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Comhairle Contae Chill Dara
Kildare County Council

MAYNOOTH TO LEIXLIP PROJECT

Maynooth to Leixlip Project

Phase 2 Options Report

Volume C Appendices

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Comhairle Contae Átha Cliath Theas
South Dublin County Council

NTA
Údarás Náisiúnta Iompair
National Transport Authority

TII
Bonneagar Iompair Éireann

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Appendices

MAYNOOTH TO LEIXLIP PROJECT

Appendix 2.1

Constraints Report

Kildare County Council

Maynooth to Leixlip Project

Phase 2 Constraints Study

272691-ARUP-02-OS-RP-ZM-000001

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4 Constraints Study

4.1 Introduction

A Constraints Study was undertaken in order to identify constraints within the study area, so as to inform the development of option(s) for potential transport solution(s) for the Maynooth to Leixlip Project.

The objective of the Constraints Study is to identify the international, national, regional, county and local issues that must be taken into account when planning and designing the project so that the phases which follow (Options Selection and Design and Environmental Evaluation) can be properly informed.

This Constraints Chapter has been prepared in accordance with the *TII Project Management Guidelines (PE-PMG-02041)* and the *TII Project Manager's Manual for Major National Road Projects (PE-PMG-02042).* It has been compiled based on desk studies, site survey work (where appropriate) and consultation with stakeholders.

The constraints are divided into three principal categories:

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

This constraints chapter has also been prepared in accordance with the *Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports* (EPA, 2017) and *Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report* (EC, 2017).

4.2 Study Area

The boundary for the study area was identified to ensure a suitable study area for the examination of alternatives to transportation solutions, the identification of key constraints and development of feasible options for a transportation intervention. It was also identified to carry out a systematic assessment of these options leading to the selection of a preferred option(s) which will form the basis for the detailed design to follow.

The development of the study area was influenced by a number of factors, including:

- Topography;
- Existing M4/N4 corridor tie-in locations;
- Extent of public transport infrastructure and catchment for same;

- Environmental criteria; and
- Potential zone of influence of project options and impacts.

The study area for the Maynooth to Leixlip Project is presented in Figure 4.1. The study area extends across two counties, with the greater part of the area located in County Kildare and the remainder in County Dublin. The overall boundary encompasses an area of approximately 17.5km^2 extending from Lucan in County Dublin to west of Maynooth in County Kildare. The study area has been refined from Phase 1 to Phase 2 as it is deemed that there is no merit in having a study area encompassing areas that options and/or alternatives are not envisaged.

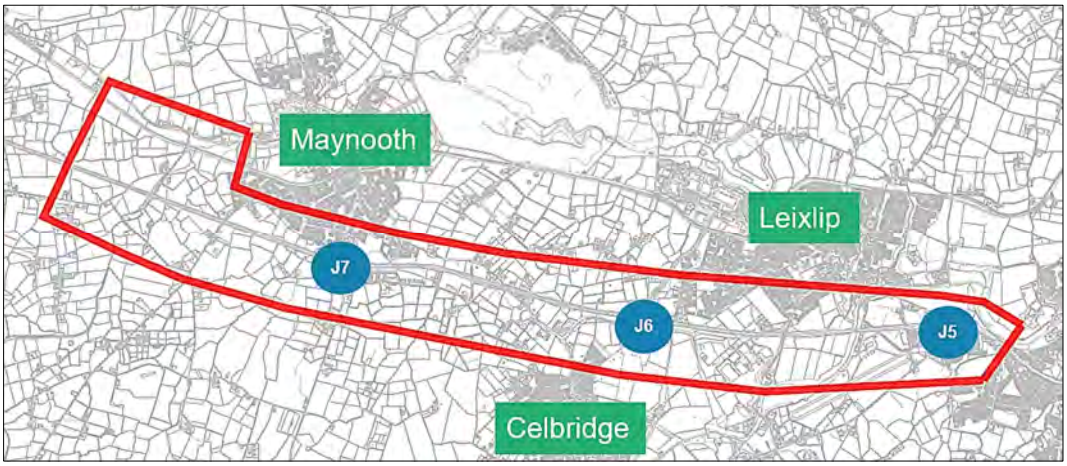

Figure 4.1: Proposed Study Area (© Google Map Data ©2023 Tele Atlas)

4.3 Public Consultation

The information presented below provides a summary representation of the feedback received during the consultation period. Feedback is not presented in order of importance. The submissions received raised issues and topics across a very broad spectrum, including inter alia environmental concerns, local and community issues, amenities, property and land impacts and personal matters. It is not intended to convey particular personal concerns raised within this report and instead, submissions have been reviewed to establish principal themes and topics identified therein.

Junction 6 Celbridge was brought to the attention of the project team numerous times in relation to the safety of vulnerable road users. It was noted that it is difficult to make safe movements through Junction 6 due to the high speed of vehicular traffic and the current configuration of vulnerable road user facilities.

Junction 7 Maynooth was brought to the attention of the project team numerous times in relation to capacity and traffic issues throughout the morning and evening peak times. Additional concerns were raised regarding the safety of vulnerable road users navigating through this junction.

Numerous members of the public commented on the noise levels emitted from the M4 mainline and requested that low road surfacing and noise barriers were utilised to minimise noise pollution.

General concerns for the rising population of the surrounding areas and the road network capability of coping with rising population and associated increased vehicular traffic levels.

The bus priority measures received very positive feedback throughout the public consultation process with members of the public noting infrastructure that could support improved bus services are paramount to the successful implementation of any improvement measures.

Concerns were raised over the Maynooth Local Area Plan orbital road that was indicated on the Junction 7 Maynooth options graphics. These concerns related to the potential proximity of a new road to residents, such as Straffan Court.

Business and landowners in the vicinity of Junction 7 Maynooth noted their dissatisfaction with a potential new junction, including converting the existing Junction 7 Maynooth to an overbridge, due to a potential reduction in incidental footfall to business premises along with the disturbance that new link roads in the vicinity of their dwelling houses may cause.

4.4 Biodiversity

4.4.1 Introduction

This section describes the biodiversity (flora and fauna) constraints identified within the study area for the Maynooth to Leixlip Project. This section should be read in conjunction with the Biodiversity Constraints Figures 4.4.1 to 4.4.12.

Biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems. Alongside the term "biodiversity", the terms "ecology" and "ecological" are also used throughout this section of the report as a broader term to refer to the relationships of biodiversity receptors to one another and to their environment.

Sections 4.4.2 outlines the relevant legislative policies and guidance documents, while Section 4.4.3 describes the methodologies and sources of information that were used to carry out the constraints study. Section 4.4.4 describes the existing environment within the study area, through a combination of field and desk study results. A summary is presented in Section 4.4.5 and references are listed in Section 4.4.6.

4.4.2 Relevant Legislation, Policy Documents and Plans and Guidance Documents

The collation of baseline biodiversity data and the preparation of this section has had regard to the following legislation, policy documents and plans, and guidance documents.

Legislation

- Council Directive 92/43/EEC of the 21st of May 1992 on the conservation of natural habitats and of wild fauna and flora (hereafter referred to as 'the Habitats Directive').
- Directive 2009/147/EC of the European Parliament and of the Council of the 30th of November 2009 on the conservation of wild birds (hereafter referred to as 'the Birds Directive').
- Directive 2014/52/EU of the European Parliament and of the Council of the 16th of April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (hereafter referred to as 'the EIA Directive').
- European Communities (Birds and Natural Habitats) Regulations, 2011 (SI No. 477 of 2011) (as amended), (hereafter referred to as 'the Birds and Habitats Regulations').
- Planning & Development Acts 2000 to 2021 (hereafter referred to as 'the Planning and Development Acts').
- Wildlife Acts 1976 to 2020 (hereafter referred to as 'the Wildlife Acts').

- Flora (Protection) Order, 2015 (SI No. 356 of 2015).
- Fisheries (Consolidation) Act, 1959, as amended (hereafter referred to as 'the Fisheries Act').

Policies and Plans

- National Biodiversity Action Plan 2017 – 2021[1]
- River Basin Management Plan for Ireland 2018 – 2021[2]
- Kildare County Development Plan 2017-2023[3]
- South Dublin County Development Plan 2016-2022[4]
- Leixlip Local Area Plan 2020-2023[5]
- Maynooth Local Area Plan 2013-2019[6]
- Celbridge Local Area Plan 2017-2023[7]
- County Kildare Biodiversity Action Plan 2009-2014[8]
- County Kildare Heritage Plan 2019 – 2025[9]

Guidance Documents

- Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports[10]
- Draft Advice Notes for Preparing Environmental Impact Statements[11]
- Guidelines on the Information to be contained in Environmental Impact Statements[12]
- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements[13]

[1] Department of Culture, Heritage and the Gaeltacht (2017) National Biodiversity Action Plan 2017 – 2021.
[2] Department of Housing, Planning and Local Government (2018) River Basin Management Plan for Ireland 2018-2021.
[3] Kildare County Council (2017) Kildare County Development Plan 2017-2023.
[4] South Dublin County Council (2016) South Dublin County Development Plan 2016-2022.
[5] Kildare County Council (2020) Leixlip Local Area Plan 2020-2023.
[6] Kildare County Council (2013) Maynooth Local Area Plan 2013-2019.
[7] Kildare County Council (2017) Celbridge Local Area Plan 2017-2023.
[8] Kildare County Council (2009) County Kildare Biodiversity Action Plan 2009 – 2014.
[9] Kildare County Council (2019) County Kildare Heritage Plan 2019 – 2025.
[10] Environmental Protection Agency (2017) Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports.
[11] Environmental Protection Agency (2015) Draft Advice Notes for Preparing Environmental Impact Statements.
[12] Environmental Protection Agency (2002) Guidelines on the Information to be contained in Environmental Impact Statements.
[13] Environmental Protection Agency (2003) *Advice Notes on Current Practice in the Preparation of Environmental Impact Statements*.

- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine[14]
- Environmental Impact Assessment of National Road Schemes – A Practical Guide[15]
- Guidelines for Assessment of Ecological Impacts of National Road Schemes[16]
- Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes[17]
- Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes[18]
- Circular NPWS 1/10 & PSSP 2/10 Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities[19]
- Circular Letter PD 2/07 and NPWS 1/07 Compliance Conditions in respect of Developments requiring (1) Environmental Impact Assessment (EIA); or (2) having potential impacts on Natura 2000 sites[20]
- Circular Letter NPWS 2/07 Guidance on compliance with Regulation 23 of the Habitats Regulations 1997 – strict protection of certain species/applications for derogation licences[21]

4.4.3 Methodology

4.4.3.1 Desk Study and Data Sources

The desktop study involved the collection and review of relevant published and unpublished sources of biodiversity information and data.

The following information sources and datasets were reviewed as part of this constraints study:

[14] Chartered Institute of Ecology and Environmental Management (2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine*.
[15] National Roads Authority (2008) *Environmental Impact Assessment of National Road Schemes – A Practical Guide*.
[16] National Roads Authority (2009) *Guidelines for Assessment of Ecological Impacts of National Road Schemes*.
[17] National Roads Authority (2008) *Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes*.
[18] National Roads Authority (2006) *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes*.
[19] National Parks & Wildlife Service (2010) *Circular NPWS 1/10 & PSSP 2/10 Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities*.
[20] National Parks & Wildlife Service (2007) *Circular Letter PD 2/07 and NPWS 1/07 Compliance Conditions in respect of Developments requiring (1) Environmental Impact Assessment (EIA); or (2) having potential impacts on Natura 2000 sites*.
[21] National Parks & Wildlife Service (2007) *Circular Letter NPWS 2/07 Guidance on compliance with Regulation 23 of the Habitats Regulations 1997 – strict protection of certain species/applications for derogation licences*.

- Online data available from the National Parks and Wildlife Service (NPWS) on Natura 2000 sites (hereafter referred to as European sites)[22] and other designated sites protected at the national level (i.e. Natural Heritage Areas, or NHAs, and proposed Natural Heritage Areas, or pNHAs).[23]
- Records of rare and protected species from the NPWS for the 10km grid squares [N93 and O03].[24]
- National Biodiversity Data Centre (NBDC) Search of Online Database for 10km Grid Squares [N93 and O03].[25]
- Orthophotography[26]. Recent orthophotographs were reviewed and interpreted to initially identify and define sites of potential biodiversity value for the habitats present (hereafter referred to as 'ecological sites'). The final definition, description and evaluation of these ecological sites also takes into account the other habitat information collated as part of the desk study.

Habitat GIS datasets available to download from the NPWS website, as follows:

- Ancient and Long-Established Woodland (updated 2012);[27]
- National Survey of Native Woodlands 2003 - 2008 (updated 2012); [28]
- Article 17 Data for Annex I habitats (2019).[29]

[22] European sites are defined under the Habitats Directive (Article 3) as a European ecological network of Special Areas of Conservation and Special Protection Areas, composed of sites which host the natural habitat types listed in Annex I and habitats of the protected species listed in Annex II. The aim of the network is to aid the long-term survival of Europe's most vulnerable and threatened species and habitats. In Ireland these sites are designated as European sites – defined under the Planning Acts and/or Birds and Habitats Regulations as (a) a candidate site of Community importance, (b) a site of Community importance, (c) a candidate special are of conservation, (d) a special area of conservation, (e) a candidate special protection area, or (f) a special protection area. They are commonly referred to in Ireland as Special Areas of Conservation (SACs) and Special Protection Areas (SPAs).

[23] NPWS (2020) Protected Sites in Ireland. Available from: www.npws.ie/protectedsites/ and http://webgis.npws.ie/npwsviewer/ [Accessed 23 November 2020]

[24] Unpublished records and records published on the NPWS (2020) Online Map Viewer. Available from: http://webgis.npws.ie/npwsviewer/. And the Flora Protection Order bryophyte map viewer available from: http://dahg.maps.arcgis.com/apps/webappviewer/index.html?id=71f8df33693f48edbb70369d7fb26b7e [Accessed 25 January 2021]

[25] National Biodiversity Data Centre (2020) Online Database. Available from: https://maps.biodiversityireland.ie/Map [Accessed 25 January 2021]

[26] Online orthophotography available via Google Maps (https://www.google.com/maps) and Bing Maps (https://www.bing.com/maps) [Accessed 21 January 2021], and Ordnance Survey Ireland orthophotography.

[27] NPWS (2012) GIS Dataset for Ancient and Long-Established Woodland. Available from: https://www.npws.ie/maps-and-data/habitat-and-species-data [Accessed 23 November 2020]

[28] NPWS (2012) GIS Dataset for the National Survey of Native Woodland 2003-2008. Available from: https://www.npws.ie/maps-and-data/habitat-and-species-data [Accessed 23 November 2020]

[29] NPWS (2019) Article 17 Data for Annex I habitats. Available from: https://www.npws.ie/maps-and-data/habitat-and-species-data/article-17 [Accessed 23 November 2020]

Spatial data relating to watercourses and lakes, downloaded from the Environmental Protection Agency's (EPA) online Geo Portal[30], specifically the following datasets:

- Water Framework Directive River Water Bodies – 27th of April 2017; and
- New Lake Water Bodies – 19th of February 2016.

Other available sources of habitat or species information, specifically the following publications:

- Online map of Irish wetlands.[31]

4.4.3.2 Consultation

The following organisations/individuals with relevance to collating information on biodiversity constraints were consulted via letter as part of the constraints study:

- National Parks and Wildlife Service (NPWS) [via the Scientific Unit] [response received on the 26th of January 2021];
- Inland Fisheries Ireland (IFI) [response received on 25th January 2021]; and
- Bat Conservation Ireland (BCI) - roost information obtained from BCI database.

4.4.3.3 Field Surveys

A walkover survey of accessible ecological sites that lie within the study area was undertaken by Scott Cawley Ltd. in April 2021 to verify the orthophotography interpretation and selection of ecological sites, to refine site boundaries and to capture additional ecological information not identified during the desk study.

Where access allowed, the site was walked, and notes taken on the habitats present. Where access was limited, ecological sites were viewed from the nearest accessible vantage point using binoculars. In some cases, due to the local topography or limited access, views of ecological sites were restricted. However, assumptions have been made on the value of those ecological sites based on orthophotography interpretation and local information gathered during the field surveys and desk study.

Where possible habitat types were classified using *A Guide to Habitats in Ireland*[32]. The likelihood/potential for Annex I habitat types was inferred where possible based on the professional judgement of the surveyor, with reference to the *Interpretation manual of European Union Habitats EUR 28*[33] and definitions of Annex I habitat types published in the corresponding national habitat survey reports

[30] EPA Water Framework Directive (WFD) river water bodies and lake water bodies datasets. Available from: http://gis.epa.ie/GetData/Download [Accessed 23 November 2020]

[31] Available from: http://www.wetlandsurveysireland.com/wetlands/map-of-irish-wetlands--/map-of-irish-wetlands---map/index.html [Accessed 25 January 2021]

[32] Fossitt, J.A. (2000) *A Guide to Habitats in Ireland*. Heritage Council, Kilkenny.

[33] CEC. (Commission of the European Communities) (2013) *Interpretation manual of European Union Habitats EUR28*. European Commission, DG Environment.

and NPWS wildlife manuals, as applicable. The nomenclature for Annex I habitats follows that of the *Interpretation manual of European Union Habitats EUR28*[33] with abbreviated names after those used in *The Status of EU Protected Habitats and Species in Ireland. Volume 1: Summary Overview*[34]. A precautionary approach was adopted with regards to the identification of the potential presence of Annex I habitats within an ecological site.

Ecological sites have been valued with regard to ecological valuation set out in *Guidelines for Assessment of Ecological Impacts of National Road Schemes*[16] and *Guidelines for Ecological Impact Assessment in the UK and Ireland; Terrestrial, Freshwater, Coastal and Marine*[14].

The overall ecological valuation for each of the ecological sites was based upon the highest value receptor known to be present, or potentially present, within the ecological site at the time of this study.

All Annex I habitats that lie outside of European sites, are valued as being of national importance, given that these habitats are of high conservation concern. However, priority Annex I habitat types are valued as being of international importance given that they are of the highest conservation concern at a European level (i.e. natural habitat types in danger of disappearance[35]).

4.4.4 Existing Environment

4.4.4.1 Desktop Study

Designated Sites

European and Nationally Designated Sites

Special Areas of Conservation (SACs) are designated under the EC Habitats Directive (92/43/EEC) for the protection of habitats listed on Annex I and/or species listed on Annex II of the Directive. Special Protection Areas (SPAs) are designated under the Birds Directive (2009/147/EC) for the protection of bird species listed on Annex I of the Directive, regularly occurring populations of migratory species (such as ducks, geese or waders), and areas of international importance for migratory birds.

Natural Heritage Areas (NHAs) are designated under the Wildlife Acts to protect habitats, species or geology of national importance. In addition to NHAs there are proposed NHAs (referred to as pNHAs), which are also sites of significance for wildlife and habitats and were published on a non-statutory basis in 1995 but have not since been statutorily proposed or designated. Proposed NHAs are offered protection in the interim period under county or city development plans which

[34] NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 1: Summary Overview. Unpublished NPWS report.
[35] From the definition of "*priority natural habitat types*" in Article 1(d) of the Habitats Directive.

requires that planning authorities give due regard to their protection in planning policies and decisions. [36]

European sites such as SACs and SPAs are of international importance from a biodiversity perspective, whilst NHAs and pNHAs are regarded as being of national importance.

Several designated sites, including those protected at a European and national level, are located within, or downstream of, the study area. These designated sites are listed in Table 4.1 along with a brief description of the features for which the sites are designated. Designated sites within the study area are shown in Figures 4.4.1 to 4.4.12.

There are no SPA or NHA sites located within, or in the immediate vicinity of, the study area. There is one SAC site located immediately adjacent to the study area (a small section of the SAC intersects with the study area boundary in the grounds of Leixlip Castle) and three pNHA sites are located within the study area boundary.

The nearest SAC site, as referenced above, is the Rye Water Valley/ Carton SAC, which is located immediately adjacent to the northern study area boundary, with a small section of the SAC being located within the study area boundary at Leixlip Demesne. There are also two SAC sites at greater distances further downstream of the study area in Dublin Bay, namely South Dublin Bay SAC and North Dublin Bay SAC.

The nearest SPA sites to the study area are South Dublin Bay and River Tolka Estuary SPA and North Bull Island SPA, both of which lie c.25km downstream.

The nearest NHA site to the study area is Hodgestown Bog NHA which is located c.11.5km to the southwest of the study area. There are three pNHA sites within the study area: Royal Canal pNHA and Liffey Valley pNHA. There are also three pNHA sites downstream of the study area in Dublin Bay: South Dublin Bay pNHA, North Dublin Bay pNHA and Booterstown Marsh pNHA.

Site Name [Code]	Ecological Features for which the Sites are Designated (*=Priority Annex I Habitat)	Location	Connectivity to Study Area
Special Areas of Conservation (SACs)			
Rye Water Valley/Carton SAC [001398]	Petrifying springs with tufa formation (Cratoneurion) [7220]* *Vertigo angustior* (Narrow-mouthed Whorl Snail) [1014] *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] NPWS (2020) *Conservation objectives for Rye Water Valley/Carton SAC [001398].*	Located within/Intersects the boundary of the study area at Leixlip Demesne	Potential hydrogeological connectivity between the Study Area and the designated site.

[36] For example, Objective 66 of the Leitrim County Development Plan 2015-2021 states 'It is an objective of the Council to protect all Natural Heritage Areas and those proposed for designation either before or during the lifetime of this plan so as to recognise that the process of designation of such sites is ongoing, with new sites being added and boundaries of existing sites being adjusted, as better information becomes available.

Site Name [Code]	Ecological Features for which the Sites are Designated (*=Priority Annex I Habitat)	Location	Connectivity to Study Area
	Generic Version 7.0. Department of Culture, Heritage and the Gaeltacht.		
Ballynafagh Bog SAC [000391]	Active raised bogs [7110] Degraded raised bogs still capable of natural regeneration [7120] Depressions on peat substrates of the Rhynchosporion [7150] NPWS (2015) *Conservation Objectives: Ballynafagh Bog SAC 000391. Version 1*. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.	c.11.5km south-west of the study area	No hydrological or hydrogeological connectivity between the Study Area and designated site. Designated site is located within a different groundwater body (i.e. Kildare GWB).
Ballynafagh Lake SAC [001387]	Alkaline fens [7230] *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016] *Euphydryas aurinia* (Marsh Fritillary) [1065] NPWS (2020) *Conservation objectives for Ballynafagh Lake SAC [001387]*. Generic Version 7.0. Department of Culture, Heritage and the Gaeltacht.	c.11.5km south-west of the study area	No hydrological or hydrogeological connectivity between the Study Area and designated site. Designated site is located within a different groundwater body (i.e. Kildare GWB).
Glenasmole Valley SAC [001209]	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) [6210] *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) [6410] Petrifying springs with tufa formation (Cratoneurion) [7220]* NPWS (2020) *Conservation objectives for Glenasmole Valley SAC [001209]*. Generic Version 7.0. Department of Culture, Heritage and the Gaeltacht.	c.12.3km south-east of the study area	No hydrological or hydrogeological connectivity between the Study Area and designated site. Designated site is located within a different groundwater body (i.e. Kilcullen GWB).
Wicklow Mountains SAC [002122]	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) [3110] Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletalia uniflorae and/or Isoeto-Nanojuncetea [3130]	c.14km south-east of the study area	No hydrological or hydrogeological connectivity between the Study Area and designated site. Designated site is located within a different groundwater

Site Name [Code]	Ecological Features for which the Sites are Designated (*=Priority Annex I Habitat)	Location	Connectivity to Study Area
	Natural dystrophic lakes and ponds [3160] Northern Atlantic wet heaths with *Erica tetralix* [4010] European dry heaths [4030] Alpine and Boreal heaths [4060] Calaminarian grasslands of the Violetalia calaminariae [6130] Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230] Blanket bogs (* if active bog) [7130] Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani) [8110] Calcareous rocky slopes with chasmophytic vegetation [8210] Siliceous rocky slopes with chasmophytic vegetation [8220] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] *Lutra lutra* (Otter) [1355] NPWS (2017) *Conservation Objectives: Wicklow Mountains SAC 002122. Version 1*. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.		body (i.e. Kilcullen GWB).
South Dublin Bay SAC [000210]	Mudflats and sandflats not covered by seawater at low tide [1140] Annual vegetation of drift lines [1210] *Salicornia* and other annuals colonising mud and sand [1310] Embryonic shifting dunes [2110] NPWS (2013) *Conservation Objectives: South Dublin Bay SAC 000210. Version 1*. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.	c.16.5km east of the study area	Hydrological connectivity between the Study Area and the designated site via the River Liffey.
North Dublin Bay SAC [000206]	Mudflats and sandflats not covered by seawater at low tide [1140]	c.18.4km east of the study area	Hydrological connectivity between the Study Area and

Site Name [Code]	Ecological Features for which the Sites are Designated (*=Priority Annex I Habitat)	Location	Connectivity to Study Area
	Annual vegetation of drift lines [1210] *Salicornia* and other annuals colonising mud and sand [1310] Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] Mediterranean salt meadows (Juncetalia maritimi) [1410] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]* Humid dune slacks [2190] *Petalophyllum ralfsii* (Petalwort) [1395] NPWS (2013) *Conservation Objectives: North Dublin Bay SAC 000206. Version 1.* National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.		the designated site via the River Liffey.
Special Protection Areas (SPAs)			
South Dublin Bay and River Tolka Estuary SPA [004024]	Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Oystercatcher (*Haematopus ostralegus*) [A130] Ringed Plover (*Charadrius hiaticula*) [A137] Grey Plover (*Pluvialis squatarola*) [A141] Knot (*Calidris canutus*) [A143] Sanderling (*Calidris alba*) [A144] Dunlin (*Calidris alpina*) [A149] Bar-tailed Godwit (*Limosa lapponica*) [A157] Redshank (*Tringa totanus*) [A162] Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Roseate Tern (*Sterna dougallii*) [A192] Common Tern (*Sterna hirundo*) [A193] Arctic Tern (*Sterna paradisaea*) [A194]	c.15.3km east of the study area	Hydrological connectivity between the Study Area and the designated site via the River Liffey.

Site Name [Code]	Ecological Features for which the Sites are Designated (*=Priority Annex I Habitat)	Location	Connectivity to Study Area
	Wetland and Waterbirds [A999] NPWS (2015*) Conservation Objectives: South Dublin Bay and River Tolka Estuary SPA 004024. Version 1*. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.		
North Bull Island SPA [004006]	Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Shelduck (*Tadorna tadorna*) [A048] Teal (*Anas crecca*) [A052] Pintail (*Anas acuta*) [A054] Shoveler (*Anas clypeata*) [A056] Oystercatcher (*Haematopus ostralegus*) [A130] Golden Plover (*Pluvialis apricaria*) [A140] Grey Plover (*Pluvialis squatarola*) [A141] Knot (*Calidris canutus*) [A143] Sanderling (*Calidris alba*) [A144] Dunlin (*Calidris alpina*) [A149] Black-tailed Godwit (*Limosa limosa*) [A156] Bar-tailed Godwit (*Limosa lapponica*) [A157] Curlew (*Numenius arquata*) [A160] Redshank (*Tringa totanus*) [A162] Turnstone (*Arenaria interpres*) [A169] Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Wetland and Waterbirds [A999] NPWS (2015) *Conservation Objectives: North Bull Island SPA 004006. Version 1*. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.	c.18.4km east of the study area	Hydrological connectivity between the Study Area and the designated site via the River Liffey.
Proposed Natural Heritage Areas (pNHAs)			
Royal Canal pNHA [002103]	Man-made waterway linking the River Liffey at Dublin to the River Shannon near Tarmonbarry. Diversity of species and linear habitats.	within the boundary of the study area	Located within the boundary of the Study Area. Potential hydrogeological connectivity between

Site Name [Code]	Ecological Features for which the Sites are Designated (*=Priority Annex I Habitat)	Location	Connectivity to Study Area
	NPWS (2009) *Site Synopsis Royal Canal pNHA*		the Study Area and the designated site.
Rye Water Valley/Carton pNHA [001398]	[Site synopsis not available] See also Rye Water Valley/Carton SAC above	within the boundary of the study area	Located within the boundary of the Study Area. Potential hydrogeological connectivity between the Study Area and the designated site.
Liffey Valley pNHA [000128]	This site overlaps in part with the Liffey Valley Special Amenity Areas Order 1990. The site is considered important because of the diversity of the habitats within the site, ranging from aquatic to terrestrial. A number of rare and threatened plant species have been recorded from the site. NPWS (2009) *Site Synopsis Liffey Valley pNHA*	within the boundary of the study area	Located within the boundary of the Study Area. Potential hydrogeological connectivity between the Study Area and the designated site.
Grand Canal pNHA [002104]	Man-made waterway linking the River Liffey at Dublin with the Shannon at Shannon Harbour and the Barrow at Athy. Diversity of species and linear habitats. NPWS (2009) *Site Synopsis Grand Canal pNHA*	c.2.4km south of the study area	Located 2.4km from the boundary of the Study Area. Potential hydrogeological connectivity between the Study Area and the designated site as both lie within the Dublin GWB
Donadea Wood pNHA [001391]	This site is of scientific interest as, although highly managed, it has a significant proportion of deciduous trees and parts of the site have been wooded for a long period. The site is also notable for the presence of two rare species of Myxomycete fungus, namely *Diderma chondrioderma* and *Licea testudinacea*,. NPWS (2009) *Site Synopsis Donadea Wood pNHA*	c.6.4km south-west of the study area	Located 6.4km from the boundary of the Study Area. Potential hydrogeological connectivity between the Study Area and the designated site as both lie within the Dublin GWB
Slade Of Saggart And Crooksling Glen pNHA [000211]	The site includes a good example of a wooded river valley and a small wetland system. The presence of a rare plant, a rare invertebrate and a variety of wildfowl species adds to the interest of the site. NPWS (2009) *Site Synopsis Slade of Saggart and Crooksling Glen pNHA*	c.9.8km south of the study area	No hydrological or hydrogeological connectivity between the Study Area and designated site. Designated site is located within a different groundwater body (i.e. Kilcullen GWB).

Site Name [Code]	Ecological Features for which the Sites are Designated (*=Priority Annex I Habitat)	Location	Connectivity to Study Area
Lugmore Glen pNHA [001212]	A fine example of a wooded glen with a good representation of woodland plants. This type of semi natural habitat is now scarce in Co. Dublin. The presence of a rare plant species adds to the interest of the site. NPWS (2009) *Site Synopsis Lugmore Glen pNHA*	c.9.8km south-east of the study area	No hydrological or hydrogeological connectivity between the Study Area and designated site. Designated site is located within a different groundwater body (i.e. Kilcullen GWB).
Dodder Valley pNHA [000991]	The site represents the last remaining stretch of natural riverbank vegetation on the River Dodder in the built-up Greater Dublin Area. NPWS (2009) *Site Synopsis Dodder Valley pNHA*	c.11.1km south-east of the study area	Located 11km from the boundary of the Study Area. Potential hydrogeological connectivity between the Study Area and the designated site as both lie within the Dublin GWB.
Ballynafagh Bog pNHA [000391]	[Site synopsis not available] See also Ballynafagh Bog SAC above	c.11.5km south-west of the study area	No hydrological or hydrogeological connectivity between the Study Area and designated site. Designated site is located within a different groundwater body (i.e. Kildare GWB).
Ballynafagh Lake pNHA [001387]	[Site synopsis not available] See also Ballynafagh Lake SAC above	c.11.5km east of the study area	No hydrological or hydrogeological connectivity between the Study Area and designated site. Designated site is located within a different groundwater body (i.e. Kildare GWB).
Glenasmole Valley pNHA [001209]	[Site synopsis not available] See also Glenasmole Valley SAC above	c.12.3km south-east of the study area	No hydrological or hydrogeological connectivity between the Study Area and designated site. Designated site is located within a different groundwater body (i.e. Kilcullen GWB).

Site Name [Code]	Ecological Features for which the Sites are Designated (*=Priority Annex I Habitat)	Location	Connectivity to Study Area
Kilteel Wood pNHA [001394]	This site is a fine example of a largely deciduous wood. Its elevated position gives it scenic value. NPWS (2009) *Site Synopsis Kilteel Wood pNHA*	c.12.7km south of the study area	No hydrological or hydrogeological connectivity between the Study Area and designated site. Designated site is located within a different groundwater body.
Rathmoylan Esker pNHA [000557]	One of the few remnants of wooded esker in Ireland, this site is of high ecological and geomorphological interest. Rathmoylan is also one of the most easterly wooded eskers in Ireland. NPWS (2009) *Site Synopsis Rathmoylan Esker pNHA*	c.14km north-west of the study area	No hydrological or hydrogeological connectivity between the Study Area and designated site. Designated site is located within a different groundwater body.
Santry Demesne pNHA [000178]	The primary importance of this site is that it contains a legally protected plant species Hairy St. John's-wort *Hypericum hirsutum.* NPWS (2009) *Site Synopsis Santry Demesne pNHA*	c.14.4km north-east of the study area	No hydrological or hydrogeological connectivity between the Study Area and designated site. Designated site is located within a different groundwater body.
North Dublin Bay pNHA [000206]	[Site synopsis not available] See also North Dublin Bay SAC above	c.15km east of the study area	Hydrological connectivity between the Study Area and the designated site via the River Liffey.
South Dublin Bay pNHA [000210]	[Site synopsis not available] See also South Dublin Bay SAC above	c.16.5km east of the study area	Hydrological connectivity between the Study Area and the designated site via the River Liffey
Booterstown Marsh pNHA [001205]	Booterstown Marsh is the only saltmarsh in south Dublin and, despite some concerns about the increasing salinity of the site, it remains a valuable habitat for many birds as well as containing a diverse flora including the protected plant Borrer's Saltmarsh grass *Puccinellia fasciculata*. NPWS (2009) *Site Synopsis Booterstown Marsh pNHA*	c.17.9km east of the study area	Hydrological connectivity between the Study Area and the designated site via the River Liffey and Dublin Bay.
Natural Heritage Areas (NHAs)			

Site Name [Code]	Ecological Features for which the Sites are Designated (*=Priority Annex I Habitat)	Location	Connectivity to Study Area
Hodgestown Bog NHA [001393]	Peatlands [4] Hodgestown Bog NHA is a site of considerable conservation significance comprising as it does a raised bog, a rare habitat in the E.U. and one that is becoming increasingly scarce and under threat in Ireland. This site supports a good diversity of raised bog microhabitats, including hummocks. NPWS (2002) *Site Synopsis Hodgestown Bog NHA*	c.11.5km south-west of the study area	No hydrological or hydrogeological connectivity between the Study Area and designated site. Designated site is located within a different groundwater body (i.e. located between Kildare and Trim GMBs).

Table 4.1 Designated Sites located within, or in the vicinity of, the Study Area

Habitats

Non-designated Areas of Annex I Habitat

Based on a review of available desktop data, specifically Article 17 reporting data regarding the national distribution of Annex I habitats, no designated or non-designated Annex I habitats occur within the study area.

Annex I habitats are of national importance from a biodiversity perspective, whilst priority Annex I habitats are regarded as being of international importance. In addition, *ex-situ* Annex I habitats may act as supporting features to habitats contained within Designated Sites (e.g., by acting as ecological stepping-stones or corridors, providing connectivity for protected species, ensuring viable commuting and foraging routes, and providing habitats for supporting populations).

It should be noted that although no records of Annex I habitats were returned from the desk study, it is possible that areas of Annex I habitats, not currently recorded or mapped by NPWS or as a result of site visit to inform the constraints report, may be present within the study area.

Non-Annex I Woodland Habitats

A review of databases available from the NPWS, specifically data relating to the Ancient and Long-Established Woodland[27] survey and the National Survey of Native Woodlands 2003 - 2008[28], confirmed that areas of the following woodland habitat types are present within, or close to, the study area:

- Native woodlands of oak-ash-hazel woodland (WN2) at Laragh Demesne, Castletown and Coldblow – included within ecological sites EC4, EC36 and EC54 respectively. Both the woodlands at Laragh Demesne and Castletown are described as corresponding with *Fraxinus excelsior* - *Hedera helix* woodland group and of a *Geum urbanum* - *Veronica montana* vegetation type, while the woodlands at Coldblow are described as corresponding with *Fraxinus excelsior*

- *Hedera helix* woodland group and of an *Acer pseudoplatanus - Crataegus monogyna* vegetation type.

- Possible ancient woodland sites at Castletown and Coldblow (shared boundary as native woodland sites described above) comprised of oak-ash-hazel woodland (WN2).

Other areas of woodland exist within the study area and, excluding areas of conifer plantation, these have been captured within the ecological sites described in Section 4.4.4.2.

Woodlands are of ecological value, particularly semi-natural woodland types such as oak-ash-hazel woodland (WN2), due to the relative scarcity of woodland in Ireland and the high degree of biodiversity they can support. In addition, woodlands provide habitats and foraging resources for a range of protected fauna species e.g. badger, red squirrel, pine marten, birds and bats. Woodlands can also provide ecological connectivity across the wider landscape and environment, including in some cases providing habitat links between designated sites.

In general, the ecological value of areas of non-Annex I woodland habitats within Ireland ranges from local (higher) to national importance, depending on their vegetative composition, extent and age.

Flora

Desktop records of protected, rare or other notable plant species within the study area are listed in Table 4.2. To note, this includes all records of protected flora species within the 10km grid references N93 and O03. Given the habitats present, a number of the species below are likely to occur within the study area.

Common Name/ Scientific Name	Legal Status[37]	Red List Status[38]	Source	Known Locations/ Habitat Preferences
Green Figwort *Scrophularia umbrosa*	N/A	Endangered	NBDC online database N93	Sites for the species are on the margins of rivers and lakes and occurring in damp shady places. It has been recorded from one site in Limerick, in 6 sites along a stretch of the river Liffey on the Kildare-Dublin border [38]
Fountain Feather-moss *Amblystegium tenax*	N/A	Near threatened	NBDC online database N93	[not available]
Sausage Beard-moss *Didymodon tomaculosus*	N/A	Vulnerable	NBDC online	[not available]

[37] HDII/IV/V = Habitats Directive Annexes II/IV/V; FPO = Flora (Protection) Order, 2015; WA = Wildlife Acts

[38] Vascular Flora listed in threatened categories from the Irish Red List No. 10 Vascular Plants (Wyse-Jackson *et al.*, 2016); Bryophytes from the Irish Red List No. 8 Bryophytes- Mosses, Liverworts & Hornworts (Lockhart *et al.*, 2012).

Common Name/ Scientific Name	Legal Status[37]	Red List Status[38]	Source	Known Locations/ Habitat Preferences
			database N93	
Cornflower *Centaurea cyanus*	N/A	Regionally Extinct	NBDC online database O03	Previously a common arable weed. Now garden escape or sown as part of wildflower mixtures. Waste ground, roadsides[39]
Hairy St John's-wort *Hypericum hirsutum*	N/A	Endangered	NBDC online database O03	Occurs on riverbanks and shady places has been recorded from 5 counties in eastern Ireland, concentrated in the river Liffey valley[38]
Lamiastrum galeobdolon subsp. montanum	N/A	Vulnerable	NBDC online database O03	Occurring on moist woodlands, hedges, roadsides and grikes of limestone pavement, usually on heavy soils. It is often associated with ancient woods[40]
Meadow Barley *Hordeum secalinum*	N/A	Endangered	NBDC online database O03	Occurring on lowland coastal and inland meadows and pastures, mostly on damp heavy soils[38]
Opposite-leaved Pondweed *Groenlandia densa*	N/A	Endangered	NBDC online database O03	Occurs in ditches, streams, ponds and canals and on marginal muds in estuaries.[38]
Spring Vetch *Vicia lathyroides*	N/A	Vulnerable	NBDC online database O03	Occurs on sandy ground near the sea[38]
Chalk Screw-moss *Tortula vahliana*	N/A	Regionally Extinct	NBDC online database O03	Used to grow on mud-capped walls, although some of these could recolonise in chalk or gravel pits[38]
Hook-beak Tufa-moss *Hymenostylium recurvirostrum*	N/A	Near threatened	NBDC online database O03	[not available]
Lance-leaved Pottia *Tortula lanceola*	N/A	Critically Endangered	NBDC online database O03	[not available]
Rigid Aloe-moss *Aloina rigida*	N/A	Regionally Extinct	NBDC online	Used to grow on mud-capped walls, although some

[39] Irish wildflowers website. Available from http://www.irishwildflowers.ie/pages/654a.html [Accessed 28/01/2021]
[40] Online Atlas of the British and Irish Flora. Available at https://www.brc.ac.uk/plantatlas/ [Accessed 28/01/2021]

Common Name/ Scientific Name	Legal Status[37]	Red List Status[38]	Source	Known Locations/ Habitat Preferences
			database O03	of these could recolonise in chalk or gravel pits[38]
Spiral Chalk-moss *Pterygoneurum lamellatum*	N/A	Regionally Extinct	NBDC online database O03	Used to grow on mud-capped walls, although some of these could recolonise in chalk or gravel pits[38]
Starke's Pottia *Microbryum starckeanum*	N/A	Regionally Extinct	NBDC online database O03	[not available]
Twisting Thread-moss *Bryum torquescens*	N/A	Vulnerable	NBDC online database O03	Typically grows on calcareous soil in open sunny places, especially on free-draining substrates on banks, in open patches in grassland, on roadsides, about old quarries, and on thin soil overlying rocks, especially limestone but also hard metamorphic rocks and concrete

Table 4.2 Records of Protected, Rare or Notable Flora recorded from the Desk Study within the Study Area

Planting, dispersing, or allowing/causing the dispersal, spread or growth of certain non-native invasive alien plant species is controlled under Article 49 of the European Communities (Birds and Natural Habitats) Regulations, 2011 as amended); and refers to plant or animal species listed on the Third Schedule of those regulations. The accidental spread of non-native invasive plant species as a result of construction works has the potential to impact upon terrestrial habitats within and immediately adjacent to the study area boundary; potentially affecting plant species composition, diversity and abundance over the long-term. The effects of introducing such non-native invasive plant species to highly sensitive and ecologically important habitat areas (e.g. designated area for nature conservation or areas of Annex I habitat) have the potential to result in a likely significant negative effect, at geographic scales ranging from local to international.

There are several non-native invasive alien plant species, which have been returned from the desk study for the study area.

These are summarised in Table 4.3 below. For the purposes of this report only those listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations, 2011 as amended) and those listed within the invasive alien plant species technical guidance prepared by TII[41] are included in the table below.

[41] TII Publications (2020) *The Management of Invasive Alien Plant Species on National Roads – Technical Guidance*. GE-ENV-01105

Common Name/ Scientific Name	Invasive Categorisation	Third Schedule Species (SI 477 of 2011)	Species of European Concern (EU regulation 1143/2014 & amendments 1263/2017, 1262/2019)	TII Species of Concern	Source
Canadian Waterweed (*Elodea canadensis*)	High Impact Invasive Species	Yes	No	No	NBDC online database N93, O03
Giant Hogweed (*Heracleum mantegazzianum*)	High Impact Invasive Species Phytotoxic Species	Yes	Yes	Yes	NBDC online database N93, O03
Indian Balsam (*Impatiens glandulifera*)	High Impact Invasive Species	Yes	Yes	Yes	NBDC online database N93, O03
Japanese Knotweed (*Reynoutria japonica*)	High Impact Invasive Species	Yes	No	Yes	NBDC online database N93, O03
Nuttall's Waterweed (*Elodea nuttallii*)	High Impact Invasive Species	Yes	Yes	No	NBDC online database O03
Rhododendron ponticum	High Impact Invasive Species	Yes	No	Yes	NBDC online database N93, O03
Spanish Bluebell (*Hyacinthoides hispanica*)	N/A	Yes	No	Yes	NBDC online database O03
Three-cornered Garlic (*Allium triquetrum*)	Medium Impact Invasive Species	Yes	No	Yes	NBDC online database N93, O03
Butterfly-bush (*Buddleja davidii*)	Medium Impact Invasive Species	No	No	Yes	NBDC online database N93, O03
Himalayan Honeysuckle	Medium Impact	No	No	Yes	NBDC online

Common Name/ Scientific Name	Invasive Categorisation	Third Schedule Species (SI 477 of 2011)	Species of European Concern (EU regulation 1143/2014 & amendments 1263/2017, 1262/2019)	TII Species of Concern	Source
(*Leycesteria formosa*)	Invasive Species				database O03
Russian-vine (*Fallopia baldschuanica*)	Medium Impact Invasive Species	No	No	Yes	NBDC online database O03

Table 4.3 Records of Non-native Invasive Plant Species recorded from the Desk Study within the Study Area

Fauna

The desk study returned that there are several European and nationally protected mammal, bird, fish, amphibian, reptile and invertebrate species which have been recorded within the study area. These are summarised in Table 4.4.

A variety of wintering and breeding red and amber listed bird species were returned from the desk study of the study area including whooper swan, tufted duck and most notably the barn owl. Given the nature of the habitats within the study area, barn owl are likely to occur, and they are particularly vulnerable to vehicle collisions. In the case of bird species, only those species listed in Annex I of the Birds Directive or on the Birds of Conservation Concern in Ireland [42](BoCCI) Red List are included in the table below.

With regards to bat species, the following habitat features/areas, present within the constraints study area, are likely to be important for local populations; areas of woodland, river corridors, agricultural lands with well-developed hedgerow/ treeline network, old buildings, bridges and underground structures (e.g. ice-houses, souterrains etc). Bats, and their breeding and resting places, are protected under the Wildlife Acts. All bat species are also listed on Annex IV of the EU Habitats Directive and are afforded strict protection under the Habitats Directive and the European Communities (Birds and Natural Habitats) Regulations, 2011.

The NBDC database returned records of the following bat species within the vicinity of the study area: Daubenton's bat *Myotis daubentonii*, Leisler's bat *Nyctalus leisleri*, brown long-eared bat *Plecotus auritus*, Natterer's bat *Myotis nattereri,* soprano pipistrelle bat *Pipistrellus pygmaeus*, common pipistrelle bat *Pipistrellus pipistrellus,* Nathusius pipistrelle bat *Pipistrellus nathusii, and* whiskered bat *Myotis mystacinus.*

Additionally, a search of the Bat Conservation Ireland database returned records of three known roosts from within the study area. These roosts, which are located in

[42] Colhoun & Cummins (2013). Birds of Conservation Concern in Ireland 2014-2019. Birdwatch Ireland

the general area of Crinstown, Crodaun and Lucan Demesne, belong to an unknown bat species, common pipistrelle and unidentified pipistrelle bat species respectively.

Records for the Annex II Marsh fritillary butterfly were returned during the desk study from within the study area. Devil's-bit scabious, *Succisa pratensis*, the main food plant and an essential component of suitable marsh fritillary habitat, was also returned from the desk study with the closest records from along the banks of the Royal Canal and the Rye Water River at Louisa bridge.

Common Name/ Scientific Name	Legal Status[43]	Red List Status[44]	Source
Amphibians			
Common frog (*Rana temporaria)*	HD V; WA	Least Concern	NBDC online database N93, O03
Smooth newt (*Lissotriton vulgaris)*	WA	Least Concern	NBDC online database N93, O03
Invertebrates			
Freshwater White-clawed Crayfish (*Austropotamobius pallipes*)	HD II, V; WA	Not Evaluated	NBDC online database N93, O03
Andrena (Andrena) fucata	N/A	Near threatened	NBDC online database N93, O03
Andrena (Andrena) praecox	N/A	Vulnerable	NBDC online database N93, O03
Andrena (Melandrena) nigroaenea	N/A	Vulnerable	NBDC online database N93, O03
Andrena (Taeniandrena) wilkella	N/A	Data deficient	NBDC online database N93, O03
Barbut's Cuckoo Bee (*Bombus (Psithyrus) barbutellus*)	N/A	Endangered	NBDC online database N93, O03
Chaetarthria seminulum	N/A	Data deficient	NBDC online database N93, O03
Dark Nomad Bee (*Nomada sheppardana*)	N/A	Regionally Extinct	NBDC online database N93, O03
Dingy Skipper (*Erynnis tages*)	N/A	Near threatened	NBDC online database N93, O03

[43] HDII/IV/V = Habitats Directive Annexes II/IV/V; FPO = Flora (Protection) Order, 2015; WA = Wildlife Acts; BD I/II/III= Birds Directive Annexes I/II/III

[44] Fauna species listed in threatened Red List categories: from Butterflies from the Irish Red List No. 4 Butterflies (Regan *et al*., 2010); Amphibians, Reptiles & Fish from the Irish Red List No. 5 Amphibians, Reptiles & Freshwater Fish (King *et al*., 2011); Terrestrial Mammals from the Irish Red List No.3 Terrestrial Mammals (Marnell et al., 2009); Cartilaginous Fish from the Irish Red List no. 11 Cartilaginous Fish (Sharks, Skates, Rays & Chimaeras) (Clarke *et al.,* 2016); Birds from Birds of Conservation Concern in Ireland 2014-2019 (Colhoun & Cummins, 2013); Non-Marine Molluscs from Irish Red List No. 2 Non-Marine Molluscs (Byrne *et al*., 2009); Water Beetles from Irish Red List No. 1 Water Beetles (Foster *et al.,* 2009); Mayflies from Irish Red List No.7 Mayflies (Ephemeroptera) (Kelly-Quinn & Regan, 2012); Bees from Regional Red List of Irish Bees (Fitzpatrick *et al*., 2006).

Common Name/ Scientific Name	Legal Status[43]	Red List Status[44]	Source
Ephemerella notata	N/A	Endangered	NBDC online database N93, O03
Gatekeeper (*Pyronia tithonus*)	N/A	Near threatened	NBDC online database N93, O03
Halictus (Seladonia) tumulorum	N/A	Near threatened	NBDC online database N93, O03
Hill Cuckoo Bee (*Bombus (Psithyrus) rupestris*)	N/A	Endangered	NBDC online database N93, O03
Hylaeus (Prosopis) brevicornis	N/A	Endangered	NBDC online database N93, O03
Large Red Tailed Bumble Bee (Bombus (*Melanobombus) lapidarius*)	N/A	Near threatened	NBDC online database N93, O03
Marsh Fritillary (*Euphydryas aurinia*)	HD II	Vulnerable	NBDC online database N93, O03
Megachile (Delomegachile) willughbiella	N/A	Near threatened	NBDC online database N93, O03
Minutest Diving Beetle (*Bidessus minutissimus*)	N/A	Regionally Extinct	NBDC online database N93, O03
Moss Carder-bee (*Bombus (Thoracombus) muscorum*)	N/A	Near threatened	NBDC online database N93, O03
Neat Mining Bee (*Lasioglossum (Evylaeus) nitidiusculum*)	N/A	Vulnerable	NBDC online database N93, O03
Nebrioporus (Nebrioporus) depressus	N/A	Data deficient	NBDC online database N93, O03
Nomada panzeri	N/A	Near threatened	NBDC online database N93, O03
Procloeon bifidum	N/A	Vulnerable	NBDC online database N93, O03
Rhithrogena germanica	N/A	Vulnerable	NBDC online database N93, O03
Small Blue (*Cupido minimus*)	N/A	Endangered	NBDC online database N93, O03
Small Heath (*Coenonympha pamphilus*)	N/A	Near threatened	NBDC online database N93, O03
Trimmer's Mining Bee (*Andrena (Hoplandrena) trimmerana)*	N/A	Critically Endangered	NBDC online database N93, O03
Wall (*Lasiommata megera*)	N/A	Endangered	NBDC online database N93, O03
Brown Snail (*Zenobiella subrufescens)*	N/A	Vulnerable	NBDC online database N93, O03
Common Oyster (*Ostrea edulis*)	N/A	OSPAR Convention	NBDC online database N93, O03

Common Name/ Scientific Name	Legal Status[43]	Red List Status[44]	Source
Common Whorl Snail (*Vertigo (Vertigo) pygmaea*)	N/A	Near threatened	NBDC online database N93, O03
Desmoulin's Whorl Snail (*Vertigo (Vertigo) moulinsiana*)	HD II; WA	Endangered	NBDC online database N93, O03
Duck Mussel (*Anodonta (Anodonta) anatina*)	N/A	Vulnerable	NBDC online database N93, O03
Ear Pond Snail (*Radix auricularia*)	N/A	Vulnerable	NBDC online database N93, O03
English Chrysalis Snail (*Leiostyla (Leiostyla) anglica*)	N/A	Vulnerable	NBDC online database N93, O03
Field Slug (*Deroceras (Deroceras) agreste*)	N/A	Data deficient	NBDC online database N93, O03
Globular Pea Mussel (*Pisidium hibernicum*)	N/A	Near threatened	NBDC online database N93, O03
Glutinous Snail (*Myxas glutinosa*)	N/A	Endangered	NBDC online database N93, O03
Lake Orb Mussel (*Musculium lacustre*)	N/A	Vulnerable	NBDC online database N93, O03
Lesser Bulin (*Merdigera obscura*)	N/A	Endangered	NBDC online database N93, O03
Pisidium pseudosphaerium	N/A	Endangered	NBDC online database N93, O03
Pisidium pulchellum	N/A	Endangered	NBDC online database N93, O03
Plated Snail (*Spermodea lamellata*)	N/A	Endangered	NBDC online database N93, O03
Point Snail (*Acicula fusca*)	N/A	Vulnerable	NBDC online database N93, O03
Prickly Snail (*Acanthinula aculeata*)	N/A	Near threatened	NBDC online database N93, O03
Swan Mussel (*Anodonta (Anodonta) cygnea*)	N/A	Vulnerable	NBDC online database N93, O03
Fish			
Atlantic salmon (*Salmo salar)*	OSPAR Convention; HD II, V	Vulnerable	NBDC online database N93, O03;
European eel (*Anguilla anguilla)*	OSPAR Convention	Critically Endangered	NBDC online database N93, O03
Terrestrial Mammals			
Eurasian badger (*Meles meles)*	WA	Least Concern	NBDC online database N93, O03
Eurasian pygmy shrew (*Sorex minutus)*	WA	Least Concern	NBDC online database N93, O03

Common Name/ Scientific Name	Legal Status[43]	Red List Status[44]	Source
Eurasian red squirrel (*Sciurus vulgaris)*	WA	Near Threatened	NBDC online database N93, O03
European otter (*Lutra lutra)*	HD II, IV; WA	Near Threatened	NBDC online database N93, O03
Red deer (*Cervus elaphus)*	WA	Least Concern	NBDC online database N93, O03
West european hedgehog (*Erinaceus europaeus)*	WA	Least Concern	NBDC online database N93, O03
Pine marten (*Martes martes)*	HD V; WA	Least Concern	NBDC online database N93, O03
Irish hare (*Lepus timidus* subsp. *hibernicus)*	WA	Least Concern	NBDC online database N93, O03
Irish stoat (*Mustela erminea* subsp. *hibernica)*	WA	Least Concern	NBDC online database N93, O03
Brown long-eared bat (*Plecotus auritus)*	HD IV; WA	Least Concern	NBDC online database N93, O03
Daubenton's bat (*Myotis daubentoniid)*	HD IV; WA	Least Concern	NBDC online database N93, O03
Leisler's bat (*Nyctalus leisleri)*	HD IV; WA	Near Threatened	NBDC online database N93, O03
Nathusius's pipistrelle (*Pipistrellus nathusii)*	HD IV; WA	Least Concern	NBDC online database N93, O03
Natterer's bat (*Myotis nattereri)*	HD IV; WA	Least Concern	NBDC online database N93, O03
Common pipistrelle (*Pipistrellus pipistrellus)*	HD IV; WA	Least Concern	NBDC online database N93, O03
Soprano pipistrelle (*Pipistrellus pygmaeus)*	HD IV; WA	Least Concern	NBDC online database N93, O03
Whiskered bat (*Myotis mystacinus)*	HD IV; WA	Least Concern	NBDC online database N93, O03
Birds			
Barn Owl (*Tyto alba*)	WA	Red List	NBDC online database N93, O03
Black-headed Gull (*Chroicocepahlus ridibundus*)	WA	Red List	NBDC online database N93, O03
Common Kingfisher (*Alcedo atthis*)	BD I; WA	Amber List	NBDC online database N93, O03
Common Pochard (*Aythya ferina*)	BD II, III; WA	Red List	NBDC online database N93, O03
Common Redshank (*Tringa totanus*)	WA	Red List	NBDC online database N93, O03
Corn Crake (*Crex crex*)	BD I; WA	Red List	NBDC online database N93, O03

Common Name/ Scientific Name	Legal Status[43]	Red List Status[44]	Source
Eurasian Curlew (*Numenius arquata*)	BD II; WA	Red List	NBDC online database N93, O03
Eurasian Wigeon (*Anas penelope*)	BD II, III; WA	Red List	NBDC online database N93, O03
Eurasian Woodcock (*Scolopax rusticola*)	BD II, III; WA	Red List	NBDC online database N93, O03
European Golden Plover (*Pluvialis apricaria*)	BD I, II, III; WA	Red List	NBDC online database N93, O03
Grey Partridge (*Perdix perdix*)	BD II, III; WA	Red List	NBDC online database N93, O03
Herring Gull (*Larus argentatus*)	WA	Red List	NBDC online database N93, O03
Little Egret (*Egretta garzetta*)	BD I; WA	Green List	NBDC online database N93, O03
Merlin (*Falco columbarius*)	BD I; WA	Amber List	NBDC online database N93, O03
Northern Lapwing (*Vanellus vanellus*)	BD II; WA	Red List	NBDC online database N93, O03
Northern Pintail (*Anas acuta*)	BD II, III; WA	Red List	NBDC online database N93, O03
Peregrine Falcon (*Falco peregrinus*)	BD I; WA	Green List	NBDC online database N93, O03
Red Grouse (*Lagopus lagopus*)	BD II, III; WA	Red List	NBDC online database N93, O03
Tufted Duck (*Aythya fuligula*)	BD II, III; WA	Red List	NBDC online database N93, O03
Whooper Swan (*Cygnus cygnus*)	BD I; WA	Amber List	NBDC online database N93, O03
Yellowhammer (*Emberiza citrinella*)	WA	Red List	NBDC online database N93, O03

Table 4.4 Records of Protected, Rare or Notable Fauna within the Study Area

Rivers, Fisheries and the Aquatic Environment

According to the EPA online dataset[45], several rivers, and their associated tributaries, are located within the study area. The main rivers and their associated sub-catchments are displayed in Table 4.5.

A consultation letter was sent to Inland Fisheries Ireland (IFI) on the 19th of January 2021, requesting desktop information regarding the watercourses which lie within the study area, including any records of rare/protected species and any data regarding the fishery potential of relevant watercourses. A response was received on the 25th of January 2021, which outlined the following sensitive species as being

[45] Environmental Protection Agency (2020) Data available for download at http://gis.epa.ie/GetData/Download

present within the adjacent watercourses and the downstream receiving environment within the River Liffey: Atlantic salmon, brown trout and eel. In addition to the above, the Rye Water River also supports populations of freshwater crayfish and lamprey.

In addition to supporting rare/protected aquatic species these river systems are likely to also support terrestrial mammals such as otter (*Lutra lutra*), bat and bird species (e.g., kingfisher) which use aquatic systems for foraging and commuting purposes.

The watercourses contained within the study area are deemed to range in ecological value from local to international importance, owing to their designations and the fact that they may support rare/protected species of conservation value and provide ecological connectivity across and downstream of the study area.

Catchment	River/Stream Name
Liffey and Dublin Bay catchment	Taghadoe; Lucan Stream; Liffey; Kilmacredock Upper; Lyreen; Rye Water; Gragadder; Ballycanon

Table 4.5 Main Watercourses and their associated Sub-catchments located in the Study Area

Local Area Plan Policies and Objectives

The study area lies within the functional areas of both Kildare County Council (KCC) and South Dublin County Council (SDCC). Plans and developments within Kildare County and South Dublin County should comply with the policies and objectives of the Kildare County Development Plan 2017-2023 and South Dublin County Development Plan 2016-2022 respectively, both of which reference the National Biodiversity Plan 2017-2021 (Department of Arts, Heritage and the Gaeltacht, 2017). Other plans relevant to the proposed study area include Leixlip Local Area Plan 2020-2023, the Maynooth Local Area Plan 2013-2019 and the Celbridge Local Area Plan 2017-2023.

Any future development must be cognisant of the objectives and policies of the above plans (Kildare and South Dublin) including any mitigations or protections that may be in place. All existing and future developments will be constrained by timings, protections and other requirements through the policies and objectives within these documents.

The policies within these plans which are relevant to ecology and the natural environment, present potential constraints, mostly in the protection of green infrastructure networks, the protection of designated sites, the protection of habitats outlined as being of ecological importance (i.e. woodland, hedgerows, treelines and watercourses) and the protection and retention of vegetation within key

development areas (i.e. the Wonderful Barn key development area, Celbridge Road East Key Development Area and Leixlip Gate Key Development Area)[46].

Any loss of green infrastructure linkages or loss of ecologically important habitats would be a constraint.

Ecological Sites

Following a review of orthophotography and collation of available existing habitat information, 54 ecological sites were identified. The description and evaluation of the ecological sites are presented in Section 4.4.4.2, Table 4.6 with the locations of the ecological sites shown in Figures 4.4.1 to 4.4.12.

4.4.4.2 Field Surveys

Terrestrial Habitats

Walkover Surveys of Ecological Sites

A habitat walkover survey was carried out in September 2022, with the focus on accessible sites along and adjacent to motorway junctions, as well as car -based survey of larger roads. The identification and description of ecological sites, at this stage is largely based on desktop research.

Ecological Sites

For the purposes of this report, the ecological sites are defined and described based on the results of desk study and orthophotography and informed by limited walkover surveys. Summary descriptions of each are provided in Table 4.6. Ecological sites are sites of ecological value: i.e. those likely or determined to be at least of a local importance (higher value). These are primarily defined based on the habitat types present or considered likely to be present but may also include important flora and fauna sites or populations.

The boundaries of the ecological sites have been defined based on the results of the desk study and interpretation of orthophotography. Refinement of these boundaries will be completed following a ground truthing exercise at ecological sites identified at the options stage to verify the types of habitats present.

Ecological sites identified in the study area are presented in Table 4.6 and Figures 4.4.1 to 4.4.12.

Ecological Site Number	Location	Description
EC01	Maws	Mixed broadleaf woodland
EC02	Northern side of M4 roadway	Narrow woodland band/ Treeline
EC03	Southern side of M4 roadway	Narrow woodland band/ Treeline
EC04	Laragh Demesne	Mixed broadleaf woodland

[46] Including policies NH1, GI1and OS1.6 within *Leixlip local Area Plan 2020-2023* and policies NH1 – NH6 and GI1 – GI10 within *Maynooth local Area Plan 2020-2023*

Ecological Site Number	Location	Description
EC05	Northern side of M4 roadway	Narrow woodland band/ Treeline
EC06	Southern side of M4 roadway	Narrow woodland band/ Treeline
EC07	Along the northern bank of the Royal Canal pNHA	Narrow woodland band/ Treeline
EC08	Northern side of M4 roadway	Narrow woodland band/ Treeline
EC09	Southern side of M4 roadway	Narrow woodland band/ Treeline
EC10	Laraghbryan East	Mixed broadleaf woodland
EC11	Newtown	Woodland/Scrub
EC12	Northern side of M4 roadway	Narrow woodland band/ Treeline
EC13	Southern side of M4 roadway	Narrow woodland band/ Treeline
EC14	Northern side of M4 roadway	Narrow woodland band/ Treeline
EC15	Southern side of M4 roadway	Narrow woodland band/ Treeline
EC16	Crinstown	Mixed broadleaf woodland
EC17	Newtown	Mixed broadleaf woodland
EC18	Northern side of M4 roadway (island)	Narrow woodland band/ Treeline
EC19	Southern side of M4 roadway (island)	Narrow woodland band/ Treeline
EC20	Northern side of M4 roadway	Narrow woodland band/ Treeline
EC21	Southern side of M4 roadway	Narrow woodland band/ Treeline
EC22	Northern side of M4 roadway	Narrow woodland band/ Treeline
EC23	Southern side of M4 roadway	Narrow woodland band/ Treeline
EC24	Southern side of M4 roadway	Narrow woodland band/ Treeline
EC25	Moortown	Mixed broadleaf woodland
EC26	Castletown	Mixed broadleaf woodland
EC27	Southern side of M4 roadway	Narrow woodland band/ Treeline
EC28	Northern side of M4 roadway	Narrow woodland band/ Treeline
EC29	Northern side of M4 roadway	Narrow woodland band/ Treeline
EC30	Southern side of M4 roadway	Narrow woodland band/ Treeline
EC31	Treeline lining Leixlip Gate roadway	Narrow woodland band/ Treeline
EC32	Castletown	Mixed broadleaf woodland
EC33	Castletown	Mixed broadleaf woodland
EC34	Southern side of M4 roadway	Narrow woodland band/ Treeline
EC35	Rinawade Upper	Mixed broadleaf woodland
EC36	Castletown	Mixed broadleaf woodland
EC37	Northern side of M4 roadway	Broadleaf/conifer woodland/ Treeline

Ecological Site Number	Location	Description
EC38	Southern side of M4 roadway within boundary of HP site	Narrow woodland/ Treeline planting
EC39	Southern side of M4 roadway	Narrow woodland band/ Treeline
EC40	Northern side of M4 roadway	Narrow woodland band/ Treeline
EC41	Southern side of M4 roadway	Narrow woodland band/ Treeline
EC42	Leixlip Demesne	Narrow woodland band/ Treeline
EC43	Leixlip Demesne	Narrow woodland band/ Treeline
EC44	Northern side of M4 roadway	Narrow woodland band/ Treeline
EC45	Southern side of M4 roadway	Narrow woodland band/ Treeline
EC46	Along River Liffey adjacent to pNHA	Narrow woodland band/ Treeline associated with pNHA
EC47	Northern side of M4 roadway (island)	Narrow woodland band/ Treeline
EC48	Southern side of M4 roadway (island)	Narrow woodland band/ Treeline
EC49	Grounds of Lucan golf club	Scattered trees and parkland/ Narrow woodland blocks/ Treelines
EC50	Along River Liffey adjacent to pNHA	Narrow woodland band/ Treeline associated with pNHA
EC51	Within the boundary of Lucan demesne	Scattered trees and parkland/ Treelines/ Narrow woodland band
EC52	Along River Liffey adjacent to pNHA	Narrow woodland band/ Treeline associated with pNHA
EC53	Cooldrinagh	Open space and parkland/ Mixed broadleaf and conifer woodland
EC54	Narrow woodland band/ Treeline adjacent to pNHA	Narrow woodland band/ Treeline associated with pNHA

Table 4.6 Ecological Sites identified in the Study Area

4.4.5 Summary and Conclusions

As outlined above, 54 ecological sites were identified within the study area based on an examination of aerial photography and information gathered during the desktop study and limited walkover survey undertaken at accessible junctions. These ecological sites mostly comprise of areas of mixed broadleaf woodland, areas of scattered trees and parkland as well as narrow land bands and treelines lining the existing M4/N4. In addition to the 54 ecological sites identified, the following features were also noted as constraints within the study area:

- Designated sites in the vicinity of the study area and within the downstream receiving environment (including SACs, SPAs, NHAs and pNHAs);

- Rare, protected and notable flora;
- Invasive non-native flora species;
- Rare, protected and notable fauna;
- Policies and objectives outlined within the relevant local area plans (i.e. Leixlip LAP, Celbridge LAP and Maynooth LAP); and,
- Waterbodies (including rivers, streams and lakes).

4.4.6 References

Atherton, I., Bosanquet, S. & Lawley, M. (2010) Mosses and Liverworts of Britain and Ireland: A Field Guide. Latimer Trend & Co., Plymouth

Blockeel, T.L., Bosanquet, S.D.S., Hill, M.O. and Preston, C.D. (2014). Atlas of British and Irish bryophytes. British Bryological Society (Pisces Publications, Newbury).

Byrne, A., Moorkens, E.A., Anderson, R., Killeen, I.J. & Regan, E.C. (2009) Ireland Red List No. 2 – NonMarine Molluscs. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

CEC. (Commission of the European Communities) (2013) Interpretation manual of European Union Habitats EUR28. European Commission, DG Environment.

Chartered Institute of Ecology and Environmental Management (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine.

Clarke, M., Farrell, E.D., Roche, W., Murray, T.E., Foster, S. and Marnell, F. (2016) Ireland Red List No. 11: Cartilaginous fish [sharks, skates, rays and chimaeras]. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. Dublin, Ireland.

Colhoun, K. & Cummins, S. (2014) Birds of Conservation Concern in Ireland 2014 -2019. BirdWatch Ireland.

Department of Culture, Heritage and the Gaeltacht (2017) National Biodiversity Action Plan 2017 – 2021.

Department of Housing, Planning and Local Government (2018) River Basin Management Plan for Ireland 2018-2021.

Environmental Protection Agency (2017) Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports.

Environmental Protection Agency (2015) Draft Advice Notes for Preparing Environmental Impact Statements.

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

Environmental Protection Agency (2003) Advice Notes on Current Practice in the Preparation of Environmental Impact Statements.

Fitzpatrick, U., Murray, T.E., Byrne, A., Paton, R.J. & M.J.F. Brown (2006). Regional Red List of Irish Bees, Higher Education Authority

Fossitt, J.A. (2000) A Guide to Habitats in Ireland. Heritage Council, Kilkenny.

Foster, G. N., Nelson, B. H. & O Connor, Á. (2009) Ireland Red List No. 1 – Water beetles. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

Government of Ireland (2011). European Communities (Birds and Natural Habitats) Regulations, 2011, (S.I.) No. 477/ 2011.

Kelly-Quinn, M. & Regan, E.C. (2012) Ireland Red List No. 7: Mayflies (Ephemeroptera). National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Kildare County Council (2017) Kildare County Development Plan 2017-2023.

Kildare County Council (2020) Leixlip Local Area Plan 2020-2023.

Kildare County Council (2017) Celbridge Local Area Plan 2017-2023

Kildare County Council (2013) Maynooth Local Area Plan 2013-2019.

Kildare County Council (2009) County Kildare Biodiversity Action Plan 2009 – 2014.

Kildare County Council (2019) County Kildare Heritage Plan 2019 – 2025.

King, J.L., Marnell, F., Kingston, N., Rosell, R., Boylan, P., Caffrey, J.M., FitzPatrick, Ú., Gargan, P.G., Kelly, F.L., O'Grady, M.F., Poole, R., Roche, W.K. & Cassidy, D. (2011) Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Lockhart, N., Hodgetts, N. & Holyoak, D. (2012) Ireland Red List No.8: Bryophytes. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Marnell, F., Kingston, N. & Looney, D. (2009) Ireland Red List No. 3: Terrestrial Mammals, National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

National Roads Authority (2008) Environmental Impact Assessment of National Road Schemes – A Practical Guide.

National Roads Authority (2009) Guidelines for Assessment of Ecological Impacts of National Road Schemes.

National Roads Authority (2008) Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes.

National Roads Authority (2006) Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes.

National Parks & Wildlife Service (2010) Circular NPWS 1/10 & PSSP 2/10 Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities.

National Parks & Wildlife Service (2007) Circular Letter PD 2/07 and NPWS 1/07 Compliance Conditions in respect of Developments requiring (1) Environmental Impact Assessment (EIA); or (2) having potential impacts on Natura 2000 sites.

National Parks & Wildlife Service (2007) Circular Letter NPWS 2/07 Guidance on compliance with Regulation 23 of the Habitats Regulations 1997 – strict protection of certain species/applications for derogation licences

National Parks & Wildlife Service (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 1: Summary Overview. Unpublished NPWS report.

Parnell, J. & Curtis, T. (2012). Webb's An Irish Flora. Eighth Edition.

Regan, E.C., Nelson, B., Aldwell, B., Bertrand, C., Bond, K., Harding, J., Nash, D., Nixon, D., & Wilson, C.J. (2010) Ireland Red List No. 4 – Butterflies. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Ireland.

Smith, G.F., O'Donoghue, P., O'Hora, K. & Delaney, E. (2011) Best Practice Guidance for Habitat Survey and Mapping. The Heritage Council Church Lane, Kilkenny, Ireland.

South Dublin County Council (2016) South Dublin County Development Plan 2016-2022.

Stace, C. (2019) New Flora of the British Isles. 4th Edition. C&M Floristics.

Weekes, L.C. & FitzPatrick, Ú. (2010) The National Vegetation Database: Guidelines and Standards for the Collection and Storage of Vegetation Data in Ireland. Version 1.0. Irish Wildlife Manuals, No. 49. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

Wyse Jackson, M., FitzPatrick, Ú., Cole, E., Jebb, M., McFerran, D., Sheehy Skeffington, M. & Wright, M. (2016). Ireland Red List No. 10: Vascular Plants. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, Dublin, Ireland.

4.5 Land and Soils

4.5.1 Introduction

This section describes the land and soils constraints identified within the study area for the Maynooth to Leixlip Project. This covers the soil, geology and potential contamination of each within the study area. This section should be read in conjunction with the Land and Soils Constraints Figures 4.5.1 to 4.5.24.

Section 4.5.2 describes the methodologies and sources of information that were used to carry out the study. Section 4.5.3 describes the existing land and soils environment and constraints within the study area. A summary is presented in Section 4.5.4 and references are listed in Section 4.5.5.

4.5.2 Methodology and sources of information

The following sources were studied in order to develop this constraints study.

4.5.2.1 Methodology

The study has been carried out in accordance with the National Roads Authority (NRA) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes. The NRA is now known as Transport Infrastructure Ireland (TII), however for the purpose of this report the guidelines mentioned above are referred to as the NRA guidelines.

The assessment is based on the results of a Preliminarily Sources Study Report (PSSR) and historical publicly available ground investigation results. The PSSR includes a review of the information sources listed in Section 4.5.2.2 to identify the constraints associated with land and soils within the study area.

4.5.2.2 Sources of information

Topographical and Geographic Maps and Datasets

The following mapping and geographical datasets were reviewed as part of this study:

- EPA Contours;
- Bing Maps (2020) base mapping;
- Google Maps (2020);
- EPA River Network Routes;
- EPA Lake Segments;
- EPA Corine Landcover; and
- Ordnance Survey Discovery series Mapping (1:50,000).

Published Standards and Guidelines

The following publications were referenced and reviewed as part of this study:

- National Roads Authority. (2008). *Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.* Ireland; and
- TII 'Managing Geotechnical Risk' (2019) *DN-ERW-03083.*

Solid Geology

The following digital datasets and maps from the GSI were reviewed as part of this study:

- Bedrock Geology of Ireland (1:100,000 scale).

Drift Maps

The following drift maps were reviewed as part of this study:

- Soil map (EPA National Soils) and Soil Parent Material Classification and Map Codes;
- Quaternary Geology of Ireland (1:50,000 scale); and
- Quaternary Geomorphology (1:50,000 scale).

Geological Survey Ireland (GSI) Data Sets

The following GSI datasets were consulted:

- GSI karst landform features and traced underground connections;
- GSI landslide database;
- GSI Landslide Susceptibility Classification;
- GSI active quarries and pits database;
- GSI APM Pits and Quarries;
- GSI mineral localities;
- GSI aggregate potential mapping final scores for granular and rock deposits;
- GSI geological heritage sites;
- GSI Geotechnical Borehole;
- GSI Verified Boreholes;
- GSI Unverified Boreholes;
- GSI Geotechnical Sites Submitted by Industry;
- GSI Geotechnical Boreholes Submitted by Industry;
- GSI Groundwater Wells and Springs;
- GSI Public Supply Abstraction Points;

- GSI Groundwater Source Protection Areas;
- GSI Catchment and Water Framework Directive (WFD);
- GSI Groundwater Recharge;
- GSI Groundwater Vulnerability;
- GSI Subsoil Permeability;
- GSI Groundwater Resources (Aquifers);
- GSI Hydrostratigraphic Rock Unit;
- GSI Groundwater Flooding Data Viewer; and
- GSI Groundwater Bodies.

Other Datasets

The following datasets were also consulted:

- Environmental Protection Agency (EPA) Licenced Waste Facilities;
- Water Framework Directive: Article 5 Landfill;
- EPA Historic Landfill Sites;
- EPA Waste Facility Permits;
- Exploration and Mining Viewer;
- Water Framework Directive: Article 5 Mine;
- EPA Extractive Industries Register;
- Urban Wastewater Treatment (UWWT) Plants 2008;
- 1830's Ordnance Survey Historic mapping;
- 1890's Ordnance Survey Historic mapping;
- Ordnance Survey Aerial Photographs;
- EPA IEL/ IPC Register;
- EPA Waste Licence Register;
- National Monuments Service;
- EPA Protected Areas;
- EPA Water (monitoring, WFD, water quality, water features, water regions);
- National Parks & Wildlife Service (NPWS) Designated Ecological Areas;
- Public groundwater supply abstractions / springs;
- WFD Article 5: Section 4 Discharge Points;
- Section 4 Discharge Point;
- WFD Article 5: Wastewater Treatment Plant (WWTP);
- WFD Article 5: Water Treatment Plant (WTP);

- Industrial Emissions (IE) Facility;
- Integrated Pollution Control (IPC) Sites;
- EPA Mine Historic Site Locations;
- Mine Historic Site Boundary;
- WFD Article 5: Quarry;
- Crushed Rock Aggregate Final Scores; and
- OSI Historic Industrial Sites.

Other Sources of Information

The following other sources of information were also consulted:

- Kildare County Council personnel and South Dublin County Council personnel; and
- Maynooth to Leixlip Project PSSR, prepared by Arup.

Publications

- River Liffey Hydro-Electric Stations, ESB.

4.5.3 Existing Environment

4.5.3.1 Site Description

The section of the M4/N4 under consideration is located south of Leixlip and Maynooth, and north of Celbridge. The extent of the corridor is approximately 10km in length.

The study area is largely greenfield agricultural land punctuated by the urban centres of Maynooth, Celbridge and Leixlip. The rivers that cross through the study area are the River Liffey, the River Graggader, the River Ballycannon, the River Lyreen which is a tributary of the River Rye and the Royal Canal. The Maynooth – Dublin railway line runs parallel and to the south of the Royal Canal.

The study area boundary extends from west of Junction 7 Maynooth to Junction 5 Leixlip. The northern extents of the study area are bounded by the River Liffey in the eastern section, through Kilmacredock, south of Grangewilliam, the southern end of Maynooth and in the far western section the railway line and the Royal Canal. The southern extents of the study area are bounded by Leixlip Reservoir in the east, the northern end of Celbridge and west of Clonfert Pet Farm in the west.

4.5.3.2 Topography

The topography of the study area is relatively flat. The study area peaks in the middle, at 90mOD just east of Junction 7 Maynooth at Ballygoran. From this high point the topography falls to 60mOD to the west of Maynooth and to 40mOD to the east, along the River Liffey.

The River Liffey intersects the eastern end of the study area and flows from south to north. The Lucan Stream, a tributary of the River Liffey is located southeast of Leixlip and flows east towards the River Liffey. The Kilmacredock Upper River (also a tributary of the River Liffey) crosses the study area just north of the Liffey Business Park. Tributaries from the River Rye cut across the western end of the of the study area, including the Taghadoe River which runs through Maynooth, flowing north towards the River Rye. The River Lyreen, River Graggader and the River Ballycannon, tributaries of the River Rye, are located west of Maynooth and flow north easterly and easterly towards the River Rye. The River Taghadoe merges with the River Lyreen adjacent to Maynooth University. The Maynooth stream connects to the Lyreen River, just west of it and flows in a north westerly direction, outside the study area as shown on Figure 4.2.

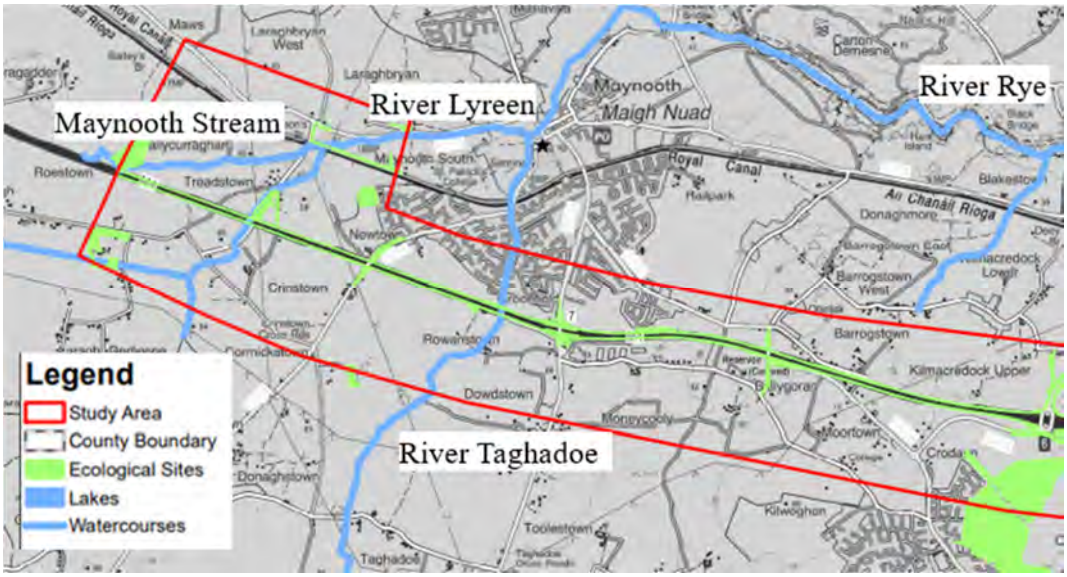

Figure 4.2: Rivers in the Maynooth area

The Leixlip Reservoir and Dam is located to the southeast of the study area in a section of the River Liffey channel to the south of Leixlip Hydro Plant.

4.5.3.3 Geomorphology

The geomorphology of the surrounding area reflects its glacial history, the latest of which occurred during the last major period of glaciation, the Midlandian about 10,000 years ago. The course of the rivers in the study area, such as the River Liffey and outside the study area, such as the River Rye runs along the alignment of historic glacial fluvial meltwater channels from which deposits of alluvium and gravels originate. Streamlined bedrock are found in the centre and the eastern section of the study area.

Glacial deposition features such as crag and tails and glaciofluvial terraces are recorded to the north outside the study area. Towards the south, outside the study area, are a cluster of drumlins and hummocky sand and gravels.

4.5.3.4 Soil Deposits

The most dominant soils within the study area in accordance with EPA National Soils dataset (National Soils 2015) are the BminPD, a poorly drained basic mineral, which is located in the western section and the centre, near Leixlip, of the study area. The BminDW, a deep well drained basic mineral is located in the western section, east of Maynooth near Ballygoran and in the east, surrounding Leixlip. There is a localised area of shallow well drained mineral (BminSW) in the western section of the study area, near Ballygoran and in the eastern section along the River Liffey. In the west of the study area there are deposits of alluvial mineral (AlluvMIN) along the River Lyreen, the River Graggader and along the River Liffey, which is to the east of the study area. There are four areas of Made Ground deposits within the study area related to Lucan and Leixlip, to the south of Junction 6 Celbridge and south of Maynooth. There is a localised area of Made Ground in the centre of the study area, north of the existing M4 at Barrogstown. Typically, Made Ground is comprised of variable materials of varying strengths and depths. In the western section of the study area south of Maynooth there are three small localised areas of BminSP, a shallow poorly drained mineral. A small localised Lacustrine deposit is located within the study area to the southwest of Maynooth.

One area of Blanket peat is recorded directly outside of the study area to the south of the R405.

The seven soil types throughout the study area can be grouped into the following categories:

- BminPD is a poorly drained basic mineral that is of low importance for agriculture;
- BminDW is a deep well drained basic mineral that is of medium importance for agriculture;
- BminSW is a shallow well drained basic mineral that is of medium important for agriculture;
- AlluvMIN is an alluvium is considered medium importance for agriculture;
- BminSP is a shallow poorly drained mineral is considered low importance for agriculture;
- Made ground is considered low importance for agriculture; and
- Lacustrine type soil is considered low important for agriculture.

Soils are also major components of ecosystems and a non-renewable resource. In accordance with the EIA Directive (2014/52/EU, reference), threats to soil functions such as organic matter, erosion, compaction and sealing from increased land take needs to be limited and considered in the assessment of the project.

After consultation with the GSI, it was determined that Teagasc are responsible for compiling, maintaining and updating the national soils map, which is hosted by the EPA. The Teagasc soils map hosted on the GSI website is not up to date. Both the

Teagasc and EPA descriptions are presented in Table 4.7 as both databases use the same acronyms for soil types, but descriptions differ.

Soil Type	Teagasc Description	EPA Description
BminPD	Poorly drained basic mineral	Surface water Gleys / Ground water Gleys Basic
BminDW	Deep well drained basic mineral	Grey Brown Podzolics / Brown Earths Basic
BminSW	Shallow well drained basic	Renzinas / Lithosols
BminSP	Shallow poorly drained mineral	Surface water Gleys / Ground water Gleys Shallow
Lac	Lacustrine type soil	Lacustrine
AlluvMIN	Alluvium	Mineral alluvium
Urban	Made Ground	Made

Table 4.7 List of Soils within the Study Area

4.5.3.5 Subsoils Deposits

Superficial deposits (subsoil) comprise geological deposits which cover the solid geology.

The subsoils mapping indicate that the study area is dominated by Till derived from Limestone. Alluvium deposits are concentrated along the flood plains of the River Rye tributaries to the west near Maynooth, along the River Liffey and the Lucan Stream to the east of Leixlip.

There are three locations of Urban (Made Ground) deposits in the study area. They are located at the western end under the footprint of Maynooth, to the south of Junction 6 Celbridge, under the footprint of Celbridge, and at the eastern end of the study area under the footprint of Leixlip.

As noted in the soils section, there is an area of cut/cutover raised peat recorded directly outside of the study area to the south of the R405. Similarly, the Lacustrine deposit to the southwest of Maynooth is also identified in the subsoils map of the study area.

A cluster of bedrock outcrops and subcrops are recorded within the western portion of the study area just south of the M4, in Crinstown with another cluster north of Ballygoran and in the eastern section of the study area, along the River Liffey and another two outcrops south of Leixlip.

The subsoil types as classified by the GSI Quaternary mapping within the study area are listed in Table 4.8.

Soil Type	Description
A	Alluvium
Rck	Bedrock outcrop or subcrop
TLs	Till derived from limestones
Urban	Made Ground

Soil Type	Description
L	Lacustrine

Table 4.8 List of Subsoils (Quaternary) within Study Area

4.5.3.6 Bedrock Geology

The rock formations encountered in the study area are detailed in Table 4.9.

The bedrock geology underlying the study area comprises the Lucan, Tober Colleen, the Waulsortian Limestones and the Boston Hill formations. Refer to Table 4.9 for descriptions of each of these lithologies. The Lucan formation underlies the majority of the study area aside from a sequence of the Tober Colleen formation (a calcareous shale and limestone conglomerate) overlying the Waulsortian limestone and the Boston Hill, a muddy limestone and shale in the anticlinal fold crossing Maynooth towards the west of the study area.

There is a scattered cluster of outcrop and sub cropping features within the study area surrounding Maynooth, in areas such as Treadstown, Cormickstown, Newtown, north of Junction 7 Maynooth and scattered north from Ballygoran.

There is a cluster of shallow outcrops and sub crops to the eastern end of the study area. These outcrops and sub crops follow the alignment of the River Liffey and surround Leixlip. There is another small cluster of outcrops south of Junction 5 Leixlip.

There is a northwest to southeast running fault to the northwest within the study area.

The study area comprises a complex geological history with periods of folding and faulting.

The bedrock geology within the study area ranges between the middle to lower carboniferous period and are detailed in Table 4.9.

Geological Period	Formation	Description
Middle Carboniferous	Lucan Formation	Lithological Summary: A dark limestone and calp shale. The Lucan formation is approximately equivalent to the Calp of Marchant and Sevastopulo (1980). The formation comprises dark-grey to black, fine-grained, occasionally cherty, micritic limestones that weather paler, usually to pale grey. There are rare dark coarser grained calcarenitic limestones, sometimes graded, and interbedded dark-grey calcar
Middle Carboniferous	Tober Colleen Formation	Lithological Summary: A calcareous shale, limestone conglomerate. The section is exposed in boreholes at Hunstown and Feltrim quarries. Dark-grey, calcareous, commonly bioturbated mudstones and subordinate thin micritic limestones.
Lower Carboniferous	Waulsortian Limestones	Lithological Summary: A massive unbedded lime-mudstone. The Name Waulsortian Limestones is taken from rocks of similar lithology and age in Belgium.

Geological Period	Formation	Description
Middle Carboniferous	Lucan Formation	Lithological Summary: A dark limestone and calp shale. The Lucan formation is approximately equivalent to the Calp of Marchant and Sevastopulo (1980). The formation comprises dark-grey to black, fine-grained, occasionally cherty, micritic limestones that weather paler, usually to pale grey. There are rare dark coarser grained calcarenitic limestones, sometimes graded, and interbedded dark-grey calcar
Middle Carboniferous	Tober Colleen Formation	Lithological Summary: A calcareous shale, limestone conglomerate. The section is exposed in boreholes at Hunstown and Feltrim quarries. Dark-grey, calcareous, commonly bioturbated mudstones and subordinate thin micritic limestones.
Lower Carboniferous	Boston Hill Formation	Lithological Summary: A nodular & muddy limestone & shale. The formation is divided into a number of informal units from the base - the Lower Calcarenite Unit, Main Bioclastic limestone, Upper Laminated Limestone, Calcarenite B, Banded Shaly Unit, Crinoidal Shaly Unit, Calcarenite A, Calcarenite Marker and Calcareni

Table 4.9 Summary of Bedrock Geology

4.5.3.7 Karst Features

The GSI Karst database was reviewed to determine if the Limestone formations within the region are karstic and contain karst solution features. There are no karst features recorded within the study area. However, the underlying bedrock geology may be susceptible to karst as karst features were recorded in the same formations outside of the study area.

There are three karst features outside of the study area recorded by the GSI. These include the following:

- A spring titled St. Columbs well, within the Lucan Formation, located in the vicinity of the study area, north of Leixlip in Newtown;
- A cave within the Tober Colleen Formation is located in the centre of the region, within the Carton Demesne; and
- A cave within the Tober Colleen Formation is located in the centre of the region, within the Carton Demesne.

4.5.3.8 Slope Stability

The GSI has developed a landslide susceptibility map for the entire area of the Republic of Ireland.

Generally, landslide susceptibility is correlated to the topography, so the areas with higher landslide susceptibility are in the higher, steeper elevations, coastal cliffs and valley sides. The majority of the study area has a low landslide susceptibility with localised areas having a moderately low to moderately high susceptibility.

These localised areas are recorded along the western bank of the River Liffey and along the eastern bank just north of Leixlip Dam within the study area.

There are no recorded landslides within the study area.

4.5.3.9 Contaminated Sites and Unsuitable Material

Potential sources of contamination within the study area have been investigated and identified into the following four categories as described in the following sections:

- Landfills (licensed and historical);
- Pits, quarries and mines (historical);
- Industrial facilities (licensed and historical); and
- Historical land use contamination.

Publicly available records both online, within Kildare County Council, South County Dublin Council, the EPA website and from historic maps have been consulted to determine the type and location of sites that are possibly contaminated or could store unsuitable material. While the results are detailed below, it should be noted that it is possible there are such facilities that are not officially recorded and therefore these are not shown on the Figures or reported in this document.

4.5.3.10 Landfills

There are no recorded landfills within the study area. There is a historic landfill at Ryevale, 1km north of the M4 outside of the study area.

4.5.3.11 Historic Pits and Quarries

Historical pits and quarries are potential sources of ground contamination or unsuitable material as the nature of backfill material is generally highly variable and unregulated.

The GSI pits and quarries and the OSI historic maps were reviewed to compile a list of historic pits and quarries in the study area. According to these records there is one historical pit and four historical quarries within the study area. Three of the early to mid-20th century quarries are in the eastern section of the study area near the Leixlip Hydro-Electric plant, north of Hydro-Electric Plant, where Leixlip Castle is located and north of the Lucan Golf Club. The historic gravel pit is located in the Lucan Golf Club. The final quarry is in the western section of the study area, in Ballygoran near the Ballygoran Reservoir.

There is a small cluster of early to mid-20th century quarries just south of the Lucan Golf Club, outside the study area. There is a large cluster of historic pits and quarries surrounding Leixlip outside the study area.

4.5.3.12 Industrial Facilities

There is one recorded Industrial Emissions Licence (IEL) facility in the study area and is listed in Table 4.10. Hewlett Packard Production Company Limited is located

in the Liffey Business Park, adjacent to Junction 6 Celbridge. This IEL was surrendered in 1997.

RegCD	Name	Licence Status	Licence Type	Address
P0195	HP Production Company Limited.	Surrendered	IEL	Barnhall, Parsonstown, Rinawade Upr & Rinawade Lr., Leixlip, Kildare

Table 4.10 IEL/IPC licenced industrial facilities (Datasets: Industrial Emissions Licence, IPC Site)

There is a Drinking Water Treatment Plant located within the study area, south of Leixlip and north of Weston Airport that has two associated Wastewater Discharge (WWD) licences listed by Irish Water. These licences could possibly be associated with coagulation/floculation or filter backwashes within the plant.

Kildare County Council and South Dublin County Council were contacted for information pertaining to groundwater, surface water and wastewater discharge licences within the study area. The information provided showed five abstraction points from the River Liffey, downstream of the Leixlip Drinking Water Treatment Plant, north of the Liffey Bridge. Four of the abstraction points are used for public water scheme supply for the Leixlip Drinking Water Plant while one of the abstraction points provides the water necessary for hydropower generation at the hydro-electric power plant.

There is one fuelling station within the study area, south of the M4 on the R449 (E 696636, N 735274). There are seven other fuelling stations outside of the study area, located in the east, in Leixlip, to the south in Celbridge and to the west in Maynooth.

4.5.3.13 Current Land Use

On the Corine Land Cover map 2018, the primary land use within the study area is pasture. There are four recorded discontinuous urban fabrics which are clustered in urban areas such as at Maynooth, Celbridge, Leixlip and Lucan to the eastern end of the study area. Along the study area between Maynooth and Leixlip there is a localised area designated for road and rail networks and associated land, which is the existing M4 route. To the west of the study area, west of Maynooth, there is a localised area of pastures and non-irrigated arable land. In the centre of the study area, between Leixlip and Celbridge, there is land use designated as industrial or commercial units at the site of the Liffey Business Park. Mixed forest land use and non-irrigated arable land is present to the south of Junction 6 Celbridge. The eastern end of the study area is characterised as sport and leisure facilities (Lucan Golf Club), non-irrigated arable land and the land associated with Weston Airport.

4.5.3.14 Historic Land Use Contamination

Land contamination is related to site history and previous land use which can leave contaminants in the ground depending on historic site activities. The extent of soil

contamination from historic land uses are typically localised. The NRA Guidelines (National Roads Authority, 2008) do not define specifically what is a heavy or light industry. The following categories are recommended:

Heavy industries includes for the following definitions:

- Medium to large scale industries, such as power stations, gas works, wastewater treatment plants, other municipal facilities, etc.

According to the OSI review of 1830's and 1890's historic mapping, EPA records and aerial photos, there are two medium to large scale industries within the study area which are the Liffey Hydro-Electric Plant and the Leixlip Drinking Water Treatment Plant (E700664, N735719).

To the north, outside the study area, a historic gas works is recorded in Maynooth, near Maynooth University (E69333, N73727).

According to the OSI review of 1830's and 1890's historic mapping EPA records and aerial photos, there are two historic mills from the 1830's within the study area, a flour mill (E700432; N735103) and a corn mill (E702361; N735018). The flour mill was located in the area of the commercial buildings south of the River Liffey Bridge on the eastern bank of the River Liffey. The corn mill was located east of the Lucan Spa Hotel adjacent to the R835. The footprint of the covered reservoir at Ballygoran was significant in the 6-inch Cassini historic map. In the 1995 aerial photograph the footprint was considerably less.

It is possible that the larger area displayed on the 6-inch Cassini map was backfilled with unsuitable material as the nature of backfill material may be highly variable and unregulated. There is also a reservoir on the grounds of Leixlip Castle that appears to be backfilled also.

The Maynooth-Dublin railway line which historically was referred to as the Midland Great Western Railway runs along the southern side of the Royal Canal which cuts the western side of the study area. Historically the Royal Canal was used for freight and passenger transportation between Dublin and Ireland.

4.5.3.15 Economic Geology

The economic geological features within the study area have been subdivided into the following categories:

- Crushed Rock Aggregate Potential;
- Granular Aggregate Potential;
- Active pits, mines and quarries;
- Mineral resource locations; and
- Subsoil deposits important for agriculture.

4.5.3.16 Crushed Rock Aggregate Potential

GSI carried out national crushed rock aggregate potential mapping between 2007 and 2013. The maps are compiled based on the bedrock lithology, as well as existing and historic quarry activity. The final scores have five bands ranging from very low potential (blue) to very high potential (red) and have been applied to the entire area of the Republic of Ireland.

The crushed rock aggregate potential across the study area is as follows:

- An isolated strip of very low to moderate potential of crushed rock aggregated cuts across the study area in the western section, from Cormickstown and Newtown into the southeast section of Maynooth;
- An isolated strip of low to moderate potential crushed rock aggregate cuts across the study area in the western section, near Ballygoran. Further north and south along this strip the potential drops to very low;
- An isolated strip of low potential crushed rock aggregate follows the alignment of the River Liffey south of Leixlip;
- Moderate potential of crushed rock aggregate occurs along the majority of the study area, from the far western section, west of Maynooth, to Moneycooly and between Barrogstown and Leixlip;
- High to very high potential of crushed rock aggregate is recorded in the western section of the study area at Ballygoran north, south of Maynooth;
- High to very high potential of crushed rock aggregate is located to the west of Maynooth at Treadstown; and
- High to very high potential of crushed rock aggregate is in the eastern section of the study area, along the banks of the River Liffey and the Lucan Stream. There is a narrow band of moderate potential along the corridor of the M4/N4.

4.5.3.17 Granular Aggregate Potential

The GSI Granular Aggregate Potential Mapping categorises granular superficial deposits in terms of aggregate resource into five levels, from very high potential to very low potential not defined.

In the far eastern section of the study area, west of Lucan Town, there is a mixture of moderate, low to very low granular potential along the alignment of the River Liffey. There is very low potential along the Lucan Stream in the same area. There is also very low granular aggregate potential underlying the footprint of Weston Airport south of Leixlip. In the western section of the study area there is very low granular aggregate potential along the alignment of the River Lyreen, River Gragadder and the Ballycannon River. The remaining study area has no aggregate potential as in accordance with the GSI there are no potential natural aggregate resources here.

4.5.3.18 Active Pits, Mines and Quarries

The GSI 2014 Active Quarry, Pits and Mineral Localities Directory was checked and there are no recorded active mines within the study area.

The GSI 2014 Quarry Directory was consulted. There are no recorded active crushed rock, dimensioned stone or sand and gravel quarries within the study area.

4.5.3.19 Mineral Resource Locations

There are no mineral resource locations within the study area according to the GSI Mineral Localities database.

The Exploration and Mining Division website and the GSI website has been reviewed to check on the status of mine licensing within the study area.

The study area is located within two prospecting licences. The western section of the study area is prospecting licence 3329. In the centre of the study area is prospecting licence 3614. Both licences are held by Teck Ireland Limited. The licences are for base metals, barytes, gold, ores of sliver and ores of platinum group elements. The start date for each licence is the 26th of January 2012.

The GSI website has recorded a verified borehole that was historically used for mineral prospecting in the Waulsortian Reef Bedrock to the west of the study area just south of Maynooth. The borehole RN 3329-4 within the study area recorded ‘coarsely crystalline dolomite’.

4.5.3.20 Geological Heritage

According to the GSI 2020 Geological Heritage audited and unaudited sites directory, there are no Geological Heritage audited and unaudited sites within the study area.

4.5.3.21 Soft and/or Unstable Ground

Deposits of soft ground, such as alluvial mineral (AlluvMIN) are located as indicated by the EPA National Soils map mainly along the alignments of the River Liffey and the Ballycannon River and the Lucan Stream. There is a localised Lacustrine deposit to the southwest of Maynooth.

Made Ground is generally concentrated in urban areas such as Lucan, Leixlip, Celbridge and Maynooth. In the EPA National Soils map, there is Made Ground located in the centre of the study area, north of the existing M4 at Kilmacredock Upper.

Other areas of potential soft or unstable ground include the locations of historic pits and quarries and also possibly the historic footprint of the Ballygoran and Leixlip Castle Reservoir as shown on the 6-inch Cassini historic map.

4.5.4 Summary

The soils and geological features that represent constraints within the study area have been identified in this Section and are summarised in Table 4.11.

Category	Name	Relevant Characteristic / Key Constraints
Soils	Well drained soils	Importance for agriculture.
	River alluvium	Importance for agriculture.
	All	Limiting impact on the soil ecosystem in accordance with EIA Directive (2014/52/EU).
Subsoils	Alluvium and Lacustrine Deposits	Possible requirement to excavate and replace soft ground for approaching embankments or structures at the River Liffey. Soft soils are also present along the alignment of the River Lyreen, Graggader, Ballycannon and the Lucan Stream. There is a small localised Lacustrine deposit southeast of Maynooth. Any excavated soft ground would need to be disposed of offsite to an appropriate licensed facility. Land take in areas of cut through soft ground could be significant.
	Made Ground	Variable ground both in consistency and content. This material will possibly need to be excavated and could potentially be contaminated. Made Ground is generally concentrated in urban areas such as Lucan, Leixlip, Celbridge and Maynooth and at a localised area in the centre of the study area, north of the existing M4 at Barrogstown.
Bedrock Geology	Limestone Formations	Potential for karst features and associated voids, potential to cause collapse of ground. A number of springs and caves noted outside the study area to the north in the rock formations that underlie the study area.
	Shallow Bedrock	Potential for shallow bedrock in areas of bedrock outcrops and subcrops surrounding Maynooth, in areas such as Treadstown, Cormickstown, Newtown, north of Junction 7 Maynooth and scattered north from Ballygoran. There is a cluster of shallow outcrops and subcrops to the eastern end of the study area. These outcrops and sub crops follow the alignment of the River Liffey and surround Leixlip. There is another small cluster of outcrops south of Junction 5 Leixlip.
Soil Stability	Landslide Susceptibility	There is moderately high susceptibility recorded along the western bank of the River Liffey within the study area and along the eastern bank just north of Leixlip Dam.

Category	Name	Relevant Characteristic / Key Constraints
	Soft Compressible Soils	The presence of soft alluvial deposits along the alignment of the River Liffey, Lyreen, Graggader, Ballycannon and the Lucan Stream are susceptible to instability during construction and significant long-term settlement. The Lacustrine deposit to the southeast of Maynooth is also a soft deposit.
Contamination and Unsuitable Material	Historic Pits, Quarries and Mines	Historic pits and quarries could be backfilled with potentially variable contaminated material and/or material that has been poorly compacted. Underground workings associated with previous extractive works may not be fully mapped and charted and may lead to instabilities. According to these records there is one historical pit and four historical quarries within the study area. One pit and three quarries are located to the east of the study area. The three quarries were located at Leixlip Hydro-Electric plant, north of Hydro-Electric Plant and north of Lucan golf club. The historical pit was located at Lucan Golf Club. The historical quarry in the west was located at Ballygoran.
	Industrial Facilities	The IE licensed facility in the Liffey Business Park (HP Production Company Ltd), Leixlip Hydro-Electric Station and Leixlip Drinking Water Treatment Plant east of the River Liffey Bridge could potentially be a source of contamination if environmental protection procedures were not adhered to.
	Soil Contamination associated with Historic Land Use Contamination	The historic activities and land use at the sites of the corn and flour mill east of the River Liffey could have resulted in soil contamination.
	Existing Earthworks	Potential impact from existing earthworks embankments and cut slopes from previous development of the M4/N4.
	Traffic on the road	Surface water runoff comprising hydrocarbons from traffic from the existing road into the adjacent soils.
Economic Geology	Crushed Rock Aggregate Potential	Moderate to very high potential for crushed rock aggregate is noted in the western and eastern section of the study area. These areas align with the location of shallow bedrock.
	Prospecting licences	There are two prospecting licences within the study area. Prospecting licence 3329 and 3614. Both are held by Teck Ireland Limited for base metals, barytes, gold, ores of sliver and ores of platinum group elements.

Table 4.11 Summary of Geological Constraints

4.5.5 References

There are no sources in the current document.

4.6 Hydrogeology

4.6.1 Introduction

This section describes the hydrogeological constraints identified within the study area for the Maynooth to Leixlip Project. This desktop study collates information from readily available sources that will be used to inform the Maynooth to Leixlip Project. This section should be read in conjunction with the Hydrogeology Constraints Figures 4.6.1 to 4.6.18.

Section 4.6.2 describes the methodologies and sources of information that were used to carry out the study. Section 4.6.3 describes the existing hydrogeological environment and constraints within the study area. A summary is presented in Section 4.6.4 and references are listed in Section 4.6.5.

4.6.2 Methodology and Sources of Information

4.6.2.1 Methodology

This assessment was prepared in accordance with the requirements of the Transport Infrastructure Ireland (TII), formerly National Roads Authority (NRA) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes, NRA 2009[47]. This desktop study includes a review of the information listed in Section 4.6.2.2, to identify the constraints associated with hydrogeology within the study area.

The guidelines[47] provide criteria for ranking the importance of the hydrogeological constraints identified, and these criteria are presented in Table 4.12.

Importance	Criteria	Typical Example
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. SAC or SPA status.
Very High	Attribute has a high quality or value on a regional or national scale	Regionally Important Aquifer with multiple wellfields. Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – e.g. NHA status. Regionally important potable water source supplying >2500 homes. Inner source protection area for regionally important water source.
High	Attribute has a high quality or value on a local scale	Regionally Important Aquifer. Groundwater provides large proportion of baseflow to local rivers.

[47] TII (2009) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes. Available from: https://www.tii.ie/technical-services/environment/planning/Guidelines-on-Procedures-for-Assessment-and-Treatment-of-Geology-Hydrology-and-Hydrogeology-for-National-Road-Schemes.pdf

Importance	Criteria	Typical Example
		Locally important potable water source supplying >1000 homes. Outer source protection area for regionally important water source. Inner source protection area for locally important water source.
Medium	Attribute has a medium quality or value on a local scale	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	Poor Bedrock Aquifer. Potable water source supplying <50 homes.

Table 4.12 Criteria for rating the importance of identified features (based on TII Guidelines (2009) Box 4.3: Criteria for Rating Site Attributes)

The desk study includes a hydrogeological assessment of the following criteria:

- Aquifer type and classification;
- Groundwater vulnerability;
- Groundwater resources;
- Groundwater discharge licences; and
- Hydro-ecology.

4.6.2.2 Sources of Information

The following list of data sources were the main information sources consulted to identify hydrogeological constraints:

- Ordnance Survey Discovery series Mapping (1:50,000)[48]
- Bedrock Geology Map (1:100,000)[49]
- Groundwater Resources (Aquifers)[49]
- Groundwater Vulnerability[49]
- Groundwater Rock Unit[49]
- GSI Groundwater Bodies[50]

[48] Ordnance Survey Ireland. Available from:https://www.osi.ie (Accessed: 11/02/2021)
[49] Geological Survey Ireland (GSI) Bedrock Geology 1:100,000, Groundwater Rock Units, Groundwater Aquifers, Groundwater Vulnerability, Groundwater Wells and Springs, Groundwater Flood Data . Available from: https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228 [Accessed: 11/02/2021]
[50] Geological Survey of Ireland, Groundwater Bodies, available from: https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/activities/understanding-ireland-groundwater/Pages/Groundwater-bodies.aspx [Accessed: 11/02/2021]

- Groundwater Source Protection Areas[49]
- Groundwater Wells and Springs[49]
- Karst Features and Tracer Test Database[49]
- Licensed Facilities[51]
- Water Quality Monitoring Database and Reports[51]
- Designated ecological area maps[51]
- Groundwater Flood Data[49]

4.6.3 Existing Environment

This section describes the hydrogeological constraints identified within the study area. Constraints associated with aquifer classification and groundwater bodies, aquifer vulnerability, groundwater resources, groundwater discharge licences and water dependant terrestrial ecosystems within the study area are described herein.

4.6.3.1 Aquifer Classification and Groundwater Bodies

The GSI has classified geological strata for hydrogeological purposes based on the value of the groundwater resources and the hydrogeological characteristics. There are three principal categories of aquifer, corresponding to whether they are major, minor or unproductive resources whereby:

- Regionally Important Aquifers are capable of supplying regionally important abstractions (e.g. large public water supplies), or excellent yields (>400 m^3/d);
- Locally Important Aquifers are capable of supplying locally important abstractions (e.g. smaller public water supplies, group schemes), or good yields (100-400 m^3/d); and
- Poor Aquifers are capable of supplying small abstractions (e.g. domestic supplies), or moderate to low yields (<100 m^3).

The three principal aquifer categories are further subdivided into ten aquifer sub-categories49 in Table 4.13.

Aquifer Category	Sub-category Description	Code
Regionally Important (R)	Karstified Bedrock dominated by diffuse flow	(Rkd)
	Karstified Bedrock dominated by conduit flow	(Rkc)
	Fissured bedrock	(Rf)
	Extensive sand & gravel	(Rg)
Locally Important (L)	Sand & gravel	(Lg)
	Bedrock which is Generally Moderately Productive	(Lm)
	Bedrock which is karstified to a limited degree or limited area	(Lk)

[51] Environmental Protection Agency (EPA) Maps, available from: https://gis.epa.ie/EPAMaps/ [Accessed 11/02/2021]

Aquifer Category	Sub-category Description	Code
	Bedrock which is Moderately Productive only in Local zones	(Ll)
Poor (P)	Bedrock which is Generally Unproductive except for Local zones	(Pl)
	Bedrock which is Generally Unproductive	(Pu)

Table 4.13 Aquifer Category49

Examples of significant impacts to aquifers are as follows:

- The disruption of groundwater flow paths during earthworks;
- Reduced yield and groundwater levels in groundwater supplies adjacent to earthworks or road cuttings;
- Disruption of baseflow to groundwater fed rivers or fens; and
- Contamination of the aquifer through accidental spillage.

The aquifers in the region include the following:

- The majority of the study area is underlain by a locally important aquifer. This is a bedrock aquifer which is moderately productive but only in local zones (Ll); and
- Two sections located approximately 1.6km to the east (approximately 300m wide) and 1km to the west of Junction 7 Maynooth (approximately 600m wide) are classified as Poor Aquifer (Pl).

The aquifers are part of the Dublin groundwater body which is classified as being at “Good” status under the Water Framework Directive.

Aquifer Classification	Rock Formation	Groundwater Rock Unit	Groundwater Body50	Constraint Importance Ranking
Ll	Calp	Dinantian Upper Impure Limestones	Dublin	Medium
	Waulsortian Limestones	Dinantian Pure Unbedded Limestones		
	Boston Hill Formation	Dinantian Lower Impure Limestones		
	Lucan Formation	Dinantian Upper Impure Limestones		
Pl	Tober Colleen Formation	Dinantian Upper Impure Limestones	Dublin	Low

Table 4.14 Aquifer Classification and Groundwater Bodies within the Study Area49

There are no karst features recorded within the study area. However, the underlying bedrock geology may be susceptible to karst as karst features were recorded in the same formations outside of the study area.

4.6.3.2 Aquifer Vulnerability

Aquifer vulnerability is the term used to describe the intrinsic geological and hydrogeological characteristics which determine the ease with which a groundwater body may be contaminated by human activities.

Aquifer vulnerability is determined mainly by the permeability and thickness of the subsoils that underlie the topsoil. For example, bedrock with a thick, low permeability overburden is less vulnerable than bedrock with a thin, high permeability, gravel overburden. This is due to the ability of potential contaminants to reach the aquifer in a relatively short period and with little or no contaminant attenuation due to the thin or absent overburden.

Aquifer vulnerability classification guidelines[52] are given in Table 4.15.

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

Notes: (1) N/A = not applicable
(2) Precise permeability values cannot be given at present.
(3) Release point of contaminants is assumed to be 1-2 meters below ground surface.

Table 4.15 GSI Vulnerability Rating Matrix[52]

Groundwater vulnerability within the study area ranges from 'Extreme' where bedrock is close or at the surface to 'Moderate' vulnerability in areas where thick subsoil deposit is present, refer to Figures 4.6.1 to 4.6.18.

4.6.3.3 Groundwater Resources

Groundwater sources include springs, wells or boreholes which are used for groundwater abstraction by domestic, agricultural, commercial, industrial, local authority or group water scheme users.

Groundwater sources can be impacted by lowering of the water-table which may reduce the supply available and by accidental spillages or releases of contaminants which may impact the water quality.

[52] Department of the Environment and Local Government (DoELG), Environmental Protection Agency (EPA) and Geological Survey of Ireland (GSI) (1999) Groundwater Protection Schemes, Available from: https://www.gsi.ie/documents/Groundwater_Protection_Schemes_report.pdf, [Accessed February 2021]

Source Protection Zone (SPZ) reports have been produced by the GSI and the EPA. The reports aim to guide development planning and regulation to provide protection to groundwater sources. To date no SPZ reports have been produced for any location within the study area. In addition, no Group Water Scheme abstraction points are located in the study area.

22 boreholes or springs from the GSI database have been identified within the study area, however, the record does not state which wells are currently used for abstraction. It is expected that these are potable water sources supplying less than 50 homes, which is considered to be of low importance as a constraint (based on TII Guidelines (2009) Box 4.3: Criteria for Rating Site Attributes)47.

In terms of well accuracy (which refers to the location of a well within a defined radius, the exact location is not known), there are nine boreholes and springs within 10m, none within 100m, two within 200m, one within 500m and 10 within an accuracy of 1km. Note, wells with a 5km accuracy have not been included as knowledge of their location is considered too poor for them to be accurately assessed in relation to potential route options.

The boreholes, springs, potential wells and potential springs are identified in Figures 4.6.1 to 4.6.18.

4.6.3.4 Groundwater Discharge Licences

Kildare County Council and South Dublin County Council have been consulted for their records of groundwater discharge licences within the study area. There are no licences to discharge to groundwater identified in the study area.

4.6.3.5 Hydro-ecology

Groundwater dependant habitats are hydrogeological constraints as they have the potential to be impacted as a result of deterioration in groundwater levels, flows or quality through, for instance, accidental spillages, dewatering causing alteration of baseflow to the habitat causing the area to dry out. A conservative approach was taken regarding water dependent habitats. In advance of a detailed survey at environmental impact assessment stage, some features have been included and given an importance rating as if they are dependent on both surface water and groundwater.

The water dependant habitats within the study area include watercourses and calcareous springs (tufa springs).

Water dependant habitats are listed in Table 4.16 Water Dependant Habitats and presented in Figures 4.6.1 to 4.6.18. These habitats are further discussed in Section 4.4 Biodiversity. The constraint importance ranking shown in Table 4.16 Water Dependant Habitats is only related to the hydrogeological importance ranking due to the site being a water dependant habitat.

Site Name	Site Code	Designation	Characteristics	Constraint Importance Ranking
Royal Canal	002103	pNHA	The canal contains the following habitats: calcareous grassland, reed fringe, open water, scrub and woodland.	Very high
Liffey Valley	000128	pNHA	Meandering river associated with deciduous woodland and wet marsh	Very high
Rye Water	001398	SAC pNHA	Tributary of the River Liffey associated with deciduous and coniferous woodland Petrifying springs with tufa formation [7220]	Extremely high

Table 4.16 Water Dependant Habitats

4.6.3.6 Groundwater Flooding

The GSI groundwater flooding maps provide information on historic groundwater flooding as well as a potential areas of flooding[49]. There are two areas within the study area where historic flooding has been identified. Refer to Figures 4.6.1 to 4.6.18.

4.6.4 Summary and Conclusions

This section has identified the hydrogeological constraints for the study area by assessing:

- Aquifer type;
- Vulnerability of groundwater;
- Quantifying groundwater as a resource;
- Groundwater discharge licences; and
- Presence of water dependant terrestrial ecosystems.

These hydrogeological attributes have been assessed in terms of importance so that they can be considered in the development and assessment of potential options.

The majority of the study area is underlain by a locally important aquifer of medium importance. There also two areas of poor aquifer present in the study area which are of low importance.

The groundwater abstraction wells identified within the study area are of low importance with no group water schemes or public supply source protection areas.

There are three water dependant habitats within the study area which have been ranked from very high to extremely high importance. The ranking presented in this section is only related to the habitats being water dependent and further information on the importance related to biodiversity is provided in Section 4.4.

Refer to Figures 4.6.1 to 4.6.18 which summarise the hydrogeological constraints within the study area.

4.6.5 References

Department of the Environment and Local Government (DoELG), Environmental Protection Agency (EPA) and Geological Survey of Ireland (GSI) (1999) Groundwater Protection Schemes, Available from: https://www.gsi.ie/documents/Groundwater_Protection_Schemes_report.pdf, [Accessed February 2021]

Environmental Protection Agency (EPA) (2021) Maps, available from: https://gis.epa.ie/EPAMaps/ [Accessed February 2021]

Geological Survey Ireland (GSI) (2021) Bedrock Geology 1:100,000, Groundwater Rock Units, Groundwater Aquifers, Groundwater Vulnerability, Groundwater Wells and Springs. Available from: https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228 [Accessed February 2021]

Geological Survey of Ireland, Groundwater Bodies, Available from: https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/activities/understanding-ireland-groundwater/Pages/Groundwater-bodies.aspx [Accessed February 2021]

Ordnance Survey Ireland (OSI) (2021) Available from: https://www.osi.ie [Accessed: February 2021]

TII (2009) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes. Available from: https://www.tii.ie/technical-services/environment/planning/Guidelines-on-Procedures-for-Assessment-and-Treatment-of-Geology-Hydrology-and-Hydrogeology-for-National-Road-Schemes.pdf, [Accessed February 2021]

4.7 Hydrology

4.7.1 Introduction

This section presents the hydrological constraints identified within the study area for the Maynooth to Leixlip Project. Hydrogeological (i.e. groundwater) and karst constraints have been separately considered in Section 4.6. This section should be read in conjunction with the Hydrology Constraints Figures 4.7.1 to 4.7.12.

Section 4.7.2 describes the methodologies and sources of information that were used to carry out the study. Section 4.7.3 describes the existing environment within the study area as it relates to hydrology. A summary is presented in Section 4.7.4 and references are listed in Section 4.7.5.

4.7.2 Methodology and Sources of Information

This assessment has been prepared taking cognisance of the requirements of the Transport Infrastructure Ireland (TII) guidance, formally National Roads Authority (NRA) guidance, for the assessment and treatment of geology, hydrology and hydrogeology on national road schemes[53].

These guidelines provide useful criteria for ranking of the identified hydrological constraints and the criteria are presented in Table 4.17.

Importance	Criteria	Typical Example
Extremely High	Attribute has a high quality or value on an international scale	River, wetland or surface water body ecosystem protected by EU legislation e.g. 'European sites' designated under the Habitats Regulations or 'Salmonid waters' designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988.
Very High	Attribute has a high quality or value on a regional or national scale	River, wetland or surface water body ecosystem protected by national legislation – NHA status Regionally important potable water source supplying >2500 homes Quality Class A (Biotic Index Q4, Q5) Flood plain protecting more than 50 residential or commercial properties from flooding Nationally important amenity site for wide range of leisure activities
High	Attribute has a high quality or value on a local scale	Salmon fishery Locally important potable water source supplying >1000 homes Quality Class B (Biotic Index Q3-4) Flood plain protecting between 5 and 50 residential or commercial properties from flooding Locally important amenity site for wide range of leisure activities

[53] Environmental Impact Assessment of National Road Schemes – Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes, NRA 2009.

Importance	Criteria	Typical Example
Medium	Attribute has a medium quality or value on a local scale	Coarse fishery Local potable water source supplying >50 homes Quality Class C (Biotic Index Q3, Q2- 3) Flood plain protecting between 1 and 5 residential or commercial properties from flooding
Low	Attribute has a low quality or value on a local scale	Locally important amenity site for small range of leisure activities Local potable water source supplying <50 homes. Quality Class D (Biotic Index Q2, Q1). Flood plain protecting 1 residential or commercial property from flooding. Amenity site used by small numbers of local people

Table 4.17 Criteria for rating site attributes – Estimation of importance of Hydrology attributes

This desktop study collated and reviewed the following sources of information to identify hydrological constraints within the study area:

- Draft Preliminary Flood Risk Assessment (PFRA) Mapping[54];
- Historic flood data[55];
- Catchment Flood Risk Assessment and Management (CFRAM) Flood Maps[56];
- Catchment Mapping[57];
- Sub-catchment Mapping[57];
- River/Lakes/Canal Risk Mapping[57];
- Water Framework Directive (WFD) Status 2013-2018 Mapping[57];
- River Q values[58];
- Groundwater Wells and Springs Mapping[59].
- Ordnance Survey Discovery mapping (1:50,000)[60];
- Ordnance Survey Discovery historic mapping[8;]

[54]Office of Public Works Preliminary Flood Risk Assessment (PFRA) Mapping. Available from https://www.floodinfo.ie/about_frm/pfra/ [Accessed: 22 Jan 2021].
[55]Office of Public Works Historic Flood Mapping, Available from: http://www.floodinfo.ie [Accessed: 22 Jan 2021].
[56]Office of Public Works Catchment Flood Risk Assessment and Management (CFRAM), Available from: https://www.floodinfo.ie/map/floodmaps/, [Accessed: 21 Jan 2021].
[57]Environmental Protection Agency (EPA) Catchment, Sub-catchment, River Waterbodies Risk, Latest River Q values, River Waterbody WFD (Water Framework Directive) Status 2010-2015, Available from: https://gis.epa.ie/EPAMaps/ [Accessed: 12 Feb 2021].
[58] EPA River Quality Surveys. Available from: http://www.epa.ie/QValue/webusers/. [Accessed 15 Feb 2021]
[59]Geological Survey Ireland (GSI) Groundwater Wells and Springs: Available from: https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=3400f393afa844538e5b81679552205d, [Accessed: 21 Jan 2021].
[60] Ordnance Survey Ireland. Ordnance survey maps. Available from: https://www.osi.ie [Accessed: 20 Jan 2021].

- NPWS NHA/SAC/SPA mapping[61]; and
- River Basin Management Plan for Ireland 2018-2021 (Department of Housing, Planning and Local Government, 2018)[62].

4.7.3 Existing Environment

The following section presents the existing environment and identifies the hydrological constraints within the study area.

4.7.3.1 Surface Water Features

The study area lies entirely within the Liffey and Dublin Bay Catchment, which is itself part of the National River Basin. Under the Water Framework Directive, Ireland is required to prepare River Basin Management Plans to ensure an integrated approach is taken to the protection, improvement and sustainable management of the water environment. This work is undertaken by the Environmental Protection Agency (EPA) and we are currently in the second River Basin Management planning period, covering 2018-2021[62]. The River Basin Management Plan (RBMP) 2018-2021 outlines the new approach that Ireland will take as it works to protect its rivers, lakes, estuaries and coastal waters over the four-year period.

The study area falls entirely within hydrometric area 9 (Liffey and Dublin Bay Catchment) and four sub-catchments (one for the River Lyreen and three for the River Liffey). The details for the four sub-catchments relative to the study area are presented in Table 4.18.

Associated Sub-catchment	Total Contributing Catchment Area	Contributing Catchment Area included within the study area	Percentage of Catchment within the Study Area
	km^2	km^2	%
Lyreen_SC_010	87.7	8.4	9.6
Liffey_SC_080	76.6	6.8	8.9
Liffey_SC_090	136.5	2.15	1.6
Liffey_SC_100	35.7	0.15	0.4

Table 4.18 Total contributing sub-catchment area sites included in the Study Area

The study area contains a number of surface water features including lakes, a canal, watercourses and their associated tributaries. These are presented in Figures 4.7.1 to 4.7.12, Surface Water Features. The rivers and their associated sub-catchments are summarised in Table 4.19.

[61] National Parks and Wildlife Services National Heritage Areas (NHA), Special Area of Conservation (SAC), Special Protection Areas (SPA). Available from: https://www.npws.ie/national-parks [Accessed: 21 Jan 2021].
[62] River Basin Management Plan 2018-2021 River Basin Management Plan. Available from: https://www.housing.gov.ie/ [Accessed: 15 Feb 2021]

Catchment	Sub-catchment	Associated River	Tributary stream
Liffey and Dublin Bay	Lyreen_SC_010	Lyreen	Gragadder
			Ballycannon
			Meadowbrook/Taghadoe
	Liffey_SC_080	Liffey	Kilmacredock Upper
	Liffey_SC_090	Liffey	Lucan Stream
	Liffey_SC_100	Liffey	

Table 4.19 Watercourses and their associated sub-catchments in the study area

The existing M4/N4 crosses watercourses at four locations (described from west to east):

- West of Junction 7 Maynooth: Lyreen River;
- West of Junction 7 Maynooth: Meadowbrook (Taghadoe) Stream;
- East of Junction 6 Celbridge: Kilmacredock Upper Stream; and
- West of Junction 5 Leixlip: River Liffey.

The River Liffey, downstream of the Leixlip Reservoir is known as The Liffey Valley and is a proposed Natural Heritage Area (pNHA).

There are two lakes within the study area which are summarised in Table 4.20. These are presented in Figures 4.7.1 to 4.7.12, Surface Water Features.

Name	Description
Ballygoran Reservoir	Manmade covered reservoir fed by the Leixlip water treatment plant to provide water to the surrounding environs. It is located east of Junction 7 Maynooth adjacent to the existing M4 carriageway.
Leixlip Reservoir	Large manmade reservoir on the River Liffey constructed for hydroelectric power generation and flood flow control. The existing M4 traverses this reservoir west of Junction 5.

Table 4.20 Lakes located within the Study Area

The Royal Canal passes through the study area west of Maynooth, approximately 750m north of the existing M4. The canal's source is at the River Shannon north of Lough Ree and discharges into the River Liffey in Dublin City. The canal location is presented in Figures 4.7.1 to 4.7.12, Surface Water Features. It is a proposed Natural Heritage Area (pNHA).

No surface water fed springs have been identified in the study area. Springs recognised as groundwater fed, if any, are documented in Section 4.6 Hydrogeology.

Smaller scale surface water features which are not publicly mapped, but which hold resource or amenity value if they are used for drinking water, fishing etc. may exist. Those identified in the study area are summarised in Table 4.21 and displayed in Figures 4.7.1 to 4.7.12.

ID	Location	Description
A1	Liffey Business Park	Drainage attenuation ponds
A2	Leixlip Reservoir	Designated drinking water abstraction point

Table 4.21 Surface Water Features with Amenity or Resource Value

4.7.3.2 Flooding

Historical Fluvial/Pluvial Flooding

Historical flooding has been assessed by examining reports and maps from the OPW's National Flood Hazard mapping[55]. Parts of the study area have historically been prone to fluvial flooding. A summary of the recorded flood events that have occurred within the study area are included in Table 4.22. The locations of these historic flooding points are shown in Figures 4.7.1 to 4.7.12.

FID	Year	Flood Name	Flood Mechanism
43	1993	Lyreen Maynooth Jackson's Bridge area June 1993	Fluvial
809	2000	Lyreen Maynooth M4 Nov 2000	Fluvial
1632	2000	Meadowbrook Greenfield M4 Nov 2000	Fluvial
1648	2002	M4 Motorway Treadstown Nov 2002	Not stated
1657	Recurring	Ballycurraghan reoccurring	Fluvial

Table 4.22 Summary of Recorded Flood events within the Study Area

It is noted that although there are no additional records of past flooding, it is still possible that unreported flooding may have occurred in the study area in the past.

Existing Flood Relief Schemes

The CFRAM Flood Risk Management Plan for Hydrometric Area 9[63] has been consulted to determine if there are any flood relief schemes in the study area. One such scheme is in operation on the Lyreen and Meadowbrook watercourses, within the study area. A scheme is also in operation in Leixlip which includes flood defences on the Rye Water and the Silleachain Stream, however this scheme is outside the study area.

The Lyreen and Meadowbrook Flood Relief Scheme was initiated in 2001 following major flooding in November 2000 and was constructed between 2002 and 2003.

[63] Flood Risk Management Plan for the Liffey & Dublin Bay River Basin (UOM09), available from http://www.floodinfo.ie [Accessed: 17 Feb 2021]

The scheme works included cleaning 4km of the Lyreen River channel and 1.6km of the Meadowbrook River channel, cleaning / repairing / replacing culverts, together with cleaning out aqueducts at Bond Bridge and Jackson's Bridge. The scheme also provided trash screens and flap valves on channels, where appropriate, and repairing a damaged wall at Parsons Lane. The scheme provides increased flood protection for 30 properties against flooding from the Meadowbrook and Lyreen Rivers. Any proposed option which interfaces with this scheme may create a requirement to obtain consent from the OPW under Section 9 of the Arterial Drainage Act, in addition to Section 50 consent.

Predicted Flood Risk

Tidal Flood Risk

Given the distance of the study area from the sea and its elevation above sea level, there is no risk of coastal flooding.

Pluvial Flood Risk

Pluvial flooding occurs when extreme rainfall overwhelms drainage systems or soil infiltration capacity, causing excess rainwater to pond above ground at low points in the topography. To assess the risk of pluvial flooding in the study area, the Office of Public Works (OPW) PFRA pluvial flood mapping was reviewed. This mapping indicates that parts of the study area would be at risk of pluvial flooding in a 1 in 100-year rainfall event. Most pluvial flood risk areas are indicated to be relatively small and localised. It is noted that this mapping was carried out at a national scale, is indicative, and does not take into account local drainage. These pluvial flood extents areas are shown in Figures 4.7.1 to 4.7.12. The pluvial flood risk will need to be verified as part of a detailed flood risk assessment. Pluvial flooding can typically be managed with appropriate design detailing e.g. provision of appropriate surface water drainage and grading.

Fluvial Flood Risk

Fluvial flooding occurs when, after periods of heavy rainfall, the water level rises in a watercourse to the extent that is overtops its banks and floods adjacent lands.

Predicted fluvial flood risk data was obtained from the following sources:

- Eastern Catchment Flood Risk Assessment Management Study (Eastern CFRAM); and
- Preliminary Flood Risk Assessment (PFRA).

The flood extent predictions for the 10-year (high probability), 100-year (medium probability) and 1000-year (low probability) return period events indicate the distribution of fluvial flood risk across the study area. These are presented in Figures 4.7.1 to 4.7.12.

All the watercourses detailed in Section 4.7.3.1 have been modelled and mapped as part of the Eastern CFRAM study with the exception of the Kilmacredock Upper stream. This stream has been mapped as part of the PFRA study which is a national scale high-level exercise which did not take structures such as culverts into account.

The Kilmacredock Upper is culverted beneath the M4 and therefore the predicted PFRA flood extent shown for this stream is not deemed to be realistic. Fluvial flood risk at this location may still exist. This needs to be verified as part of a flood risk assessment.

There is one extent of predicted fluvial flooding along the existing M4, approximately 2.8km in length, from the L5041 Treadstown Road Overbridge to Junction 7 Maynooth. The mapping shows predicted flooding here for the 100-year and 1000-year return period events. The source of flooding is as a result of the Lyreen River, which crosses the M4, overtopping its banks and flowing along the carriageway. Elsewhere in the study area, fluvial flooding is predicted for extents along the Gragadder, Lyreen, Meadowbrook, Liffey and Lucan Stream.

The alluvial soils presented in Figures 4.7.1 to 4.7.12 are potential locations of floodplains, although as they are representative of historic deposition, their full extent is not necessarily representative of the current floodplain (i.e. the floodplains are likely to be smaller than the extent of the alluvial soils represented on the drawings).

Strategic Flood Risk Assessments for the Kildare County Development Plan 2017-2023, South Dublin County Council Development Plan 2016 – 2022, and respective Local Area Plans for Maynooth, Celbridge and Leixlip were consulted as part of this study and no additional flood risk to the study area was identified.

4.7.3.3 Surface Water Quality

Water quality in Ireland is monitored by the EPA. Using the water quality data, the River Quality Class (Q-value)[58] system has been used to assess the watercourses within the study area. For each watercourse, the most recent data available was used. The River Quality Class system relates the biotic index to five water quality classes.

The Q-value system describes the relationship between water quality and the macroinvertebrate community in numerical terms. Q5 waters have high diversity of macroinvertebrates and good water quality, while Q1 waters have little or no macroinvertebrate diversity and bad water quality. Intermediate values, Q1-2, 2-3, 3-4 denote transitional conditions.

The EPA scheme of Biotic Indices or Quality (Q) values and its relationship to water quality is set out in Table 4.23.

Q Value	WFD Status	Pollution Status	Condition	EPA Quality Class
Q5, Q4-5	High	Unpolluted	Satisfactory	Class A
Q4	Good	Unpolluted	Satisfactory	Class B
Q3-4	Moderate	Slightly polluted	Unsatisfactory	Class C
Q3, Q2-3	Poor	Moderately polluted	Unsatisfactory	Class D
Q2, Q1-2, Q1	Bad	Seriously polluted	Unsatisfactory	Class E

Table 4.23 Biotic Indices (‘Q values’) reflect average water quality at any location

Within the study area, water quality is monitored in the Liffey and Lyreen rivers. Water quality is not monitored in their respective tributaries.

The Leixlip Reservoir is classified as a lake, its waterbody risk classification is currently under review and it was not assigned a WFD ecological status for the 2013-2018 cycle. A proportion of the motorway surface water drainage outfalls to the Leixlip Reservoir. Water is abstracted from the Leixlip Reservoir at a location just north of the M4 bridge to be treated for drinking water purposes. The reservoir, however, is fed by, and outlets to the River Liffey, which is monitored by the EPA. For this reason, it is assumed that the Surface Water Quality values of the River Liffey will be retained when referring to the Surface Water Quality of the Leixlip Reservoir.

The Surface Water Quality of the River Lyreen is measured at one point in the study area, approximately 300m downstream of where the existing M4 motorway crosses the river. On the River Liffey, Q values are given at two locations upstream and downstream of the study area. The water quality at these locations is summarised in Table 4.24.

Associated River	Station ID	Easting / Northing	Year Q-Value recorded:	Latest River Q-Score	Latest River Q-Value Status	River Waterbody Risk
River Lyreen	RS09L020035	291530 237251	2019	3*	Poor	At risk
River Liffey	RS09L011700	297359 232864	2019	4	Good	Under review
River Liffey	RS09L011900	300826 235806	2019	4	Good	Under review

* The continuing lack of pollution sensitive macroinvertebrate fauna and dominance of pollution tolerant taxa at this location continues to indicate unsatisfactory poor ecological conditions

Table 4.24 Surface Water Quality

The most recent Surface Water Quality of the River Lyreen in the study area is classified as of "Poor" status. The waterbody risk classification is "At risk". The most recent Q values for the River Liffey, for upstream and downstream of the Leixlip Reservoir, are 4. This equates to "Good" status and is classified as unpolluted and of satisfactory condition. The waterbody risk classification is currently under review, however for the 2013-2018 cycle it was declared as having "Good" ecological status.

Under the WFD, canals are required to achieve good ecological potential rather than good ecological status because they are artificial water bodies. Ecological potential can have a rating of maximum, good, moderate, poor or bad[64]. The potential of the Royal Canal within the study area is currently under review, however for the 2013-2018 cycle it was declared as having "Good" ecological potential in line with the WFD.

[64] Water Quality in Ireland 2013-2018, available from https://www.epa.ie/pubs/reports/water/waterqua/ [Accessed 16 Feb 2021]

4.7.3.4 Ecology

Section 4.4 Biodiversity documents the ecological constraints within the study area. They are not hydrological constraints in their own right, rather their ecological status may be dependent on some aspect of the hydrology (usually water levels, flows or quality).

4.7.4 Summary and Conclusions

The importance of the hydrological constraints have been summarised in Table 4.25 based on the criteria outlined in Table 4.17.

Feature	Description	Justification	Importance Ranking
Lyreen River and its tributaries	River in the Liffey and Dublin Bay Catchment	River Waterbody Risk Projection: At risk Q value status: Poor Flood Relief Scheme and floodplains protecting between 5 and 50 residential or commercial properties from flooding	High
River Liffey and its tributaries	River in the Liffey and Dublin Bay Catchment	River Waterbody Risk Projection: Under review Q value status: Good	High
Leixlip Reservoir	Manmade reservoir on the River Liffey	River Waterbody Risk Projection: Under review WFD status: assumed good based on River Liffey values Abstraction for Drinking water	Very High
Ballygoran Reservoir	Water supply reservoir	Drinking water supply	Very High
The Royal Canal	Artificial watercourse in the study area	WFD ecological potential: Good	High
Liffey Business Park	Liffey Business Park Attenuation Ponds	Locally important stormwater drainage	Low

Table 4.25 Hydrological Constraints

4.7.5 References

Environmental Impact Assessment of National Road Schemes – Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes, NRA 2009.

Office of Public Works Preliminary Flood Risk Assessment (PFRA) Mapping. Available from https://www.floodinfo.ie/about_frm/pfra/ [Accessed: 22 Jan 2021].

Office of Public Works Historic Flood Mapping, Available from: http://www.floodinfo.ie [Accessed: 22 Jan 2021].

Office of Public Works Catchment Flood Risk Assessment and Management (CFRAM), Available from: https://www.floodinfo.ie/map/floodmaps/, [Accessed: 21 Jan 2021].

Environmental Protection Agency (EPA) Catchment, Sub-catchment, River Waterbodies Risk, Latest River Q values, River Waterbody WFD (Water Framework Directive) Status 2010-2015, Available from: https://gis.epa.ie/EPAMaps/ [Accessed: 12 Feb 2021].

EPA River Quality Surveys. Available from: http://www.epa.ie/QValue/webusers/. [Accessed 15 Feb 2021]

Geological Survey Ireland (GSI) Groundwater Wells and Springs: Available from: https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=3400f393afa844538e5b81679552205d, [Accessed: 21 Jan 2021].

Ordnance Survey Ireland. Ordnance survey maps. Available from: https://www.osi.ie [Accessed: 20 Jan 2021].

National Parks and Wildlife Services National Heritage Areas (NHA), Special Area of Conservation (SAC), Special Protection Areas (SPA). Available from: https://www.npws.ie/national-parks [Accessed: 21 Jan 2021].

River Basin Management Plan 2018-2021 River Basin Management Plan. Available from: https://www.housing.gov.ie/ [Accessed: 15 Feb 2021]

Flood Risk Management Plan for the Liffey & Dublin Bay River Basin (UOM09), available from http://www.floodinfo.ie [Accessed: 17 Feb 2021]

Water Quality in Ireland 2013-2018, available from https://www.epa.ie/pubs/reports/water/waterqua/ [Accessed 16 Feb 2021]

4.8 Landscape and Visual

4.8.1 Introduction

This section presents the landscape and visual constraints identified within the study area for the Maynooth to Leixlip Project and should be read in conjunction with Landscape and Visual Figure 4.8.1.

Section 4.8.2 describes the methodologies used to carry out the study. Section 4.8.3 describes the existing environment within the study area. A summary and conclusion is presented in Section 4.8.4.

4.8.2 Methodology

The landscape and visual input to this Constraints Study has been prepared in accordance with the Transport Infrastructure Ireland (TII) document [65].

The guidelines provide recommendations on landscape character assessment in relation to the analysis of baseline conditions for infrastructural projects. It states that:

"*In Ireland Landscape Character Assessments (LCA) are available, for the most part, at an individual city and county level. These LCAs have statutory standing in that they are incorporated into the county and city development plan-making process for each particular local authority. However, in the absence of a national or regional landscape character assessment, there is an acknowledged lack of consistency in the approach, detail and quality of what is currently available, particularly across local authority boundaries*"

It is emphasised in the guidelines that it is recommended to follow existing landscape character assessments as far as possible and additional analysis should only be undertaken when there is a lack of consistency in the existing assessments:

"*it is not proposed to commence a new LCA for a project study area, but rather, to make use of the existing LCAs, and to review these for adequacy of detail, completeness, and consistency. Where lack of detail or consistency is noted and where there is deficiency in the scale or detail of landscape description or mapping, additional analysis, including field studies, mapping, and evaluation is proposed to allow completion of the LCA to the standard required to facilitate landscape and visual impact assessment".*

The landscape character assessments available for the relevant areas are of a good standard and are generally consistent in level of detail, type of description and coherence across county boundaries. It is not considered necessary to undertake further landscape character assessment in order to carry out this Constraints Study.

The desktop study involved the collection and review of online mapping resources, published guidelines and relevant published sources of information from Local

[65] Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) of Specified Infrastructure Projects - Overarching Technical Document

Authority Planning online sources. It was not considered necessary to undertake a site visit due to the high-level nature of the assessment.

The study area includes the M4/N4 corridor from Junction 7 Maynooth to Junction 5 Leixlip. The surrounding landscape has been considered as part of this constraints study due to the potential for interaction on a wider scale resulting from the proposals.

4.8.3 Baseline

4.8.3.1 Landscape Fabric and Character

The landscape fabric of the study area is composed of the M4/N4 road corridor with associated junctions, bridges, roundabouts and sections of connecting roads, and the surrounding landscape to within approximately 750m of the road. The L5041 and landscape surrounding Millfarm and Laraghbryan, to the west of Maynooth, is also included. The overall landscape is predominantly agricultural with some areas of suburban development to the fringes of Maynooth, Celbridge and Leixlip, and large-scale development in the form of Weston Airport and Liffey Business Park. Parts of seven historic demesnes are included within the study area, most notably Castletown Demesne which historically spanned both sides of the current alignment of the M4. These are described further in Section 4.10.3.6.

Existing landscaping to the M4/N4 road corridor includes substantial young/semi-mature bands of trees, hedgerows and grassland which were established as part of the road development. The vegetation effectively integrates the road corridor into the landscape and the screening effect of the existing vegetation minimises visibility of much of the road corridor and junctions within the wider area. Vegetation forms the primary feature of landscape value within the road corridor.

The character beyond the road corridor is mainly flat lowland composed of pasture or arable fields with well-treed margins and frequent pockets of woodland or copses. The study area passes through the southern extents of Maynooth and Leixlip, the northern extents of Celbridge and into the western extents of Lucan. These suburban areas are largely residential and contain visual receptors. The presence of screening vegetation along the M4/N4 corridor limits the amount of intervisibility between the road corridor and these urban areas. A network of local roads crosses the study area connecting to surrounding settlements, and the Royal Canal and Dublin to Sligo railway line pass through the western section of the study area. These transport routes are also generally well screened by adjacent well-treed hedgerows. The study area includes sections of the River Lyreen to the western end of the study area to the west of Maynooth, and the River Liffey to the east of the study area.

The eastern end of the study area passes through the Liffey Valley. This is designated in the Kildare and Fingal County Development Plans as an area of sensitive landscape character which includes areas of High Amenity.

To the east of the study area a section of the Liffey Valley is designated under a Special Amenity Area Order (SAAO), due to it being an area of outstanding natural beauty and providing special recreational value.

County landscape character assessments cover the study area and the surrounding areas. These are discussed in Section 4.8.3.3.

4.8.3.2 Landscape Policy

The following legislation and policies relating to landscape and visual are considered relevant:

International / National Legislation

- Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the EIA Directive);
- Planning and Development Act 2000, as amended;
- Planning and Development Regulations 2001, as amended; and
- European Landscape Convention 2000.

Kildare County Development Plan

The following policies from the Kildare County Development Plan 2017-2023 are relevant to the proposed works:

LA 1: *Ensure that consideration of landscape sensitivity is an important factor in determining development uses. In areas of high landscape sensitivity, the design, type and the choice of location of proposed development in the landscape will also be critical considerations.*

LA 2: *Protect and enhance the county's landscape, by ensuring that development retains, protects and, where necessary, enhances the appearance and character of the existing local landscape.*

LA 3: *Require a Landscape/Visual Impact Assessment to accompany significant proposals that are likely to significantly affect:*
- Landscape Sensitivity Factors
- A Class 4 or 5 Sensitivity Landscape (i.e. within 500m of the boundary)
- A route or view identified in maps 14.2 and 14.3 (i.e. within 500m of the boundary)

LA 4: *Seek to ensure that local landscape features, including historic features and buildings, hedgerows, shelter belts and stone walls are retained, protected and enhanced where appropriate, so as to preserve the local landscape and character of an area, whilst providing for future development.*

LA 7: *Be informed by consideration of the County Landscape Character Appraisal*

South Dublin Development Plan

The following policies from the South Dublin County Development Plan 2016-2022 are relevant to the proposed works:

Objective HA *(LV, DV, DM): To protect and enhance the outstanding natural character and amenity of the Liffey Valley, Dodder Valley and Dublin Mountains areas*

Objective RU: *To protect and improve rural amenity and to provide for the development of agriculture.*

HCL8 Objective 1: *To protect, preserve and improve Views and Prospects of special amenity, historic or cultural value or interest including rural, river valley, mountain, hill, coastal, upland and urban views and prospects that are visible from prominent public places.*

Celbridge Local Area Plan

The following policies from the Celbridge Local Area Plan 2017 – 2023 are relevant to the proposed works:

EDO2.1: *To support the development of tourism infrastructure, attractions and facilities at appropriate locations subject to the protection of architectural heritage and natural amenities.*

EDO2.2: *To support the ongoing development of Castletown House and Demesne for leisure and tourism purposes, subject to the protection of architectural heritage and natural amenities.*

EDO2.3: *To support and facilitate the development of an integrated network of Greenways and Heritage Trails along suitable corridors in Celbridge, including pathways along the River Liffey corridor, subject to relevant environmental assessments.*

EDO2.4: *To support the development of outdoor leisure activities on lands that are designated as open space, subject to the protection of landscape character and natural heritage.*

EDO2.10: *To support the development of linkages between historical sites within and around Celbridge.*

HLA1- *Historic Landscapes Areas. It is the policy of the Council to preserve the special landscape character of historic landscapes within Celbridge as set out on Map 13.1 Land Use Zoning.*

It is an objective of the Council:

HLAO1.1: *To protect the special landscape character of historic landscape areas and ensure that new development enhances the special character and visual setting of the historic landscapes outlined on Map 13.17 and to prevent development that would have a negative impact on the character of the lands within the Historic Landscape Areas.*

HLAO1.2: *To support the preparation of Woodland Conservation and Management Plans for lands within the Historic Landscape Areas.*

Maynooth Local Area Plan

The following policies from the Maynooth Local Area Plan 2013 - 2019 are relevant to the proposed works:

NH 5: *To prohibit development where it is likely that damage would be caused either to trees protected by a Tree Preservation Order or, to those which have a particular local amenity or nature conservation value. Development that requires the felling of mature trees of amenity value, conservation value or special interest notwithstanding the fact that they may not be listed in this Plan, will be discouraged.*

Leixlip Local Area Plan

The following policies from the Leixlip Local Area Plan 2020 - 2023 are relevant to the proposed works:

NH1.3: *To ensure that any proposal for development within or adjacent to the Royal Canal (pNHA) and Liffey Valley (pNHA) is located and designed to minimise its impact on the biodiversity, geological, water and landscape value of the pNHA.*

GI 1: *It is the policy of the Council to protect, enhance and further develop the green infrastructure network in Leixlip to provide a shared space for amenity, recreation and biodiversity.*

Objective MT1.11 seeks *"To support the delivery of a pedestrian and cycle overpass of the M4 to link The Wonderful Barn at Leixlip to Castletown Demesne in Celbridge in consultation with Transport Infrastructure Ireland (TII)."*

BH1.3: *To protect the landscape character, values, sensitivities, focal points and views in Leixlip, including those identified in the Kildare County Development Plan. This will include, inter alia, the following:*

a) the requirement of a Visual Impact Assessment for developments with potential to impact on areas of significant landscape character, value or sensitivity, including both urban and natural features, significant townscapes and historic buildings, as appropriate.

b) prohibit development that will block or interfere with a significant focal point or a view. Where it is considered that a development may impact on focal points or views, proposals must have regard to the significance of any such impact and any appropriate mitigation measures that should be incorporated.

BH1.6: *To promote The Wonderful Barn as an integrated tourism attraction including the restoration of the main features of the complex and its historical landscape:*

(i) The re-arrangement of the existing access way.

(ii) The integration of car parking facilities,

(iii) The consolidation and eventual restoration of the historic buildings.

(iv) The reinstatement of the walled garden and rear courtyard;

(v) The insertion of complementary commercial uses to ensure a sustainable future for the project. The feasibility of a Discovery Park including play facilities and a picnic area shall be investigated.

GI1.7: *To seek to protect trees with a particular local amenity or conservation value.*

GI1.8: *To promote appropriate tree planting within public open spaces along transport networks and in the public realm*

4.8.3.3 Landscape Character Assessments

A landscape character assessment is the process of identifying and describing variations in the character of the landscape and identifying the features that give a locality its 'sense of place'. The process identifies, documents and explains the unique combination of elements and features that make landscapes distinctive.

There is no national landscape character assessment available for Ireland, however, assessments are available for the Local Authority areas of relevance to this project. Landscape character areas are not generally clearly geographically defined due to the gradated nature of landscape character, and indirect impacts can result from changes to the landscape context of an area. This effect can be pronounced where character areas have a high inter-visibility, for example for lowland areas with little topographic variation or other screening features. It is also possible for character areas to be artificially dissected by the separate assessments carried out for Local Authority areas. It is therefore necessary to consider landscape character areas outside of the study area which have potential to be affected.

The study area passes through Kildare County Council, South Dublin County Council, marginally into Fingal County Council and in the vicinity of County Meath. The landscape character assessments for these counties provide a good level of detail and are relatively consistent in description where there are contiguous areas of similar landscape character. The assessments are of a sufficient standard to facilitate a landscape and visual impact assessment and no further landscape character assessment is needed for this process.

Kildare Landscape Character Assessment

In 2004, a Landscape Character Assessment of Kildare was undertaken and has been incorporated into the latest Kildare County Development Plan 2017-2023.

The assessment focuses on characterisation i.e. the discernment of the character of the landscape based on its land cover and landform, but also on its values, such as historical, cultural, religious and other understandings of the landscape. Table 14.1 of the Development Plan indicates the dominant sensitivity of each Landscape Character Area with the accompanying note (Section 14.4, Development Plan) which states "*It is important to note that within each of these areas there can be a wide variety of local conditions that can significantly increase or decrease sensitivity*".

The study area is located mainly within the 'Northern Lowlands' character area. The Northern Lowlands has been classified as having a 'Low Sensitivity' rating

(Class 1). Landscape areas of low sensitivity are described as '*Areas with the capacity to generally accommodate a wide range of uses without significant adverse effects on the appearance or character of the area*'. Within Chapter 14, Section 14.4.2 of the Development Plan examines the impacts of development types on different landscape areas. A table is provided for "*guidance on the likely compatibility between a range of land-use classes and the principal landscape areas of the county classified by sensitivity*". Road projects are not listed as a land-use within this table; however, the Northern Lowlands character area is defined as having 'high' or 'most' capacity for all listed development types.

An approximately 150m section of the study area passes through the '*River Liffey*' character area. This character area has been classified as having a '*Special Sensitivity*' rating (Class 4) which is defined as an area with '*low capacity to accommodate uses without significant adverse effects on the appearance or character of the landscape having regard to special sensitivity factors*'.

South Dublin Landscape Character Assessment

The Landscape Character Assessment for South Dublin was completed in 2015 and is incorporated into the South Dublin County Council Development Plan 2016 - 2022. It divides South Dublin into 5 Landscape Character Areas (LCA).

The study area passes through LCA 1 Liffey Valley, LCA2 Newcastle Lowlands and LCA 5 Suburban South Dublin. LCA 5, covering the urbanised areas of South Dublin, was not assessed in detail in the character assessment as it requires a finer scale townscape character assessment, however key characteristics are provided. The overall sensitivity and key characteristics of most relevance to the proposed scheme are shown below in Table 4.26.

Name	Relevant Key Characteristics	Landscape Sensitivity
LCA 1 Liffey Valley	• River valley of significant historical importance • Incised valley for much of its journey through South Dublin County, the wooded and pasture slopes combined with riparian vegetation create an attractive landscape setting • Enclosed and intimate with views to river from the Strawberry Beds and at river crossings • Ridgelines of low hills adjoining valley form attractive setting to settlements • Settlements of Lucan and Palmerstown with important built heritage and attractive townscapes present • Major transport corridors of N4 and M50 • Visual and landscape quality reflected in designation as Special Area Amenity Order • On-going urban infrastructure developments notably road improvements generate increasing volumes of traffic and detract from opportunities to create or maintain tranquil settings • Traffic pressures	Medium/high to high sensitivity The landscape characteristics and landscape value of this LCA confer on it a distinct sense of place. The elements that are key include historic and cultural heritage exemplified by Lucan and Palmerstown, and the variety of preserved naturalistic and rural landscapes in the area. This sense is potentially at risk due to urbanisation. Recommendations are thus made aimed at preserving that sense of place and relate to conservation, protection and enhancement where possible of those key landscape elements and values.
LCA 2 Newcastle Lowlands	• Low-lying and gently undulating agricultural lands over limestone • Established communication corridors include the grand canal and railway corridor traverse east to west and two aerodromes at Weston and Baldonnel • Agricultural land use primarily pasture and tillage • Increasing influence of urban activities closer to the motorways, national roads and regional roads	Medium The Newcastle lowlands function as an important agricultural resource but vulnerable to urbanising pressures. In addition, its character as a rural landscape provides a distinct and important identity to this area of western Dublin. To conserve its sense of place requires measures protecting the integrity of the agricultural landscape by controls on urban expansion, ribbon development and

Name	Relevant Key Characteristics	Landscape Sensitivity
		other sources of erosion and fragmentation, and requires site planning guidance on the use of appropriate vernacular styles and treatments in new developments.
LCA 5 Suburban South Dublin	• Built – up urban area with extensive housing estates and industrial /commercial parks. Variety of house styles and layouts dating from the late 19th century to late 20th century • Major traffic corridors with M50 traversing north- south through the area, and LUAS line travelling north from Tallaght, parallel to the M50, to city centre • Grass open spaces in gardens, industrial parks, golf courses, school playing fields, and miscellaneous spaces in housing areas Recreational facilities – public parks and golf courses - provide amenities and ecological resources	Not described. Likely to be variable within area depending on local land-uses. Amenity areas and residential areas may be high sensitivity.

Table 4.26 Landscape Character Areas, South Dublin

Fingal Landscape Character Assessment

A small portion of the eastern end of the study area is within Fingal County Council. The Fingal Development Plan 2017-2023 Landscape Character Assessment provides for the classification of Fingal's landscapes into six Landscape Character Types (LCT) representing generic areas of distinctive character that makes one landscape different from another, such as uplands or the coast. The assessment places a value on each landscape character type ranging from exceptional to low. Subsequent to the type and value being identified, the sensitivity of each character type is defined as its overall ability to sustain its character in the face of change. Sensitivity is evaluated using criteria ranging from high to low. A highly sensitive landscape is likely to be vulnerable to change whereas a landscape with a low sensitivity is likely to be less at risk from change. It is important to note that it does not necessarily follow that an exceptional value landscape will be highly sensitive to change or similarly a low value landscape will have a low sensitivity to change.

The study area includes a small section of River Valleys and Canal Landscape Character Type. This is described as follows:

"*The Tolka and Liffey valleys together with the Royal Canal Corridor are the main landscape features in this area. The Tolka and Liffey valleys are characterised by areas of grassland along meandering river valleys which, especially in the case of the Liffey, are well wooded at the edge of the floodplain and along the valley slopes. Areas of both valleys support recreational facilities along their corridors. A number of institutional and private demesnes along the valley edges maintain a rural and wooded character to the areas. However, housing estates are beginning to encroach into corridor areas. In recognition of the special amenity value of this area a Special Amenity Area Order (SAAO) was made for the Liffey Valley between Lucan and Chapelizod in 1990. This designation includes specific controls over development. … This Character Type is categorised as having a high value, due to the visual and recreation qualities contained therein. This is evident by virtue of the High Amenity zoning and SAA designation in the area in addition to the dense tree belts and steep river valley*"

Meath Landscape Character Assessment

The study area is located approximately 850m from County Meath. The Meath Landscape Character Assessment was prepared as part of the Meath County Development Plan 2013-2019 and carried through to the Development Plan 2020-2026. The assessment notes that:

"*Transport corridors, i.e. roads and railways, may be improved or created. The most likely impacts of this type of development are noise and visual intrusion, which are often exacerbated by the loss of existing boundary hedgerows, walls and trees associated with this type of development. Other potential impacts on archaeology and drainage are also likely*"

The assessment divides Meath into five Landscape Character Types (LCT), broad scale landscape areas of similar character, and 20 Landscape Character Areas (LCA) of unique character.

The nearest LCTs are LCT 3 - River Corridors and Estuaries (0.5km north-west) and LCT 2 - Lowland Areas (1.2km north). The nearest section of LCT 3 to the study area is centred around the Royal Canal, this section is described as follows:

"The Royal Canal runs near the southern border of Meath and is primarily a product of 19th Century industry. There are several towns along its banks that have grown because of the industries that the canal supported. All the rivers and the canal are tourist resources providing a range of recreation opportunities including walking, cycling, water sports and fishing."

General recommendations for LCT 3 of most relevance are:

"To continue and encourage the improved management of field boundaries such as hedgerows and stonewalls and hunting copses/ wooded copses."

"To further define popular tourist routes such as the Bru Na Boinne drive and create links with new routes to additional areas of interest. Vehicular and pedestrian routes should be developed in tandem."

LCT 2 - Lowland Areas is described as having "*an enclosed character with well-treed road corridors, dense hedgerows, parkland and areas of woodland*." It is noted as "*crucial that future development of this LCT is carried out sensitively and with particular reference to the rural nature of the landscape*"

The nearest LCAs are LCA 14 – Royal Canal (0.5km north-west) and LCA 11 – Southeast Lowlands (1.2km north). Key characteristics of the relevant LCAs and potential capacity to accommodate transport infrastructure are listed in Table 4.27.

Name	Relevant Key Characteristics	Landscape Capacity
LCA 11 – Southeast Lowlands	• Complex drumlin landform created by glacial movement. Limestone is overlain by a variety of rocks and soils – boulder clay, kames and eskers - most of which have been deposited by melting glaciers. • Mix of small pasture fields with some large arable fields in the south. • Extensive estate landscapes. • Motorway interchanges are likely to encourage further development around them.	Medium potential capacity to accommodate new transport routes. Main transport corridors are already a feature of the area, but the upgrading of existing roads must be carefully planned to avoid the loss of landscape features that screen existing road and rail corridors.
LCA 14 – Royal Canal	• Complex drumlin landform created by glacial movement. • Predominantly arable farmland with areas of scrubby pasture. • Royal Canal is a popular recreational boating route from Dublin to Mullingar. • Designated walks which branch off the existing Royal Canal Way and provide links to other tourist attractions/heritage towns would be a valuable addition. • Settlement type is small towns and ribbon development. • Pressure from Dublin metropolitan area will significantly effect settlements like Enfield and Kilcock. • Potential rail improvements between Dublin and Sligo will improve public transport provision in this area and may increase commuting pressure. • This area is located on the proposed M4 motorway Economic Dynamic Corridor	Low potential capacity for further new roads as this is a narrow LCA where the existing M4 road corridor is already a significant feature. Further such development would alter the character of this LCA beyond repair. However, the LCA would have medium potential capacity to accommodate the upgrading of roads and railways due to the potential opportunities to screen such development with existing vegetation.

Table 4.27 Landscape Character Areas, Meath

4.8.3.4 Designed Landscapes

The study area passes through seven designed landscapes or demesne landscapes, details of which are provided in Section 4.10.3.6. These landscapes were designed and established around historic buildings which may or may not be extant and protected. These designed landscapes have importance for maintaining the setting of associated historic buildings as well as having value in their own right as attractive large scale landscape compositions with scenic, artistic or horticultural interest.

Not all demesne landscapes are subject to statutory protection. However, where a demesne exists in association with a protected structure (dependant on the preservation of the landscape), this can be considered to be attendant grounds and as such falls within the remit of the Planning and Development Act 2000, as amended.

The completeness and coherence of a designed landscape influences their perceived value as well as their susceptibility to changes resulting from transport infrastructure development. The existing M4/N4 corridor passes through four historic demesnes/designed landscapes. These are Castletown, Leixlip Castle, Westonpark House and Cooldrinagh Lodge, and the route has also impacted on the edge of Lucan Demesne. The presence of the M4/N4 corridor through or close to the demesnes has arguably reduced their sensitivity to transport development, but in some cases left them vulnerable to further fragmentation.

4.8.3.5 Protected Views

Protected views consist of important and valued views and prospects within the landscape. These are of high value and sensitivity unless degraded by the presence of detracting landscape features.

Kildare County Development Plan

There is one Protected View within the study area; RC8 - Jackson's Bridge at Laraghbryan East lies within the north-western section of the study area.

Beyond the study area three further viewpoints have potential to interact with the study area, these are:

- RC1 – Bailey's Bridge Maws with views down the Royal Canal to the east into the study area;
- RC7 – Bond Bridge Maynooth with views down the Royal Canal to the west which may extend into the study area; and
- RL2 – New Bridge, Coneyburrow, Leixlip which has views to the north across the Leixlip Reservoir into the study area.

Celbridge Local Area Plan

The Celbridge Local Area Plan 2017-2023 (Kildare County Council) includes three protected views which cross the study area:

- View between Castletown House and Conolly's Folly to the north-west which crosses the M4 near to M4 Interchange Business Park;
- View between Castletown House and the Wonderful Barn, which crosses the M4 north of Liffey Business Park; and
- View from New Bridge, Coneyburrow, Leixlip which has views to the north across the Leixlip Reservoir into the study area. This matches view RL2 in the Kildare County Development Plan.

The views to and from Castletown House follow designed prospects through Castletown demesne towards historic 18th century structures designed to be focal points in the landscape. These structures were placed at the end of long vistas demarcated by avenues cut through woodland, avenue planting or landscape boundaries some of which are still in evidence. The existing M4 corridor cuts across these vistas and bands of tree planting along the road edges are likely to at least partially screen views and impact on intervisibility between Castletown House and the structures.

Maynooth Local Area Plan

The Maynooth Local Area Plan 2013-2019 includes several '*Views and Prospects to be Preserved*'. A single viewpoint is within the study area; The view from Jackson's Bridge at Laraghbryan East lies within the north-western section of the study area. This is the same viewpoint listed as RC8 in the Kildare County Development Plan. Other protected views are outside of the study area, however, a view from Bond Bridge, Maynooth, may extend to the west into the study area; this viewpoint is the same as RC7 in the Kildare County Development Plan.

Leixlip Local Area Plan

Leixlip Local Area Plan 2020 – 2023 includes several '*Views and Prospects to be Preserved*'. Two of these cross the study area:

- View along tree lined avenue within Castletown demesne towards the Wonderful Barn, along the edge of Liffey Business Park;
- View from the grounds of the Wonderful Barn towards Castletown House.

South Dublin Development Plan

South Dublin County Council Development Plan 2016 -2022 includes protected significant views, one of which is within the eastern end of the study area. This view looks out from a public open space adjacent to Leixlip Road away from the N4 and out over the Liffey Valley to the north.

4.8.3.6 Scenic Routes

Kildare County Development Plan

There are two Scenic Routes designated in the Kildare Development Plan which are within the vicinity of the study area. These are as follows:

- Route 31 - Views within Castletown - Donaghcumper Rural Area; Views to the South and North from Castletown House, including axial views to the Obelisk and the Wonderful Barn. Views within Castletown Demesne have a high scenic value as a result of the landscape quality of the demesne lands. The open green areas and existing mature vegetation add to the visual amenity value. Views onto the River Liffey are also available; and
- Route 32 - Views of the River Liffey from the main avenue of Castletown House Castletown. Views towards the River Liffey are available from the main road within Castletown Demesne. Although the river corridor itself is not visible due to the mature vegetation growing along its banks, the quality of the vistas is of significance.

Celbridge Local Area Plan

A single scenic route is designated within the Celbridge LAP. This route follows the same route as Route 31 of the Kildare CDP, however the eastern most section adjacent to Barnhall Rugby Club is not included.

4.8.3.7 Other Designations

Kildare County Development Plan

In addition to Landscape Character Areas and the sensitivity of these areas to development, there are certain special landscape areas within the study area, some of which overlap with sensitive landscapes. These are defined in the Development Plan as Areas of High Amenity. They are classified because of their outstanding natural beauty and/or unique interest value and are generally sensitive to the impacts of development. The study area passes through the '*The River Liffey and the River Barrow Valleys*' area of high amenity. It is noted (Section 14.5.3 of Development Plan) that these valleys are "*of significance in terms of landscape and amenity value and as such are sensitive to development*." It is also noted that:

"*Shelter vegetation exists along some stretches of the valleys with the presence of natural and native woodland that grows on the floodplains of the rivers, as well as by conifer plantation in adjacent lands. This vegetation has a shielding and absorbing quality in landscape terms. It can provide a natural visual barrier as well as adding to the complexity of a vista, breaking it up to provide scale and containment for built forms*."

This Landscape Character Type is categorised as having a high value, due to the visual and recreation qualities contained therein. This is evident by virtue of the High Amenity zoning and Special Amenity Area designation in the area in addition to the dense tree belts and steep river valley slopes.

Maynooth Local Area Plan

The Maynooth Local Area Plan 2013-2019 indicates areas of hedgerows/treelines between the M4 and the Maynooth Business Campus as forming part of the green infrastructure within the plan area. Numerous areas of amenity grassland are also identified within the portion of southern fringe of the town which is encompassed by the study area.

Celbridge Local Area Plan

The Celbridge Local Area Plan (LAP) 2017-2023 designates a Historic Landscape Area (HLA) containing the historic demesnes of Castletown, St. Wolstan's and Donaghcumper to the east of the town centre comprised of designed landscapes made up of parklands, river walks, ruins and structures which collectively form the landscape setting of Castletown House and its grounds, and to the west of the town centre, the gardens and pleasure grounds of Celbridge Abbey and Oakley Park which define the landscape setting of the River Liffey and the western edge of the town centre. The LAP notes that this is a "*single landscape of heritage value*" and that the LAP supports the preservation of the composite landscape. It states: "*While it is not intended to preclude development within the historic landscape areas, the LAP will seek to ensure that the landscape features, including the views and prospects that define the character of these areas, are preserved*."

The portion of the HLA within Castletown Demesne extends into the study area and there is potential for indirect landscape and visual effects to occur for the area of the HLA beyond the study area to the south.

Liffey Valley Designations

The Liffey Valley is recognised as an area of sensitive landscape character in the Landscape Character Assessments of Fingal and South Dublin County Development plans. In addition, certain areas are defined as having a high amenity value. South Dublin County Development Plan lists areas within the study area under Zoning Objective HA-LV, which aims '*to protect and enhance the outstanding character of the Liffey Valley*'. This designation is contiguous with areas within the study area to the north within Fingal County that are designated as Zoning Objective HA, which aims to '*Protect and Enhance High Amenity Areas'*.

To the east of the study area a section of the Liffey Valley is designated under a Special Amenity Area Order (SAAO) in the South Dublin and Fingal County Development Plans, due to being area of outstanding natural beauty and providing special recreational value. Changes to the landscape within the eastern edge of the study area may have potential to indirectly impact on landscape character or the visual amenity of this area, although the area is well screened by the steep-sided topography of the Liffey Valley and areas of woodland to the valley sides.

4.8.4 Summary and Conclusions

In summary, from a landscape and visual perspective, there are several potential constraints, including those detailed below.

4.8.4.1 Protection of Green Infrastructure and Tourism

The protection of green infrastructure is an objective within the Kildare Development Plan, Leixlip Local Area Plan, Celbridge Local Area Plan and Maynooth Local Area Plan. Roadside vegetation, hedgerows, groups of trees, river corridors and the Royal Canal corridor would constitute a constraint with regards to these policies. The Maynooth Local Area Plan 2013-2019 indicates areas of hedgerows/treelines between the M4 and the Maynooth Business Campus as forming part of the green infrastructure within the plan area. Numerous areas of amenity grassland are also identified within the portion of southern fringe of the town which is encompassed by the study area.

A possible further constraint would be Objective BH1.6 of the Leixlip LAP which seeks to develop The Wonderful Barn and the surroundings as a tourist attraction.

4.8.4.2 Sensitivity of Landscape Character

The sensitivity of landscape character areas both with in the study area and in the vicinity of the project is a key constraint, as follows:

Kildare Landscape Character Assessment

- The River Liffey character area has a low capacity to accommodate uses without significant adverse effects on the appearance or character of the landscape having regard to special sensitivity factors.
- River Liffey and the River Barrow Valleys Area of High Amenity (Kildare County Development Plan) which is of significance in terms of landscape and amenity value and as such are sensitive to development, although the presence of vegetation provides shielding and absorbing quality which may help attenuate landscape and visual effects.

South Dublin Landscape Character Assessment

- LCA 1 – Liffey Valley is of medium/high to high sensitivity to development which may affect its distinct sense of place.
- LCA 2 - Newcastle Lowlands is of medium sensitivity to development which is vulnerable to urbanising pressures.
- LCA 5 – Suburban South Dublin may have localised areas of high landscape and visual sensitivity, for example, in residential areas, historic centres of settlements or areas with high value recreational or amenity space. Areas close to existing N4/M4 corridor likely to have lower sensitivity.

Fingal Landscape Character Assessment

- River Valleys and Canal Landscape Character Type is categorised as having a high value, due to the visual and recreation qualities contained therein.

Meath Landscape Character Assessment

- LCA 11 – Southeast Lowlands. This has a medium potential capacity to accommodate new transport routes. Although outside of the study area indirect landscape and visual effects may occur.
- LCA 14 – Royal Canal - Low potential capacity for further new roads as this is a narrow LCA where the existing M4 road corridor is already a significant feature. Further such development would alter the character of this LCA beyond repair. However, the LCA would have medium potential capacity to accommodate the upgrading of roads and railways due to the potential opportunities to screen such development with existing vegetation. Although outside of the study area indirect landscape and visual effects may occur.

4.8.4.3 Designed or Demesne Landscapes

The study area passes through or close to seven designed landscapes or demesne landscapes. The completeness and coherence of a designed landscape influences their perceived landscape value as well as their susceptibility to changes resulting from road development. The presence of the M4/N4 corridor through or close to the demesnes has arguably reduced their sensitivity to transport development, but in some cases left them vulnerable to further fragmentation.

4.8.4.4 Protected Views and Scenic Routes

There are a number of constraints associated with protected views and scenic routes, including:

- Protected views listed in Kildare County Development Plan. One within the study area and three in the vicinity which have potential to be affected. Of high sensitivity to change, however the presence of the existing road corridor has already negatively impacted on the value of these views.
- Protected views listed in Celbridge Local Area Plan, Maynooth Local Area Plan and Leixlip Local Area Plan. Six views in total which cross the study area and a further view with potential views into the study area. Of high sensitivity to change, however the presence of the existing road corridor has already negatively impacted on the value of these views and has reduced sensitivity to the proposed development.
- Scenic routes within Castletown demesne designated in the Kildare County Development Plan and Celbridge Local Area Plan. These are outside of but within the vicinity of the study area, and users may experience views into the study area.

4.8.4.5 Other Designations

The following constraints are also identified:

- The Celbridge Local Area Plan (LAP) 2017-2023 designates a Historic Landscape Area (HLA) containing the historic demesnes of Castletown, St. Wolstan's and Donaghcumper to the east of the town centre and to the west of the town centre, the gardens and pleasure grounds of Celbridge Abbey and Oakley Park.
- High Amenity/Open Space lands at the eastern extent of the study area in the vicinity of the Liffey Valley with high sensitivity. Zoning Objective HA-LV (South Dublin County Development Plan) and Zoning Objective HA (Fingal County Development Plan).
- Although outside the study area, the Liffey Valley SAAO may be sensitive to indirect landscape and visual effects, although the area is well screened by the steep-sided topography of the Liffey Valley and areas of woodland to the valley sides.
- Visual receptors such as people at home in neighbouring residential areas, users of public open spaces, users of Demesne landscapes, recreational users of the Royal Canal and visitors to heritage landmarks where the landscape forms an important part of the experience would generally be considered to have high sensitivity to change. Visitors to Castletown Demesne, Conolly's Folly and the Wonderful Barn would be highly sensitive visual receptors and a constraint. Users of transport routes where the landscape does not form an important part of the experience would generally be of low sensitivity to visual changes.

4.9 Planning

4.9.1 Introduction

This section describes land use and planning constraints identified within the study area for the Maynooth to Leixlip Project.

Section 4.9.2 describes the methodologies and sources of information that were used to carry out the study. Section 4.9.3 describes the land use and planning constraints within the study area which will help identify any county and local planning policy issues and pending or awarded planning decisions which may have an impact on the identification of feasible route corridors. A summary is presented in Section 4.9.4 and references are listed in Section 4.9.5.

4.9.2 Methodology and Sources of Information

The following sources of information were utilised in the preparation of this section:

- Regional Spatial and Economic Strategy for the Eastern and Midlands Region, 2020;
- Kildare County Council Development Plan, 2017-2022;

- South Dublin County Council Development Plan, 2016-2022;
- Maynooth Local Area Plan, 2013-2019;
- Leixlip Area Plan, 2020-2023;
- Celbridge Local Area Plan, 2017-2023;
- Kildare County Council Website www.kildarecoco.ie; and
- South Dublin County Council Website www.sdcc.ie.

In addition, a review of planning applications lodged within the study area was carried out using www.myplan.ie. This includes new planning applications, as well as those granted within the past five years, having regard to the five-year validity of planning applications.

4.9.3 Existing Land Use and Planning

The study area includes the following land uses:

- The western and southern existing built-up areas of Maynooth, the northern extent of the exiting built-up area of Celbridge, the southern existing built-up area of Leixlip, and the north-western extent of the existing built-up area at Lucan;
- The Dublin to Sligo railway line;
- Existing rural dwellings and farm buildings, including Robinson farms;
- Ballygoran Park stud and Cooldrinagh Lodge;
- Part of the Royal Canal; Laraghbryan Cemetery, Maynooth Town Football Club, Maynooth Lodge Nursing Home, existing B&Bs and Blackberry Stables located to the west of Maynooth;
- Maynooth Business Campus, M4 Interchange Business Park, Salesian College, Celbridge Community School, Celbridge Business Park;
- Liffey Park Technology Campus to the south of Junction 6 Celbridge;
- Leixlip Wastewater Treatment Plant, drinking water plant, ESB generating station, and reservoir to the south of Leixlip;
- Weston Airport;
- Backweston Park;
- Part of Liffey Valley Golf Club; and
- Lucan Golf Club.

A search of the planning history of the area aligns with these existing land uses.

4.9.3.1 Eastern and Midland Regional Assembly Regional and Spatial and Economic Strategy 2019-2021

There are four settlements within the study area – Maynooth, Leixlip, Celbridge and Lucan.

Maynooth is identified as a Key Town in the Dublin Metropolitan Area in the Eastern and Midlands Regional Spatial and Economic Strategy (RSES) 2020. Table 4.2 of the RSES defines such towns as:

'Large economically active service and/or county towns that provide employment for their surrounding areas and with high-quality transport links and the capacity to act as growth drivers to complement the Regional Growth Centres'.

The policy objectives for Maynooth are set out in the RSES (page 77) and include:

RPO 4.33: *Support the continued development of Maynooth, co-ordinated with the delivery of strategic infrastructure including pedestrian and cycle linkages within the town and to the Royal Canal Greenway, DART expansion and road linkages forming part of the Maynooth Outer Orbital Route in a manner which supports future development and population growth and builds on synergies with Maynooth University promoting a knowledge-based economy.*

RPO 4.34*: Support Maynooth as a key town to act as an economic driver for north Kildare and provide for strategic employment at key locations to improve the economic base of the town and provide for an increased number of local jobs.*

The RSES references the upgrade of the M4 from Maynooth to Leixlip as one of the planned infrastructure upgrades (page 77 of the RSES). Table 8.4 of the RSES and Table 5.1, and Section 5.6 of the Dublin Metropolitan Area Strategic Plan (MASP) references road upgrades as short-term enabling infrastructure for Maynooth and Leixlip.

4.9.3.2 Kildare County Development Plan 2017-2023

The study area encompasses lands which fall within the administrative jurisdiction of Kildare County Council.

Maynooth and Leixlip are designated as Large Growth Towns II in the settlement hierarchy of the Kildare County Development Plan (KCDP) 2017-2023, with a population of between 15,000- 30,000 people, and are designated to act *as important self-sustaining regional economic drivers, accommodating significant new investment in transport, housing, economic and commercial activity, while capitalising on international connectivity and high quality connections to Dublin City Centre.* They also have a key role in supporting and servicing a wider local economy (Section 3.4.1 of the Plan). In this context, policy objective SO 2 of the KCDP seeks to:

'*Carry out a strategic Land Use, Employment and Transportation Study of northeast Kildare including the Metropolitan area towns of Leixlip (and Collinstown), Maynooth, Celbridge and Kilcock.*

The preparation of the study will have regard to existing and emerging local area plans. It is envisaged that the study will involve the participation of all strategic stakeholders, including the National Transportation Authority, adjoining local authorities (i.e. Meath, Fingal and South Dublin County Councils), the Regional Assembly, transportation providers, Waterways Ireland, Government Departments and Environmental Agencies.'

The status of this study needs to be clarified, and the outcome of this study could have implications for the extent of unconstrained land to facilitate the Maynooth to Leixlip Project.

In addition, the following strategic movement and transportation policies of the KCDP will, if not progressed by Kildare County Council, potentially constrain the advancement of the Maynooth to Leixlip Project. The strategic plans and studies required by policies MTO 1, 2 and 3 will underpin the planning rationale for the proposed Maynooth to Leixlip Project:

- *MTO 1: Prepare a County Mobility Plan that addresses the long-term mobility needs of communities and businesses in the county. The plan should address urban and rural transport issues, the integration of transport modes and public transport connections between key settlements of the county, including the primary growth towns.*
- *MTO 2: Prepare a Strategic Land Use and Transportation Study for: (a) northeast Kildare including the Metropolitan area towns of Leixlip, Maynooth, Celbridge and Kilcock; and (b) The central towns of Naas, Newbridge, Kilcullen, Kildare Town and Clane; In consultation with the National Transport Authority (NTS), DTTS (Department of Transport, Tourism and Sport), Transport Infrastructure Ireland (TII) and other stakeholders to inform the strategic development of these areas and identify the roads and transportation infrastructure that is required to support the future development of these areas66.*
- *MTO 3: Review and implement Integrated Transport Studies for Maynooth, Leixlip, Celbridge, Naas, Newbridge, Kildare and Athy in conjunction with the DTTS, TII and NTA and to prepare new Integrated Transport Studies for other towns, villages and settlements as required, to provide a framework to cater for the movement of pedestrians, cyclists, public transport and private vehicles.*

Furthermore, Section 6.6.1 of the KCDP sets out the policies and policy objectives in respect of motorways. These include:

- *MO 6: Improve safety and capacity at the M4 Maynooth Interchange (Junction 7) and to investigate the provision of a future improved connection to the M4, at this location or elsewhere near Maynooth.*
- *MO 8: Examine the feasibility of delivering an overpass of the M4 to link the Wonderful Barn at Leixlip to Castletown Demesne in Celbridge in consultation with TII.*

It may need to be clarified if these priority projects, which do not include the Maynooth to Leixlip Project, would impact on, or need to be advanced, prior to the Maynooth to Leixlip Project.

In addition, policy objective RS 7, which seeks to secure the implementation of major road projects that are consistent with the 'Principles of Road Development' criteria set out in Section 5.8.3 of the Transport Strategy for the Greater Dublin

[66] Policy Objective MT3.4 of the Leixlip LAP 2020-2023 also seeks to support the development of a North-east Kildare Strategic Land Use and Transportation Study in accordance with objective MTO2 of the Kildare County Development Plan 2017-2023 including investigations for potential connections to the north and southeast of the Leixlip Plan area with adjoining counties.

Area 2016- 2035, and are identified within this County Development Plan (Table 6.1 and Table 6.2) and Local Area Plans relevant to the Maynooth to Leixlip Project, identifies a number of priority major regional and local roads projects for the Maynooth area, including:

- Moyglare Road (Maynooth LAP roads objective PC04I) (L1012);
- Inner Relief Road, (Maynooth LAP roads objective TR02(d)) (R148 to L1012 c. 3km – Kilcock Road to Moyglare Road);
- Maynooth Outer Relief Road, (Maynooth LAP roads objective TR02(b)) (L1012 Moyglare Road and Dunboyne Road (Co. Meath) to be delivered by Meath County Council under Section 85 agreement);
- R148 County boundary at Leixlip to county boundary at Cloncurry via Maynooth and Kilcock; and
- R148 County boundary at Kilmurry to county boundary at Clonard.

The status of the relevant local roads projects that are identified in Table 6.1 of the KCDP may need to be established, as will clarity on whether these priority projects would impact on, or need to be advanced, prior to the Maynooth to Leixlip Project.

The area to the west of Leixlip within the study area falls within the Conical Surface of the Weston Aerodrome, and the whole of the study area falls within the Outer Horizontal Surface of Weston Aerodrome, as illustrated in Plate V1 6-4 of the KCDP. Refer to **Figure 4.2** Policy objective WAO 3 of the KCDP seeks to refer any development within 3.6km of Weston Aerodrome's runway (i.e. within the area of its Horizontal and Conical Surfaces) to the Irish Aviation Authority, and also to refer to the IAA any development of 50m or greater in height above ground level within a 10km radius of Weston Aerodrome (i.e. within the area of its Outer Horizontal Surface).

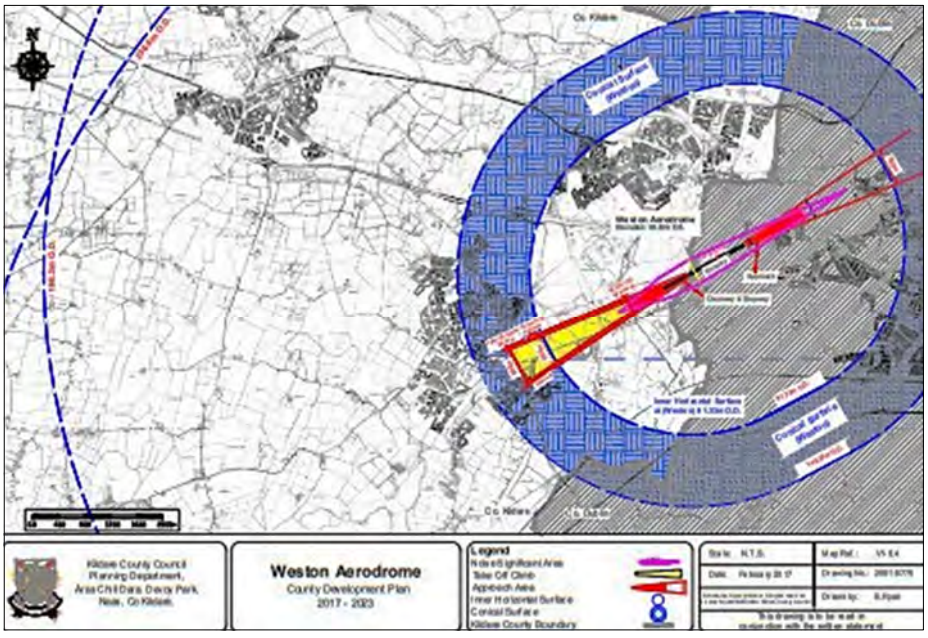

Figure 4.3: Weston Aerodrome and Consultation Zones

4.9.3.3 South Dublin County Council Development Plan 2016-2022

The study area also encompasses lands which fall within the administrative jurisdiction of South Dublin County Council.

As illustrated in **Figure 4.3**, that part of the study area to which the South Dublin County Development Plan (SDCDP) 2016-2022 applies is principally zoned HA – LV '*to protect and enhance the outstanding natural character and amenity of the Liffey Valley*', to the north of the existing M4, and RU '*to protect and improve rural amenity and to provide for the development of agriculture*', to the south of the existing M4. The Study Area includes Backweston Park, zoned OS, '*to preserve and provide for open space and recreational amenities, as well as the established residential areas of Weston and Kew Park*'. There are also long-term roads proposals identified for the HA and RU zoned lands.

The area zoned HA-LV is subject to site specific objective HCL10 Objective 1, which seeks to '*restrict development within areas designated with Zoning Objective 'HA – LV' (To protect and enhance the outstanding character and amenity of the Liffey Valley) and 'HA – DV' (To protect and enhance the outstanding character and amenity of the Dodder Valley) and ensure that new development is related to the area's amenity potential and is designed and sited to minimise environmental and visual impacts*'.

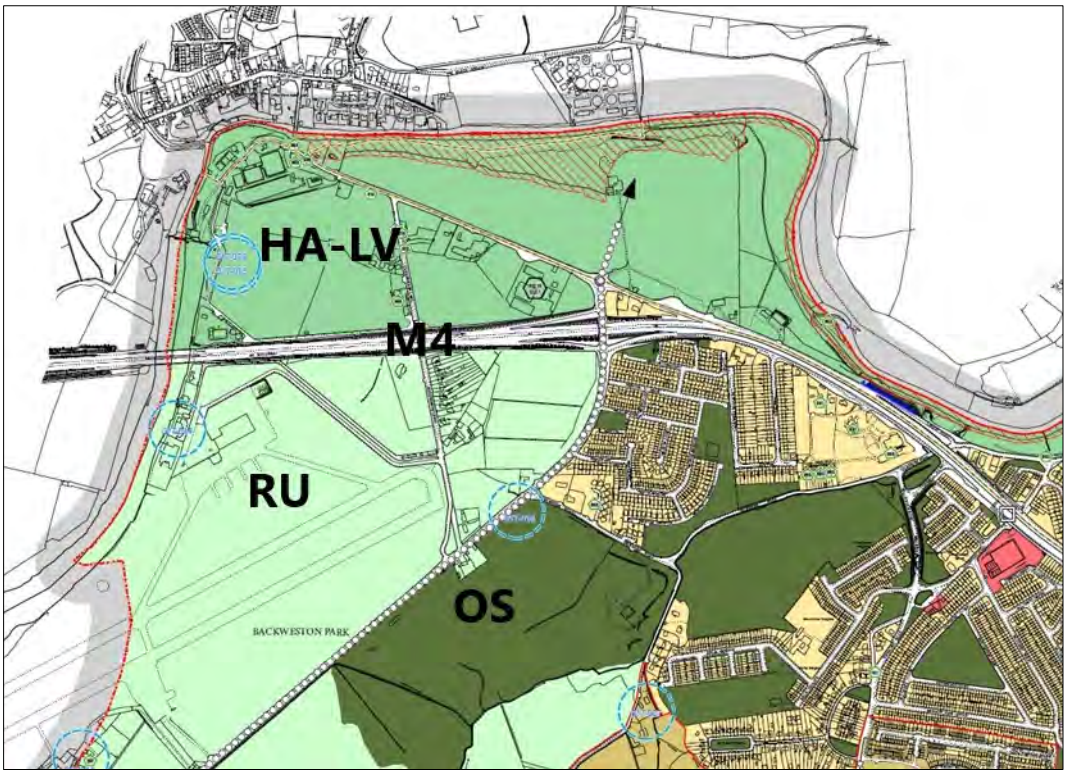

Figure 4.4: South Dublin County Development Plan Map 1

This area is also subject to objective CS6 SLO 1, which states as follows:

'*To initiate a plan led approach to the sustainable regeneration of the brownfield lands in the Naas Road / Ballymount REGEN zoned lands. The plan led approach*

will include the preparation of a masterplan in 2019 with a view to preparing a Local Area Plan or other appropriate mechanism for the Regeneration (REGEN) and Local Centre (LC) at Walkinstown zoned lands. The masterplan will provide a framework for the sequential and phased development of the lands, integrating sustainable transport, land use and blue and green infrastructure. The spatial planning of the area will be informed by the Naas Road Framework Plan (2010)'.

4.9.3.4 Maynooth Local Area Plan 2013-2019

In the Maynooth Local Area Plan (LAP) 2013-2019 (which has expired, but is still in effect), there is a 91m setback either side of the M4 incorporated into the LAP Roads Objective Map, as illustrated in **Figure 4.4**.

Figure 4.5: Maynooth LAP – Roads Objectives

Figure 4.4 also illustrates an indicative route for new ring roads around the town.

In addition, it is noted in the Maynooth LAP, that there are amenity grasslands identified along the northern section of the M4 within the LAP boundary, as illustrated in Figure 4.5.

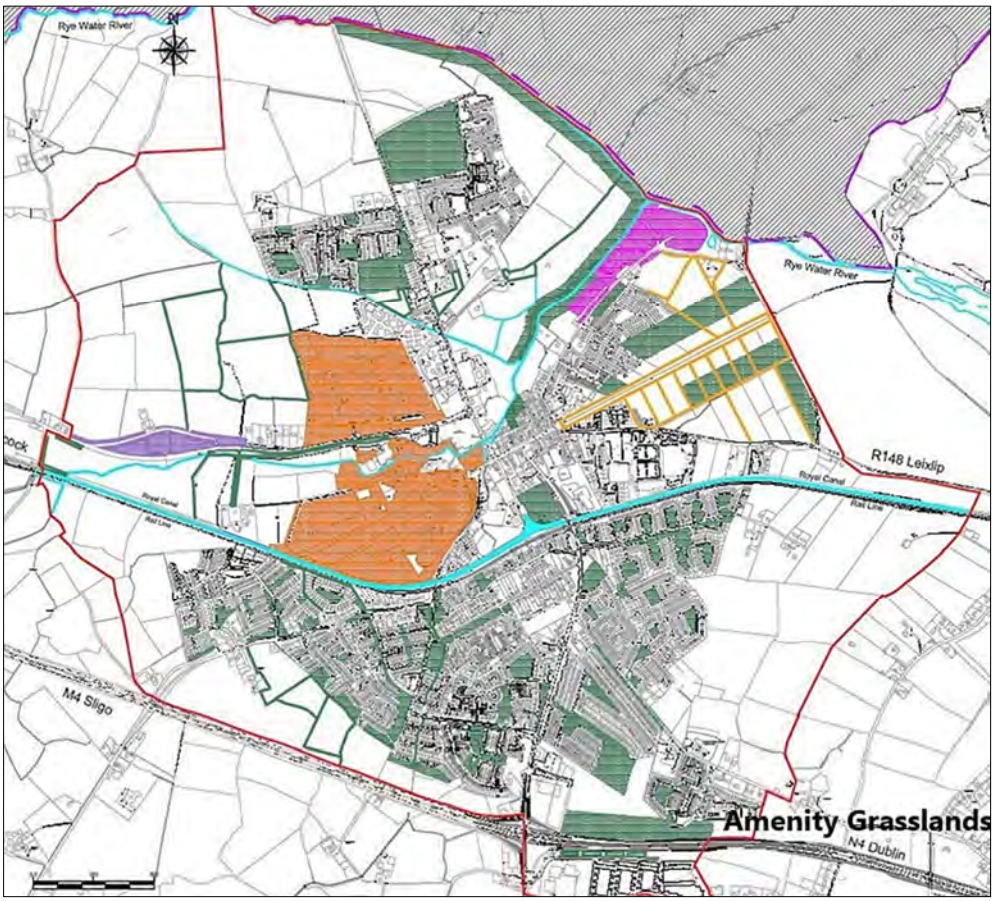

Figure 4.6: Extract from Maynooth LAP

4.9.3.5 Leixlip Local Area Plan 2020-2023

In the Leixlip Local Area Plan (LAP) 2020-2023, the lands to the south of the existing built-up area of Leixlip are identified as the following Key Development Areas:

- Leixlip Gate Key Development Area – with the potential for 323 residential units
- Wonderful Barn Key Development Area – 450 residential units. An Action Area Plan has been prepared for this Key Development Area.
- Celbridge Road East Key Development Area – with the potential for 280 residential units. An Action Area Plan has been prepared for this Key Development Area.

In addition, lands at Collinstown, in the vicinity of the Intel campus, and to the immediate north-west of the study area as it relates to Leixlip, are identified as a strategic location for a future Business Campus.

The overall strategy for Leixlip is illustrated in **Figure 4.6**.

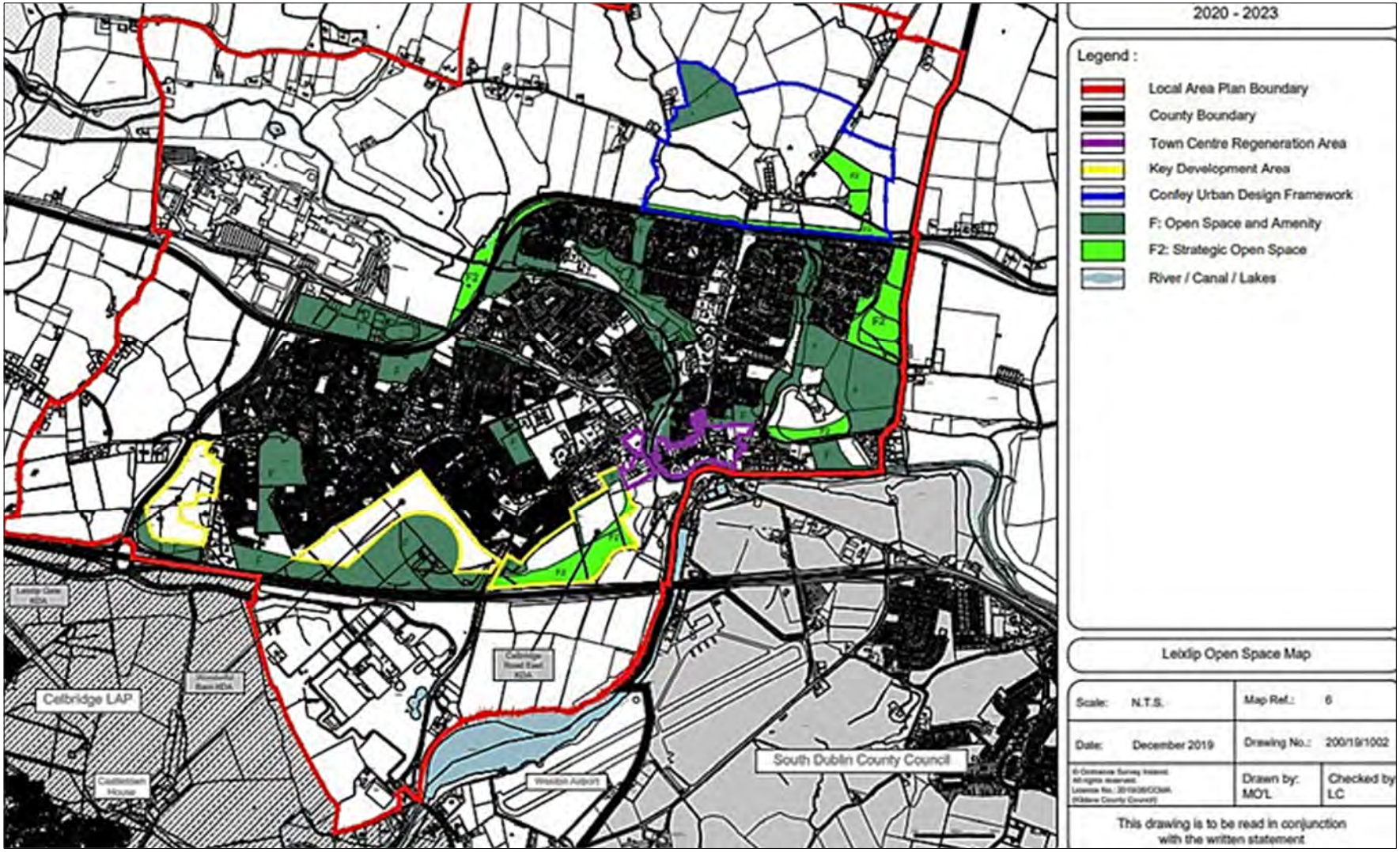

Figure 4.7: Leixlip Local Area Plan 2020-2023 Key Development Areas

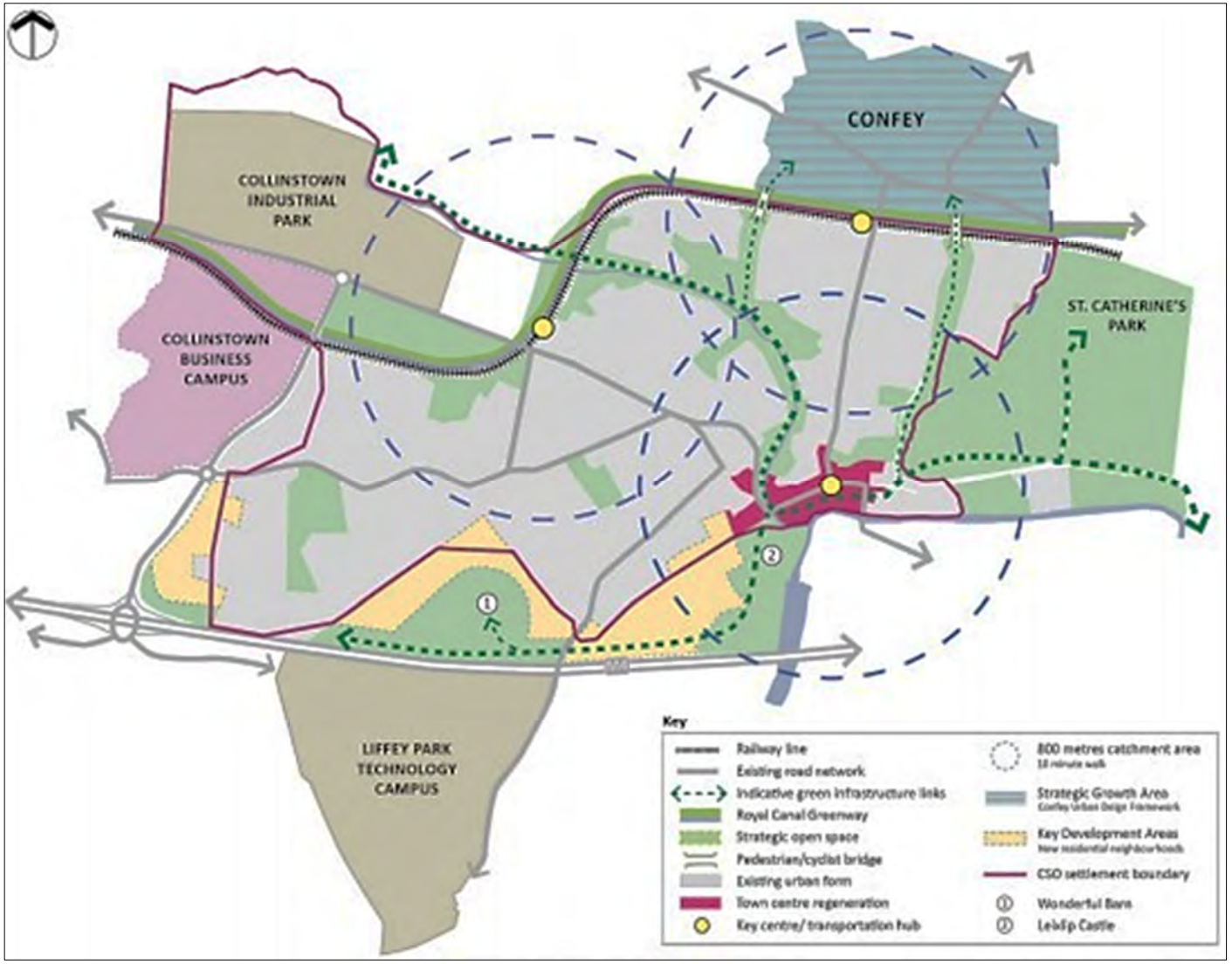

Figure 4.8: Leixlip Strategy

In relation to Liffey Park Technology Campus, Section 6.2.1 of the LAP states that:

The Liffey Business Campus at Barnhall comprises the Hewlett Packard (HP) site which is now occupied by a number of small and medium enterprises. Given the size and scale of the former HP campus it is an objective of the Council to work with local and national agencies to ensure the site can be redeveloped in an appropriate manner and remain a key employment hub for Leixlip and the Dublin Metropolitan Area. Having regard to its proximity to the M4 Motorway and the provisions of the Spatial Planning and National Roads Guidelines for Planning Authorities (DoECLG, 2012) any planning applications for significant development on the site shall be the subject of a Transport Impact Assessment (TIA) which shall include consideration of existing and proposed sustainable transport modes e.g. walking, cycling and public transport.

In terms of transportation, Section 8.3 of the LAP states that the provision of additional capacity on the M4 between Maynooth and Leixlip/Lucan as identified in Section 8.4 'Transport Investment Priorities' of the Regional Spatial and Economic Strategy is also supported. In this respect, policy objective MT3.2(v) of the LAP supports:

(v) Capacity enhancements of the M4 Leixlip to Maynooth as provided for in the NTAs Transport Strategy for the Greater Dublin Area 2016-2035 and the Regional Spatial and Economic Strategy.

In relation to transport, and as illustrated in **Figure 4.8**, there is a proposed pedestrian/cycle overpass between the Wonderful Barn KDA and the Liffey Park Technology Campus.

Figure 4.9: Leixlip LAP Transportation Polices

4.9.3.6 Celbridge Local Area Plan 2017-2023

The part of Celbridge that is included in the study area is zoned a Historic Landscape Area (Leixlip demesne) in the Celbridge Local Area Plan (LAP) 2017-2023, as illustrated in **Figure 4.9**. Policy objective HLA 1 of the LAP supports the preservation of this composite landscape. While it is not intended to preclude development within the Historic Landscape Area, the LAP will seek to ensure that the landscape features, including the views and prospects that define the character of these areas, are preserved.

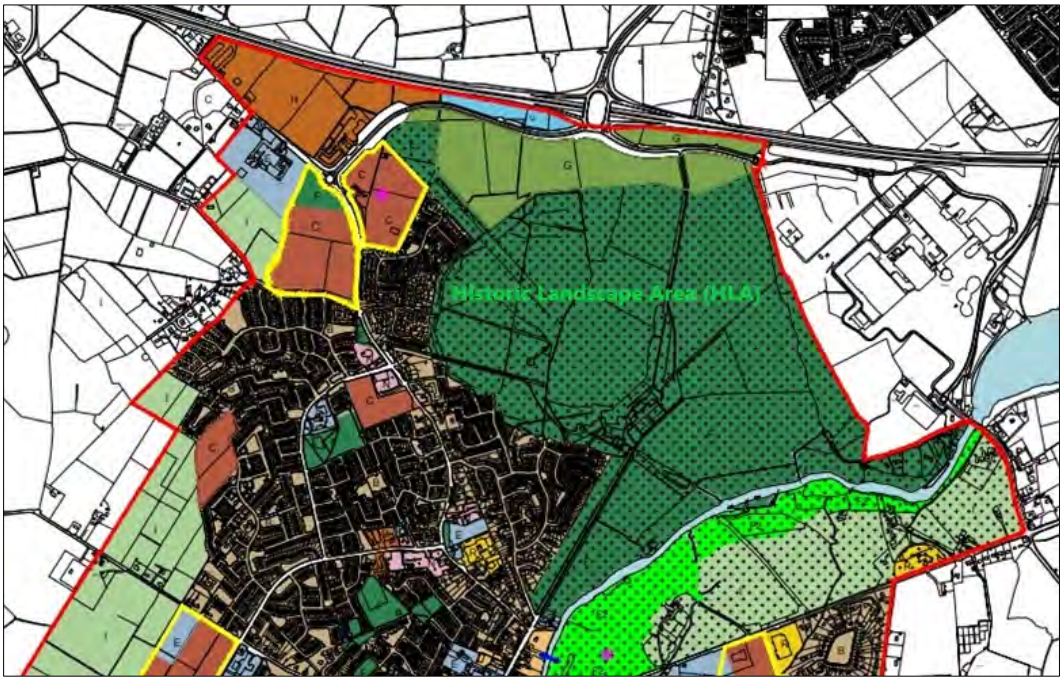

Figure 4.10: Extract from Celbridge LAP

In addition, as illustrated in **Figure 4.10**, there are protected views between Connolly's Folly, Wonderful Barn and Castletown House in the Celbridge LAP, which may be a constraint.

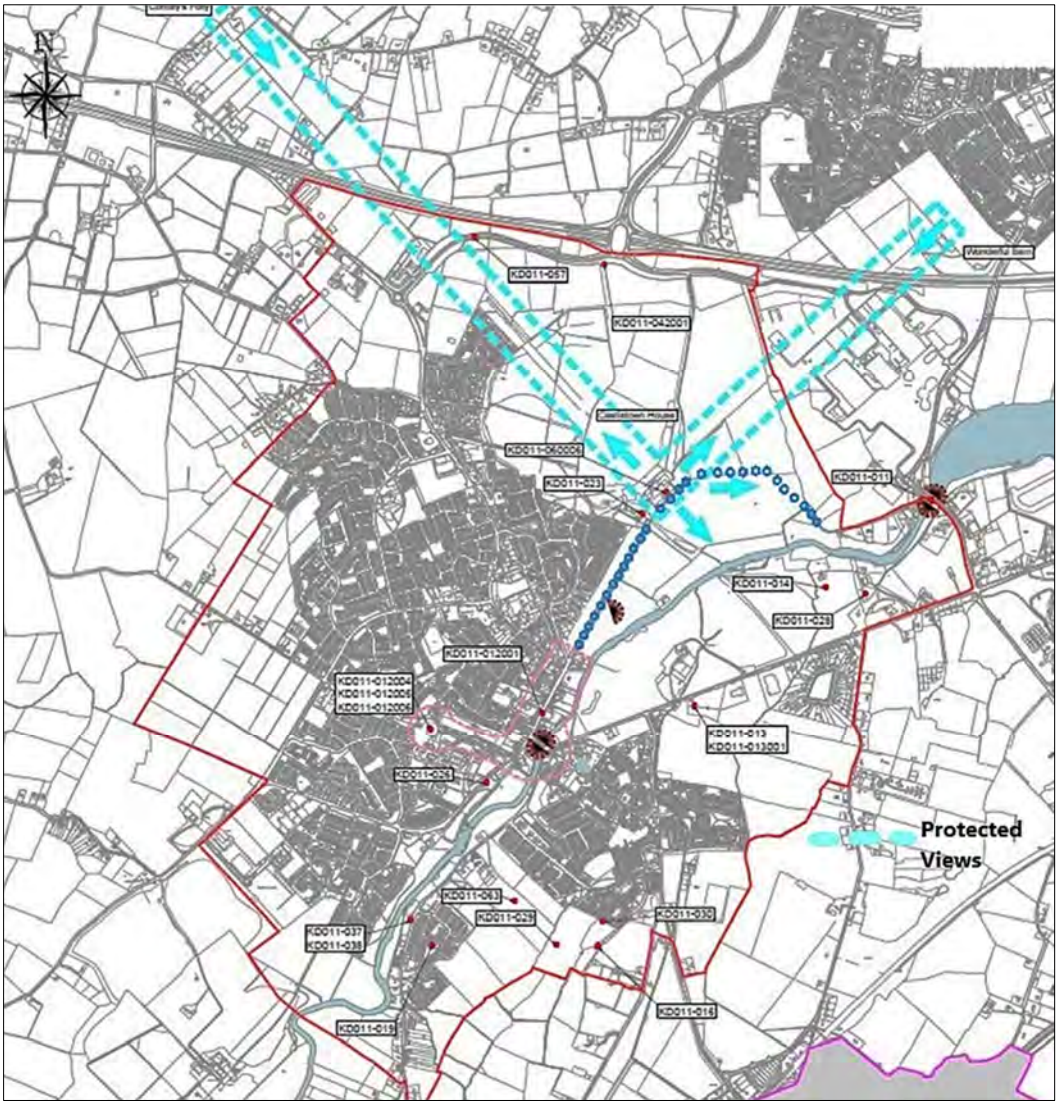

Figure 4.11: Extract from Celbridge LAP

4.9.4 Proposed and Planned Developments

A review of the MyPlan National Planning Application Database (www.myplan.ie) reveals the following permitted and proposed developments (since 2015) within the study area:

Planning Ref No.	Description	Location	Decision Date
21/166	for the existing single storey dwelling (area circa 63sqm), surface water to soakways, all accessed via an existing vehicular entrance and all associated site works. Planning Permission is sought to 1) extend the existing dwelling to provide a new living room and utility (21sqm), provide a new porch entrance (3.5sqm) and a new canopy (resulting in total floor area of 87.5sqm). 2) Clad the dwelling in a metal sheeting cladding. 3) Provide new boundary treatment. 4) Provide an on-site effluent treatment system and percolation area for the dwelling for which retention is sought. 5) Provide an onsite effluent treatment system and percolation area for the existing adjacent family home which will replace the existing septic tank and percolation area serving the existing adjacent family home. 6) All associated site works including hard and soft landscaping	Ballygoran Road, Moneycooley, Maynooth	Decision due 8.4.2021
21/79	the change of use of the existing and permitted (Reg. Ref:. 95/923) Ancillary Production Support Office associated with part of Building No. 2 to a standalone independent Office use including break room and tea station (c. 1,139sqm). The proposed development specifically relates to Building No. 2 located to the north-east of the centre of the site. (No alteration to the balance of the development is sought by this Application.) The site is principally bounded by: Barnhall Road to the north; Celbridge Road to the east; Barnhall Rugby Football Club to the south; and by grounds associated with Castletown House to the west. At a site of c.80.56 hectares at Liffey Business Campus (formerly known as the Hewlett Packard Campus)	Barnhall Road, Leixlip, Co. Kildare	Decision due 22.3.2021
20306504	STRATEGIC HOUSING DEVELOPMENT (ABP Decision) The demolition of an existing agricultural structure on site and the provision of a new vehicular access onto the R405 Regional Road (Celbridge-Maynooth) to serve the proposed residential development that consists of 372 no. new residential units, comprising the following: • 122 No. Apartments arranged in 2 no. Apartment blocks of 4-storey height comprising 46 X 1 bed units (measuring either 49.4sqm or 52sqm in Gross Floor Area (GFA) and 76 X 2 bed units (ranging in size from 67.3sqm to 82.8sqm GFA each). • 12 no. 1 bed Maisonettes (own door apartments), measuring 61sqm GFA (Unit Type A2) or 53.8sqm (Unit Type A1). • 20 no. Duplex units, comprising 10 X 1 bed units, measuring 54sqm GFA (Unit Type A3) and 10 x 2 bed units, measuring 99.7 sqm GFA (Unit Types B2 and B3) • 218 no. houses, comprising a variety of housing sizes and forms to include: 20 X 2 bed/4 person, two storey terraced houses measuring 87.5sqm GFA	Crodaun, Celbridge, Co. Kildare.	Granted 3.9.2020

Planning Ref No.	Description	Location	Decision Date
	(House Type B1) 88 X 3 bed/5 person, two storey terraced houses measuring 110.9sqm GFA (House Type C1) 8 X 3 bed/5 person, two storey semi-detached houses measuring 115.2sqm GFA (House Type C2) 1 X 3 bed/5 person, two storey detached house measuring 115.2sqm GFA (House Type C3) 7 X 3 bed/6 person, three storey terraced houses measuring 124.6sqm GFA (House Type C4) 36 X 3 bed/5 person, two storey terraced houses measuring 102sqm GFA (House Type C5) 36 x 4 bed/7 person, two storey semi-detached houses measuring 133sqm GFA (House Type D1) 12 X 4 Bed/7 person, two storey, semi-detached houses measuring 142.6sqm GFA (House Type D2) 10 X 4bed/8 person, three storey, terraced houses measuring 145.6sqm GFA (House Type D3) • A childcare facility is proposed at ground floor level of Apartment Block B (104approx. 191sqm GFA) A total of 633 no. car parking spaces and 340 no. bicycle parking spaces are proposed. The proposed development also includes the provision of 2 no. ESB sub-stations, site and infrastructural works including foul and surface water drainage, attenuation areas, open space, boundary walls and fences, landscaping, lighting, internal roads, cycle paths, footpaths, and cycle and pedestrian connections to the R405 and the R449 Regional Roads.		
PL09 .307223	STRATEGIC HOUSING DEVELOPMENT Demolition of existing buildings, construction of 239 no. residential units (136 no. houses, 103 no. apartments), creche and associated site works.	Leixlip Gate, Kilmacredock, Co. Kildare	Granted 10.9.2020
20/1119	the construction of new 2-storey detached dormer dwelling, single storey detached garage and car port, together with a new on site waste-water treatment facility to current EPA standards, and all ancillary site works including a new vehicular entrance onto the public road	Ballygoran, Maynooth, Co. Kildare	Granted 1.3.2021
20/873	the construction of a logistics warehouse with ancillary office accommodation (total c. 25,268 sqm) to an overall height of 14.86 metres. The warehouse element of the development is principally single storey including an ancillary mezzanine level (554 sqm). The ancillary offices, comprising c. 1,737 sqm, are provided over three storeys and include toilets, change rooms, showers, cafeteria, gym, plant areas and circulation spaces. The proposed development will also include: the provision of a new vehicular access from Barnhall Road roundabout with ancillary associated entry/exit gates, access road and footpath; 179 no. surface car parking spaces including electric vehicle charging stations and 18 no. bicycle parking; solar pv panels on the warehouse roof; hard and soft landscaping; signage; sprinkler storage tanks and pump house; an electrical substation (c. 54 sqm); and all ancillary works including boundary treatments, street lighting, site excavation and development works above and below	Barnhall Road, Leixlip, Co. Kildare	Granted 20.12.2020. Appealed (ABP-309233-21) – decision due 24.5.2021

Planning Ref No.	Description	Location	Decision Date
	ground. The site is principally bounded by: Liffey Business Campus to the north; Barnhall Road to the east; Barnhall Rugby Football Club to the south; and by grounds associated with Castletown House to the west. At this site of c. 8.19 hectares at Liffey Business Campus (formerly known as the Hewlett Packard Campus		
20/546	the nature and extent of the proposed development is: The use of unit A12, Second Floor, Building A, Celbridge M4 Business Park, as an Adult Training Centre and associated internal work. Unit A12 is 1150 sqm in area. Permission was granted for the development works associated with unit A12 (ref: 05/2210),	Townland of Crodaun, Celbridge, Co. Kildare	Granted 28.8.2020
20/534	(i) a single storey extension (120 sq.m) to provide storage, circulation and staff facilities; (ii) a single storey extension (75 sq.m) to the existing play area to provide dedicated soft-play area for babies and toddlers up to five years of age; (iii) a single storey entrance porch (12 sq.m) to the main entrance; (iv) a two storey infill extension at the north eastern corner of the existing building to provide an office/meeting room (78 sq.m) at ground floor and which is linked at first floor to a new mezzanine floor within the existing building in order to provide an indoor football pitch (330 sq.m) at first floor level; (iv) an external storage area and facilities area (covered and enclosed) to the rear elevation and (v) the relocation and re-configuration of the previously permitted car park serving Base Entertainment Centre together with an additional 19 no. car parking spaces to serve the additional floor area sought to be retained in this application together with all ancillary landscaping, services, lighting and internal connections to the existing building necessary to serve the development sought to be retained	Base Entertainment Centre , Block C M4 Interchange Park , Celbridge	Granted 26.8.2020
20/120	(a) the change of use of ancillary day space areas to additional bedroom space, to include the provision of 8 additional residents within 6 single en-suite bedrooms and 1 double en-suite bedroom. (b) retention of 1 window to the West Elevation, the change of use is accommodated within the existing footprint granted under 09/1197 and 14/649 with no additional floor area required	Crinnstown, Maynooth, Co. Kildare	Granted 30.6.2020
19/918	construction of new single storey ASD unit 659 sq.m to rear of existing school buildings comprising classrooms, tuition rooms, activity rooms, sensory & calm rooms, consultation and meeting rooms, office, storage and WCs; single storey enclosed link corridor 117 sq.m to existing classroom building, outdoor play area, new internal vehicular access surface and set-down area and all associated site works	Salesian College, Moortown , Celbridge	Granted 3.2.2020
19/437	the construction of a new single storey temporary post primary school building including general classrooms, specialist classrooms, general purpose area, administration areas, circulation areas and other ancillary accommodation. Also the provision of an additional 40 no. bicycle parking spaces, 25 no. new car parking spaces, new tarmac play area, new paladine boundary fencing and all ancillary site works	Celbridge Community School, Maynooth Road, Moortown	Granted 26.2.2020

Planning Ref No.	Description	Location	Decision Date
SD19B/0085	The construction of a 2000mm high boundary consisting of a 500mm low planter, made of a dry wall to the house side and a low gabion wall to River Liffey side with a 1500mm high metal security fence atop the planter along the entire boundary between the rear of the existing bungalow and the River Liffey to a seating area; seating area shall have a glass balustrade railing with a paved surface and seating; associated landscape works of paving, dry wall, tree, shrub and hedge planting for screening to M4 motorway and River Liffey.	The Hunter's Lodge, Backweston Park, Cooldrinagh Road, Lucan, Co. Dublin	Granted 3.6.2020
P8201911	Part 8 Civic Amenity and Waste Transfer Facility at Celbridge, Co. Kildare – KCC Ref. P82019.11'	Kilmacredock Upper & Castletown, Celbridge, Co. Kildare	Approved 15.11.2019
P8201908	Part 8: Maynooth Eastern Ring Road	East of Maynooth Town	Approved 29.7.2019
18/300606	STRATEGIC HOUSING DEVELOPMENT (ABP Decision) consisting of 450 no. new residential units; a childcare facility (538sqm); a new roundabout on the Celbridge Road (R404) and associated road realignment to facilitate vehicular access to the application site with revised entrance arrangement to the Wonderful Barn Complex (a Protected Structure), and incorporating landscape features and signage to the Wonderful Barn Complex (a Protected Structure); associated internal roads, pedestrian and cycle paths and linkages; open space; and, all associated site and development works. The residential development consists of the following: 16 no. one-bed, two-storey, own door apartments, 54sqm and 56 sqm Gross Floor Area (GFA) each (Type 1B1 & 1B2); 42 no. two-bed apartments, 83.7sqm GFA each (Type 2B1), with 42 no. three bed duplex units above, ranging in size from 119.2 to 120.4sqm GFA (Type 3B1 & 3B2), in three-storey terraces; 48 no. two-bed, two-storey terraced houses, 86.6sqm each (Type F1 & F2); 187 no. three-bed, two-storey terraced, semi-detached and detached houses, ranging in size from 110.7sqm to 126.4sqm GFA (Types D1-7, E1-5 & H1-4); 2 no. three-bed, single storey, detached houses, 113.7sqm each (Type J); 97 no. four-bed, two-storey, semi-detached and detached houses ranging in size from 130.2sqm to 206sqm (Types A, B1, B4, C1, C2 & G1-3); 16 no. four-bed, three-storey semi-detached houses ranging in size from 216.5sqm to 219.7sqm (Types C3 & C4). A total of 929 no. car parking spaces, including 875 no. spaces serving the residential units and 54 no. visitor spaces dispersed throughout the scheme (of which 13 no. spaces are designated for use by the childcare facility), are proposed. The associated site and infrastructural works include foul and surface water drainage, attenuation areas, open space, landscaping buffer with the Wonderful Barn	Barnhall, Leixlip, Co. Kildare	Granted 13.4.2018

Planning Ref No.	Description	Location	Decision Date
	parkland, boundary walls and fences, internal roads, cycle paths and footpaths including linkages towards the Wonderful Barn Complex (a Protected Structure) and to established residential areas to the north of the site. An Environmental Impact Assessment Report has been prepared in respect of the proposed development.		
18/1382	The proposed development will consist of the construction of 1 no. 3 and 4 storey office building consisting of 2 no. blocks with a central glazed atrium area and a screened plant area, solar panels and equipment at roof level, providing a total GFA of 12,641m2. The proposed road infrastructure, and site services as per the previously approved ref. ref 99/2073. Minor amendments to reg. ref. 99/2073 to include rearrangement of previously approved parking, the addition of 12 no. total car parking spaces, 200 no. cycles parking spaces, landscaping consisting of new tree planting, and grass planting, public lighting, and footpaths, ESB substation and switch room, and all associated site and infrastructural works. Revised by significant further information consisting of: Provision of a basement level car park (131 no spaces), access ramp and consequent revisions to the ground floor layout, site layout plans and minor amendments to the rear elevation.	M4 Motorway to the north Ballygoran Road to the south, Maynooth Business Campus to the west & east, off R406 Straffan Road	Granted on appeal (304658-19) 14.10.2019
18/762	Revision of previously approved development under Reg. Ref. 16/1153 and will consist of the omission of portion of lands to the northwest and change of house type from that previously approved. The development (Section B) will consist of the construction of 91 No. dwellings, link street (Objective TRO 2(a) Maynooth LAP), new boundary wall to replace existing boundary wall with Carton Court on western side of public open space, new boundary wall to rear of proposed housing along northern boundary with Greenfield Drive and Maynooth Park, provision for pedestrian and cycle link to Greenfield drive, external bin stores to House Nos. 2 and 71 and all associated site works. The housing breakdown is as follows: 36 No. House Type B (3 bed, 2 storey, 114.5sqm); 4 No. House Type C (3 bed, 2 storey, 117.7sqm); 10 No. House Type F (2 bed, 2 storey, 89.6sqm); 8 No. House Type G (3 bed, 2.5 storey, 132.2sqm) and 33 No. House Type G1 (4 bed, 2.5 storey, 135.9sqm). Total No. of dwellings is 91.Revised by significant further information consisting of; extended red line boundary of application site, revised site layout plan, revised hosing mix to include 4 no. 1 bed units and an increase in the total number of units from 91 to 93. The revised housing breakdown is as follows; 36 No. House Type B (3 bed, 2 storey, 114.5sqm); 3 No. House Type C (3 bed, 2 storey, 117.7sqm); 10 No. House Type F (2 bed, 2 storey, 89.6sqm); 8 No. House Type G (3 bed, 2.5 storey, 132.2sqm), 32 No. House Type G1 (4 bed, 2.5 storey, 135.9sqm), 2 No. House Type J (1 bed, first floor maisonette, 45sqm) & 2 No. House Type K (1 bed, ground floor maisonette, 51sqm). This is an increase of 2 no. units to a total of 93	Greenfield, Maynooth, Co. Kildare	Granted 31.1.2019
18/743	New bungalow/storey and a half type dwelling house, new on-site wastewater treatment system, new site entrance, landscaping and all associated site development works	Laragh, Maynooth, Co. Kildare	Granted 9.11.2018

Planning Ref No.	Description	Location	Decision Date
18/596	The construction of a new detached two storey house (247 sqm) together with an adjacent single storey stable block (91 sqm) and all associated services (including on-site waste-water treatment system and polishing filter), site development and landscaping works	Roestown, Maynooth, Co. Kildare	Granted 26.10.2018
18/557	To construct 1 No. detached single storey temporary accommodation unit, containing 4 No. classrooms, 2 No. resource rooms, 2 No. changing rooms, 1 No. general purpose room and 1 No. accessible toilet with connection to the existing storm and foul drainage, building signage and all associated development works located to the east of the main school building in the townland of Moortown	Celbridge Community School, Maynooth Road , Moortown	Granted 29.8.2018
18/201	Change of use from light industry to office use at first floor level of existing full height workshop area, with internal alterations to existing offices	Maynooth DSU, Unit F8 Maynooth Business Campus, Straffan Road Moneycooly	Granted 7.6.2018
SD18A/0411	Construction of a machinery shed with ancillary site works.	Celbridge Road, Lucan, Co. Dublin.	Granted 25.2.2019
SD18A/0056	Erection of a 17.5m SCADA communications pole with associated underground cable ducting enclosed in a 2.4m high fenced compound.	ESB Leixlip Generating Station, Leixlip, Towland of Cooldrinagh, Co. Dublin, W23 W3P9	Granted 30.10.2018
17/14949	Conversion of the attic to habitable space as bedrooms/ensuite with dormer windows to front and rear and with new stairs from hall and retention planning permission is sought for a) the bungalow in its as constructed orientation b) the garage and store as constructed and c) lifting of condition 4 of the original grant of planning permission ref 1008/90 to facilitate development of the remainder of the lands in compliance with Rural Housing Policy (Local Needs). Revised by significant further information consisting of; 1. Upgrade of existing wastewater treatment system 2. Withdrawal of Part C of the original application (removal of Condition 4 of planning permission 1008/90 to facilitate development of the remaining lands) 3. Alteration to entrance in compliance with Kildare Co Council drawing E3639-1	Barrogstown, Maynooth, Co. Kildare	Granted 6.9.2018

Planning Ref No.	Description	Location	Decision Date
SD17A/0415	Single storey infill motor showroom extension (70sq.m), located between existing motor showroom building and existing service workshop building, form new opes for glazed screens to front and side of existing building, new single storey office extension (35sq.m) to rear of existing motor showroom, provision of new gate and railings at entrance to existing side compound.	McCoy Motors Ltd, Lucan By-Pass, Lucan, Co. Dublin.	Granted 6.3.2018
17/323	A material change of use from class 3 agriculture to class 1 residential for the first floor and part ground floor of an existing two story stable yard storage building, together with modifications to the existing ground and first floor window and door openings to the north and west façade, the addition of 3 no. rooflights and associated site works. The building is located in the curtilage of Ballygoran Park House which is a protected structure Ref. B11-20	Ballygoran Park Stud, Maynooth, Co. Kildare	Granted 26.1.2018
17/210	(1) The refurbishment, restoration, extension, reconfiguration and part demolition of the existing dwellings (2 no. semi-detached bungalows) on site to accommodate 1 no. single storey 4-bedroom dwelling (2) Connected to the main house a 1-bedroom family flat with ground and attic level accommodation (3) On site wastewater treatment system and soakaway system, and (4) All associated boundary treatments, site development works and services.	Ballygoran, Ballygoran View Road, Maynooth	Granted 18.8.2017
16/1153	Residential development of 214 no. dwellings, a 2-storey crèche (552m2) and all associated and ancillary site development works including link road. The housing breakdown is as follows; 21 no. House Type A (4 bed, 2.5 storey, 174m2); 28 no. House Type B (3 bed, 2 storey, 118.8m2); 24 no. House Type B1 (4 bed, 2.5 storey, 162.1m2); 14 no. House Type C1 (4 bed, 2.5 storey, 165m2); 27 no. House Type D (4 bed, 2.5 storey, 165.5m2); 14 no. House Type D1 (4 bed, 2.5 storey, 165.9m2); 54 no. House Type F (3 bed, 2 storey, 106.5m2); 4 no. House Type G (5 bed, 2.5 storey, 201.7m2); 14 no. House Type H (4 bed, 2.5 storey, 176.3m2); 11 no. House Type J (2 bed, 2 storey, 110.1m2) and 3 no. House Type J1 (3bed, 2.5 storey, 147.8m2) as revised by significant further information consisting of revised Site Layout Plan, a reduction in the number of units from 214 to 181, revised house designs, revised housing mix and additional details including a Geophysical Survey, Noise Impact Assessment, Traffic Assessment, Road Safety Audit & Revised Site Specific Flood Risk Assessment. The proposed development now provides for 181 no. dwellings, a 2-storey Crèche (552m2) and all associated and ancillary site development works including link road. The housing breakdown is as follows; 10 No. House Type A (4 bed, 2.5 storey, 151.7m2); 61 No. House Type B (3 bed, 2 storey, 114.5m2); 8 No. house Type C (3 bed, 2 storey, 117.7m2); 70 No. House Type D (4 bed, 2.5 storey, 157.6m2); 14 No. House Type E (4 bed, 2.5 storey, 149.4m2) and 18 No. House Type F (2 bed, 2 storey, 89.6m2). This is a reduction of 33 no. units. This is a revision to previously approved development under Reg. Ref. 06/1379 (extended under Reg. Ref. 12/26). On lands comprising 12.498Ha. at Greenfield, Maynooth, Co. Kildare, bounded by the M4 motorway to the south, Barton Bus depot to the west, Lidl supermarket to the north-west, Carton Court Estate to the north, Greenfield Drive and Maynooth Park to the northeast and Griffin Rath Manor to the east.	Greenfield, Maynooth, Co. Kildare	Granted 18.8.2017

Planning Ref No.	Description	Location	Decision Date
16/982	Construction of a one and half/two story house with integrated open car port, secondary effluent treatment system, recessed entrance and all associated site work	Roestown, Maynooth, Co. Kildare	Granted 18.4.2017
16/647	Construction of a new detached two storey type dwelling along with a detached single storey domestic garage/shed/plant room, entrance from public road to serve the dwelling via the existing private lane, installation of a new proprietary waste-water treatment system together with all associated landscaping, site works and services	(Dowdstown), Rowanstown, Maynooth	Granted 4.11.2016
16/99	Storey and half bungalow, domestic garage, a percolation area for an existing Puraflo (Bord na Mona) wastewater treatment system and all associated works	Ballygoran, Maynooth, Co. Kildare	Granted 26.9.2016
15/1159	Construction of a one and half storey dormer bungalow, domestic garage, secondary effluent treatment system and all associated site works	Crinnstown, Maynooth, Co. Kildare	Granted 28.6.2016
15/837	The construction of a new detached two storey house (296 sqm). The development will include a main dwelling, separate garage (40 sqm) and associated site works for development onto the R408	Crinstown, Maynooth, Co. Kildare	Granted 12.7.2016
15/552	(a) The construction of a new single storey temporary post primary school building including general classrooms, specialist classrooms, social areas, administration areas, circulation areas and other ancillary accommodation. (b) The provision of new site entrances, car parking, set down, ball courts and all ancillary site works	Moortown, Maynooth Road, Celbridge	Granted 3.2.2016
15/327	The construction of a new all-weather football pitch with new panel fencing to 2.4m high and new netting to 6.0m high. Flood lighting will be provided to the perimeter of the pitch to a height of 12m	Maynooth Town Football Club, Newtown, Maynooth	Granted 8.2.2016

Table 4.28 Planning History of the Study Area (since 2015)

The potential impact of each of these permissions and applications will be addressed in the Options Selection process.

4.9.5 Summary and Conclusions

In summary, from a planning policy and history perspective, there are a number of potential constraints, including:

- Existing, established land uses, including business parks, schools, studs, farm buildings, and individual dwellings, as well as the existing built up areas of Maynooth, Leixlip and Celbridge
- Permitted developments, including strategic housing developments in the vicinity of the M4 at Leixlip and Celbridge
- The status and implications of the Strategic Land Use, Employment and Transportation study for northeast Kildare, and the integrated transport studies for Maynooth, Leixlip and Celbridge, as identified in the current Kildare County Development Plan
- The status and implications of the identified improvements to Junction 7 Maynooth, the identified future improved connection to the M4 near Maynooth and the potential overpass of the M4 between Wonderful Barn and Castletown Demesne, as identified in the current Kildare County Development Plan
- The status and implications of the relevant local roads projects that are identified in Table 6.1 of the current Kildare County Development Plan for the Maynooth to Leixlip Project
- The specific land use zoning objectives that apply to the study area including:
    - The amenity grasslands identified along the northern section of the M4 within the Maynooth LAP boundary
    - The Key Development Areas (KDAs) to the west and south of Leixlip and the north-west of Celbridge, which now have the benefit of permission for Strategic Housing Developments
    - The status of the Liffey Park Technology Campus to the south of Leixlip on the opposite side of the M4 as a key employment hub
    - The proposed pedestrian/cycle overpass between the Wonderful Barn KDA and the Liffey Park Technology Campus.
    - The sensitivity of the Historic Landscape Area of Leixlip Demesne to the south of the M4 at Celbridge, including the need to preserve views and prospects, including the protected views between Connolly's Folly, Wonderful Barn and Castletown House
    - The sensitivity of the High Amenity/Open Space lands at the eastern extent of the study area in the vicinity of the Liffey Valley
    - The implications of the safety designations (Conical Surface and Outer Horizontal Surface) as they relate to the Weston Aerodrome

These will need to be taken into account in the Options Selection process.

4.9.6 References

Regional Spatial and Economic Strategy for the Eastern and Midlands Region, 2020

Kildare County Council Development Plan, 2017-2021

South Dublin County Council Development Plan, 2016-2022

Maynooth Local Area Plan, 2013-2019

Leixlip Area Plan, 2020-2023

Celbridge Local Area Plan, 2017-2023

Kildare County Council Website www.kildarecoco.ie

South Dublin County Council Website www.sdcc.ie

www.myplan.ie

4.10 Archaeology, Architectural and Cultural Heritage

4.10.1 Introduction

This section presents the archaeology, architectural and cultural heritage constraints identified within the study area for the Maynooth to Leixlip Project. This section should be read in conjunction with Archaeology, Architectural and Cultural Heritage Constraints Figures 4.10.1 to 4.10.6.

The assessment involved a study of the archaeological, architectural, historical, and cultural background of the study area. This included information from the Record of Monuments and Places (RMP) and the Sites and Monuments Records (SMR) of Counties Kildare and Dublin as well as a review of all relevant county development plans and the National Inventory of Architectural Heritage (NIAH).

The study has been carried out in accordance with the TII Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes (2005a) and the TII Guidelines for the Assessment of Architectural Heritage Impacts of National Road Schemes (2005b) (formerly the National Roads Authority).

Section 4.10.2 describes the methodologies and sources of information that were used to carry out the study. Section 4.10.3 describes the existing constraints within the study area. A summary is presented in Section 4.10.4 and references are listed in Section 4.10.5.

4.10.2 Methodology and Sources of Information

Research for this constraints study was undertaken as a desktop exercise. The following sources were consulted in order to identify archaeological, architectural and cultural heritage constraints:

- Record of Monuments and Places (RMP) for Counties Kildare and Dublin;
- Sites and Monuments Record (SMR) for Counties Kildare and Dublin;
- Monuments in State Care Database;
- Preservation Orders;
- Register of Historic Monuments;
- Cartographic and written sources relating to the study area;
- Kildare County Development Plan 2017–2023;
- Leixlip Local Area Plan 2020-2023;
- Maynooth Local Area Plan 2013 – 2019;
- Celbridge Local Area Plan 2017 – 2023;
- South Dublin County Council Development Plan 2016–2022;
- Excavations Bulletin (1970-2020); and
- National Inventory of Architectural Heritage (NIAH): Architectural & Garden Survey, Counties Kildare and Dublin.

Record of Monuments and Places (RMP) Section 12 (1) of the National Monuments Act (1994 amendment) provides that the Minister for Arts, Heritage, Gaeltacht and the Islands (now the Minister for Housing, Local Government and Heritage) shall establish and maintain a record of monuments and places (RMP) where it is known that such monuments exist. The record comprises of a list of monuments and relevant places and mapping showing each monument and relevant place in respect of each county in the State. Sites recorded on the Record of Monuments and Places all receive statutory protection under the National Monuments Act. All recorded monuments are referred to as Archaeological Heritage (AH sites) within this assessment.

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 Service as 'un-located sites' and cannot be afforded legal protection. As a result these are omitted from the Record of Monuments and Places. SMR sites are also listed on a website maintained by the Housing, Local Government and Heritage (DoHLGH – www.archaeology.ie. All SMR sites are referred to as Archaeological Heritage (AH sites) within this assessment.

National Monuments in the State Care Database is a list of all the National Monuments in the 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.

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

The Minister for the Department of Housing, Local Government and Heritage 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 and/or Temporary Preservation Orders, can be assigned to a site or sites that are deemed to be in danger of injury or destruction. These are allocated 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 (DoHLGH).

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.

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. Documentary sources were consulted to gain background information on the archaeological, architectural and cultural heritage landscape containing the proposed corridor options.

Development Plans contain a catalogue of all the Protected Structures, archaeological sites and Architectural Conservation Areas within every county. The relevant development plans for South County Dublin and County Kildare were examined as part of this assessment, along with relevant local or town plans. All protected structures are referred to as Built Heritage sites (BH) as part of this assessment.

The National Inventory of Architectural Heritage is a government-based organisation tasked with making a nationwide record of significant local, regional, national and international structures, which in turn provides county councils with a guide as to what structures to list within the Record of Protected Structures. The NIAH have also carried out a nationwide desk-based survey of historic gardens, including demesnes that surround large houses. All NIAH structures are referred to as Built Heritage sites (BH) as part of this assessment.

Whilst the NIAH Garden Survey was utilised as part of this assessment, this was carried out in conjunction with detailed analysis of the historic Ordnance Survey maps in order to identify all designed landscapes (DL) within the corridor option corridors.

Excavations Bulletin is a summary publication that has been produced every year since 1970. The hard copy publication summarises every archaeological excavation that has taken place in Ireland during that year up until 2010 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 1970-2020.

Once all archaeological heritage (RMP/SMR) and built heritage (protected structures and NIAH structures) sites had been identified during the initial research, the information was mapped onto OS maps of the area. Refer to Figures 4.10.1 to 4.10.6. In addition, further constraints, which may not be subject to statutory protection, but should none the less be considered as cultural heritage constraints, have been identified and mapped, including all areas of designed landscapes or demesnes, which often include the site or ruins of a former country house (designed landscapes).

For the purposes of this study, all RMP and SMR sites are listed as Archaeological Heritage sites (AH). All structures included in the RPS and NIAH are listed as Built Heritage Sites (BH). All designed landscapes are listed as DL. All previous archaeological excavations are listed as EX.

4.10.3 Existing Environment

4.10.3.1 Archaeological Heritage Sites

A total of 46 RMP/SMR individual sites have been identified within the study area. Of the 46 recorded sites, none are listed as National Monuments in state ownership or guardianship or as being subject to a Preservation Order. The 46 sites have been grouped (where appropriate) into 30 AH sites, as detailed in Table 4.29.

Of the 46 archaeological sites recorded within the study area, 13 are listed on the RMP and are subject to statutory protection. A further 11 sites are proposed for inclusion in the next revision of the RMP. Therefore, these are not yet subject to statutory protection.

Of the 46 archaeological sites recorded within the study area, 19 are recorded on the SMR only and are not subject to statutory protection. Many of these sites represent the sites of excavated archaeological remains and the relevant cross references with excavations are included in Table 4.29 below. A total of three monuments are classed as 'redundant records' on the SMR; however, they have been included within the assessment, as in the past sites that have been made redundant have later been found to be archaeological in nature. The remaining SMR entries records sites of various date and form that are not intended to be added to the RMP at the next revision.

AH No	SMR Ref.	Classification	Townland	Statutory Protection	EX No
AH 1	KD005-036	Enclosure	Laraghbryan East	No	-
AH 2	KD005-008	Castle - unclassified	Laraghbryan East	Yes	-
	KD005-009002	Church	Laraghbryan East	Yes	-
	KD005-009001	Ecclesiastical site	Laraghbryan East	No	-
	KD005-009003	Graveyard	Laraghbryan East	Yes	-
AH 3	KD005-021	Ecclesiastical enclosure	Laraghbryan East	No	-
AH 4	KD005-017	Redundant record	Treadstown	No	EX 1
AH 5	KD005-018	Habitation site	Crinstown	No	EX 2
AH 6	KD010-008	Field system	Moneycooly	No	EX 5
AH 7	KD011-061	Furnace	Moneycooly	No	EX 4
AH 8	KD010-040	Burial ground	Moneycooly	No	EX 4
AH 9	KD011-022	Redundant record	Ballygoran	No	-
AH 10	KD011-069001	Burial	Crodaun	No	EX 20
	KD011-069	Enclosure	Crodaun	No	EX 20
AH 11	KD011-057	Habitation site	Kilmacredock Upper	No	EX 10
AH 12	KD011-002003	Church	Kilmacredock Upper	Yes	-
	KD011-002001	Ecclesiastical enclosure	Kilmacredock Upper	Yes	-
	KD011-002	Ecclesiastical site	Kilmacredock Upper	Yes	-

AH No	SMR Ref.	Classification	Townland	Statutory Protection	EX No
	KD011-002004	Graveyard	Kilmacredock Upper	Yes	-
	KD011-002002	Road - road/trackway	Kilmacredock Upper	No	-
AH 13	KD011-032	Field system	Kilmacredock Upper	Yes	-
AH 14	KD011-047	Burnt mound	Kilmacredock Upper	No	EX 17
AH 15	KD011-046	*Fulacht fia*	Kilmacredock Upper	No	EX 16
AH 16	KD011-049	Burnt mound	Kilmacredock Upper	No	EX 19
AH 17	KD011-048	Habitation site	Kilmacredock Upper	No	EX 18
AH 18	KD011-058	Habitation site	Kilmacredock Upper	No	EX 14
AH 19	KD011-045	Burnt mound	Kilmacredock Upper	No	EX 15
AH 20	KD011-043	Habitation site	Kilmacredock Upper	No	EX 14
	KD011-044	Habitation site	Kilmacredock Upper	No	EX 14
AH 21	KD011-050	Kiln - corn-drying	Kilmacredock Upper	No	EX 13
	KD011-059	Metalworking site	Kilmacredock Upper	No	EX 12
AH 22	KD011-042002	Enclosure	Castletown	No	EX 11
	KD011-042001	Kiln - corn-drying	Castletown	No	EX 11
	KD011-042	Ring-ditch	Castletown	No	EX 11
AH 23	KD011-031	Redundant	Barnhall	No	EX 23
AH 24	KD011-062	Fulacht fia	Parsonstown (Celbridge Ed)	No	EX 24
AH 25	KD011-018	Mound	Leixlip Demesne	Yes	-
AH 26	KD011-017	Bridge	Leixlip Demesne	Yes	-
	DU017-087	Bridge	Backwestonpark	No	-
	DU017-014	Weir - fish	Backwestonpark	Yes	-
	KD011-017001	Weir - fish	Leixlip Demesne	No	-
AH 27	KD011-004002	Castle - Anglo-Norman masonry castle	Leixlip	No	-
AH 28	DU017-075001	Barrow	Cooldrinagh	Yes	EX 32
	DU017-079	Prehistoric site - lithic scatter	Cooldrinagh	No	EX 30
AH 29	DU017-094	Ring-ditch	Lucan Demesne	No	-
AH 30	DU017-015	Enclosure	Cooldrinagh	Yes	-

Table 4.29 Archaeological Heritage Sites within the Study Area

4.10.3.2 Previous Archaeological Investigations

A review of the Excavations Bulletin (1970–2020) has revealed that a number of archaeological investigations have been carried out within the study area. These are summarised in Table 4.30 and shown in Figures 4.10.1 to 4.10.6. Where applicable,

a cross reference is provided to the relevant AH site, if the results of the excavation have been included in the SMR as a record only.

Ex Ref.	Licence	Bulletin Reference	Description	Townland
EX 1 (AH 4)	-	Bennett 1989:060	Archaeological investigations as part of the Maynooth – Leixlip – Kilcock Motorway Scheme failed to reveal any features of archaeological significance.	Treadstown
EX 2 (AH 5)	-	Bennett 1987:26	Archaeological excavation as part of the Leixlip–Kilcock by-pass, revealed an area of cobbling and a habitation layer associated with finds dating from the early 13th century.	Crinstown
EX 3	97E0390	Bennett 1997:273	Archaeological monitoring of the installation of gas pipeline did not reveal any features of archaeological potential.	Laraghbryan East
EX 4 (AH 8, AH 7)	04E0644	Bennett 2004:0851	Archaeological testing and subsequent excavation a number of archaeological areas. Area 1 included of 55 individuals forming part of an Early Christian cemetery. Ten additional features included two linear gullies and eight pit features. One of the pits contained a sickle and a piece of glass and was deemed to be of post-medieval date. In Area 2, four undated pits were identified. Area 3 contained two adjacent bowl furnaces, containing metallurgical waste and a hearth. Area 4 comprised three pits. Area 5 was non-archaeological. Further small-scale and undated features were identified in Areas 6-8.	Moneycooly
EX 5 (AH 6)	00E0888	Bennett 2000:0503, 2001:667	Monitoring in advance of construction failed to identify any features of archaeological significance.	Moneycooly
EX 6	08E0575	Bennett 2008:670	Archaeological testing failed to identify any features or deposits of archaeological significance.	Railpark
EX 7	13E0249	Bennett 2013:210	Archaeological monitoring as part of a water pipeline scheme failed to identify any features of deposits of archaeological potential.	Ballygoran & Donaghmore
EX 8	13E0016	Bennett 2013:185	Archaeological monitoring was carried out as part of the Ballygoran to Castlewarden pipeline scheme. The scheme passed through 22 townlands, including Ballygoran, Moneycooly and Griffenrath within the constraints area. Nothing of archaeological significance was identified within the study area.	Ballygoran, Moneycooly, Griffenrath
EX 9	01E0306	Bennett 2001:610	Archaeological monitoring of groundworks associated with the Celbridge Interchange identified 17 archaeological sites and one	Kilmacredock Upper, Castletown

Ex Ref.	Licence	Bulletin Reference	Description	Townland
			site which was later proven to be of natural origin.	
EX 10 (AH 11)	01E0306	Bennett 2001:610	Site on the Celbridge Interchange comprising a possible fire-pit and posthole.	Kilmacredock Upper
EX 11 (AH 22)	01E0669	Bennett 2001:609	Site on the Celbridge Interchange comprising a stone-built kiln feature set into a ditch of an enclosure.	Castletown
EX 12 (AH 21)	01E0306	Bennett 2001:651	Site on the Celbridge Interchange comprising three bowl furnaces and two associated burnt deposits.	Kilmacredock Upper
EX 13 (AH 21)	01E0547	Bennett 2001:652	Site on the Celbridge Interchange comprising a corn-drying kiln incorporated into an earlier ditch.	Kilmacredock Upper
EX 14 (AH 18, AH 20)	01E0306	Bennett 2001:651	Site on the Celbridge Interchange Scheme comprising two pits and a shallow spread of material.	Kilmacredock Upper
	01E0596 ext.	Bennett 2001:651	Site on the Celbridge Interchange Scheme comprising three pits and one trench or oval pit. Two small fragments of prehistoric pottery and a piece of flint were recovered from the site.	Kilmacredock Upper
EX 15 (AH 19)	01E0998	Bennett 2001:653	Site on the Celbridge Interchange comprising a burnt mound. The burnt mound material extended north out of the excavated area. Two large postholes were recorded and a quern stone was also present on site.	Kilmacredock Upper
EX 16 (AH 15)	01E0715	Bennett 2001:651	Site on the Celbridge Interchange Scheme comprising a spread of burnt material and a small pit.	Kilmacredock Upper
EX 17 (AH 14)	01E0855	Bennett 2001:651	Site on the Celbridge Interchange Scheme comprising a spread of burnt mound material.	Kilmacredock Upper
EX 18 (AH 17)	01E0856	Bennett 2001:651	Site on the Celbridge Interchange Scheme comprising four possible post-holes forming an arc and an additional post-hole to the southeast.	Kilmacredock Upper
EX 19 (AH 16)	01E0960	Bennett 2001:651	Site on the Celbridge Interchange Scheme comprising 14 areas of burnt stone or ash later interpreted as a burnt mound.	Kilmacredock Upper
EX 20 (AH 10)	18E0724	Bennett 2019:239	Archaeological testing was carried out that identified four areas of archaeological potential.	Crodaun
	19E0214	Bennett 2019:601	An early medieval enclosure identified during earlier testing was subject to full archaeological excavation. Associated field or enclosure ditches, cereal-drying kilns	Crodaun

Ex Ref.	Licence	Bulletin Reference	Description	Townland
			and an iron-working pit were located in proximity to the main enclosure. Artefacts recovered included a fragment of a lignite bracelet, a stone spindle-whorl, the pin of an iron loop-headed ring-pin, knife blades and nails. One inhumation burial was discovered within main enclosure ditch.	
EX 21	05E1022	Bennett 2005:784, 2006:981	Archaeological monitoring failed to identify any features or deposits of archaeological significance.	Barnhall, Rinawade Upper
EX 22	17E0333	Bennett 2017:645	Targeted archaeological testing following geophysical survey identified a circular enclosure, c. 40m wide.	Barnhall
EX 23 (AH 23)	97E0175	Bennett 1997:258	Archaeological testing of a possible enclosure failed to identify anything of archaeological significance.	Barnhall
EX 24 (AH 24)	96E0327	Bennett 1997:286, 1997:287	Archaeological monitoring failed to identify any features or deposits of archaeological significance.	Parsonstown
	95E0172	Bennett 1995:153	Archaeological testing failed to identify any features of archaeological potential. However, a small stone axe head and a fragment of worked flint were recovered from the topsoil.	Parsonstown
	95E0264	Bennett 1995:154	Archaeological monitoring failed to identify any features or deposits of archaeological significance.	Parsonstown, Rinawade Upper
	95E0264	Bennett 1996:186	Archaeological monitoring and subsequent excavation revealed four pits filled with *fulacht fia* material.	Parsonstown, Rinawade Upper
EX 25	97E0167	Bennett 1997:275	Archaeological monitoring of a drainage scheme failed to identify anything of archaeological significance.	Leixlip Demesne
EX 26	07E0265	Bennett 2007:526	A riverbank survey and underwater archaeological investigation and metal-detector survey of the riverbed sediments and adjacent riverbank features was carried out and identified a stone-built quayside to the east and west of the project area. A single fragment of late medieval pottery was recovered in the collapsed wall.	River Liffey, Leixlip
EX 27	E2034; C0135	Bennett 2007:449	Five test-trenches were excavated but nothing of archaeological significance was identified.	Cooldrinagh
EX 28	07E0983	Bennett 2007:448	Monitoring of the groundworks associated with installation of new ESB poles failed to identify any archaeological remains.	Cooldrinagh
EX 29	E2034; C014	Bennett 2006:585	Archaeological testing was carried out that revealed what appeared to be the remains of a prehistoric tomb, located in an east–west	Cooldrinagh

Ex Ref.	Licence	Bulletin Reference	Description	Townland
			paleo-channel. Immediately to the east of this, was a circular kerb of large stones, within which were a small central cairn and two cists. This monument had also been severely disturbed. One of the cists contained an inhumation while the other contained only charcoal and small fragments of bone.	
EX 30 (AH 28)	97E0027	Bennett 1997:090	Three areas were subject to archaeological testing. No features or structures were uncovered in any of the tested areas and no finds were recovered. During subsequent monitoring works, a dozen flint flakes and one sherd of unglazed medieval pottery were recovered from the topsoil. Further hand-testing of a limited section of the site was carried out. This produced 20 further flint flakes as well as several more sherds of medieval pottery, all from the topsoil.	Cooldrinagh
EX 31	E4414, C014	Bennett 2012:189	Archaeological monitoring and metal detection of spoil was carried out but failed to identify anything of archaeological significance.	Cooldrinagh
EX 32 (AH 28)	95E0039	Bennett 1995:052	Archaeological investigations of a circular mound prior to development revealed an enclosing fosse which produced flint flakes and modern pottery. A copper-alloy brooch pin was recovered. The removal of the mound exposed an earlier ditch that produced cremated bone and a pit complex which produced iron slag and an unidentified iron object.	Cooldrinagh
EX 33	CO14	Bennett 2005:410	A programme of combined ploughsoil survey and test-trenching produced an assemblage of 330 knapped flint pieces that were Mesolithic in date, although Neolithic and Bronze Age lithics were also present. A cairn constructed of angular stones was also identified. Additional trenches were opened along the line of the periphery of the cairn and a number of possible kerbstones were also revealed. A polished stone ball, a type of artefact often associated with the passage tomb tradition, was found in the ploughsoil at another location within the proposed development area. Cremated bone and worn human teeth were recovered from the cairn. A number of additional small-scale archaeological features were also recorded.	Cooldrinagh
EX 34	06E0289 ext	Bennett 2009:348	Monitoring of the installation of a water pipeline failed to reveal any features of archaeological significance.	Lucan Demesne

Table 4.30 Archaeological Investigations carried out within the Study Area

4.10.3.3 Areas of Archaeological Potential

Areas of Archaeological Potential (AAPs) can be defined as parts of the landscape that possess the potential to contain archaeological remains due to the presence of topographic features such as rivers, lakes, turloughs, high defendable ground and bog. Rivers and lakes are a focus for human habitation due to the obvious transport and food resources. They also have the potential to preserve organic archaeological deposits or artefacts such as wood or leather, which do not usually survive within the alkaline conditions associated with terrestrial archaeology. Rivers and lakes may have also played a role in prehistoric ritual, as significant artefacts from the prehistoric periods and into the early medieval period, are often found within river-bed deposits. All areas containing rivers, streams and bodies of water (both fresh and salt water), and their margins, within the study area should be considered as possessing archaeological potential, the most significant of which is the River Liffey.

4.10.3.4 Architectural Heritage

A total of 47 structures of architectural heritage significance have been identified within the study area. These are either listed within the Record of Protected Structures (RPS) (Kildare County Development Plan 2017–2023 and South Dublin County Council Development Plan 2016 –2022) or have been identified as part of the architecture surveys carried out by the National Inventory of Architectural Heritage (NIAH). The 47 structures have been grouped into 18 BH sites, as detailed in Table 4.31.

Structures of architectural, historical, archaeological, artistic, cultural, scientific, social, or technical interest are protected under the Planning and Development Act, 2000 as amended, where the conditions relating to the protection of the architectural heritage are set out in Part IV. The act defines a protected structure as *'(a) a structure, or (b) a specified part of a structure which is included in a Record of Protected Structures (RPS), and, where that record so indicates, includes any specified feature which is within the attendant grounds of the structure and which would not otherwise be included in this definition*.' Protection of the structure or part of a structure includes conservation, preservation, and improvement compatible with maintaining the character and interest of the structure or part.

Buildings recorded in the RPS can include recorded monuments, structures listed in the NIAH, or buildings deemed to be of architectural, archaeological, or artistic importance by the Minister for Housing, Local Government and Heritage. Inclusion within the NIAH survey does not afford statutory protection. However, the structure may be added to the RPS by the relevant local authority in the future. As such the buildings should be considered to be constraints.

Structures and sites that are included within the RMP and RPS, are subject to statutory protection under both the National Monuments Act and the Planning and Development Act, as amended.

The NIAH rating values are International, National, Regional, Local, and Record Only (I, N, R, L, O). Structures which are considered of International, National, and

Regional significance are recommended by the Minister to the relevant planning authority for inclusion in their RPS (NIAH Handbook 2017, DoCHG).

International: Structures or sites of sufficient architectural heritage importance to be considered in an international context. These are exceptional structures that can be compared to and contrasted with the finest architectural heritage in other countries.

National: Structures or sites that make a significant contribution to the architectural heritage of Ireland. These are structures and sites that are considered to be of great architectural heritage significance in an Irish context.

Regional: Structures or sites that make a significant contribution to the architectural heritage within their region or area. They also stand in comparison with similar structures or sites in other regions or areas within Ireland. Increasingly, structures that need to be protected include structures or sites that make a significant contribution to the architectural heritage within their own locality. Examples of these would include modest terraces and timber shopfronts.

Local: These are structures or sites of some vintage that make a contribution to the architectural heritage but may not merit being placed in the RPS separately. Such structures may have lost much of their original fabric.

Record Only: These are structures or sites that are not deemed to have sufficient presence or inherent architectural or other importance at the time of recording to warrant a higher rating. It is acknowledged, however, that they might be considered further at a future time.

Overall, there are 47 RPS and/or NIAH structures located within the study area, these have been grouped into 18 Built Heritage constraints and are marked as BH in Figures 4.10.1 to 4.10.6. Of the 47 structures across the constraints area, 40 are Protected Structures. These consist for the most part of country houses and elements of their associated demesnes, vernacular houses, churches, railway infrastructure and bridges.

BH No	RPS	NIAH	Name	Townland	Statutory Protection
BH 1	-	11900505	Jackson's Bridge (and Lock)	Laraghbryan East	No
BH 2	B11-113	11901101	Leixlip Gate	Barnhall/ Kilmacredock Upper	RPS
BH 3	B11-15	11901102	Wonderful Barn	Barnhall	RPS
BH 4	B11-62	11804057	Leixlip Castle- Outbuilding	Leixlip Demesne	RPS
	B11-55	11804047	Leixlip Castle- Folly		
	B11-65	11804060	Leixlip Castle- Outbuilding		
	B11-61	11804056	Leixlip Castle- Outbuilding		
	B11-64	11804059	Leixlip Castle- Outbuilding		
	B11-63	11804058	Leixlip Castle- Dovecote/ Pigeon House/ Aviary		
	B11-59	11804054	Leixlip Castle- Demesne walls/gates/railings		

BH No	RPS	NIAH	Name	Townland	Statutory Protection
	B11-60	11804055	Leixlip Castle- Garden temple		
	B11-69	11804065	Leixlip Castle- Garden structure		
	B11-52	11804045	Leixlip Castle		
	B11-56	11804048	Leixlip Castle- Outbuilding		
		11804046	Leixlip Castle- house		
	B11-66	11804061	Leixlip Castle		
	B11-57	11804052	Leixlip Castle- Outbuilding		
	B11-58	11804053	Leixlip Castle- Demesne walls/gates/railings		
	B11-67	11804062	Leixlip Castle- Garden structure		
BH 5	-	11201001	Dam/reservoir/basin	Cooldrinagh	No
BH 6	9	11201003	Salmon Leap Inn	Cooldrinagh	RPS
BH 7	-	11201005	House	Cooldrinagh	No
BH 8	14	11201007	Milestone	Cooldrinagh	RPS
BH 9	40	11201014	Beckett Hotel	Cooldrinagh	RPS
	21	11201008	Cooldrinagh demesne walls/gates/railings	Cooldrinagh	RPS
	-	11201013	Cooldrinagh Walled Garden		No
	-	11201015	Cooldrinagh Stables		No
BH 10	18	11201009	Outbuilding	Cooldrinagh	RPS
BH 11	26	11201010	1 Cooldrinagh Lane	Cooldrinagh	RPS
	26	11201011	2 Cooldrinagh Lane		
	26	11201012	3 Cooldrinagh Lane		
BH 12	-	11201016	Water pump	Cooldrinagh	No
BH 13	98	11204003	Kiln	Cooldrinagh	RPS
BH 14	54	11201017	Weir	Coldblow, Lucan Demesne	RPS
BH 15	81	11201018	Round House	Cooldrinagh	RPS
BH 16	87	11201019	The Lucan County	Cooldrinagh	RPS
BH 17	89	11201020	Lucan Spa Hotel	Cooldrinagh	RPS
BH 18	95	11204006	1 The Crescent	Doddsborough	RPS
		11204007	2 The Crescent		
		11204008	3 The Crescent		
		11204009	4 The Crescent		
		11204010	5 The Crescent		
		11204011	6 The Crescent		
		11204012	7 The Crescent		
		11204013	8 The Crescent		
		11204005	The Crescent		
		11204004	West Winds, the Crescent		

Table 4.31 Built Heritage Sites within the Study Area

4.10.3.5 Architectural Conservation Areas (ACAs)

An Architectural Conservation Area (ACA) is defined as:

'*A place, area, group of structures or townscape, taking account of building lines and heights, that is of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest or that contributes to the appreciation of a protected structure, and whose character it is an objective of a development plan to preserve*.' (DoAHG, 2011, 40).

Chapter II of Part IV of the Planning and Development Act 2000, as amended states that that all development plans must now include objectives for preserving the character of ACAs. As such ACAs are subject to statutory protection and are a key constraint.

There is one ACA partially located within the study area: Leixlip ACA. This is situated in the townlands of Leixlip, Leixlip Demesne and Newtown within the core area of Leixlip town. Refer to Figures 4.10.1 to 4.10.6.

4.10.3.6 Designed Landscapes

The first edition six-inch OS maps of Counties Kildare (1839) and Dublin (1843) shows the extent of demesne landscapes as shaded portions of land within the study area. These were established as a naturalised landscaped setting for the large houses of the landed gentry.

Later OS mapping (c. 1906-9) can also indicate demesne extent, although they are not shaded. Not all demesne landscapes are subject to statutory protection. However, where a demesne exists in association with a protected structure (dependant on the preservation of the landscape), this may be considered to represent the curtilage or attendant grounds and as such may fall within the remit of the Planning and Development Act 2000, as amended. One of the demesne landscapes within the study area, which is associated with Leixlip Castle, is protected as part of the Leixlip ACA.

A total of seven designed landscapes have been identified from the desktop resource. These are listed below in Table 4.32 and are marked as 'DL' in Figures 4.10.1 to 4.10.6. The NIAH have carried out a desk-based survey of identifiable demesnes within Counties Kildare and Dublin; however, only six of the seven demesnes are included within the survey results.

DL No.	NIAH Garden Ref	Name	Description
DL 1	1911	Dowdstown House demesne	Principal building extant and boundary defined, with some areas of parkland survive. Original demesne has been subject to modern development.
DL 2	1924	Castletown demesne	Principal structure included in the RPS (outside the study area). Whilst the western sections of the demesne have been developed, the core of the landscape remains intact. The existing M4 truncates the northern tip of the original landscape.
DL 3	N/a	Parsonstown demesne	No longer extant. Demesne removed by modern development

DL No.	NIAH Garden Ref	Name	Description
DL 4	1931	Leixlip Castle demesne	The principal building survives along with multiple associated structures (included in the RPS) in the northern part of the demesne (BH 4), many of which are also included in the ACA. The remainder of the demesne is formed by an open agricultural landscape that retains designed elements, such as tree belts. It is truncated in an east-west direction by the existing M4.
DL 5	2205	Westonpark House	Principal structure present but not protected. The demesne has been subject to development as an airfield and many of the original characteristics have been removed.
DL 6	2207	Cooldrinagh Lodge	Buildings and associated architectural features present and included in the RPS (BH 9). Elements of the designed landscape do survive, but the northern half of the area now contains a water works, with industrial development further to the south. The southern section of the demesne is truncated by the existing M4.
DL 7	2217	Lucan Demesne	This is the western section of a demesne associated with Lucan House, which is an RPS outside of the study area. Whilst the section of demesne in the study area remains as open agricultural fields and a belt of trees, a large portion of the remainder has been developed as a golf course.

Table 4.32 Designed Landscapes within the Study Area

4.10.4 Summary and Conclusions

A total of 46 individual recorded archaeological sites of varying dates are listed within the study area indicating a continuance of activity and settlement in the region from the prehistoric through to the post-medieval period. These have been grouped into 30 AH sites for the purposes of this study and many of the sites represent the location of previously excavated archaeological remains, which exist as record only. A substantial number of these sites are prehistoric in date with burnt mounds and *fulachtaí fia* being the most commonly recorded monuments. All recorded archaeological sites that are included in the RMP or proposed as RMPs should be considered as cultural heritage constraints during the design of the route options and avoided where possible.

A survey of the Excavations Bulletin (1970–2020) has revealed that a total of 34 individual or groups of investigations have been carried out within the study area. Many of these have been recorded within the SMR as record only and where applicable, the relevant AH and EX designations have been applied.

The main Area of Archaeological Potential (AAP) within the study area is the River Liffey. However, all watercourses can possess archaeological potential and should be avoided where possible. Where avoidance is not possible, potential impacts should be minimised through design. This includes the use of clear span structures across waterways.

An analysis of the built heritage within the study area has provided a holistic view of the built heritage resource, with the later years of the post-medieval period well-represented by the presence of a substantial number of country houses and demesnes, vernacular houses, bridges and transport infrastructure. Structures that

are architecturally and socially important are listed within the development plans of Counties Kildare and South Dublin and NIAH survey for Counties Kildare and Dublin. Protected structures receive statutory protection that helps to ensure their preservation for the future. A total of 47 individual protected structures and/or NIAH structures are located within the study area, which have been grouped into 18 BH sites. All protected structures and NIAH structures should be considered as cultural heritage constraints, with direct impacts and impacts on settings to be avoided where possible.

Part of one ACA has been identified within the study area, which is subject to statutory protection. The Leixlip ACA focusses on the settlement of Leixlip and includes part of the northern section of the demesne landscape associated with Leixlip Castle. This is a significant constraint and should be avoided where possible.

A total of seven Designed Landscapes have been identified from the desktop resource within the study area, six of which are included on the NIAH Garden Survey. Some of these landscapes still retain their principal building and/or outbuildings, whilst others have been lost over the course of time.

The landscapes should be considered as cultural heritage constraints during the development of the route options with demesnes retaining their principal structures that are included in the RPS, being considered as key constraints.

4.10.5 References

Bennett, I. (ed.) 1987-2010 Excavations: Summary Accounts of Archaeological Excavations in Ireland. Bray. Wordwell.

Celbridge Local Area Plan 2017 – 2023

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

Department of Arts, Heritage, Gaeltacht and the Islands. 1999b. Policy and Guidelines on Archaeological Excavation. Government Publications Office, Dublin.

Department of Culture, Heritage and the Gaeltacht. 2017. NIAH Handbook.

Kildare County Development Plan 2017–2023

Leixlip Local Area Plan 2020-2023

Maynooth Local Area Plan 2013 – 2019

National Monument Service, Department of Housing, Local Government and Heritage. Sites and Monuments Record, Counties Kildare and Dublin.

National Roads Authority 2005a Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes.

National Roads Authority 2005b Guidelines for the Assessment of Architectural Heritage Impacts of National Road Schemes.

South Dublin County Council Development Plan 2016–2022

Electronic Sources

www.excavations.ie – Summary of archaeological excavation from 1970-2020. -

www.archaeology.ie – DoHLGH website listing all SMR/RMP sites and historic OS maps

www.heritagemaps.ie – The Heritage Council web-based spatial data viewer which focuses on the built, cultural and natural heritage.

www.bingmaps.com – Website containing aerial photographic datasets.

www.logainm.ie – Placenames Database of Ireland launched by Fiontar agus Scoil na Gaelige and the DoCHG.

www.googleearth.com – Satellite imagery of the study area.

4.11 Material Assets – Agriculture (Agronomy)

4.11.1 Introduction

This section describes the material assets that are agricultural constraints within the study area for the Maynooth to Leixlip Project and should be read in conjunction with Material Assets – Agriculture Constraints Figures 4.11.1 to 4.11.18.

Section 4.11.2 describes the methodologies and sources of information that were used to carry out the study. Section 4.11.3 describes the material assets - agricultural constraints within the study area. A summary is presented in Section 4.11.4 and references are listed in Section 4.11.5.

4.11.2 Methodology and Sources of Information

The following guidelines and legislation were referred to:

- European Union (2018) (Planning and Development) (Environmental Impact Assessment) Regulations. (SI 296 of 2018)
- Environmental Protection Agency (EPA) (August 2017) Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports[67]
- Transport Infrastructure Ireland (TII) (2020) Project Management Guidelines PE-PMG-02041[68]. In line with these TII and EPA guidelines, the constraints study seeks to identify the issues that are likely to be important at this stage of the environmental assessment process and to inform the design team so that preventative action can be pursued. This constraints study has comprised of a desktop collation and interpretation of published data, online resources, aerial photography and a site visit of the study area that was undertaken in January 2021. The purpose of this constraints study was to identify features which reflect the agricultural potential and agricultural sensitivity of the study area. The desktop study has considered the following sources of information:
- Data from the Central Statistics Office (CSO):
    - The 2010 Census of Agriculture[69]. The Agricultural Census in 2010 publication is the only source of data which gives the number of farms for each farm enterprise at a county level. While there are newer surveys on the CSO website, these surveys present data on a regional rather than a county basis. The county data is used as an indicator of the size of farms within the study area.

[67] Environmental Protection Agency (August 2017) Guidelines on the Information to be contained in Environmental Impact Assessment Reports. Available from: http://www.epa.ie/pubs/advice/ea/EPA%20EIAR%20Guidelines.pdf
[68] Transport Infrastructure Ireland (2020) Project Management Guidelines PE-PMG-02041. Available from: https://www.tiipublications.ie/library/PE-PMG-02041-03.pdf
[69] Central Statistics Office (December 2012), Census of Agriculture 2010 – Final Results. Available from: https://www.cso.ie/en/media/csoie/releasespublications/documents/agriculture/2010/full2010.pdf [Accessed on 04/08/2020]

It is possible to drill down through the 2010 census data on the Central Statistics Office (CSO) website in the Agrimap[70] part of the website to access this data at an Electoral Division (ED) level. This data is presented in Table 4.34. Some of the electoral divisions within the study area have such low numbers of farms that the details are not published. The most recent agricultural census is from 2010 and the next agricultural census should have been in 2020 but was deferred due to Covid. Some changes will be expected during this period, therefore, although a useful indicator of agricultural data relevant to County Kildare and the study area, the 2010 census should be interpreted with caution. Also, the geographical location of the EDs is not exactly the same as the study area and this must be taken into account.

- Soil mapping data from the Teagasc Irish Soil Information System[71] was used to identify the soil types within the study area. The soil quality and type varies within a small area and the mapping data used is consistent over large areas, thus the information is indicative only.
- 2018 Corine data[72] on land use was examined for the study area
- Bing [73] and Google[74] aerial maps were used to identify yards, farm facilities, forestry, scrub and rough boggy land
- The Property Registration Authority of Ireland (PRAI)[75] open database was used to identify folio land parcels where horses were noted during the site visit.

The following features have been identified from desktop information sources:

- Yards and farm facilities - Farm yards and other yards and facilities such as sand arenas and training facilities used by horses and farm paddocks and roadways typical of dairy farms have been identified from aerial photography
- Equine farms are generally within the high to very high range of enterprise sensitivity. Refer to Table 4.33. As outlined above, the PRAI open database[75] has been used to identify folio land parcels associated with these enterprises
- Areas with good quality soils generally have a higher agricultural potential than poor quality land. Good quality land was initially identified by using the Teagasc Irish Soils Information System[71] and aerial photography[73] [74] and later verified with a site visit.

[70] Central Statistics Office (2020), Statistics, Agriculture, Census of Agriculture 2010, Agrimap. Available from: http://census.cso.ie/agrimap/ [Accessed on 04/12/2020]. At the time of publication the Electoral Division data formerly available on Agrimap database is replaced by the CSO's 'PxStat' dissemination database system.
[71] Teagasc (2020), Irish Soil Information System. Available from http://gis.teagasc.ie/soils/ [Accessed on 04/12/2020]
[72] Corine 2018 ITM. Available from: http://gis.epa.ie/geonetwork/srv/eng/catalog.search#/metadata/e09739bf-abd1-4408-9fa5-510a156673ba [Accessed in November 2020]
[73] Bing Aerial Mapping (2020). Available from: https://www.bing.com/maps [Accessed November - December 2020]
[74] Google Aerial Mapping (2020). Available from: https://www.google.com/maps [Accessed November - December 2020]
[75]Property Registration Authority (2020). Available from https://www.landdirect.ie/index. [Accessed in November 2020]

A site visit was conducted in January 2021. The site survey involved driving through the study area and recording farm enterprises, land use and land quality. The purpose of the site survey was to verify where possible the desktop data and identify the following:

- Farmyards and other facilities - Farmyards and facilities such as stables, sand arenas, racehorse training tracks and lounging areas were identified;
- Fields with horses; and
- Land quality - desktop information was verified and areas with forestry, scrub and marshes were noted.

Where farm enterprises are identified, the information in Table 4.33 is used to categorise the sensitivity. Table 4.33 provides an indication of the range of common enterprise categories in Ireland and has been adopted based on the professional judgement of the author.

Farm Enterprise Type	Intensity / Scale	Sensitivity
Racehorse training farms are very high sensitivity. Stud-farms are generally high or very high sensitivity. Intensive horticulture is generally high or very high sensitivity.	High	Very High
	Medium	High
	Low	Medium
Dairy farms and equine enterprises.	High	High
	Medium	High
	Low	Medium
Non-dairy grazing livestock enterprises (including beef, sheep and small non intensive equine) and grass cropping enterprise.	High	Medium
	Medium	Low
	Low	Very low
Tillage	High	Medium
	Medium	Low
	Low	Very low
Rough Grazing, Bog, Forestry, Woodland	Low	Low or Very low

Table 4.33 Farm Sensitivity

Existing Environment

The study area is illustrated in Table 4.34 and is approximately 17.5km^2 with 88% in County Kildare and 12% in County Dublin.

Land Use Category	% of Study Area
Total area (ha)	1,750
Agricultural	72%
Urban / built on / water	26%
Forestry / woodland	2%

Table 4.34 Land Use within the Study Area[76]

26% of the land area is urban, built on or water. There is a strong urban influence on the land use and several former farmyards now have commercial businesses (e.g. car sales, fitness gym, SAP Nursery).

4.11.2.1 Statistical Analysis of Agriculture in the Study Area

Enterprise Type (Table 2 Agri Census 2010)	County Kildare	County Dublin	National
Dairy (%)	5	4	11
Beef, sheep, grass cropping (%)	73	65	78
Tillage (%)	16	25	3
Mixed crops and livestock (%)	5	3	7
Other (including equine farms, pig & poultry farms, horticulture) (%)	1	3	1

Table 4.35 Enterprise Types in the Study Area

Table 2 of the 2010 census shows the number of specialist dairy farmers (generally high sensitivity) is 4% and 5% in County Dublin and County Kildare compared to 11% nationally. County Dublin and County Kildare have a notably higher percentage of tillage farmers (medium sensitivity). County Dublin has a higher proportion of 'Other' enterprises – many of these will be equine and horticulture enterprises (high sensitivity). Table 8A of the 2010 census shows that 14.5% and 18% of farms have an average of 6 and 11 horses in County Dublin and County Kildare compared with 12% of farms nationally with an average of 6 horses.

There are seven relevant electoral divisions which are located within the study area, however because the number of farms in Lucan – St Helens, Lucan North and Leixlip are so low the statistics are not published for these electoral divisions. The electoral divisions can be examined to get more representative data on the study area.

[76] With reference to Corine 2018 data and Aerial Mapping data

Electoral Division (ED)	County	Size of farm (ha)	Pasture (%)	Cattle per farm	Dairy cows/farm	Sheep / farm	Horse / farm	Dairy cows per sq km	Horses per sq km
Lucan-St. Helen's	Dublin	No details available due to low numbers of farmers							
Lucan North	Dublin	No details available due to low numbers of farmers							
Maynooth	Kildare	66.6	79	50.1	9.7	3.7	8.0	14.6	12.1
Celbridge	Kildare	50.7	91	64.5	8.6	1.3	6.4	16.9	12.7
Donaghcumper	Kildare	53.7	75	48.3	5.5	27.6	4.0	10.3	7.5
Kilcock	Kildare	31.5	91	52.8	7.9	3.4	1.7	25.1	5.3
Leixlip	Kildare	No details available							
Average for EDs		50.6	84	53.9	7.9	9	5	16.7	9.4
County Kildare		44.1	73	48.5	4.4	55.4	2.0	10.1	4.5
County Dublin	No details available								

Table 4.36 2010 Electoral Division Statistical Data for the Study Area

Approximately 84% of the agricultural land within the study area is grass land with the majority of the remainder in arable use. The farms in the study area electoral divisions are larger on average than farms in County Kildare, which comprises the majority of the study area. The average size of farms in County Dublin is 47.6ha (Table 1, 2010 Agri Census). While no dairy cows were noted in the study area from the site survey the statistics show that this part of the County has a higher average of dairy cows per farm and square kilometre than the County as a whole. Important stud farms were noted during the windshield survey and the statistics show that the number of horses per farm and square kilometre in the study area are approximately double the county average.

4.11.2.2 Soils in the Study Area

The main soil groups of the study area are shown in Table 4.37 and Figures 4.11.1 to 4.11.18.

General Soil Type	% of Study Area
Luvisol	53
Surface water gleys	45
Alluvial	2

Table 4.37 Land use within the Study Area

The main soil type is a Luvisol type soil which is a deep soil where the clay content of the upper horizons has been depleted by weathering and leaching. From an agricultural perspective this soil type is good quality. It occupies the eastern part of the study area. Surface water gleys occur in the west of the study area. These soils tend to be poorly drained due to permanent or intermittent water logging caused by their low-lying location within the study area. Alluvial soils are located along river valleys and water features throughout the study area and are often subject to seasonal flooding.

4.11.2.3 Site Survey

A site survey was conducted on the 15th of January 2021 to identify fields where horses and/or dairy cows were grazing and to identify facilities associated with these high sensitivity farms (e.g. milking parlours, stud farm fencing, stables etc.). The results of the site survey combined with the examination of aerial photography are presented in Figures 4.11.1 to 4.11.18.

4.11.2.4 Agricultural Constraints

The main agricultural constraints as shown in Figures 4.11.1 to 4.11.18 are identified as:

- Good quality land;
- Farmyards; and
- Equine enterprises.

Good Quality Agricultural Land

From an agricultural perspective, urban or built land is a lower constraint than forestry or agricultural land. Forestry, woodland and scrub is a lower constraint than agricultural land. Good quality land has a higher agricultural potential than poorer quality land.

The information provided in the soil map in Figures 4.11.1 to 4.11.18 indicates that the good quality Luvisol soils occur in the eastern section of the study area. The surface water gleys, although heavy in nature are also reasonably good quality. Therefore, complete avoidance of good quality land may be impractical during the options selection process.

Yards and Equine Training Facilities

All yards and associated facilities identified in the site study and from examination of aerial photography are identified as agricultural constraints and should be avoided if possible.

Farm Enterprises

There are regionally important stud farms in Kilmacredock, Mooretown, Moneycooly and Thornhill in the southern and middle section of the study area. These are very high sensitivity. There is a nursery enterprise in Ballygoran – this is a very high sensitivity enterprise.

There is a dog kennel / boarding facility and an equine enterprise in Cooldrinagh, County Dublin which are classed as having a high sensitivity. There is an equine enterprise in Crinstown, Co Kildare which is classed as having a medium to high sensitivity. These enterprises are shown in Figures 4.11.1 to 4.11.18.

4.11.3 Summary and Conclusions

There is a high percentage of non-agricultural (e.g. urban and water) land within the study area.

Approximately 72% of the study area consists of agricultural land. Good quality land (luvisol and surface water gleys) is identified as a constraint, however because it occurs throughout the study area it cannot be avoided.

There are commercial enterprises in some of the farmyards. There is a relatively high number of horses in the study area and some of the equine enterprises are classed as having a very high sensitivity. All farmyards are a constraint and should be avoided where possible. High sensitivity enterprises (e.g. equine and horticulture) should be avoided.

4.11.4 References

Bing Aerial Mapping (2020). Available from: https://www.bing.com/maps [Accessed November - December 2020]

Central Statistics Office (December 2012), Census of Agriculture 2010 – Final Results. Available from: https://www.cso.ie/en/media/csoie/releasespublications/documents/agriculture/2010/full2010.pdf [Accessed on 04/12/2020]

Central Statistics Office (2020), Statistics, Agriculture, Census of Agriculture 2010, Agrimap. Available from: http://census.cso.ie/agrimap/ [Accessed on 04/12/2020]

Central Statistics Office (2020), Statistics, Agriculture, Crops and Livestock June Final Results, Table 4. Available from: https://www.cso.ie/en/releasesandpublications/er/clsjf/cropsandlivestocksurveyjunefinal2019/ [Accessed on 04/12/2020]

Central Statistics Office (2020), Statistics, Agriculture, Farm Structure Survey, Tables 20.1 and 4.1. Available from: https://www.cso.ie/en/releasesandpublications/ep/p-fss/farmstructuresurvey2016/ [Accessed on 04/12/2002]

Environmental Protection Agency (August 2017) Guidelines on the Information to be contained in Environmental Impact Assessment Reports. Available from: http://www.epa.ie/pubs/advice/ea/EPA%20EIAR%20Guidelines.pdf

Google Aerial Mapping (2020). Available from: https://www.google.com/maps [Accessed November - December 2020]

Teagasc (2020), Irish Soil Information System. Available from http://gis.teagasc.ie/soils/ [Accessed on 25/12/2020]

Transport Infrastructure Ireland (2019) Project Management Guidelines PE-PMG-02041. Available from: https://www.tiipublications.ie/library/PE-PMG-02041-02.pdf

4.12 Material Assets – Non-Agriculture

4.12.1 Introduction

This section describes the material asset non-agricultural constraints identified within the study area for the Maynooth to Leixlip Project and should be read in conjunction with Material Assets – Non-Agriculture Constraints Figures 4.12.1 to 4.12.24.

Material assets non-agriculture includes amenities, residential properties, commercial properties, industrial properties, utilities and services and waste facilities.

Section 4.12.2 describes the methodologies and sources of information that were used to carry out the constraints study. Section 4.12.3 describes the material assets non-agricultural constraints within the study area. A summary is presented in Section 4.12.4 and references are listed in Section 4.12.5.

4.12.2 Methodology and Sources of Information

The aim of this assessment is to first identify the non-agricultural material assets within the study area and to then assess these assets to distinguish if they are constraints.

The assessment methodology comprises a desktop study, surveys and information gathered through consultation with statutory organisations and service providers. The desktop study consists of an analysis of information contained within land registry records, statutory records, orthophotography and both Kildare County and South Dublin County planning records. The relevant information sources are listed in Table 4.38.

Information Type	Data Sources
Land ownership and land use details	Property Registration Authority (Land Registry)[77] Orthophotography
Locations of properties	Orthophotography
Planning Applications	Kildare County Council Planning database[78] SDCC Planning database[79]
ESB/ESBI	Review of Topographical Survey data
Gas Networks Ireland (Bord Gáis)	Review of Topographical Survey data

[77] Property Registration Authority (2020) Land Registry: Available from https://www.landdirect.ie/ [Accessed 16 March 2021]
[78] Kildare County Council (2020), Map Based Planning Enquiry: Available from: http://webgeo.kildarecoco.ie/ [Accessed 16 March 2021]
[79] SDCC County Council (2020), Map Based Planning Enquiry. Available from: https://sdublincoco.maps.arcgis.com/apps/webappviewer/index.html?id=004b5a1a557a4c1a91b4629923f9d4b7 [Accessed 16 March 2021]

Information Type	Data Sources
Water, Wastewater, Stormwater	Review of Topographical Survey data
Virgin Media	Consultation between the Design Team and Virgin Media representatives
BT Ireland	Consultation between the Design Team and BT Ireland representatives
Eircom/Eir	Review of Topographical Survey data
Vodafone	Consultation between the Design Team and Vodafone representatives
Three	Consultation between the Design Team and Three representatives
E-net	Consultation between the Design Team and E-net representatives

Table 4.38 Material Assets Non-Agriculture Sources of Information

The data sources listed in Table 4.38 were consulted to identify the location of waste-based constraints:

Information Type	Data Sources
Waste Facility Permits and Certificates of Registration issued by local authorities	Local Authority Waste Facility Register[80]
Civic Amenity Sites	Repack Website[81]
Existing waste applications, licences, or environnemental information	EPA Waste Licence Applications[82]
Records of closed landfills	EPA Report- Focus on Landfilling in Ireland[83]
Active and other landfills in the region	East-Midlands Waste Management Plan 2015-2021[84]

Table 4.39 Sources of Waste Facility Information

Existing Environment

The Maynooth to Leixlip Project study area is located within both County Kildare and County Dublin. Lands are therefore zoned under two County Development

[80] Local Authority Waste Facility Register (2020), National Waste Collection Permit Office. Available from: http://facilityregister.nwcpo.ie/ [Accessed 16 March 2021]
[81] Repak (2020) Recycling Register. Available from: https://repak.ie/ [Accessed August 2020]
[82] Environmental Protection Agency (2020) Licensing and Permitting, Waste Licence Search. Available from: http://www.epa.ie/terminalfour/waste/ [Accessed 16 March 2021]
[83] Environmental Protection Agency (2010) EPA Report – Focus on Landfilling in Ireland. Available from: http://www.epa.ie/pubs/reports/waste/stats/EPA_Focus_on_Landfilling_Ireland.pdf [Accessed 16 March 2021]
[84] Eastern-midlands Region Waste Management Plan 2015 – 2021. Available from: http://emwr.ie/emwr-plan/ [Accessed 16 March 2021]

Plans. Maynooth[85], Leixlip[86] and Celbridge[87] Local Area Plans (LAPs) were also reviewed.

Zoned lands may act as constraints to the Maynooth to Leixlip Project as they are identified as lands being made available for a particular type of development. The zoned lands are identified in the following plans:

- Kildare County Development Plan 2014-2020[88]; and
- South Dublin County Development Plan 2015-2021 [89].

The aim of the Development Plans is to establish a framework for the planned, co-ordinated, and sustainable development of areas. Their objective is to enhance and facilitate the balancing of economic, social, and environmental infrastructure to maintain and develop a high quality of life without compromising the protection of the environment and the needs of future generations.

The following zones were identified in the development plans and LAPs:

- Enterprise and Employment;
- Primarily Residential;
- Residential Reserve/Support;
- Mixed Use;
- General Development;
- Social and Community;
- Open Space and Amenity; and
- Tourism Related Development.

4.12.2.1 Amenities (Open Spaces, Recreation and Tourism and Leisure Related)

Maynooth LAP

Maynooth has a good provision of civic and public open spaces including Courthouse Square, Carton Avenue, and the public park adjacent to the canal.

[85] http://kildare.ie/CountyCouncil/AllServices/Planning/LocalAreaPlans/LocalAreaPlans/MaynoothLAP2013-2019incorporatingAmendmentNo1/ [Accessed 16 March 2021]
[86] http://kildare.ie/CountyCouncil/AllServices/Planning/LocalAreaPlans/LocalAreaPlans/LeixlipLocalAreaPlan2020-2023/Final%20Leixlip%20LAP%2020202023%20for%20Web.pdf [Accessed 16 March 2021]
[87] http://kildare.ie/CountyCouncil/AllServices/Planning/LocalAreaPlans/LocalAreaPlans/CelbridgeLocalAreaPlan2017-2023/A%20Final%20Written%20Statement%20%20May%202018.pdf [Accessed 16 March 2021]
[88] Kildare County Council (2017) Kildare County Development Plan 2017-2023. Available from: http://kildare.ie/countycouncil/YourCouncil/Publications/Planning/developmentplans/KildareCountyDevelopmentPlan2017-2023/ [Accessed July 2020]
[89] South Dublin County Council (2016) South Dublin County Development Plan 2016-2022. Available from: https://sdcc.ie/en/services/planning/development-plan/plan-2016-2022/plan-2016-2022.html [Accessed July 2020]

Recreational areas include GAA pitches on the Moyglare road and soccer pitches close to Carton Avenue and Rathcoffey Road. The Royal Canal towpath and Carton Avenue are also seen as examples of quality passive recreational areas. However, the majority of these amenities are not within the study area.

Celbridge LAP

Celbridge has a significant amount of open spaces although some areas are limited. Parklands at Castletown and Donaghcumper dominate the eastern edge of the town. In addition to the demesnes, the River Liffey provides significant opportunity for open space that can connect into the regional network although the river is nearly impossible to access at most points in Celbridge other than a few overgrown areas. However, the majority of these amenities are not within the study area.

Leixlip LAP

There are currently 154Ha of land zoned as "Open Space & Amenity" within the Leixlip LAP. These lands are primarily for recreational and amenity purposes and represents 11% of the total Leixlip area. Wonderful Barn and St. Catherine's Park comprise circa 34% of the total amenity open space provision in this area. In addition, there are seven local parks, six green corridors, five sport areas and one playground with the remaining space comprising of green spaces. However, the majority of these amenities are not within the study area.

4.12.2.2 Residential Properties

The Kildare County Development Plan states that the population projection for Kildare to the end of the Plan period is 238,993, giving rise to the need for 6,235 additional residential units by 2023.

The Kildare County Development Plan classes Maynooth as a key town while Leixlip is classed as a self-sustaining growth town and Celbridge is classed as a self-sustaining town. All three towns are expected to see a population growth of over 1,500 with a dwellings target in excess of 600 units for each of the three towns.

Maynooth LAP

The housing stock in Maynooth has increased considerably from 3,289 households in 1996 to 5,171 in 2016. The type of housing shifted from the traditional family detached and semi-detached houses of the 1970's to apartment developments in the 2000's. Recently, however, the apartment type housing has changed back to a more traditional family type household. Maynooth also has a large student population with a significant proportion of the residential properties being rental properties and with approximately 50% of Maynooth University's 8,400 students residing in Maynooth.

Celbridge LAP

The Celbridge LAP identified 121Ha of land with a residential or mixed-use zoning which equates to an approximate 3,519 household units. Residential development in Celbridge predominantly comprises medium density detached or semi-detached houses. Census 2016 indicates that houses represent 89% of the housing stock,

while apartments represent 10%. Numerous new residential developments are identified in Ballyoulster, Oldtown, Crodaun and Simmonstown.

Leixlip LAP

Given the proximity and connectivity of Leixlip to Dublin and being a key employment centre in the Greater Dublin Area (GDA), it is anticipated that there will continue to be a strong demand for a varied mix and type of housing in the Plan area. There is a high proportion of three-bed semi-detached type dwellings within the town. The LAP seeks to address this mono type of housing and will seek to ensure a greater mix of housing. Residential schemes should provide for both a mix of dwelling size and dwelling type to cater for a diverse range of housing needs.

4.12.2.3 Industrial and Commercial Properties

Within the study area there are a number of business parks including the M4 Business Park, the Maynooth Business Campus, and the Liffey Business Campus (former HP site).

Collinstown, a 59ha site situated in close proximity to the Intel Ireland Campus in Leixlip, is to be promoted as a future Business Campus as per the Leixlip LAP and although not directly within the study area of this project it is still of worthy note. The Celbridge LAP also identifies lands for industrial and warehousing development on the Maynooth Road.

The industrial heritage of Celbridge includes the Celbridge Mill complex on Main Street and the Temple Mills further west along the River Liffey.

4.12.2.4 Proposed Developments (Non-Agricultural)

Proposed developments are detailed in Section 4.9 Planning.

4.12.2.5 Utilities and Services

Irish Water (Water Supply and Foul Sewer Infrastructure)

Topographical survey information was reviewed to determine the water supply and foul sewer infrastructure within the study area as shown in Figures 4.12.1 to 4.12.6. Storm watermains are located in much of the existing M4/N4 mainline, from Maynooth to Leixlip.

Numerous watermains are evident throughout the study area running adjacent to the M4 mainline and throughout localised residential developments. Watermains cross the M4 at various locations, usually utilising an existing overbridge although also traversing under the M4 mainline at times. There is a reservoir located east of Junction 7 Maynooth with various watermain inlets and outlets.

Leixlip Hydro Station and Leixlip Drinking Water Treatment Plant are situated west of Junction 5 Leixlip.

The public foul wastewater network is primarily located within residential and industrial developed areas of the study area. Gravity fed foul wastewater network

mainline crossings are evident at Junction 7 Maynooth, the R404 and west of the River Liffey Bridge. There is a combined sewer crossing at Junction 5 Leixlip.

ESB Electricity Supply

Topographical survey information was reviewed to determine the ESB infrastructure within the study area as shown in Figures 4.12.1 to 4.12.6.

There is one overhead HV ESB lines within the study area. This is located east of Junction 7 Maynooth. Underground HV lines are located adjacent to the Ballygoran Road and end at a sub-station also located on the Ballygoran Road.

There is a LV/ MV overhead crossing located between Junction 6 Celbridge and Junction 5 Leixlip.

Eirgrid

Eirgrid is responsible for the development, management, and operation of the electricity transmission grid in Ireland. Eirgrid was contacted in relation to the location of works on existing or proposed infrastructure which may form a constraint on the Maynooth to Leixlip Project. The locations of high voltage transmission lines within the study area are shown in Figures 4.12.1 to 4.12.6.

Gas Networks Ireland

Topographical survey information was reviewed to determine gas infrastructure within the study area as shown in Figures 4.12.1 to 4.12.6.

Decommissioned gas infrastructure was evident west of Junction 6 Celbridge. Low pressure gas infrastructure was evident east of Junction 6 Celbridge. Medium pressure gas infrastructure was evident throughout the study area with an underground M4 mainline crossing east of the R405 Ballygoran Road Overbridge and a M4 mainline crossing on the R404 Celbridge Road Overbridge.

EIR

Topographical survey information was reviewed to determine the EIR telecommunications infrastructure within the study area as shown in Figures 4.12.1 to 4.12.6.

Numerous EIR infrastructure is evident within the study area with at-grade crossings at Junction 7 Maynooth and Junction 5 Leixlip. M4 mainline crossings are also evident at the M4 Business Park, the R404 Celbridge Road Overbridge and east of Junction 5.

BT

Topographical survey information was reviewed to determine BT telecommunications infrastructure within the study area as shown in Figures 4.12.1 to 4.12.6.

There is a small quantity of BT infrastructure located at Junction 6 Celbridge and adjacent to Barnhall Road. Further BT infrastructure crosses the M4 mainline on the R404 Celbridge Road Overbridge.

UPC

Topographical survey information was reviewed to determine UPC infrastructure within the study area.

UPC infrastructure was evident throughout the study area with M4 mainline crossings located at Junction 6 Celbridge, the R405 Ballygoran Road Overbridge, the R404 Celbridge Road Overbridge, Junction 5 Leixlip and east of Junction 5 Leixlip.

Vodafone

No response received.

Three

No response received.

ComReg

The Commission for Communications Regulation (ComReg) is the statutory body responsible for the regulation of the electronic communications sector (telecommunications, radio-communications, and broadcasting transmission) and the postal sector. They are the national regulatory authority for these sectors in accordance with EU law which is subsequently transposed into Irish legislation.

Antenna information can be viewed through the ComReg website[90].

The following antennae were observed within the study area as shown in Table 4.40.

Site ID	Location	Operator	Services
1295	Adjacent to R835	Meteor	GSM, LTE, UMTS
DN366	Adjacent to R835	Vodafone	GSM, LTE, UMTS
Three_DU0201	Adjacent to R835	Three	GSM, LTE, UMTS
3523	Leixlip WTP	Meteor	GSM, LTE, UMTS
DN882	Leixlip WTP	Vodafone	GSM, LTE, UMTS
Three_DU1222	Leixlip WTP	Three	GSM, LTE, UMTS
1812	Ballygoran Road	Meteor	GSM, LTE, UMTS
KE014	Ballygoran Road	Imagine	LTE
Three_KD0176	Ballygoran Road	Three	GSM, LTE, UMTS
Three_KD0204	Meadowbrook Road	Three	UMTS
3385	Meadowbrook Road	Meteor	UTMS
KE105	Newtown Road	Vodafone	GSM, LTE, UMTS
Three_KD0215	Newtown Road	Three	GSM, LTE

[90] https://siteviewer.comreg.ie/#site/DN882/53.3584811519/-6.4859721855/1/Site%20DN882

Site ID	Location	Operator	Services
1813	Newtown Road	Meteor	GSM, UMTS

Table 4.40 ComReg Antenna Locations within the Study Area

Virgin Media

No response received.

Aurora (Telecom)

The Aurora Telecom Network Maps[91] were consulted and there is no network located within the study area.

Enet

No response received.

Colt (Telecom)

The Colt online Fibre Availability Checker[92] was consulted and there is no network located within the study area.

SIRO (Telecom)

The SIRO Roll-Out Map[93] was consulted and SIRO do not have any existing infrastructure within the study area.

4.12.2.6 Waste Facilities

Licenced Facilities

The Environmental Protection Agency (EPA) provides licensing for certain activities in the waste sector. These include landfills, transfer stations, hazardous waste disposal and other significant waste disposal and recovery activities. A waste licence is a single integrated licence dealing with emissions to all environmental media and the environmental management of the facility.

4.12.2.7 Closed/ Historical Landfills

The EPA is obliged to process applications from local authorities in relation to "closed landfills" in accordance with the Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations, 2008.

"Closed landfills" are also commonly referred to as historic landfills.

[91] Aurora (2020) Network Maps. Available from: https://www.auroratelecom.ie/network-maps/ [Accessed: August 2020]
[92] Colt (2020) Fibre Availability Checker. Available from: https://www.colt.net/colt-network-map/ [Accessed: March 2021]
[93] SIRO (2020) SIRO Roll-Out Map. Available from https://siro.ie/roll-out/#Kildare [Accessed: March 2021]

A search of the list of Historic Landfill-Certificates of Authorisation[94] available on the EPA website showed one Historic Landfills in South Dublin and four in Kildare although none of these are within the study area.

4.12.2.8 Waste Facility Permits/ Certificate of Registration

The Waste Facility Permit and the Certificate of Registration Database is a register for waste facility permits and certificates of registration issued by local authorities under the Waste Management (Facility Permit and Registration) Regulations, S.I. No. 821 of 2007, as amended.

A search of the Local Authority Waste Facility Register[80] returned 36 Permits and Certificates of Registration for Kildare and 45 for South Dublin County Council. None of the Permits or Certificates of Registration identified are located within the study area.

4.12.2.9 Civic Amenity Sites

A civic amenity site was previously proposed for North Celbridge[95].

The area of land is within the study area, situated between the R449 and M4 mainline south of Junction 6 Celbridge. However, this proposal was not taken through the formal planning application process.

4.12.2.10 Recycling

The Repak Recycling Register[81] was examined and although there are a number of Bring Banks located at various stores and carparks within the study area, there are no recycling facilities present which would act as a constraint to the Maynooth to Leixlip Project.

4.12.2.11 Pits, Mines and Quarries

The presence of historic and active pits, quarries and mines are discussed in Section 4.5.3.11 Land and Soils.

4.12.3 Summary and Conclusions

In summary, there are many constraints relating to non-agricultural material assets present within the study area. The most significant of these include:

- Tourism and recreational attractions;
- Amenities associated with the River Liffey;
- Residential, Industrial, Business and Commercial Properties; and

[94] Environmental Protection Agency (2020) Historic Landfill-Certificate of Authorisation. Available at: http://www.epa.ie/terminalfour/HLF/HLF-search.jsp?status=Applied&Submit=Search+by+Status [Accessed: August 2020]
[95] http://kildare.ie/CountyCouncil/AllServices/Planning/Part8Schemes/Environment/CelbridgeCivicAmenitySitePublicConsultationPart8/ [Accessed March 2021]

- Existing M4/N4.

4.12.4 References

Aurora (2020) Network Maps. Available from: https://www.auroratelecom.ie/network-maps/ [Accessed: March 2021]

Colt (2020) Fibre Availability Checker. Available from: https://www.colt.net/colt-network-map/ [Accessed: March 2021]

ComReg (2021). Available at https://siteviewer.comreg.ie/#explore [Accessed: March 2021]

Environmental Protection Agency (2010) EPA Report – Focus on Landfilling in Ireland. Available from: http://www.epa.ie/pubs/reports/waste/stats/EPA_Focus_on_Landfilling_Ireland.pdf [Accessed: March 2021]

Environmental Protection Agency (2020) Licensing and Permitting, Waste Licence Search. Available from: http://www.epa.ie/terminalfour/waste/ [Accessed: March 2021]

Environmental Protection Agency (2020) Historic Landfill-Certificate of Authorisation. Available at: http://www.epa.ie/terminalfour/HLF/HLF-search.jsp?status=Applied&Submit=Search+by+Status [Accessed: March 2021]

Geological Survey Ireland (2020) Spatial Resources, Available from: https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228 [Accessed: March 2021]

Google Maps (2020). Available from: https://www.google.ie/maps [Accessed: March 2021]

Kildare County Council (2017) Kildare County Development Plan 2017-2023. Available from http://kildare.ie/CountyCouncil/YourCouncil/Publications/Planning/DevelopmentPlans/KildareCountyDevelopmentPlan2017-2023/Final%20Written%20Statement%20of%20Variation%20No.%201.pdf [Accessed: March 2021]

Kildare County Council (2020) Leixlip Local Area Plan 2020-2023. Available at http://kildare.ie/CountyCouncil/AllServices/Planning/LocalAreaPlans/LocalAreaPlans/LeixlipLocalAreaPlan2020-2023/Final%20Leixlip%20LAP%2020202023%20for%20Web.pdf [Accessed: March 2021]

Kildare County Council (2017) Celbridge Local Area Plan 2017-2023. Available at

http://kildare.ie/CountyCouncil/AllServices/Planning/LocalAreaPlans/LocalAreaPlans/CelbridgeLocalAreaPlan2017-2023/A%20Final%20Written%20Statement%20%20May%202018.pdf [Accessed: March 2021]

Kildare County Council (2013) Maynooth Local Area Plan 2013-2019. Available at http://kildare.ie/CountyCouncil/AllServices/Planning/LocalAreaPlans/LocalAreaPlans/MaynoothLAP2013-2019incorporatingAmendmentNo1/ [Accessed: March 2021)

Local Authority Waste Facility Register (2020), National Waste Collection Permit Office. Available from: http://facilityregister.nwcpo.ie/ [Accessed: July 2020]

Property Registration Authority (2020) Land Registry: Available from https://www.landdirect.ie/ [Accessed: March 2021]

Repak (2020) Recycling Register. Available from: https://repak.ie/ [Accessed March 2021]

South Dublin County Council (2016) South County Dublin Development Plan 2016-2022. Available from https://www.southdublindevplan.ie/sites/default/files/documents/CDP%202016-2022%20%28lower%20res%29_0.pdf [Accessed: March 2021]

South Dublin County Council (2020) Civic Amenity Sites (Recycling Centres)-Information. Available from: http://kildare.ie/CountyCouncil/AllServices/Environment/Waste/Recycle/Recyclingcentres/ [Accessed: March 2021]

4.13 Air Quality

4.13.1 Introduction

This section describes the air quality constraints identified within the study area for the Maynooth to Leixlip Project and should be read in conjunction with Figures 4.15.1 to 4.15.12.

The study area consists of a mixture of urban and suburban areas. A number of areas such as Maynooth and Leixlip include high density urban residential zones. The main constraints associated with air quality are the numbers of sensitive locations in the study area and the assimilative capacity of the baseline air quality relative to limit values. The figures include sensitive receptor locations, including Designated Sites.

Section 4.13.2 describes the methodologies and sources of information that were used to carry out this constraints study. Section 4.13.3 describes the air quality constraints and the ambient air quality within the study area for the constraints study. A summary is presented in Section 4.13.4 and references are listed in Section 4.13.5.

4.13.2 Methodology and Sources of Information

4.13.2.1 Methodology

The air quality constraints study has been prepared in accordance with the Transport Infrastructure Ireland (TII), formerly, the National Roads Authority, Guidelines[96].

Section 2.3, *Route Selection Process Stage 1 Preliminary Options Assessment,* of the above document[96] includes the initial steps to be taken to identify air quality constraints within a study area. These are, in part, as follows:

"The initial step (Stage 1, i.e., Preliminary Options Assessment) in the Route Selection Process is to identify the nature and extent of significant constraints within a defined Study Area.

These constraints should be documented and mapped so that feasible route options can be designed to avoid such constraints, where possible.

The first part of this data collection should be based on deskbound research studies. All known physical constraints from an air quality perspective should be identified and recorded on suitably scaled maps.

….to characterise the existing ambient air quality in the study area and to initially identify all sensitive receptor locations within the study area likely to be impacted by a proposed scheme before feasible route options are identified…"

[96] TII (2011) Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes. Available from https://www.tii.ie/technical-services/environment/planning/Guidelines-for-the-Treatment-of-Air-Quality-during-the-Planning-and-Construction-of-National-Road-Schemes.pdf [Accessed 17 April 2019].

The above approach has been followed for this constraints study.

In addition, Section 2.3 of the TII document[96] also describes the air quality input required for the Stage 1 Preliminary Options Assessment. This states, in part, the following:

"Describe existing local air quality conditions within the study corridor in relation to nitrogen dioxide (NO_2) and PM_{10}.This should take full account of any existing monitoring data from networks established by the Environmental Protection Agency (EPA) and local authorities and monitoring carried out by other organisations, as relevant. It should also identify any areas where the standards are exceeded;

Describe any non-road sources that may significantly affect air quality within the study corridor, for example, industry, ports, areas of domestic solid fuel combustion, or powerstations;

Take full account of all previous studies, local air quality assessments or reports, and any other air quality work undertaken by the NRA, EPA or local authorities, and

Include a review of planning permissions granted within the Study Area of relevance from an air quality perspective (e.g. significant sensitive receptors and developments likely to have a significant impact on air quality)".

Sensitive receptor locations are defined in the Guidelines[96] as residential housing, schools, hospitals, places of worship, sports centres and shopping areas, i.e. locations where members of the public are likely to be regularly present.

Designated habitats are also potentially sensitive receptors. Such sites include Natural Heritage Areas (NHA), Special Areas of Conservation (SAC), Special Protection Areas (SPA), National Parks, Nature Reserves, Refuges for Fauna, Refuges for Flora, Wildfowl Sanctuaries, Ramsar Sites, Biogenetic Reserves and UNESCO Biosphere Reserves.

These receptors are detailed in Section 4.13.3.6. All ecologically sensitive sites identified in the study area will be considered in terms of nitrogen oxide concentrations at the options selection phase.

4.13.2.2 Air Quality Standards

National and European statutory bodies have set limit values in ambient air for a range of air pollutants in order to reduce the risk of poor air quality. These limit values are set for the protection of human health and ecosystems.

On the 12th of April 2011, the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011) came into force and transposed Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe into Irish law.

The purpose of the Air Quality Standards Regulations 2011 is to:

- Establish limit values and alert thresholds for concentrations of certain pollutants;

- Provide for the assessment of certain pollutants using methods and criteria common to member states;
- Ensure that adequate information on certain pollutant concentrations is obtained and made publicly available; and
- Provide for the maintenance and improvement of ambient air quality where necessary.

The limit values established under these regulations are included in Table 4.41 which presents the United Nations Economic Commission for Europe (UNECE, 2003) Critical Loads for Nitrogen as presented in the Guidelines[96].

Pollutant	Limit Value for the protection of:	Averaging Period	Limit Value ($\mu g/m^3$)	Basis of application of Limit Value
Nitrogen Dioxide (NO_2)	Human Health	1-hour	200	≤18 exceedances p.a. (99.79 %ile)
		Calendar year	40	Annual mean
Nitrogen Oxides (NO_x)	Vegetation	Calendar year	30	Annual mean
Particulate Matter (PM_{10})	Human Health	24-hours	50	≤35 exceedances p.a. (98.1%ile)
		Calendar year	40	Annual mean
Particulate Matter ($PM_{2.5}$)	Human Health	Calendar year	20	Annual mean
Carbon Monoxide (CO)	Human Health	8-hour Annual Average	10,000	8-hour Average
Benzene	Human Health	Calendar year	5	Annual mean

Table 4.41 Air Quality Standards (AQS) from Regulations 2011 (S.I No. 180 of 2011)

Ecosystem Type	Kg(N)/ha/yr	Reliability and indication of exceedance effects (see reliability key at end of table)
Forest habitats		
Temperate and boreal	10-20	# Changes in soil processes, ground vegetation, mychorrhiza, increased risk of nutrient imbalances and susceptibility to parasites
Heathland, scrub and tundra habitats		
Tundra	5-10[a]	# Changes in biomass, physiological effects, changes in species composition in moss layer, decrease in lichens
Arctic, alpine and subalpine scrub habitats	5-15[a]	(#) Decline in lichens, mosses and evergreen shrubs

Ecosystem Type	Kg(N)/ha/yr	Reliability and indication of exceedance effects (see reliability key at end of table)
Northern wet heath • 'U' Calluna dominated wet heath (upland moorland) • 'L' Erica tetralix dominated wet heath	10-20 10-25[a,b]	(#) Decreased heather dominance, decline in lichens and mosses (#) Transition heather to grass
Dry heaths	10-20[a,b]	## Transition heather to grass, decline in lichens
Grassland and tall forb habitats		
Sub-Atlantic semi-dry calcareous grassland	15-25	## Increase tall grasses, decline in diversity, increased mineralization, N leaching
Non-Mediterranean dry acid and neutral closed grassland	10-20	# Increase in graminoids, decline typical species
Inland dune pioneer grasslands	10-20	(#) Decrease in lichens, increase biomass
Inland dune siliceous grasslands	20-30	(#) Increase in tall grasses, decrease in diversity
Mountain hay meadows	10-20	(#) Increase in nitrophilous graminoids, changes in diversity
Moist and wet oligotrophic grasslands • *Molinia caerulea* meadows • Heath (*Juncus*) meadows and humic (*Nardus stricta*) swards	15-25 10-20	(#) Increase in tall graminoids, decreased diversity, decrease of bryophyte # Increase in tall graminoids, decreased diversity, decrease of bryophytes
Alpine and subalpine grasslands	10-15	(#) Increase in nitrophilous graminoids, biodiversity change
Moss and lichen dominated mountain summits	5-10	# Effects upon bryophytes or lichens
Mire, bog and fen habitats		
Raised and blanket bogs	5-10[a,c]	## Change in species composition, N saturation of Sphagnum
Poor fens	10-20	# Increase sedges and vascular plants, negative effects on peat mosses
Rich fens	15-35	(#) Increase tall graminoids, decrease diversity, decrease of characteristic mosses
Mountain rich fens	15-25	(#) Increase vascular plants, decrease bryophytes
Inland and surface water habitats		
Permanent oligotrophic waters • Softwater lakes • Dune slack pools	 5-10 10-20	## Isoetid species negatively affected (#) Increased biomass and rate of succession

Ecosystem Type	Kg(N)/ha/yr	Reliability and indication of exceedance effects (see reliability key at end of table)
Coastal habitat		
Shifting coastal dunes	10-20	(#) Biomass increase, increase N leaching
Coastal stable dune grassland	10-20	# Increase tall grasses, decrease prostrate plants, increased N leaching
Coastal dune heaths	10-20	(#) Increased plant production, increase N leaching, accelerated succession
Moist to wet dune slacks	10-25	(#) Increased biomass, tall graminoids
Marine habitats		
Pioneer and low-mid salt marshes	30-40	(#) Increased late-successional species, increase productivity

Table 4.42 UNECE Critical Loads for Nitrogen

Reliability key: ## reliable, # quite reliable, (#) expert judgement

[a] Use towards high end of range at phosphorus limitation, and towards lower end if phosphorus is not limiting

[b] Use towards high end of range when sod cutting has been practiced, use towards lower end of range with low intensity management

[c] Use towards high end of range with high precipitation and towards low end of range with low precipitation

4.13.2.3 Sources of Information

The existing constraints have been determined through the review of published data from the EPA[97,98]. The EPA collates all air quality monitoring data carried out by the EPA and local authorities.

4.13.3 Existing Environment

This section describes the existing local air quality conditions within the study area. Any non-road sources that may significantly affect air quality within the study area are also described. Finally, sensitive receptor locations within the study area are described.

4.13.3.1 Existing Local Air Quality Conditions within the Study Area

The existing air quality is determined from air quality data recorded by the EPA. The EPA divides Ireland into four zones, with air quality data recorded for each zone.

[97] EPA, Air Quality Reports. Available from: http://www.epa.ie/pubs/reports/air/quality/ [Accessed 15 October 2020]
[98] EPA, EPA Maps. Available at:https://gis.epa.ie/EPA Maps [Accessed 15 April 2019]

- Zone A includes Dublin City and its environs;
- Zone B includes Cork City and its environs;
- Zone C is defined by the EPA as 21 large towns in Ireland with a population greater than 15,000; and
- Zone D includes Rural Ireland, i.e. the remainder of the State excluding Zones A, B and C.

Pollutants that are of concern have been identified and quantified in Table 4.43 to Table 4.45 The data for the Zone A, C and D sites in the EPA Reports have been averaged to represent the Annual Average for the zones. They are NO_2, NO_x, CO, PM and benzene. Table 4.43 presents the baseline data for the most recent available years, 2019, 2018, and 2017 for each of these pollutants, based on EPA monitoring data[99,100,101].

As the study area covers Zone A, Zone C and Zone D, background data for all three zones have been presented. Baseline values are compared to the limit values from the Air Quality Standards.

4.13.3.2 Zone A

Zone	Year	Pollutants	Time Period	Measurements µg/m^3	Air Quality Standard Limit µg/m^3	% of Air Quality Standard Limit
Zone A	2019	NO_2	Annual Average	25.9	40	64.8
		NO_x	Annual Average	51.5	30	171.7
		CO	8-hour Annual Average	300	10,000	3.0
		$PM_{2.5}$	Annual Average	9.3	25	37.0
		PM_{10}	Annual Average	14.1	40	35.3
		Benzene	Annual Average	0.1	5	2.0
	2018	NO_2	Annual Average	21.3	40	53.3
		NO_x	Annual Average	34.7	30	115.7
		CO	8-hour Annual Average	200	10,000	2.0
		$PM_{2.5}$	Annual Average	7.5	25	30.0
		PM_{10}	Annual Average	14.2	40	35.5
		Benzene	Annual Average	0.3	5	6.0

[99] Air Quality in Ireland 2019, EPA, 2020. Available from: https://www.epa.ie/pubs/reports/air/quality/epaairqualityreport2019.html [Accessed 15 October 2020]
[100] Air Quality in Ireland 2018, EPA, 2019. Available from: https://www.epa.ie/pubs/reports/air/quality/epaairqualityreport2018.html [Accessed 15 April 2019]
[101] Air Quality in Ireland 2017, EPA, 2018. Available from: https://www.epa.ie/pubs/reports/air/quality/epaairqualityreport2017.html [Accessed 15 April 2019]

Zone	Year	Pollutants	Time Period	Measurements µg/m³	Air Quality Standard Limit µg/m³	% of Air Quality Standard Limit
	2017	NO_2	Annual Average	19.7	40	49.3
		NO_x	Annual Average	31.5	30	105.0
		CO	8-hour Annual Average	140	10,000	1.4
		$PM_{2.5}$	Annual Average	7.5	25	30.0
		PM_{10}	Annual Average	12.3	40	30.8
		Benzene	Annual Average	0.9	5	18.0

Table 4.43 Baseline Concentrations of Pollutants – Zone A

4.13.3.3 Zone C

Zone	Year	Pollutants	Time Period	Measurements µg/m³	Air Quality Standard Limit µg/m³	% of Air Quality Standard Limit
Zone C	2019	NO_2	Annual Average	9.3	40	23.3
		NO_x	Annual Average	13.9	30	46.3
		CO	8-hour Annual Average	100	10,000	1.0
		$PM_{2.5}$	Annual Average	9.5	25	38.0
		PM_{10}	Annual Average	14.8	40	37.0
		Benzene	Annual Average	0.1	5	2.0
	2018	NO_2	Annual Average	8.5	40	21.3
		NO_x	Annual Average	11.5	30	38.3
		CO	8-hour Annual Average	200	10,000	2.0
		$PM_{2.5}$	Annual Average	-	25	-
		PM_{10}	Annual Average	11.0	40	27.5
		Benzene	Annual Average	-	5	-
	2017	NO_2	Annual Average	8.0	40	20.0

Zone	Year	Pollutants	Time Period	Measurements µg/m³	Air Quality Standard Limit µg/m³	% of Air Quality Standard Limit
		NO_x	Annual Average	11.8	30	39.3
		CO	8-hour Annual Average	150.0	10,000	1.5
		$PM_{2.5}$	Annual Average	10.6	25	42.4
		PM_{10}	Annual Average	15.8	40	39.5
		Benzene	Annual Average	0.2	5	3.6

Table 4.44 Baseline Concentrations of Pollutants – Zone C

4.13.3.4 Zone D

Zone	Year	Pollutants	Time Period	Measurements µg/m³	Air Quality Standard Limit µg/m³	% of Air Quality Standard Limit
Zone D	2019	NO_2	Annual Average	5.7	40	14.3
		NO_x	Annual Average	7.8	30	26.0
		CO	8-hour Annual Average	-	10,000	-
		$PM_{2.5}$	Annual Average	10.3	25	41.2
		PM_{10}	Annual Average	12.8	40	32.0
		Benzene	Annual Average	0.1	5	2.0
	2018	NO_2	Annual Average	4.7	40	11.7
		NO_x	Annual Average	6.7	30	26.7
		CO	8-hour Annual Average	500	10,000	5.0
		$PM_{2.5}$	Annual Average	7.5	25	30.0
		PM_{10}	Annual Average	11.0	40	27.5
		Benzene	Annual Average	-	5	-
	2017	NO_2	Annual Average	4.4	40	10.9
		NO_x	Annual Average	5.7	30	19.0
		CO	8-hour Annual Average	-	10,000	6.2
		$PM_{2.5}$	Annual Average	7.4	25	29.6
		PM_{10}	Annual Average	9.9	40	24.8
		Benzene	Annual Average	-	5	-

Table 4.45 Baseline concentrations of pollutants – Zone D

4.13.3.5 Average Background Data

The average background concentrations for each pollutant of concern during 2017-2019 is outlined in Table 4.46. These averaged values will be used as the baseline for the air quality assessment undertaken. This approach is in accordance with EPA guidance[102] which states that air monitoring data should be averaged over the most recent two to three years available.

Zone	Pollutant	Average background concentration (µg/m^3) 2017-2019	Air Quality Standard Limit (µg/m^3)	% of Air Quality Standard Limit
Zone A	NO_2	22.3	40	55.8%
	PM_{10}	13.5	40	33.8%
	$PM_{2.5}$	8.1	25	32.4%
	NO_x	39.2	30	130.7%
	CO	213.3	10,000	2.1%
	Benzene	0.4	5	8.0%
Zone C	NO_2	8.6	40	21.5%
	PM_{10}	13.9	40	34.8%
	$PM_{2.5}$	10.1	25	40.4%
	NO_x	12.4	30	41.3%
	CO	150	10,000	1.5%
	Benzene	0.15	5	3.0%
Zone D	NO_2	4.9	40	12.3%
	PM_{10}	11.2	40	28.0%
	$PM_{2.5}$	8.4	25	33.6%
	NO_x	6.7	30	22.3%
	CO	500	10,000	5.0%
	Benzene	0.1	5	2.0%

Table 4.46 Averaged Pollutant Background Concentrations 2017-2019

For Zone A, the greatest levels of baseline concentrations relative to the Air Quality Standards (AQS) are for Nitrogen Oxide (NO_x) 131%, Nitrogen Dioxide (NO_2) 55%, Particulate Matter (PM_{10}) 34% and Particulate Matter ($PM_{2.5}$) 32%. Background levels for Benzene are 8% of the AQS, and levels for Carbon Monoxide are 2%.

For Zone C, the greatest levels of baseline concentrations relative to the Air Quality Standards (AQS) are for Nitrogen Oxide (NO_x) 41%, Nitrogen Dioxide (NO_2) 22%, Particulate Matter (PM_{10}) 35% and Particulate Matter ($PM_{2.5}$) 40%. Background levels for Benzene are 3% of the AQS, and levels for Carbon Monoxide are 2%.

[102] EPA Air Dispersion Modelling Guidance Note (AG4), 2020

For Zone D, the greatest levels of baseline concentrations relative to the Air Quality Standards (AQS) are for Nitrogen Oxide (NO_x) 22%, Nitrogen Dioxide (NO_2) 12%, Particulate Matter (PM_{10}) 28% and Particulate Matter ($PM_{2.5}$) 34%. Background levels for Carbon Monoxide are 5% and Benzene background levels are 2%.

These constraints will be the key focus during the air quality assessment.

The majority of the measured pollutant concentrations are within air quality standards with the exception of NO_x in Zone A.

4.13.3.6 Ecological Sensitive Areas

Nitrogen emissions will be of critical importance to ecologically sensitive areas due to their harmful effect on vegetation. The following designated sites have been identified within the study area:

- Rye Water Valley/Carton SAC;
- Royal Canal pNHA;
- Rye Water Valley/Carton pNHA; and
- Liffey Valley pNHA.

Refer to Section 4.4 Biodiversity for further details.

4.13.3.7 Road Emissions within the Study Area

The emissions to air from existing vehicles and road networks are assumed to form part of the baseline concentration levels as presented in Table 4.46.

The M4/N4 is the major road network in the study area. Annual average daily traffic (AADT) levels have been provided where obtained from the TII 'Traffic Counter Data Website'[103] as presented in Table 4.47. Data from 2019 was also included as the traffic data from 2020 may not be wholly representative of the typical traffic flows at this location due to the Covid-19 pandemic.

Road	Location	AADT		Coverage	
		2019	2020	2019	2020
M4	Between Junction 6 Celbridge and Junction 7 Maynooth, Maynooth, Co. Kildare	59,350	42,333	88.9%	100%

Table 4.47 M4 AADT within Study Area

The data presented in the table above shows the current major volumes of traffic within the study area. The emissions to air from existing vehicles are assumed to form part of the baseline concentration levels as presented in Table 4.43 to Table 4.45.

[103] Transport infrastructure Ireland (TII), Traffic Counter Data Website. Available at https://www.nratrafficdata.ie/c2/gmapbasic.asp?sgid=ZvyVmXU8jBt9PJE$c7UXt6

4.13.3.8 Non-road Air Quality Sources in the Study Area

There are no industrial facilities licenced by the EPA[104] (within the study area, with Industrial Emissions Directive (IED) or Integrated Pollution Control (IPC) licences in place.

The effect of the emission sources presented in Table 4.47 are likely to be reflected in the baseline air monitoring data presented in Table 4.43 to Table 4.45 No significant additional new sources have been determined through a review of planning permissions and draft EPA licences in the study area.

Refer to Figures 4.15.1 to 4.15.12 for sensitive receptor locations and Designated sites. These sites are discussed in detail in Section 4.4 Biodiversity.

4.13.4 Summary and Conclusions

The air quality concentrations recorded by the EPA are shown to be within the Air Quality Standards with the exception of NO_x in Zone A.

The assimilative capacity of the air is described as the ability for pollutants to be absorbed by an environment (air) without detrimental effects to the environment. In relation to the assimilative capacity of the air within the study area, for Zone C and Zone D it is considered high while for Zone A it is considered low. The main constraint associated with air quality is the statutory requirement to continue to comply with Air Quality Standards for the protection of human health and vegetation.

There are no industrial facilities located within the study area. However, any emissions from facilities within the wider vicinity of the study area, are assumed to be represented in the baseline environment.

4.13.5 References

Environmental Protection Agency (2019) Air Quality Reports. Available from: http://www.epa.ie/pubs/reports/air/quality/

Environmental Protection Agency (2018) Air Quality Reports. Available from: http://www.epa.ie/pubs/reports/air/quality/

Environmental Protection Agency (2017) Air Quality Reports. Available from: http://www.epa.ie/pubs/reports/air/quality/

Environmental Protection Agency, EPA Maps. Available from: https://gis.epa.ie/EPAMaps/

Transport Infrastructure Ireland (2011) Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes. Available from: https://www.tii.ie/technical-

[104] Environmental Protection Agency, IED and IPC Licence Search. Available at https://gis.epa.ie/EPAMaps/

services/environment/planning/Guidelines-for-the-Treatment-of-Air-Quality-during-the-Planning-and-Construction-of-National-Road-Schemes.pdf

Transport infrastructure Ireland (TII), Traffic Counter Data Website. Available from: https://www.nratrafficdata.ie/c2/gmapbasic.asp?sgid=ZvyVmXU8jBt9PJE$c7UXt

4.14 Climate

4.14.1 Introduction

This section describes the climate constraints identified within the study area for the Maynooth to Leixlip Project.

Section 4.14.2 describes the methodologies and sources of information that were used to carry out this constraints study. Section 4.14.3 describes the climate constraints. A summary is presented in Section 4.14.4 and references are listed in Section 4.14.5.

No significant variation in climatic constraints is expected which would influence the choice of options, as climate is a regional issue.

4.14.2 Methodology and Sources of Information

4.14.2.1 Methodology

As climate is a regional issue, no significant variation in climatic constraints is expected. However, climate is considered in the context of national emissions and Ireland's EU and national climatic obligations. Flood risk is assessed separately in Section 4.7.

4.14.2.2 Climate Commitments

The Government of Ireland's Climate Action Plan[105] was published in 2019. It commits to achieving a net zero carbon energy systems objective for Ireland. The plan sets out a detailed sectoral roadmap to deliver a cumulative reduction in emissions.

The Climate Action and Low Carbon Development (Amendment) Bill 2021[106] was published by Government in October 2020 and updated in March 2021. The Bill sets out the national objective of transitioning to a low carbon, climate resilient and environmentally sustainable economy in the period up to 2050. The Act provides for the preparation of National Mitigation Plans (the July 2017 Plan was quashed in July 2020) and Sectoral Plans which will specify policies to reduce greenhouse gas emissions for each sector.

In October 2014, the European Council reached political agreement on headline greenhouse gas emissions reduction targets in the context of the 2030 Climate and Energy Framework[107]. An overall EU reduction of at least 40% in greenhouse gas emissions by 2030 compared to 1990 levels is to be delivered collectively by the EU. Ireland's 2030 target is to achieve a 30% reduction of non-Emissions Trading Scheme (ETS) sector emissions on 2005 levels with annual binding limits set for each year over the period 2021-2030.

[105] Climate Action Plan, Government of Ireland 2019
[106] Climate Action and Low Carbon Development Bill 2020.
[107] European Commission, 2013. 2030 Climate & Energy Framework

The study area lies within both the Kildare County Council and South Dublin County Council administrative areas.

Kildare County Council has now prepared a Local Authority Climate Change Adaptation Strategy[108]. The Kildare County Council Climate Change Adaptation Strategy takes on the role as the primary instrument at local level to:

- Ensure a proper comprehension of the key risks and vulnerabilities of climate change;
- Bring forward the implementation of climate resilient actions in a planned and proactive manner and; and
- Ensure that climate adaptation considerations are mainstreamed into all plans and policies and integrated into all operations and functions of Kildare County Council.

The South Dublin County Council Climate Change Action Plan 2019-2024[109] was adopted in 2019. The plan is now published, and South Dublin County Council is working towards achieving its four main targets:

- A 33% improvement in the Council's energy efficiency by 2020;
- A 40% reduction in the Council's greenhouse gas emissions by 2030;
- To make Dublin a climate resilient region, by reducing the impacts of future climate change-related events; and
- To actively engage and inform citizens on climate change.

A Climate Change Team is working with Action Teams across the five main action areas to ensure the plan is delivered effectively.

4.14.2.3 Sources of Information

The existing climatic constraints have been determined through the review of published data from the EPA on existing and projected greenhouse gas emissions[110].

4.14.3 Existing Environment

4.14.3.1 Climate

Analysis of the meteorological records shows that Ireland's climate is changing in line with global patterns. The clearest trend is evident in the temperature records which show a mean temperature increase of 0.7° C between 1890 and 2008, i.e. an increase of 0.06 °C per decade. The increase was 0.4°C during the period 1980-2008, i.e. equivalent to 0.14 °C per decade.

[108] Kildare County Council Climate Change Adaptation Strategy, 2019-2024
[109] South Dublin County Council Climate Action Plan, 2019 -2024
[110] https://www.epa.ie/pubs/reports/air/airemissions/ghgprojections2019-2040/2020-EPA-Greenhouse-Gas-Emissions-Projections_final.pdf

4.14.3.2 Greenhouse Gas Emissions

EU greenhouse gas emission reduction targets and reduction obligations for Ireland are split into two broad categories. The first category covers the large energy and power (i.e. energy intensive) industry which have their emissions controlled under the EU Emissions Trading Scheme (ETS). The second category deals with the non-Emissions Trading Scheme (non-ETS) sectors such as agriculture, transport, residential, commercial, waste and non-energy intensive industry.

In July 2020, the EPA released the report Ireland's Greenhouse Gas Emissions Projections 2019-2040[111]. This report states that the With Additional Measures scenario (which includes the impact of the 2019 Climate Action Plan) will deliver an emission saving of approximately 78.8 Mt $CO_{2\,eq}$ over the period 2021-2030. An average reduction in emissions of 2.9% per year is projected over this period.

The projected emissions in 2025 and 2030 for the With Existing Measures and With Additional Measures scenarios for the non- ETS sectors (which includes transport) are outlined in Table 4.48.

Scenarios	Projected Emissions for non-ETS sector in 2025 (Mt CO_2 eq.)	Projected Emissions for non-ETS sector in 2030 (Mt CO_2 eq.)
Projections (with existing measures)[112]	45.96	44.17
Projections (with additional measures)[113]	40.73	33.65

Table 4.48 Projected Emissions for the non-ETS Sectors and Total Emissions (EPA, 2020)[111]

Ireland is projected to meet non-ETS EU targets over the period 2021 to 2030. This assumes full implementation of the 2019 Climate Action Plan and the use of flexibilities in relation to land use, land use change and forestry.

4.14.4 Summary and Conclusions

In 2021, it is expected that a carbon budget will be provided for the transport sector, in line with the Climate Action and Low Carbon Development Bill.

This carbon budget will be the main constraint for the Maynooth to Leixlip Project, as potential projected increases in carbon emissions will need to align with this budget.

[111] EPA, 2020. Ireland's Provisional Greenhouse Gas Emissions 2019 – 2040.
[112] The *With Existing Measures* scenario assumes that no additional policies and measures, beyond those already in place by the end of 2018 (latest national greenhouse gas emission inventory), are implemented. (EPA, 2020)
[113] The *With Additional Measures* scenario assumes implementation of the *With Existing Measures* scenario in addition to, based on current progress, further implementation of Government renewable and energy efficiency policies and measures including those set out in the National Renewable Energy Action Plan (NREAP) and the National Energy Efficiency Action Plan (NEEAP) and more recently Ireland's National Development Plan 2018 - 2027 (EPA, 2020).

4.14.5 References

Climate Action Plan, Government of Ireland 2019

Climate Action and Low Carbon Development Bill 2020.

European Commission, 2013. 2030 Climate & Energy Framework

South Dublin County Council Climate Action Plan, 2019 -2024

EPA, 2020. Ireland's Provisional Greenhouse Gas Emissions 2019 – 2040. https://www.epa.ie/pubs/reports/air/airemissions/ghgprojections2019-2040/2020-EPA-Greenhouse-Gas-Emissions-Projections_final.pdf

4.15 Noise and Vibration

4.15.1 Introduction

This section describes the noise and vibration constraints identified within the study area for the Maynooth to Leixlip Project and should be read in conjunction with the Noise and Vibration Constraints Figures 4.15.1 to 4.15.12.

The specific objective on the noise constraints study is to identify any receptors that may be deemed to be particularly sensitive to noise and / or vibration. Examples of sensitive receptors include residential buildings (houses, hotels, hostels etc.), schools, hospitals, places of worship, heritage buildings, special habitats, amenity areas in common use and designated quiet areas (Source: TII *Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes*[114] and *Guidelines for the Treatment of Noise and Vibration in National Road Schemes*[115]). Some commercial or industrial uses can also be noise sensitive, for example noise recording studios and research or manufacturing facilities using noise or vibration sensitive equipment.

Section 4.15.2 describes the methodologies and sources of information that were used to carry out the study. Section 4.15.3 describes the noise and vibration constraints within the study area. A summary is presented in Section 4.15.4 and references are listed in Section 4.15.5.

4.15.2 Methodology and Sources of Information

The noise and vibration constraints study has been prepared in accordance with the following guidelines:

- TII (2014) Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes114 (hereafter referred to as TII 2004); and
- TII (2004) Guidelines for the Treatment of Noise and Vibration in National Road Schemes115 (hereafter referred to as TII 2004).

The study consisted of a desk-based study of the study area.

The following information was reviewed as part of this study:

- OS Mapping;
- Satellite Mapping (Google Earth, Bing Maps);
- EPA Road Traffic Noise Maps Round 3 (2016)116;

[114] Transport Infrastructure Ireland (TII) (2014) (previously National Roads Authority (NRA)) Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes
[115] Transport Infrastructure Ireland (2004) (previously National Roads Authority (NRA)) Guidelines for the Treatment of Noise and Vibration in National Road Schemes
[116] Environmental Protection Agency (EPA) https://gis.epa.ie/EPAMaps/

- Kildare County Council. Third Noise Action Plan 2019 to 2023 117 (Hereafter referred to as the Kildare Co. Co. NAP 2019);
- Dublin Agglomeration Environmental Noise Action Plan – Volume 4: South Dublin County Council 2018 - 2023118 (Hereafter referred to as the SDCC NAP 2018).

4.15.3 Existing Environment

This section is set out as follows:

- Desktop description of existing noise environment using published information; and
- Identification of any receptors or areas that may be deemed to be particularly sensitive to noise and / or vibration.

4.15.3.1 Review of Published Noise Data

The study area is a mixture of suburban and urban areas. Road traffic is the dominant source of noise across the study area to varying extents depending on the proximity of sensitive receptors to the road edge. The M4 motorway, the N4 dual carriageway and regional roads (R408, R148, R406, R405, R404, R403, R449, R835) within the study area, contribute to the prevailing traffic noise at noise sensitive locations. Residential estates and residential clusters located south of Maynooth and Leixlip, make up the majority of noise sensitive locations within the study area. There are several businesses, commercial and retail parks south of the M4 within the study area which have the potential to add to the prevailing noise environment in their immediate environs.

The round three road traffic noise maps published by the EPA as part of the Environmental Noise Regulations119 have been reviewed to determine the range of modelled traffic noise in the vicinity of the study area. As part of the noise mapping requirements, all roads with traffic flows greater than three million vehicle trips per annum (approximately 8,200 Annual Average Daily Traffic (AADT)) were required to be mapped. Within the study area, the following sections of roads have been mapped and noise contours produced:

- M4 and N4: full extent of study area;
- R406: north and south of Junction 7 Maynooth;
- R449: north and south of Junction 6 Celbridge;
- R148: north of Junction 5 Leixlip;

[117] Kildare County Council (2019) Third Noise Action Plan 2019 to 2023
[118] Dublin Local Authorities including Dublin City Council (DCC), Fingal County Council (FCC), South Dublin County Council (SDCC) and Dún Laoghaire Rathdown County Council (DLRCC) Dublin Agglomeration Third Environmental Noise Action Plan December 2018 – July 2023 – Volume 4: South Dublin County Council
[119] S.I. No. 549/2018 – European Communities (Environmental Noise) Regulations 2018

- R403: south of Junction 5 Leixlip; and
- R835: east and west of N4 at Lucan.

Noise levels due to road traffic from these roads have been modelled and the relevant noise maps prepared. The maps are presented in noise contour bands within the study area in increments of 5 decibels (dB) starting at 55 dB L_{den} and 50 dB $L_{night.}$ Figures 4.15.1 to 4.15.12 display the noise maps for the L_{den} period (Annual 24-hour average) which is the noise parameter used to assess road traffic noise in Ireland[114] [115].

The results of the mapping indicate that residential properties within the study area south of Maynooth fall within the 55 to 59 dB L_{den} and 60 to 64 dB L_{den} noise contour bands with a small number of residential properties closest to the M4 in this section of the study area mapped within the 65 to 69 dB L_{den} noise contour band. Residential properties along Ballygoran Road, north of the M4 are mapped within the 60 to 64 dB L_{den} and 65 to 69 dB L_{den} noise contour bands, depending on their distance from the M4 road. Two schools within the study area located south-west of Maynooth along the R405 Celbridge Road, are mapped within the 55 to 59 dB L_{den} noise contour band.

There are a small number of individual residential properties located within 50m north and south of the M4 at Ballygoran and along the R405 south of the M4, which are mapped within the 70 to 74 dB L_{den} noise contour band.

Residential properties north of Celbridge within Crodaun Forest Park, within the study area, are mapped within the 55 to 59 dB L_{den} noise contour band or are outside of the noise mapping extents, i.e., <55 dB L_{den}.

Residential properties within the study area south of Leixlip are mapped within the 55 to 59 dB L_{den} and 60 to 64 dB L_{den} noise contour bands with a small number of residential properties close to the M4 in this section of the study area mapped within the 65 to 69 dB L_{den} and 70 to 74 dB L_{den} noise contour bands.

Residential properties located between the N4 Leixlip Road and R835 Old Celbridge Road are mapped within the 65 to 69 dB L_{den} noise contour band along the immediate boundary with the N4 with a small number of properties mapped within the 70 to 74 dB L_{den} noise contour band closest to the road edge. Residential properties located further south are mapped within the 60 to 64 dB L_{den} noise contour band, reducing to 55 to 59 dB L_{den}.

The Old Lucan Golf Club located south of the R835 Old Celbridge Road is mapped within the 55 to 59 dB L_{den} noise contour band across the majority of the course with a section of the lands mapped within the 60 to 64 dB L_{den} noise contour band along the edge of the R835 Old Celbridge Road. The Liffey Valley Par 3 course is mapped within the 60 to 64 dB L_{den} noise contour band across the majority of the course with a small section of the lands mapped within the 65 to 69 dB L_{den} noise contour band along the edge of the R148 Leixlip Road and M4. The section of the River Liffey Woodland walk within the study area, located north of the N4, is mapped within the 55 to 59 dB L_{den} and 60 to 64 dB L_{den} noise contour bands.

The Kildare Co. Co NAP 2019[117] includes the following threshold noise levels, above which areas may require noise mitigation or management which are

consistent with those used by other Local Authorities and with EPA guidance for Noise Action Plans. The proposed onset levels for the consideration of noise mitigation measures are:

- Day-Evening Night-time Noise Value: 70 dB (A) L_{den}
- Night-time Noise Value: 57 dB (A) L_{night}

Road traffic noise levels at the closest noise sensitive locations to the M4/N4 within the study area of Kildare County Council for are for the majority, just below the L_{den} noise threshold value of 70dB L_{den}. A small number of properties are, however, exposed to noise levels above this threshold value typically within 50m of the M4/N4 road edge. Traffic noise levels are therefore high at noise sensitive properties located along the existing M4/N4. These locations are identified within the existing Kildare Co. Co NAP 2019. The approach for review and management of areas mapped above the threshold noise levels are set out in the relevant sections of the Kildare Co. Co. NAP 2019.

The SDCC NAP 2018[118] includes the following threshold noise levels, above which areas may require noise mitigation or management. These threshold values differ from those included within the Kildare Co. Co NAP 2019. The SDCC NAP 2018 notes the following target values for desirable low and undesirable high sound levels:

Desirable Low Sound levels:

< 50 dB(A) L_{night}

< 55 dB(A) L_{day}

Undesirable High Sound levels

> 55 dB(A) L_{night}

> 70 dB(A) L_{day}

The SDCC NAP 2018 uses the L_{day} parameter as a threshold value as opposed to the L_{den} parameter discussed above as part of the noise mapping and included within the Kildare Co. Co NAP 2019. For road traffic noise along a national road, the L_{den} parameter is typically 2 to 3dB higher than the L_{day} parameter.

Road traffic noise levels at the closest noise sensitive locations to the M4/N4 road of South Dublin County Council are all above the 'Desirable Low' sound level value of 55 dB L_{day} and are at or just below the Undesirable High threshold value of 70dB L_{day}. A small number of individual properties are however exposed to traffic noise levels above this threshold value along the immediate road edge south of the M4 and N4. Traffic noise levels are therefore high at the closest noise sensitive properties to the M4/N4. These locations are identified within the existing SDCC NAP 2018. The approach for review and management of areas mapped above the threshold noise levels are set out in the relevant sections of the SDCC NAP 2018.

For new national roads in Ireland the TII 2004[1] and 2014[2] Guidelines set a design goal for road traffic noise of 60 dB L_{den} for residential properties. For the majority of residential areas within the study area (residential estates south of Maynooth and

Leixlip), traffic noise levels are at or below this noise level. Residential properties located typically within 150 to 200m of the existing M4/N4 are mapped within noise contour bands above 60 dB L_{den}.

4.15.3.2 Identification of Noise and/or Vibration Sensitive Receptors

The study area was examined to identify the distribution of noise and/or vibration sensitive receptors and to determine the presence, if any, of significant constraints relating to noise and / or vibration.

The following noise and / or vibration sensitive areas were identified and grouped into the following categories:

- Schools;
- Amenity areas with noise sensitivity (parks/ golf courses etc.);
- Religious buildings / areas; and
- Residential areas.

The OS mapping and satellite imagery mapping were reviewed in order to identify the presence of these locations. These are discussed in turn below.

Education Establishments

The location of schools within the study area have been identified and annotated as part of the constraint mapping process for the study. A total of two schools (Salesian College and Celbridge Community School) are identified and located southeast of Maynooth and north of the M4, along the R405 Celbridge Road.

The presence of a school building does not preclude proposed transport infrastructure in its vicinity; however, their presence should be included for consideration to avoid encroaching in proximity to avoid high noise levels and potential impacts.

Amenity Areas

The location of amenity areas which are considered potentially sensitive to noise within the study area have been identified and annotated as part of the constraint mapping process for the study. The locations include Lucan Golf Club, Liffey Valley Par 3 Course, and the River Liffey woodland walk. The prevailing noise environment at these amenity areas is dominated by road traffic noise at present.

Ballygoran Stud, which is located approximately 600m south of the M4, is also a potential noise sensitive area. This location is set back further from existing road traffic and is outside the noise mapping zone for road traffic from the M4 and adjacent mapped roads.

Where the prevailing noise environment in these areas is considered an important part of the character of the area, consideration should be given to preserve the noise environment, as far as practicable.

Religious Buildings

One graveyard is identified within the study area, west of Maynooth town along the Kilcock Road. Whilst it is noted, the presence of a graveyard or other religious building does not preclude a road development in its vicinity, their presence should, be considered when developing options.

Residential Areas

There is one nursing home (Maynooth Lodge Nursing Home) within the study area, located approximately 350m south of the M4 on the R408 Newtown Road. This is shown in Figures 4.15.1 to 4.15.12.

All other residential buildings have not been annotated in the constraints mapping due to the large proportion of these building types within the study area. Whilst these are not specifically marked on mapping, they are weighted the same importance as the other constraint areas discussed above.

The most densely populated residential areas within the study area are located north of the M4 motorway on the outskirts of Maynooth and Leixlip. There are additional smaller clusters of residential estates located south of the M4, to the north of Celbridge, and south of the N4 to the west of Lucan. The range of road traffic noise levels across these areas is discussed in Section 4.15.3.1.

Within the remainder of the study area, residential dwellings are typically in smaller clusters at crossroads and ribbon style development along the local road network. Given the distribution of residential areas within the study area, it will not be possible for offline options to avoid passing in proximity to them. Consideration will however be given to development of options which minimise the number of residential buildings in their vicinity, as far as practicable. This will form part of the route selection process.

Vibration Sensitive Receptors

Road traffic along normal maintained surfaces is not a source of any significant levels of vibration in terms of human perception, vibration sensitive equipment or structural integrity of vulnerable structures. There are no vibration sensitive buildings or areas identified within the study area where road traffic would pose any significant perceptible impact. During the construction phase, there is potential for minor vibration levels to be generated depending on the works involved. Any construction activity will be controlled through strict vibration limits.

Sensitive Area Overview

The presence of the noise sensitive receptors listed above is not necessarily considered to be a strict constraint which would prevent the development of an option in proximity to them. The purpose of this initial exercise is to highlight those areas which should be considered, where possible, when developing options in conjunction with the other identified constraints. In this instance, where it is not possible to develop new off-line route options away from identified noise sensitive locations, consideration can be given to the vertical alignment, the use of natural screening or false cuttings to act as noise buffers and mitigation measures as part of the base design.

Residential dwellings make up the majority of the noise sensitive receptors within the study area. As discussed in Section 4.15.3.1, the prevailing noise environment across these areas is currently dominated by road traffic noise from the M4, N4 and the identified regional roads.

In this instance, consideration will be given to a balance between protecting residential properties currently not exposed to high levels of road traffic noise and not increasing or generating significant negative impacts to residential properties already exposed to high levels of road traffic and other environmental sources. Particular attention will be given to potential transport options and alternatives within the existing corridor, which are in in close proximity to residential areas already exposed to road traffic noise levels above the Kildare Co. Co. NAP 2019 and the SDCC NAP 2018 noise threshold levels. Where possible, options passing through or in proximity to clusters of residential estates with large populations should be avoided.

Other noise sensitive receptors include two schools, a nursing home, a small number of amenity areas including a stud farm and a graveyard. The prevailing noise environment across the majority of these areas is also currently dominated by road traffic noise. As these areas are significantly less distributed across the study area compared to housing, they are in turn, easier to direct options away from.

For non-residential noise sensitive areas, consideration will be given to the sensitivity of the specific areas depending on their use in addition to the existing noise environment in which they are located.

For all receptors, the availability for noise mitigation in the form of the horizontal and vertical alignments, natural screening and road surfaces will all be considered during the options development stage.

4.15.4 Summary and Conclusions

The study area consists of a mixture of urban and suburban areas. Residential dwellings make up the majority of the noise sensitive receptors within the study area which are highest in density to the south of Maynooth and Leixlip.

The location of amenity areas which are considered potentially sensitive to noise within the study area have been identified and annotated as part of the constraint mapping process for the study. Refer to Figures 4.15.1 to 4.15.12. The locations include Lucan Golf Club, Liffey Valley Par 3 Course, the River Liffey woodland walk and Ballygoran Stud. Two schools, a nursing home and a graveyard are also identified.

Whilst there is a mix of noise sensitive areas distributed across the study area, a large proportion of these are already exposed to road traffic noise to varying degrees depending on traffic volumes, distance from the road edge and screening.

During the Options Selection phase, the distribution and density of noise sensitive areas will be determined, and the potential noise impacts assessed. Consideration will be given to protecting existing noise sensitive areas, where feasible.

4.15.5 References

Environmental Protection Agency (2016) Strategic Noise Mapping Round 3. (Environmental Protection Agency (EPA) https://gis.epa.ie/EPAMaps/

Dublin Local Authorities including Dublin City Council (DCC), Fingal County Council (FCC), South Dublin County Council (SDCC) and Dún Laoghaire Rathdown County Council (DLRCC) Dublin Agglomeration Third Environmental Noise Action Plan December 2018 – July 2023 – Volume 4: South Dublin County Council

Kildare County Council (2019) Third Noise Action Plan 2019 – 2023.

S.I. No. 549/2018 – European Communities (Environmental Noise) Regulations 2018.

Transport Infrastructure Ireland (TII) (2014) (previously National Roads Authority (NRA)) Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes.

TII (2004) (previously National Roads Authority (NRA)) Guidelines for the treatment of noise and vibration for national road schemes.

4.15.6 Glossary of Terms

dB	Decibel - The scale in which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the RMS pressure of the sound field and the reference pressure of 20 micro-pascals (20 μPa).
ambient noise	The totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, near and far.
noise sensitive location	NSL – Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or other area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels.
L_{den}	is the 24-hour noise rating level determined by the averaging of the L_{day} with the $L_{evening}$ (plus a 5 dB penalty) and the L_{night} (plus a 10 dB penalty). L_{den} is calculated using the following formula, as defined within the Environmental Noise Regulations (S.I. No. 140/2006)

$$L_{den} = 10log\left(\frac{1}{24}\right)\left(12 * \left(10^{\frac{Lday}{10}}\right) + 4 * \left(10^{\frac{Levening+5}{10}}\right) + 8 * \left(10^{\frac{Lnight+10}{10}}\right)\right)$$

Where:

L_{day} is the A-weighted long-term average sound level as defined in ISO 1996-2, determined over all the day periods of a year. The 12hr daytime period is between 07:00hrs and19:00hrs.

$L_{evening}$ is the A-weighted long-term average sound level as defined in ISO 1996-2, determined over all the evening periods of a year. The 4hr evening period is between 19:00hrs and 23:00hrs.

L_{night} is the A-weighted long-term average sound level as defined in ISO 1996-2, determined over all the night periods of a year. The 8hr night-time period is between 23:00hrs and 07:00hrs.

4.16 Population

4.16.1 Introduction

This section describes the population constraints identified within the study area for the Maynooth to Leixlip Project and should be read in conjunction with Population Constraints Figures 4.16.1 to 4.16.6.

This section covers the settlement patterns, population characteristics and economic and social well-being of people at a community level. For the purposes of the assessment, the constraints primarily relate to community facilities, including social, cultural, health and religious facilities, retail businesses, places of employment, and destinations for recreation, as these relate to the assessment criteria of journey patterns, journey amenity, general amenity, community severance, business, tourism and employment. Other aspects relevant to Population such as natural amenity, built and natural heritage, ecosystem services, material assets and nuisance are dealt with in other sections of the report, including:

- Material Assets Non-Agriculture;
- Material Assets – Agriculture;
- Air Quality;
- Noise and Vibration;
- Archaeological, Architectural and Cultural Heritage; and
- Landscape and Visual.

4.16.2 Methodology and Sources of Information

An assessment of Population requires that an understanding of the community is built up through background research, site visits, and conversations with local people and community representatives. As this assessment has been conducted during Covid-19 pandemic restrictions, information for this constraints study has been collected from the following sources:

- Primary data sources (e.g. demographic data from Census 2016 and Census 2011 produced by the Central Statistics Office). This section introduces demographic data relevant to the constraints assessment;
- A map of the study area;
- Maps of the surrounding area, including 1:50,000 Ordnance Survey Discovery Series;
- Spatial data, including Google Maps and Google Streetview, OpenStreetMap, and Department of Education school maps;
- Observations of local settlements and travel patterns and identification of community facilities; and
- Websites identifying local tourism, walks and trails, and river-based activity.

4.16.3 Existing Environment

4.16.3.1 Population

The populations of both Maynooth and Celbridge have doubled in size since the early 1990s. Leixlip has achieved a degree of stability in the last ten years with growth of 0.3% in the last inter-Census period, although the populations of Maynooth and Lucan continue on a strong upward trajectory as indicated in Table 4.49. The southern sections of both Maynooth and Leixlip are located within the study area while the north-eastern section of Celbridge is located within the study area.

Settlements	2016	2011	Percent Change
Maynooth	14,585	12,510	16.6%
Leixlip	15,504	15,452	0.3%
Celbridge	20,288	19,537	3.8%
County Kildare	222,504	210,312	5.8%
Lucan	49,279	46,514	5.9%
County South Dublin	278,767	265,205	5.1%

Table 4.49 Population: Main Settlements

The population increase in County Kildare between 2011 and 2016 was 5.8% which compares with an average for the State of 3.8%, with only counties Fingal and Meath having a higher level of growth nationally. Population by Electoral Division (ED) is shown in Table 4.50.

Electoral Divisions	2016	2011	Percent Change	Population Density (km^2)
Maynooth	15,998	13,617	17.5%	475
Leixlip	15,576	15,597	-0.1%	1,368
Celbridge	15,653	15,323	2.2%	889
Lucan-St Helens	10,658	9,450	12.8%	2,912

Table 4.50 Population: Electoral Divisions (ED)

The levels of absolute and relative social and economic disadvantage by ED as identified by the Pobal HP Deprivation index (Haase & Pratschke, 2017) are listed in Table 4.51. These figures are also relevant to health. The absolute deprivation index captures several of the individual statistics provided by the CSO as a composite index. It is based on criteria of age dependency, population change, education, household occupancy, employment and social class, and has a mean of zero which is influenced by economic conditions for the country as a whole at that time. Positive figures therefore indicate low deprivation compared with the national average. Relative disadvantage is an index relative to average levels across the country for the census period (in this case 2016).

Pockets of disadvantage are to be found in the study area, mainly in a few neighbourhoods of Lucan. Overall, the study area has a high socio-economic status

with Leixlip and Celbridge defined as being "extremely affluent" and Maynooth as "very affluent" as indicated by the positive figures in the table relative to the national average. Comparing the absolute figures for 2016 and 2011, there was an improvement on the situation during the depth of the last recession in 2011 for all EDs. In relative terms, all EDs, but especially Maynooth, demonstrate a continuing relative improvement compared with the national situation.

Electoral Divisions	2016 Absolute	2011 Absolute	2016 Relative	2011 Relative
Maynooth	8.2	3.3	12.9	10.4
Leixlip	1.1	-1.8	5.1	5.0
Celbridge	1.9	-1.3	6.1	5.4
Lucan-St Helens	2.9	-0.7	7.4	6.1

Table 4.51 Population: HP Deprivation Index 2016

A breakdown of the mode of travel used by commuters to travel to work is shown in Table 4.52. The figures indicate that car use accounts for between 61% and 67% of commuting journeys when passengers are included too, equating to over 15,600 vehicle journeys. These figures are also boosted by van or lorry journeys (included under "Other") and which account for 4% to 5% of commuting trips. Vehicle use is proportionately lower in Maynooth and Leixlip as some large employers are located in these towns. As a result of this, these areas have higher levels of walking and also are located in close proximity to a train station. Being closer to Dublin , bus use is higher in Celbridge and especially Lucan, as is bicycle use, although this only accounts for a very small share of total journeys at 2%.

Journeys to school or college for the EDs combined add another 15,000 one-way trips per day, although 43% of these are by foot, 5% by bicycle and 13% by bus.

Of the total journeys to work, school or college, the highest proportions occur between 7.30 and 9am (Table 4.53) with just over half taking less than 30 minutes (Table 4.54).

Electoral Division	On Foot	Bicycle	Bus or similar	Train	Motor Cycle	Car Driver	Car Pass.	Other	Home	Not Stated	Total
Maynooth	589	127	415	921	27	3,960	201	256	190	159	6,845
Leixlip	395	105	717	768	65	4,116	229	376	184	179	7,134
Celbridge	328	109	882	191	45	4,563	235	368	211	171	7,103
Lucan SH	166	98	812	89	37	2,990	173	190	100	171	4,826
Total	**1,478**	**439**	**2,826**	**1,969**	**174**	**15,629**	**838**	**1,190**	**685**	**680**	**25,908**

Electoral Division	On Foot	Bicycle	Bus or similar	Train	Motor cycle	Car Driver	Car pass.	Other	Home	Not Stated
Maynooth	8.6%	1.9%	6.1%	13.5%	0.4%	57.9%	2.9%	3.7%	2.8%	2.3%
Leixlip	5.5%	1.5%	10.1%	10.8%	0.9%	57.7%	3.2%	5.3%	2.6%	2.5%
Celbridge	4.6%	1.5%	12.4%	2.7%	0.6%	64.2%	3.3%	5.2%	3.0%	2.4%

Electoral Division	On Foot	Bicycle	Bus or similar	Train	Motor cycle	Car Driver	Car pass.	Other	Home	Not Stated
Lucan SH	3.4%	2.0%	16.8%	1.8%	0.8%	62.0%	3.6%	3.9%	2.1%	3.5%

Table 4.52 Means of Travel to Work (excluding School/College)

Electoral Division	Before 6.30	6.30-7.00	7.00-7.30	7.30-8.00	8.00-8.30	8.30-9.00	9.00-9.30	After 9.30	Not Stated
Maynooth	6.4%	9.1%	9.7%	13.4%	19.2%	20.2%	7.3%	11.8%	2.8%
Leixlip	6.9%	11.0%	11.3%	17.1%	17.4%	15.2%	11.4%	6.4%	3.1%
Celbridge	6.7%	10.2%	12.1%	15.0%	20.5%	21.4%	4.1%	7.0%	3.1%
Lucan SH	6.2%	10.5%	11.7%	16.8%	20.2%	20.0%	3.3%	7.3%	4.1%

Table 4.53 Time of Leaving for Work, School or College

Electoral Division	<15 mins	15-30 mins	30-45 mins	45-60 mins	60-90 mins	>90 mins	Not stated
Maynooth	28.1%	29.5%	15.5%	7.3%	12.2%	3.3%	4.0%
Leixlip	26.9%	25.1%	19.8%	9.5%	11.2%	2.2%	5.3%
Celbridge	24.3%	28.1%	19.9%	8.3%	11.5%	3.0%	4.9%
Lucan SH	24.9%	26.3%	20.3%	8.9%	10.5%	2.6%	6.6%

Table 4.54 Journey Time to Work, School or College

4.16.3.2 Constraints in the Study Area

The study area is represented by a broad corridor which extends both north and south of the existing M4/N4 from Maynooth to Leixlip. This corridor includes the southern parts of Maynooth and Leixlip, the northern edge of Celbridge and a portion of Lucan. In each of these towns, a high proportion of the population commutes each day into Dublin, but each town is also an important employment centre in its own right. Key employers include the University of Maynooth, Intel to the northwest of Leixlip and former Hewlett Packard site which is located between Leixlip and Celbridge. In addition, there are various industrial or commercial estates located largely on the edge of each town. Important cultural facilities consist of the University of Maynooth (including St. Patrick's College 'The National Seminary for Ireland'), and the amenities of Castletown Demesne, Lucan Demesne and Carton House Golf Club to the north of the study area (also used for walking), as well as the River Liffey. Semi-rural areas separate each of the towns and contain good quality agricultural land, equine activity areas, clusters of residential housing, playing fields, golf clubs, cemeteries, nursing homes, Weston Airport and Leixlip Reservoir.

In terms of transport, the main Dublin-Sligo railway line is located within the study area along with the existing M4/N4 and regional roads including:

- R148 (connecting Maynooth and Leixlip);
- R449 (connecting the Collinstown Industrial Park, including Intel, with the M4 and Celbridge);
- R043 (connecting Lucan, the M4, Celbridge and Clane);

- R404 (connecting Leixlip, Hewlett Packard and Celbridge);
- R405 (connecting Maynooth and Celbridge); and
- R406 (connecting Maynooth, the M4 and Straffan).

The Royal Canal is frequently used for amenity walking and cycling. A list of community facilities within the study area is provided below.

Constraints within the study area are shown in Figures 4.16.1 to 4.16.6 and have been grouped into the following headings:

- Clusters of rural houses;
- Green space, playing fields;
- Equestrian/stables;
- Agri-business;
- Public utility;
- Business/industrial;
- Montessori/creche;
- Nursing home;
- Hotel or accommodation;
- School, college;
- Bar;
- Heritage/tourism;
- Retail; and
- Health.

Of these facilities, residential clusters may be subject to new physical or social severance (or relief from severance) in the event that potential transport options were to impact traffic flows between properties or residential clusters.

Businesses feature highly among the facilities that are located closest to the existing M4/N4 or to regional roads such as the R148 between Maynooth, Leixlip and Lucan and the R405 between Maynooth and Celbridge. Direct impacts on business premises could have both an economic and employment impact depending on the size and local significance of the business. However, businesses could also benefit from improvements in connectivity due to the presence of a new road.

Hotels attract tourist visitors and are of economic importance, making a modest, but important contribution to the local economy.

Most of the hotels in the study area are located so as to benefit from good accessibility to major roads, and especially the M4/N4, so maintenance of this accessibility would be of relevance to potential transport options to be considered.

Direct impacts on churches or other religious facilities or sites would be of profound significance, but proximity to roads are not necessarily of significance if noise levels are acceptable based on reference indices and guidelines. Noise can have an

impact on cemeteries, although many established cemeteries are located beside major roads. Noise is discussed in Section 4.15 and is also of relevance to Human Health.

Schools and nursing homes would also be sensitive to noise and to air quality impacts and are again discussed in the respective sections and under Human Health. Schools would also be vulnerable to physical severance and often have nearby manned or signalised crossings lights where traffic levels are high. Impacts could extend to adjacent roads.

The community facilities in the study area are shown in Table 4.55. The most important of which, in terms of employment or social/economic effect, include Hewlett Packard, the Royal Canal and Castletown Demesne. However, all listed facilities are of importance, and many have a particular local importance. The measure of significance indicates the facility's importance as a community facility or for employment/economy, but also its sensitivity to potential construction or traffic impacts.

No	Community Facility	Purpose/Type	Significance
1	Laraghbryan Cemetery	Religious	Profound
3	Laragh Guest House Hotel	Accommodation	Moderate
5	Maynooth Town FC	Sports	Significant
6	Maynooth Lodge	Nursing home	Significant
7	Robinson Farm	Large agricultural	Moderate
8	Kids@Play Playschool	Creche/playschool	Moderate
9	The Grove B&B	Accommodation	Slight
11	Newtown Inn & Off License	Community /retail	Moderate
12	Spar, Maynooth	Retail	Moderate
13	Lidl & Circle K	Retail	Moderate
14	Bartons Transport	Business	Significant
14	Brian Noone auto repairs	Business	Moderate
15	Barretts Maynooth	Business	Significant
15	Earthridge Limited	Business	Significant
16	Maynooth Business Campus	Business	Profound
19	Greenfield B&B	Accommodation	Slight
20	Olympic Cars	Business	Moderate
21	Gaelscoil Ui Fhiaich	Education	Profound
21	Maynooth Educate Together	Education	Significant
23	Spring Lodge	Accommodation	Slight
24	Ballygoran Reservoir	Utility	Profound
25	SAP Landscapes Limited	Business	Significant
26	Ballygoran Lodge B&B	Accommodation	Slight
27	Sunrooms Ireland	Business	Moderate
28	Ray Crofton Motors	Business	Moderate
29	Maynooth Fireplaces & Stoves	Business	Moderate
29	Levelling Equipment Services	Business	Moderate
30	Celbridge Community School	Education	Significant
31	Salesian College	Education	Significant

No	Community Facility	Purpose/Type	Significance
32	M4 Business Park	Business	Significant
32	Peelo School of Dance	Education/business	Significant
32	Applegreen	Business	Moderate
32	Celbridge Playzone	Business	Moderate
35	Hewlett Packard	Business	Profound
36	Wonderful Barn folly	Heritage	Profound
37	Wonderful Barn Allotments	Community	Moderate
39	Kelly Medical Centre	Health	Moderate
40	Spion Lodge	Accommodation	Slight
41	Eurospar	Retail	Moderate
41	Canton House Takeaway	Retail	Slight
42	Leixlip Castle	Heritage	Profound
43	International Education Services	Business	Significant
44	Weston Airport	Transport/amenity	Profound
45	Auto Solutions Weston	Business	Significant
46	Top Dogs Canine Centre	Business	Moderate
47	Becketts Hotel	Accommodation	Significant
48	Springfield Hotel	Accommodation	Significant
49	Tara Park	Business	Moderate
49	Dreamtime Bouncy Castles	Business	Moderate
50	Liffey Valley Par Golf	Amenity	Significant
51	Lucan Lodge Guest House	Accommodation	Moderate
52	McCoy Motors	Business	Moderate
53	Lucan Spa Hotel	Accommodation,	Significant
53	Lucan Country Bar	Community	Significant
54	Sluice Carpark (for demesne)	Amenity	Slight
55	Lucan Demesne	Amenity	Profound
56	Lucan Golf Club	Amenity	Significant
59	Salmon Leap Inn	Community	Moderate
60	Alensgrove Cottages village	Community	Moderate
62	Royal Canal	Amenity (linear)	Profound
65	River Liffey	Amenity (kayaking, angling)	Profound

Table 4.55 List of Community Facilities

Summary and Conclusion

The list of community facilities reveals the presence of some major businesses and employers, and important amenities within the study area. It includes a full range of facilities spread across the study area, with clusters occurring within the urban areas, a significant number of which are of profound or high significance in terms of their local importance or sensitivity to potential impacts. These include a large number of individual businesses, many of which are located in the vicinity of the R405. Each of these facilities is dependent on good transport connectivity and several are located beside the M4, but they are also potentially sensitive to potential transport solutions.

4.16.4 References

CSO Population Census Small Area Population Statistics 2016

CSO Population Census Small Area Population Statistics 2011

EPA: Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports, August 2017

EPA: Advice Notes for Preparing Environmental Impact Statements, Draft, September 2015

Haase, Trutz & Pratschke, Jonathan (2017) The 2016 Pobal HP Deprivation Index for Small Areas

Kildare County Council & Local Community and Development Committee

Kildare Census 2016 Profile: Demographics

4.17 Engineering Constraints

4.17.1 Introduction

This section describes the engineering constraints identified within the study area for the Maynooth to Leixlip Project and should be read in conjunction with Engineering Constraints Figures 4.17.1 to 4.17.6.

Section 4.17.2 describes the methodologies and sources of information that were used to carry out the study. Section 4.17.3 describes the engineering constraints within the study area. A summary is presented in Section 4.17.4 and references are listed in Section 4.17.5.

The objective of this engineering constraints study is to identify the engineering constraints within the study area. The existing environment has been analysed under the headings of topography and landscape, rivers, existing road network, road safety characteristics of the existing road network, other transport modes, quarries, and other amenities.

4.17.2 Methodology and Sources of Information

Research for this constraints study was undertaken as a desktop exercise. The following information sources were consulted in order to identify engineering constraints:

- Bus Éireann;
- Environmental Protection Agency (EPA);
- Geological Survey of Ireland (GSI);
- Iarnród Éireann;
- Ordnance Survey Ireland (OSI);
- Road Safety Authority (RSA); and
- Transport for Ireland (TFI).

4.17.3 Existing Environment

This section describes the engineering constraints within the study area. These constraints comprise the natural features (topography, landscape, and rivers) and the main infrastructure (roads, railways, and public transport) within the study area, and the road safety characteristics of the existing road network are examined. Quarries and other amenities are also identified as constraints in this section. Major utility constraints such as gas, water, electricity, and telecommunications are detailed in Section 4.12 Material Assets Non-Agriculture.

4.17.3.1 Landscape

This section traverses two Local Authorities, Kildare County Council and South Dublin County Council. Kildare County Council has been appointed as the lead

Local Authority and Sponsoring Agency of the Maynooth to Leixlip Project. Kildare National Roads Office (KNRO) has been appointed by Transport Infrastructure Ireland (TII), acting as the Approving Authority, to project manage the delivery of the project.

The existing M4/N4 corridor is predominantly in County Kildare with 1.5km of the approximate 10km length in South Dublin County Council.

The study area is largely greenfield agricultural land punctuated by the urban centres of Maynooth, Celbridge and Leixlip.

The Rye Water Valley/Carton SAC (Special Area of Conservation) runs parallel to the line of the M4/N4 along the Rye River from Leixlip to Maynooth. The R157 and R406 allow for the transfer of strategic traffic from the M4/N4 to the M3 and M7 respectively.

4.17.3.2 Existing Natural Constraints

There are a number of areas of notable environmental significance within the study area. These include the following:

- Rye Water Valley/Carton SAC;
- Rye Water Valley/Carton pNHA;
- Ballynafagh Bog SAC;
- Ballynafagh Lake SAC;
- Royal Canal pNHA;
- Grand Canal pHNA; and
- River Liffey.

Refer to Section 4.7 Hydrology and Section 4.4 Biodiversity for further details.

4.17.3.3 Existing Road Network

National Road Network

The existing M4/N4 is a national primary road from the M50 in Dublin to Sligo over a length of approximately 200km. It is a dual carriageway standard from the M50 to Junction 5 Leixlip incorporating direct accesses, busways, footpaths, cycleways, and bus stops over a length of approximately 7km. The section from the M50 to Lucan was constructed in the mid-1980's with the Lucan Bypass constructed in the late 1980's, severing the old village to the north from the newer areas to the south. In 2009, the section of the M50 to Lucan was upgraded to 3 lanes in each direction and closed off the majority of local accesses. It is motorway standard from Junction 5 Leixlip in Dublin to Coralstown in County Westmeath over a length of approximately 53km. It is a single carriageway from Coralstown in County Westmeath to Sligo over a length of approximately 140km. The section of the M4 between Junction 5 Leixlip and

Junction 7 Maynooth is a strategic two-lane motorway that has been in operation since 1994.

Regional and Local Road Network

The surrounding regional and local road network provides access to the M4 and various towns and villages throughout the study area. The R148 runs from Dublin to Kinnegad in County Westmeath. The road is 45km long. It is generally of a very high standard for a regional road, with wide lanes, hard shoulders, and turning bays. It is still heavily used by traffic avoiding the tolled M4 between Kilcock and Kinnegad. The R148 was previously categorised as a National Primary route until the opening of the M4 motorway. It follows the same corridor and serves the same east west commuters as the M4. The R148 regional road extends from Leixlip, crossing the River Liffey and the Royal Canal. From the canal, it passes the Intel campus and continues to Maynooth. It then extends outside of the study area in a westerly direction via Kilcock and Enfield and finally terminates in Kinnegad in County Meath / Westmeath.

The R403 connects the M4 at Junction 5 and continues through Celbridge town in a southwest direction outside of the study area.

The R449 links into the M4 at Junction 6. From here it continues north and ties into the R148 at the Intel Ireland campus to the west of Leixlip town. The R449 ties into the R405 southwest of Junction 6. The R405 extends from Celbridge to Maynooth and crosses the M4 via an overbridge. The R406 (Straffan Road) links into the M4 at Junction 7 Maynooth. From here it continues north before tying into the R148 in Maynooth town centre. The R406 extends south and ties into the R403 and Barberstown Road at a four-armed roundabout. Barberstown Road extends south before tying into the L2007 which then connects to Straffan Road tying into the N7 at Junction 7 Maynooth. This provides a link from the M4 to the M7.

The existing road network is **Figure 4.12**.

Figure 4.12: Existing Road Network within Study Area (© Google Map data ©2023 Tele Atlas)

4.17.3.4 Road Safety Characteristics of Existing Road Network

Current and Future Traffic Volumes

Annual Average Daily Traffic (AADT) volumes were collected from the TII permanent traffic counters as shown in Table 4.56. The TII traffic counter locations are shown in **Figure 4.13**.

Road Type	TII Counter Location	AADT (2019)
Dual Carriageway - 3 Lane + Bus Lane	N4 Junction 3 Newcastle – Junction 4 Lucan	85,939
Motorway - 2 Lane	M4 Junction 6 Celbridge – Junction 7 Maynooth	59,435
Motorway - 2 Lane	M4 Junction 7 Maynooth – Junction 8 Kilcock	46,585
Motorway - 2 Lane	M4 Junction 8 Kilcock – Junction 9 Enfield (east)	29,402
Motorway - 2 Lane	M4 Junction 9 Enfield (west)	14,971

Table 4.56 M4 AADT Data Summary

Figure 4.13: TII Traffic Counter Locations (© Google Map data ©2023 Tele Atlas)

A summary of the key operational issues affecting the route are outlined below:

- High dependency on cars (>60%) for those living in Maynooth but working outside of Maynooth (Maynooth Traffic Management Plan, 2017).
- The predicted modal shift has not happened within the study area from private car to public transport, which is a contributing factor to the traffic and congestion problems along the M4.
- Between Junction 6 Celbridge and Junction 7 Maynooth, the AADT increased by 16% between 2013 and 2019. The minimum target for Level of Service (LoS) D on the M4 motorway is exceeded by 15%.
- Between Junction 7 Maynooth and Junction 8 Kilcock, the AADT increased by 22% between 2013 and 2019. The minimum target for LoS D is currently being achieved however trends suggest that this may change in the near future. Should

AADT trends continue to grow in line with actual AADT growth from 2013 to 2019, the minimum target for LoS D would be exceeded by 2025.

Collision Data

The number of casualties resulting from traffic collisions from 1996 to 2013 within the study area and the M4/N4 corridor is listed below. This data has been obtained from the Road Safety Authority's collision statistics database and classifies accidents by severity, i.e. fatal, serious, or minor.

A summary of the collision data is shown in Table 4.57.

Year	Fatal	Seriously Injured	Minor Injury	Injury
1996	0	11	46	3
1997	3	16	66	2
1998	0	17	44	1
1999	1	11	43	1
2000	1	12	87	1
2001	1	12	40	5
2002	1	10	64	4
2003	3	7	58	1
2004	0	3	36	0
2005	1	3	50	0
2006	1	2	40	0
2007	1	2	19	0
2008	3	2	50	0
2009	2	0	29	3
2010	0	9	56	2
2011	2	10	43	1
2012	0	2	40	0
2013	1	3	55	0
Total	21	132	866	24

Table 4.57 Collision Data Summary

As expected, pedestrian involvement is lower at the three main junctions of the mainline in comparison to the wider study area. A high quantity of rear end shunt type collisions are evident at Junction 5 while Junction 6 displays a higher than average level of single vehicle collisions.

The distribution of collisions and incidents on the M4 corridor closely matches the typical profile of the traffic along the route. This is evidence that a high proportion of incidents may be attributed to the impacts of congestion.

Capacity enhancement is not the sole means of reducing congestion difficulties – volumes may also be eased through demand management measures or by achieving a modal shift to public transport and a reduction in car-based commuting. Any solutions which ease congestion on the route may improve safety for all road users and should be considered.

4.17.3.5 Other Transport Modes

Rail

The study area interacts with two rail lines:

- Western rail line extending from Dublin Connolly (City Centre) to Sligo and passing through Leixlip and Maynooth; and
- Southern rail line extending from Dublin Heuston to Cork and passing to the south of Celbridge, where it is serviced by the Hazelhatch / Celbridge station.

The frequency of the existing rail services through the study area is as follows:

- Maynooth is serviced by two routes:
  - Dublin-Maynooth/Longford route with services typically running every 20 to 30 minutes to Maynooth during the weekdays and typically every 30 minutes to one hour during the weekends; and
  - Dublin Connolly - Sligo with 11 services daily during weekdays and a reduced number of services during weekends.
- Leixlip is serviced by two stations - Leixlip Confey and Leixlip Louisa Bridge. These stations are serviced by the Dublin-Maynooth / Longford route. This route typically runs every 30 minutes during the weekdays to Leixlip and every 30 minutes to one hour during weekends;
- Celbridge is serviced by three routes:
  - Dublin Heuston – Galway with one service during weekdays;
  - Dublin Heuston – Waterford with two services during weekdays and one service on Saturdays. There are no services on Sundays; and
  - Grand Canal Dock and Dublin Heuston – Portlaoise – Cork with up to 45 services during the weekdays, 19 services on Saturdays and 5 services on Sundays.

Road Based Public Transport

The population centres within the study area are reliant on the bus network to a considerable degree with a variety of routes served by Dublin Bus, Bus Éireann, Go Ahead and private operators, as shown in **Figure 4.14**.

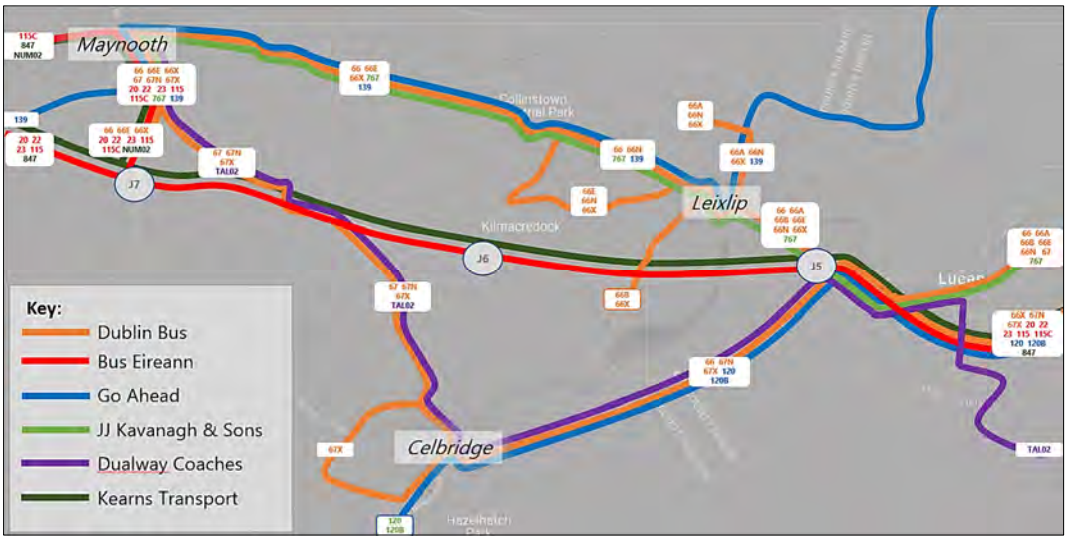

Figure 4.14: Bus Routes within the Study Area (© Google Map data ©2023 Tele Atlas)

- **Dublin Bus Route 66:** Operates from Merrion Square to Maynooth Straffan road via Parkgate Street, Chapelizod, Lucan Village and Leixlip Village with a frequency of up to every 30 minutes.
- **Dublin Bus Route 66a:** Operates from Merrion Square to Leixlip Captains Hill via O Connell Bridge, Parkgate Street, Chapelizod, Liffey Valley Shopping Centre and Lucan Village with a frequency of up to every hour.
- **Dublin Bus Route 66b:** Operates from Merrion Square to Castletown (Hewlett Packard) via O Connell Bridge, Parkgate Street, Chapelizod, Liffey Valley Shopping Centre, Lucan Village and Leixlip Village with a frequency of up to every hour.
- **Dublin Bus Route 66e:** Operates from Merrion Square to Maynooth via Parkgate Street, Chapelizod, Liffey, Lucan Village and Leixlip Village with five services during the weekdays only.
- **Dublin Bus Route 66x:** Operates from UCD Belfield to Maynooth Straffan Road with three services during weekdays only. Operates from UCD Belfield to Captains Hill or Castletown Rd with one service each during the weekdays only. Operates from Westmoreland Street to Straffan Road with two services during weekdays only.
- **Dublin Bus Route 67:** Operates from Merrion Square to Maynooth Straffan road via O'Connell Bridge, Parkgate Street, Chapelizod, Liffey Valley Shopping Centre, Lucan Village and Celbridge with a frequency of up to every 30 minutes. Last service of the day departs from Westmoreland Street.
- **Dublin Bus Route 67x:** Operates from UCD Belfield to Maynooth (via Aghards Road) through Celbridge Salesian College with four services during the weekdays only. Operates from UCD Belfield to Maynooth (via Celbridge Main Street) through Celbridge Salesian College, with two services during the weekdays only. Operates from Westmoreland Street to Maynooth (via Celbridge Main Street) through Celbridge Salesian College with two services during the weekdays only. Operates from Merrion Square to Maynooth (via Celbridge Main Street) through Celbridge Salesian College with one service during the weekdays only. Operates from Merrion Square to Maynooth (via

Aghards Road) through Celbridge Salesian College with one service during the weekdays only.

- **Dublin Bus 66n:** Operates from Westmoreland Street to Leixlip Louisa Bridge via Glen Easton. Night bus with 5 services on Friday and Saturday nights only.
- **Dublin Bus 66n:** Operates from Westmoreland Street to Celbridge/Maynooth. Night bus with 4 services on Friday and Saturday nights only.
- **Bus Eireann 20:** Operates from Dublin Airport to Galway, with five services through Maynooth daily.
- **Bus Eireann 22:** Operates from Dublin Airport/Dublin Busarus to Ballina with seven services through Maynooth daily.
- **Bus Eireann 23:** Operates from Dublin Airport/Dublin Busarus to Sligo with two to three services through Maynooth daily.
- **Bus Eireann 115:** Operates from Dublin Connolly to Mullingar via Maynooth with service frequencies of 30 minutes.
- **Bus Eireann 115C:** Operates from Kilcock to Mullingar with one service through Maynooth daily.
- **Go Ahead 120:** Operates from Dublin Connolly to Edenderry via Celbridge with service frequencies of 30 minutes.
- **JJ Kavanagh & Sons 139:** Operates from Blanchardstown IT to Naas via Leixlip and Maynooth with nine services daily.
- **Kearns:** 847 Operates from Portumna to Dublin Cathal Brugha Street with two service through Maynooth during the weekdays and 2-4 services on the weekend.
- **Kearns:** NUM02 Operates during college term only from Birr to Maynooth.
- **Airport Hopper 767:** Operates from Maynooth to Dublin Airport via Leixlip with service frequencies of 30 minutes.
- **Maynooth TAL02:** Operates from Maynooth to IT Tallaght via Leixlip and Celbridge once daily in each direction.

BusConnects

The BusConnects proposal for weekday midday frequencies for Maynooth and Leixlip are as follows:

- Bus service every 20 to 25 minutes for Maynooth;
- Orbital bus service every 30 minutes for both Maynooth and Leixlip;
- Bus service every 10 to 15 minutes for Leixlip. This is comprised of 2 No. 20 to 25-minute services; and
- Commuter rail service every 30 minutes.

The BusConnects proposal for weekday midday frequencies for Celbridge is as follows:

- Bus service every 20 to 25 minutes;
- 2 No. orbital bus services every 30 minutes; and
- Rail service greater than 30-minute frequencies.

Ports

Dublin Port is the closet port to the Maynooth to Leixlip Project at approximately 35km from the study area. Dublin Port is located either side of the River Liffey, out to its mouth. On the north side of the river, the main part (205 hectares or 510 acres) of the port lies at the end of East Wall and North Wall, from Alexandra Quay. The element of the port on the south side of the river is much smaller (51 hectares or 130 acres) and lies at the beginning of the Poolbeg peninsula. Approximatively two-thirds of Ireland's port traffic travels via Dublin Port, which is by far the busiest on the island of Ireland.

The main activity of the port is freight handling, with a wide range of vessels, from large container carriers to small diesel lighters, visiting daily. Roll-on/roll-off passenger ferry services run regularly across the Irish Sea to Holyhead in Wales, Liverpool in England and in the summer months and at Christmas to the Isle of Man and also Cherbourg in France. Dublin Port is also increasingly a docking point for cruise liners.

Airports

Dublin Weston Airport is located between Celbridge and Lucan, south of Junction 5 Leixlip on approximately 250 acres of land. It is a Class “C” airport. Dublin Weston Airport is Ireland’s only executive airport attracting commercial and economic opportunities within the aerospace sector in Ireland. Dublin Weston Airport is a fully operational public licensed airport with full terminal facilities while also catering for many trainee aviation roles.

Dublin Airport, Irelands largest and busiest airport, is located approximately 25km from the study area, in Collinstown south of Swords. In 2019, approximately 33 million passengers passed through the airport, making it the airport's busiest year on record. It is the 12th busiest airport in Europe.

The airport has an extensive short and medium haul network, served by an array of carriers, as well as a significant long-haul network focused on North America and the Middle East.

4.17.3.6 Quarries

There are currently no active quarries within the study area of the Maynooth to Leixlip Project. The closet active quarries are Rathcore Quarry in Enfield, County Meath and Belgard Quarry in Tallaght, County Dublin although these are both outside of the study area.120There are four historical quarries in the study area.

[120]https://dcenr.maps.arcgis.com/home/webmap/viewer.html?useExisting=1&layers=de18ea08ecd344b88c52b65b55fd9abb [Accessed 15 March 2021]

Refer to Section 4.5 Land and Soils for more information on active and historical quarries within the study area.

4.17.3.7 Other Amenities

There are a number of schools within the study area including Salesian College in Celbridge, Celbridge Community School, Maynooth Educate Together National School and Gaeilscoil Ui Fhiaich. Numerous other schools/ Montessori's/ creches and colleges are located in the vicinity of the study area although not within the study area.

Numerous hotels and guest houses are within the study area including Lucan Spa Hotel, Lucan Lodge Guest House, and Laragh Guesthouse along with numerous B&B's.

There are pitches owned by Maynooth Town Football Club within the study area. A large quantity of GAA, rugby and football pitches are also evident in the vicinity of the study area although not within the study area.

Other amenities within the study area include the Leixlip Reservoir, the River Liffey, and the Royal Canal which cater for angling and kayaking and Lucan Golf Club.

Laraghbryan Cemetery is also located within the study area.

Further amenities including shops, restaurants, fuel stations, business parks and housing estates are located within the study area.

4.17.4 Summary and Conclusions

The purpose of this section is to identify the engineering constraints located within the study area for the Maynooth to Leixlip Project. The natural engineering constraints within the study area include the topography, Rye Water Valley/Carton SAC, Rye Water Valley/Carton pNHA, Ballynafagh Bog SAC, Ballynafagh Lake SAC, Royal Canal pNHA, Grand Canal pHNA and the River Liffey.

The primary infrastructural constraints comprise the existing road network, the Western and the Southern Rail Line. Other constraints within the project in the built environment consist of the urban and residential zones, disused quarries, and a number of amenity areas.

The River Liffey creates a significant risk of seasonal flooding. Consideration of this issue in association with any works or proposals is required, especially in the event of any new river crossing/ outfall point being introduced.

There is an extensive road network within the study area, and this must be observed as a constraint. The railway lines also provide an infrastructural constraint within the study area.

4.17.5 References

Bus Éireann. (2020). *View Timetables*. Available from: https://www.buseireann.ie/. [Accessed 15 March 2021]

Environmental Protection Agency. (2019). *EPA Contours*. Available from: https://dcenr.maps.arcgis.com/home/item.html?id=088740d9f8ad466788fc25e268394656 [Accessed 15 March 2021]

Geological Survey Ireland. (2020). *Active Quarries and Pits Ireland*. Available from: https://dcenr.maps.arcgis.com/home/item.html?id=de18ea08ecd344b88c52b65b55fd9abb [Accessed 15 March 2021]

Geological Survey Ireland. (2019). *APM Pits and Quarries*. Available from: https://dcenr.maps.arcgis.com/home/item.html?id=a205a046a2474e82944f9823b6568ea0 [Accessed 15 March 2021]

Iarnród Éireann. (2020). *Covid-19 Temporary Timetable*. [Accessed 15 March 2021]

Kildare County Council. (2017). *Maynooth Traffic Management Plan*

http://www.dublinport.ie

https://www.dublinairport.com/

4.18 External Parameters

4.18.1 Introduction

In addition to the identification of natural and artificial constraints, various external parameters must also be considered as part of the Constraints Study. These external parameters include:

- Funding and scope;
- Construction phasing;
- Required levels of service;
- Technical standards (design speeds, road type etc.);
- Policy documents; and
- Procedural and legal requirements.

The external parameters which may influence the Maynooth to Leixlip Project are described in detail in this section.

4.18.2 Funding and Scope

Under the Roads Acts 1993 to 2007121, Transport Infrastructure Ireland (TII) in conjunction with the Local Authorities are responsible for the planning, design, and implementation of national roads projects. The M4 has been identified within the National Development Plan (2018 – 2027)122 as a section of the national road network to be progressed through pre-appraisal and early planning from 2018.

As funding is subject to change, TII continuously monitor their commitments to on-going projects. The decision to proceed with the various phases of a project relies on the funding being made available by central government.

Kildare County Council on behalf of itself and South Dublin County Council, under an agreement made pursuant to Section 85 of the Local Government Act 2001, are developing a solution to the existing transportation issues along the M4 corridor between Junction 7 Maynooth and Junction 5 Leixlip. Funding has been provided to take the project through Phases 1 to 4 of the TII Project Management Guidelines (PMG)123. This includes:

- Phase 1 - Concept and Feasibility;
- Phase 2 - Options Selection;

[121] Government of Ireland, Law Reform Commission (2016) Roads Act 1993 REVISED Updated to 8 March 2016. Available from: https://www.lawreform.ie/_fileupload/RevisedActs/WithAnnotations/HTML/EN_ACT_1993_0014.htm [Accessed 15 March 2021]
[122] Government of Ireland, Department of Public Expenditure and Reform (2018) National Development Plan 2018-2027. Available from: https://www.gov.ie/pdf/?file=https://assets.gov.ie/37937/12baa8fe0dcb43a78122fb316dc51277.pdf#page=null [Accessed 15 March 2021]
[123] Transport Infrastructure Ireland (2017) Project Management Guidelines. Available from: https://www.tiipublications.ie/library/PE-PMG-02041-01.pdf [Accessed 15 March 2021]

- Phase 3 - Design and Environmental Evaluation; and
- Phase 4 - Statutory Processes.

4.18.3 Construction Phasing

Construction phasing and sequencing is a key item with any project. Successful site management minimises the length of time for which land disturbing activities are undertaken; essentially one part of the site is graded and completed before construction commences on other parts of the site. As well as planning and scheduling benefits, construction sequencing seeks to minimise the environmental impacts to an area, such as excess sedimentation.

Construction phasing becomes more critical at the interfaces with existing infrastructure. At these locations, sequencing of work would also seek to minimise delay and impact on existing road users throughout the construction of the project. As the study area contains built up, populated areas, the potential to affect a significant number of people is increased. Construction phasing then becomes key in seeking to reduce the amount of delay and nuisance caused to the public and also getting the project completed in a reasonable amount of time.

The project may be broken down into smaller segments, each of which can be completed separately, so that benefits are realised incrementally. More precise details of exact construction sequencing will be developed at detailed design stage. Potential impacts due to any interim construction phasing arrangement will be assessed as part of the Environmental Impact Assessment Report, to be completed under Phase 3 Design and Environmental Evaluation.

4.18.4 Key Performance Indicators

Traditionally, the Level of Service concept was used to determine the quality of a given roads project. However, this measure was developed with the private motor car in mind and with the primary concern of keeping traffic congestion to a minimum.

More recently, the Level of Service concept has evolved to include all road users including pedestrians, cyclists, and public transport users. Levels of Service relating to pedestrians and cyclists include wait time at junctions and actual route lengths in comparison to desire lines. The Level of Service of a public transport system includes wait time, frequency of available services, ease of interchange between different modes, access locations and journey comfort. Many of the specific objectives of the Maynooth to Leixlip Project will ultimately be achieved if existing Levels of Service can be enhanced for all transport users.

Key Performance Indicators (KPI) were identified, and the performance of each option will be assessed against these KPIs to ensure that a robust project which meets the project objectives is delivered.

4.18.5 Technical Standards

4.18.5.1 Roads

Any new national roads, associated link and connector roads and merge/diverge slip roads will be designed in accordance with the National Road Authority Design Manual for Roads and Bridges (NRA DMRB).

Public streets and urban roads will be designed in accordance with the Department of Transport's Design Manual for Urban Roads and Streets (DMURS). Pedestrian facilities will also comply with the guidelines outlined in DMURS.

Internal road networks of residential housing estates will be designed in accordance with "Recommendations for Site Development Works for Housing Areas" by the Department of the Environment and Local Government.

4.18.6 Cycle and Pedestrian Routes

Cyclist facilities, if applicable, will consider the recommendations outlined in the National Transport Authority, National Cycling Manual 2011.

4.18.7 Drainage

The following will be designed in accordance with the requirements of the NRA DMRB:

- Runoff generated from any new road development;
- Upgrades to the existing infrastructure;
- Runoff from catchments which are impacted on by a new road development; and
- Upgrade to the existing infrastructure.

Any public foul sewers impacted on by the works, will be designed in accordance with BS EN 752 "Drain and Sewer Systems Outside Buildings - Sewer System Management" and the Department of the Environment and Local Government "Recommendations for Site Development Works for Housing Areas" and will comply with any particular drainage requirements outlined by the relevant Local Authority as appropriate to the sewer in question.

Public surface water sewers will be designed in accordance with national best practice for drainage Works i.e. Greater Dublin Strategic Drainage Study Regional Drainage Policy Volume 2 – New Development (GDSDS-RDP Volume 2) and will comply with any particular drainage requirements outlined by the relevant Local Authority as appropriate to the sewer in question.

Works involving alteration to significant rivers or streams will be subject to Section 50 approval under the Office of Public Works Arterial Drainage Act 1945.

4.18.8 Structures

The design of structures will be carried out in accordance with the NRA DMRB and relevant Eurocodes. Loading will be applied in accordance with EN 1991- 2: Eurocode 1 - Actions on Structures – Part 2: Traffic loads on bridges and its associated National Annex.

4.18.9 Policy Documents

The M4 Maynooth to Leixlip Project is listed as a section of the transport network to be progressed through pre-appraisal and early planning and prioritised for delivery under the National Development Plan 2018–2027. The network forms part of the Trans-European Transport Network (TEN-T) comprehensive network.

The section of M4/N4 corridor under consideration includes the M4 mainline carriageway from Maynooth to Leixlip and the associated junctions, railway lines, the surrounding road network and any existing and proposed alternative transport modes or routes that provide suitable alternatives to the M4/N4.

4.18.10 Procedural and Legal Requirements

The TII Project Management Guidelines (PE-PMG-02041) outline a procedural framework for the phased approach to the development, management, and delivery of major national road projects in Ireland. The guidelines set out the project phases and describe each of the processes, deliverables and approvals required at each phase throughout the development of a project so that it is delivered in accordance with the 2015 Roads Act. Actions required by Local Authorities, An Bord Pleanála, TII and Consultant Design Teams are listed in the PMG also so that phased scheduling of time and resources are allocated appropriately on the project.

Please note, the PMG are only a guide as to how National Road and Public Transport Capital Projects should progress. Deviations from the guide can be discussed and agreed with TII so to enact the most appropriate elements of the PMG for the project in question.

It is required that the detailed design shall comply with all relevant design standards.

It is a legal requirement that detailed design of the preferred option shall be designed for safety in construction in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2013.

It is a legal requirement to ensure compliance with the various environmental directives.

4.18.11 Summary

While there are various external parameters which are likely to constrain the project, the most notable are the legal constraints as the project must be deliverable within the bounds of the law.

4.18.12 References

TII's online suite of Standards and Technical publications related to national road and light rail networks in Ireland https://www.tiipublications.ie/

Department of Transport's Design Manual for Urban Roads and Streets (DMURS)

4.19 Overall Conclusion

The constraints information gathered and documented within this report is used to inform the development of options for the Maynooth to Leixlip Project and to enable a systematic assessment of the potential impacts associated with these options.

FOR INFORMATION

Legend

- Study Area
- County Boundary
- Ecological Sites
- Lakes
- Watercourses

Notes

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Clients

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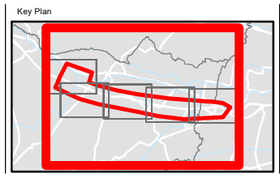
Key Plan



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Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:40,000 @A3
Role	Biodiversity
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

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Drawing Title

Biodiversity Constraints
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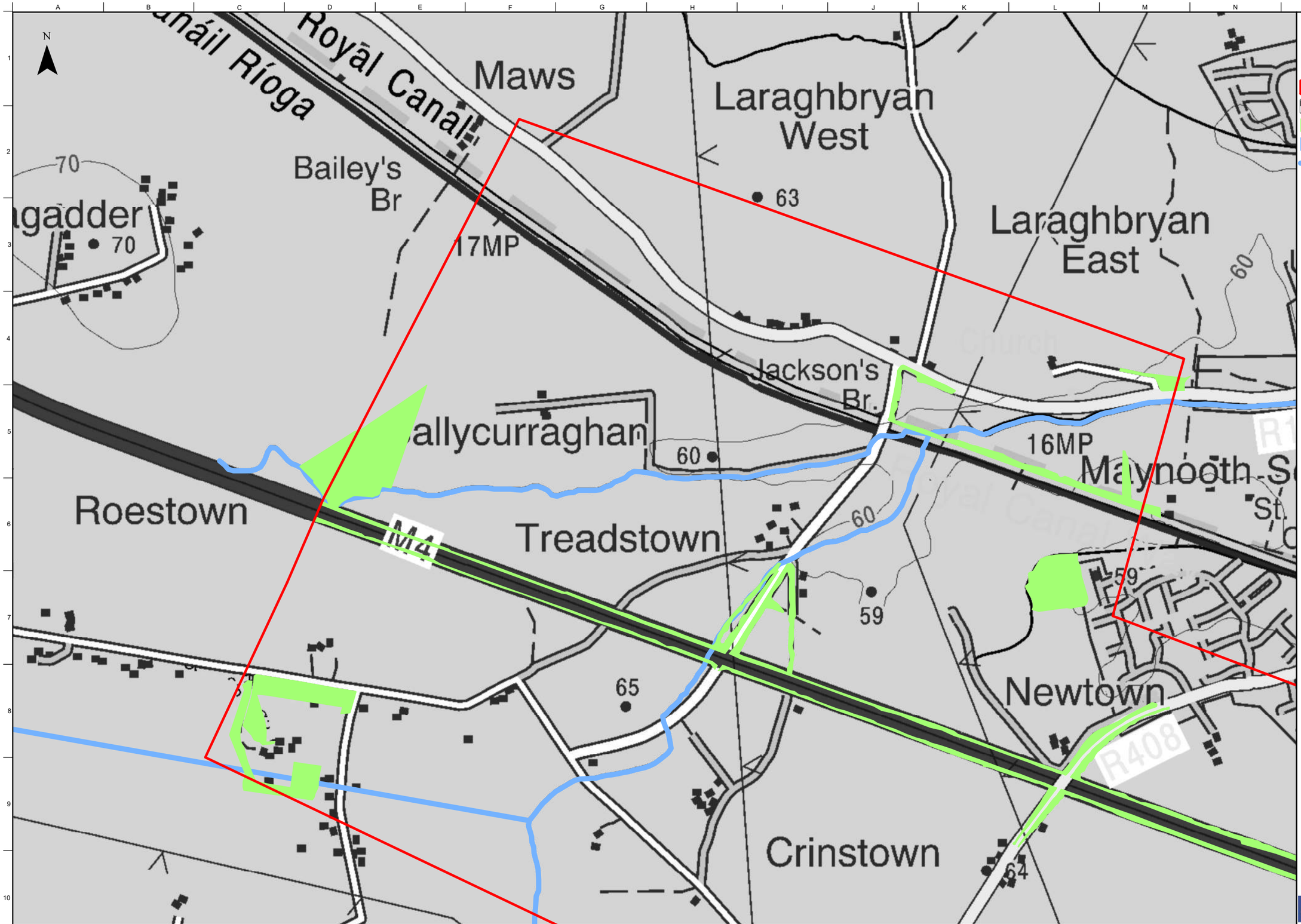

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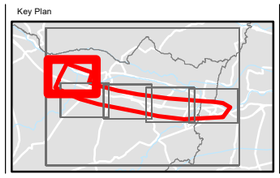

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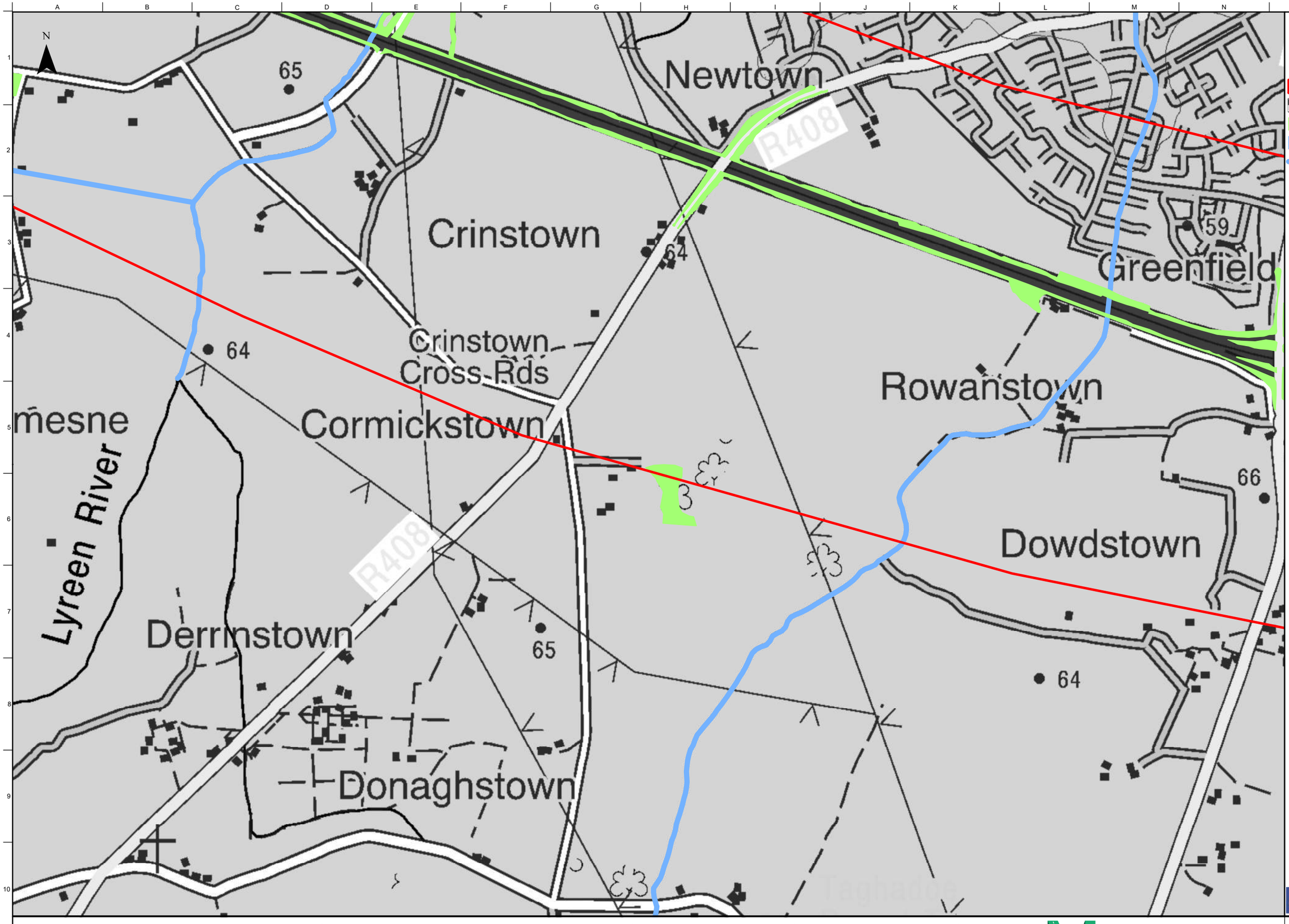

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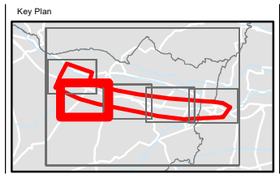

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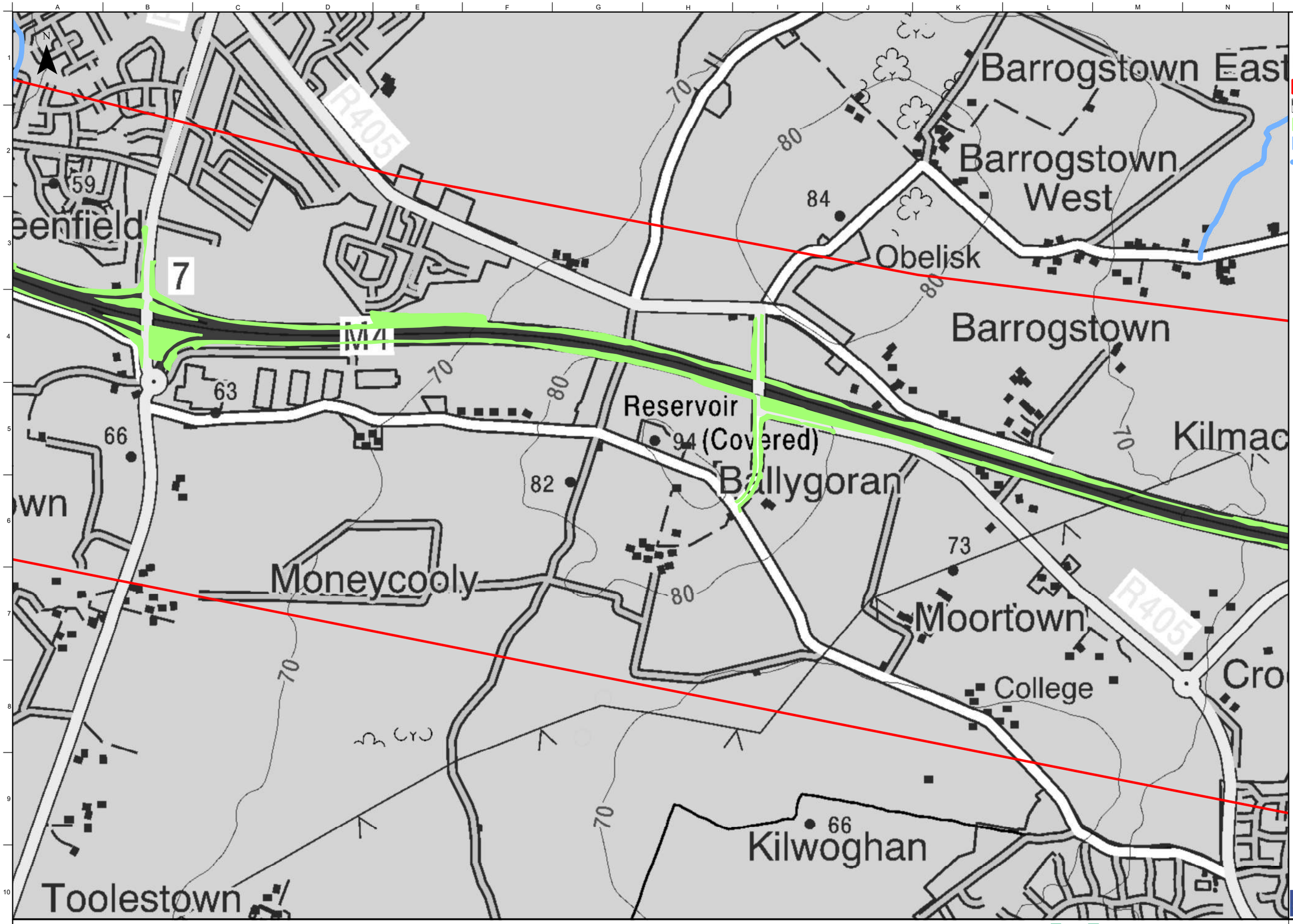

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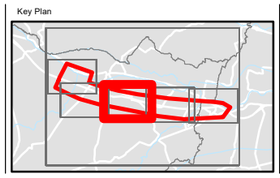

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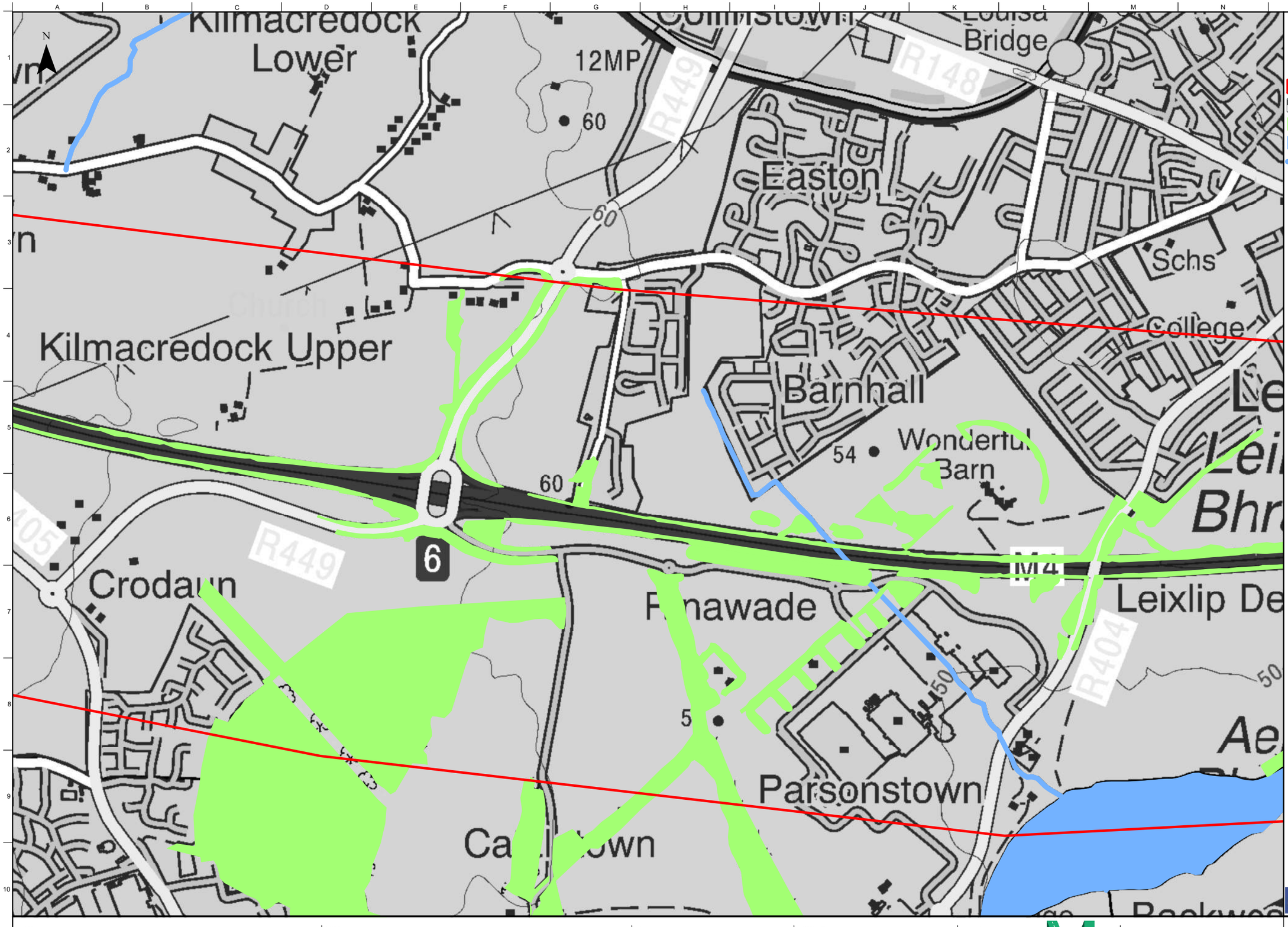

FOR INFORMATION

Legend

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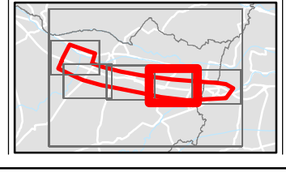

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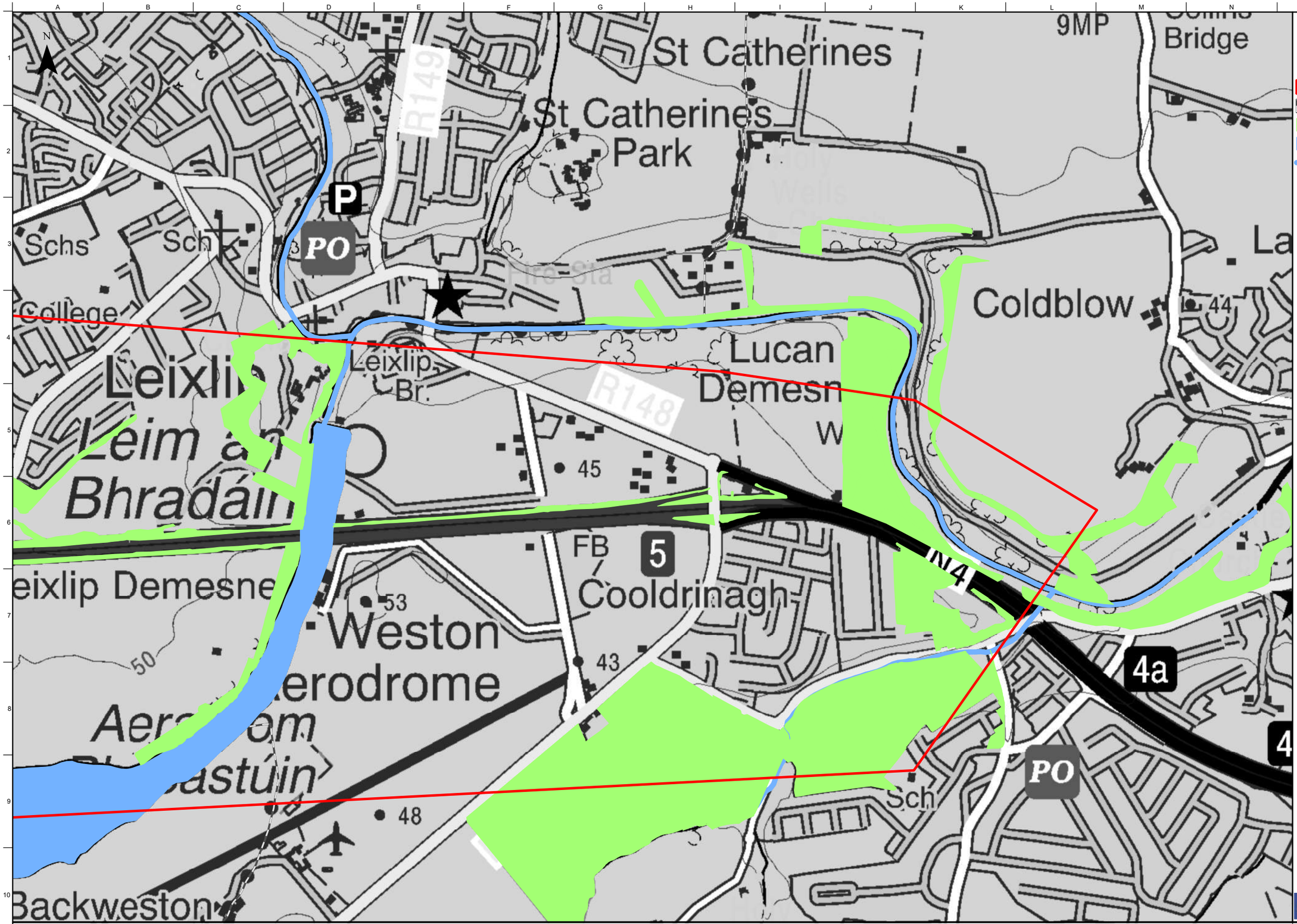

FOR INFORMATION

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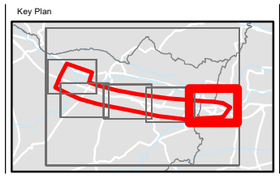

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FOR INFORMATION

Legend

- Study Area
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Designated Sites

- pNHA
- SAC

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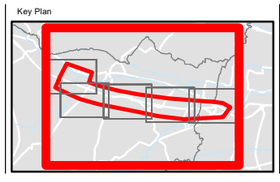

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Biodiversity Constraints
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- pNHA

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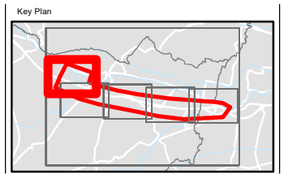

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Biodiversity Constraints
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Job No	Figure ID	Rev.
272691	Figure 4.4.8	P01

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272691-ARUP-02-OS-DR-YEBIO-000011

Do not scale

FOR INFORMATION

Legend

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Designated Sites

- pNHA

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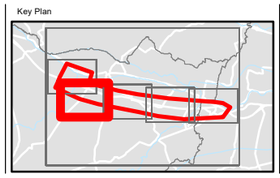
Key Plan



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Do not scale

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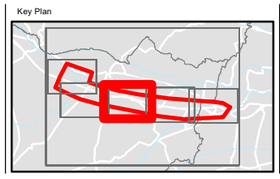
Clients

Tionscadal Éireann Project Ireland 2040 | TII Bonneagar Iompair Éireann Transport Infrastructure Ireland | An Roinn Iompair Department of Transport | Comhairle Contae Átha Cliath Theas South Dublin County Council | KILDARE nro National Roads Office | Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Biodiversity
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title

Biodiversity Constraints
Designated Sites
Sheet 4 of 6

Suitability: S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.4.10	P01

Drawing No: 272691-ARUP-02-OS-DR-YEBIO-000013

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary
- Lakes
- Watercourses

Designated Sites

- pNHA
- SAC

Notes

Disclaimer Note:
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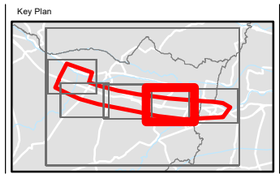
Clients

Tionscadal Éireann Project Ireland 2040 | TII Bonneagar Iompair Éireann Transport Infrastructure Ireland | An Roinn Iompair Department of Transport | Comhairle Contae Átha Cliath Theas South Dublin County Council | Kildare nro National Roads Office | Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title
Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Biodiversity
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL
S2 - For Information				

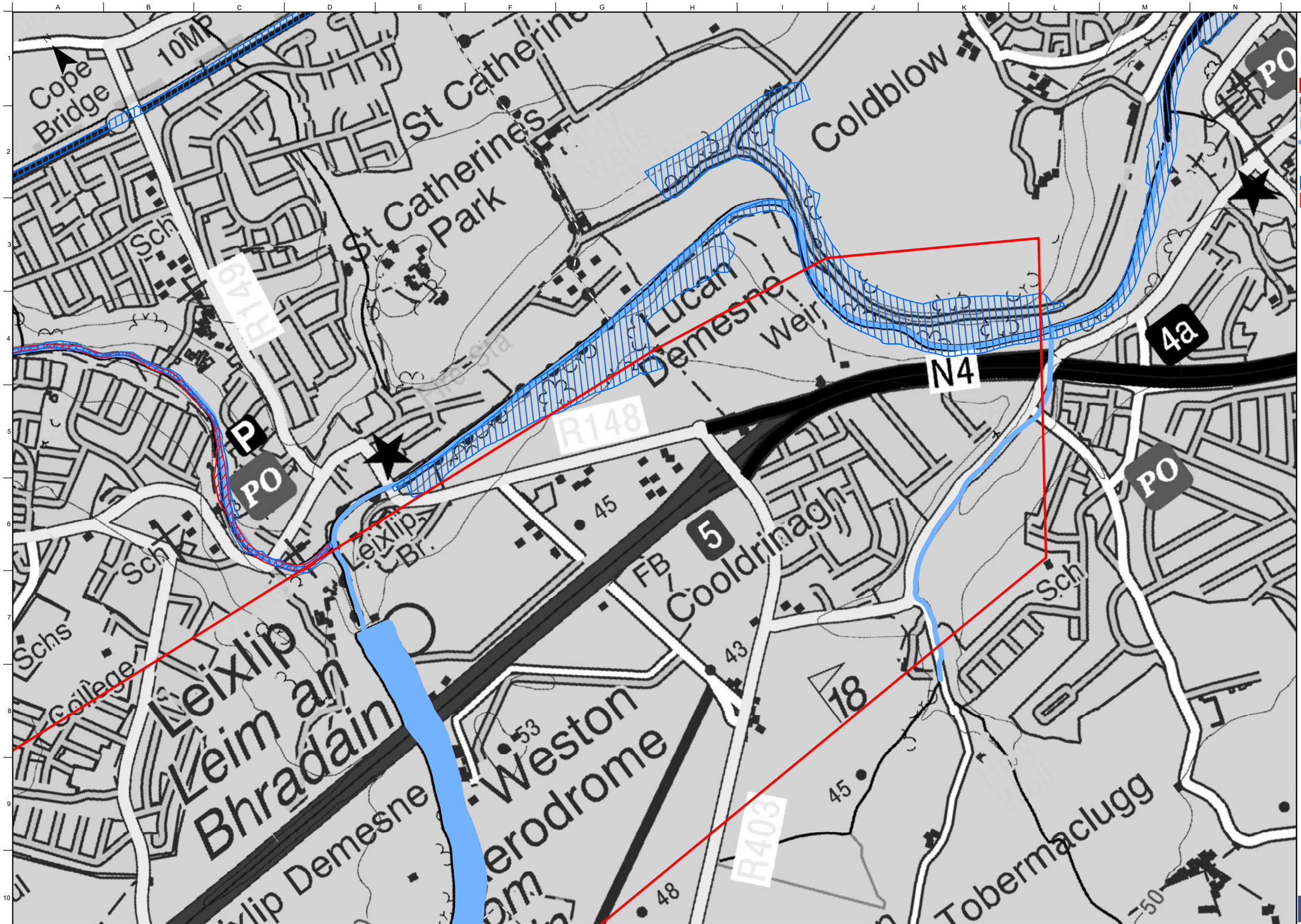
Drawing Title
Biodiversity Constraints
Designated Sites
Sheet 5 of 6

Suitability
S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.4.11	P01

Drawing No
272691-ARUP-02-OS-DR-YEBIO-000014

Do not scale



FOR INFORMATION

Legend

- Study Area
- County Boundary
- Lakes
- Watercourses

Designated Sites

- pNHA
- SAC

Notes

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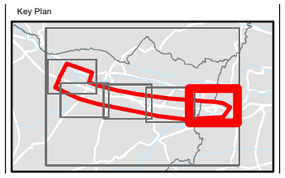
Clients

Tionscadal Éireann Project Ireland 2040 | TII Transport Infrastructure Ireland | An Roinn Iompair Department of Transport | Comhairle Contae Átha Cliath Theas South Dublin County Council | KILDARE nro National Roads Office | Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title
Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Biodiversity
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL
S2 - For Information				

Drawing Title
Biodiversity Constraints
Designated Sites
Sheet 6 of 6

Suitability
S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.4.12	P01

Drawing No
272691-ARUP-02-OS-DR-YEBIO-000015

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary

Teagasc Soils

- AeoUND
- AlluvMIN
- AlluvMRL
- AminDW
- AminPD
- AminPDPT
- AminSP
- AminSPPT
- AminSRPT
- AminSW
- BktPt
- BminDW
- BminPD
- BminPDPT
- BminSP
- BminSPPT
- BminSRPT
- BminSW
- Cut
- FenPt
- Lac
- Made
- MarSands
- MarSed
- RsPt
- Scree
- Swamp
- Water

Notes

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Clients

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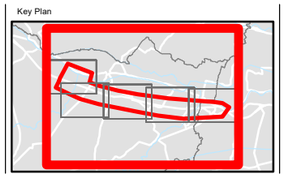
Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:40,000 @A3
Role	Land and Soils
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title

Soils and Geological Constraints
Soils Deposit Map
Sheet 1 of 6

Suitability
S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.5.1	P01

Drawing No
272691-ARUP-02-OS-DR-YEGEO-000001

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary

Teagasc Soils

- AeoUND
- AlluvMIN
- AlluvMRL
- AminDW
- AminPD
- AminPDPT
- AminSP
- AminSPPT
- AminSRPT
- AminSW
- BktPt
- BminDW
- BminPD
- BminPDPT
- BminSP
- BminSPPT
- BminSRPT
- BminSW
- Cut
- FenPt
- Lac
- Made
- MarSands
- MarSed
- RsPt
- Scree
- Swamp
- Water

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Clients

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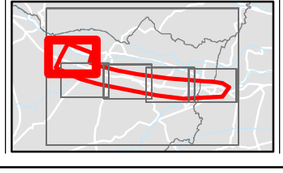
Key Plan



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Job Title
Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Land and Soils
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL
S2 - For Information				

Drawing Title
Soils and Geological Constraints
Soils Deposit Map
Sheet 2 of 6

Suitability
S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.5.2	P01

Drawing No
272691-ARUP-02-OS-DR-YEGEO-000002

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary

Teagasc Soils

- AeoUND
- AlluvMIN
- AlluvMRL
- AminDW
- AminPD
- AminPDPT
- AminSP
- AminSPPT
- AminSRPT
- AminSW
- BktPt
- BminDW
- BminPD
- BminPDPT
- BminSP
- BminSPPT
- BminSRPT
- BminSW
- Cut
- FenPt
- Lac
- Made
- MarSands
- MarSed
- RsPt
- Scree
- Swamp
- Water

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Clients

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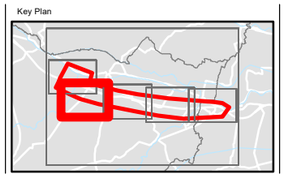
Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale 1:10,000 @A3

Role Land and Soils

Date 29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title

Soils and Geological Constraints
Soils Deposit Map
Sheet 3 of 6

Suitability S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.5.3	P01

Drawing No 272691-ARUP-02-OS-DR-YEGEO-000003

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary

Teagasc Soils

- AeoUND
- AlluvMIN
- AlluvMRL
- AminDW
- AminPD
- AminPDPT
- AminSP
- AminSPPT
- AminSRPT
- AminSW
- BktPt
- BminDW
- BminPD
- BminPDPT
- BminSP
- BminSPPT
- BminSRPT
- BminSW
- Cut
- FenPt
- Lac
- Made
- MarSands
- MarSed
- RsPt
- Scree
- Swamp
- Water

Notes

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Clients

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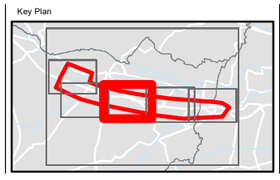
Key Plan



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Job Title
Maynooth to Leixlip Project
MAYNOOTH TO LEIXLIP PROJECT

Scale 1:10,000 @A3
Role Land and Soils
Date 29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title
Soils and Geological Constraints
Soils Deposit Map
Sheet 4 of 6

Suitability
S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.5.4	P01

Drawing No
272691-ARUP-02-OS-DR-YEGEO-000004

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary

Teagasc Soils

- AeoUND
- AlluvMIN
- AlluvMRL
- AminDW
- AminPD
- AminPDPT
- AminSP
- AminSPPT
- AminSRPT
- AminSW
- BktPt
- BminDW
- BminPD
- BminPDPT
- BminSP
- BminSPPT
- BminSRPT
- BminSW
- Cut
- FenPt
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- RsPt
- Scree
- Swamp
- Water

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Clients

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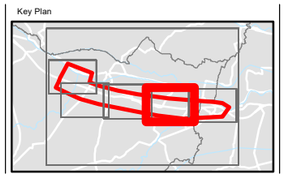
Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Land and Soils
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title

Soils and Geological Constraints
Soils Deposit Map
Sheet 5 of 6

Suitability: S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.5.5	P01

Drawing No: 272691-ARUP-02-OS-DR-YEGEO-000005

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary

Teagasc Soils

- AeoUND
- AlluvMIN
- AlluvMRL
- AminDW
- AminPD
- AminPDPT
- AminSP
- AminSPPT
- AminSRPT
- AminSW
- BktPt
- BminDW
- BminPD
- BminPDPT
- BminSP
- BminSPPT
- BminSRPT
- BminSW
- Cut
- FenPt
- Lac
- Made
- MarSands
- MarSed
- RsPt
- Scree
- Swamp
- Water

Notes

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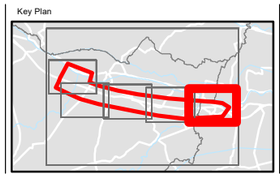
Clients

Tionscadal Éireann Project Ireland 2040 | Bonneagar Iompair Éireann Transport Infrastructure Ireland | An Roinn Iompair Department of Transport | Comhairle Contae Átha Cliath Theas South Dublin County Council | KILDARE nro NATIONAL ROADS OFFICE | Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title
Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Land and Soils
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title
Soils and Geological Constraints
Soils Deposit Map
Sheet 6 of 6

Suitability
S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.5.6	P01

Drawing No
272691-ARUP-02-OS-DR-YEGEO-000006

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary

Quaternary Sediments

- A, Alluvium
- Ag, Alluvium (gravelly)
- BasEsk, Eskers comprised of gravels of basic reaction
- Cut, Cut over raised peat
- GLs, Gravels derived from Limestones
- L, Lacustrine sediments
- Rck, Bedrock outcrop or subcrop
- TLs, Till derived from limestones
- Urban
- Water

Meltwater Landforms

- Esker ridge
- Meltwater channel

Subglacial Lineation (Large)

- Crag-and-Tail
- Drumlin
- Streamlined Bedrock

Subglacial Lineation Striae

- Striae

Deglacial Landform

- Glaciofluvial Terrace
- Hummocky Sand and Gravel

Geotechnical Boreholes

- Geotechnical Boreholes

Notes

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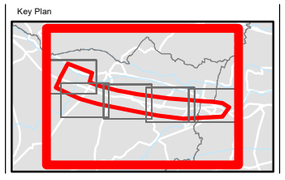
Clients

Tionscadal Éireann Project Ireland 2040 | TII Bonneagar Iompair Éireann Transport Infrastructure Ireland | An Roinn Iompair Department of Transport | Comhairle Contae Átha Cliath Theas South Dublin County Council | KILDARE nro National Roads Office | Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:40,000 @A3
Role	Land and Soils
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title

Soils and Geological Constraints
Subsoil Deposits Map
Sheet 1 of 6

Suitability: S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.5.7	P01

Drawing No: 272691-ARUP-02-OS-DR-YEGEO-000010

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary

Quaternary Sediments

- A, Alluvium
- L, Lacustrine sediments
- Rck, Bedrock outcrop or subcrop
- TLs, Till derived from limestones
- Urban

Notes

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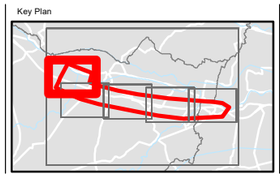
Clients

Tionscadal Éireann Project Ireland 2040
Bonneagar Iompair Éireann Transport Infrastructure Ireland
An Roinn Iompair Department of Transport
Comhairle Contae Átha Cliath Theas South Dublin County Council
KILDARE nro NATIONAL ROADS OFFICE
Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title
Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale 1:10,000 @A3

Role Land and Soils

Date 29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title
Soils and Geological Constraints
Subsoil Deposits Map
Sheet 2 of 6

Suitability
S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.5.8	P01

Drawing No
272691-ARUP-02-OS-DR-YEGEO-000011

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary

Quaternary Sediments

- A, Alluvium
- BasEsk, Eskers comprised of gravels of basic reaction
- L, Lacustrine sediments
- Rck, Bedrock outcrop or subcrop
- TLs, Till derived from limestones
- Urban

Meltwater Landforms

- Esker ridge

Notes

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Clients

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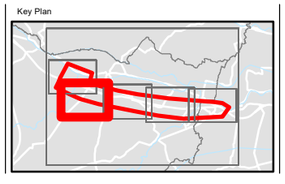
Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Land and Soils
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL
S2 - For Information				

Drawing Title

Soils and Geological Constraints
Subsoil Deposits Map
Sheet 3 of 6

Suitability: S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.5.9	P01

Drawing No: 272691-ARUP-02-OS-DR-YEGEO-000012

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary

Quaternary Sediments

- Cut, Cut over raised peat
- Rck, Bedrock outcrop or subcrop
- TLs, Till derived from limestones
- Urban

Subglacial Lineation (Large)

- Streamlined Bedrock

Notes

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Clients

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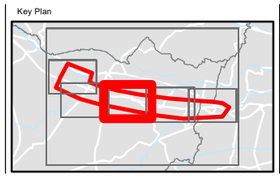
Key Plan



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Job Title
Maynooth to Leixlip Project

MAYNOOTH TÓ LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Land and Soils
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title
Soils and Geological Constraints
Subsoil Deposits Map
Sheet 4 of 6

Suitability
S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.5.10	P01

Drawing No
272691-ARUP-02-OS-DR-YEGEO-000013

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary

Quaternary Sediments

- A, Alluvium
- Rck, Bedrock outcrop or subcrop
- TLs, Till derived from limestones
- Urban
- Water

Subglacial Lineation (Large)

- Streamlined Bedrock

Geotechnical Boreholes

- Geotechnical Boreholes

Notes

Disclaimer Note:
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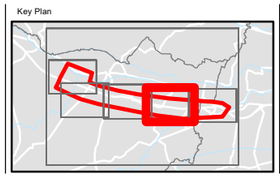
Clients

Tionscadal Éireann Project Ireland 2040 | Transport Infrastructure Ireland | An Roinn Iompair Department of Transport | Comhairle Contae Átha Cliath Theas South Dublin County Council | KILDARE nro NATIONAL ROADS OFFICE | Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Land and Soils
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title

Soils and Geological Constraints
Subsoil Deposits Map
Sheet 5 of 6

Suitability: S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.5.11	P01

Drawing No: 272691-ARUP-02-OS-DR-YEGEO-000014

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary

Quaternary Sediments

- A, Alluvium
- Ag, Alluvium (gravelly)
- GLs, Gravels derived from Limestones
- Rck, Bedrock outcrop or subcrop
- TLs, Till derived from limestones
- Urban
- Water

Meltwater Landforms

- Meltwater channel

Subglacial Lineation (Large)

- Streamlined Bedrock

Deglacial Landform

- Glaciofluvial Terrace

Geotechnical Boreholes

- Geotechnical Boreholes

Notes

Disclaimer Note:
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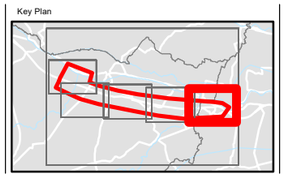
Clients

Tionscadal Éireann Project Ireland 2040
Bonneagar Iompair Éireann Transport Infrastructure Ireland
An Roinn Iompair Department of Transport
Comhairle Contae Átha Cliath Thiar South Dublin County Council
KILDARE nro NATIONAL ROADS OFFICE
Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title
Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Land and Soils
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title
Soils and Geological Constraints
Subsoil Deposits Map
Sheet 6 of 6

Suitability
S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.5.12	P01

Drawing No
272691-ARUP-02-OS-DR-YEGEO-000015

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary

Bedrock Outcrop

- Bedrock Outcrop

Bedrock Geology

- Boston Hill Formation
- Lucan Formation
- Tober Colleen Formation
- Waulsortian Limestones

Structural Symbols (Bedrock)

- Strike and dip of bedding, right way up

Geological Linework

- Anticlinal axis
- Fault

Notes

Disclaimer Note:
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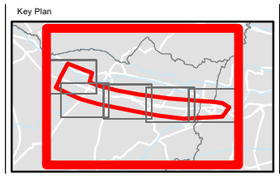
Clients

Tionscadal Éireann 2040 | Project Ireland 2040
TII Bonneagar Iompair Éireann Transport Infrastructure Ireland
An Roinn Iompair Department of Transport
Comhairle Contae Átha Cliath Theas South Dublin County Council
KILDARE nro NATIONAL ROADS OFFICE
Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:40,000 @A3
Role	Land and Soils
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title

Soils and Geological Constraints
Bedrock Geology Map
Sheet 1 of 6

Suitability
S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.5.13	P01

Drawing No
272691-ARUP-02-OS-DR-YEGEO-000020

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary

Bedrock Outcrop

- Bedrock Outcrop

Bedrock Geology

- Lucan Formation
- Tober Colleen Formation
- Waulsortian Limestones

Structural Symbols (Bedrock)

- Strike and dip of bedding, right way up

Geological Linework

- Fault

Notes

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Clients

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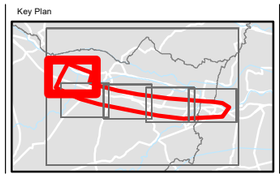
Key Plan



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MAYNOOTH TO LEIXLIP PROJECT

Scale 1:10,000 @A3
Role Land and Soils
Date 29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

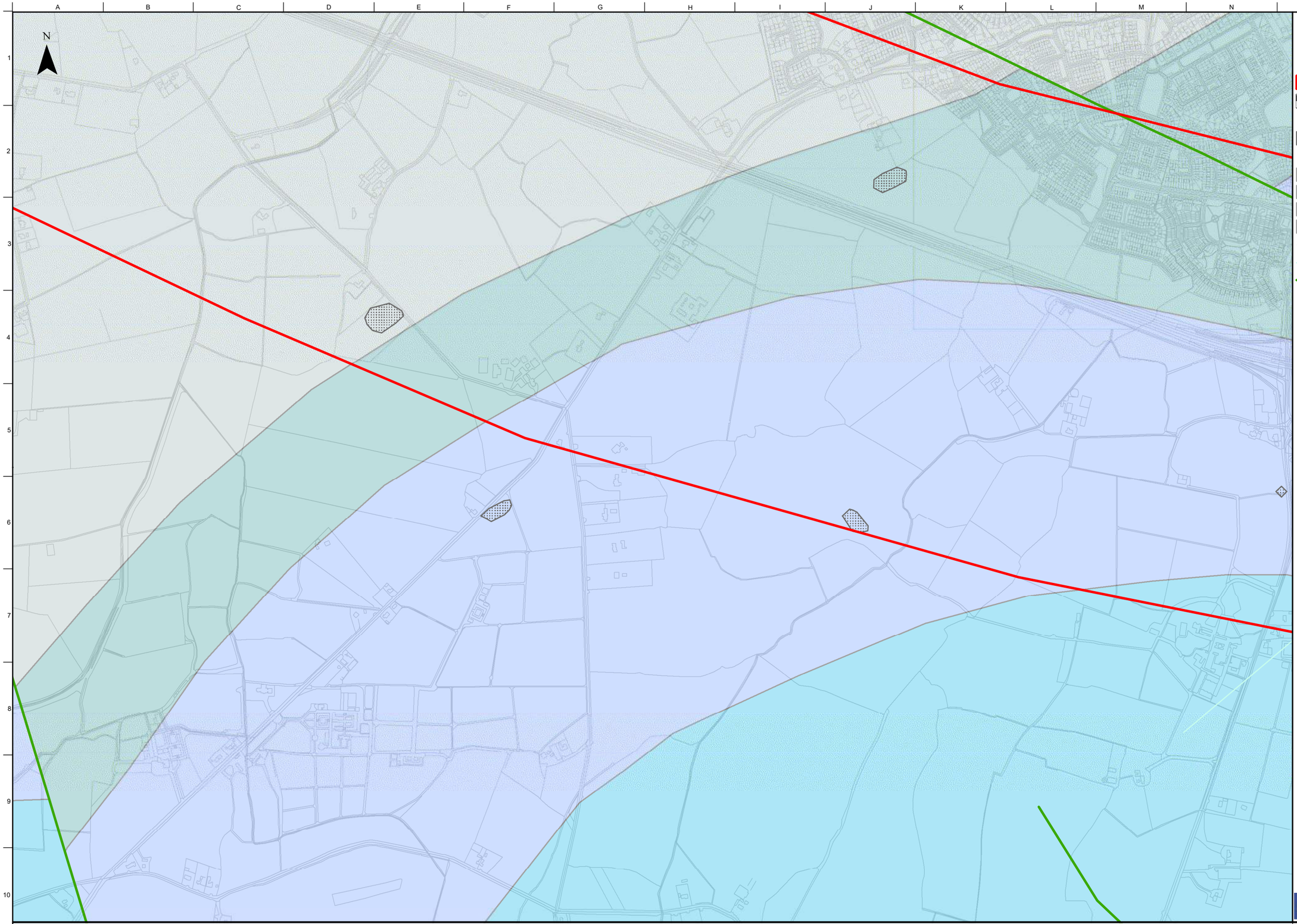
Drawing Title
Soils and Geological Constraints
Bedrock Geology Map
Sheet 2 of 6

Suitability
S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.5.14	P01

Drawing No
272691-ARUP-02-OS-DR-YEGEO-000021

Do not scale



Notes

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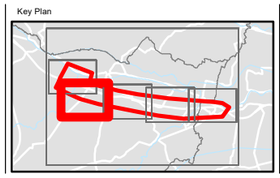
Clients

Tionscadal Éireann Project Ireland 2040
Transport Infrastructure Ireland
An Roinn Iompair Department of Transport
Comhairle Contae Átha Cliath Theas South Dublin County Council
KILDARE nro NATIONAL ROADS OFFICE
Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Land and Soils
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title

Soils and Geological Constraints
Bedrock Geology Map
Sheet 3 of 6

Suitability
S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.5.15	P01

Drawing No
272691-ARUP-02-OS-DR-YEGEO-000022

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary

Bedrock Outcrop

- Bedrock Outcrop

Bedrock Geology

- Boston Hill Formation
- Lucan Formation
- Tober Colleen Formation
- Waulsortian Limestones

Structural Symbols (Bedrock)

- Strike and dip of bedding, right way up

Geological Linework

- Anticlinal axis
- Fault

Notes

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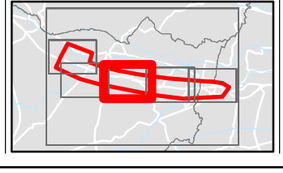
Clients

Tionscadal Éireann Project Ireland 2040 | TII Transport Infrastructure Ireland | An Roinn Iompair Department of Transport | Comhairle Contae Átha Cliath Theas South Dublin County Council | Kildare NRO National Roads Office | Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Land and Soils
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title

Soils and Geological Constraints
Bedrock Geology Map
Sheet 4 of 6

Suitability: S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.5.16	P01

Drawing No: 272691-ARUP-02-OS-DR-YEGEO-000023

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary

Bedrock Outcrop

- Bedrock Outcrop

Bedrock Geology

- Lucan Formation

Structural Symbols (Bedrock)

- Strike and dip of bedding, right way up

Geological Linework

- Fault

Notes

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Clients

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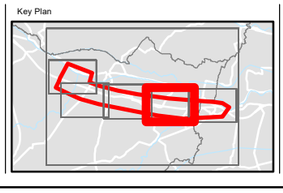
Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Land and Soils
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title

Soils and Geological Constraints
Bedrock Geology Map
Sheet 5 of 6

Suitability: S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.5.17	P01

Drawing No: 272691-ARUP-02-OS-DR-YEGEO-000024

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary

Bedrock Outcrop

- Bedrock Outcrop

Bedrock Geology

- Lucan Formation

Structural Symbols (Bedrock)

- Strike and dip of bedding, right way up

Geological Linework

- Fault

Notes

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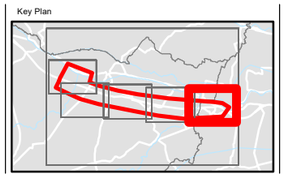
Clients

Tionscadal Éireann Project Ireland 2040 | Transport Infrastructure Ireland | An Roinn Iompair Department of Transport | Comhairle Contae Átha Cliath Theas South Dublin County Council | National Roads Office | Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Land and Soils
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title

Soils and Geological Constraints
Bedrock Geology Map
Sheet 6 of 6

Suitability: S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.5.18	P01

Drawing No: 272691-ARUP-02-OS-DR-YEGEO-000025

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary
- Historic Pits/Quarries
- KCC Absraction Points
- Unverified Boreholes
- Waste Facility Permit
- Soft Ground Areas
- Industrial Emisson Licencing
- Urban Waste Water Treatment (UWWT) Plant Location
- Integrated Pollution Control (IPC) Site
- Geological Heritage Site
- Historic Industrial Sites

Mineral Locations

- Non-metallic

P0286
P0229

Notes

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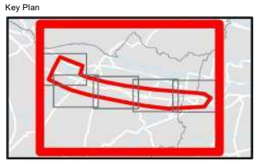
Clients

Tionscadal Éireann Project Ireland 2040 | TII Bonneagar Iompair Éireann Transport Infrastructure Ireland | An Roinn Iompair Department of Transport | Comhairle Contae Átha Cliath Thiar South Dublin County Council | Kildare NRO National Roads Office | Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:40,000 @A3
Role	Land and Soils
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title

Geological Constraints Map

Sheet 1 of 6

Suitability

S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.5.19	P01

Drawing No

272691-ARUP-02-OS-DR-YEGEO-000030

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary
- Soft Ground Areas

Notes

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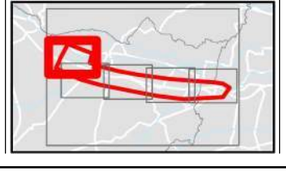
Clients

Tionscadal Éireann 2040 | TII Transport Infrastructure Ireland | An Roinn Iompair Department of Transport | Comhairle Contae Átha Cliath Theas South Dublin County Council | Kildare Nro National Roads Office | Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Land and Soils
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL
S2 - For Information				

Drawing Title

Geological Constraints Map

Sheet 2 of 6

Suitability
S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.5.20	P01

Drawing No
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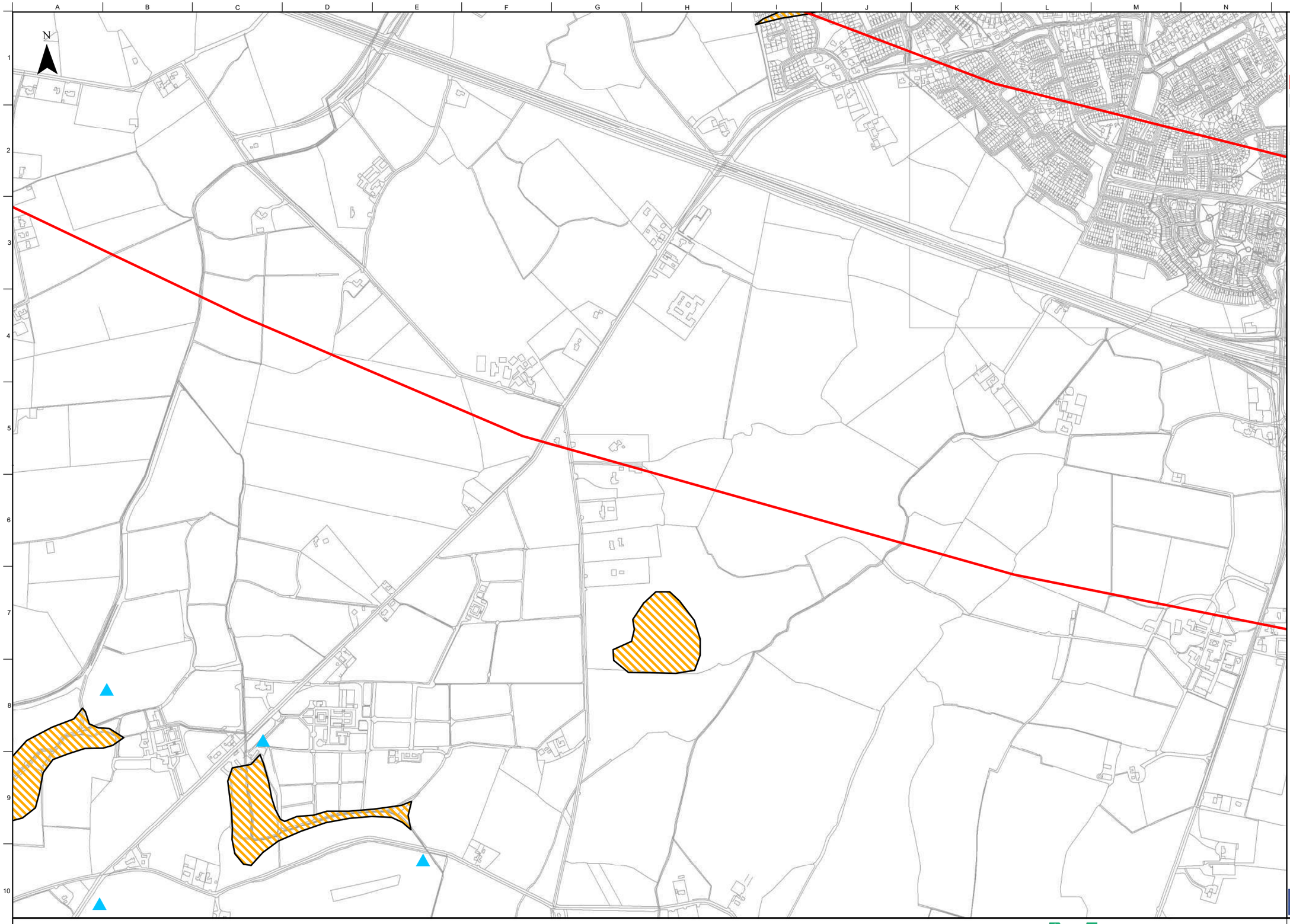
Do not scale



Notes

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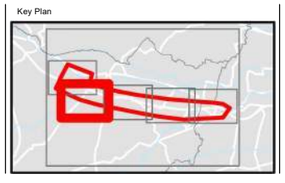
Clients

Tionscadal Éireann 2040 | TII Bonneagar Iompair Éireann | An Roinn Iompair Department of Transport | Comhairle Contae Átha Cliath Theas South Dublin County Council | KILDARE nro National Roads Office | Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title
Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Land and Soils
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL
S2 - For Information				

Drawing Title
Geological Constraints Map

Sheet 3 of 6

Suitability
S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.5.21	P01

Drawing No
272691-ARUP-02-OS-DR-YEGEO-000032

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary
- Historic Pits/Quarries
- Soft Ground Areas

Notes

Disclaimer Note:
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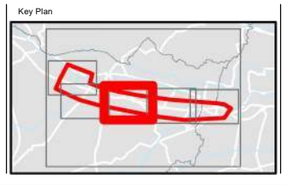
Clients

Tionscadal Éireann Project Ireland 2040
TII Bonneagar Iompair Eireann
An Roinn Iompair Department of Transport
Comhairle Contae Átha Cliath Theas South Dublin County Council
KILDARE nro NATIONAL ROADS OFFICE
Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Land and Soils
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL
S2 - For Information				

Drawing Title

Geological Constraints Map

Sheet 4 of 6

Suitability
S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.5.22	P01

Drawing No
272691-ARUP-02-OS-DR-YEGEO-000033

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary
- Historic Pits/Quarries
- Soft Ground Areas
- Industrial Emisson Licencing
- Geological Heritage Site

Notes

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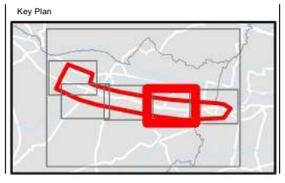
Clients

Tionscadal Éireann Project Ireland 2040 | Transport Infrastructure Ireland | An Roinn Iompair Department of Transport | Comhairle Contae Átha Cliath Theas South Dublin County Council | KILDARE nro National Roads Office | Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Land and Soils
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title

Geological Constraints Map

Sheet 5 of 6

Suitability

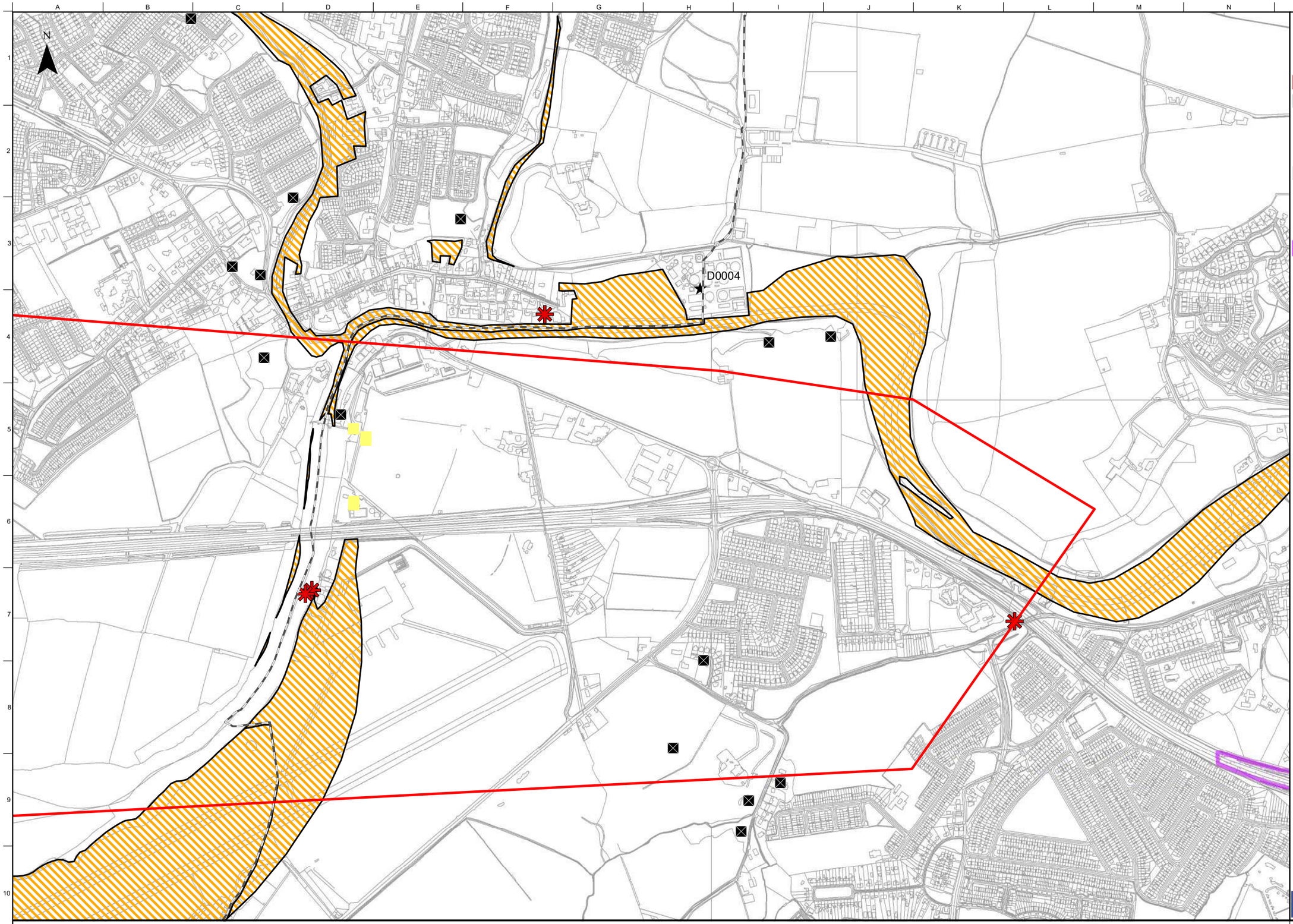
S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.5.23	P01

Drawing No

272691-ARUP-02-OS-DR-YEGEO-000034

Do not scale



FOR INFORMATION

Legend

- Study Area
- County Boundary
- Historic Pits/Quarries
- KCC Absraction Points
- Soft Ground Areas
- Urban Waste Water Treatment (UWWT) Plant Location
- Geological Heritage Site
- Historic Industrial Sites

Notes

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Clients

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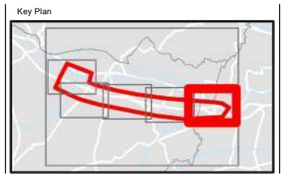
Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Land and Soils
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL
S2 - For Information				

Drawing Title

Geological Constraints Map

Sheet 6 of 6

Suitability
S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.5.24	P01

Drawing No
272691-ARUP-02-OS-DR-YEGEO-000035

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary

Groundwater Vulnerability

- Rock at or near Surface or Karst
- Extreme
- High
- Moderate
- Low
- Water

Notes

Disclaimer Note:
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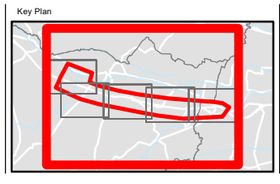
Clients

Tionscadal Éireann Project Ireland 2040 | TII Bonneagar Iompair Éireann Transport Infrastructure Ireland | An Roinn Iompair Department of Transport | Comhairle Contae Átha Cliath Theas South Dublin County Council | KILDARE nro National Roads Office | Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title
Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:40,000 @A3
Role	Hydrogeological
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title
Hydrogeological Constraints
Aquifer Vulnerability Mapping
Sheet 1 of 6

Suitability
S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.6.1	P01

Drawing No
272691-ARUP-02-OS-DR-YEHYG-000001

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary

Groundwater Vulnerability

- Rock at or near Surface or Karst
- Extreme
- High
- Moderate

Notes

Disclaimer Note:
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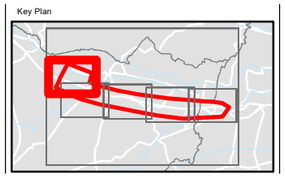
Clients

Tionscadal Éireann Project Ireland 2040 | Transport Infrastructure Ireland | An Roinn Iompair Department of Transport | Comhairle Contae Átha Cliath Thiar South Dublin County Council | Kildare Roads | Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale 1:10,000 @A3

Role Hydrogeological

Date 29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title

Hydrogeological Constraints
Aquifer Vulnerability Mapping
Sheet 2 of 6

Suitability

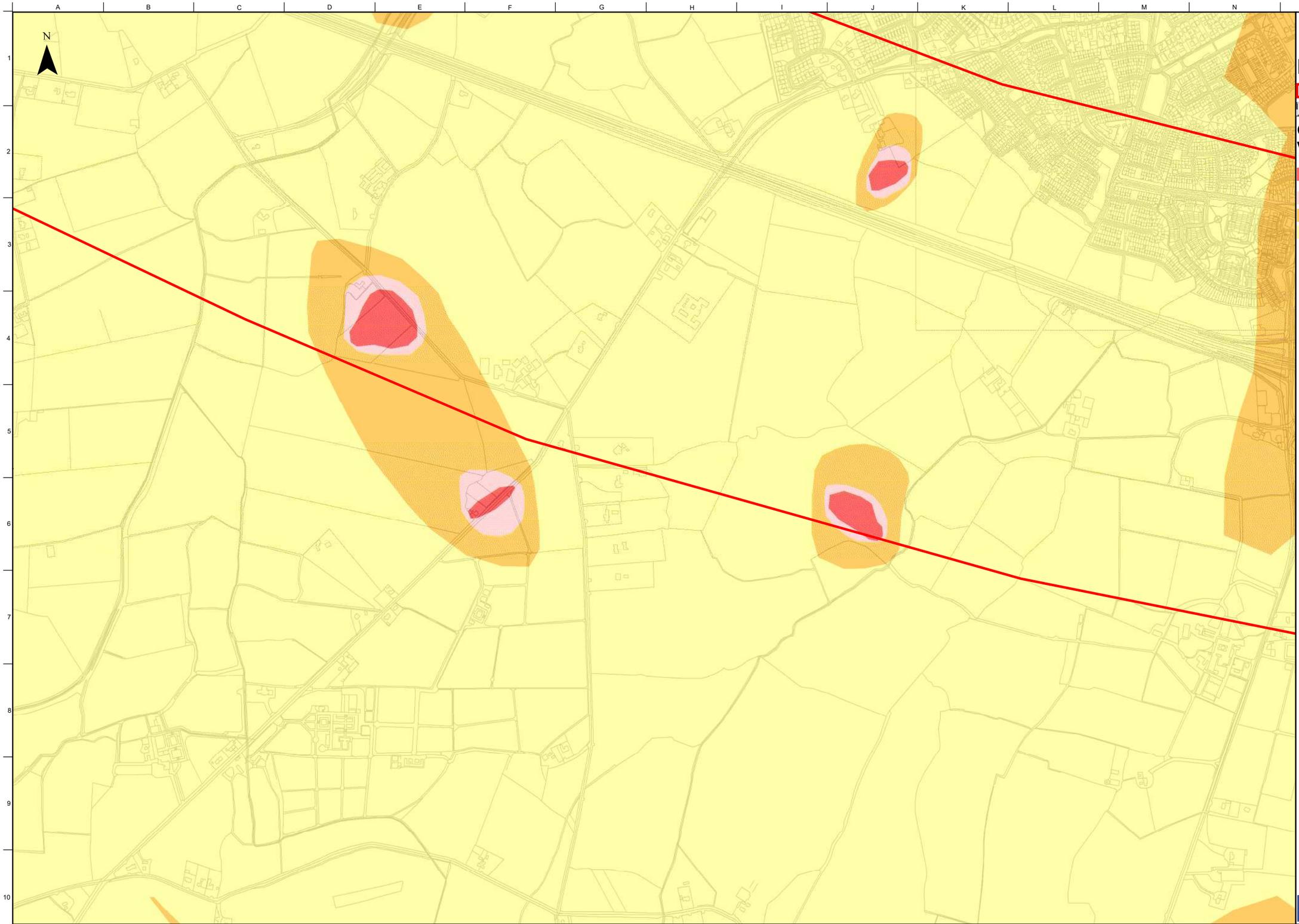
S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.6.2	P01

Drawing No

272691-ARUP-02-OS-DR-YEHYG-000002

Do not scale



Notes

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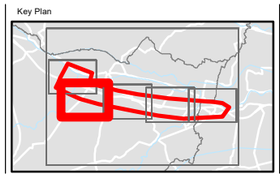
Clients

Tionscadal Éireann Project Ireland 2040
Transport Infrastructure Ireland
An Roinn Iompair Department of Transport
Comhairle Contae Átha Cliath Theas South Dublin County Council
National Roads Office
Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title
Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Hydrogeological
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title
Hydrogeological Constraints
Aquifer Vulnerability Mapping
Sheet 3 of 6

Suitability
S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.6.3	P01

Drawing No
272691-ARUP-02-OS-DR-YEHYG-000003

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary

Groundwater Vulnerability

- Rock at or near Surface or Karst
- Extreme
- High
- Moderate

Notes

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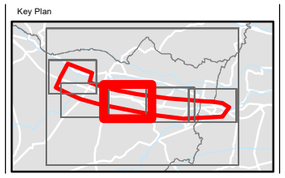
Clients

Tionscadal Éireann Project Ireland 2040 | TII Bonneagar Iompair Éireann Transport Infrastructure Ireland | An Roinn Iompair Department of Transport | Comhairle Contae Átha Cliath Thiar South Dublin County Council | KILDARE nro National Roads Office | Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Hydrogeological
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title

Hydrogeological Constraints
Aquifer Vulnerability Mapping
Sheet 4 of 6

Suitability: S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.6.4	P01

Drawing No: 272691-ARUP-02-OS-DR-YEHYG-000004

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary

Groundwater Vulnerability

- Rock at or near Surface or Karst
- Extreme
- High
- Moderate
- Water

Notes

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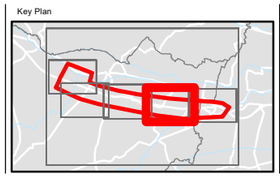
Clients

Tionscadal Éireann Project Ireland 2040 | TII Bonneagar Iompair Éireann Transport Infrastructure Ireland | An Roinn Iompair Department of Transport | Comhairle Contae Átha Cliath Theas South Dublin County Council | KILDARE nro NATIONAL ROADS OFFICE | Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Hydrogeological
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title

Hydrogeological Constraints
Aquifer Vulnerability Mapping
Sheet 5 of 6

Suitability: S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.6.5	P01

Drawing No: 272691-ARUP-02-OS-DR-YEHYG-000005

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary

Groundwater Vulnerability

- Rock at or near Surface or Karst
- Extreme
- High
- Moderate
- Water

Notes

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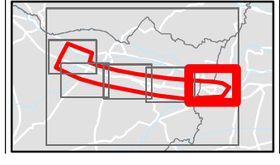
Clients

Tionscadal Éireann Project Ireland 2040 | TII Bonneagar Iompair Eireann | An Roinn Iompair Department of Transport | Comhairle Contae Átha Cliath Theas South Dublin County Council | KILDARE nro National Roads Office | Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale 1:10,000 @A3

Role Hydrogeological

Date 29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL
S2 - For Information				

Drawing Title

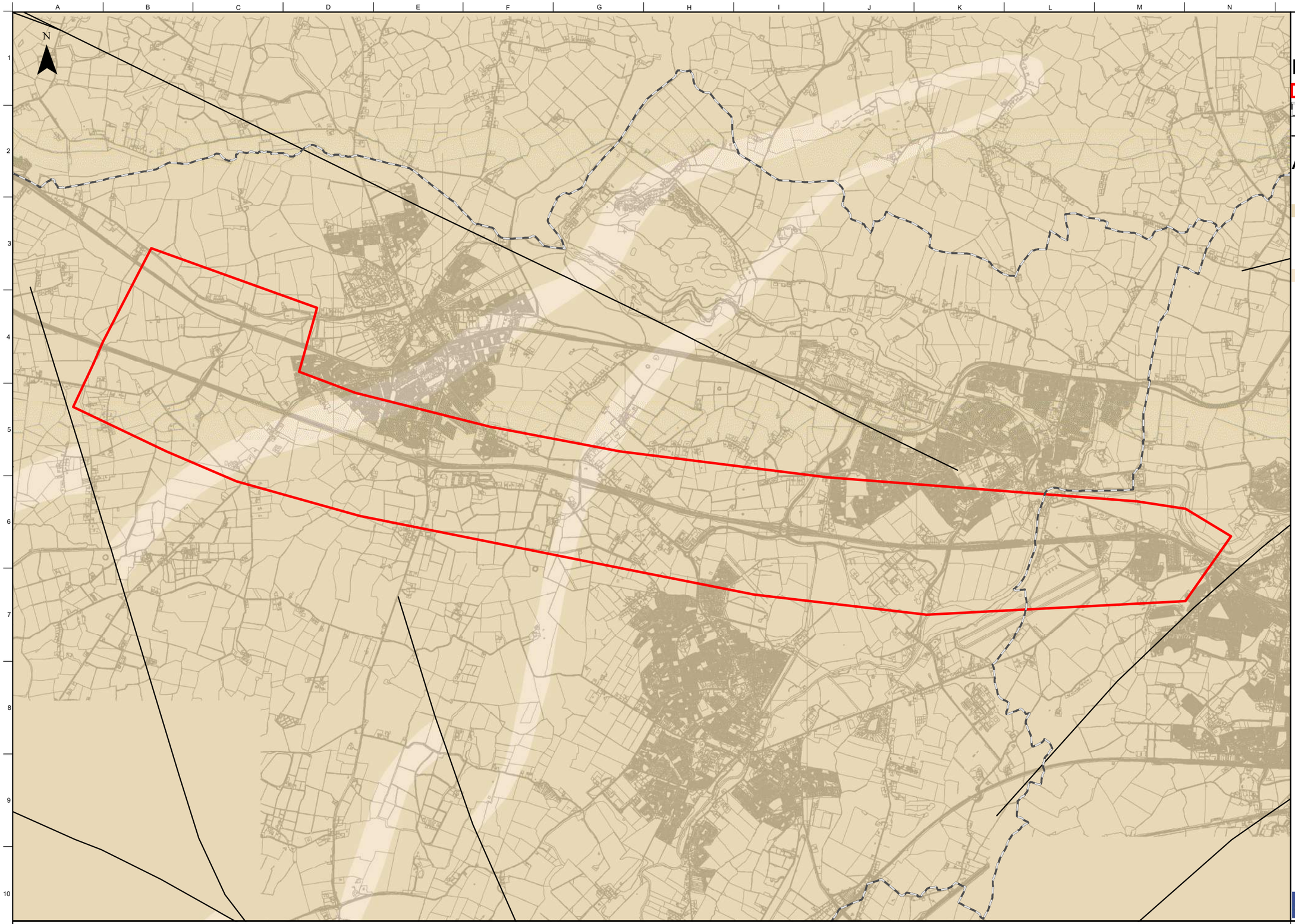
Hydrogeological Constraints
Aquifer Vulnerability Mapping
Sheet 6 of 6

Suitability S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.6.6	P01

Drawing No 272691-ARUP-02-OS-DR-YEHYG-000006

Do not scale



FOR INFORMATION

Legend

- Study Area
- County Boundary
- Aquifer Bedrock Faultline

Aquifer Bedrock

- LI - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- PI - Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones

Notes

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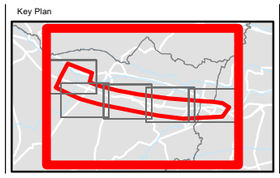
Clients

Tionscadal Éireann Project Ireland 2040 | Bonneagar Iompair Éireann Transport Infrastructure Ireland | An Roinn Iompair Department of Transport | Comhairle Contae Átha Cliath Theas South Dublin County Council | KILDARE nro National Roads Office | Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title
Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:40,000 @A3
Role	Hydrogeological
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

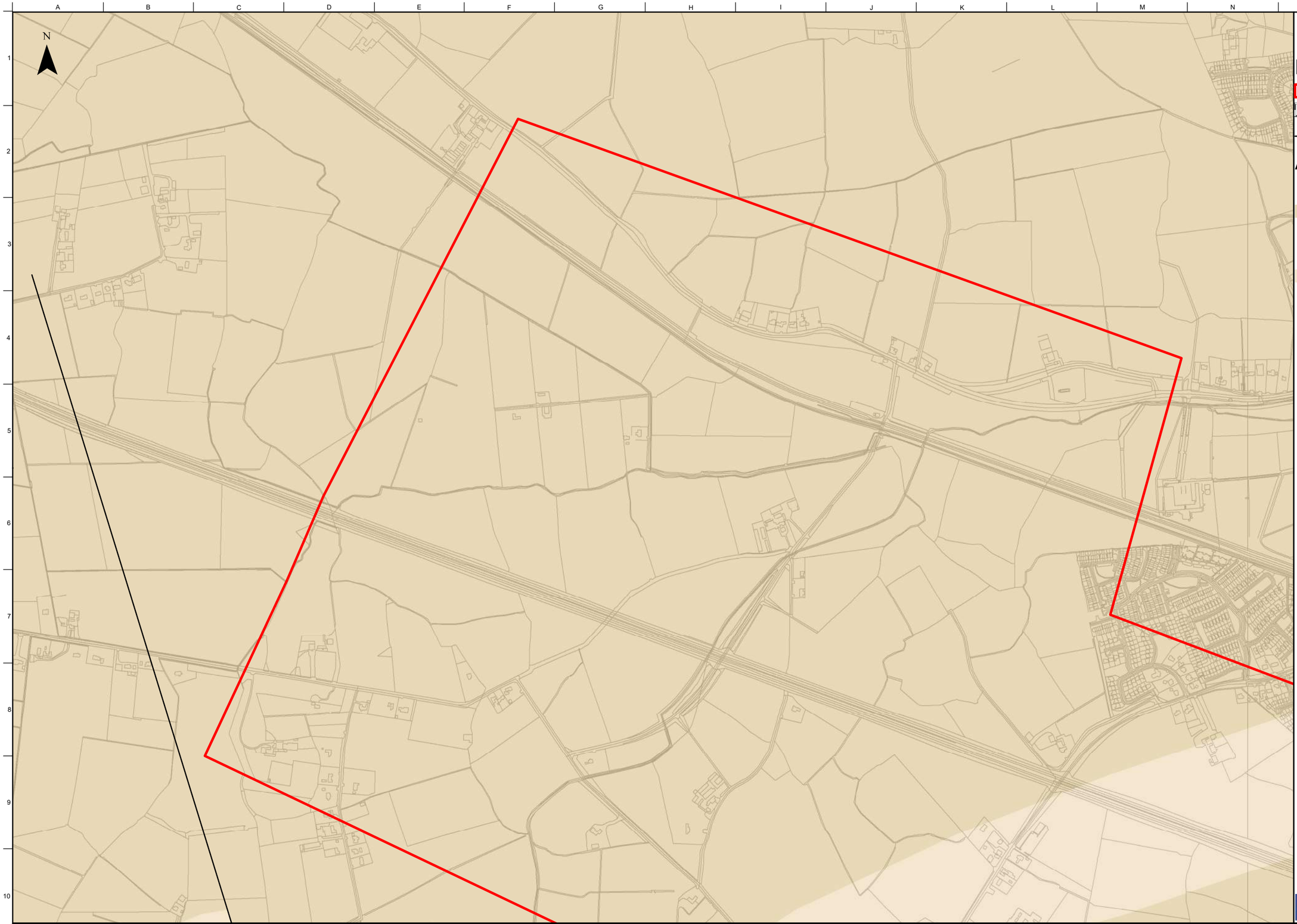
Drawing Title
Hydrogeological Constraints
Aquifer Mapping
Sheet 1 of 6

Suitability
S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.6.7	P01

Drawing No
272691-ARUP-02-OS-DR-YEHYG-000010

Do not scale



FOR INFORMATION

Legend

- Study Area
- County Boundary
- Aquifer Bedrock Faultline

Aquifer Bedrock

- LI - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- Pl - Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones

Notes

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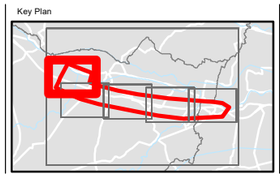
Clients

Tionscadal Éireann Project Ireland 2040 | TII Transport Infrastructure Ireland | An Roinn Iompair Department of Transport | Comhairle Contae Átha Cliath Theas South Dublin County Council | Kildare nro National Roads Office | Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Hydrogeological
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title

Hydrogeological Constraints
Aquifer Mapping
Sheet 2 of 6

Suitability: S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.6.8	P01

Drawing No: 272691-ARUP-02-OS-DR-YEHYG-000011

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary
- Aquifer Bedrock Faultline

Aquifer Bedrock

- LI - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- Pl - Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones

Notes

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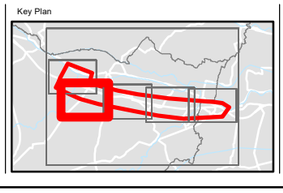
Clients

Tionscadal Éireann Project Ireland 2040 | Transport Infrastructure Ireland | An Roinn Iompair Department of Transport | Comhairle Contae Átha Cliath Theas South Dublin County Council | KILDARE nro NATIONAL ROADS OFFICE | Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Hydrogeological
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title

Hydrogeological Constraints
Aquifer Mapping
Sheet 3 of 6

Suitability: S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.6.9	P01

Drawing No: 272691-ARUP-02-OS-DR-YEHYG-000012

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary
- Aquifer Bedrock Faultline

Aquifer Bedrock

- LI - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- Pl - Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones

Notes

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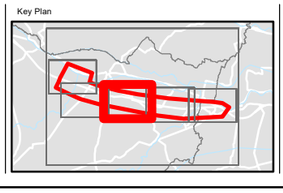
Clients

Tionscadal Éireann Project Ireland 2040 | TII Bonneagar Iompair Éireann Transport Infrastructure Ireland | An Roinn Iompair Department of Transport | Comhairle Contae Átha Cliath Theas South Dublin County Council | KILDARE nro National Roads Office | Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Hydrogeological
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title

Hydrogeological Constraints
Aquifer Mapping
Sheet 4 of 6

Suitability: S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.6.10	P01

Drawing No: 272691-ARUP-02-OS-DR-YEHYG-000013

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary
- Aquifer Bedrock Faultline

Aquifer Bedrock

- LI - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones

Notes

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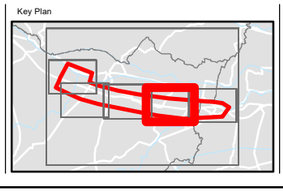
Clients

Tionscadal Éireann Project Ireland 2040 | TII Bonneagar Iompair Éireann Transport Infrastructure Ireland | An Roinn Iompair Department of Transport | Comhairle Contae Átha Cliath Theas South Dublin County Council | KILDARE nro NATIONAL ROADS OFFICE | Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Hydrogeological
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title

Hydrogeological Constraints
Aquifer Mapping
Sheet 5 of 6

Suitability: S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.6.11	P01

Drawing No: 272691-ARUP-02-OS-DR-YEHYG-000014

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary
- Aquifer Bedrock Faultline

Aquifer Bedrock

- LI - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones

Notes

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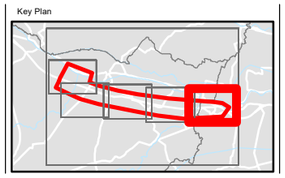
Clients

Tionscadal Éireann Project Ireland 2040 | TII Transport Infrastructure Ireland | An Roinn Iompair Department of Transport | Comhairle Contae Átha Cliath Theas South Dublin County Council | KILDARE nro National Roads Office | Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Hydrogeological
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title

Hydrogeological Constraints
Aquifer Mapping
Sheet 6 of 6

Suitability

S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.6.12	P01

Drawing No

272691-ARUP-02-OS-DR-YEHYG-000015

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary
- WFD Article 5: Section 4 Discharge Point

Karst Landforms

- Cave
- Spring

Designated Sites

- pNHA
- SAC

CFRAM

- Fluvial Flood Risk - High Probability - Current Scenario
- Fluvial Flood Risk - Medium Probability - Current Scenario
- Fluvial Flood Risk - Low Probability - Current Scenario

Notes

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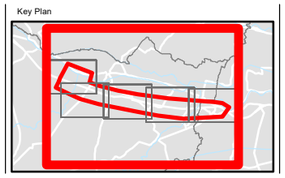
Clients

Tionscadal Éireann Project Ireland 2040 | TII Bonneagar Iompair Éireann Transport Infrastructure Ireland | An Roinn Iompair Department of Transport | South Dublin County Council | Kildare County Council | NRO National Roads Office

Key Plan



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Job Title
Maynooth to Leixlip Project
MAYNOOTH TO LEIXLIP PROJECT

Scale	1:40,000 @A3
Role	Hydrogeological
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL
S2 - For Information				

Drawing Title
Hydrogeological Constraints
Hydrogeoloigcal Constraints Mapping Sheet 1 of 6

Suitability
S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.6.13	P01

Drawing No
272691-ARUP-02-OS-DR-YEHYG-000020

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary

Designated Sites

- pNHA

CFRAM

- Fluvial Flood Risk - High Probability - Current Scenario
- Fluvial Flood Risk - Medium Probability - Current Scenario
- Fluvial Flood Risk - Low Probability - Current Scenario

Notes

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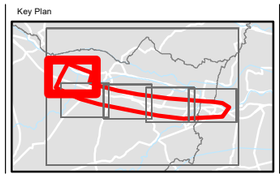
Key Plan



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Job Title
Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Hydrogeological
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL
S2 - For Information				

Drawing Title
Hydrogeological Constraints
Hydrogeoloigcal Constraints Mapping Sheet 2 of 6

Suitability
S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.6.14	P01

Drawing No
272691-ARUP-02-OS-DR-YEHYG-000021

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary

CFRAM

- Fluvial Flood Risk - High Probability - Current Scenario
- Fluvial Flood Risk - Medium Probability - Current Scenario
- Fluvial Flood Risk - Low Probability - Current Scenario

Notes

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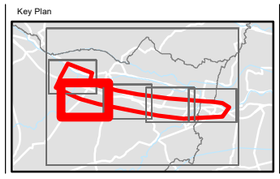
Clients

Tionscadal Éireann Project Ireland 2040 | Transport Infrastructure Ireland | An Roinn Iompair Department of Transport | Comhairle Contae Átha Cliath Theas South Dublin County Council | KILDARE nro National Roads Office | Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Hydrogeological
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title

Hydrogeological Constraints
Hydrogeoloigcal Constraints Mapping Sheet 3 of 6

Suitability: S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.6.15	P01

Drawing No: 272691-ARUP-02-OS-DR-YEHYG-000022

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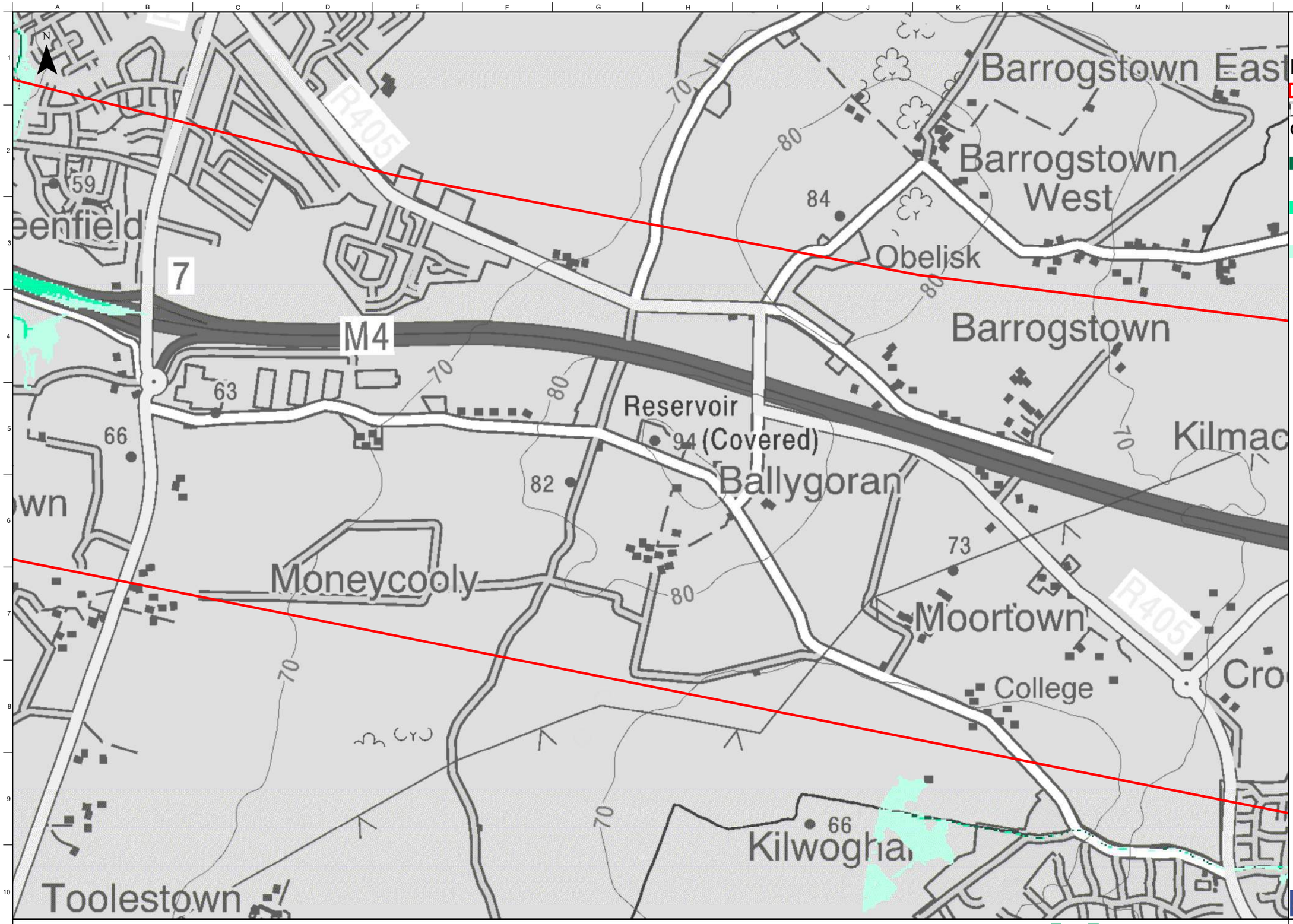

FOR INFORMATION

Legend

- Study Area
- County Boundary

CFRAM

- Fluvial Flood Risk - High Probability - Current Scenario
- Fluvial Flood Risk - Medium Probability - Current Scenario
- Fluvial Flood Risk - Low Probability - Current Scenario

Notes

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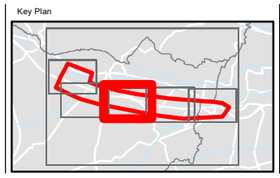
Clients: Tionscadal Éireann Project Ireland 2040; TII Bonneagar Iompair Éireann; An Roinn Iompair Department of Transport; Comhairle Contae Átha Cliath Theas South Dublin County Council; KILDARE nro National Roads Office; Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title
Maynooth to Leixlip Project
MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Hydrogeological
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title
Hydrogeological Constraints
Hydrogeoloigcal Constraints Mapping Sheet 4 of 6

Suitability: S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.6.16	P01

Drawing No: 272691-ARUP-02-OS-DR-YEHYG-000023

Do not scale

FOR INFORMATION

Legend

- Study Area
- County Boundary

Designated Sites

- pNHA
- SAC

CFRAM

- Fluvial Flood Risk - High Probability - Current Scenario
- Fluvial Flood Risk - Medium Probability - Current Scenario
- Fluvial Flood Risk - Low Probability - Current Scenario

Notes

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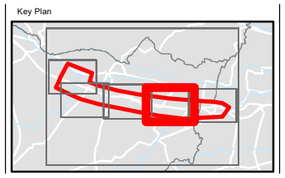
Clients

Tionscadal Éireann Project Ireland 2040 | TII Bonneagar Iompair Éireann Transport Infrastructure Ireland | An Roinn Iompair Department of Transport | Comhairle Contae Átha Cliath Theas South Dublin County Council | KILDARE nro National Roads Office | Kildare County Council Comhairle Contae Chill Dara

Key Plan



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Job Title
Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale 1:10,000 @A3
Role Hydrogeological
Date 29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title
Hydrogeological Constraints
Hydrogeoloigcal Constraints Mapping Sheet 5 of 6

Suitability
S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.6.17	P01

Drawing No
272691-ARUP-02-OS-DR-YEHYG-000024

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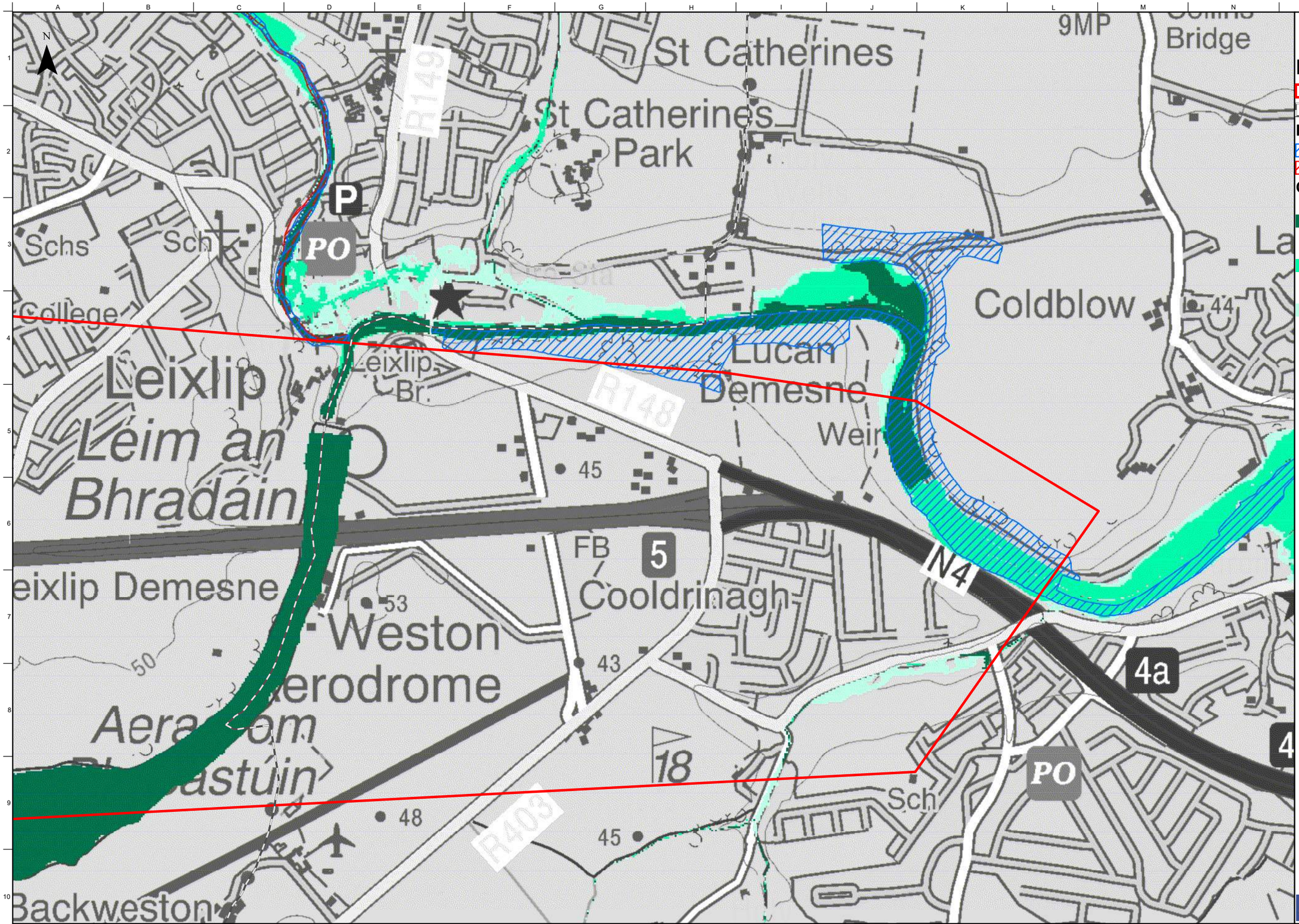

FOR INFORMATION

Legend

- Study Area
- County Boundary

Designated Sites

- pNHA
- SAC

CFRAM

- Fluvial Flood Risk - High Probability - Current Scenario
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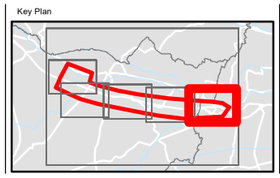
Key Plan



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Job Title

Maynooth to Leixlip Project

MAYNOOTH TO LEIXLIP PROJECT

Scale	1:10,000 @A3
Role	Hydrogeological
Date	29/01/2021

Issue	Date	By	Chkd	Appd
P01		AOR	SB	ZL

S2 - For Information

Drawing Title

Hydrogeological Constraints
Hydrogeoloigcal Constraints Mapping Sheet 6 of 6

Suitability: S2 - For Information Only

Job No	Figure ID	Rev.
272691	Figure 4.6.18	P01

Drawing No: 272691-ARUP-02-OS-DR-YEHYG-000025

Do not scale