of the level crossing.

Ch. 4+050 to Ch. 4+300

This short section is also located within the townland of Gowlan West and is marked as empty rough landscape on the first edition. The second edition shows the railway and a foot path to the south of the track. A culvert crossing a stream, which is also marked as a townland boundary, is shown at Ch. 4+050 (BH 8).

Ch. 4+300 to Ch. 11+150

This lengthy section of the proposed route is located within the townlands of Derrylea, Munga, Emlaghmore and Derryvickrune. The first edition OS map shows this as an open, marginal landscape, which is dominated by bog and lakes. Very occasionally a small structure is indicated to the north or south of the proposed route, often accompanied by a lime kiln and a small field system. By the time of the second edition, the path of the railway is shown. Numerous culverts are shown along its length (BH 9, 11, 13, 14, 15, 17 and 20) (BH 16 and BH 17 shown in **Images 13.2** and **13.3** respectively) along with two level crossings for access tracks (BH 11 and 18). Within the townland of Derryvickrune, a structure is shown adjacent to the railway, although no remains are apparent at this location today. At Ch. 11+150 the proposed route may follow two options.

Image 13.2 BH 16, stone culvert (Ch. 4+300 to Ch. 11+150), facing north

Image 13.3 BH 17, large culvert (Ch. 4+300 to Ch. 11+150), facing north

Ch. 11+150 to Ch. 11+700

Within this section there are two options that the proposed route can take. The former railway track continues in an easterly direction and crosses the Owenmore River by means of a now derelict bridge. It then turns onto the R341. The alternate route takes the greenway north-east of the railway along an existing forestry track. This track then reaches a small tertiary road that the proposed route will follow across a bridge over the Owenmore River before turning north-east onto the R341. The first edition OS map shows that both options are located within the demesne lands associated with Ballnahinch Castle. The first edition shows that the track way and tertiary road (Ch. 11+150 to Ch. 11+700) are present at this time and continue to be marked on the second edition. The second edition also shows the railway running to the east and crossing the Owenmore River by means of a bridge (BH 21). It then crosses a level crossing (BH 23), just to the west of Ch. 11+700. The alternate route follows a road bridge across the Owenmore River, which is marked on the first edition and present on the second edition (BH 22). Very few structures are shown in the area on the first edition map. By the time of the second edition, the demesne is characterised by a large amount of coniferous trees. Ballynahinch Station (BH 24) is shown to the north of Ch. 11+700.

Ch. 11+750 to Ch. 12+600

This section of the proposed route follows the existing R341, which is marked on both the first and second edition maps. The first edition shows the road as bordering the demesne lands associated with Ballynahinch Castle (AH 16), but by the time of the second edition the demesne lands are mostly covered with coniferous planting. The second edition also shows a circular enclosure (AH 15) c. 60m to the north of the road and proposed route, which is not present on the first. At Ch. 12+600 the proposed route re-joins the railway, which runs parallel to the road on its northern side. Whilst the area is shown as demesne land on the first edition, the railway is marked on the second. To the west of Ch. 12+600 a small structure is marked on the second edition, adjacent to the railway and a new entrance into Ballynahinch demesne. This appears to be a gate lodge (BH 25), although is not annotated as such.

Ch. 12+600 to Ch. 14+800

This section of the greenway follows the railway embankment and travels through the townlands of Cloonbeg, Killeen and Ballinafad. The area is marked as being included within the demesne of Ballynahinch Castle and is characterised by lakes, woodland and rough ground. The second edition shows the railway embankment travelling in an east-west direction. Culvert BH 26 is shown, as is the recorded crannog at AH 22 c. 50m to the north. Further to the east two further culverts are shown (although these were not identified in the field) along with a level crossing (BH 27), providing access to a farm further to the north. At Ch. 14+800 a level crossing is marked, with a cottage to the immediate south of the track (BH 28).

Ch. 14+800 to Ch. 15+150

This is a very short section, where the proposed route follows the existing road before re-joining the railway further to the east. The road is marked on both map editions, with scattered farmsteads and cottages shown to the north of the road. To the immediate south-east of Ch. 15+150 a building is annotated as Ballinafad School (BH 29) on both editions.

Ch. 15+150 to Ch. 17+400

This section of the proposed route travels through the townlands of Ballinafad and Athry. The first edition map shows a track running roughly east-west to the south of Lough Nabrucka, which is flanked by scattered structures. By the time of the second edition the railway is shown. Only one of the six culverts is shown with BH 30, but the bridge at BH 31 is shown. Numerous ruined properties are also indicated further to the south-east. As the route turns north-east one further culvert is shown at BH 33, see **Image 13.4**.

Image 13.4 BH 33, culvert (Ch. 15+150 to Ch. 17+400), facing south-east

Ch. 17+400 to Ch. 19+950

This section of the proposed route follows the railway through the townlands of Athry and Garroman. The first edition shows this area as open landscape. No structures or features are marked in the vicinity of the route. The railway is shown on the second edition. At Ch. 17+400 the level crossing is marked, along with the associated cottage (BH 34). Culvert BH 36 is also indicated, along with culverts BH 39 and 40. An additional culvert is shown between 39 and 40 but this was not identified in the field.

Ch. 19+950 to Ch. 20+050

This is a very short section, where the proposed route will follow an alternate line, due to the presence of a small bungalow. This structure (BH 41) occupies the site of a level crossing cottage, shown on the second edition OS map, although a 'level crossing' is not indicated on the mapping. No structures are marked in the area on the first edition.

Ch. 20+050 to Ch. 31+500

This is a long section, where the proposed greenway will form part of a proposed NRA cycle route adjacent to the existing N59. The route will cross the Weir Bridge (BH 43), which is marked on both editions to the east of Ch. 20+050. Slightly further east the second edition shows Recess Station (BH 44), as well as the accommodation bridge (BH 42). Both editions also show that the N59 was formerly relatively winding. A structure (BH 45) is shown on the northern side of the road on the second edition in Lissoughter. Very few structures are shown on the first edition, although the area is characterised by small quarry pits, which flank the road.

At the eastern end of Garroman or Glendollagh Lough, both editions show the proposed route crossing Recess Bridge. To the east of this a Police Station and two outbuildings are marked on the first edition. However, by the time of the second edition, this site is occupied by Recess Hotel (BH 48) and a post office is shown to the west (BH 47). To the south of the hotel an associated platform is marked, along the route of the railway. To the east of the platform, the entrance (BH 49) to Lissoughter Lodge (BH 51) is shown. Although the entrance drive crosses the railway, the presence of a bridge (BH 50) is not annotated on the mapping. This area is shown as open landscape on the first edition, with scattered structures and the occasional lime kiln. Slightly further east again, neither BH 52 nor 53 are shown; although a number of structures are shown on the second edition map lining the route into Recess.

As the route continues east through Lissoughter and Caher, the first edition indicates a very empty landscape, characterised by bogs, lakes and the occasional quarry pit. Tullywee Bridge (BH 57) is marked on both editions, with BH 55 indicated on the second edition. The second edition also shows the railway bridge (BH 56) to the south of Tullywee Bridge. Slightly further east, structures are shown at BH 58, but they occupy a different footprint to the house there today. BH 59 (stables) is not indicated.

As the proposed route enters the townland of Derryneen, the historic maps show that the main road becomes quite winding in several places, although by the time of the second edition, the railway has been established almost directly parallel to the road. Scattered dwellings are shown within the landscape on the first edition. By the time of the second edition more features are indicated, especially associated with the railway. Due to more recent realignment of the N59, the road now follows the actually path of the railway, resulting in removal or replacement of the infrastructure. A number of bridges and culverts marked on the map have now disappeared.

Cloonloppeen Bridge is marked to the north of the proposed route, along the original Clifden-Oughterard road (BH 62). This is shown on both editions. The second edition indicates at least six buildings to the east of this structure, but they are no longer present. Vernacular structures survive at

BH 63, where the current N59 leaves the path of the railway. Here a small bridge (BH 64) associated with the railway is also shown.

To the immediate north of Oorid Lough, the current N59 follows the path of the railway again, as marked on the second edition. The original road is shown on the first and second editions as passing the lough on the northern side, whereas the railway occupied a causeway in places as parts of it infringed on the lough edges. The second edition shows a culvert is marked at BH 65, along with several others along the railway and road. The culvert at BH 66 is also shown to the south of Bunskannive Bridge (no longer extant). The bridge is shown on both editions.

Ch. 31+500 to Ch. 34+500

This section sees the proposed greenway leaving the N59 and travelling once again along the path of the railway, which travels through the townlands of Bunscanniff and Shannaunnafeola. In the townland of Bunscanniff the first edition shows the current N59 travelling south-east, past a structure called the Halfway House. This is also present on the second edition. The second edition also indicates the presence of a railway bridge at Ch. 31+500, but this has since been removed. The railway bridge at BH 67 is shown, along with two level crossings to the east. As the route travels further south culverts BH 70, 71, 72, 73 are indicated, but not BH 68 and 69. The first edition shows this area as open, marginal landscape.

Ch. 34+500 to Ch. 35+450

This particular section of the route way follows the path of the railway within the townland of Lurgan or Shindilla. Once again, few features are indicated on the first edition map, although the tertiary road running north-south to Maam Cross is shown. The second edition shows the railway, as well as culvert BH 74, the level crossing and cottage at BH 75 (**Image 13.5**) and the structures associated with Maam Cross Station (BH 76). A culvert is also shown to the immediate west of Ch. 35+450 (BH 77). An additional building is also shown on the northern side of the track to the immediate north of BH 75, although it is no longer extant today.

Image 13.5 BH 75, level crossing cottage (Ch. 34+500 to Ch. 35+450), facing south-west

Ch. 34+500 to Ch. 35+450

This section of the route (an alternative to the above) will follow the roads in the area. Ch. 34+500 to Ch. 34+950 follows a track way, which is not marked on either edition. Ch. 34+950 to Ch. 35+150 follows the tertiary road into Maam Cross. The first edition shows this road, but no buildings associated with the cross roads, with the exception of 'Butlers Lodge, in ruins'. This is marked on the north-east side of the cross roads. By the time of the second edition several buildings are shown in the area, including Shindilla School, on the north-west side of the cross roads; a post office on the north-east side and a constabulary hut on the south-east side. Ch. 35+150 to Ch. 35+450 follows the N59, which is marked on both editions. Ch. 35+450 to Ch. 35+450 from south to north, travels north across boggy ground, which is marked as such on both editions.

Ch. 35+450 to Ch. 40+200

This is a substantial portion of the proposed route, which travels via the path of the railway, through the townlands of Lurgan or Shindilla, Derreennagusfoor and Bunnakill. Once again the area is marked on the first edition as open, marginal landscape with few features other than lakes or streams. The second edition shows the railway track crossing this landscape. Several culverts are shown on the mapping, but could not be identified in the field. BH 81 is shown, but not BH 80, 82 and 83. To the north-west of Ch. 40+200 several features are shown on the second edition. Three level crossings are indicated, including as well as a culvert (BH 84). A structure (BH 86) is shown to the north of the central level crossing and several structures, including Bofin Lodge, are shown adjacent to the N59, which is close to the railway at this located. The southernmost level crossing, at Ch. 40+200, is accompanied by a cottage (BH 86).

Ch. 40+200 to Ch. 41+850

This portion of the proposed route continues along the former railway, through the townlands of Bunnakill, Letterfore and Leam West. No features are marked in this area on the first edition. The second edition shows the bridge at BH 87 as well as numerous culverts (BH 88-92). Two additional culverts are also indicated, which could not be located in the field. The second edition also indicates the presence of an oval feature c. 250m east of the proposed route, on the shore of Lough Bofin. This feature appears to be marked as a quarry on the first edition, but modern OS maps have annotated it as a ringfort.

Ch. 41+850 to Ch. 44+500

This is a long section of the proposed route, where it travels along the southern side of Lough Bofin. Once again the first edition map shows an open, marginal landscape, with occasional structures and small irregular field systems indicated. The second edition shows the railway track and proposed route travelling through the townland of Leam West. Numerous culverts are shown along the track, including BH 94, 95, 96 and 97. Culverts BH 98 and 99 are not shown. The landscape to the south-west of Ch.44+500 is characterised by several irregular field systems with small structures and occasional lime kilns. More structures are shown in this area on the first edition map.

Ch. 44+500 to Ch. 44+800

This short section follows a tertiary road from the railway to the existing N59. No structures are shown on the first edition, with the exception of the Leam Bridge (BH 104, 'Quiet Man' Bridge) (**Image 13.6**). However, the second edition shows a level crossing and cottage (BH 101) at Ch. 44+500, along with Leam School and associated teacher's house (BH 100).

Image 13.6 BH 104 (with BH 103 in background), 'The Quiet Man' Bridge (Ch. 44+500 to Ch. 44+800), facing SSW

Ch. 44+800 to Ch. 46+200

Here the proposed route will follow the path of the existing N59 for a distance of c. 1.5km through the townlands of Derryerglinna and Glengowla West. The road is shown on the first edition, with several structures scattered along its length. By the time of the second edition, additional structures are shown, including the railway track, which runs parallel to the road on its southern side. BH 107 (house) is marked, but many of the other structures are no longer extant.

Ch. 46+200 to Ch. 48+800

This alignment will see the proposed route following the existing N59 into Oughterard, as part of NRA road realignment. The road is marked on both OS editions. Scattered buildings flank its length on the first edition, and it also crosses Glengowla Bridge (BH 110). A large village is shown to the north of the road in Glengowla West. To the east of Ch. 48+800 a copper mine is marked (AH 39). Very little has changed by the time of the second edition, although the village at Glengowla West is marked as ruinous. A building is shown at BH 111 (cottage) and at BH 108 and the copper mine is no longer marked to the east of Ch. 48+800. However, an enclosure (AH 40) is indicated.

Ch. 46+200 to Ch. 46+550

At Ch. 46+200 the proposed route will follow an access track in a southerly direction for a short distance before turning east across rocky marginal ground. Several buildings are marked in the vicinity on the second edition OS map, including a railway bridge (BH 109) and buildings that are no longer extant.

Ch. 46+550 to Ch. 48+850

This section of the proposed route travels through the townlands of Glengowla West and Glengowla East. It follows the path of the railway track. The first edition map shows the area mostly as open landscape, although a ringfort (AH 34) is shown to the north of the route, along with a village within the townland of Glengowla East. By the time of the second edition a number of changes have taken place with the construction of the railway. The bridge at BH 112 is shown, although the culvert at BH 113 is not indicated. Although several structures are indicated in the landscape, the village at Glengowla East has been reduced to two structures. Ringfort AH 34 continues to be marked. Two disused lead mines are also shown (AH 33 and 35). A structure potentially associated with the mines (vernacular house) is also marked (BH 114). Further to the east a small railway bridge is also shown (BH 116).

Ch. 48+850 to Ch. 48+800

This is an alternative route that will join the section of greenway that runs along the railway, with a cycle route that runs along the N59 (Ch. 46+200 to Ch. 48+800). It follows a linear track, which is not marked on either edition. The route crosses marginal, open landscape. No features or structures are marked here.

Ch. 48+850 to Ch. 51+300

This section represents the final portion of the proposed route, where it travels along the former railway track. It travels through the townlands of Glengowla East, Claremount and Canrawer West. The first edition shows the landscape as open and marginal, with no buildings or features close to the route. That is with the exception of the eastern most point of the route, where a small village is shown to the immediate north in Canrawer West. By the time of the second edition, a railway bridge is shown, which crosses the Owenriff River (BH 118). Two foot sticks are marked to the north of the bridge. Further east another bridge across the railway track is indicated at BH 120 (**Image 13.7**) and BH 121. At Ch. 51+300 a level crossing and cottage are shown at BH 122, with Oughterard Station marked c. 100m to the east (BH 123). Little remains of the village marked on the first edition and Oughterard town itself has extended in size. A large work house is shown to the immediate north of Oughterard Station, although this is no longer extant.

Image 13.7 BH 120, railway bridge (Ch. 48+850 to Ch. 51+300), facing west

13.3.1.3 County Development Plan

The County Galway Development Plan (2009–2015), Clifden Local Area Plan (2009–2015) and Oughterard Local Area Plan were examined as part of this assessment. All three LAP documents identify and acknowledge the statutory protection afforded to the RMPs within the vicinity of the proposed scheme under the National Monuments Act. The Oughterard LAP lists AH 44 within the boundaries of the LAP and the receiving environment of the proposed scheme. The Clifden LAP lists AH 7 and 8 within its LAP boundary and the receiving environment of the proposed scheme. In the wider environs it also notes the position of GA035-059, 060 and 051 and AH 8-10.

A total of 32 individual or groups of sites of archaeological significance are recorded within 300m of the proposed route way and recognised within the Galway County Development Plan. None of these are listed as National Monuments, or subject to preservation orders. The closest recorded site consists of AH 10, the site of a possible late 18th century burial. This is located c. 30m south of the proposed route within the townland of Killmongaun (Points 1-2). These sites are detailed in **Appendix D.1.**

13.3.1.4 Aerial Photographic Analysis

Inspection of the aerial photographic coverage of the proposed development area held by the Ordnance Survey (1995, 2000, 2005) and Google Earth (2008) revealed no previously unrecorded sites of archaeological potential within the receiving environment of the proposed Greenway.

13.3.1.5 Field Inspection

The field inspection sought to assess the proposed development area, its previous and current land use, the topography and whether any areas or sites of archaeological potential were present. During the course of the field investigation the proposed development area and its immediate surrounding environs were inspected for known or previously unknown archaeological sites. For the ease of dissemination of information, chainages have been applied to the proposed greenway route from Ch. 0 at the start outside Clifden to Ch. 51+300 outside Oughterard. This includes the greenway route itself and proposed NRA cycle routes. Sections are clearly marked on **Figures 13.1 to 13.18**. Please note that structures of architectural merit, including railway structures, are identified and described in **Section 13.3.2.4** of this report and accompanying images can be found in **Appendix D.8**.

Ch 0 to Ch. 3+200

Here the proposed route commences along a road on the southern edge of Clifden town and proceeds in a roughly easterly direction through the townlands of Ardbear and Killymongaun. The road provides access to a variety of modern residential dwellings in the area. It is narrow and as it travels further to the east it becomes very rough in places, traversing small hills, with boggy level terrain to the south. Despite the OS mapping showing numerous dwellings along the length of the track, since 1840, very little in terms of vernacular architecture survives. AH 10 is located c. 40m to the south of the track along this section, but visible remains of the grave were not obvious from the track way. To the west of AH 10, the track improves and again services modern residential dwellings. At Ch. 3+200, the proposed route leaves the tertiary road and turns south-east onto the former railway track.

Ch. 3+200 to Ch. 4+050

This section is located within the townland of Gowlan West. The proposed route is confined to the disused railway embankment between Ch. 3+200 and Ch. 4+050. A large, disused quarry is located on the northern side of the railway embankment, which is first marked on the 1898 second OS map edition. It is possible that the quarry was created during the construction of the railway. At Ch. 4+050 the proposed route reaches a tertiary road.

Ch. 4+050 to Ch. 4+300

This short section is also located within the townland of Gowlan West, but there are two route options. The route of the railway passes to the immediate north-east of a residential premises and yard, which was not accessible during field inspection. The alternative runs parallel to the railway to the south and crosses an area of rough ground.

Ch. 4+300 to Ch. 11+150

This lengthy section of the proposed route is located within the townlands of Derrylea, Munga, Emlaghmore and Derryvickrune. Between Ch. 4+300 and Ch. 11+150 the proposed greenway is confined to the disused railway track, which crosses a marginal landscape characterised by small lakes, localised peat cuttings, rock out crops and bog. For most part the route follows the railway embankment, although the eastern most section travels through a substantial cutting. The townland boundary between Derrylea and Munga is formed by a relatively large river valley. The western section of the route borders the southern side of a modern coniferous plantation. A large part of the eastern section (currently owned by *Coillte*) is also characterised by plantations. Much of the former railway track is accessible by off-road vehicle and as such survives in relatively good condition. Whilst the three enclosures (AH 11-13) are clearly visible in aerial photographs to the south-west of the route, they were not visible from the route on foot. The route passes immediately adjacent to several lakes, including Lough Knocknacalliagh, Lough Fadda and a smaller oval un-named lough. With the exception of the generic archaeological potential that lakes, water courses and bog land possess, no specific features of archaeological potential were noted between the points.

Ch. 11+150 to Ch. 11+700

Within this section there are two options that the proposed route can take. The former railway track continues in an easterly direction and crosses the Owenmore River by means of a now derelict bridge (BH 21). It then turns onto the R341. The alternate route takes the greenway north-east of the railway along an existing forestry track. This track then reaches a small tertiary road that the proposed route will follow ESE across a bridge over the Owenmore River before turning north-east onto the R341. There are a number of built heritage features in this area, including Ballynahinch Station (BH 24), as well as two bridges (BH 21, 22). These will be described later in the report.

Ch. 11+750 to Ch. 12+600

This section of the proposed route follows the existing R341 in an easterly direction for c. 800m. The road is characterised by a relatively wide carriage way, flanked by dense vegetation. The former railway is located on the northern side of the road, where it travels through Ballynahinch demesne. Due to the demesne vegetation along this section, very little is visible of the surrounding landscape.

Ch. 12+600 to Ch. 14+800

This section of the greenway returns to the railway embankment and travels through the townlands of Cloonbeg, Killeen and Ballinafad. The western section of the embankment was difficult to access being very overgrown with trees. The eastern part of this section is difficult to trace in places, due to long grasses and vegetation and the fact that the track followed a very low embankment. Ballinafad Lough is located to the immediate north of the track along this section. At Ch. 14+800 the proposed route re-joins the R341.

Ch. 14+800 to Ch. 15+150

This is a very short section, where the proposed route follows the existing road before re-joining the railway further to the east. This is due to the construction of a modern dwelling on the former railway.

The road is flanked by scattered modern dwellings with the exception of a level crossing cottage (BH 28) and a former National School building (BH 29) (see later section for descriptions).

Ch. 15+150 to Ch. 17+400

This section of the proposed route travels through the townlands of Ballinafad and Athry. The western section of the railway is used as an access to a modern cemetery, whilst the remainder of the track is used for farm access. The western section travels through a substantial cutting, whilst the remainder of the track occupies a man-made scarp into the hill side that overlooks Lough Nabrucka to the immediate north. Here the track is bordered on both sides by dense tree growth. To the immediate east of the lough, the route turns north-east and crosses a small river. The railway bridge (BH 31) at this location has been removed, with only the abutments extant. The route continues along embankment and then cutting and passes to the immediate north-west of Athry Lough before reaching Ch. 17+400 where it crosses the N59.

Ch. 17+400 to Ch. 19+950

This section of the proposed route follows the railway through the townlands of Athry and Garroman. The Derryclare Lough and river are located to the immediate north of the route, which for the most part is along an embankment. A short section does travel through cutting. The majority of the track is in good condition, being used for farm access. The eastern most section is not as easy to access, with some gorse overgrowth present. A modern deciduous plantation is located to the south of the route. With the exception of the generic archaeological potential that lakes and water courses possess, no specific features of archaeological potential were noted between the points.

Ch. 19+950 to Ch. 20+050

This is a very short section, where it is probable that the proposed greenway will have to follow an alternate route, as a bungalow (BH 41) now occupies the path of the railway, to the immediate west of the N59. The alternate route will travel across rocky outcrops to the immediate south of the bungalow.

Ch. 20+050 to Ch. 31+500

This is a long section, where the proposed greenway will form part of a proposed NRA cycle route adjacent to the existing N59. The existing road has been subject to some realignment and is a wide carriageway in places. Part of the N59 has been realigned along the route of the railway, whereas other sections are located adjacent to the railway embankment. The existing road passes through the townlands of Lissoughter, Caher, Derryneen, Bohershal, Shannakeela and Bunscanniff. It passes within the immediate vicinity of a number of loughs and crosses marginal bog land. A number of structures of architectural heritage merit were identified in close proximity to the road, which are described later in the chapter. No specific sites of archaeological potential were noted immediately adjacent to the road.

Ch. 31+500 to Ch. 34+500

This section sees the proposed greenway leaving the N59 and travelling once again along the path of the railway, which travels through the townlands of Bunscanniff and Shannaunnafeola. From Ch. 31+500, the route travels in a south-east direct, through a cutting, before crossing a small river and turning east north east. It continues past a small quarry in an easterly direction to the immediate north of Lough Shindilla. Here the former railway was located upon an embankment, the majority of which survives in good condition. The western part of the embankment is bordered by small trees, whereas the central section is covered in grass and grazed by cattle. A small stretch travels through a shallow cutting. The route crosses a number of small streams, including a larger water course that also forms the townland boundary between Bunscanniff and Shannaunnafeola. With the exception of the generic

archaeological potential that lakes and water courses possess, no specific features of archaeological potential were noted between the points.

Ch. 34+500 to Ch. 35+450

This particular section of the route way follows the path of the railway within the townland of Lurgan or Shindilla, but is unlikely to be used due to the presence of a house and farm within the path of the route. Between Ch. 34+500 and Ch. 35+100 the railway track is aligned east-west with the western part overgrown due to lack of use. The eastern section is used as a drive way to a modern bungalow located to the immediate north of the former track. Between Ch. 35+100 and Ch. 35+450 the former track travels through a farm, which is also the location of the Maam Cross station (BH 76). Fragments of the original station buildings survive (see architectural section).

Ch. 34+500 to Ch. 35+450

This section of the proposed route is more likely to be used for the proposed greenway and for the most part is confined to the existing road network or track ways. Between Ch. 34+500 to Ch. 35+450 the route follows an existing farm track through rough, boggy ground. At Ch. 35+450 it reaches the road to turn south and travel to Maam Cross. At Ch. 35+150 it turns east along the existing N59 for a short distance, before turning north again away from the N59 to arrive at Ch. 35+450 on the dismantled railway. At Ch. 35+450 the proposed route re-joins the railway track. At Ch. 35+450 between the N59 and the dismantled railway the route will cross rough, marginal boggy ground that slopes gently to the south. With the exception of the generic archaeological potential that bog land possesses, no specific features of archaeological potential were noted between the points.

Ch. 35+450 to Ch. 40+200

This is a substantial portion of the proposed route, which travels via the path of the railway, through the townlands of Lurgan or Shindilla, Derreennagusfoor and Bunnakill. A large section of the route is aligned east-west and the railway is currently used as access to peat cutting areas. Here the former railway travelled along an embankment, to avoid the bog land on both sides. Several lakes are located to the north and south of the route, including Loughanillaun, Loughaunierin and Tawnaghbeg Lough and a number of smaller, un-named lakes. The route curves south-east around Loughaunierin, still on embankment. As it passes into the townland of Bunnakill, the route gradually leaves embankment and follows an artificial scarp, which has been excavated into a gentle north-east facing slope. Here the former track is bordered by dense vegetation. Just to the north-west of Ch. 40+200 the track emerges from the vegetation and passes to the south of a residential dwelling. It crosses the site of a level crossing and continues along a wide, grassy embankment. At Ch. 40+200 it reaches the existing N59 (plus the site of another level crossing) and continues in a southerly direction.

Ch. 40+200 to Ch. 41+850

This portion of the proposed route continues along the former railway, through the townlands of Bunnakill, Letterfore and Leam West. It skirts the western and southern parts of Lough Bofin. The section of the former track to the immediate south of Ch. 40+200 (c. 500m) is very overgrown and appears to consist of a slight cut, which is gradually being subsumed back into the surrounding bog land. It was not accessible on foot. After c. 500m the former railway continues on an embankment, before crossing a small accommodation bridge over the Glashanasmearany River (BH 87). After the bridge, the embankment continues with a metalled surface, as it is used for farming access. After c. 1km and at the approximate location of Ch. 41+850, the track way becomes road way. This is due to the conversion of the former railway track into part of the public road network. It is used to access a number of dwellings along its length.

Ch. 41+850 to Ch. 44+500

This is a long section of the proposed route, where it travels along the southern side of Lough Bofin and the public road. The road was established along the path of the railway once the track was decommissioned. A number of modern dwellings and farms are located along the length of the road. The second edition OS map shows a small village in the townland of Leam West, which is marked as a largely ruinous by the time of early 20th century mapping. Very little vernacular architecture is left in this area today, although two derelict properties were noted on the shore of Lough Bofin (BH 93, see later architectural section). With the exception of the generic archaeological potential that lakes and water courses possess, no specific features of archaeological potential were noted between the points.

Ch. 44+500 to Ch. 44+800

This short section of the route is an alternate route as it is unlikely that the greenway will continue east along the railway track, as it passes through a farm yard. As such the proposed route is likely to turn north-east along the existing road, across The Quite Man Bridge (BH 104) and join up with the proposed NRA cycle way along the existing N59 at Ch. 44+800.

Ch. 44+800 to Ch. 46+200

Here the proposed route will follow the path of the existing N59 for a distance of c. 1.5km through the townlands of Derryerglinna and Glengowla West. At Ch. 46+200 the route will turn south along an access road.

Ch. 46+200 to Ch. 48+800

This alignment will see the proposed route following the existing N59 into Oughterard, as part of NRA road realignment. No specific archaeological sites were noted adjacent to the existing N59. However, the site of a copper mine is located to the east of Ch. 48+800 (AH 39), along with the site of an enclosure (AH 40). Both sites are located within greenfield areas.

Ch. 46+200 to Ch. 46+550

At Ch. 46+200 the proposed route will follow an access track in a southerly direction for a short distance before turning east across rocky marginal ground. This is due to the presence of residential structures along the railway line in Glengowla West. However, to the east of the small settlement at Glengowla village, the proposed route re-joins the former railway track at Ch. 46+550. The access track that the route will follow consists of stone and gravel and is not tarmacked. The area of marginal ground is characterised by low stone walls, rock out crops and boggy patches. No specific features of archaeological potential were noted, with the exception of the generic archaeological potential of bog land and water courses.

Ch. 46+550 to Ch. 48+850

This section of the proposed route travels through the townlands of Glengowla West and Glengowla East. It follows the path of the railway track, which at Ch. 46+550 occupies a substantial embankment. It crosses the Owenriff River just to the east of Ch. 46+550, although the original bridge is no longer extant (BH 112). To the east of the River the route continues along the embankment, although it was very overgrown and was not fully accessible. When the former railway emerges further to the east from the environs of the river, it also accesses higher ground and as such occupies a shallow cut. This travels through marginal, boggy land, where the railway track is beginning to subsume back into the landscape. The track then leaves the cut and sits on a low embankment, which was overgrown with gorse bushes in places. The embankment gradually becomes more substantial as it travels to the

east. However, c. 200-300m east of the townland boundary between Gengowla West and East, a portion of the embankment has been completely removed and the area levelled and crossed by a modern track. The route and the track then enters a cutting, the sides of which are very overgrown, before it reaches the point where the former lead mines at Glengowla East are located to the immediate north (AH 35). At this location the former railway track is overgrown and a large amount of spoil (removed from the mines) has been dumped on the track bed.

As the route travels away from the mines it turns ENE and occupies an embankment until it reaches Ch. 48+850. The embankment is characterised by a large amount of vegetation on either side, although the track bed remains accessible and is level and under grass.

Ch. 48+850 to Ch. 48+800

This is an alternative route that will join the section of greenway that runs along the railway, with a cycle route that runs along the N59 (Ch. 48+850 to Ch. 48+800). The route follows a grassy access track, which also provides access to a modern house from the N59. The track continues south-east from the house towards the railway. The track way is not marked on any of the historic OS mapping and due to its relatively linear nature is likely to be modern in date.

Ch. 48+850 to Ch. 51+300

This section represents the final portion of the proposed route, where it travels along the former railway track. It travels through the townlands of Glengowla East, Claremount and Canrawer West. From Ch. 48+850 the route follows the former railway, which runs along an embankment. It crosses the Owenriff River, which also forms the townland boundary between Claremount and Canrawer West by means of an extant railway bridge (BH 118) and continues in an easterly direction. Here the low embankment is very overgrown with gorse and was not accessible. Approximately 200m to the east of the bridge, the route enters a substantial cutting. This was also very overgrown and very difficult to access. The cutting is one of the longest along the proposed route and travels for a distance of c. 600m. Parts of the rock face of the cutting have collapsed, due to the growth of vegetation and the passage of water. A small stream now runs along the base of the cut. Approximately 350m from the eastern termination point of the proposed route, the cut finishes and the former railway once again occupies a substantial grassy embankment. It crosses a small road via an accommodation bridge (BH 121), before terminating to the west of the former Oughterard Station (BH 123), at the junction with a small north-south aligned road.

With the exception of the generic potential that can be attributed to bog land and water course such as the River Owenriff, no specific features of archaeological potential were noted.

It should be noted that the proposed greenway, where it runs along the former railway track, or along the N59 and portions of access tracks, is confined to areas which have already been subject to a large amount of disturbance. The construction of the road network, tracks and the railway directly impacted on areas where archaeological features may have once been present, but have since been removed. Only several short sections of the proposed route will travel within portions of undisturbed ground (alternate routes from; Ch. 4+050 to Ch. 4+300, Ch. 19+950 to Ch. 20+050, Ch. 35+450 to Ch. 35+450, Ch. 46+200 to Ch. 46+550).

13.3.1.6 Conclusions

The proposed greenway scheme is a substantial development, as it will run for c. 51km between Clifden and Oughterard, Co. Galway. However, for the most part the greenway will be confined to the existing disused railway or the N59. As a result, very little disturbance will be required during construction of previously undisturbed areas.

There are a total of 32 individual or groups of recorded monuments within 300m of the proposed Greenway. None of these are located within the footprint of the proposed development. The closest recorded site consists of AH 10, the site of a possible late 18th century burial. This is located c. 30m south of the proposed route within the townland of Killmongaun (Ch 0 to Ch. 3+200). The remaining sites vary in type and date, ranging from early medieval through to post medieval garden features. Several of the recorded sites have been deemed to be 'non antiquities' (**Appendix D.1**). The Galway County Development Plan, as well as the town plans for Clifden and Oughterard recognise and identify RMP sites as subject to statutory protection, under the National Monuments Act (1930-2004).

A review of the topographical files held by the National Museum of Ireland has revealed a number of stray finds have been recovered from the receiving environment of the proposed Greenway. Unfortunately the exact location of these finds has not been recorded. Two polished stone axes have been recovered from Clifden, indicating the presence of at least a transient prehistoric population. The remaining finds are dominated by bog butter vessels or wooden objects, the majority of which have been identified during peat cutting within the townland of Derreighter.

Despite the large receiving environment, a review of the Excavations Bulletin (1970–2008) and the database of archaeological licences held by the Department of Arts, Heritage and the Gaeltacht (2009–2012) has revealed that only two programs of archaeological investigation have been undertaken within the receiving environment of the proposed scheme. Monitoring within the town and vicinity of Clifden (Fitzpatrick, 2006; Licence Ref.: 06E0735) revealed nothing of archaeological significance. However, in 2005, a medieval or post-medieval turf-built structure was identified in the townland of Derrylea prior to the realignment of the N59 (Hull, 2005; Licence Ref.: 05E0977). The site was located c. 1.2km north of the proposed greenway route. The structure has been interpreted as a temporary hut possibly used as a shepherd's bothy or a pen for animals such as sheep.

Analysis of the aerial photographic coverage of the receiving environment failed to identify any previously unrecorded sites of archaeological potential. Analysis of the historic mapping resource was also undertaken. Due to the marginal nature of the landscape there are only two map editions from the Ordnance Survey that cover the entire scheme (1839, 1898). Whilst the depiction of structures and features associated with the railway meant that these features were easier to identify in the field, no specific previously unrecorded sites of archaeological potential were identified.

A field inspection of the proposed scheme was carried out during February 2012. The route of the greenway and its immediate environs were subject to inspection. With the exception of the railway embankment/cut and the generic archaeological potential associated with waterways, lakes and bog land, no specific features of archaeological potential were identified. The proposed route will for the most part be confined to the existing disused railway or N59. Only several short sections of the proposed route will travel within portions of undisturbed ground (alternate routes from: Ch. 4+050 to Ch. 4+300, Ch. 19+950 to Ch. 20+050, Ch. 35+450 to Ch. 35+450, Ch. 46+200 to Ch. 46+550). These short routes cross marginal ground, which is characterised by rock out crops or bog land.

13.3.2 Results and Analysis – Architecture

13.3.2.1 Built Heritage Background

Built heritage refers to all built features in the environment including buildings and other structures such as harbours, bridges, and wells. These sites have been identified through consultation with the County Development Plan (2009–2015), National Inventory of Architectural Heritage (NIAH), cartographic analysis and field inspection.

The built heritage within the receiving environment is dominated by the Victorian architectural associated with the construction of the railway from Clifden to Oughterard. Of the 123 built heritage

sites that have been identified during this assessment, 85 are directly associated with the railway consisting of several stations and numerous bridges and culverts. However, prior to the construction of the railway, it was the vernacular cottage that was the most common structure within the landscape. Many of these are shown on the first and second edition OS maps, but very few survive today. Vernacular architecture is defined in James Steven Curl's Encyclopaedia of Architectural Terms as 'a term used to describe the local regional traditional building forms and types using indigenous materials, and without grand architectural pretensions', i.e. the homes and workplaces of the ordinary people built by local people using local materials. This is in contrast to formal architecture, such as the grand estate houses of the gentry, churches and public buildings, which were often designed by architects or engineers. The majority of vernacular buildings are domestic dwellings. Examples of other structures that may fall into this category include shops, outbuildings, mills, lime kilns, farmsteads, forges, gates and gate piers. A number of vernacular buildings have been identified within the receiving environment of the scheme. These include cottages and houses (BH 4, 5, 6, 29, 41, 45, 55, 59, 63, 85, 93, 100, 103 and 107).

Clifden town, located at the western end of the scheme, was founded in the 1820s by John D'Arcy of Kiltullagh (Killanin & Duignan 1962, 92), who resided at Clifden Castle. It was the famine and the poor conditions of the local population that motivated John to established the town. He canvassed the government in Dublin for funds to help ease the suffering of the locals and suggested ways in which aid could be rendered (Villiers-Tuthill 2006, 11). The growth of the town was slow but by the late 1820s merchant vessels were trading iron, pitch, ropes and earthenware for fish, corn, kelp and marble (Robinson 1997, 338). However, John D'Arcy died in 1839 and whilst he had achieved his wish, the advent of the famine in 1845 brought the towns prosperity to a sudden end. By 1848, nine tenths of the population were on relief. By 1850 the Clifden estate was sold to Thomas and Charles Eyre of Bath in Somerset (ibid. 15). The desertion that took place within the landscape is well documented within the Ordnance Survey maps. The second edition of 1898 shows a less settled landscape than the 1839 edition.

The town itself retains much of its architectural character, being mostly arranged around a large square. At Ch. 0 of the proposed scheme, there are several structures located within the immediate environs of the route, including the Ardbear Old Bridge (BH 2), which is a protected structure and included within the NIAH survey. Ardbear New Bridge (BH 3) is located 75m to the west, whilst houses dating to the late 1800s are located 25-90m to the east of the route.

In 1818 Thomas Martin obtained a presentment for a road to link the new town to Galway which was completed in 1835. This road today forms the majority of the N59, although it has been significantly straightened in places. The contractor for the construction of the road was Samuel Jones, who worked under the direction of celebrated Scottish engineer Alexander Nimmo. Nimmo designed a number of the bridges along the road, some of which survive, whilst others have been replaced and encased during widening. Nimmo was also responsible for the design of the quay at Clifden. The proposed route will cross several of the original c. 1830s bridges, whilst it follows the route of the existing N59. These include Weir Bridge (BH 43), Caher Bridge (BH 57), Cloonloppeen Bridge (BH 62) and Glengowla Bridge (BH 110).

Lewis records that Oughterard, located at the eastern end of the proposed scheme, was a small village and post-town in 1837 that was much frequented by invalids for its chalybeate spa (Lewis, 451). This is reflected within the Ordnance Survey mapping, as the town indeed appears as a village in 1839. The most common feature of the landscape surrounding Oughterard within the early mapping are demesnes of varying sizes that were designed to capture the setting of Lough Corrib to the north-east.

The 18th century, a relatively peaceful period, saw the nationwide large-scale development of demesnes and country houses in Ireland. Demesnes were dominant features of the rural landscape throughout the 18th and 19th centuries. A number of demesne lands are highlighted on the first edition OS map within proximity of the proposed scheme, although most are associated with the settlements at Clifden and Oughterard. Glenowen House and Clifden Castle were located in close proximity to Clifden, whilst Sandymount, Clareville, Lemonfield, Ardvarra, Corrib View and Portacarron were all located in close proximity to Oughterard. The first edition OS map only shows two further demesnes in

the vicinity of the proposed greenway, between the two towns. These consist of Ballynahinch Castle demesne and a smaller demesne associated with Glendollagh House. By the second edition of 1898 a further small demesne has been established in associated with Lissoughter Lodge at Recess.

However, from the mid to late 19th century, the Anglo-Irish landowning classes began to slowly lose their grip on the thousands of acres of Irish landscape that formed a large part of their estates. The large country house and demesne were often only a small part of the visible wealth possessed by such families and their demise was brought about by a number of factors including The Famine; the loss of a younger generation to the first world war and the fight for independence by the Republicans. Indeed the selling on of the Clifden estate by John D'Arcy's son was a direct result of the famine. The lower classes resented the amount of land that was owned by the Anglo-Irish gentry and in 1922 the Land Commission was established. The purpose of the Commission was to purchase these estates (often for a greatly reduced price) so they could be re-distributed amongst the lower classes. As a result of this, many families became little more than upper class farmers and as a result many left Ireland to return to England. The large houses and demesnes were often left to decay with the houses often demolished for building materials and the demesnes subsumed back into the landscape.

The proposed greenway scheme will follow the path of a significant built heritage feature (BH 1), namely the route of The Midland Great Western Railway. The Midland Great Western Railway (MGWR) Act of 1845 was passed by Parliament and the first route, Dublin to Enfield, opened in 1847. At its peak the MGWR extended over a network of 538 miles (866km), making it the third largest network, after the Great Southern & Western Railway and the Great Northern Railway. The MGWR network reached Galway by August 1851 and in 1890 it received a grant of 264,000 pounds (£9,000 per mile) to construct a railway from Galway, across Connemara, to Clifden, with stations at Moycullen, Oughterard, Maam Cross, Recess and Ballynahinch. This section of railway opened on 1 July 1895 but due to the inland route chosen it did not service the bulk of the area's population and it was closed in 1935. The total length of the line from Clifden to Galway was 48 miles (www.maamcrossmart.com) and it was only open for 40 years.

In January 1891 there were 500 men working along the line, earning an average wage of 12 shillings per week (Villiers-Tuthill 2008, 12). Whilst over 200 of these took up lodgings in Clifden others were accommodated in wooden huts along the route. However, workers were unhappy with their employment terms and during March 1891 a strike was called in Clifden. Whilst the strike was resolved promptly, problems continued with the contractors and payment of wages until third contractor finally completed the project in 1895. The railway was subject to delays though, and should have opened just over a year earlier (ibid., 15).

During construction the workforce swelled to as many as 1500 men and as a result supply huts were erected in Ballinafad to serve the need of the workforce and shebeen houses were opened along the line (*ibid*.). In all there were 28 bridges, 13 bridges less than 12 feet span and numerous culverts along the route (*ibid*.). An imposing steel viaduct crossed the River Corrib in Galway. The station houses and ancillary buildings, such as at Oughterard (BH 123), Maam Cross (BH 76), Recess (BH 44), Ballynahinch (BH 24) and Clifden were made of local sandstone and red bricks and blended well with the surrounding landscape. The entire line was fenced, either with dry stone walls or wire and stakes. Very little original fencing survives today. No wire and stake fencing was noted during the field inspection.

Oughterard, Recess and Ballynahinch stations are all included in the register of protected structures and the NIAH survey for County Galway. Maam Cross station retains some of the original railway structures, although the station house has been demolished. The site is now used as a farm and whilst it is not registered as a protected structure, it is included within the NIAH survey.

There were a total of 18 gatekeeper cottages (from Galway to Clifden), situated at level crossings on public road, many of which survive and are now inhabited. A number of river and road crossings are traversed by the railway and numerous culverts have been identified during the course of the assessment. The majority of these consist of small, square headed stone built culverts. The stone is roughly dressed and many of the features are very overgrown. Some larger arched, single span

culverts survive, where the voussoirs are formed by red brick with the stone work dressed in a 'rock face' manner, typically associated with railway architecture. The railway bridges along the scheme (where extant) are all characterised by stone abutments (again with coursed, rock face masonry) and an iron girder span. Some of these structures are still in use for agricultural access, whereas other structures are in poor condition.

13.3.2.2 Cartographic Analysis

See **Section 13.3.1.2** for details

13.3.2.3 County Development Plan

The County Galway Development Plan (2009–2015), Clifden Local Area Plan (2009–2015) and Oughterard Local Area Plan (2006-2012) identify Protected Structure designations within the local area and county. Protected Structures are recorded on a schedule attached to the development plans and marked on associated mapping.

A review of the plan has revealed that there are a total of eight protected structures located within c. 300m of the proposed route. All of these are also included within the NIAH survey for County Galway (see below). The closest structure to the scheme to BH 2, Ardbear Old Bridge, which is located at the beginning of the route (Ch. 0).

BH No.:	RPS No:	Townland:	Classification:	NGR:	NIAH Ref:
BH 2	RPS 97	Clifden/ Ardbear	Ardbear Old Bridge.	66036, 250387	30325027
BH 3	RPS 598	Clifden/ Ardbear	Ardbear New Bridge.	65952, 250368	30325033
BH 5	RPS 805	Ardbear	Terrace of houses.	66149, 250432	30325029-32
BH 24	RPS 623 & 624	Cloonbeg	Ballynahinch Station.	76039, 246621	30403613-15
BH 25	RPS 621	Killeen	Ballynahinch Castle gate lodge and entrance.	76660, 246886	30403608-09
BH 44	RPS 628	Lissoughter	Recess Station House and out buildings.	83570, 247619	30403708-09
BH 51	RPS 626	Lissoughter	Lissoughter Lodge.	85679, 247340	30403705
BH 123	RPS 672	Cregg	Oughterard Station.	111863, 242080	30326018

13.3.2.4 National Inventory of Architectural Heritage

A review of both the architectural survey and garden survey was undertaken as part of this assessment. An area up to 300m that surrounds the proposed scheme was examined in order to identify any buildings or areas of architectural significance.

Building Survey

A total of 20 individual or groups of buildings were identified within the survey in proximity of the proposed greenway. Of these, eight are already listed within the register of protected structures (see above). Several of the structures are located along the scheme. These include Ardbear Old Bridge (BH 2), a railway bridge at Ballynahinch (BH 21), a road bridge at Cloonbeg (BH 22), a railway bridge

at Letterfore (BH 87) and the 'Quiet Man' bridge (BH 104). Whilst inclusion within the NIAH does not automatically result in statutory protection under the Planning Act; the survey results are used by relevant county councils in order to inform the inclusions of structures in the RPS.

BH No.:	NIAH No:	Townland:	Classification:	NGR:	RPS Ref:
BH 2	30325027	Clifden/ Ardbear	Ardbear Old Bridge.	66036, 250387	97
BH 3	30325033	Clifden/ Ardbear	Ardbear New Bridge.	65952, 250368	598
BH 4	30325028	Ardbear	House.	66080, 250371	N/A
BH 5	30325029-32	Ardbear	Terrace of houses.	66149, 250432	805
BH 21	30403610	Ballynahinch/ Killeen	Railway bridge.	75922, 246506	N/A
BH 22	30403610-11	Ballynahinch/ Killeen	Cloonbeg Bridge.	75896, 246567	N/A
BH 24	30403613-15	Cloonbeg	Ballynahinch Station.	76039, 246621	623, 624
BH 25	30403608-09	Killeen	Ballynahinch Castle gate lodge & entrance.	76660, 246886	621
BH 29	30403702	Ballinafad	Ballinafad School.	79124, 246691	N/A
BH 42	30403707	Garroman/ Lissoughter	Railway bridge.	83471, 247593	N/A
BH 44	30403708-09	Lissoughter	Recess Station House.	83570, 247619	628
BH 50	30403703	Lissoughter	Railway bridge.	85693, 247434	N/A
BH 51	30403705	Lissoughter	Lissoughter Lodge.	85679, 247340	626
BH 54	30403710	Lissoughter	Roman Catholic Church.	87018, 247472	N/A
BH 75	30403902	Lurgan or Shindilla	Level crossing cottage.	97672, 246398	N/A
BH 76	30403902	Lurgan or Shindilla	Maam Cross Station.	97854, 246398	N/A
BH 87	30405301	Letterfore/ Leam West	Railway bridge.	102227, 244605	N/A
BH 100	30405302-03	Leam East	National School and teacher's house.	105402, 242742	N/A
BH 104	30405305	Leam East/ Derryerglinna	The 'Quiet Man' Bridge.	105477, 242774	N/A
BH 123	30326018	Cregg	Oughterard Station.	111863, 242080	672

Garden Survey

A desk based assessment of demesnes and gardens within the County Galway has been completed by the NIAH. This was reviewed as part of this assessment to gain an insight into the possible significance of any surviving demesnes within the receiving environment of the proposed scheme. Two demesnes were identified, which are associated with Ballynahinch Castle and Glendollagh House.

The NIAH Site Survey Report includes:

- Initial Overview: general comment on the overall site and impact of any recent development;
- Architectural Features: the presence and survival of the principal buildings and other structures such as gatehouses and garden buildings.

- Movement within Site: the presence of drives, walks and avenues and changes in these since the maps were made.
- Landscape Features: the presence of key features such as walled gardens, woodland, orchards, formal gardens, vistas, lakes and rivers. A short comment will normally be provided on the character and condition of the landscape.

In the Initial Overview there is a reference to the Feature Richness Index. This is a figure that can range from 1 to 16 and represents the total number of major traditional garden features identified. It could be a high figure for a site that is partially destroyed, but could also be a low figure for a site that is virtually complete and unchanged. *The Feature Richness Index is not an indication of heritage significance or merit.* It should also be noted that features could survive that are not visible on the aerial photography as this is only a desk based assessment (NIAH survey, www.buildingsofireland.ie).

There are five possible options identified for the Statement of Condition:

- Main features substantially present: - no loss of integrity
- Main features substantially present: - some loss of integrity
- Main features substantially present:- peripheral features unrecognisable
- Main features unrecognisable: - peripheral features visible
- Virtually no recognisable features

Site Name	Townland	Dist. from development	NIAH Feature index rating	Statement of condition
Ballynahinch Castle (AH 16)	Ballynahinch & Killeen	Proposed greenway travels along southern boundary of demesne	5	Main features unrecognisable - peripheral features visible
Comment:	None			
Glendollagh House	Garroman	Northern edge of demesne 250m south of proposed route	5	Main features substantially present - some loss of integrity
Comment:	None			

13.3.2.5 Field Inspection

The architectural field inspection sought to assess the proposed route of the greenway and identify any structures of architectural merit. Due to the past use of the proposed route as a railway, many of the structures (85 out of 123) relate directly to its former use. For the ease of dissemination of information, the proposed greenway route has been split into a number of sections numbering 1 to 30. This includes the greenway route itself and proposed NRA cycle routes. Sections are clearly marked on **Figures 13.1-13.18**. These structure of architectural merit are outlined in **Appendix D.2**

BH 1 is the former railway route itself. The construction of this major infrastructural feature during the 19th century necessitated massive manual labour, with the construction of embankments or cuttings through bed rock. The route for the most part survives in good condition, with parts already used for agricultural access. The remains of the railway are described in the archaeological field inspection section of this report (**Section 13.3.1.5**).

13.3.2.6 Conclusions

The proposed scheme is dominated by structures of built heritage merit, the majority of which are associated with the Clifden to Oughterard Railway, which has been out of use for 77 years. A total of 123 buildings or features of built heritage merit have been identified during this assessment. Of these, 85 are directly associated with the railway. A total of eight protected structures have been identified within the receiving environment and 20 NIAH structures. All of the protected structures are included in that NIAH total.

The County Galway Development Plan (2009–2015), Clifden Local Area Plan (2009–2015) and Oughterard Local Area Plan (2006-2012) were reviewed in order to identify the protected structures. Of the eight that are present within the receiving environment, three are associated with the railway and consist of the stations (and associated outbuildings) at Oughterard (BH 123), Recess (BH 44) and Ballynahinch (BH 24). Of the remaining structures, two consist of road bridges at Clifden (BH 2 and BH 3); whilst a gate lodge and entrance are recorded at Ballynahinch Castle (BH 25) and a modest country house is listed within the townland of Lissoughter (Lissoughter Lodge, BH 51). The closest structure to the scheme to BH 2, Ardbear Old Bridge, which is located at the beginning of the route (Ch. 0).

The NIAH building survey for County Galway was carried out in three phases over 2008 and 2009. A total of 20 individual or groups of buildings are located within the receiving environment of the proposed scheme. The total of 20 also includes the eight protected structures. Nine of the structures are directly associated with railway (BH 21, 24, 42, 44, 50, 75, 76, 87 and 123). In addition, four road bridges are recorded (BH 2, 3, 22 and 104), along with two schools (BH 29 and 100), two houses (BH 4 and 5), Lissoughter Lodge (BH 51) and the gate lodge at Ballynahinch (BH 25). Several of the structures are located along the scheme. These include Ardbear Old Bridge (BH 2), a railway bridge at Ballynahinch (BH 21), a road bridge at Cloonbeg (BH 22), a railway bridge at Letterfore (BH 87) and the ‘Quiet Man’ bridge (BH 104).

A review of the NIAH garden survey revealed that there are two demesne landscapes located within the receiving environment of the proposed greenway. To date the garden survey has only been carried out as a desk based assessment. The proposed route will travel around the southern boundary of the Ballynahinch Castle demesne, deemed to have a features richness index of five. The route will travel c. 250m to the north of the northern edge of Glendollagh House demesne, also deemed to have a feature richness index of five.

A review of the historic mapping resource, coupled with a field inspection of the proposed route, led to the identification of 103 structures or features of built heritage merit. Of these, a large number are associated with the railway. A total of 52 culverts, which varied in size, were identified. In addition to this, ten railway bridges (some of which are now ruinous) were also identified, as well as 11 level crossings/ cottages. Fifteen vernacular structures were also included. The majority of these consist of cottages or houses. Three larger houses were also noted, along with a possible pump associated with the railway, a Guarda Barracks, the site of Recess Hotel and two relatively modern monuments.

Despite the marginal nature of the landscape and the fact that a large amount of vernacular architecture has been lost or replaced with modern housing, the receiving environment of the proposed scheme is rich in architectural history. Whilst the railway infrastructure is relatively recent, the longevity of the structures attests to the quality of Victorian engineering, especially when considering that the railway was only in use for 40 years and has been decommissioned for over 77 years.

13.3.3 Results and Analysis – Cultural Heritage

13.3.3.1 Place Name Analysis

The proposed greenway route traverses a large area between Oughterard and Clifden, County Galway. The surrounding landscape is characterised by loughs, waterways and marginal terrain. Following the path of a disused railway track (BH 1, formerly the Midland Great Western Railway) the route travels through, or in proximity to 49 townlands. These townlands are located within the parishes of Omey, Moyrus, Ballindoon and Kilcummin and within the Baronies of Ballynahinch and Moycullen.

Barony	Parish	Townland
Ballynahinch	Omey	Clifden, Tullyvoheen, Ardagh
	Moyrus	Ardbear, Killymongaun, Gowlan West, Derrylea, Emlaghmore, Derryvickrune, Derryadd West, Ballynahinch, Killeen, Arkeen More, Arkeen Beg, Derryadd East, Cloonbeg, Ballinafad, Athry, Glencoaghan, Garroman, Cloonnacarton, Lissoughter, Cappaghhoosh, Caher, Derryneen, Boheeshal, Shannakeela
	Ballindoon	Munga
Moycullen	Kilcummin	Oorid, Bunscanniff, Shannaunnafeola, Lurgan or Shindilla, Bunnakill, Tullaghaboy, Tawnaghbeg, Letterfore, Leam West, Leam East, Derryerglinna, Derreighter, Glengowla West, Glengowla East, Derradda, Rusheeny, Lettercraff, Claremount, Clare, Canrawer West, Canrawer West, Cregg.

Townland and topographic names are an invaluable source of information on topography, land ownership and land use within the landscape. They also provide information on history; archaeological monuments and folklore of an area. A place name may refer to a long forgotten site, and may indicate the possibility that the remains of certain sites may still survive below the ground surface. The Ordnance Survey surveyors wrote down townland names in the 1830's and 1840's, when the entire country was mapped for the first time. Some of the townland names in the study area are of Irish origin and through time have been anglicised. The main reference used for the place name analysis is *Irish Local Names Explained* by P.W Joyce (1870). A description and possible explanation of each townland name in the environs of the proposed route are provided in **Appendix D.2**.

13.3.3.2 Townlands

The townland is an Irish land unit of considerable longevity as many of the units are likely to represent much earlier land divisions. However, the term townland was not used to denote a unit of land until the Civil Survey of 1654. It bears no relation to the modern word 'town' but like the Irish word *baile* refers to a place. It is possible that the word is derived from the Old English *tun land* and meant 'the land forming an estate or manor' (Culleton 1999, 174).

Gaelic land ownership required a clear definition of the territories held by each sept and a need for strong, permanent fences around their territories. It is possible that boundaries following ridge tops, streams or bog are more likely to be older in date than those composed of straight lines (*ibid.* 179).

The vast majority of townlands are referred to in the 17th century, when land documentation records begin. Many of the townlands are mapped within the Down Survey of the 1650s, so called as all measurements were carefully 'laid downe' on paper at a scale of forty perches to one inch. Therefore most are in the context of pre-17th century landscape organisation (McErlean 1983, 315).

In the 19th century, some demesnes, deer parks or large farms were given townland status during the Ordnance Survey and some imprecise townland boundaries in areas such as bogs or lakes, were given more precise definition (*ibid.*). Larger tracks of land were divided into a number of townlands,

and named Upper, Middle or Lower, as well as Beg and More (small and large) and north, east, south and west (Culleton 1999, 179). By the time the first Ordnance Survey had been completed a total of 62,000 townlands were recorded in Ireland.

The proposed greenway will travel through or in close proximity to 49 townlands. Due to the marginal nature of the landscape some of the boundaries follow natural watercourses, but many were defined properly in the 19th century and have no definition within the landscape. The proposed scheme will not impact on townland boundaries as it is following the local road network, the existing disused railway and the N59. The development of the communications infrastructure has already impacted upon the landscape and the locations where townlands will be crossed.

13.3.3.3 Cultural Heritage Sites

The term 'cultural heritage' can be used as an over-arching term that can be applied to both archaeology and architectural. However, it also refers to more ephemeral aspects of the environment, which are often recorded in folk law or tradition or possibly date to a more recent period. Two sites have been identified within the architectural section of this assessment, which could be deemed to be cultural heritage too. The first is the statue of 'Connemara', c. 25m south of the N59 in Recess (BH 46). This was erected by a local craft shop for 'no reason' in 1999, but has since become a land mark feature and tourist attraction on the shores of Garroman or Glendollagh Lough. The second is a memorial (BH 61) on the eastern shores of Lough Tawnagh or Park Lough. Here a memorial was erected in 1986 in order to commemorate the 'Trees for Ireland' scheme. The lectern stands by a large tract of coniferous forestry planting that was sponsored or partly sponsored by Irish-American donors under a scheme called 'Trees for Ireland'. Donors could purchase a tree for $10 and the Irish national Forestry Service developed this 'seed money' by planting 0.5 ha of forestry for every 100 trees donated. A memo of 7/1/1986 from the Assistant Chief Inspector to all 'Foresters-in-Charge' included the stipulation that 'a suitably inscribed notice board will issue to each designated forest' (O'Sullivan, *in lit.*).

13.3.3.4 Conclusions

A review of the townlands names within the receiving environment of the proposed greenway development has revealed some common topographical terms, which were used to describe portions of the landscape. These gradually became anglicised and lost their original form, although it still is possible to investigate their original structure. The majority of the townland names within the vicinity are derived from topographical features, former function and landscape use or type. Some of the townland names refer to ownership. It is clear from the townland names that reference to woodland and especially oak, is common, potentially indicating that a large amount of deciduous woodland has been lost from the area. The other common term refers to marshy terrain, which is not surprising when considering the nature of the marginal landscape.

The proposed greenway will travel through or in close proximity to 49 townlands. The proposed scheme will not impact on townland boundaries as it is following the local road network, the existing disused railway and the N59. The development of the communications infrastructure has already impacted upon the landscape and the locations where townlands will be crossed.

Two sites have been identified within the architectural section of this assessment, which could be deemed to be cultural heritage too. The first is the statue of 'Connemara', c. 25m south of the N59 in Recess (BH 46). This was erected by a local craft shop for 'no reason' in 1999. The second is a memorial (BH 61) on the eastern shores of Lough Tawnagh or Park Lough. Here a memorial was erected in 1986 in order to commemorate the 'Trees for Ireland' scheme.

13.4 POTENTIAL IMPACTS

13.4.1 Potential Impacts

13.4.1.1 Archaeology

- The proposed greenway development will not impact on any of the recorded archaeological sites located within the receiving environment.

- Due to the fact that the existing communications network is likely to have removed any previously existing archaeological resource, it is anticipated that the likelihood of a direct impact on the same resource is very low. However, at certain locations the proposed route will travel 'offline' from the existing roads and railway (alternate routes from; Ch. 4+050 to Ch. 4+300, Ch. 19+950 to Ch. 20+050, Ch. 35+450 to Ch. 35+450, Ch. 46+200 to Ch. 46+550). It is possible that ground disturbances at these locations, which are associated with the development of the scheme, may have a direct significant negative impact on previously unrecorded archaeological features or deposits that have the potential to survive beneath the current ground surface.

13.4.1.2 Architecture

- It is proposed to retain the drainage culverts that are located along the path of the railway and the proposed route. In order for the culverts to fulfil their function, they will be cleaned out and repaired where necessary. It is possible that inappropriate repairs will result in a direct significant impact on these features.

- It is proposed to retain or replace the existing railway bridges. Replacement of the bridge will be in the form of a wooden decking structure across existing stone abutments. The removal of any of the iron girder frames from the bridges will result in a direct significant negative impact on the structures. The use of wooden decking spans at bridges that have already had their iron frames removed will result in a direct moderate negative impact on the character of the structure.

- BH 1, the path of the railway itself, is formed by embankment or cut. The development of the greenway may result in a direct significant negative impact on the feature due to any potential re-grading of the embankment that may take place.

- No direct or indirect impacts are anticipated for the remaining built heritage resource, which is located within the receiving environment of the proposed scheme.

- It is not anticipated that overall, development of the greenway will impact negatively on the architectural heritage resource. Indeed, the scheme will open up the landscape and associated architecture to the public, resulting in a greater awareness and appreciation of the resource. Therefore an overall direct moderate positive impact is predicted with regards to the architectural and built heritage resource.

13.4.1.3 Cultural Heritage

- No direct or indirect impacts are anticipated for the cultural heritage resource, which is located within the receiving environment of the proposed scheme.

13.4.2 Do Nothing Impact

If the proposed development were not to proceed, there would be no direct negative impact on the archaeological resource. However, there may be a direct negative impact on the architecture associated with the railway, due to its gradual dereliction, which will result in the collapse of bridges and culverts and degrading of the railway bed.

13.4.3 Worst Case Impact

Under a worst case scenario, the proposed development would disturb previously unrecorded and unidentified deposits, artefacts and structures, without proper excavation and recording being undertaken.

13.5 MITIGATION MEASURES

13.5.1.1 Archaeology

- It is recommended that all ground disturbances, such as topsoil removal, which take place in areas that are undisturbed (alternate routes from ; Ch. 4+050 to Ch. 4+300, Ch. 19+950 to Ch. 20+050, Ch. 35+450 to Ch. 35+450, Ch. 46+200 to Ch. 46+550) be monitored by a suitably qualified archaeologist. Full provision should be made available for the resolution of any features or deposits that may be identified, should that be deemed the most appropriate manner in which to proceed.

13.5.1.2 Architecture

- It is recommended that all drainage culverts are retained with repairs made where necessary. However, should repair be required then every effort should be made to replicate building materials, finishing and style (i.e. brick, dressed masonry). Should significant repairs or replacement of culverts be required it is recommended that a full written and photographic record be made of the feature (with measurements), by a suitably qualified archaeologist or historic buildings expert.

- It is recommended that all existing railway bridges, which will be incorporated into the proposed scheme, be subject to appropriate restoration (to include stone abutments where necessary, and steel girder frame). However, if this is not possible then it is recommended that a full written and photographic record, along with a measured survey, be made of the structure, by a suitably qualified archaeologist or historic buildings expert. This should be carried out before alteration goes ahead. In addition, it is recommended that in any replacement span structure, an effort is made to replicate the character of the existing railway bridge architecture. This should be carried out in consultation with a conservation architect or historic buildings advisor.

- It is recommended that the railway embankment/cut is left intact and re-grading does not take place. However, should regarding be required it is recommended that any sections to be directly impacted upon are subject to topographical survey in order to fully record the feature.
- Whilst direct/indirect impacts are not anticipated for the remaining built heritage along the scheme (due to the low impact nature of the development) the design element may be changed in the future, resulting in a change of impacts (especially along the N59 section, where extent of widening has not been defined). As such it is recommended that direct impacts on all 123 BH sites be avoided. Should impacts alter then further advice should be sought on appropriate mitigation measures.

13.5.1.3 Cultural Heritage

- No mitigation is deemed necessary.

13.5.2 Monitoring

The mitigation measures recommended above would also function as a monitoring system to allow the further assessment of the scale of the predicted impacts and the effectiveness of the recommended mitigation measures.

13.6 RESIDUAL IMPACTS

Archaeology

If the above mitigation measures are carried out, then there will be no residual negative impact on the archaeological resource.

Architecture

If the above mitigation measures are carried out, then there will be no residual negative impact on the architectural resource. It is predicted that there will be a residual positive impact on the architectural heritage resource.

Cultural Heritage

If the above mitigation measures are carried out, then there will be no residual negative impact on the cultural heritage resource.

Please note that all recommendations are subject to approval by the National Monument Service of the Heritage and Planning Division, Department of Arts, Heritage and the Gaeltacht.

14 LANDSCAPE AND VISUAL

14.1 INTRODUCTION

The purpose of this chapter is to make an assessment of the landscape and visual impacts associated with the proposed Connemara Greenway Project - Clifden to Oughterard. The assessment begins with a description of the existing landscape setting and visual resources to establish baseline conditions. The proposal is then applied to the baseline, and the impacts of the proposed Greenway Project upon the existing landscape setting and visual resources are then predicted.

This chapter outlines the methodologies used to assess the potential landscape and visual impacts, describes the potential impact including the residual impact, and provides details on mitigation measures.

14.2 METHODOLOGY

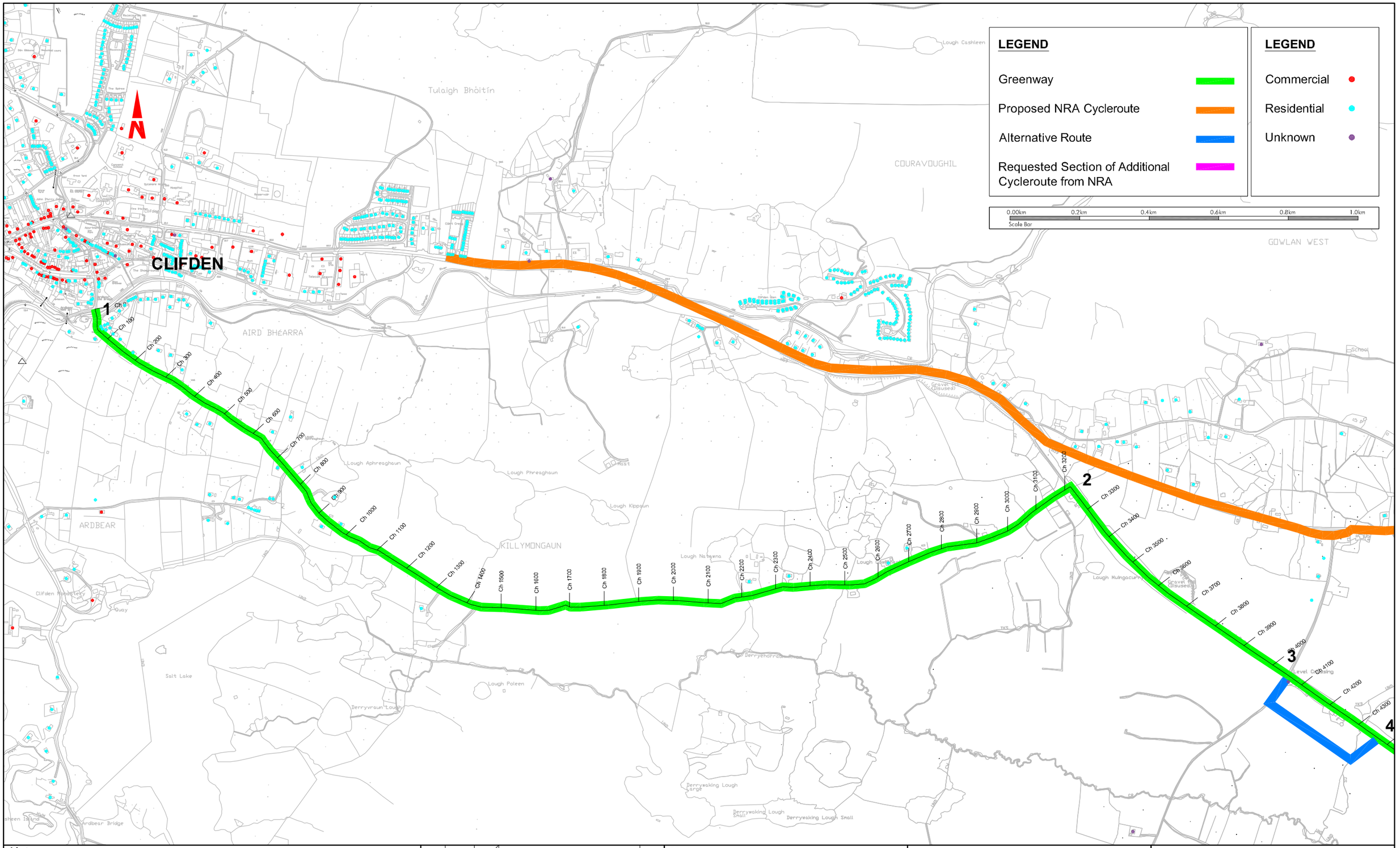
The landscape and visual assessment methods are derived from the *Guidelines for Landscape and Visual Impact Assessment* (The Landscape Institute and Institute of Environmental Management & Assessment, 2002). In addition to this the *Guidelines on the Information to be contained in Environmental Impact Statements'*, (EPA, 2002) and *'Advice Notes on Current Practice in the preparation of Environmental Impact Statements',* (EPA, 2002) were consulted in completing this assessment.

The landscape has been appraised to allow it to be described and classified into landscape character areas that in turn enable the categorisation of landscape quality. The capacity of a landscape to accept change of the type proposed is then assessed. The key landscape components are landform, vegetation and historical and cultural components. Landform relates to topography, drainage characteristics and geology. Vegetation plays an important role in how the landscape and visual resources of an area are viewed and is an integral component of a landscape character. Historical and cultural components include historic landscapes, protected structures, conservation areas and historic designed landscapes.

Assessment was undertaken through analysis of up to date digital copies of OSI Discovery Series raster and OSI vector maps and aerial photography, in conjunction with drawings of the project (**Figures 14.1 to 14.15**). Site visits were undertaken to assess the existing environment and the landscape and visual impacts associated with the proposed Greenway Project.

Existing visual resources were established along with sensitive receptors, i.e. residential properties, scenic viewpoints and visitor amenity areas. The proposed Greenway Project was then applied to this landscape and visual baseline and potential impacts predicted.

A review of the Galway County Development Plan 2009 – 2015 relevant statutory documents was undertaken to establish if there are any relevant landscape related designations that may influence the assessment within the study area.



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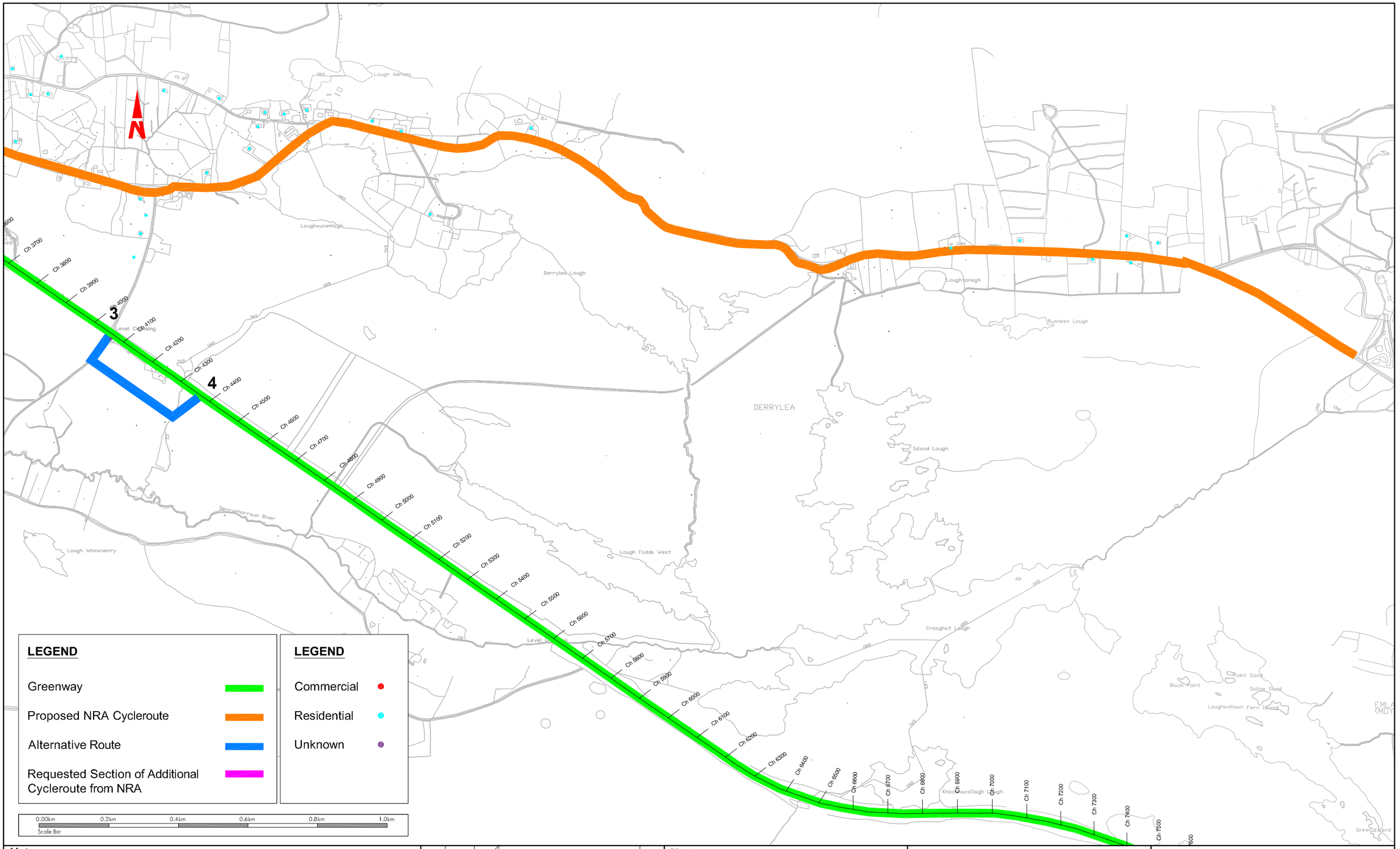

LEGEND

- Greenway
- Proposed NRA Cycleroute
- Alternative Route
- Requested Section of Additional Cycleroute from NRA

LEGEND

- Commercial
- Residential
- Unknown

0.00km 0.2km 0.4km 0.6km 0.8km 1.0km
Scale Bar

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FIGURE 14.2
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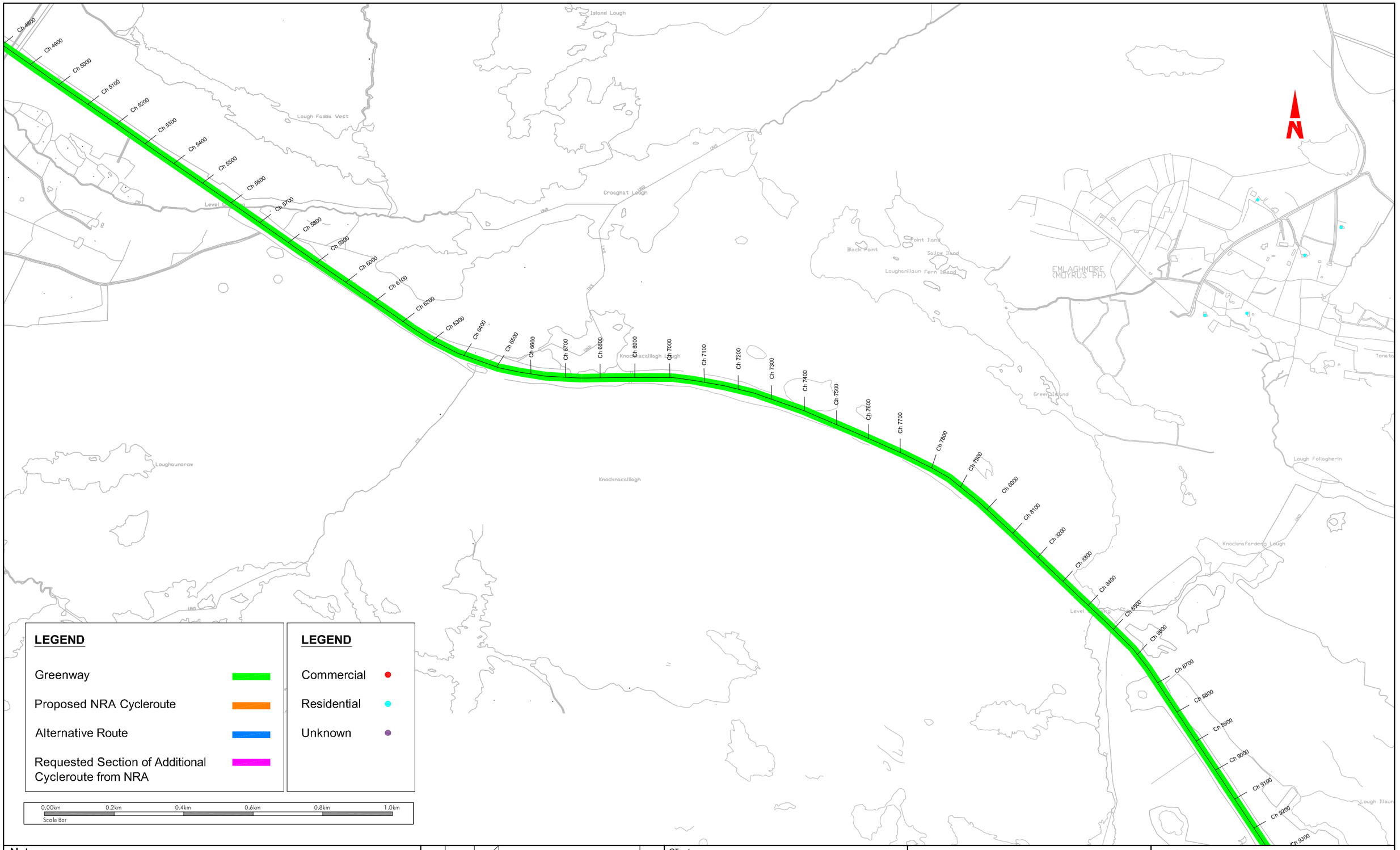

LEGEND

- Greenway
- Proposed NRA Cycleroute
- Alternative Route
- Requested Section of Additional Cycleroute from NRA

LEGEND

- Commercial
- Residential
- Unknown

0.00km 0.2km 0.4km 0.6km 0.8km 1.0km
Scale Bar

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FIGURE 14.3
LANDSCAPE & VISUAL ASSESSMENT
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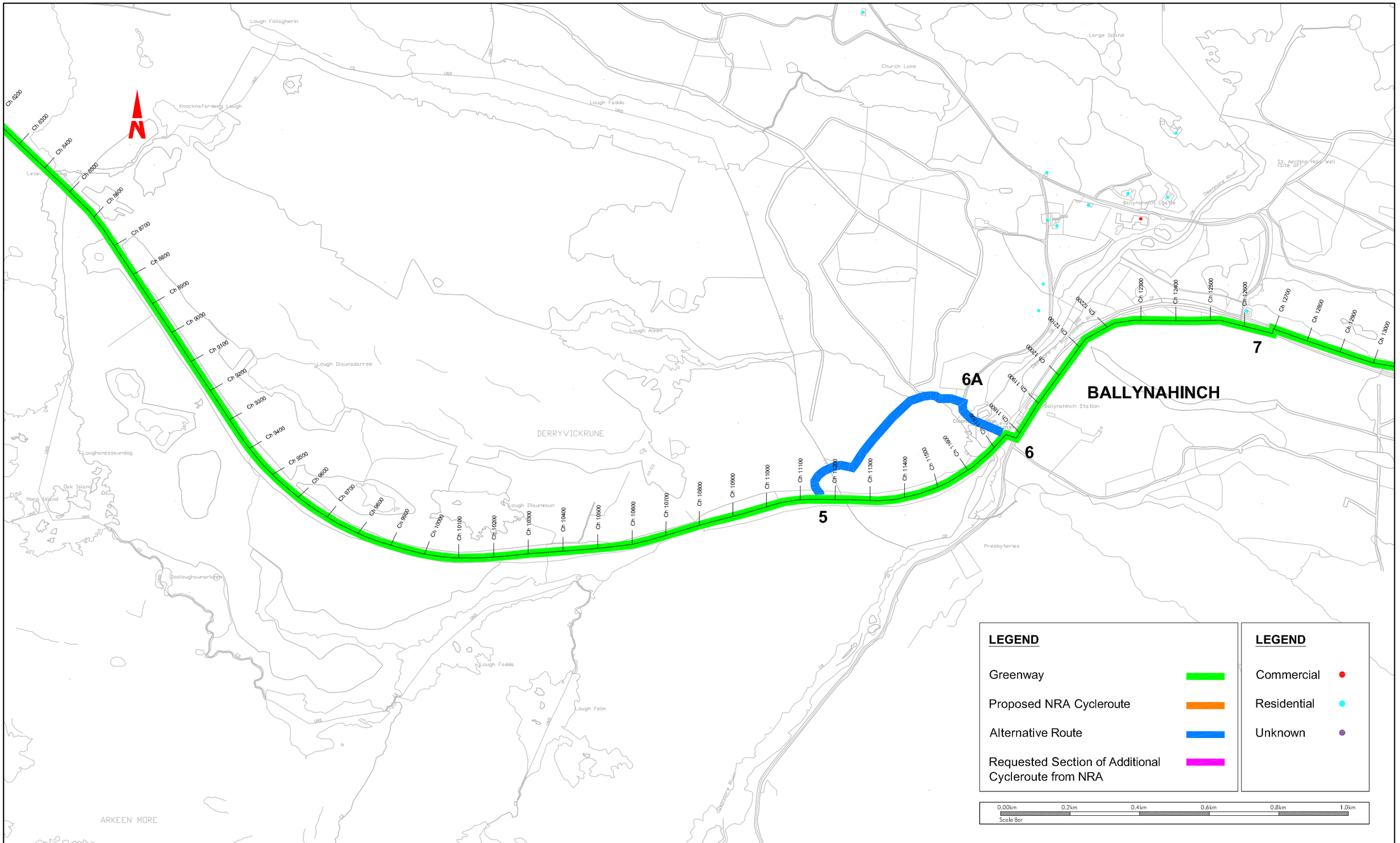

LEGEND

- Greenway
- Proposed NRA Cycleroute
- Alternative Route
- Requested Section of Additional Cycleroute from NRA

LEGEND

- Commercial
- Residential
- Unknown

0.00km 0.2km 0.4km 0.6km 0.8km 1.0km
Scale Bar

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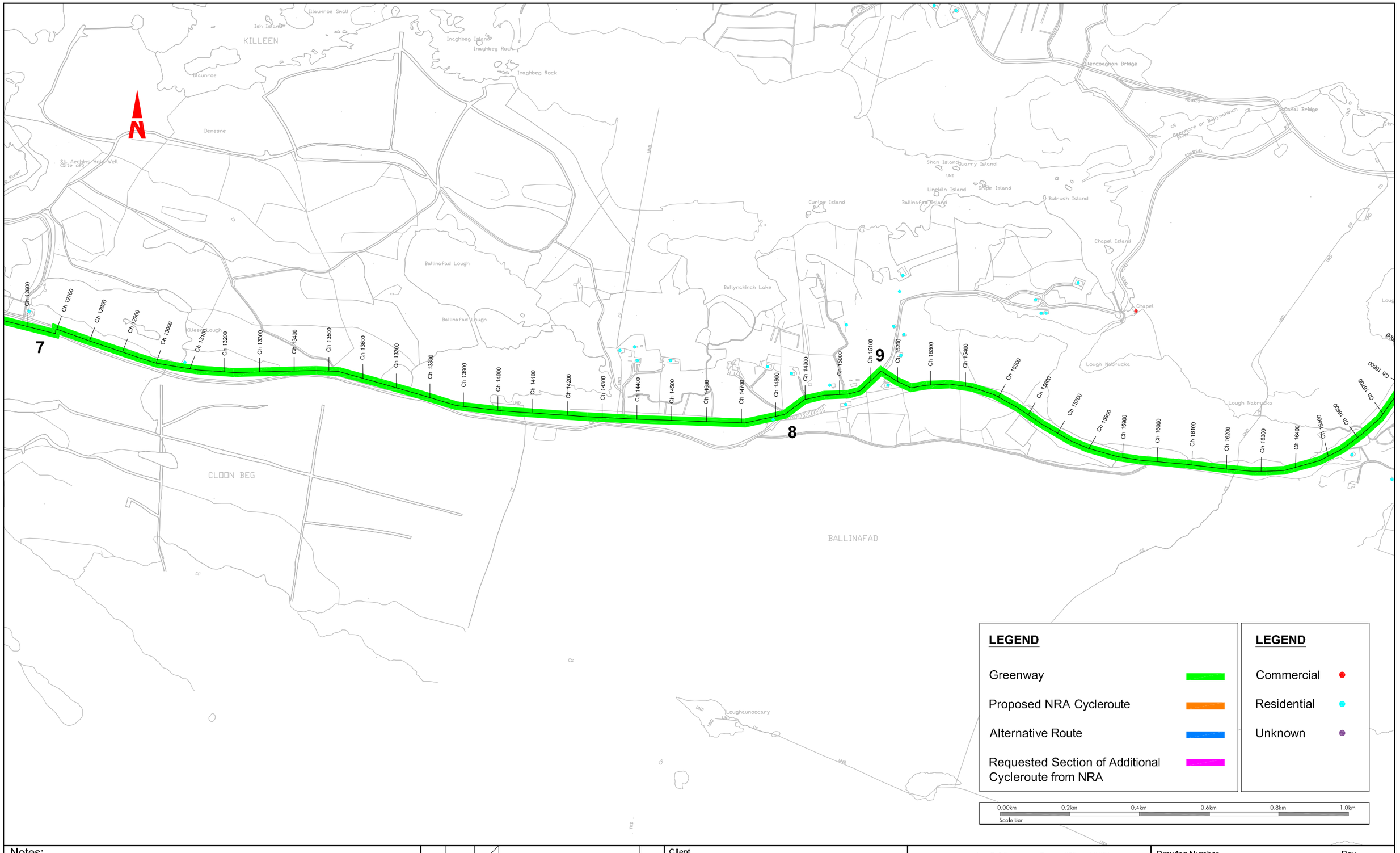

LEGEND

- Greenway
- Proposed NRA Cycleroute
- Alternative Route
- Requested Section of Additional Cycleroute from NRA

LEGEND

- Commercial
- Residential
- Unknown

0.00km 0.2km 0.4km 0.6km 0.8km 1.0km
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FIGURE 14.5
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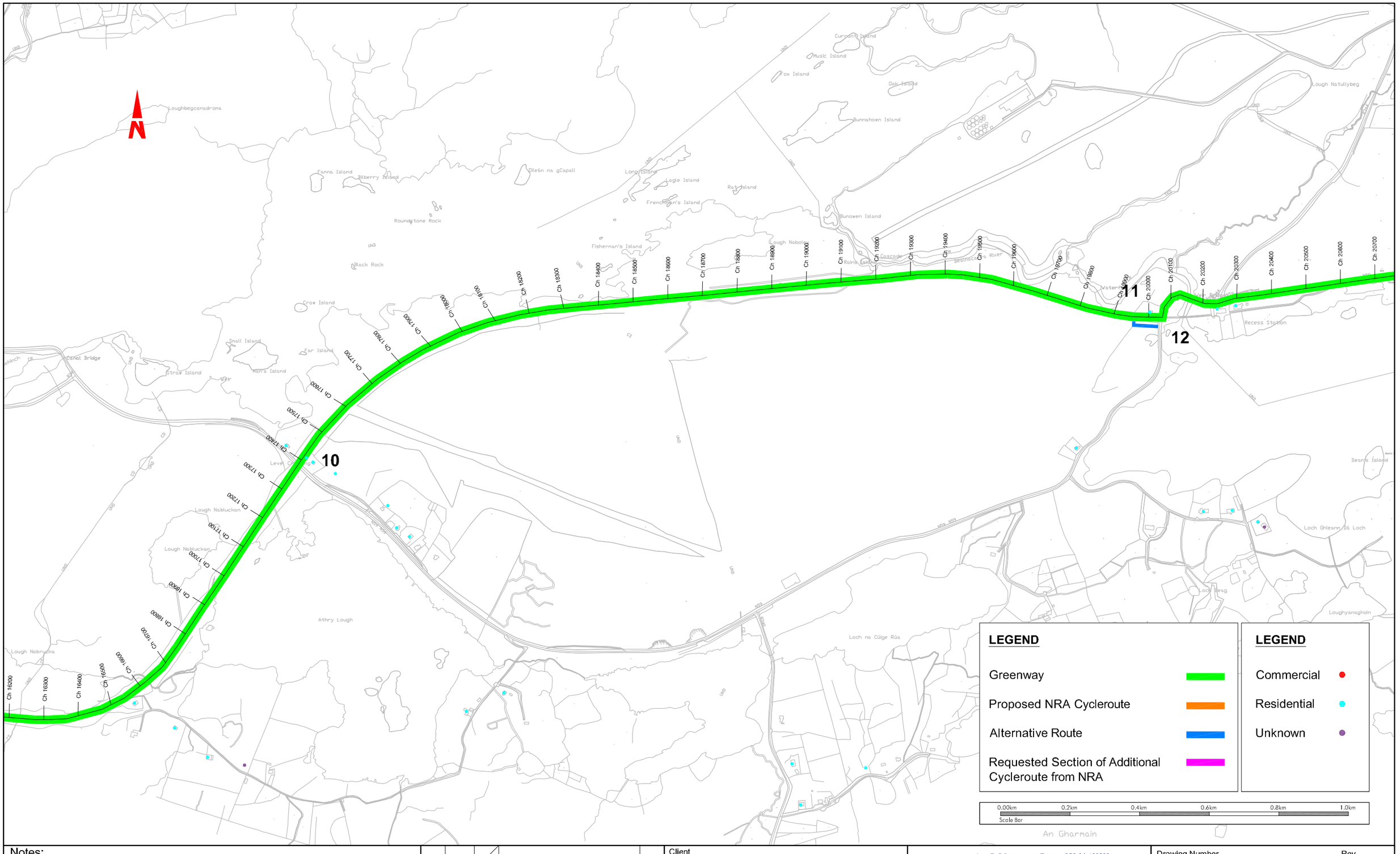

LEGEND

- Greenway
- Proposed NRA Cycleroute
- Alternative Route
- Requested Section of Additional Cycleroute from NRA

LEGEND

- Commercial
- Residential
- Unknown

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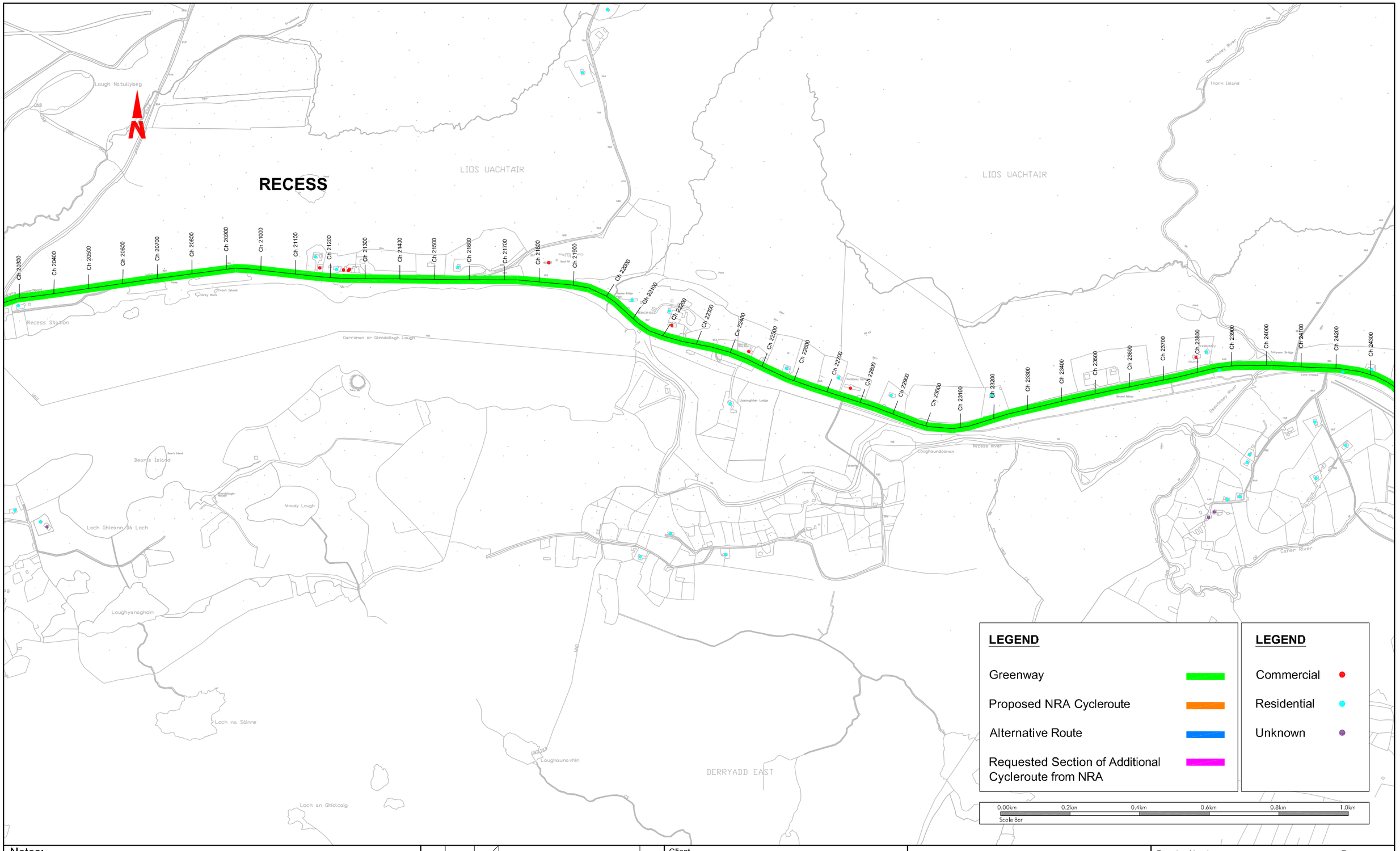

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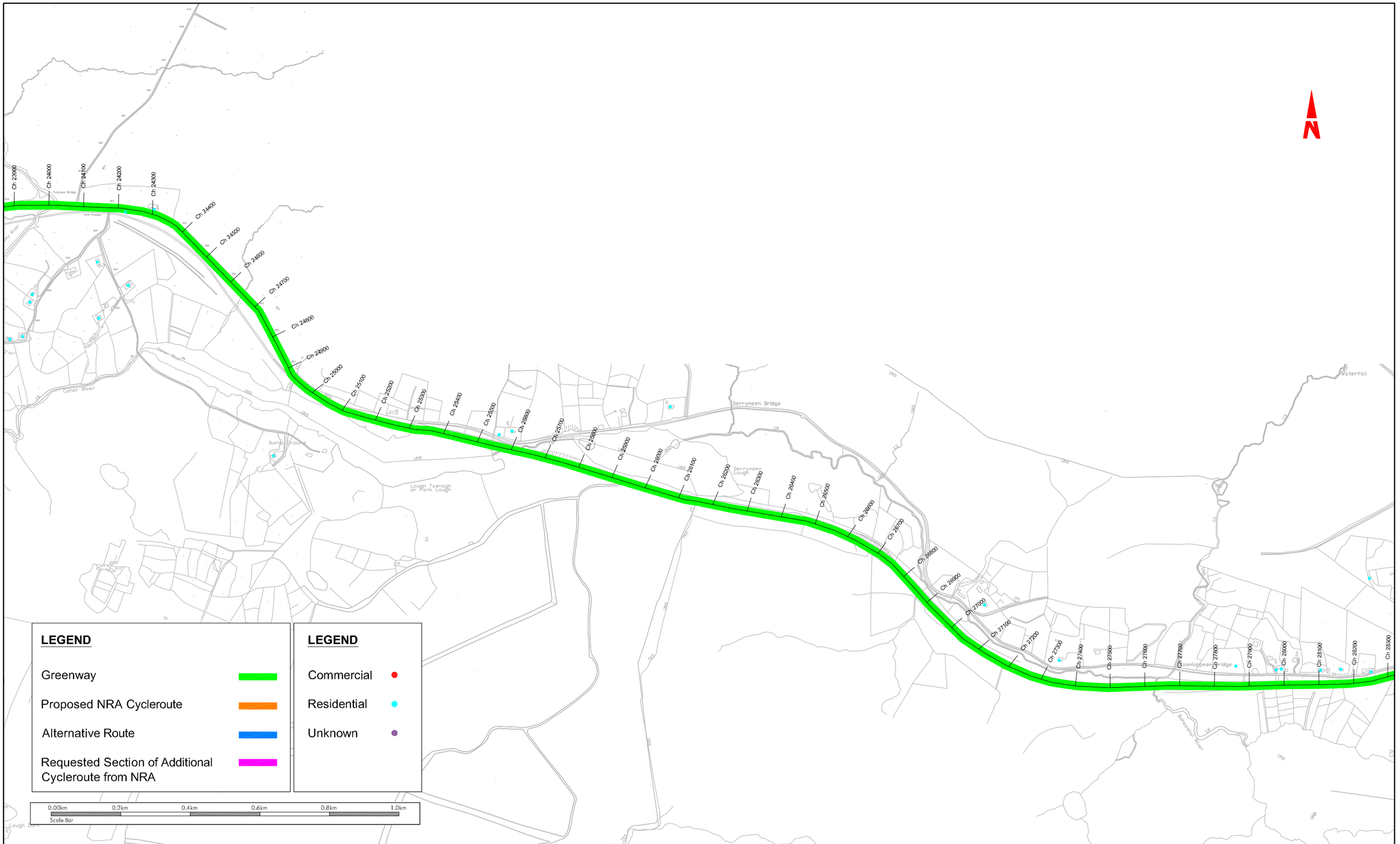

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FIGURE 14.8
LANDSCAPE & VISUAL ASSESSMENT
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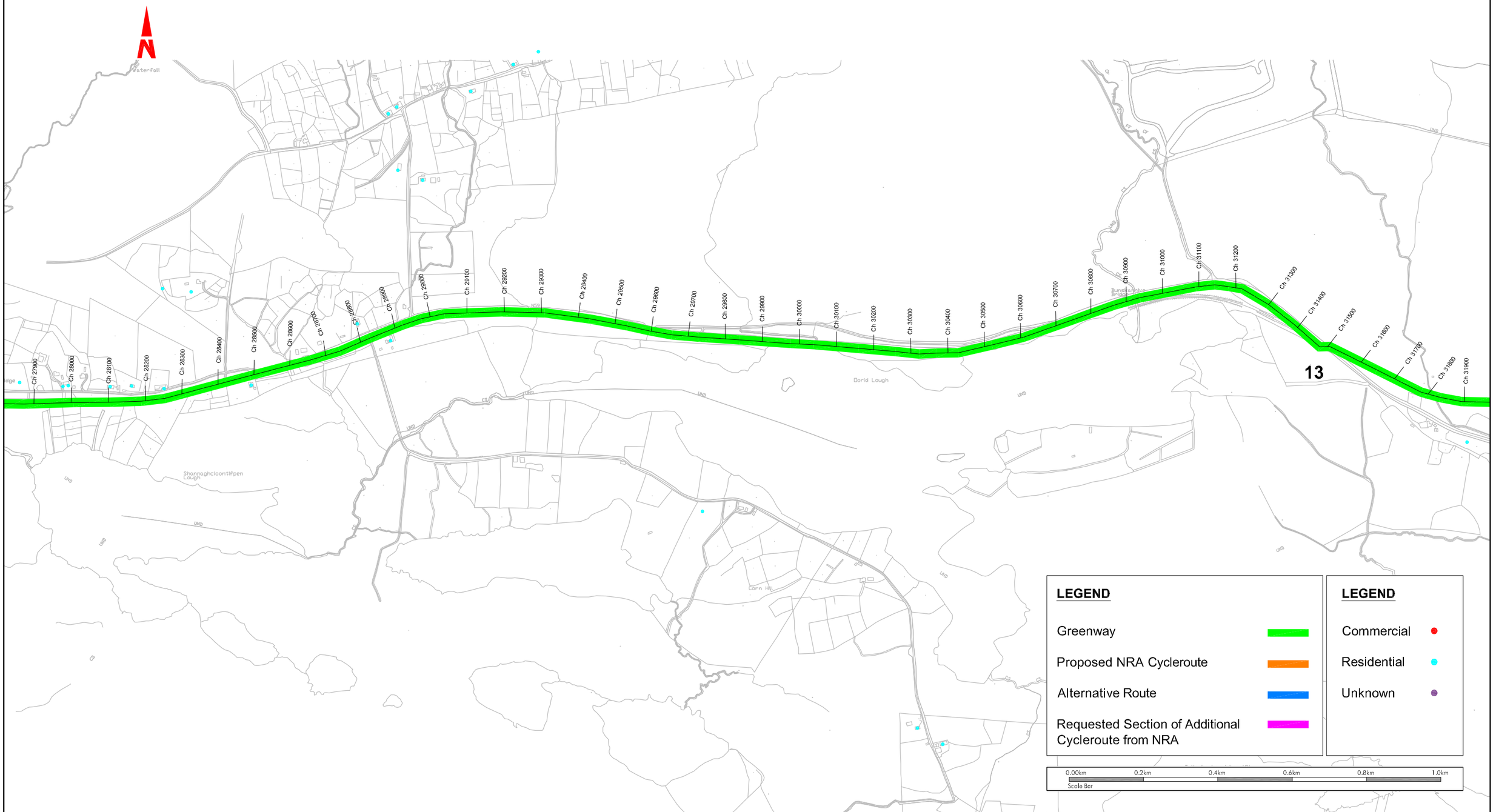

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FIGURE 14.9
LANDSCAPE & VISUAL ASSESSMENT
Sheet 9 of 15

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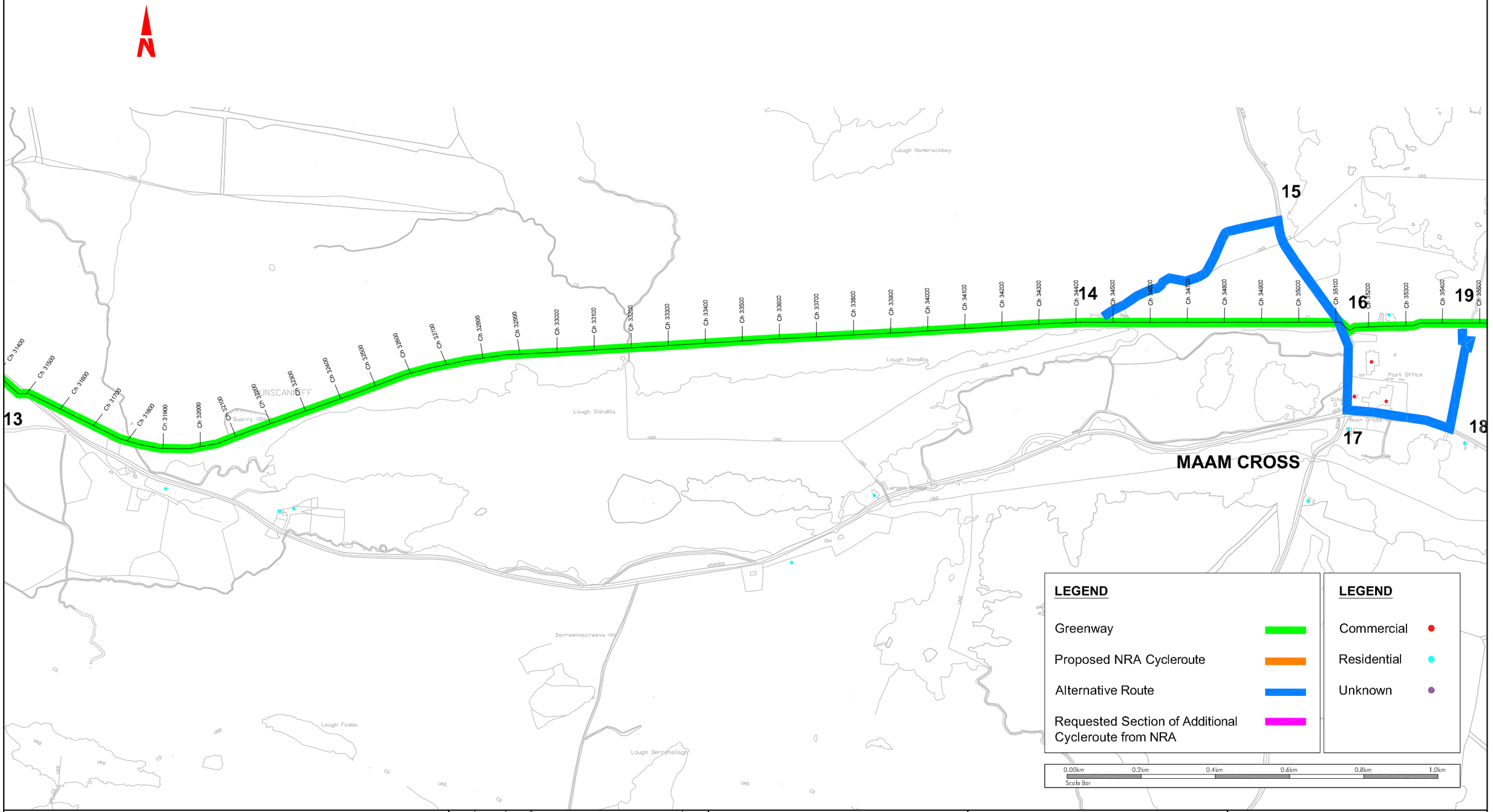

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D02	20.04.12	AN / DM	DRAFT ISSUE	WM
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Project: CONNEMARA GREENWAY PROJECT

Drawing Number: MGE0269/DG0005-10
Rev: F01

Title: FIGURE 14.10 LANDSCAPE & VISUAL ASSESSMENT Sheet 10 of 15

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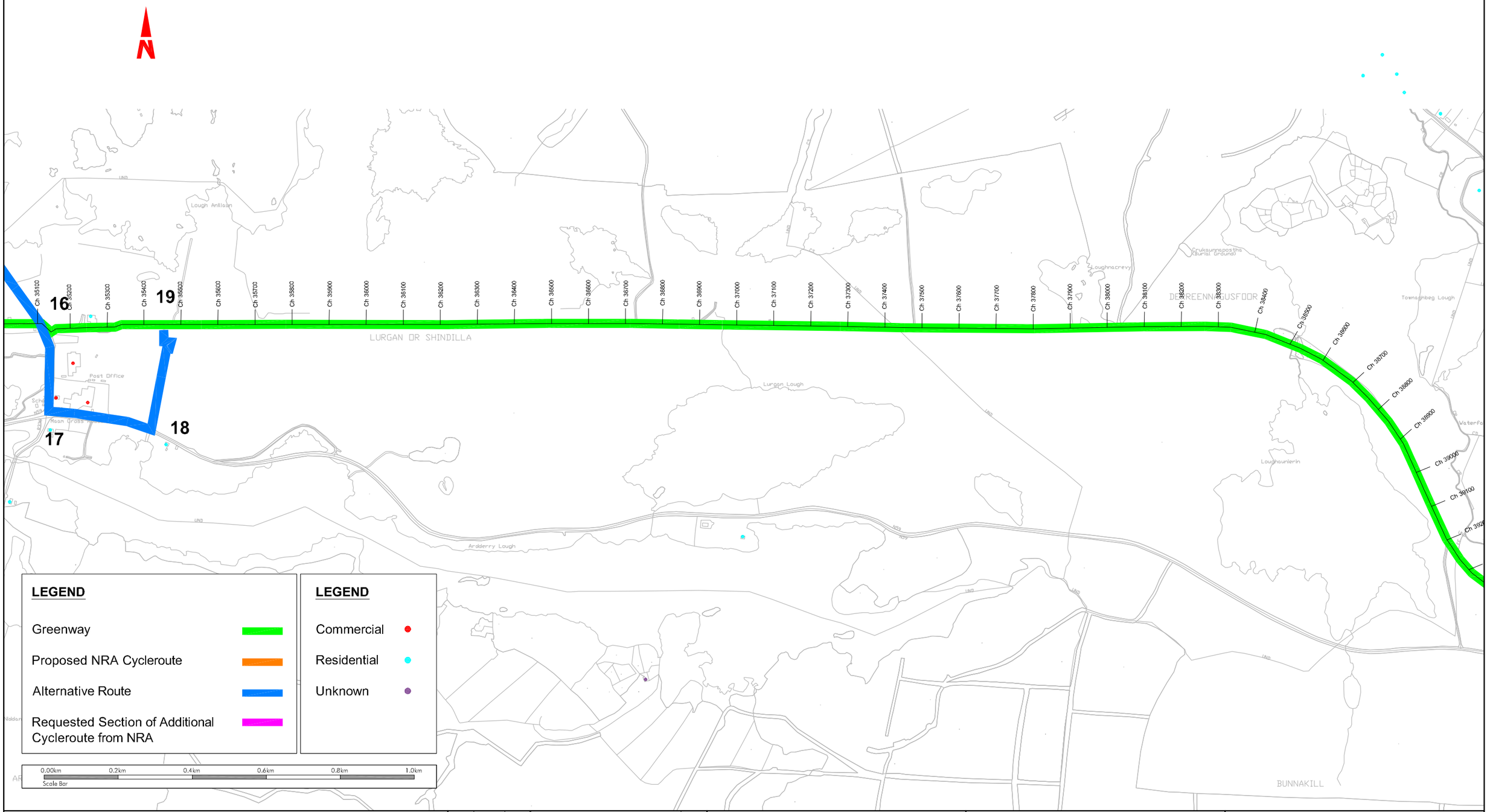

LEGEND

- Greenway
- Proposed NRA Cycleroute
- Alternative Route
- Requested Section of Additional Cycleroute from NRA

LEGEND

- Commercial
- Residential
- Unknown

0.00km 0.2km 0.4km 0.6km 0.8km 1.0km
Scale Bar

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Drawing Number
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Title
FIGURE 14.11
LANDSCAPE & VISUAL ASSESSMENT
Sheet 11 of 15

Scale	Drawn By	Checked By	Approved By	Date
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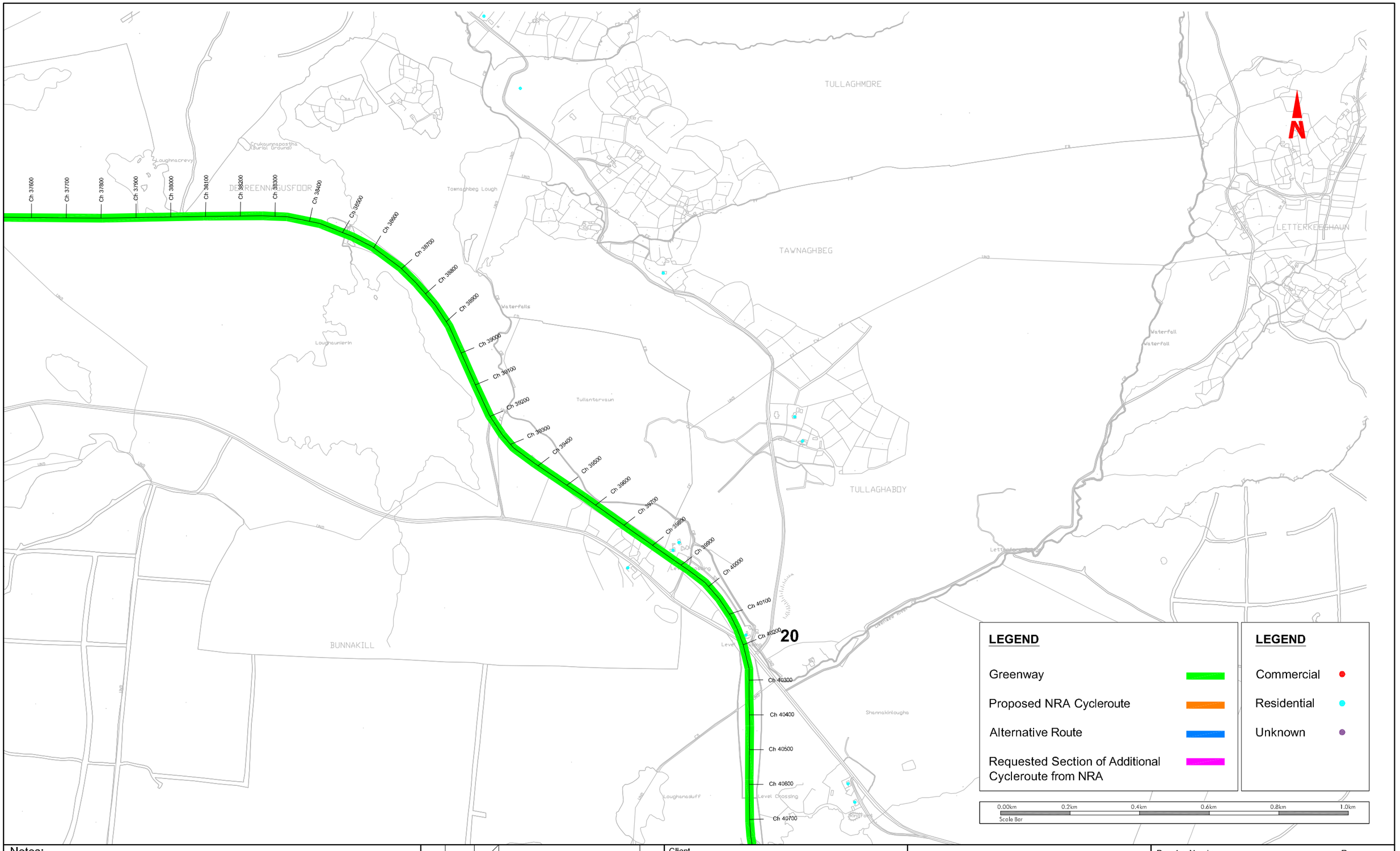

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Title: FIGURE 14.12 LANDSCAPE & VISUAL ASSESSMENT Sheet 12 of 15

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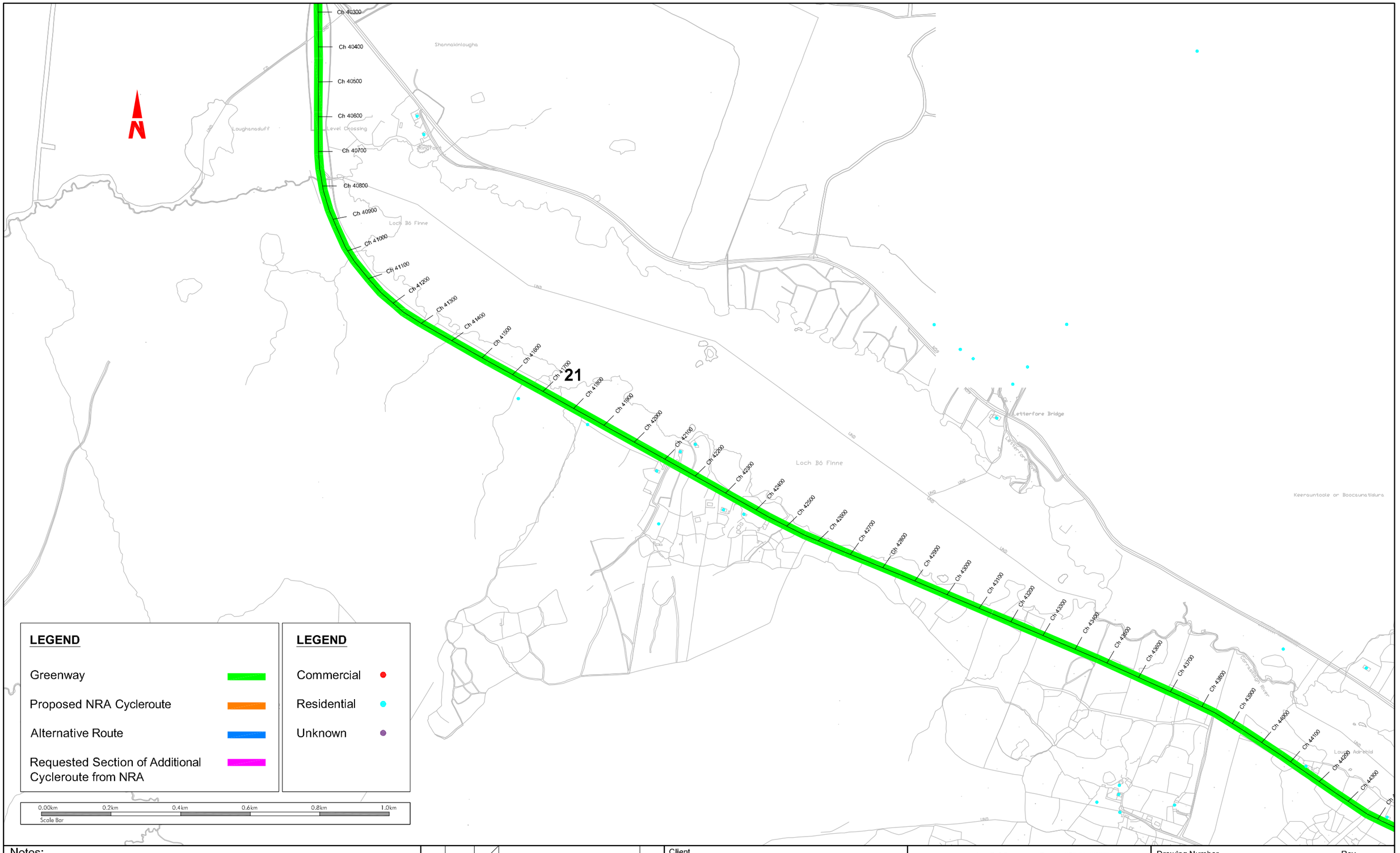

LEGEND

- Greenway
- Proposed NRA Cycleroute
- Alternative Route
- Requested Section of Additional Cycleroute from NRA

LEGEND

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- Residential
- Unknown

0.00km 0.2km 0.4km 0.6km 0.8km 1.0km
Scale Bar

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Title: FIGURE 14.13 LANDSCAPE & VISUAL ASSESSMENT Sheet 13 of 15

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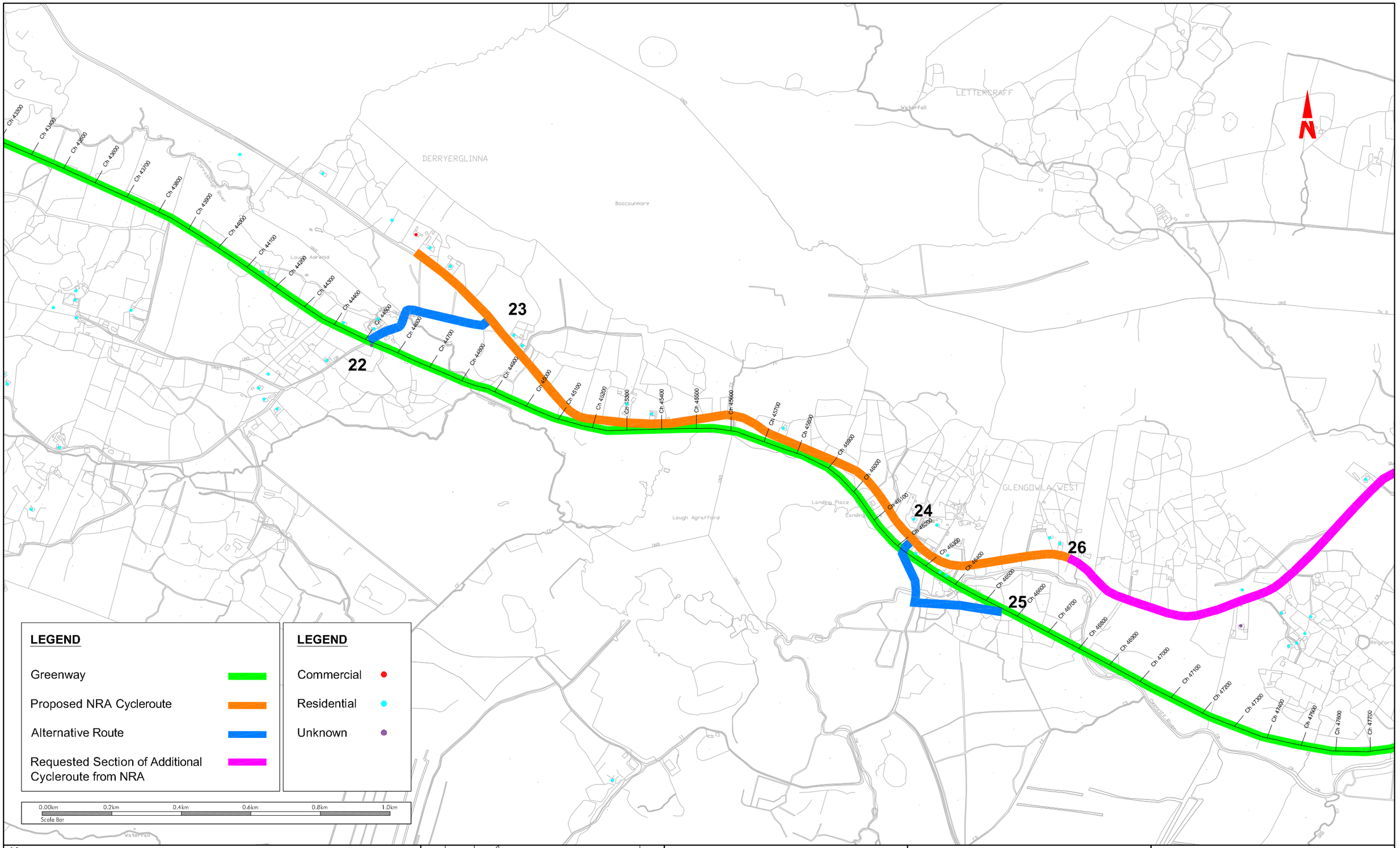

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FIGURE 14.14
LANDSCAPE & VISUAL ASSESSMENT
Sheet 14 of 15

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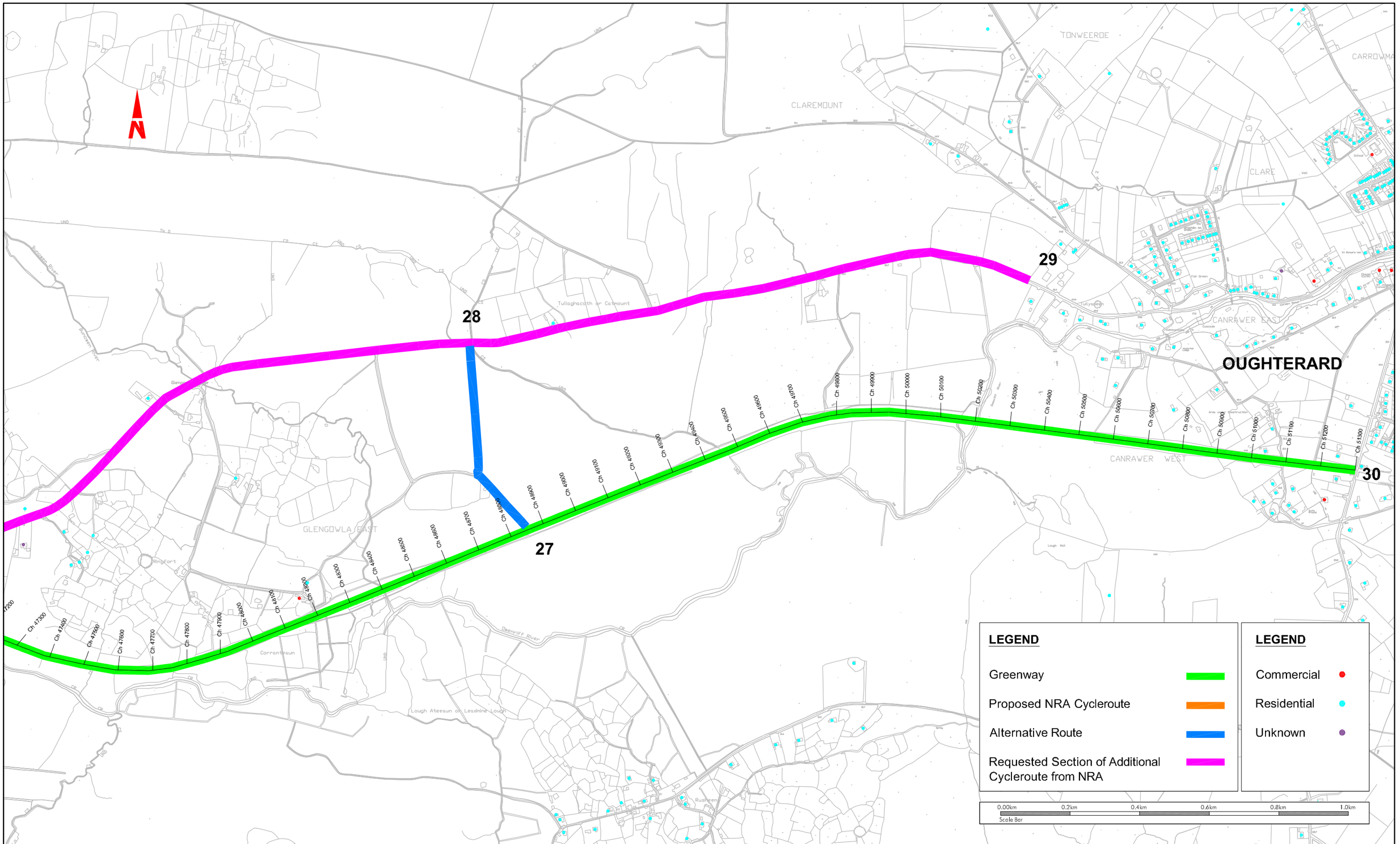

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Project: **CONNEMARA GREENWAY PROJECT**

Drawing Number: MGE0269/DG0005-15

Rev: **F01**

Title: **FIGURE 14.15 LANDSCAPE & VISUAL ASSESSMENT Sheet 15 of 15**

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14.2.1 Landscape Assessment Methodology

This section describes the key criteria and terminology used in the landscape assessment.

Landscape Resource

The combination of elements that contribute to landscape context, character and value.

Landscape Value

The relative value or importance attached to a landscape that expresses national, regional or local consensus because of intrinsic characteristics.

Landscape Character

The distinct and homogenous pattern that occurs in the landscape reflecting geology, landform, soils, vegetation and mans impact.

Landscape Quality

In assessing landscape quality the value of the landscape in relation to its rarity, location and landscape character attributes are considered. In general, the higher the quality of landscape the more sensitive it will be to change.

Based on information gathered as part of the classification of the landscape, it is possible to assess the landscape quality of the study area using a 5-point scale as follows:

a) Highest quality - the landscapes of highest quality are, by definition, landscapes of an 'awe inspiring' or 'sublime' nature and are important on an international and national level.

b) Very attractive - this definition relates to landscapes which are still of high value nationally and can be defined as highly scenic.

c) Good landscape - this category contains areas that, although still attractive, have less significant and more common landscape features.

d) Ordinary landscape - this category contains areas that have only common landscape features and some intrusive elements such as conspicuous infrastructure with scope for improvement in management.

e) Poor landscape – this category includes areas that contain frequent detracting aspects and/or lack of management results in a degraded landscape with very few valued features.

Landscape sensitivity is used to establish the capacity of the landscape to accommodate the type of development proposed and is defined using the following categories and criteria:

High:- Highest/Very Attractive landscape quality with highly valued or unique characteristics susceptible to relatively small changes

Medium:- Good landscape quality with moderately valued characteristics reasonably tolerant of changes;

Low:- Ordinary/Poor landscape quality with common characteristics capable of absorbing substantial change.

Magnitude of Landscape Resource Change: Direct resource changes on the landscape character of the study area are brought about by the introduction of the proposal and its effects on the key landscape characteristics. The following categories and criteria have been used:

High:- Total loss or alteration to key elements of the landscape character, which result in fundamental change;

Medium:- Partial or noticeable loss of elements of the landscape character;

Low:- Minor alteration to elements of the landscape character.

Significance of Landscape Impact: The level of significance of impact on landscape character is a product of landscape sensitivity and the magnitude of change in landscape resource as indicated in the **Table 14.1.**

Table 14.1 Significance of Landscape Impact

Magnitude of Landscape Resource Change	**Landscape Sensitivity**		
	Low	**Medium**	**High**
No Change	No change	No change	No change
Low	Slight	Slight / moderate	Moderate
Medium	Slight / moderate	Moderate	Moderate / Substantial
High	Moderate	Moderate / Substantial	Substantial

14.2.2 Visual Assessment Methodology

The following text describes the key criteria and terminology used in the visual assessment.

Visual Amenity

Visual amenity is the value of a particular area or view in terms of what is seen by the viewer. This value may be influenced by the physical condition of the landscape viewed and the contribution the characteristics of the view make to the local environment.

Visual Resources

Visual resources are the overall key elements/features/characteristics that combine to make a view.

Viewer Sensitivity

Viewer sensitivity is a combination of the sensitivity of the human receptor (i.e. resident; commuter; tourist; walker; recreationist; or worker) and the quality of view experienced by the viewer and is defined using the following categories and criteria:

High sensitivity: - users of an outdoor recreation feature which focuses on the landscape; valued views enjoyed by the community; tourist visitors to scenic viewpoint; occupiers of residential properties with a high level of visual amenity;

Medium sensitivity: - users of outdoor sport or recreation which does not offer or focus attention on landscape; occupiers of residential properties with a medium level of visual amenity;

Low sensitivity: - regular commuters, people at place of work; occupiers of residential properties with a low level of visual amenity.

Magnitude of Visual Resource Change: the magnitude of change in visual resource or amenity results from the scale of change in the view with respect to the loss or addition of features in the view and changes in the view composition, including proportion of the view occupied by the proposed development. Distance and duration of view must be considered. Other infrastructure features in the landscape and the backdrop to the development will all influence resource change. The following categories and criteria have been used;

High: - Total loss or alteration to key elements/ features/ characteristics of the existing landscape or view and/or introduction of elements considered totally uncharacteristic when set within the attributes of the receiving landscape or view;

Medium: - Partial loss or alteration to key elements/ features/ characteristics of the existing landscape or view and/or introduction of elements that may be prominent but not necessarily substantially uncharacteristic when set within the attributes of the receiving landscape/view;

Low: - Minor loss or alteration to key elements/ features/ characteristics of the existing landscape or view and/or introduction of elements that may not be uncharacteristic when set within the attributes of the receiving landscape/view;

No change: - Very minor loss or alteration to key elements/ features/ characteristics of the existing landscape or view and/or introduction of elements that are not uncharacteristic when set within the attributes of the receiving landscape/view.

Significance of Visual Impact: Significance of visual impact can only be defined on a project by project basis responding to the type of development proposed and its location. The principal criteria for determining significance are magnitude of visual resource change and viewer sensitivity.

Table 14.2 illustrates significance of visual impact as a correlation between viewer sensitivity and magnitude of visual resource change.

Table 14.2 Significance of Visual Impact

Magnitude of visual resource change	**Viewer Sensitivity**		
	Low	**Medium**	**High**
No change	No change	No change	No change
Low	Slight	Slight / moderate	Moderate
Medium	Slight / moderate	Moderate	Moderate / Substantial
High	Moderate	Moderate / Substantial	Substantial

14.3 EXISTING ENVIRONMENT

14.3.1 Landscape & Visual Context

The route of the proposed Connemara Greenway Project – Clifden to Oughterard emerges from the coastal town of Clifden to the west and travels through a lake rich transitional zone which lies between the southern foothills of the mountainous Connemara National Park to the north and extensive bog lands to the south.

The Connemara Mountains dominate this landscape, in particular between Clifden and Maam Cross. The Twelve Bens to the west and the Maumturk Mountains further east are the most iconic mountain ranges in this area. Whilst relatively modest in elevation, their fully exposed conical shapes and sharp peaks make them highly dramatic features in the landscape. Their rugged mountain peaks are formed by exposed rock faces followed by open peat bog and treeless mountain moorland. Small areas of marginal pasture and occasional blocks of conifer forests, often in conjunction with small settlements, can be found on the lower foothills and at lake edges. Extending to the south of the mountain slopes are the flat Connemara lowlands, a vast open tundra like landscape mostly covered by blanket peat and an abundance of lakes and rivers with occasional pockets of woodlands and heather.

Along most of its route the existing N59 travels in close proximity to a series of these major lakes, including Ballynahinch Lake to the south of the Twelve Bens, Derryclare and Garroman Lough south of Inagh Valley and Lough Oorid and Lough Shindilla at the foothills of the Maumturk Mountains. Larger lakes to the east of Maam Cross include Ardderry Lough, Lough Bofin and Lough Agraffard. As mentioned above frequently situated between or adjacent to these Loughs are small settlement clusters set in patches of broadleaf woodlands and small areas of marginal farmland. Patches of conifer forests also exist. Examples include the conifer forests surrounding Ballynahinch Lake, at Derryclare and Ardderry Lough. The largest and dominating land cover surrounding the route, however, remains expansive open bog and moorland.

14.3.2 Galway County Development Plan 2009-2015

The Galway County Development Plan 2009-2015 and other relevant statutory documents were reviewed to establish if there are any relevant landscape related designations that may influence the assessment within the study area.

The Planning and Development Acts require the inclusion of a development plan objective for:

"The preservation of the character of the landscape where, and to the extent that, in the opinion of the Planning Authority, the proper planning and sustainable development of the area requires it, including the preservation of views and prospects and the amenities of places and features of natural beauty or interest".

The following policies, objectives and standards have been included within the Galway County Development Plan in relation to landscape.

Landscape Conservation and Management Policies

Policy HL93: The consideration of Landscape Sensitivity Ratings shall be an important factor in determining development uses in areas of the County. In areas of high Landscape sensitivity, the design and the choice of location of proposed development in the landscape will also be critical considerations.

Policy HL94: Preserve and enhance the character of the landscape where, and to the extent that, in the opinion of the Planning Authority, the proper planning and sustainable development of the area requires it, including the preservation and enhancement, where possible of views and prospects and the amenities of places and features of natural beauty or interest. This shall be balanced against the need to develop key strategic infrastructure to meet the strategic aims of the Plan.

Policy HL95: Preserve the status of traditionally open/unfenced landscape. The merits of each case will be considered in light of landscape Sensitivity Ratings and views of amenity importance.

Policy HL96: The Planning Authority shall prepare a detailed project of listed views for protection in addition to the views and prospects included in Map HL2 within 2 years of adoption of the Plan.

Policy HL97: Review the views and prospects set out on Map HL2 to provide greater clarity and guidance with respect to important views and prospects to be retained.

Landscape Conservation and Management Objectives

Objective HL44: The Planning Authority shall have regard to the Landscape Sensitivity Classification of sites in the consideration of any significant development proposals and, where necessary, require a Landscape/Visual Impact Assessment to accompany such significant proposals.

Objective HL45: Development that would have a detrimental effect on listed views and prospects will generally not be permitted.

DM Standard 36: Compliance with Landscape Sensitivity Designations

Subject to the provisions of the Plan but in particular the settlement policies of Section 2 and 3 of the Plan and the consequent restriction on development in rural areas, the control of permissible development shall be in accordance with the policies as they relate to the five sensitivity classes of landscape in Section 9.4 in the Plan. It will deem the following types of development generally to be acceptable in the various areas of sensitivity as follows:

1. **Class 1 – Low Sensitivity** All developments consistent with settlement policies.
2. **Class 2 – Moderate Sensitivity** Various developments, which are of appropriate scale and design and are in compliance with settlement policies.
3. **Class 3 – High Sensitivity** Few developments, including those with substantiated cases for such a specific location and which are in compliance with settlement policies.
4. **Class 4 – Special** Restricted to essential residential needs of local households and family farm business.
5. **Class 5 – Unique** Negligible alteration will be allowed only in exceptional circumstances.

The Galway County Development Plan 2009-2015 incorporates the findings of the Landscape Character Assessment carried out in 2003 which assessed each area of the County under the following classifications:

1. Character
2. Sensitivity
3. Values

Landscape Character is a combination of landform, land cover and visual units, which are attractive in the landscape. The Galway County Development Plan 2009-2015 indicates the study area encompasses four Landscape Character Areas:

- Area No. 22 "Connemara National Park (Including Lough Fee, Lough Inagh and Derryclare Lough)"
- Area No. 14 "West Connemara"
- Area No. 10 "East Connemara Mountains (Moycullen, Recess to Glinsk)"
- Area No. 19 "West Coast (Gorteen Bay to Clifden)"

Area No. 22 Connemara National Park is described 'as comprising a diverse range of natural landscapes from mountains, valleys, and loughs to coniferous and deciduous woodlands. Integrated within this area are visitor facilities sensitively located to avoid visual intrusion. The area is unspoiled and highly scenic with outstanding views throughout.' In recognition of the scenic quality of this landscape character area the County Development Plan has stated that the Landscape Sensitivity for the Connemara National Park Landscape Character Area is Class 5: Unique. The County Development Plan identifies this Landscape Character Area as having a Landscape Value Rating of Outstanding.

Area No. 14 West Connemara is described having 'flat low lying bog and heath with many scattered lakes and turloughs. There is very little development and the landscape is stated as being atmospheric and quite distinct although not highly scenic. The County Development Plan states that the Landscape Sensitivity of the West Connemara Landscape Character Area is Class 4: Special. The County Development Plan identifies this Landscape Character Area as having a Landscape Value Rating of High.

Area No. 10 East Connemara Mountains (Moycullen, Recess to Glinsk) is described as largely mountainous with slopes covered with coniferous forestry. The lower areas comprise rocky outcrops and areas of rough grassland around the many small loughs and turloughs. The landscape is scenic although not remarkable. The County Development Plan states that the Landscape Sensitivity for the East Connemara Mountains (Moycullen, Recess to Glinsk) Area is Class 3: High with pockets of Class 4: Special. The County Development Plan identifies this Landscape Character Area as having a Landscape Value Rating of High.

Area No. 19 West Coast (Gorteen Bay to Clifden) is described as encompassing the coastline from Gorteen Bay to Clifden and is low lying, harsh and exposed and the adjacent land is rough grassland with rocky outcrops. There is very little development in the area and the landscape is generally dramatic and scenic. The County Development Plan states that the Landscape Sensitivity for West Coast (Gorteen Bay to Clifden) Area is Class 4: Special. The County Development Plan identifies this Landscape Character Area as having a Landscape Value Rating of Outstanding.

An extract of the Landscape Character maps from the Galway County Development Plan 2009-2015 are shown in **Figures 14.1** and **14.2** below. The Landscape Sensitivity and Rating for Landscape Character Areas within the study area are summarised in **Table 14.3**.

Table 14.3 Summary of Landscape Value and Landscape Sensitivity for Landscape Characters in the Study Area

Landscape Character Area	Landscape Value	Landscape Sensitivity
Connemara National Park	Outstanding	Unique
West Connemara	High	Special
East Connemara Mountains (Moycullen, Recess to Glinsk)	High	High to Special
West Coast (Gorteen Bay to Clifden)	Outstanding	Special

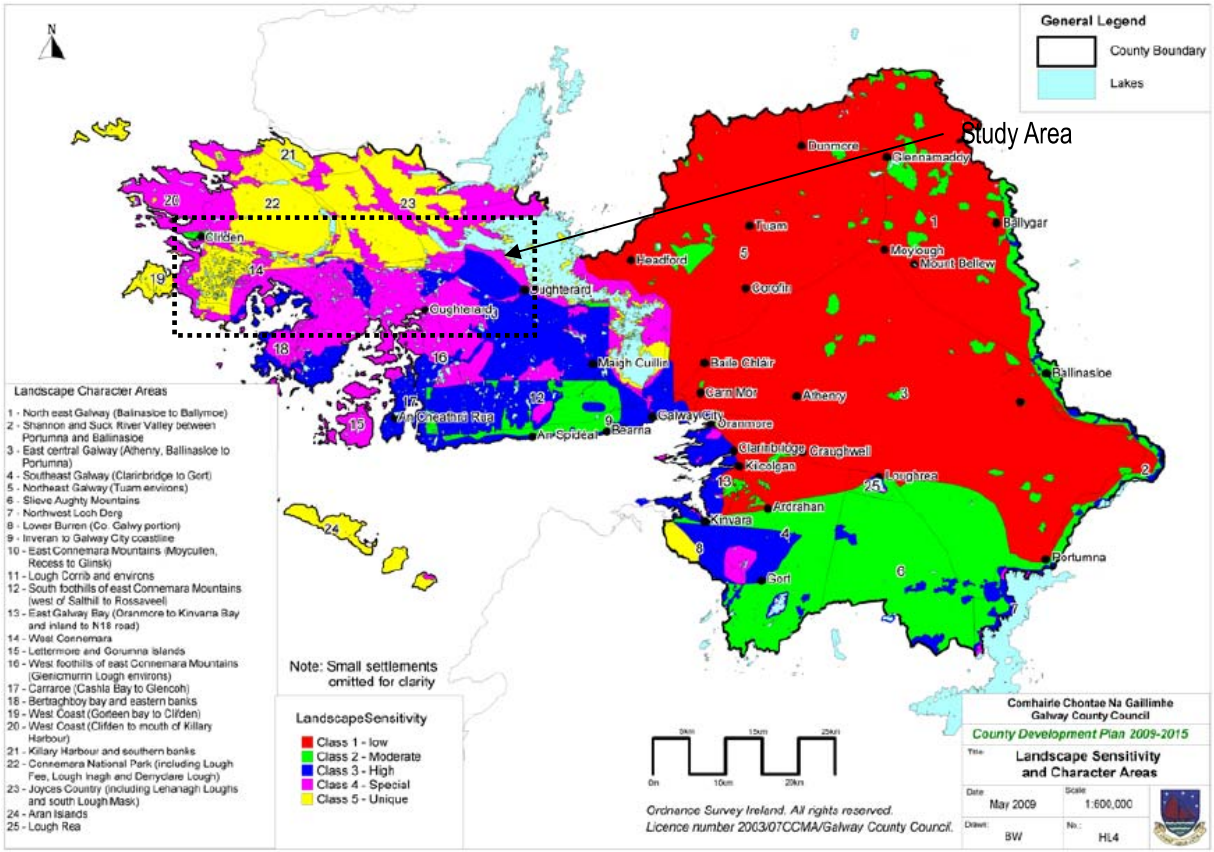


Figure 14.1 Landscape Sensitivity and Character Areas of County Galway (Source: Galway County Development Plan 2009-2015)

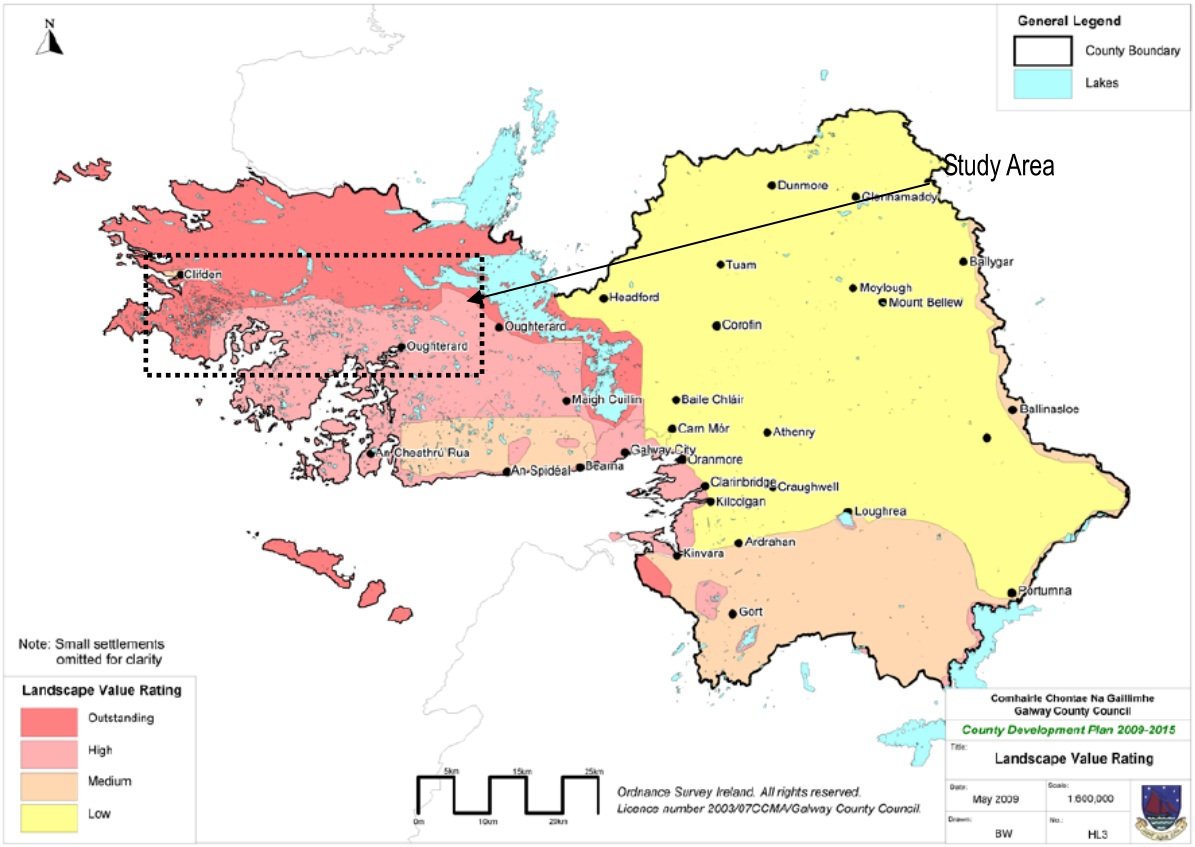


Figure 14.2 Landscape Value Rating of Galway County (Source: Galway County Development Plan 2009-2015)

Focal Points/Views

The Galway County Development Plan 2009-2015 and other relevant statutory documents were reviewed to establish if there are any relevant focal points/views that may influence the assessment within the study area.

Focal Points/Views identified (see Plan Map HL2):

- 101: Cnoc Mordain
- 37: Castle al Monuit

Protected routes have not been identified in the Galway County Development Plan 2009-2015.

There are no protected views in proximity to the proposals and as such protected views are not considered further.

14.4 POTENTIAL IMPACTS

14.4.1 Impacts During Construction stage of Connemara Greenway Project – Clifden to Oughterard

Typical construction stage impacts for this type of project would be created by the following activities:

(i) Temporary accommodation of materials and personnel;

(ii) Phased development along the length of the scheme;

(iii) Site preparation works;

(iv) Machinery and plant;

(v) Spoil handling, storage and final deposition.

Landscape Character Impacts

An assessment of the significance of the impact of the proposed Greenway Project during the construction stage on the landscape character areas described above has been completed and summarised as below.

The construction of the proposed scheme will occur in a linear fashion along the route resulting in a phasing of impacts rather than a single construction impact across the entire scheme. Landscape impacts therefore will be temporary in nature as works progress along the route of the scheme. More focussed construction impacts will occur at the proposed new bridges but these bridges are at the location of existing bridges.

Overall when construction stage landscape character impacts are considered the predicted impact will be slight negative and temporary in duration.

Visual Impacts

The assessment of the existing visual environment and the impact of the proposed Connemara Greenway Project – Clifden to Oughterard and its various component parts during the construction stage has established that the likely sources of impact will be at ground level with occasional vehicles accessing the site for preparation works and therefore barely visible from within the wider landscape. Such surface changes and individual vehicles will be readily absorbed into the wider panoramic view.

The site preparation and construction of the project will be phased and at each phase will be temporary in nature and duration. While construction works will take place near existing residential properties such road works are not uncharacteristic of the bitmac roads that are partially present already. The low level of construction and the short duration of works will significantly reduce the potential for visual impacts.

When viewed from surrounding viewpoints and residential properties the overall visual impacts during the site preparation and construction stage will be no change to slight due to the topography and limited viewer exposure. No significant visual impacts are predicted for the construction stage of the proposed scheme.

14.4.2 Impacts During Operational Stage of Connemara Greenway Project – Clifden to Oughterard

14.4.2.1 Landscape Impacts

The proposed cycle/walking route crosses four landscape character areas which have been assessed to have outstanding and high value namely Connemara National Park, West Connemara, East Connemara Mountains (Moycullen, Recess to Glinsk) and West Coast (Gorteen Bay to Clifden) Landscape Character Area.

The existing railway line in some areas is currently used for local access and as such is hard surfaced to some extent. Many of these areas have fallen into disrepair. Other areas of the existing railway line have been allowed to grow over with scrub; however there is visual evidence that the route is being used and maintained with access being controlled in some parts with the use of gates. The full reinstatement of the existing track with hard surface along the dismantled train line from Oughterard to Clifden would not be a change to the current landscape as historically all cuttings and embankments have already been created that now form the current landscape. Fundamentally, the landscape will not be altered by the full reinstatement and installation of a hard landscaped surface along the existing train line. Seven bridges are to be up graded which will improve the landscape quality and further open up access to recreational users. The development of the dismantled railway line will be an improvement to the landscape character areas that it crosses.

Overall the proposed Connemara Greenway Project – Clifden to Oughterard will follow the existing railway line and the enhancement of this route will have a beneficial impact as parts of the route have fallen into disrepair. When the landscape impact is assessed for the four landscape characters crossed by the proposed scheme, Connemara National Park, West Connemara, East Connemara Mountains (Moycullen, Recess to Glinsk) and West Coast (Gorteen Bay to Clifden) Landscape Character Area the predicted landscape impact is slight positive.

14.4.2.2 Visual Impacts – Impact on Visual Residential Amenity

An assessment has taken place of the potential visual impact on residential properties along the route of the proposed Greenway. This assessment has been described in the following text by use of sections between chainages which break the route into easier to describe portions. Locations of receptors are shown on **Images 14.1 to 14.15**.

Landscape and Visual Impacts Ch. 0 to Ch. 3+ 200

Image 14.1 Section 1-2 Looking East from Clifden

Image 14.2 Ch. 0 to Ch. 3+ 200 Looking West to Clifden from Killymongaun

The section between Ch. 0 and Ch. 3+ 200 is an existing track which is a part bitmac and part stone track, with both clusters of, and individual scattered, residences along the route on the north and south sides. **Image 14.1** shows Waterfalls Homes abutting the route. There will be no change to a low

change in visual resource for these properties. There are single residences set back from the route between Ch. 2+200 and Ch. 2+700 on the north side. Properties on the northern side of the route, at this location, are elevated relative to the route and as such have views beyond the route and will have no change in visual resource. Much of the route runs though the open landscape of Killymongaun where there are no residential properties (**Image 14.2**). When potential visual impacts are assessed for Ch. 0 to Ch. 3+ 200, no significant visual impacts are predicted for residential properties.

14.4.2.3 Landscape and Visual Impacts Ch. 3+200 to Ch. 4+400

Image 14.3 Looking South East at Ch. 3+200

The route section between Ch. 3+200 and Ch. 4+400 extends for approximately 1km. There are occasional single residences along this section which abut the route. At Ch. 3+200 the route will run alongside the property shown in **Image 14.3**. The property will be screened by the existing vegetation with only a low change in visual resource as the roadway already exist at this location. From Ch. 4+100 to Ch.4+300 there are properties abutting the route. The impact will be slight for the new route. When potential visual impacts are assessed between Ch. 3+200 and Ch. 4+400 no significant visual impacts are predicted for residential properties.

14.4.2.4 Landscape and Visual Impacts Ch. 4+400 to Ch. 11+200

The section between Ch. 4+400 to Ch. 11+200 is approximately 6.5km long. There are no residences along this section of the proposal (**Image 14.4**). When potential visual impacts are assessed for this section no significant visual impacts are predicted for residential properties.

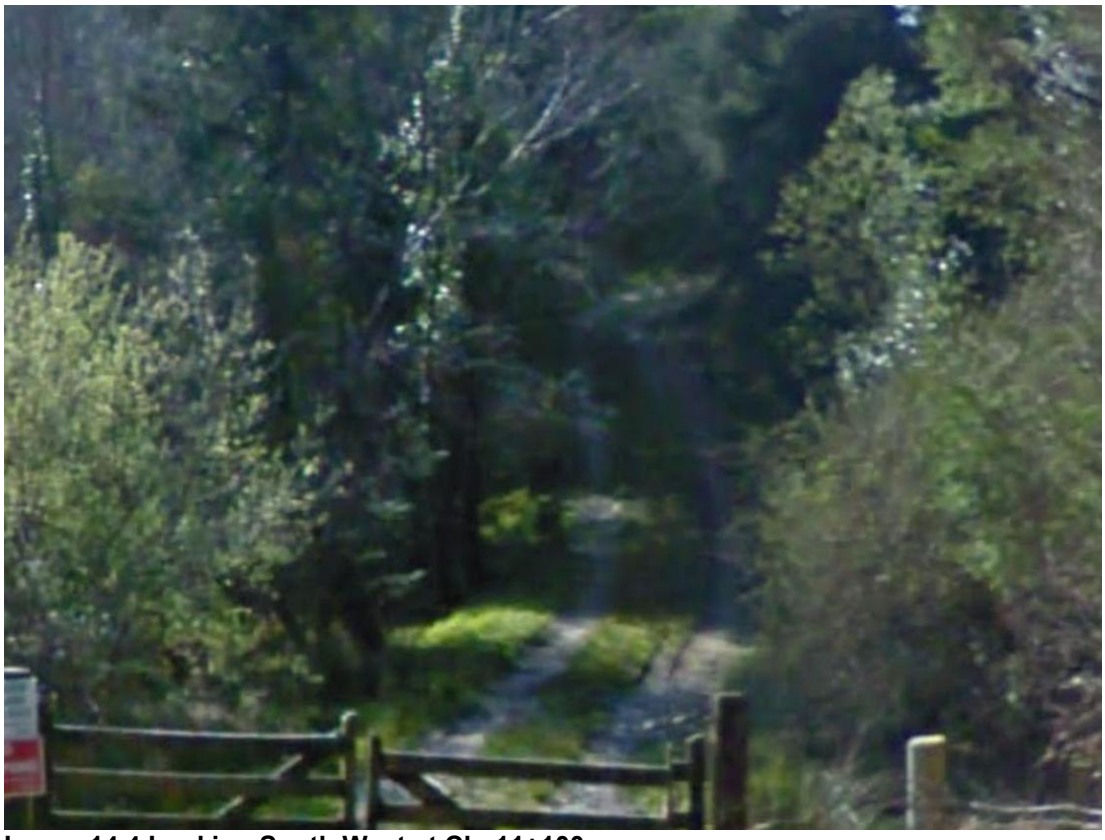


Image 14.4 Looking South West at Ch. 11+100

14.4.2.5 Landscape and Visual Impacts Ch. 11+200 to Ch. 11+800

Image 14.5 Looking North West at Ch. 11+600

The section between Ch. 11+200 and Ch. 11+800 is a short section at approximately 0.5km long (**Image 14.5**). There is a single residence on the northern side at Ch. 11+700. It is bounded by existing vegetation and a boundary wall which will provide screening from the proposed greenway giving no change in visual change. The Cloonbeg River Bridge is at Ch. 11+650 which is proposed to be enhanced for access purposes but will not be visible from this property.

When potential visual impacts are assessed for this section no significant visual impacts are predicted for residential properties.

14.4.2.6 Landscape and Visual Impacts Ch. 11+800 to Ch. 15+150

Image 14.6 Looking East at Ch. 12+600

Image 14.7 Looking West at Ch. 14+800

Image 14.8 Looking East at Ch. 15+000

The proposed route runs along side the existing R341 weaving from side to side and then joining with it at Ch. 14+800. There is a building set back from the road (**Image 14.6**) which is partially screened form the existing road by existing vegetation and walls. There will be low change in visual resource for this property. There is a property set back form the roadside at Ch. 13+100 and a cluster of houses set back from the route from Ch. 14300 to Ch.15200 on its north side. There will be no change in visual impact as the route is screened by topography and existing vegetation. **Image 14.7** illustrates a location where the proposed route joins the R341. From Ch. 14+800 to Ch. 15+150 there are properties abutting the south side of the route. They are situated on a lower level and have good views of the route. However the view is towards the existing roadway and as such there is only low change in visual resource (**Image 14.8**).

When potential visual impacts are assessed between Ch. 11+800 and Ch. 15+150 no significant visual impacts are predicted for residential properties.

14.4.2.7 Landscape and Visual Impacts Ch. 15+150 to Ch. 17+450

The section between Ch. 15+150 and Ch. 17+450 is approximately 2km long with few residences (**Image 14.9**). There is a property abutting the route which has screening by existing vegetation at Ch. 17+400 (see **Image 14.10**). There will be low change in visual resource for this property. There are a couple of residences set back from the route which will have no change in visual amenity due to distance and topography. When potential visual impacts are assessed for this section no significant visual impacts are predicted for residential properties.

Image 14.9 Looking East at Ch. 15+250

Image 14.10 Looking North East at Ch. 17+400

14.4.2.8 Landscape and Visual Impacts Ch. 17+450 to Ch. 20+100

The section between Ch. 17+450 to Ch. 20+100 is approximately 2.5km long (**Image 14.11** shows a view of this section looking south-west from Ch. 17+450). There is one residence abutting the route along this section at Ch. 20+000. There will be a low change in visual resource for this property.

When potential visual impacts are assessed for this section no significant visual impacts are predicted for residential properties.

Image 14.11 Looking South West at Ch. 17+400

14.4.2.9 Landscape and Visual Impacts Ch. 20+100 to Ch. 31+500

The section between Ch. 20+100 and Ch. 31+500 is approximately 11.5km long and runs on the existing N59 (part of this section shown in **Image 14.12**). There are two properties abutting the route, but they are heavily screened by high walls and existing vegetation. There will be no change in the visual resource for either property. There are further clusters and scattered dwellings of residential and commercial properties along the route in this section (**Image 14.13**). They will have no change as they abut on to the existing N59 route with no change in visual resource.

When potential visual impacts are assessed for this section no significant visual impacts are predicted for residential properties.

Image 14.12 Looking East at Ch. 20+200

Image 14.13 Looking East at Ch. 21+200

14.4.2.10 Landscape and Visual Impacts Ch. 31+500 to Ch. 34+400

Image 14.14 Looking East at Ch. 31+500

There are no residential properties between Ch. 31+500 and Ch. 34+400. **Image 14.14** shows where the cycle route departs from the N59.

When potential visual impacts are assessed for this section no significant visual impacts are predicted for residential properties.

14.4.2.11 Landscape and Visual Impacts Ch. 34+400 to Ch. 35+500

There is one residence abutting the route with little screening. The change in visual resource will be low.

When potential visual impacts are assessed for this section of the route no significant visual impacts are predicted for residential properties.

14.4.2.12 Ch. 35+500 to Ch. 40+200

There are two residential dwellings back from the route as can be seen in the background of **Image 14.15**. The properties will have no change in visual amenity due to distance from the route and screening by local topography. There is a further property abutting the route which will have a low change in visual resource as the existing route consists of roadway.

When potential visual impacts are assessed for this section, no significant visual impacts are predicted for residential properties.

Image 14.15 Looking North West at Ch. 40+200

14.4.2.13 Landscape and Visual Impacts Ch. 40+200 to Ch. 44+500

Image 14.16 Looking South East at Ch. 42+200

There are a few scattered residences set back from the route and a cluster of houses set back from the route on an elevated position along the existing roadway which will have no change in visual amenity as the existing roadway is located within their views as shown in **Image 14.16**.

When potential visual impacts are assessed for this section no significant visual impacts are predicted for residential properties.

14.4.2.14 Landscape and Visual Impacts Ch. 44+500 to Ch. 48900

There are a few scattered residences abutting and set back from the route between Ch. 44+500 and Ch. 48+900. The dwellings either have existing vegetation which will provide screening and will give no change to low change in visual amenity or will have no change due to screening from topography and distance to the route.

When potential visual impacts are assessed for this section, no significant visual impacts are predicted for residential properties.

14.4.2.15 Landscape and Visual Impacts Ch. 48+900 to Ch. 51+300

There are clusters of residences at the end of the route at Ch. 51+300 which are set back from the route (**Image 14.17** shows a view looking west from Ch. 51+300 with no residences). The properties generally have existing vegetation offering screening which will allow no change to low change in visual resource. At Ch. 50+200 a single span timber bridge will replace the existing Oughterard River Bridge. This replacement will improve the visual amenity of the area.

When potential visual impacts are assessed for this section no significant visual impacts are predicted for residential properties.

Image 14.17 Looking West at Ch. 51+300

14.5 MITIGATION MEASURES

14.5.1 Landscape Aims and Objectives

The landscape aims and objectives are as follows:

- The physical and visual integration of the proposed Greenway Project and associated features into the surrounding landscape;
- Replacement of topsoil in areas where topsoil will be stripped to spread spoil and topsoil replaced, and returned fit for purpose to landowners, e.g. in areas of improved agricultural grassland (GA1);
- Retention of the existing vegetation and earth banks to field boundaries as far as possible;
- Use of natural material that reflect those used in the local landscape;
- Site preparation areas and access route areas will be kept tidy at all times.

14.6 RESIDUAL IMPACTS

This section assesses the impact of the proposed Connemara Greenway Project – Clifden to Oughterard on the landscape and visual environment after the mitigation described above has been completed. After reinstatement and establishment of the vegetation cover along the route and near bridges, the proposed project will blend with the existing landscape. Satisfactory reinstatement of disturbed landscapes will result in no residual landscape impacts.

There will no significant loss of existing views. The Connemara Greenway Project – Clifden to Oughterard will not be a prominent feature in the landscape due its low-lying nature and design mitigation measures. No significant visual impacts are predicted. From time to time, visits by maintenance vehicles will occur but such activities will be temporary in nature and consistent with the maintenance of the existing roadways.

This landscape and visual assessment has a direct interaction with the Terrestrial and Aquatic Ecology Section (**Chapters 10**) of the EIS. The loss of habitats is described fully in **Chapter 10** and not elaborated in this landscape and visual assessment. In completing the landscape and visual assessment due consideration has been afforded to appropriate mitigation measures outlined within the terrestrial ecology and aquatic ecology chapters of this EIS.

14.7 CONCLUSIONS

The proposed Connemara Greenway Project - Clifden to Oughterard is located within four landscape character areas identified as Connemara National Park, West Connemara, East Connemara Mountains (Moycullen, Recess to Glinsk) and West Coast (Gorteen Bay to Clifden) Landscape Character Areas. These landscape areas have been identified as having outstanding and high landscape value rating. The restoration of the dismantled railway for recreational use with the use of bitmac surfaces and restoring seven bridges with sympathetically designed structures will result in a beneficial impact on the landscape. Parts of the dismantled railway are currently being used as recreational routes by walkers and cyclists. There are scattered dwellings along the existing route and visual impacts range from no change to slight visual impacts for such properties. Overall no significant landscape or visual impacts have been predicted for the proposed scheme. The broader landscape area and visual context around Connemara National Park and West Connemara have the capacity to absorb a proposal of this scale and the proposal is acceptable in landscape and visual terms.

15 HUMAN BEINGS & MATERIAL ASSETS

15.1 INTRODUCTION

Human beings and their associated material assets (physical resources in the environment, which may be either of human or natural origin) are an important element of the environment. Any potential impact on the status of human beings by the proposed Greenway Project must therefore be comprehensively assessed. The principal concern is that human beings within the study area experience no significant unacceptable diminution in aspects of quality of life as a consequence of the Connemara Greenway Project - Clifden to Oughterard. Relevant components of this chapter of the EIS include land use, demography, employment, amenity/community aspects and services/utilities.

This chapter describes the potential impacts on material assets as a result of the proposed Greenway Project. For the purposes of this assessment, material assets include:

- Economic Assets of Natural and Human Origin, and
- Cultural Assets of a Physical and Social Type.

15.2 METHODOLOGY

The EPA Advice Notes on Current Practice in the preparation of Environmental Impact Statements (2003) sets out a useful framework methodology, which has been consulted in the process of preparing this assessment. The Advice Notes suggest that the human environment be assessed under the following headings:

- **Economic Activity** – will the proposed Greenway Project stimulate additional development and/or reduce economic activity, and if either, what type, how much and where?
- **Social Consideration** – will the proposed Greenway Project change patterns and types of activity and land use?
- **Land Use** – will there be severance, loss of rights of way or amenities, conflicts, or other changes likely to ultimately alter the character and use of the surroundings?
- **Health and Safety** – will there be risks of death, disease, discomfort or nuisance?

Likewise the Advice Notes suggest that Material Assets should be assessed under the following headings:

- **Economic Assets of Natural and Human Origin**, and
- **Cultural Assets of a Physical and Social Type**.

These issues are addressed in this assessment and a baseline study of the existing human and material assets environment was undertaken in order to complete this. Desktop research comprised the method of obtaining this information. The following sources of information were consulted in the process of this assessment:

- 2006 Census of Ireland, Central Statistics Office, 2006,
- 2011 Census of Ireland, Central Statistics Office, 2011, and
- Galway County Development Plan 2009-2015.

Some of the issues discussed in this chapter including traffic, noise, air quality, visual amenity and water quality are addressed in greater detail in the relevant chapters of this EIS. This chapter should be read in conjunction with the layout plans for the project description section of this EIS (**Chapter 6**).

Where relevant, impacts on material assets such as the road network and designated conservation sites are more appropriately described in other chapters of this EIS. **Table 15.1** below highlights other chapters that are relevant to human beings and material assets.

Table 15.1 EIS Chapters Relevant to Human Beings and Material Assets

Chapter No.	Title	Human Aspect or Assets
7	Hydrology	Water
8	Soils, Geology & Hydrogeology	Natural Resources
10	Terrestrial & Aquatic Ecology	Designated Conservation Sites
11	Air Quality & Climate	Air Quality
12	Noise	Noise Environment
13	Archaeology, Architectural and Cultural Heritage	Cultural Assets
14	Landscape and Visual	Views
16	Traffic	Road Infrastructure

15.3 EXISTING ENVIRONMENT

The Connemara Greenway Project – Clifden to Oughterard is a community driven project by local community groups in Clifden, Recess and Oughterard with support from Failte Ireland, Galway County Council and Forum Connemara Ltd. The proposed Greenway begins on the outskirts of Oughterard village and follows the N59 through the village of Recess. The Greenway diverges from the route of the N59 in the townland of Athry and runs to the south of Ballynahinch Lake, Lough Fada and Croghat Lough. The Greenway rejoins the N59 at Gowland West before diverging to the south of Lough Phreaghaun and terminating at Clifden town. The two main settlements within this region are Oughterard and Clifden. Beyond these urban settlements the land is mountainous and is composed predominantly of blanket peat and bedrock outcrops. There are many mineral sites present in the study area. There are also two extractive industry related activities within a 1km boundary of the Greenway, including Lackagh Quarries and Lissoughter Green Marbles Quarry, both located in Recess.

Oughterard and Clifden have some relatively dense, modern, semi urban development. There are very few industrial or commercial facilities outside of these two urban areas. The area between Oughterard and Clifden is characterised by low density ribbon settlement along the N59 and local roads with clusters at Oughterard, Recess and Clifden. The vast majority of the settlement is within 1km either side of the N59.

15.3.1 Human Environment

15.3.1.1 Economic Activity

Demography & Employment - In this section, the key demographic and employment characteristics of the resident population within the Study Area is examined.

Population

Between 2006 and 2011 Clifden experienced a 23% increase in population, while Oughterard experienced a 2% increase in population (see **Table 15.2**). The pattern of increased growth in the major towns, Clifden and Oughterard, has been balanced by population decreases in the rural areas.

Table 15.2 Population Profile of the Study Area (Source: CSO Census of Population 2002, 2006, 2011)

Population	Persons 2002	Persons 2006	Persons 2011	Percentage Change 2002-2006	Percentage Change 2006-2011
Clifden	1929	2118	2609	10%	23%
Oughterard	2380	2563	2605	8%	2%
Co. Galway	209,077	231,035	250,541	11%	8%
Connacht	464,296	504,121	542,039	8%	8%
State	3,917,203	4,234,925	4,581,269	8%	8%

Age Profile

The age profile of the study area is older than the state average. The largest weighting and the largest disparity from the national average, lies in the 45-64 age group (see **Table 15.3**).

Table 15.3 Age Profile (Source: CSO Census of Population 2006, Census 2011 figures not available for this data yet)

	Percentage of the population in each age group, 2006				
	0-14	**15-24**	**25-44**	**45-64**	**65+**
Study Area	19%	13%	26%	27%	15%
Co. Galway	20%	16%	31%	21%	11%
Connacht	20%	15%	29%	23%	13%
State	20%	15%	32%	22%	11%

Employment

In 2006 the study area had a substantially higher unemployment rate than the state average; 7% in the study area compared with 4% nationally (see **Table 15.4**).

Table 15.4 Employment Profile (Source: CSO Census of Population 2006, Census 2011 figures not available for this data yet)

	Persons aged 15 years and over by principal economic status, 2006		
	At work	Looking for first regular job	Unemployed (having lost or given up previous job)
Study Area	**49%**	**1%**	**7%**
Galway	**56%**	**1%**	**4%**
Connacht	**55%**	**1%**	**4%**
State	**57%**	**1%**	**4%**

Sectoral Composition of Employment

The employment make-up of an area is an important element of its socio-economic profile. The CSO Census of Population 2006 shows that employment in the study area is weighted towards 'farming, fishing, forestry and other agricultural', 'manufacturing' and 'building and construction'. This reflects the predominantly rural make-up of the area.

The study area has 1% less of its working age population in public administration i.e. clerical, office, administrative and government jobs than the State average. It also has 13% less working in commerce and trade roles than the state average. Again, this reflects the rural nature of the area (see **Table 15.5**).

Table 15.5 Sectoral Composition of Employment (Source: CSO Census of Population 2006, Census 2011 figures not available for this data yet)

	Agriculture, forestry and fishing	Building and construction	Manufacturing industries	Commerce and trade	Transport and communications	Public administration	Professional services	Other
Study Area	3%	10%	10%	15%	5%	5%	23%	29%
Connacht	2%	12%	17%	22%	4%	6%	22%	15%
Galway	1%	11%	18%	23%	4%	5%	22%	17%
State	1%	10%	15%	28%	5%	6%	19%	16%

The tourism industry remains an important element of employment for the region and is directly associated with the visiting community and amenity value of the region. West County Galway was visited by approximately 700,000 overseas tourists in 2009. In 2011, the west region of Ireland was visited by 1,148,000 tourists. The Connemara area has a strong tourism product that links a rich language and culture with scenic landscapes and an unpolluted, unspoiled marine environment. The N59 acts as one of only two accesses to the Connemara region from Galway City and the east, the other being the R336, which follows the coast from Galway to Rossaveal.

The Galway County Development Plan 2009-2015 sets out economic development aims for the entire County and stresses the need for a balance between economic growth and sustainable development. The strategic aims of the development plan reflect this through the following strategic aims:

- *Implement an overall development strategy for the County aimed at achieving the balanced and sustainable development of County Galway in a strategic and plan led manner.*

- *Improve the quality of life for the people of Galway and maintain the County as a uniquely attractive place in which to live, work and visit.*

- *Create a receptive development environment in response to national and regional policy, such as the National Spatial Strategy, the National Development Plan 2007-2013 and the West Regional Planning Guidelines 2004-2016 (i.e. Counties Galway, Mayo, Roscommon and Galway City) (RPGs) and secure the development of the identified major infrastructural projects which will underpin sustainable development throughout the County and Region during the Plan period.*

- *To drive forward the balanced economic and social development of Galway by facilitating new strategic developments at appropriate locations and enhancing the quality of life for the citizens of Galway within an environment of outstanding quality.*

- *To move towards a more sustainable and integrated concept of development with regard to land use, transportation, water services, energy supply and waste management over the lifetime of the Plan*.

15.3.1.2 Social Consideration

Community Facilities

The communities in the vicinity of the proposed Greenway route have developed a range of facilities that contribute to the quality of life of the area's residents. These facilities could benefit from the improved connectivity provided by the Greenway. It is unlikely that the Greenway will impact communities through severance of supporting communities. The following sections list the key community and social infrastructure along the route of the proposed Greenway. In addition, the towns of Clifden and Oughterard provide a wide range of facilities used by the residents of the study area.

Community Facilities

- Ballinahinch Church
- Recess National School
- Recess Garda Station
- Recess Church
- Health Centre, Recess
- Leam National School

Tourist Accommodation

- 10 B&Bs adjacent to nearby N59 route
    - River View B&B, Galway Road, Clifden
    - 'All the 2's' B&B, Galway Road, Clifden
    - Byrne Mal Dua House Guest House, Galway Road, Clifden
    - Joyce's Waterloo House B&B, Galway Road, Clifden

    - Cregg B&B, Killymongaun, Clifden
    - Lakeside B&B, Derrylea, Clifden
    - Dan O'Hara Farmhouse B&B, Lettershea
    - Wilderness B&B, Emlaghmore
    - Cushlough B&B, Recess
    - Tullaboy House, Maam Cross
- Clifden Glen Holiday Village, Galway Road, Clifden
- Ballinahinch Castle Hotel
- An Óige Hostel, Lettery
- Lough Inagh Lodge, Hotel and Fishery, Recess
- Peacock Hotel, Maam Cross

Tourism Facilities on-line

- Dan O'Hara Heritage Centre, Lettershea
- Glengowla Mine Experience, Glengowla

Recreational Facilities

- Connemara Ponies, Canal, Recess
- Glenmaroon Pitch and Putt, Garroman
- Owenglin Fishery, Clifden
- Ballinahinch Fishery, Clifden
- Derryclare Lough and Lough Inagh, Fishing, Recess
- Screebe Fishery, Camus, Galway
- Derroura Mountain Bike Trail, Oughterard,
- The Golden Mile, Leam, including the 'Quiet Man' Bridge, Connemara

Commercial and other Business Premises in proximity to the Greenway

- Grapefruit Moon, Recess
- Joyce's Craft Shop, Recess
- Joyce's of Recess: Grocery, Petrol, café, post office
- Paddy Feistí Bar, Recess
- Joyce's Conamara Marble, Recess
- Joyce's Hardware and Animal Feeds, Recess
- Wool Merchants, Farm Supplies, Agri Oil, Tyres, Maam Cross
- Michael Nee Bus Hire, Canal, Recess

Walking and Cycle Routes

There are a number of long-distance walking, cycling and driving routes within the vicinity of the proposed Greenway as shown in **Figure 15.1**. These are:

- Western Way

  The Western Way is a long-distance walkway that runs from Oughterard through Westport and Ballina to the border of Mayo / Sligo. Within County Galway it travels through Maam, Maumeen, Inagh and Leenane. The route is connected to Recess village by another walking route, the Slí Conamara, described below. The route is 6 km from Maam Cross, but connection here is via the existing R336 regional road.

- Slí Chonamara

  This is a way-marked long-distance walking route that journeys through Connemara, primarily along the coastline. The western part of the Slí connects the Connemara Coast at Rosmuc, northwards through forests to the Western Way north of Recess. Slí Conamara interacts with the proposed Greenway in the vicinity of Recess village.

- Bord Fáilte National Cycle Network

  The Galway to Clifden route as set out in the *A Strategy for the Development of Irish Cycle Tourism*' (2007) plan identifies a route on the proposed N59 road development west of Oughterard that turns south at Maam Cross (Chainage 256100) and arriving at Clifden via the coastal orientation on the regional road (R341), rejoining the proposed N59 road development.

- The Connemara Loop (Fáinne Conamara)

  This is an 85 km long sign-posted driving route through Connemara. It goes from Maam Cross to Leenane and onwards to Renvyle, Letterfrack and Recess before returning to Maam Cross along the existing N59.

- Clifden Looped Cycles

  Clifden serves as a hub for a number of looped cycle routes from the town. These range in length from 14 km to 40 km and run to Cleggan, the Sky Road, Errislannan and Roundstone.

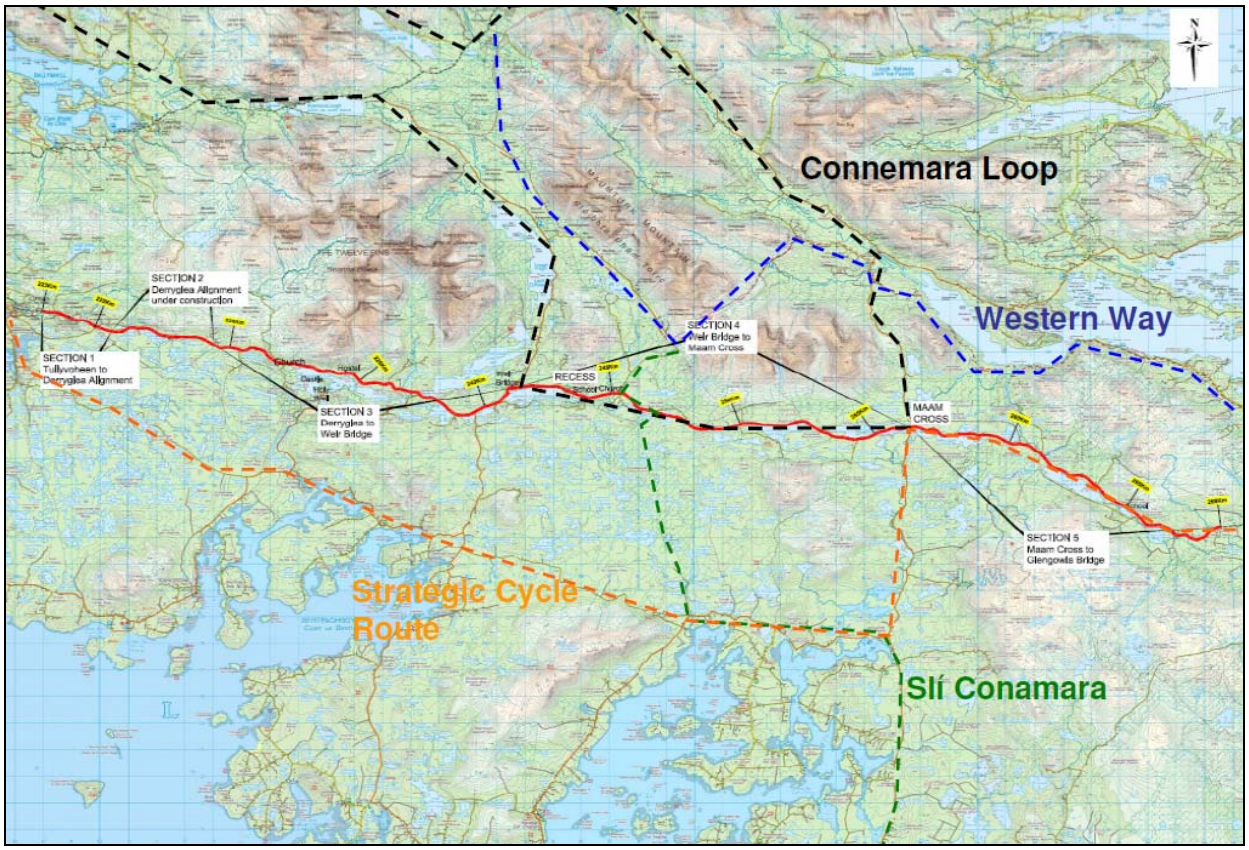


Figure 15.1 Walking and Cycling Routes

Source: Fáilte Ireland

Public Transport

The N59 route is served by the 419 / 421 Bus Éireann service. This travels between Clifden and Oughterard 3 times a day in winter and 5 times a day in summer. School bus services are also provided in the study area.

Amenity & Communities - There are three principal elements to the community of the study area, namely:

- the residential community;
- the working community, and
- the visiting community.

For the purpose of this assessment the residential community consists of those living within the Study Area. The Study Area is largely rural, apart from the urban settlements of Oughterard and Clifden.

The villages of Oughterard and Clifden host a number of local shops and a basic range of services are provided for those residing within these villages and in their immediate hinterland e.g. hotels, shops, pubs, Corporate Park, GAA club, community centre, leisure centre and offices. Oughterard remains a desirable residential location for those prepared to commute to work in the larger urban centres of Galway City. Oughterard displays the characteristics of a dormitory settlement: a high residential content, no significant local employment base and a high level of commuting.

The majority of the townlands located within the Study Area are mountainous with many lakes. There is some intensive agricultural land in the regions but it is largely extensively farmed agricultural lands and bog.

Table 15.6 shown overleaf, sets out the population structure, employment trends and employment levels for the nine main electoral divisions that cover the study area of the Connemara Greenway Project – Clifden to Oughterard.

From this table it is clear that the female working community consists mainly of professional workers or workers in the service industry. The male community consists predominantly of building and construction workers or “other workers”. There is also some reliance on the fishing, forestry and farming industry. The study area is close to Galway City for commuting for professional workers. Oughterard and Clifden are also popular tourist destinations which have resulted in the creation of a large service industry in the region.

As this information is taken from the 2006 census, it is likely that the breakdown of these working sectors has changed to reflect recent economic changes. It is likely that unemployment levels have increased and that the level of those employed in the building and construction sector will have decreased.

Table 15.6 Population Structure, Employment Trends and Employment Levels for the Nine Main Electoral Divisions (Census 2011 figures not available for this data yet

Electoral Division		Binn an Choire	Clifden	Derrycunlagh/ Derrylea	An Uillinn	Maíros	An Crompán	Letterfore	Oughterard	Wormhole
Population (15yrs +)		218	1723	202	82	316	1854	233	2027	1458
Unemployment Levels (%)		3.2	5.5	4	8.5	7.6	9.1	1.7	4.1	3.2
Main Employment Sector*	F	Service Workers	Service Workers	Service Workers	Professional / Service Workers	Service Workers	Professional Workers	Sales Workers	Professional Workers	Professional Workers
	M	Other Workers	Other Workers	Other Workers	Farming, Fishing & Forestry	Building & Construction	Building & Construction	Building & Construction	Building & Construction	Building & Construction

***F – Female M – Male** **(Source: CSO, 2006)**

In terms of the visiting community the predominant attraction is angling and tourism. Connemara is a popular region for driving, cycling and walking. A document published by Fáilte Ireland "*Tourism Facts 2010*" shows that approximately 693,000 tourists engaged in hiking and cross country walking while visiting Ireland in 2010. This figure accounts for 58% of all activities surveyed and displays the importance of hiking and cross country walking to the Irish tourism industry. Fáilte Ireland promotes a number of activities in Connemara on their website www.discoverireland.ie, including the Derroura Mountain Bike Trail at Derroura Mountain in Connemara; the Connemara Garden Trail which includes sites such as Ballynahinch Castle Hotel, Brigit's Garden's Roscahill and Cashel House Hotel Cashel; as well as the Connemara History and Heritage Trail which includes sites along the N59 such as Kilcummin Parish Church, Glengowla Mines and Aughnanure Castle in Oughterard, Ballynahinch Castle, Cashel House Hotel and Clifden Castle.

15.3.1.3 Land Use

The route for the proposed Greenway is located on the disused Galway and Clifden Railway line in a relatively sparsely populated area between Clifden and Oughterard. There are no topographical constraints in the area, as the Greenway will be located for the most part on the existing rail line. The majority of the route is located in an area designated as a 'Poor Aquifer'. Under the landscape sensitivity rating in the County Development Plan, the Plan area is classified from Class 3 (high sensitivity) to Class 5 (Unique sensitivity). The Study Area is located between the coastal town of Clifden to the west and travels through a lake-rich transitional zone which lies between the southern foothills of the mountainous Connemara National Park to the north and extensive bog lands to the south.

There are four designated or protected sites within the Study Area and surrounding environs:

- Lough Corrib NHA/SPA/cSAC;
- Connemara Bog Complex cSAC/NHA (Site Code: 002034);
- Maumturk Mountains cSAC/NHA (Site Code: 002008);
- Twelve Bens cSAC/NHA (Site Code: 002031).

Designated sites are discussed further in **Chapter 10**.

Land ownership along the route for the proposed Greenway is mostly private. The disused railway line is not a public right of way and there are a number of dwellings and one commercial operation occupied immediately adjacent to the track. The rail track is currently unfenced in many parts and therefore it is considered part of each landholding it runs through.

15.3.1.4 Health and Safety

Currently there are no risks of death, disease, discomfort or nuisance associated with the existing rail line.

15.3.2 Material Assets

Material assets can be defined as physical resources in the environment, which may be either of human or natural origin. These are further broken down in the EPA publication 'Advice Notes on Current Practice in the preparation of Environmental Impact Statements' (2003) into the following:

Economic Assets of Natural and Human Origin: The most significant natural resource occurring within the study is the scenic landscape. The mountainous peat landscape and bedrock outcrop have an economic value in terms of tourism and amenity value. The proposed Greenway is likely to attract further tourism to the area.

Other significant natural and economic assets occurring within the study area are the blanket peat and associated soils areas, the mineral resources (quarries and mines) as well as the many rivers and lakes scattered throughout the study area. The main man-made material assets include the transportation network, utilities (electricity and telephone), water and wastewater.

Blanket Peat and Associated Soils: These areas are considered to be a non-renewable natural resource of importance for the region.

Mineral Resources: There are known mineral or aggregate deposits existing within the study area. There are also two extractive industry related activities within a 1km boundary of the Greenway – Lackagh Quarries and Lissoughter Green Marbles Quarry, both located in Recess. These aspects will not be impacted negatively by the proposed Greenway

Rivers, Lakes and Streams: These freshwater habitats are important fisheries habitats which have an economic value in terms of angling, tourism and amenity value. The water quality and morphology of the river channels, lakes and streams have the potential to be influenced by the proposed Connemara Greenway Project – Clifden to Oughterard, particularly during construction stage of the works.

Transportation Network: The remnants of the railway line from Oughterard to Clifden consist of a well defined corridor for much of its length with a number of intact bridges. The corridor merges with the N59 at Lough Aggrafard, Bunscanniff townland to Cloonoppeen Bridge and at Recess. The Greenway also merges with the regional road R341 from Ballinafad to Cloonbeg Bridge. The Greenway crosses the N59 at Shannakinlough, Glendollagh Loch and Athry Lough. There are no existing modern rail corridors in the area.

Work at the river crossings, i.e. bridges, may constrain the local transport network and have the potential for disruption to electricity and telephone lines. This will need to be considered further at locations where these features are coincident.

Utilities Infrastructure: A medium voltage, 3-phase, 10kV ESB overhead powerline runs from Oughterard to Recess to Clifden, following, in different sections, the corridor of the dismantled railway line and the N59. The 10kV powerline follows the route of the proposed Greenway for approximately 5km from Oughterard village to Lough Aggrafard and for approximately 8km from Bunscanniff townland though Maam Cross to Bunnakill townland. West of Recess the 10kV overhead powerline diverges from the dismantled railway line. The proposed Greenway will cross under an additional 10kV overhead powerline close to Ballinahinch and again when entering the environs of Clifden town.

The ESB also has a 38kV overhead powerline between Oughterard and Clifden. The 38kV powerline does not follow the route of the proposed Greenway/N59 exactly. Instead the 38kV powerline runs in a north of the N59 from Oughterard to Recess crossing the N59 and the proposed Greenway at Boocaunmore. The 38kV line then follows a route between the N59 and the proposed Greenway from Recess to Clifden and crosses the Greenway at Lough Muingacurry.

Through correspondence with Bord Gais it was found that there are no gas networks in the vicinity of the study area.

Telecommunications infrastructure in the study area includes overhead telephone lines. Construction of the Greenway underneath overhead telephone lines is likely and some diversion of telephone poles may be required.

Water Supply: There are 2 public water schemes in the study area at Oughterard and Clifden.

Wastewater Treatment: There is no local authority wastewater treatment plants located within the study area. All wastewater is currently treated via private wastewater treatment systems.

Cultural Assets of a Physical and Social Type: There are 32 Records of Monuments and Places (RMP's)[12] located within 300m of the proposed Greenway.

All of the 32 individual recorded archaeological sites are listed within the RMP (Recorded Monuments and Places), with the exception of AH 32, which is a potential ringfort site. A total of 4 of the 52 sites are also designated Protected Structures in the Development Plan. None of these are listed as National Monuments, or subject to preservation orders. The closest recorded site consists of a possible late 18th century burial. This is located c. 30m south of the proposed route within the townland of Killymongaun. The remaining sites vary in type and date, ranging from early medieval through to post medieval garden features. Several of the recorded sites have been deemed to be 'non-antiquities'.

A survey as part of the archaeology assessment for this EIS found 123 built heritage sites. Due to the past use of the proposed route as a railway, many of the structures (85 out of 123) relate directly to its former use.

A review of the County Galway Development Plan (2009–2015), the Clifden Local Area Plan (2009–2015) and the Oughterard Local Area Plan (2006-2012) revealed that there are a total of eight protected structures located within c. 300m of the proposed route. The closest structure to the scheme is Ardbear Old Bridge, which is located at the beginning of the route

A total of 20 individual or groups of buildings were identified within the survey in proximity of the proposed Greenway. Of these, eight are already listed within the register of protected structures. Several of the structures are located along the scheme. These include Ardbear Old Bridge, a railway bridge at Ballynahinch, a road bridge at Cloonbeg, a railway bridge at Letterfore and the 'Quiet Man' bridge.

Refer to **Chapter 13** for details pertaining to all archaeological issues.

15.4 POTENTIAL IMPACTS

The human environment and their associated material assets in the region of the proposed Greenway Project have been set out in the previous section. This section further assesses the potential impacts on this element of the environment resulting from the proposed Greenway Project.

[12] A statutory list of all known archaeological monuments provided for in the National Monuments Acts

15.4.1 Greenway Project Construction

15.4.1.1 Impacts on Human Beings

Economic Activity – Construction of the proposed Greenway will be carried out by Galway County Council staff and/or contractors and will not result in any additional employment in the area. There will be a total of approximately 14 people employed during the construction phase.

Social Consideration – The construction phase of the proposed Greenway will not impact any types of activity and land use.

Land Use – The construction phase of the proposed Greenway may impact on use by walkers or farmers in the area where construction is underway.

Health and Safety – During construction of the proposed Greenway workers on site will be at risk from activities associated with this work. In addition, members of the public who come into contact with construction activities will be at risk from these activities. Members of the public who live in proximity to the works may also be at risk of increased noise levels and decreased air quality levels from the construction work.

15.4.1.2 Impacts on Material Assets

Economic Assets of Natural and Human Origin

Blanket Peat and Associated Soils: The majority of the proposed Greenway will be located on the existing disused railway line. During the construction phase there will be some loss of cutover peat. No part of the Greenway is proposed for blanket peat areas.

Mineral Resources: Lackagh Quarries and Lissoughter Green Marbles Quarry, both located in Recess will not be impacted negatively by the construction of the proposed Greenway. Stone for the Greenway base and surface, approximately 50,000 tonnes, will be sourced from local quarries.

Rivers, Lakes and Streams: The water quality and morphology of the river channels, lakes and streams have the potential to be influenced by the proposed Greenway during the construction stage of the works. This is particularly so when bridge replacement and land drain works are being carried out.

Transportation Network: The proposed Greenway route merges with the N59 at Lough Aggrafard, Bunscanniff townland to Cloonoppeen Bridge and at Recess and with the regional road R341 from Ballinafad to Cloonbeg Bridge. The Greenway crosses the N59 at Shannakinlough, Glendollagh Loch and Athry Lough. The Greenway has the potential to impact on the road network at these locations and in particular at river crossings on the network.

Work at the river crossings, i.e. bridges, may constrain the local transport network and have the potential for disruption to electricity and telephone lines. This will need to be considered further at locations where these features are coincident.

Utilities Infrastructure: Construction of the Greenway underneath overhead telephone lines is likely and some diversion of telephone poles may be required.

Water Supply: It is not likely that construction of the proposed Greenway will impact on water supply in the area.

Wastewater Treatment: All wastewater is currently treated via private wastewater treatment systems in the vicinity of the Greenway. It is not likely that construction of the proposed Greenway will impact on wastewater treatment in the area.

Construction of the proposed Greenway route will for the most part not pose constraints on the main land uses, population or employment in the region. Any in-stream or adjacent to river works required including bridge and drainage works could have an effect on the fisheries potential of local waterbodies, fish passage and flows with resulting impacts on the angling resources of the region. There may be temporary impacts for local people who currently use the route as a walking trail and noise sensitive receptors due to the construction of the route. However implementation of suitable mitigation measures should ensure that these impacts are minor in magnitude.

15.4.2 Greenway Project Operation

15.4.2.1 Impacts on Human Beings

Economic Activity –It is estimated that operation of the proposed Greenway will stimulate additional tourism for the local area and for the country. A similar scheme, the Great Western Greenway (Westport-Newport-Mulranny-Achill), has resulted in an increased opportunity for employment and economic stimulation in that local area and has provided the region with an additional local and tourism amenity. It has been estimated that the Great Western Greenway contributed an additional €3.8 million spend in the local economy in 2011 and helped to create an estimated 38 new full-time equivalent jobs.

Social Consideration – It is estimated that the operational phase of the proposed Greenway will impact on the types of activity in the area. The Great Western Greenway has seen use by 'local' Co. Mayo residents at 38%. Activities on the trail were broken down into 56% of local users walking on the trail, while 90% of domestic visitors and 80% of overseas visitors participating in cycling as either a sole activity or in combination with walking. It is expected that similar activities and participation levels by user groups will result during operation of the Connemara Greenway Project – Clifden to Oughterard.

Land Use – It is intended that the disused railway route will remain in private ownership with all boundaries respected. There will be no payment for access or maintenance with the route to be maintained by Galway County Council. However, it may be necessary to put alternative arrangements in place in the future. On all waymarked way trails, the owners and occupiers of private property crossed by the way will be indemnified against any negligence claims by a recreational user for accident, damage or injury sustained while walking on private property. Indemnity will be provided by Galway County Council through a policy administered by Irish Public Bodies Mutual Insurance Ltd.; hence the landowner is indemnified from any claims. The limit of indemnity provided for any one accident is €9,500,000 inclusive of all damages, costs and expenses. As such, the policy extends to all landowners whose lands either cross or adjoin the designated walking route. The indemnity is valid whether the recreational user is actually on the way or has strayed off it.

Where a walking / cycling trail development crosses either public or private land, the landowner's permission to do so must always be obtained. The majority of recreational trail developments in Ireland are established on a permissive basis. A permissive trail is a trail which people are allowed to use with the agreement of the landowner. Where the proposed Greenway crosses private lands it will be considered a permissive trail and not a public right of way. In order to maintain the permissive nature of this access the route will be closed for one day every year.

It is possible that a reduction in connectivity of the area of workable lands for agricultural purposes may occur.

Health and Safety – The proposed Greenway route will be limited to use by walkers and cyclists. Where the proposed route is adjacent to or crosses a public road there is a risk of injury or death to users and possible nuisance to road traffic.

15.4.2.2 Impacts on Material Assets

Economic Assets of Natural and Human Origin:

Blanket Peat and Associated Soils: No impacts to 'Blanket Peat and Associated Soils' during operation of the proposed Greenway are foreseen.

Mineral Resources: No impacts to 'Mineral Resources' during operation of the proposed Greenway are foreseen.

Rivers, Lakes and Streams: During the operational phase of the Greenway water quality of the river channels, lakes and streams have the potential to be influenced by the proposed Greenway as a result of weed spraying activities on the route.

Transportation Network: Where the Greenway crosses roadways there is the potential for negative impacts road traffic.

Utilities Infrastructure: No impacts to 'Utilities Infrastructure' during operation of the proposed Greenway are foreseen.

Water Supply: No impacts to 'Water Supply' during operation of the proposed Greenway are foreseen.

Wastewater Treatment: No impacts to 'Wastewater Treatment' during operation of the proposed Greenway are foreseen.

15.5 MITIGATION MEASURES

15.5.1 Greenway Project Construction

Any potential negative impact identified will be mitigated for through a range of measures which are assessed in detail in this EIS. **Table 15.9** summarises the potential impacts identified for human beings and material assets as a result of the proposed Greenway Project. Mitigation measures are included where required.

15.5.2 Greenway Project Operation

Where alteration of existing land use will occur it will be necessary to obtain landowner permission/consent and to replace lands adjacent to the Greenway fit for purpose post Greenway Project works. Potential pollution of water as a natural resource through weed spraying will be mitigated through selective weed spraying as per measures in **Chapters 10**.

15.6 RESIDUAL IMPACTS

There may be minor temporary impacts for local road users and noise sensitive receptors during construction of the Greenway Project. However implementation of suitable mitigation measure should ensure that these are minor in magnitude. The proposed Greenway Project will provide positive impacts for the local community with an added local and tourist amenity providing both economic and social benefits.

15.7 CONCLUSIONS

It is anticipated that the proposed Greenway Project – Clifden to Oughterard will have significant positive impacts for the local human environment in both economic and recreational terms. It is hoped that this development would benefit local communities in as much as it would provide a secure and safe environment for walkers and cyclists leading to an increased opportunity for physical exercise. It would also provide a unique and novel experience for visitors to the area.

It is anticipated that there may be some minor temporary disturbances to the local farming community and walkers along the disused rail line and to noise sensitive receptors during construction of the Greenway. However if proposed mitigation measures are put in place as recommended these impacts should remain minor or insignificant in nature.

Table 15.9 Summary of Impact Assessment on Human Beings & Material Assets

Potential Impact on Human and Material Assets Environment	Positive/ Negative	Major/Moderate /Minor	Area Affected	Duration*	Mitigation Measures	Residual Impact
Greenway Route Construction						
Transport machinery to site causing traffic inconvenience	Negative	Minor	Local	Temporary	• Notify local road users of time that machinery will be transport to site • Transport machinery during non- peak traffic hours	None
Increased noise levels	Negative	Minor	Adjacent to site	Temporary	• Ensure that activities are restricted to working hours where working near sensitive receptors	None
Decreased air quality	Negative	Minor	Adjacent to site	Temporary	• Measures to be put in place as per **Section 12.5.**	None
Pollution of water as a natural resource	Negative	Major	Local	Temporary	• A range of measures to be put in place as per **Chapters 8** and **10**.	None
Health and Safety Risks	Negative	Minor	Galway Co. Co. workers	Temporary	• Follow Galway County Council Health and Safety Policies and Statements at all times during works.	None
Greenway Route Operation						
Alteration of existing land use	Negative	Minor	Local	Permanent	• Obtain landowner permission/consent • Replace lands adjacent to the Greenway fit for purpose post Greenway Project works.	The land will be economically beneficial to the local community
Pollution of water as a natural resource through weed spraying	Negative	Major	Adjacent or downstream of site	Temporary	• Selective spraying as per measures in **Chapters 8** and **10**.	None
Visual Impact for local residents	Negative	Minor	Local - Adjacent	Permanent	• Retention of the existing vegetation as far as possible. • Site preparation areas and compound areas will be kept tidy at all times.	Potential minor impact for local residents

Potential Impact on Human and Material Assets Environment	Positive/ Negative	Major/Moderate /Minor	Area Affected	Duration*	Mitigation Measures	Residual Impact
Public use of private lands for route	Negative	Minor	Local	Permanent	• Obtain landowner permission/consent • Maintain upkeep of Greenway by Galway Co. Co. • Maintain indemnity insurance by Galway Co. Co. • Maintain permissive nature of route by closing route for one day each year	Potential minor impact for local landowners
Severance of agricultural landholdings	Negative	Minor	Local	Permanent	Provide cattle stops and fencing between landholding severed by the Greenway	None
Increased local and national tourism spend	Positive	Moderate	Local/Regional	Permanent	N/A	Economic benefits for County and Region
Health and Safety Risks during operation of the proposed Greenway	Negative	Minor	Public users of Greenway	Permanent	Follow Galway County Council Health and Safety Policies and Statements at all times during works.	None

16 TRAFFIC

16.1 INTRODUCTION

The purpose of this chapter is to assess the impact of the proposed Greenway Project on the receiving environment with respect to traffic conditions, transport routes and general traffic safety. The assessment identifies the existing road network in the vicinity of the proposed construction areas, potential impacts of the various stages of the proposal on the transport infrastructure and its users and proposes where required suitable mitigation measures.

The scope of this assessment is to assess existing conditions from a traffic perspective relative to the proposed Greenway Project. It is not intended to undertake detailed junction geometry surveys, detailed traffic forecasting or traffic flow modelling.

In assessing traffic as part of the proposed Greenway Project the following objectives will be considered:

- Ensure safety of workers and the public,
- Avoid damage to transport infrastructure, including roads and bridges, and
- Minimise pollution and spillage.

16.2 METHODOLOGY

A review of the existing transport infrastructure for the region was undertaken in order to establish a baseline environment for the traffic assessment. This was completed on two levels which considered:

1. The public road network in the region, and
2. The internal access routes within the existing Study Area where the proposed Greenway will be constructed.

The Greenway design was carried out in accordance with the following guidance documents:

- *The National Cycle Manual, National Transport Authority;* and
- *NRA DMRB, Traffic Management Guidelines*

16.3 EXISTING ENVIRONMENT

The existing route for walkers and cyclists is via the N59 National Secondary Road and the National Roads Authority plan to upgrade the existing N59 National Secondary Road to a Type 3 Single Carriageway (S2). The upgrade will comprise of predominantly on-line widening with some off-line sections. The overall length of proposed N59 road development is approximately 47.8km. It runs from the eastern end of Clifden town in Tullyvoheen Townland to the west of Oughterard in Claremount Townland, County Galway.

The Type 3 Single Carriageway (S2) consists of a 6.0m wide single carriageway, with 0.5m hard strips, cycleways where required and a 2.0 to 3.0m verge. The Design Speed for a Type 3 Single Carriageway (S2) is 85kph as set out in NRA TD 9/07. The proposed road cross section will include a 2.5m wide cycle way which will form part of the Greenway.

The proposed N59 will have a segregated 2.5m wide shared footway/cycleway. The section of the shared footway/cycleway between Recess and Maam Cross will form part of the Connemara Greenway Project – Clifden to Oughterard. The N59 on-line section of the Greenway is approximately 11.47km in length.

Table 16.1 N59 Summary of Shared Footway/Cycleway

Mainline Chainage		Length (km)	Comments
From	To		
223000	225680	2.68	
231640	232050	0.41	
240920	252360	11.47	On-line Greenway
264950	266510	1.56	
	Total Length	16.09	

16.3.1 Existing N59 Traffic Profile

The N59 is a scenic recreational route; traffic flows in each week are highest on Saturdays and Sundays. **Figure 16.1** shows the daily traffic totals from nine ATC sites carried out as part of the N59 Clifden to Oughterard Road project. The average vehicle proportions were 92% light and 8% heavy.

Figure 16.2 shows the average weekday traffic profile for light and heavy vehicles combined. Traffic levels are highest in the PM peak – there is in effect no AM peak on this route at the time of the traffic counts.

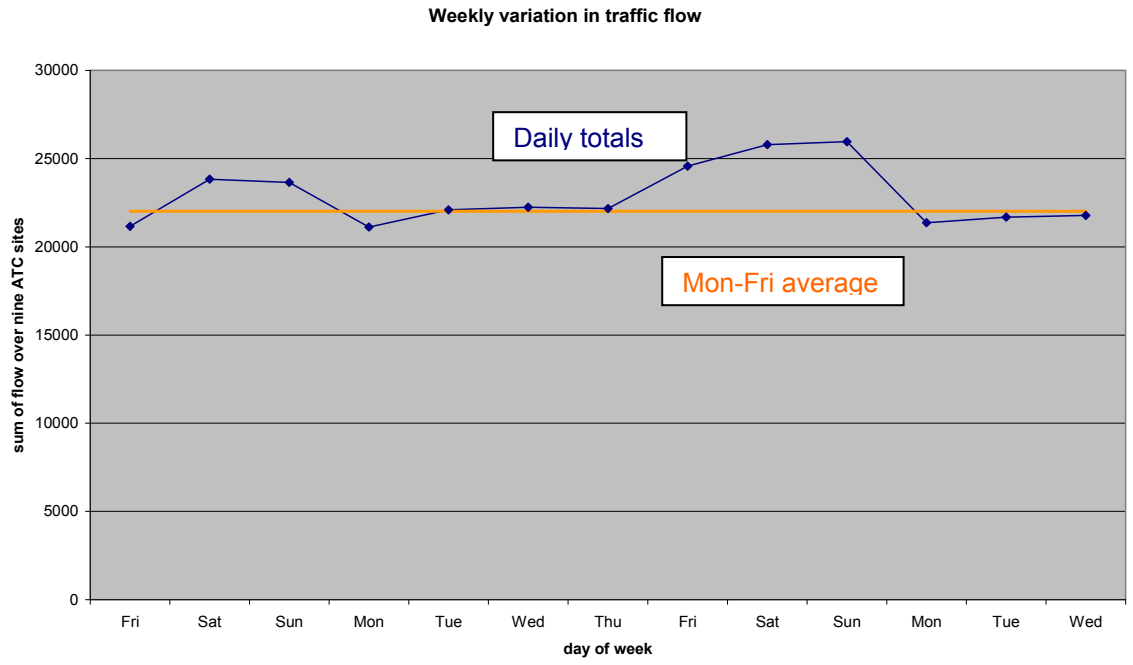


Figure 16.1 Daily Traffic Profiles

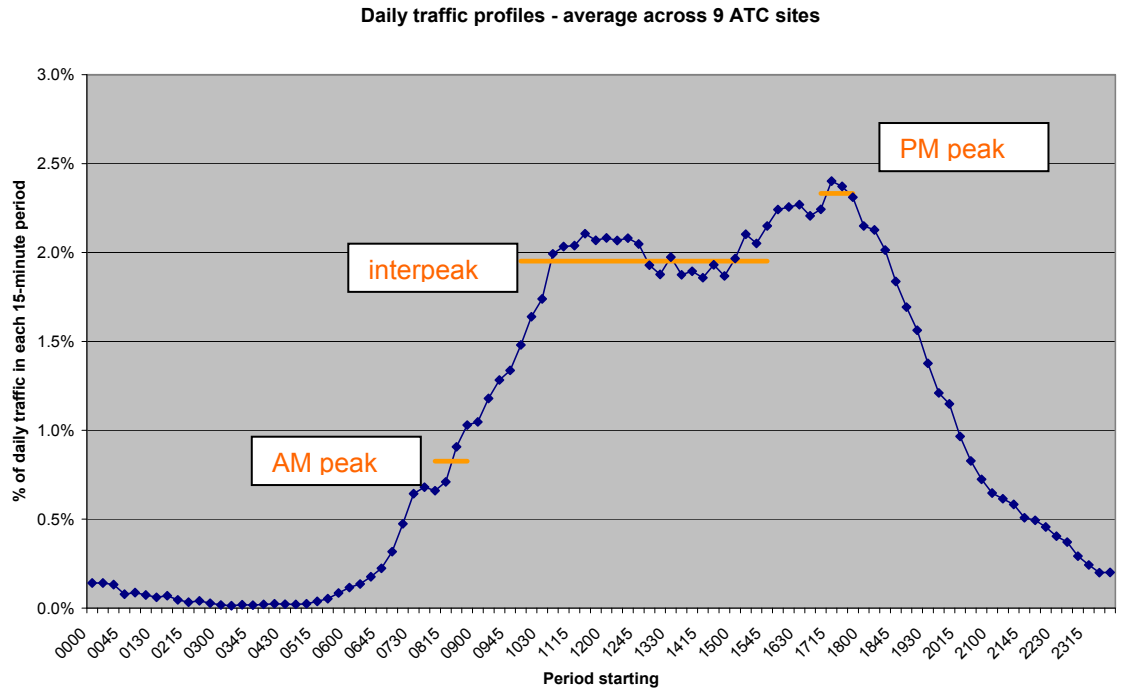


Figure 16.2 Traffic Profiles on Typical Weekday

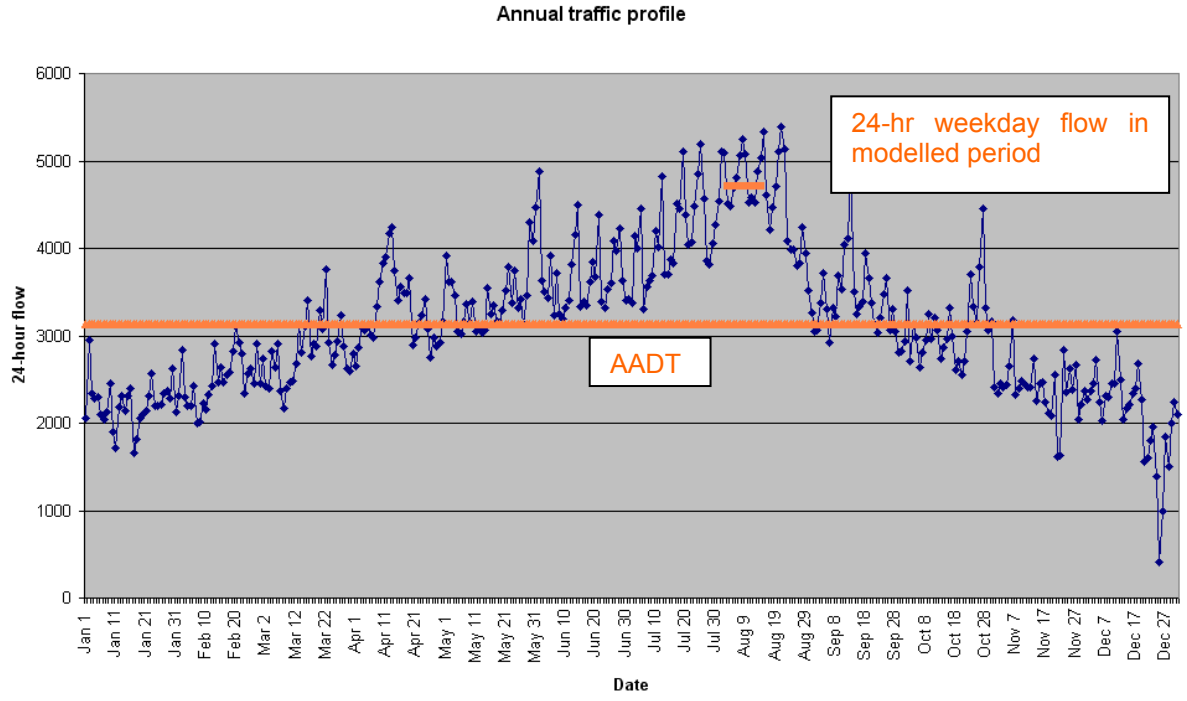


Figure 16.3 Annual Traffic Profile

The traffic surveys were undertaken as part of the N59 in the first half of August 2011. Long-term counter data for the N59 showed that the 2009 AADT was 3,135 vehicles per day. The average 24-hour weekday traffic flow recorded at this counter on weekdays in the first half of August 2009 was 4,711.

Figure 16.3 illustrates seasonal variation on this route, confirming that the first half of August is the busiest period of the year with flows substantially higher than annual average traffic levels.

16.3.2 Proposed Greenway Project Infrastructure

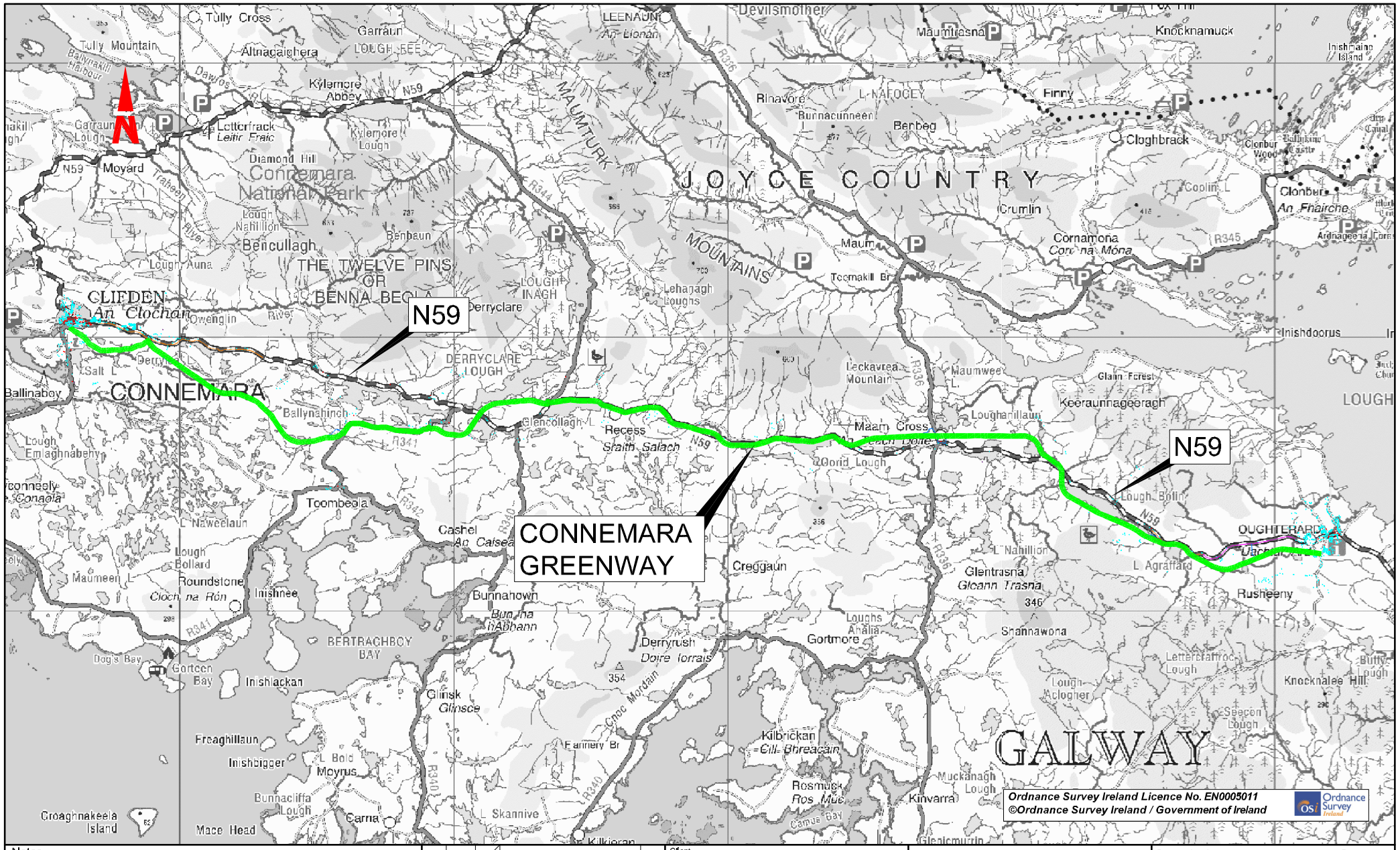
The proposed Greenway is approximately 52km in length and runs from Clifden to Oughterard. It will utilise sections of the public road network and involve new construction utilising the disused Great Western Railway line. The proposed Greenway Project site access locations for proposed works have existing roadways and tracks leading to them within the study area at the various locations, see **Chapter 6**.

The Greenway will also utilise sections of local and regional roads in addition the dismantled Great Western Railway, the various sections are detailed in **Table 16.2** below. The sections running on part of the public road system are described as on-road and the sections utilising the dismantled Great Western Railway are described as off-road.

The Greenway will cross public roads along its route. At crossing points priority will be given to motorised traffic. The crossings will be uncontrolled and yield signs for walkers and cyclist will be posted.

Table 16.2 Greenway Route

Chainage		Length	Description	On-road	Off-road	Structure	Crossing
From	To	Km					
0	3200	3.2	Start at Clifden via L-51254 local road				
3200	4040	0.84	Dismantled Railway route				
4040	11150	7.11	Dismantled Railway route				
11150	11750	0.6	L-5137 local road via the Cloonbeg River Bridge				
11750	12700	0.95	R-341 Regional Road				
12700	14800	2.1	Dismantled Railway route				
14800	15150	0.35	R-341 Regional Road				
15150	17380	2.23	Dismantled Railway route crosses the N59 at Athry Ballinafad				
17380	19950	2.57	Dismantled Railway route				
19950	20030	0.08	Alternative route-bypass dwelling				
20030	31500	11.47	On-line part of NRA N59 Road Scheme				
31500	34480	2.98	Alternative route-bypass dwelling				
34480	35450	0.97	Dismantled Railway route				
35450	40300	4.85	Dismantled Railway route				
40300	41700	1.4	Dismantled Railway route				
41700	44510	2.81	L-53281 local road via Quiet Man Bridge				
44510	46550	2.04	Alternative route-bypass dwelling				
46550	48840	2.29	Alternative route via Bog Road				
48840	51300	2.46	Oughterard terminal				
Total		**51.3**					



Notes:

1. This drawing is the property of RPS Group PLC. It is a confidential document and must not be copied, used, or its content divulged without prior written consent.
2. Verifying Dimensions.
   The contractor shall verify dimensions against such other drawings or site conditions as pertain to this part of the work.
3. Existing Services.
   Any information concerning the location of existing services indicated on this drawing is intended for general guidance only. It shall be the responsibility of the contractor to determine and verify the exact horizontal and vertical alignment of all cables, pipes, etc. (both underground and overhead) before work commences.
4. Issue of Drawings.
   Hard copies, dwf and pdf will form a controlled issue of the drawing. All other formats (dwg, dxf etc.) are deemed to be an uncontrolled issue and any work carried out based on these files is at the recipients own risk. RPS will not accept any responsibility for any errors arising from the use of these files, either by human error by the recipient, listing of un-dimensioned measurements, compatibility issues with the recipient's software, and any errors arising when these files are used to add the recipients drawing production, or setting out on site.
5. Datum: Ordnance Survey Datum, Malin Head

No.	Date	Drn	Chk	Amendment / Issue	App
F01	16.05.12	WL	PK	FINAL ISSUE	WM
D01	23.04.12	WL	SM	DRAFT ISSUE	WM

Client: Galway County Council, County Buildings, Prospect Hill, Galway. Phone: 091 509000, Frank Clinton, Director Of Services

Failte Ireland

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Project: CONNEMARA GREENWAY PROJECT

Drawing Number: MGE0269/DG0004-01

Rev: F01

Title: FIGURE 16.1 LOCATION MAP

Scale	Drawn By	Checked By	Approved By	Date
NOT TO SCALE	WL	SM	WM	April 2012

MGE0269DG0004 Location Map Traffic.dwg

16.3.3 Greenway Design

The majority of the Greenway will be a segregated off-road 2.5m wide cycle/footway that will follow the line of the dismantled Great Western Railway, see **Figure 16.5** below. The cross section will allow for cyclists two abreast to be overtaken by other users. A 2.5 metre wide cycle track will cater for peak hour cyclist volumes of 50 to 150 cyclists.

The Greenway will merge with the N59 for approximately 11.47km. The Greenway will utilise a 2.5m wide shared walkway/cycle proposed as part of the N59 improvement works. The 2.5m wide cross section is recommended where the traffic volumes are high or operating speeds are over 60 kph. The N59 has a posted speed limit of 100 kph but the traffic flows would be regarded as low. The shared walkway/cycle way will be physically separated from the running carriageway by a grass verge.

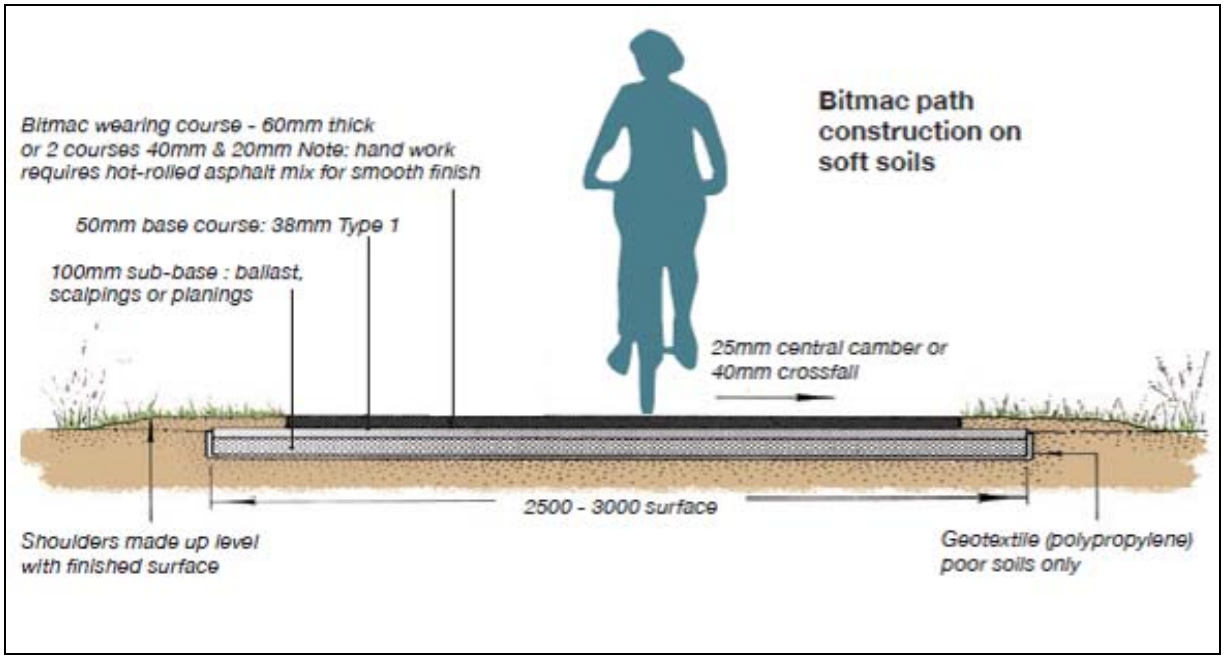

Figure 16.5 Typical Greenway Cross Section

16.3.4 Welfare Facilities Along Route

Failte Ireland recommend welfare facilities at least every 10km along the proposed Greenway. The following locations are proposed:

- Oughterard - Maam Cross (facilities at each location),
- Maam Cross – Recess (facilities in Maam Cross only),
- Recess – Ballynahinch (facilities at Ballynahinch), and
- Ballynahinch – Clifden (facilities at each location).

16.3.5 BRIDGES AND STRUCTURES

It will be necessary to construct seven new timber or steel bridges. The bridges currently in place are dilapidated and in need of replacement. Details of bridges to be replaced, their spans and locations are provided in **Table 16.3**.

Table 16.3 Bridges to be Replaced throughout the Route

Bridge No.	Bridge Name	Span	Chainage
1	Cloonbeg River Bridge	2 No. 50 Foot Spans	11+700
2	Athry River Bridge	1 No. 20 Foot Span	16+620
3	Bunscanniff Bridge	1 No. 23 Foot Span	30+920
4	Letterfore River Bridge	1 No. 20 Foot Span	44+800
5	Glengowla River Bridge	1 No. 40 Foot Span	46+800
6	Leadmines Bridge	1 No. 20 Foot Span	48+400
7	Oughterard River Bridge	1 No. 40 Foot Span	50+200

Image 16.1 Example of Possible Bridge Design

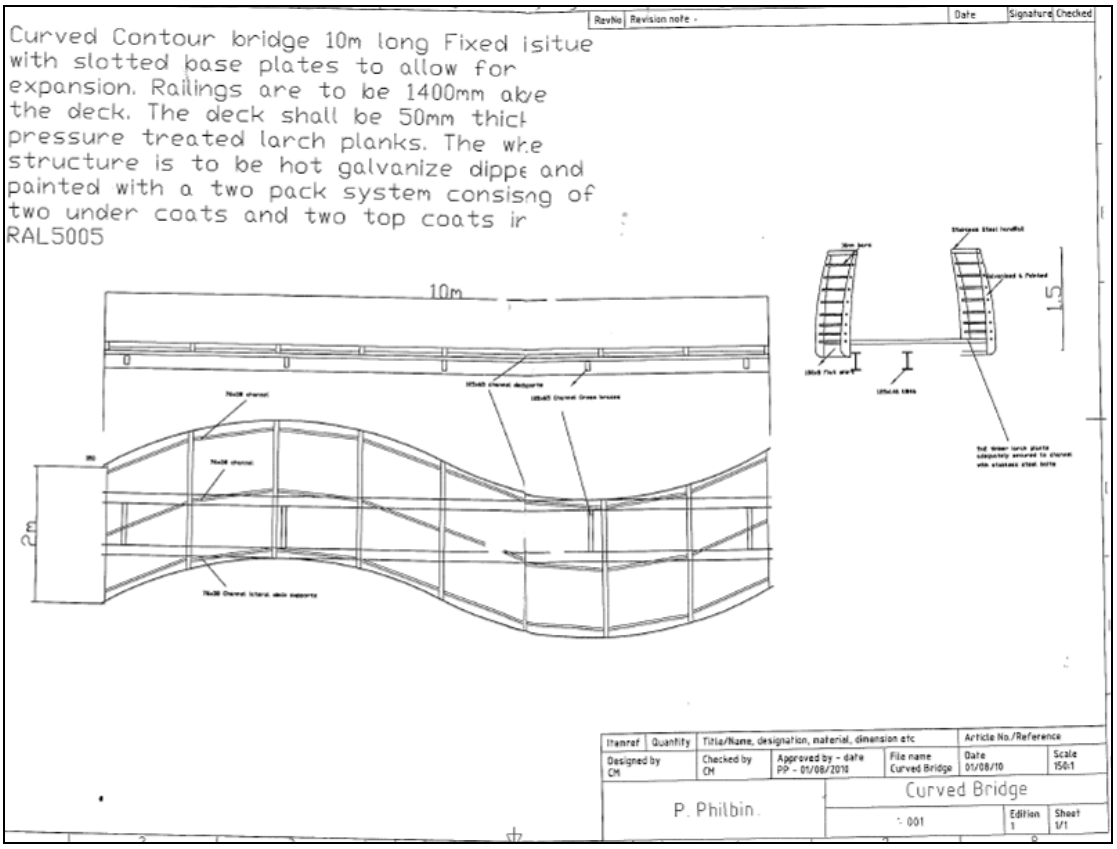

Figure 16.6 Detailed Design of Possible Bridge Design

16.3.6 Fencing, Gates and Cattle Stops

There will be a requirement to fence both sides of the Greenway where landowners require it. Otherwise it will be left unfenced. At areas where cattle need to be moved there are a number of different options to enable farmers to move livestock in a safe manner to the stock and to any Greenway user. **Image 16.2** and **Image 16.3** show a number of different options for cattle stops and fencing which are dependent on the different needs of each farmer. It is envisaged that fencing where required alongside the proposed Greenway will be the first item to be dealt with by a contractor to establish the site boundaries. The proposed fence will be timber 'post and rail' or predominantly 'post and wire' fence.

Image 16.2 Cattle Stops example

Image 16.3 Example of Cattle Stops

16.4 POTENTIAL IMPACTS

The works associated with the construction of the Greenway development will be ground works, involving excavation the existing topsoil and scrub which will be used to form embankments along the path, the laying of the stone sub base to form the foundation of the Greenway path, additional works will include the paving of the Greenway, erection of fencing on both sides of the path, if required, and the removal of existing dilapidated bridge structures and replaced with new decking and railings.

The equipment used will include excavators, generators, dumpers and rollers.

It is proposed to construct the Greenway as a linear project, meaning there will be no need to construct new access routes to facilitate works. It is not envisaged that rock breaking will be required.

16.4.1 Site Preparation

16.4.2 Site Management

Tree felling, if required, and scrub removal to be carried out during the period September to March to limit disturbance to nesting birds.

Special care shall be taken to ensure that all trees and shrubs not actually affected by the Works are not harmed in any way. Temporary fencing shall be erected around those existing individual trees, groups of trees and areas of shrubs as identified.

This protective fencing shall be maintained in good condition throughout the Contract and shall not be removed until issue of the Certificate of Completion.

Within the areas protected by temporary fencing, no materials shall be stored and no machinery is to be used, all necessary operations are to be carried out by hand.

16.5 MITIGATION MEASURES

There will be ongoing Greenway maintenance after the initial track clearing, formation and development. It will be necessary to carry out annual weed spraying of the Greenway surface and preventative measures to ensure the eradication of noxious and nuisance weeds.

After storm conditions, there will be a need to make storm repairs to both the Greenway surface and the clearing of any debris left on the track from broken tree branches or fallen trees. Track wash outs, surface damage will require repair or redressing to provide a suitable surface again.

Fences, gates, cattle stops and signage will also require maintenance effort with age, weather, stock, vehicle and vandalism damage.

Table 16.4 Summary of Potential Impacts and Proposed Mitigation Measures Relative to Traffic and Transport

Potential Impact on Traffic & Transport Environment	Positive/ Negative	Major/ Moderate/ Minor	Area Affected	Duration	Mitigation Measures	Residual Impact
Site Preparation						
Transport machinery to site causing traffic inconvenience	Negative	Minor	Local Road Users	Temporary	Notify local road users of time that machinery will be transported to site. Transport machinery during non-peak traffic hours. Do not transport machinery in convoy.	None
Delivery of material (aggregate) for river bank access track creation	Negative	Minor	Local Road Users	Temporary	Notify local road users of time that aggregate will be transport to site. Transport materials during non-peak traffic hours.	None
Construction						
Temporary road closures, diversions, or traffic controls to facilitate enhancement of water crossing points	Negative	Moderate	Local Road Users	Temporary	Discussion and agreement with Galway County Council's Roads and Planning Department required. Road Closures to be placed as Public Notices in a prominent paper to inform the public.	None
Operation						
Removal of motorised and cyclist traffic from N59	Positive	Minor	Local Road Users	Permanent	None	Permanent Minor Positive

16.6 RESIDUAL IMPACTS

If all proposed mitigation measures are implemented as recommended and if the relevant public road traffic management issues are fully discussed between Galway County Council and the Roads Department of Galway County Council it is not anticipated that there will be residual impacts resulting on the traffic and transport aspect of the environment from any stage of the proposed Greenway Project construction.

16.7 CONCLUSIONS

A review of the existing transport network, both public and internally in the proposed study area, was completed as part of this assessment. The potential for impact on traffic and transport was considered at all stages of the proposed measures implementation: site preparation, construction, and maintenance. Some potential impacts including temporary inconvenience to road users when machinery is delivered or where road traffic restrictions, closures and diversions were identified.

It is noted that details of public road traffic management, closures and diversions at the time of the Greenway construction will need to be discussed further at the appropriate time between Galway County Council and the Roads Department of Galway County Council.

It is concluded that if proposed mitigation measures are fully implemented and if the relevant public road traffic management issues are fully considered by Galway County Council at the appropriate times over the lifespan of the proposed Greenway Project measures implementation and construction, then traffic and transport will not be significantly impacted upon as a result of this project.

17 IMPACT INTERACTIONS AND CUMULATIVE IMPACTS

17.1 INTRODUCTION

Schedule 2 (b) of the Planning and Development Regulations 2001, (S.I. 600) requires consideration of the interactions between the various environmental factors:

> *"a description of the aspects of the environment likely to be significantly affected by the proposed development, including in particular;*
>
> - *human beings, fauna, flora,*
> - *soil, water, air, climatic factors and the landscape,*
> - *material assets, including the architectural; archaeological, and cultural heritage, and*
> - *the inter-relationship between the above factors".*

The environmental factors of the proposed Greenway Project have been assessed individually and mitigation measures recommended where required. It is also important to analyse any interactions that could result in impacts having a knock on effect on other elements of the environment.

In addition to the assessment of impacts on individual environmental topics including: Terrestrial Ecology, Aquatic Ecology and Water Quality, Hydrology and Drainage, Soils, Geology and Hydrogeology, Air Quality and Climate, Noise and Vibration, Archaeology, Architectural and Cultural Heritage, Landscape and Visual Impact, Human Beings and Material Assets, and Traffic, the interaction between these factors was also taken into account as part of the environmental impact statement.

This was facilitated through the iterative design process that included the holding of meetings between the engineering design and the environmental teams on a regular basis. This allowed for dynamic interaction between all parties/ topics. Where a potential exists for interaction between two or more environmental topics, the relevant specialists have taken their potential interactions into account when making their assessment and where possible complimentary mitigation measures have been proposed.

Table 17.1 illustrates the interactive impacts that could result as identified in the EIS after mitigation if measures are put in place for any impacts identified. It demonstrates that impacts resulting from one aspect of the environment can have a direct effect on other elements of the environment.

However, as suitable mitigation measures will eliminate and or reduce the possibility of these effects during the life time of the proposed Greenway, the above interactions will be avoided or significantly reduced.

Table 17.1 Summary of Potential Interaction between Environmental Factors

Potential Impact on	Interacting with
Terrestrial Ecology	• Aquatic Ecology and Water Quality • Hydrology and Drainage • Soils, Hydrogeology & Geology • Human Beings and Material Assets
Aquatic Ecology and Water Quality	• Terrestrial Ecology • Hydrology and Drainage • Soils, Hydrogeology & Geology • Human Beings and Material Assets
Hydrology and Drainage	• Terrestrial Ecology • Aquatic Ecology and Water Quality • Soils, Hydrogeology & Geology • Human Beings and Material Assets
Soils, Hydrogeology & Geology	• Terrestrial Ecology • Aquatic Ecology and Water Quality • Soils, Hydrogeology & Geology • Human Beings and Material Assets
Air Quality and Climate	• Terrestrial Ecology • Human Beings and Material Assets
Noise and Vibration	• Terrestrial Ecology • Human Beings and Material Assets
Archaeology, Architectural and Cultural Heritage	• Human Beings and Material Assets
Landscape and Visual Impact	• Human Beings and Material Assets • Archaeology, Architectural and Cultural Heritage
Human Beings and Material Assets	• Potential for impacts on human beings have interactions with all other elements of the environment
Traffic	• Human Beings and Material Assets

17.2 CUMULATIVE IMPACTS

A cumulative impact can be considered as an impact on the environment that results from incremental changes to environmental parameters when added to changes brought about by other past, present or reasonably foreseeable actions (European Commission, 1999). Cumulative impacts can result from individually minor but collectively significant actions taking place over the same period of time or/and within the same geographical area. Cumulative impacts therefore can cover all aspects of the environment.

While a single activity may itself result in a minor impact, it may, when combined with other impacts (minor or insignificant) in the same geographical area, and occurring at the same time, result in a cumulative impact that is collectively significant. This impact is known as a synergistic cumulative impact.

It was assumed that current day-to-day activities within the area would continue into the future. On examination of current activities and land-uses and the continuation of these activities it was deemed that they would not contribute significantly to compound an impact so were not considered further in this cumulative impact assessment.

To address the cumulative impacts for the proposed Greenway Project, an understanding and knowledge of historical, existing, and reasonably foreseeable future activities are essential. Details of the history of the study area have been set out in **Chapter 5** and a review of future developments in the vicinity of the site was also undertaken.

Referring to **Table 17.2** it is clear that there may be cumulative impacts of varying degrees of significance relating to the proposed Greenway and the proposed N59 National Route upgrade. These are negative for surface water quality, soils and terrestrial ecology and positive for human beings and traffic.

Table 17.2 Summary of the Potential Cumulative Impacts

Potential Impact on	Cumulative Impact of Proposed Greenway with proposed projects in the Study Area
Terrestrial Ecology	The proposed N59 route upgrade has the potential to impact negatively in combination with the Greenway through species disturbance, in the absence of mitigation.
Aquatic Ecology and Water Quality	The proposed N59 route upgrade has the potential to impact negatively in combination with the Greenway through the addition of sediment and/or nutrients to watercourses, in the absence of mitigation.
Hydrology and Drainage	The construction of the proposed N59 route upgrade occupies much of the same hydrological catchments and therefore has the potential to impact the hydrological regime. Cumulatively with the Greenway, hydrology and drainage characteristics could potentially be impacted in the absence of mitigation.
Soils, Hydrogeology & Geology	The proposed N59 route upgrade has the potential to impact negatively in combination with the Greenway on soils and hydrogeology, in the absence of mitigation.
Air Quality and Climate	The proposed N59 route upgrade has the potential to impact negatively in combination with the Greenway through construction activities and use of raw materials in the absence of mitigation measures.
Noise and Vibration	The proposed N59 route upgrade has the potential to impact negatively in combination with the Greenway through construction activities in the absence of mitigation measures.
Archaeology, Architectural and Cultural Heritage	The proposed N59 route upgrade has the potential to impact negatively in combination with the Greenway through the construction activities and excavation in the absence of mitigation measures.
Landscape and Visuals	The proposed N59 route upgrade has the potential to impact negatively in combination with the Greenway through the creation increased paved surface in a natural environment in the absence of mitigation measures.
Human Beings and Material Assets	Potential positive impacts in combination with N59, allowing safer cycling route between Clifden and Oughterard and potential for increased tourism.
Traffic	Potential positive impacts in combination with N59, allowing safer cycling route between Clifden and Oughterard and reduced hazards for road traffic.

18 SUMMARY MITIGATION MEASURES

Table 18.1 summarises those mitigation measures that have been identified as part of this EIA process for the proposed Connemara Greenway Project - Clifden to Oughterard.

Mitigation measures are proposed in this section to address any potential adverse effect on the environmental aspects of the Study Area. These measures will allow any potential impacts affecting as a result of the project to be avoided or mitigated for.

An over-arching mitigation measure will be for Galway County Council to draw up a Method Statement that includes detailed mitigation measures as outlined below in relation to the construction and operation of the proposed Greenway. This Method Statement will be strictly adhered to by Galway County Council staff and contractors involved in the works and will be overseen by Galway County Council's site representative/foreman. Galway County Council procedures will form the backbone of the Method Statement, supplemented by specific additional measures proposed below. The Method Statement will detail how these mitigation measures will be monitored for effectiveness by Galway County Council and independently by IFI and NPWS where specified. There will be ongoing consultation by Galway County Council and the relevant stakeholders as required.

Table 18.1 Schedule of Mitigation Measures

Hydrology and Drainage

No.	Stage	Description (Mitigation Measures)
1	**Pre-construction**	The following documents to be referenced for mitigation measures: - Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites. North Western Regional Fisheries Board, - CIRIA (Construction Industry Research and Information Association) guidance on '*Control of Water Pollution from Linear Construction Projects*' (CIRIA Report No. C648, 2006), and - Developing Your Stormwater Pollution Prevention Plan: A Guide for Construction Sites. EPA 833-R-060-04 May 2007.
2	**Construction**	**Drainage and Flooding** - To avoid any water logging in the lands adjacent to the river banks, it is proposed to maintain the existing surface water flow paths by providing regular breaks in any temporary or permanent stockpiles to ensure overland surface water flow is not restricted. - Any spoil stockpiles must be kept at a minimum reasonable distance (minimum 10m) from the river banks and river crossing areas, to prevent any blockage of flood water flow paths and prevent stockpiled spoil collapsing during high rainfall events. - Any impact of the proposed works on river water quality should be kept minimal. Measures proposed in **Chapter 10** should be adhered to, and - IFI should be informed prior to channel widening works commencing. All works will be carried out in accordance with the *Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites*, North Western Regional Fisheries Board and Galway County Council Environmental Management Protocols and Standard Operating Procedures (April 2011).
3	**Operation**	- Any impacts of the proposed Greenway Project to the rivers during the post construction stage are expected to be minimal
4	**Construction**	**Low-flows:** - There are no predicted impacts on the low-flow rate (reduction) in the rivers crossed by the Greenway during the construction stage of the works by maintaining the normal lateral surface water flow path to the rivers by providing regular breaks in any temporary or permanent spoil stockpiles to ensure overland surface water flow is not restricted.
5	**Operation**	- Any impacts of the proposed Greenway Project on the low-flow regime of the rivers during the post construction stage are expected to be minimal, since the proposed works will not include any deepening and widening of the existing low-flow channel of the river

Soils, Geology and Hydrogeology

No.	Stage	Description (Mitigation Measures)
6	**Construction**	- The potential negative impacts on geology and hydrogeology at construction stage are considered to be moderate to imperceptible. The existing design contains a number of mitigating measure which will ensure to minimise any impacts on the geology and hydrogeology including soil and water management. - All construction works should be completed in line with the following best practice guidelines to ensure the potential for accidental soil and groundwater contamination is minimised: • CIRIA (Construction Industry Research and Information Association) guidance on '*Control of Water Pollution from Construction Sites' (CIRIA Report No C532, 2001)* • CIRIA (Construction Industry Research and Information Association) guidance on '*Control of Water Pollution from Linear Construction Projects*' (CIRIA Report No. C648, 2006). - Spoil spreading methodology should be completed to ensure the soil is returned to the same quality of that present before the works were completed. - The construction of the new embankments should be completed to ensure slope stability based on in-situ material. The final design of these features should be approved by a geotechnical engineer to ensure slope failure will not occur. - The construction of the spoil heaps should be complete to ensure slope stability based on a mixture rock and soil type used in the construction. The final design of these features should be approved by a geotechnical engineer to ensure slope failure will not occur.
7	**Operation**	There are no operational mitigation measures with regards to soils, geology and hydrogeology.

Terrestrial and Aquatic Ecology

No.	Stage	Description (Mitigation Measures)
8	Construction	**Mitigation Measures for the control of Air Bourne Pollutants during Construction Activities** To protect sensitive receptors in the vicinity of the proposed works the following measures are proposed. Measures to mitigate the emission of dust due to construction activities include; i. control of vehicle access, ii. vehicle speed restrictions, iii. bed of gravel at site exit points to remove caked on dirt from tyres and tracks, iv. washing of equipment at the end of each work day, if they are to be moved off site, v. prevention of on-site burning, vi. hard surface roads should be wet swept to remove any deposited materials, vii. unsurfaced roads should be restricted to essential site traffic only, and viii. wheel-washing facilities should be located at all exits from the construction site.
9	Construction	**Mitigation Measures for Protection of Waterbodies** Standard pollution prevention control measures, as outlined below, will be employed where relevant when working in and near the watercourses affected by the proposed works to prevent the transport of deleterious substances to the designated sites and the associated water-dependent habitats and species. **General** - Prior to any works, all personnel involved with the proposed works will receive an on-site induction relating to operations within and adjacent to watercourses and the environmentally sensitive nature of the proximity of the Natura 2000 sites and re-emphasise the precautions that are required as well as the mitigation to be implemented. - Galway County Council will ensure that the engineer setting out the works is fully aware of the ecological constraints and mitigation requirements. - All matters relating to the works within the vicinity of the Natura 2000 sites or the vicinity of watercourses connected to the Natura 2000 sites will be reported on a regular basis to Galway County Council for ongoing review. - Any incident or observation of anything that may be considered as causing or likely to cause disturbance or damage to the cSACs will be reported to Galway County Council immediately. - Galway County Council will take immediate action to prevent or limit the impact and will notify the IFI/NPWS contact of the incident and the actions taken. - The amount of bare ground created by excavation and vegetation removal will be minimised. - It is envisaged that no in-stream works will be undertaken. However if in-stream works are required within the period 1st October to 1st May (inclusive) will only be undertaken with advanced approval of Inland Fisheries Ireland and the NPWS. **Pollution of watercourses** - All access scaffolding used within watercourses and all footwear/ waders, etc used within watercourses must be steam cleaned prior to arrival on site to prevent the spread of invasive aquatic species such as Zebra Mussel. A sign off sheet must be maintained to confirm cleaning. - The Contractor shall prevent any silting/erosion of water courses and pollution of the water that may adversely affect the quality or appearance of the water or cause obstruction or interference with the flow.

No.	Stage	Description (Mitigation Measures)
		- Establish site boundary markings to safeguard features of interest/value. - Tools and equipment are not to be cleaned in watercourses. - Chemicals used shall be stored in sealed containers in the site lockup prior to use. - The chemicals shall be applied in such a way as to avoid any spillage or leakage. Any and all excavated material is **NOT** to be temporarily stored adjacent to watercourses or karst features. - Temporary gangways should be erected if required between river banks and working platforms to avoid the need for walking through watercourses or any karst features. - Silt fencing will be erected when working adjacent to watercourses, or adjacent to drainage ditches. Double silt fencing will be provided at Freshwater Pearl Mussel sensitive watercrossing. **Fuel/Lubricant spillage from equipment** - Fuelling and lubrication will not be conducted within 50m of the watercourse. - Storage areas, machinery depots and site offices will be located at least 50m from the watercourse. - Foul drainage from the site offices and facilities will be properly treated and removed to a suitable treatment facility. - Spill kits will be made available close to streams and all staff will be properly trained on correct use. - All fuels, lubricants and hydraulic fluids will be kept in secure bunded areas at a minimum of 50m from the watercourse and the estevelle. The bunded area will accommodate 110% of the total capacity of the containers within it. Containers will be properly secured to prevent unauthorised access and misuse. An effective spillage procedure will be put in place with all staff properly briefed. Any waste oils or hydraulic fluids will be collected, stored in appropriate containers and disposed of offsite in an appropriate manner. - All plant shall be well maintained with any fuel or oil drips attended to on an ongoing basis. - Any minor spillage during this process will be cleaned up immediately. Should any incident occur, the situation will be dealt with and coordinated by the nearest supervisor who will be responsible for instructions by Galway County Council. **Concrete** Measures relating to concrete management will mostly apply to the refurbishment of the Bridges, although minimum concrete is expected to be required. - Wet concrete and cement are very alkaline and corrosive and can cause serious pollution to watercourses. - Disposal of raw or uncured waste concrete will be controlled to ensure that the watercourse or karst features will not be impacted. - Best practice in bulk-liquid concrete management addressing pouring and handling, secure shuttering / form-work, adequate curing times. - Where shuttering is used, measures should be put in place to prevent against shutter failure and control storage, handling and disposal of shutter oils. - Wash water from cleaning ready mix concrete lorries and mixers may be contaminated with cement and is therefore highly alkaline. Due to the size of the site and the proximity of sensitive watercourses, it is recommended that lorries and mixers are washed out of off site. - Cement dust must be controlled as it is alkaline and harmful to the surrounding ecology. Activities which result in the creation of cement dust will be controlled by dampening down areas. - The timing of the works must be specified and agreed with the IFI in relation to fish migration and spawning periods

No.	Stage	Description (Mitigation Measures)
		Culvert Installation - The pollution prevention controls to be adopted during the installation of culverts for the access road, are critical. If temporary or permanent diversion of any watercourses is required, this should be carried out prior to the removal of bankside vegetation. - Temporary stream diversions should be made on geotextile surfaces with a surface layer of coarse aggregate to hold it in place. Operation of machinery instream should be kept to an absolute minimum. All construction machinery operating instream should be mechanically sound to avoid leaks of oils, hydraulic fluid, etc. Machinery should be steam-cleaned and checked prior to commencement of instream works. Such works would preferentially be done during the dry period of the year when flows are low and the risk of suspended solids release is minimal. All dewatering flow should be passed through settlement ponds as detailed above, to remove sediments. **Noise and vibration from use of equipment** - All works at the watercourse should make a 'short-start' to activities to allow salmon and other fish to move away before the full intensity of works begins. - Work will be undertaken during daylight hours, starting no earlier than two hours after dawn and finishing no later than two hours before dusk, between March and October; and to start no earlier than one hour after dawn and finish one hour before dusk from November to February; and shall not continue for periods of more than 12 hours, to prevent disturbance to nocturnal species. - Specific measures in relation to protected species or habitats where they occur within the proposed works are detailed below. **Exhaust emissions from equipment** - Vehicles and plant shall be properly maintained and shall not be left idling when not in use. **Contaminated surface and/or groundwater** - Excess surface water runoff will be treated prior to entering the main channel of the Greenway and any drains or watercourses adjacent to proposed works. See **Pollution of watercourses** above **Invasive Species** Zebra Mussel has been recorded in the Lough Corrib catchment, therefore all necessary measures and precautions should be undertaken to prevent further spread, the following measure must be implemented; - All access scaffolding used within watercourses and all footwear/ waders, etc used within watercourses must be steam cleaned prior to arrival on site to prevent the spread of invasive aquatic species such as Zebra Mussel. A sign off sheet must be maintained to confirm cleaning, - The use of machinery and equipment that has been used in waters infested with Zebra Mussel should be avoided in order to prevent the further spread of this alien species. Should vehicles that have previously been used in Zebra Mussel infested waters be used on-site, they will be steam-cleaned according to Inland Fisheries Ireland guidelines and steam cleaned after use.
10	**Construction**	**Bats** Standard mitigation measures, as would apply to any development, should be adopted within the proposed work plan. For advice on general bat mitigation measures see Kelleher & Marnell 2007. These include limiting season of disturbance to reduce impacts on breeding species and implementing measures to prevent pollution and sedimentation into watercourses during construction works. **Bridges** Bridges that are scheduled for removal, whether previously surveyed for bats or not, shall be surveyed by a suitably qualified bat

No.	Stage	Description (Mitigation Measures)
		specialist immediately prior to construction works to determine if any bats are present as, due to the passage of time between survey and construction of the Greenway, bats may move into previously inspected bridges. If a roost is discovered in a structure to be removed then a sufficient number of *Schwegler* bat boxes shall be erected adjacent to the site one month prior to works to provide alternative roost sites for the bats. If a roost is found, a derogation licence for its removal must be applied for from the *National Parks and Wildlife Service* prior to works. Any work or demolition of structures identified as bat roosts or having the greatest potential for bat use shall preferably be undertaken within the winter months - November to March – as bat numbers are then known to be fewer in buildings. This would reduce impact to bats present on-site. Crevices beneath any existing bridge shall be retained or included in any new structure constructed on-site according to best practice bat mitigation measures for bridge works (see Billington and Norman 1997, Shiel 1999, Highways Agency 2001 and Joint Nature Conservation Committee 2004). Any re-pointing or pressure grouting of existing bridges shall only proceed after an inspection of the structure for bats. Any new bridge shall incorporate access points and roosting areas for bats. This can be easily done at no extra cost and without affecting the integrity of the structure. Studies have shown that bats use a variety of crevice sizes in bridges from 13mm to 70mm in width to 350mm to 1000mm in depth for summer roosts and deeper for winter hibernation sites. Ready-made artificial roost units are available for inclusion in such situations and shall be used where recommended/necessary. These units can be mounted in maintenance-free areas of the structures to avoid future disturbance from any necessary works. **Potential Bat Roosts In Trees** Where possible, treelines, woodland and mature trees that are located immediately adjacent to the Greenway works or are not directly impacted shall be avoided and retained intact. Overall impacts on these sites shall be reduced through modified design and sensitivity during construction. Any existing mature trees adjacent to the proposed works to be retained shall be protected from root damage by machinery by an exclusion zone of at least 7 metres or equivalent to canopy height. Such protected trees shall be fenced off by adequate temporary fencing prior to other works commencing. Mature trees, which are to be removed, shall ideally be felled in the period late August to late October, or early November, in order to avoid the disturbance of any roosting bats as per NRA guidelines. Tree felling shall be completed by Mid-November at the latest because bats roosting in trees are very vulnerable to disturbance during their hibernation period (November – April). Ivy- covered trees, once felled, shall be left intact on-site for 24 hours prior to disposal to allow any bats beneath the foliage to escape overnight. Landowners shall be advised that the timber from felled trees will remain for their use. This will prevent trees being felled prematurely.
11	**Construction**	**Badgers** No badger setts were found within the study area. However, some areas of impenetrable scrub were found. Ecological supervision is required during scrub clearance. If a badger sett is found and requires removal, a licence must be applied for to the NPWS, Species Protection Unit.

No.	Stage	Description (Mitigation Measures)
12	Construction	**Otters** No otter holts were recorded within the study area. However, otters are known to occur within most watercourses crossed by the proposed Greenway. The following steps significantly lessen the potential impacts of proposed works on otters. These include: 1. Leave bank vegetation untouched. This will ensure that unnecessary impacts are avoided, and overall potential impacts on otter will be minimised, and 2. Management of trees, if overhanging trees need management, use a saw or secateurs for removal, not an excavator. This will ensure that suitable riparian habitat, for otters, will not be removed unnecessarily, and potential destructive impacts on otter sites from machinery will be avoided.
13	Construction	**Birds** No scrub clearance, tree felling or other removal of vegetation should occur during the bird breeding season from 1st of March to 31st August.

Air and Climate

No.	Stage	Description (Mitigation Measures)
14	Construction	• All site preparation machinery will have speed restrictions on unsurfaced roads. • Regular maintenance of plant and equipment will take place including technical inspection of vehicles to ensure they will perform most efficiently. • Where possible temporary access roads within the temporary working area will be used to minimise traffic on the local road network, and • Engines will be turned off when not being used for prolonged periods of time

Noise and Vibration

No.	Stage	Description (Mitigation Measures)
15	Construction	• There will be no work outside of normal working hours. • Where practicable the use of quiet working methods will be selected and the most suitable plant will be selected for each activity, having due regard to the need for noise control. • All contractors will employ the best practicable means to minimise noise emissions and will be obliged to comply with the general recommendations of BS 5228, 1997. To this end all contractors will use “noise reduced” plant and/or will modify their construction methods so that noisy plant is unnecessary. • Where possible, position potentially noisy plant or operations as far as possible from a noise sensitive receptor to minimise the

No.	Stage	Description (Mitigation Measures)
		transmission of sound. • All mechanical plant used on site will be fitted with effective exhaust silencers and will be maintained in good working order. Where practicable, machines will be operated at low speeds and will be shut down when not in use. • Where practicable the number of machines in simultaneous operation will be minimised. • Plant and machinery used on-site will comply with the EC (Construction Plant and Equipment) Permissible, Noise Levels Regulations, 1988 (S.I. No. 320 of 1988). • All noise producing equipment will comply with S.I. No 632 of 2001 European Communities (Noise Emission by Equipment for Use Outdoors) Regulations 2001. • Machines in intermittent use shall be shut down in the intervening period between works or throttled down to a minimum. • Employees working on the construction site will be informed about the requirement to minimise noise and will undergo training on the following aspects: – The proper use and maintenance of tools and equipment; – The position of machinery on-site to reduce the emission of noise at the nearest noise sensitive receptors; – Avoidance of unnecessary noise when carrying out manual operations and when operating plant and equipment; – The use and maintenance of sound reduction equipment fitted to power pressure tools and machines, and – Reporting defective noise control equipment. • Cognisance will also be taken from the "Environmental Good Practice Site Guide" 2005 compiled by CIRIA and the UK Environmental Agency. This guide provides useful and practical information regarding the control of noise emissions at construction sites which can be applied to the proposed Greenway Project.

Archaeology, Architectural and Cultural Heritage

No.	Stage	Description (Mitigation Measures)
16	**Construction**	**Archaeology** • It is recommended that all ground disturbances, such as topsoil removal, which take place in areas that are undisturbed (alternate routes from ; Ch. 4+050 to Ch. 4+300, Ch. 19+950 to Ch. 20+050, Ch. 35+450 to Ch. 35+450, Ch. 46+200 to Ch. 46+550) be monitored by a suitably qualified archaeologist. Full provision should be made available for the resolution of any features or deposits that may be identified, should that be deemed the most appropriate manner in which to proceed. **Architecture** • It is recommended that all drainage culverts are retained with repairs made where necessary. However, should repair be required then every effort should be made to replicate building materials, finishing and style (i.e. brick, dressed masonry). Should significant repairs or replacement of culverts be required it is recommended that a full written and photographic record be made of the feature (with measurements), by a suitably qualified archaeologist or historic buildings expert. • It is recommended that all existing railway bridges, which will be incorporated into the proposed scheme, be subject to appropriate restoration (to include stone abutments where necessary, and steel girder frame). However, if this is not possible

No.	Stage	Description (Mitigation Measures)
		then it is recommended that a full written and photographic record, along with a measured survey, be made of the structure, by a suitably qualified archaeologist or historic buildings expert. This should be carried out before alteration goes ahead. In addition, it is recommended that in any replacement span structure, an effort is made to replicate the character of the existing railway bridge architecture. This should be carried out in consultation with a conservation architect or historic buildings advisor. • It is recommended that the railway embankment/cut is left intact and re-grading does not take place. However, should regarding be required it is recommended that any sections to be directly impacted upon are subject to topographical survey in order to fully record the feature. • Whilst direct/indirect impacts are not anticipated for the remaining built heritage along the scheme (due to the low impact nature of the development) the design element may be changed in the future, resulting in a change of impacts (especially along the N59 section, where extent of widening has not been defined). As such it is recommended that direct impacts on all 123 Built Heritage (BH) sites be avoided. Should impacts alter then further advice should be sought on appropriate mitigation measures. **Cultural Heritage** • No mitigation is deemed necessary. **Monitoring** The mitigation measures recommended above would also function as a monitoring system to allow the further assessment of the scale of the predicted impacts and the effectiveness of the recommended mitigation measures.

Landscape and Visuals

No.	Stage	Description (Mitigation Measures)
17	**Construction**	The physical and visual integration of the proposed Greenway Project and associated features into the surrounding landscape, through: • Replacement of topsoil in areas where topsoil will be stripped to spread spoil and topsoil replaced, and returned fit for purpose to landowners, e.g. in areas of improved agricultural grassland (GA1), • Reinstatement of woodlands and scrub were removed. Reinstate in a location which will not interfere with the capacity of the newly constructed Greenway, • Retention of the existing vegetation and earth banks to field boundaries as far as possible. • Site preparation areas and access route areas will be kept tidy at all times.

Human Beings and Material Assets

No.	Stage	Description (Mitigation Measures)
18	**Construction**	• Notify local road users of times that machinery will be transported to site. • Transport machinery during non- peak traffic hours. • Consult with Galway County Council Roads Department regarding road closures, diversions, traffic management measures required to implement Greenway Project works. • Notify local road users through public notice in a County paper. • Ensure that activities are restricted to working hours where working near sensitive receptors. • Notify local landowners through interference notices. • Replace lands adjacent to the river widening areas fit for purpose post Greenway Project works. • A range of measures to be put in place as per **Chapters 10** are also relevant to mitigate impacts to human beings and material assets. • Retention of the existing vegetation and earth banks to field boundaries as far as possible. • Site preparation areas and compound areas will be kept tidy at all times. • Follow Galway County Councils Health and Safety Policies and Statements at all times during works.

Traffic

No.	Stage	Description (Mitigation Measures)
19	**Construction**	• Notify local road users of time that machinery will be transported to site • Transport machinery during non- peak traffic hours • Don't transport machinery in convoy • Notify local road users of time that aggregate will be transport to site • Transport materials during non- peak traffic hours • Discussion and agreement with Galway County Council's Roads and Planning Department required. • Road Closures to be placed as Public Notices in a prominent paper to inform the public

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