

Environmental Reports in Relation to an Underground Electricity Circuit for the Laois – Kilkenny Reinforcement Project

Ecology, Cultural Heritage, Soils & Geology and Hydrology & Hydrogeology Reports

Prepared for EirGrid in relation to an underground electricity circuit for the Laois – Kilkenny Reinforcement Project.

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January 2011

Final Report

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Section 1 Executive Summary

1.1 Introduction

AOS Planning Limited has been commissioned by ESBI to prepare an environmental report for an underground electricity cable route (Route A) for a new 110kV underground electricity circuit as part of the Laois – Kilkenny Reinforcement Project. The environmental report covers the topics of Ecology, Cultural Heritage, Soils & Geology and Hydrology & Hydrogeology.

ESBI produced an initial Report entitled '*110 KV Underground Cable Feasibility Study*'. That Report details the methodologies used and studies and investigations undertaken to determine a technically feasible underground connection which is cost efficient. That Report identified a number of feasible underground cable route options and upon evaluation of same, identified Route 'A' as being the most suitable.

The purpose of this report is to identify the key environmental factors within the study area, on which the proposed Route A for the underground circuit may have an impact.

1.2 Ecology

Ecological sites of conservation importance have been identified in the study area as part of the constraints study (*Study Area Constraints Reports October 2010*). Route A is located some distance away from most of these sites, minimising potential impacts on flora and fauna. The most ecologically sensitive part of the route is the southern section, which is situated close to both the River Nore and River Owenbeg which are designated SAC as part of the River Barrow and River Nore SAC. There is one direct crossing of the Owenbeg River associated with Route A - this is at Castlemarket Bridge, Ballyragget.

The main impact on other ecological sites identified along this route are crossings of streams that have the potential to directly affect species of conservation interest, water quality and in-stream habitat at these crossings and indirectly affect habitats and species of conservation interest downstream. Overall ecological impacts associated with cable installation along roads are not likely to be significant with suitable planning and mitigation

1.3 Cultural Heritage

The broad route corridor covers an area with a medium-high density of recorded archaeological monuments and architecturally significant structures.

The construction of an underground cable will not have any *visual impact* on the archaeological heritage of the area.

The only potential instance of visual impact is where it is proposed to cross water courses such as bridges or culverts. Attaching a cable to the side of a bridge has the potential to visually impact on the structure.

The construction of an underground electricity cable has the potential to uncover previously unrecorded archaeological finds, features or deposits.

Where electricity cables are laid along roads the potential for uncovering archaeological finds, features or deposits is low. This is due mainly to the level of disturbance that has already taken place along roads. Where a cable route traverses through an archaeological constraint zone, however, this increases the likelihood of archaeological features being uncovered during the excavation of cable trenches or joint bays. Two such examples occur where the cable route passes through 2 historic towns namely Ballinakill (LA030-018) and Ballyroan (LA024-060). Both towns are archaeological zones of potential as defined by the Record of Monuments and Places. It is possible that sub-surface remains associated with the historic towns may be uncovered during cable trenching. In order to mitigate against potential damage to such sub-surface remains (if present), archaeological monitoring of all excavation works within the towns or marked zone of archaeological potential should be carried out.

1.4 Soils and Geology

Route A is assessed to have a low impact on the geological regime because it passes over blanket peat at "the pass of the planes" located along the R427, 4km southwest of Loughteog, Co. Laois, at Ballyroan, Co. Laois and Bernardsgrove, Co. Laois. Excess excavated subsoil, although it is expected to be minimal, will require off-site disposal or recovery at a nearby licensed waste facility. In terms of the route the level of impact identified was slight negative based on the location of the proposed route on existing roads, and the desk study of the soils and geology. The northern section of Route A is situated adjacent to an area of Geological Heritage Importance and there is blanket peat present at a section of the route.

1.5 Hydrology and Hydrogeology

The potential impacts of the proposed development relating to the water environment are considered imperceptible and are generally exclusively related to the construction phase. The application of the mitigation measures highlighted will help ensure that the residual impacts of the route option are imperceptible during the construction phase and the operational phase.

In terms of the route selection the level of impact identified for the route was slight negative based on the location of the proposed option on existing roads, and the desk study of the baseline water. If trenchless installations along the preferred route are required it would be necessary to carry out site specific investigations at the crossing point before confirming specifically how an underground cable installation can be achieved.

1.6 Conclusion

The development of an underground cable leads to minimal visual impact on the landscape and will minimise the potential for visual impacts at sites of archaeological/architectural interest. However, there are potential impacts during construction on other areas of the environment (Ecology, Cultural Heritage and Hydrology & Hydrogeology) and in particular where there are river crossings.

Route A passes through two 'Archaeological Zones of Potential', namely Ballinakill and Ballyroan and the broad route corridor covers an area with a medium-high density of recorded archaeological monuments and architecturally significant structures. This will have to be considered during construction with mitigation measures to be implemented. Route A is assessed to have a low impact on the geological regime. However, the northern section of Route A is situated adjacent to an area of Geological Heritage Importance and there is blanket peat present at a section of the route which will have to be considered.

Route A is some distance away from most of the sites with ecological constraints in the study area. This minimises any potential impact of disturbance to wildlife using these sites. However, the route should minimise the number of river/stream crossings.

In conclusion, an underground cable does have the potential to cause some environmental impacts but with appropriate mitigation measures these can be minimised.

Section 2 Terms of Reference

2.1 Terms of Reference

AOS Planning Limited has been commissioned by ESBI to prepare an environmental report for an underground electricity circuit as part of the Laois – Kilkenny reinforcement project. This environmental report covers the topics of Ecology, Cultural Heritage, Soils & Geology and Hydrology & Hydrogeology.

The purpose of the report is to identify the key environmental factors within the study area (as identified for the *Study Area Constraints Reports October 2010*), on which the potential route for the underground circuit may have an impact.

This report was confined to a desk study of relevant baseline information, with the assessment of impacts having regard to the design criteria and construction methodology provided by ESBI.

2.2 Specialist Consultants

The environmental reports have been prepared by specialist consultants as follows:

Ecology

Dr. Mark McCorry, Consultant Ecologist [Ph.D. MIEEM].

Cultural Heritage

Tobar Archaeological Services [Miriam Carroll and Annette Quinn, MA, MIAI].

Soils & Geology and Hydrology & Hydrogeology

AWN Consulting [Brian Tiernan, BSc., MSc.].

All consultants have previous experience in preparing similar reports for electricity projects.

Section 3 Project Description

3.1 Site Location

The cable route is located in the Counties of Laois and Kilkenny. The cable route commences at a proposed 110kV ESB substation adjacent to the existing 38kV station in Ballyragget, Co. Kilkenny and terminates at a proposed substation in Co. Laois.

ESBI considered a number of Cable Routes as detailed in the ESBI Report '*110kV Underground Cable Feasibility Study*'. Having examined the study area and considered the economic, environmental and technical factors, the preferred route corridor, Route A, was determined.

The potential route which is the subject of this report is indicated in **Figure 3.1 - Viable Cable Option** which is the ESBI drawing Reference PE424-D8001-005-005-001. An A3 copy of this drawing is also included in Appendix II.

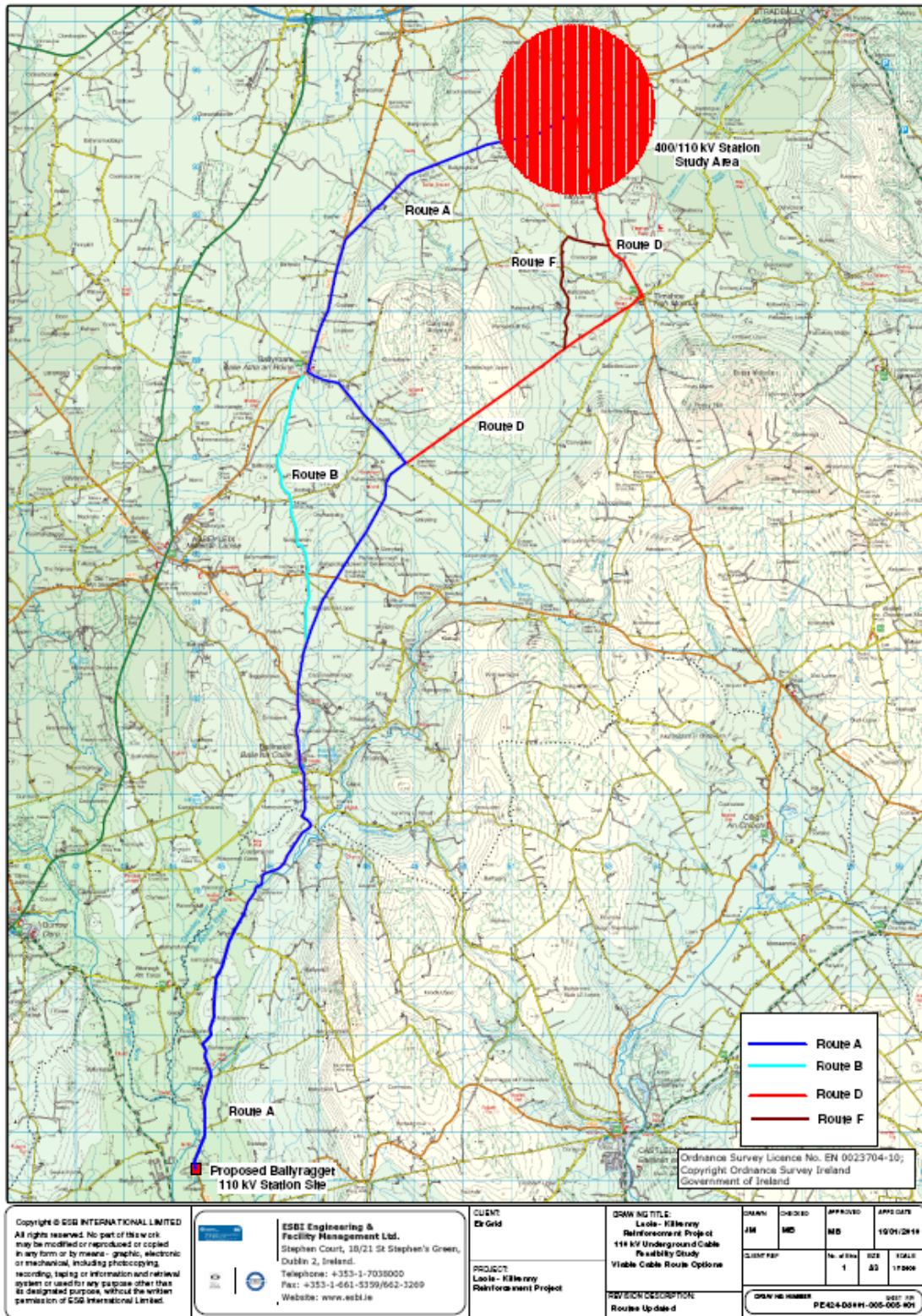


Figure 3.1 – Viable Cable Option Route A
(source ESBI Drg PE424-D8001-005-005-001)

Route A

This route is approximately 27.3km in length. It passes north from Ballyragget along the R432 regional road along the River Nore floodplain for a short section. It then deviates north-east and follows the path of the

Owenbeg River channel continuing along the R432 towards Ballynakill. The route passes over several small (undesigned) streams in this section. There is one crossing over a part of the Owenbeg River channel and associated riparian habitats that is designated as part of the cSAC.

The route continues north along the R432 towards Abbeyleix and past the Heywood Demesne, including two small lakes (Ballynakil Lake and Mass Lough). It then deviates north-east along a local road towards Ballypickas Crossroads. The route then deviates towards Ballyroan along a local road. This section crosses over several small streams that meet and are part of the Gloreen Stream. In Ballyroan the route deviates again north along the R425 regional road towards Portlaoise. This route takes a westerly path around Cullenagh Mountain.

It deviates north-east and then east at Cashel to follow the R427 regional road and continues along this road until it reaches Money Cross Roads (intersection of R426 and R427 roads). This section crosses the Foyle River (undesigned), which is part of the River Barrow catchment

3.2 Project Description

The criteria used by ESBI when considering different routes and options for underground cables are set out in the ESBI report dated September 2010. The assessments contained in this report had regard to the following additional report ***HV Cables – General Construction Methodology prepared by ESBI in January 2010.***

For the purposes of this environmental report, that ESBI report is summarised as follows:

The purpose of this report is to inform the reader of the typical method for installing an underground cable along public roads. This includes information about typical trench construction, duct installation, trench reinstatement, Joint bay construction and reinstatement.

The report contains some information to briefly describe the equipment required for cable pulling and a short description of the process including typical resources required on site. Information is also included in relation to heavy or large equipment that may be on site during cable jointing.

The information and descriptions contained within this report are typical of the construction process associated with high voltage underground cables. No project specific information is contained within the report.

The report contains information in relation to the following:

1 HV Cables – Construction Methodology

- 1.1 Site Preparation
- 1.2 Identifying the Actual Route of the High Voltage Cable
- 1.3 Extent of the Civil Works
- 1.4 Excavating the Trench
- 1.5 Installing HDPE Ducts in the Trench
- 1.6 Conflict with Third Party Services
- 1.7 Conflict with Water Courses
- 1.8 Construction of Joint Bays
- 1.9 Power Cable Installation
- 1.10 Reinstatement of Joint Chambers

2 Trenchless Installation Methods

- 2.1 Why use Trenchless Technology Installation Methods
- 2.2 Description of a typical Horizontal Directional Drill

In summary, the cable will be installed in a trench a maximum of 600mm wide by 1200mm deep. An underground cable requires extensive underground engineering works which have considerable potential to lead to adverse environmental impacts if not adequately mitigated. The various reports set out the required mitigation measures.

Figures 3.2 – 3.4 illustrate construction sites where underground cables are being installed.





Figures 3.2 – 3.4 Construction of Underground Cables

Section 4 Ecology Report

4.1 Introduction

This section has been prepared by Dr. Mark McCorry Consultant Ecologist [Ph.D. MIEEM] and outlines a preliminary ecological evaluation of the impact of an underground cable route. The main objectives of this desk study were to identify potential ecological constraints along this route and to assess its potential impact.

A previous report has already described the main ecological constraints in the study area (*AOS Planning Ecology Constraints October 2010*). Ecological constraints include areas designated by National Parks and Wildlife Service (NPWS), such as Special Areas of Conservation (SACs), candidate Special Areas of Conservation (cSACs), Natural Heritage Areas (NHAs), proposed Natural Heritage Areas (pNHAs) and Nature Reserves (NRs), and known sites with species of conservation interest. Ecological constraints also include areas listed as Important Bird Areas (IBAs) by Birdwatch Ireland (Crowe 2005) and rivers with important fisheries.

4.2 Methodology

This report follows guidelines recommended by the EPA (2002, 2003) and IEEM (2006) on the information to be contained in ecological surveys. Habitats are classified according to Fossitt (2000). The report is based on a desk study of the area. Sources of information such as National Parks and Wildlife Service (NPWS) and site synopses of sites of conservation interest (www.npws.ie) were used to identify areas of conservation interest. Records of rare plant and animal species (www.npws.ie) in the study area were consulted. The purpose of this desk top study was to collate the available information on the ecological environment and identify Local, National and European ecological constraints associated with a proposed underground electricity cable.

Consultation has previously been carried out with NPWS, Southern Regional Fisheries Board (now part of *Inland Fisheries Ireland* and referred to as such throughout this section) and Birdwatch Ireland regarding ecological constraints in the study area and potential impacts (*AOS Planning Ecology Constraints October 2010*).

4.3 Study Area

The study area for the project extends from south of Ballyragget Co. Kilkenny north to Stradbally, Co. Laois and east of Castlecomer, Co. Kilkenny. This is a

rural area and is characterised by farmland interspersed with towns, villages and small settlements that are connected by a complex road network.

The landscape of the study area is mainly characterised by lowlands through which flows the River Nore and some higher ground underlain by the Castlecomer Plateau. The lowlands in the western section are underlain by limestone and are generally quite flat and have fertile soils. This area is dominated by farmland, with a network of fields containing improved grassland and tillage and connected by hedgerows.

The Castlecomer Plateau area contains higher ground extending up to 330m and is underlain by shales and sandstones. This area has an undulating hilly landscape with some low peaks and also has some low-lying valleys that are drained by tributaries of the River Nore. This geology and environment means that soils are less fertile with impeded drainage and wet grassland is a much more prominent feature of these hillsides. Conifer plantations managed by Coillte are also much more regularly found in this area. Elevation in the study area ranges from 60m along the River Nore channel to 326m near Fossy Mountain.

The majority of this area is found within the River Nore catchment and the proposed site of the substation at Ballyragget is positioned near to this river. A small section of the study area along the eastern side lies within the River Barrow catchment. The potential location of the new 400/110kV substation also lies within this catchment.

4.4 Ecological Constraints

Ecological constraints within the study area have been described in a previous report (*AOS Planning Ecology Constraints October 2010*). Ecological constraints include sites of conservation interest that have been designated by NPWS as candidate Special Areas of Conservation (cSAC), Natural Heritage Areas (NHAs) or proposed Natural Heritage Areas (pNHA) (*Table 4.1*). The study area also includes one Nature Reserve that is owned by the state (Timahoe Eskers). Some of these designated areas overlap with each other and some of the pNHAs are sub-sites of the larger cSACs.

Type	NPWS site code	NPWS Name	County	Notes
cSAC	000859	Lisbigney Bog	La	
cSAC	002256	Ballyprior Grassland	La	
cSAC	002162	River Barrow & Nore	La/Kk	
NHA	002382	Coan Bogs	Kk	
pNHA	000860	Cloppook Wood	La	
pNHA	002076	River Nore/Abbeyleix Woods	La/Kk	overlaps with cSAC 2162
pNHA	000869	Lisbigney Bog	La	overlaps with cSAC 859
pNHA	001923	Shanahoe Marsh	La	overlaps with cSAC 2162
pNHA	001800	Stradbally Hills	La	
pNHA	000420	The Curragh and Goal River	La	overlaps with cSAC 2162
pNHA	000421	Timahoe Esker	La	also a nature reserve
pNHA	000876	Ridge of Portlaoise	La	
pNHA	000836	Inchbeg	Kk	overlaps with cSAC 2162
pNHA	000408	Mathel Church, Coolcullen	Kk	
pNHA	000832	Esker Pits	Kk	

Table 4.1 Sites of conservation interest in the study area.

Ecological constraints also include Important Bird Areas (IBA) (*Table 4.2*). The Important Bird Area (IBA) designation is a non-statutory designation, and therefore offers no legal conservation protection in Ireland. They have been identified and described as part of the Birdlife Important Bird Area Programme (Birdlife International 2001). Some of these IBAs overlap with pNHAs and cSACs. Other sites of ecological value to waterbirds have been identified (*Crushell 2010*).

Site	County	Grid Ref	Notes
Avonmore Ponds, Ballyragget	Kilkenny	S432719	Inside study area - Small constructed wetland and ponds close to River Nore (Crowe 2005)
Inchbeg	Kilkenny	S440658	Wetland area along River Nore (cSAC, pNHA) – outside - south of study area (Crowe 2005)
River Nore floodplain at Grange	Kilkenny	S442698	Inside study area – south of Ballyragget – part of cSAC (Crushell 2010)
Grantstown Lake	Laois	S334800	Adjacent to study area in Grantstown Nature Reserve (Crowe 2005)
River Nore	Laois	S402888	In study area. Adjacent to Shanahoe Marsh pNHA (Crowe 2005)
Durrow Curragh	Laois	S3778	In study area (part of Curragh and Goul River pNHA) (Crowe 2005)
Ballycolla	Laois	S386827	In study area – floodplain of Guilly River (Crowe 2005)
River Barrow (Cloney)	Laois	S641009	Outside study area (IBA IE108) (Crowe 2005)
Lisbigney Pond	Laois	S447799	Small lake (Crushell 2010)
Mass Lough (Ballinakill)	Laois	S473808	Inside study area – small lake (Crushell 2010)
Ballinakill Lake (Ballinakill)	Laois	S467810	Inside study area – small lake (Crushell 2010)
Coolderry (Ballycolla)	Laois	S382810	Inside study area – small wetland (Crushell 2010)

Table 4.2. Summary of important wetlands for birds in and adjacent to the survey area listed by Crowe (2005) and counted during the Irish Wetlands Bird Survey. Additional sites surveyed by Crushell (2010) also listed.

The study area contains several important rivers with significant fisheries value, of which the most important is the River Nore (*Table 4.3*). These are also listed as ecological constraints though there are frequent overlaps with the cSAC/pNHA designations.

Name	Conservation/fisheries value	Rating
Nore catchment		
Nore	cSAC Designated Salmonid River. Some Salmon. Good stocks of brown trout. Important Salmonid nursery. Brook and sea lamprey common. Records of white-clawed crayfish and freshwater pearl mussel. Only known site in world for <i>M. m. durrovensis</i> .	A
Erkina	cSAC. Good stocks of brown trout. Important Salmonid nursery. Records of white-clawed crayfish and freshwater pearl mussel. Brook lamprey	A
Goul	cSAC Tributary of Erkina. Good stocks of brown trout. Important Salmonid nursery. Records of white-clawed crayfish	A
Gully	cSAC Good stocks of brown trout. Important Salmonid nursery. Records of white-clawed crayfish	A
Owenbeg (Ovbeg)	cSAC Good stocks of brown trout. Important Salmonid nursery. Lamprey (unspec.) in the lower reaches.	A
Ironmills	cSAC Tributary of Owenbeg Good stocks of brown trout. Important Salmonid nursery.	A
Glashagal	Salmonid nursery.	C
Gloreen	Salmonid nursery.	C
Dinin	cSAC Important for salmonids. Lamprey (unspec.) in the lower reaches.	A
Gloshia	cSAC Tributary of Dinin River. Good stocks of brown trout. Important Salmonid nursery.	A
Kileen	Tributary of Dinin River. Salmonid nursery.	C
Clogh	Tributary of Dinin River. Salmonid nursery.	C
Moyadd Stream	Tributary of Dinin River. Salmonid nursery.	C
Monavea	Tributary of Dinin River. Salmonid nursery.	C
Mayo	Tributary of Dinin River. Salmonid nursery.	C
Barrow Catchment		
Timahoe	Salmonid nursery.	C
Timogue	Salmonid nursery.	C
Douglas River	Salmonid nursery.	C
Foyle	Salmonid nursery.	C
Blacktrench Stream	Salmonid nursery.	C
Fuer	Salmonid nursery.	C
Fusilioge	Salmonid nursery.	C

Table 4.3. Summary of conservation/fisheries value of rivers in the study area. Sources include the Southern Regional Fisheries Board (now part of Inland Fisheries Ireland) Doherty et al. 2004, Igoe et al. 2004, Kurz & Costello 1999, Moorkens 1999, Reynolds 1988. See Appendix I for explanation of rating.

In addition to the rare and notable species of conservation interest described above, there a number of records of other rare plant and animal species or species with restricted distributions within the study area. There are few rare and scarce plant species occurring within the study area that are listed from the NPWS database (www.npws.ie). Opposite-leaved Pondweed is the only

species recorded recently and has been recorded along the River Goul. This species is listed in the Red Data Book (Curtis & McGough 1988) and is also protected by the Flora Protection Order. Mammal species listed in the Red Data Book (Whilde 1993, Marnell 2009) that are present in the study area include Badger, Stoat, Hedgehog and Red Squirrel (www.npws.ie). While the NPWS database does have several records of some notable species such as Red Squirrel and Otter, these species are likely to be much more widespread than indicated from this list.

4.5 Description of the underground route

A cable route (Route A) has been selected (ESBI feasibility study). The route follows existing public road infrastructure throughout the study area. *Table 4.4* below lists the distances of the route from the ecological constraints described above.

Route A

This route is approximately 27.3km in length. It passes north from Ballyragget along the R432 regional road along the River Nore floodplain for a short section. It then deviates north-east and follows the path of the Owenbeg River channel continuing along the R432 towards Ballynakill. Both rivers and adjacent riparian habitats are designated as part of the River Barrow and Nore cSAC. *(There is also some overlap between the cSAC with River Nore/Abbeyleix Woods pNHA along the initial section adjacent to Ballyragget)*. The route passes over several small (undesigned) streams in this section. There is one crossing over a part of the Owenbeg River channel and associated riparian habitats that is designated as part of the cSAC. The route also passes close to Lisbegney Bog cSAC in this area.

The route continues north along the R432 towards Abbeyleix and past the Heywood Demesne, including two small lakes (Ballynakill Lake and Mass Lough), which are small features with small waterbird interest. It then deviates north-east along a local road towards Ballypickas Crossroads. The route then deviates towards Ballyroan along a local road. This section crosses over several small streams that meet and are part of the Gloreen Stream. In Ballyroan the route deviates again north along the R425 regional road towards Portlaoise. This route takes a westerly path around Cullenagh Mountain.

It deviates north-east and then east at Cashel to follow the R427 regional road and continues along this road until it reaches Loughteog. This section crosses the Foyle River (undesigned), which is part of the River Barrow catchment

Ecological constraints within study area	Type¹	County	Distance from A Approximate distance from nearest section of route
Lisbigney Bog	cSAC & pNHA	LA	0.99 km
Ballyprior Grassland	cSAC	LA	4.5 km
River Barrow & Nore	cSAC	LA/KK	0.1 km at Ballyragget
River Barrow & Nore			Crosses cSAC and Owenbeg River at Castlemarket Bridge
River Barrow & Nore			Adjacent to cSAC North of Castlemarket Bridge, Ballynakill
Coan Bogs	NHA	KK	> 10 km
Cloppook Wood	pNHA	LA	> 5 km
Shanahoe Marsh	pNHA	LA	> 5 km
Stradbally Hill	pNHA	LA	4.9 km
The Curragh and Goul River	pNHA	LA	> 5 km
Timahoe Esker	pNHA	LA	2.05 km
River Nore/Abbeyleix Woods	pNHA	LA	0.1 km
Ridge of Portlaoise	pNHA	LA	2.8 km
Inchbeg	pNHA	KK	> 5 km
Mathel Church, Coolcullen	pNHA	KK	> 10 km
Esker Pits	pNHA	KK	> 5 km
Avonmore Ponds, Ballyragget	IWB	KK	1.3 km
Inchbeg	IWB	KK	> 5 km
River Nore floodplain at Grange	IWB	KK	2.5 km
Grantstown Lake	IWB	LA	> 10 km
River Nore	IWB	LA	0.1 km
Durrow Curragh	IWB	LA	> 5 km
Ballycolla	IWB	LA	> 5 km
River Barrow (Cloney)	IBA	LA	> 10 km
Lisbigney Pond	IWB	LA	0.99 km
Mass Lough (Ballinakill)	IWB	LA	0.67 km
Ballinakill Lake (Ballinakill)	IWB	LA	0.11 km
Coolderry (Ballycolla)	IWB	LA	> 5 km
Nore Catchment			
Nore	Fi	LA/KK	0.1 km at Ballyragget
Nore			Crosses several tributaries (Owenbeg) and streams in Nore catchment
Erkina	Fi	LA	Not in catchment
Goul	Fi	LA/KK	Not in catchment
Gully	Fi	LA	Not in catchment
Owenbeg (Ovbeq)	Fi	LA/KK	Crosses Owenbeg River at Castlemarket Bridge

Ecological constraints within study area	Type¹	County	Distance from A Approximate distance from nearest section of route
Ironmills	Fi	LA/KK	Not in catchment
Glashagal	Fi	KK	Crosses stream
Gloreen	Fi	LA	Crosses tributary near Ballyroan
Dinin	Fi	KK	Not in catchment
Gloshia	Fi	KK	Not in catchment
Kileen	Fi		
Clogh	Fi	KK	Not in catchment
Moyadd Stream	Fi	LA	Not in catchment
Monavea	Fi	KK	Not in catchment
Mayo	Fi	KK	Not in catchment
Barrow Catchment			
Timahoe	Fi	LA	2.4 km
Timogue	Fi	LA	1.88 km
Douglas River	Fi	LA	Not in catchment
Foyle	Fi	LA	Crosses river near Pass of the Pluumes
Blacktrench Stream	Fi	LA	Not in catchment
Fuer	Fi	LA	Not in catchment
Fusilioge	Fi	LA	Not in catchment

¹ IWB – Important Wetland Bird Area, IBA – Important Bird Area, Fi – River with fisheries value.

Table 4.4 Distance of route from the ecological constraints

4.6 Potential ecological impacts requiring mitigation

The potential impacts of the underground cable on ecological constraints are outlined in this section. Impact assessment has been undertaken with reference to the EPA Advice Notes on Current Practice (2003); the EPA Guidelines on the information to be contained in Environmental Impact Statements (2003); with reference to the Institute of Ecology and Environmental Management's Guidelines for Ecological Impact Assessment (IEEM, 2006) and the National Roads Authority's Guidelines (NRA 2006), for ecological impact assessment. A precautionary approach has been used in making these assessments in cases of uncertainty it was assumed the effects could be significant.

The route is some distance away from most of the sites with ecological constraints in the study area. This minimises any potential impact of disturbance to wildlife using these sites. The route only crosses one section of cSAC or pNHA's (Owenbeg River crossing at Castlemarket Bridge, Ballyragget). This means that there will be no significant permanent loss or fragmentation of any habitats of conservation significance.

In general, underground cables are not routed across open country. They are generally kept to public land and available space under transportation corridors, mainly roads. The trench width for the cable is only 700mm (except for joint bays) and represents a relatively small area which could be subject to such disturbance. The ecological impacts along public roads are likely to be short term and negligible.

Most of the impacts that can be predicted at this stage are largely associated with the construction phase. Construction impacts can involve disturbance to wildlife from light and noise. Potential impacts on aquatic habitats, fisheries and water quality could arise from the use of fuels, oils and other pollutants and run-off through soil disturbance during construction activity. These impacts could directly or indirectly (by affecting habitats downstream in the catchment) affect some of the water-courses in the study area, as there are several unavoidable river crossings. There are likely to be time constraints on when the operations might be carried out to ensure minimal disturbance on sensitive aquatic species. Care should be taken to minimise the run-off of silt into drains during construction along the road. Suitable mitigation measures include the use of silt-traps to avoid run-off of silt during construction entering the adjacent drainage system.

Consultations with the Inland Fisheries Ireland have also highlighted several other issues to be taken into consideration, such as avoidance damage to fish habitat or creation of blockages, the prepared use of pre-cast concrete, the use of silt-traps to intercept runoff to streams and rivers, secure storage of fuels and the timing of any in-stream works to be carried out during July-September to minimise impacts on fish spawning. The Fisheries Board have published guidelines relating to construction works along rivers (<http://www.srfb.ie/pdf/ROADCONSTRUCTION.pdf>). The aim of these guidance notes is to identify the likely impact on fisheries habitat in the course of construction and development work, and to outline practical measures for the avoidance and mitigation of damage. In all Salmonid catchments, works should be carried out during the period May to September.

Consideration should be taken as to whether the cable can be placed on the bridge, on the river bed or directionally drilled at all bridge crossings. Trenchless technology e.g. directional drilling (as described in ESBI document '*HV Cables – General Construction Methodology*') under the rivers is likely to be the least damaging method given the ecologically sensitive nature of the sites. The methodology for such drilling would need to satisfy a number of agencies including NPWS and Inland Fisheries Ireland. It is probable that there would be time constraints on when the operations might be carried out to ensure minimal disturbance on sensitive species. There are likely to be some temporary disturbance impacts and possible habitat loss on either side

of the river due to site operations when this directional drilling is carried out. Further consultation with the Inland Fisheries Ireland will be required about specific river crossings..

Construction practices should aim to avoid unnecessary disturbance of habitats along the route. Hedgerows should also be avoided and care should be taken to limit disturbance to wet and dry drainage ditches. Where possible, the felling of mature trees should be minimised. Mature trees may be used for roosting by some bat species, so there may be some potential negative impacts on bat species if trees are felled. Consideration should be given to the Wildlife Act. Any felling of trees and clearance of vegetation should take place outside of the bird nesting season (March to August). It is an offence to disturb the breeding place of protected bird species. However, there are certain exemptions for particular operations and consultations should be carried out with regional NPWS staff.

In general, there should be limited residual impact to any of the sites containing habitats of conservation significance or used by species of conservation significance (ecological constraints). Construction impacts are temporary and will be alleviated when construction is finished. Proper planning and mitigation should minimise any potential negative impacts on water quality of water courses in the study area.

Potential impacts on features of ecological importance within the study area are outlined in the following sections.

River Barrow and Nore cSAC.

The southern part of Route A is situated close to this cSAC and it also makes several river or stream crossings. This part of the River Nore is a highly sensitive area of ecological importance. The proposed substation at Ballyragget is located close to the boundary of the River Nore cSAC (within 160m) and is within 280m of the main River Nore channel. This is probably the most important site of ecological interest in the study area. This stretch of the Nore (from Ballyragget to Abbeyleix) contains the rare freshwater Pearl Mussel (*M. m. durrovensis*) and is the only site in the world for this species. Several other species of interest are likely to use this stretch of river such as Freshwater Cray-fish, Salmon, Lamprey species, Otter, Daubenton's Bat and Brown long-eared Bat. These species would be very sensitive to any significant reduction in water quality or damage to river channel aquatic habitats from siltation etc. The river banks and adjacent meadows may have populations of rare and protected plant species such as Autumn Crocus (*Colchicum autumnale*) and Summer Snowflake (*Leucojum aestivum*). Works in this section have the potential to indirectly affect water quality via sediment mobilisation related to soil/ground disturbance, fuel spillages, and river-bed

disturbance during on-site works. Consultation with NPWS and Inland Fisheries Ireland will be required regarding timing of works and construction of river crossings.

There is potential for impacts on rare or protected species in those areas where the routes deviate from the public road at river and stream crossings. Flora and fauna surveys of these areas should be carried out prior to construction and NPWS notified should any protected species be discovered. In such cases, appropriate mitigation may be required.

Lisbegney Bog cSAC.

This site is about 1km from the nearest part of Route A. Therefore there are not likely to be many significant impacts on this site. The distance involved means that disturbance to wildlife from construction is likely to be low. There is also no direct connection via water-courses to the hydrology of this site so there is no potential for impacts on water quality.

Timahoe Esker pNHA

This site is more than 2km away. The distance involved means that disturbance to wildlife from construction is likely to be low. This type of site (esker and not wetland or aquatic habitat) is not likely to be vulnerable to indirect impacts on its hydrology.

Wetland sites with some value to waterbirds

The only other wetland sites (not including those that overlap with other designations such as the River Nore) in the immediate vicinity of the route are the two small lakes at Ballynakil, Ballynakil Lake and Mass lough, and Avonmore Ponds, Ballyragget. There could be some impact of disturbance to wildlife and waterbirds using these sites during the construction phase.

Other rivers and streams of fisheries value

The route crosses streams and rivers that are undesignated as cSAC or pNHAs. The study area is dissected by a network of rivers with notable salmonid potential and species of conservation interest. Consultations with the Inland Fisheries Ireland have also highlighted the importance of smaller streams to fisheries, which is sometimes overlooked. All of the streams and rivers that are likely to be directly affected by ground works and river crossings are part of the River Nore or Barrow catchments, so there is still potential for impacts downstream of these crossings.

Works near or at rivers/streams have the potential to indirectly affect water quality via sediment mobilisation related to soil/ground disturbance, fuel

spillages, and river-bed disturbance during on-site works. Consultation with NPWS and Inland Fisheries Ireland will be required regarding timing of works and construction of river crossings.

4.7 Route Evaluation

The most sensitive section is the southern part of the route that passes close to the main River Nore channel and River Owenbeg channels and associated riparian habitats.

Several tributaries of the River Nore have to be crossed along this section of Route A. These include the Glashagal River and the Owenbeg River at Castlemarket Bridge (designated as part of the River Barrow and Nore cSAC). This part of Route A also passes within 1km of Lisbigney Bog cSAC.

The southern part of the route is also close (< 1.5km) to several wetlands of some value to waterbirds such as the Avonmore ponds at Ballyragget and two small lakes at Ballynakil. There is some limited potential for disturbance to wildlife at these sites during the construction phase.

North of Ballynakill Route A crosses several small streams such as the Gloreen Stream that are part of the Nore catchment. The northern section also crosses several more streams (Foyle River) that are part of the Barrow catchment. The end of the route is in the same locality as Timahoe Eskers pNHA.

4.8 Conclusions

The route has the potential to have some adverse ecological impacts. The most ecologically sensitive part of the route is the southern section, which is situated close to both the River Nore and River Owenbeg, and there are no alternative routes to potentially lessen the impact of the development of the underground cable route.

The main impact on any ecological constraints along this route are crossings over streams that have the potential to directly affect species of conservation interest, water quality and in-stream habitat at these crossings and indirectly affect habitats and species of conservation interest downstream. Ecological impacts associated with cable installation along roads are not likely to be significant so the route selection should minimise the number of river/stream crossings of the route.

Desktop survey constraints

It is important to note that NPWS state that their datasets may be incomplete so that absence of records in a particular area should not be taken as an indicator of low biodiversity. Other useful datasets that may have valuable information are not generally available or distribution data is only available at a low resolution (e.g. 10km grid squares – National Biodiversity Data Centres). Useful data such as records of particular rare and protected species at particular sites may be available in a variety of other publications such as EIS's and ecological surveys within the study area, but these records are also difficult to access.

This report assessed the potential impacts of the underground cable route on the major ecological constraints within the study area based on available desk-top data. However, field-based ecological surveys during the EIS stage are likely provide more detailed data on the ecological value of some sites along a particular route.

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Section 5 Cultural Heritage

5.1 Introduction

This section has been prepared by Tobar Archaeological Services and provides an outline of the archaeology, architectural and cultural heritage located along Route A associated with the proposed underground electricity cable. This section is based on a desktop study only.

The proposed development consists of the construction of an underground electricity cable over a distance of approximately 27.3km in length from Ballyragget, Co. Kilkenny to Loughteog, Co. Laois. The development will involve ground disturbance in the form of the excavation of cable trenches. The aim of this report is to assess if the proposed development is likely to have any impacts on the cultural heritage landscape.

5.2 Study Area

This report focuses on the archaeological and cultural heritage landscape within the broad study area which incorporates Route A. The study corridor covers an area measuring approximately 500m on either side of the proposed cable route (*Figure 5.1*).

5.3 Methodology

5.3.1 Objectives of Report

This desk based study will assist in assessing the potential environmental impacts of the proposed cable route and the identification of areas or sites of archaeological, cultural heritage or architectural significance. Cultural Heritage includes archaeology, built heritage and items of historical value.

5.3.2 Consultations

The following sources were consulted for this preliminary report:

- The Sites and Monuments Record (SMR) (OPW Stephen's Green, Dublin).
- The Record of Monuments and Places (RMP) (OPW Stephen's Green, Dublin)
- The Topographical Files of the National Museum of Ireland
- The Archaeological Inventory of County Laois (Kilkenny unpublished)
- First edition Ordnance Survey maps (www.irishhistoricmaps.ie).
- Third edition Ordnance Survey Map (Record of Monuments and Places for Counties Laois, Kilkenny – in house)
- Excavations Bulletins
- Laois County Development Plan 2006-2012, Laois County Council

- Kilkenny County Development Plan 2008-2014, Kilkenny County Council
- National Inventory of Architectural Heritage (NIAH)

5.3.3 References

- Code of Practice between EirGrid and the Minister of the Environment, Heritage and Local Government in relation to Archaeological Heritage.
- *Framework and Principles for the Protection of the Archaeological Heritage*, 1999, Department of the Arts, Heritage, Gaeltacht and the Islands
- National Inventory of Architectural Heritage (NIAH).
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- Record of Monuments and Places (RMP) for County Laois and Kilkenny.
- Sites and Monuments Record (SMR) and Record of Monuments & Places (RMP) and www.archaeology.ie National Monuments Service website
- List of Monuments covered by Preservation Orders and List of National Monuments in the ownership / guardianship of the Minister for the Environment, Heritage and Local Government
- Archaeological Inventory of County Laois
- Kilkenny County Development Plan 2008-2014
- Laois County Development Plan 2006-2012
- Kildare County Development Plan 2005-2011
- www.buildingsofireland.ie website of the National Inventory of Architectural Heritage
- Excavations Bulletins (www.excavations.ie)
- 1st and 2nd edition OS mapping

5.3.4 Other Sources

- Files pertaining to recorded archaeological monuments in County Kilkenny – National Monuments Service, Dublin.
- Topographical Files, National Museum of Ireland, Kildare Street, Dublin.

5.3.5 Statutory Context

Archaeological monuments are safeguarded through national and international policy, which is designed to secure the protection of the cultural heritage resource. This is undertaken in accordance with the provisions of the European Convention on the Protection of the Archaeological Heritage (Valletta Convention). This was ratified by Ireland in 1997.

Both the National Monuments Acts 1930 to 2004 and relevant provisions of the Cultural Institutions Act 1997 are the primary means of ensuring protection of archaeological monuments, the latter of which includes all man-made structures of whatever form or date. There are a number of provisions under the National Monuments Acts which ensure protection of the archaeological resource. These include the Register of Historic Monuments (1997 Act) which means that any interference to a monument is illegal under

that Act. All registered monuments are included on the Record of Monuments and Places (RMP).

The Record of Monuments and Places (RMP) was established under Section 12 (1) of the National Monuments (Amendment) Act 1994 and consists of a list of known archaeological monuments and accompanying maps. The Record of Monuments and Places affords some protection to the monuments entered therein. Section 12 (3) of the 1994 Amendment Act states that any person proposing to carry out work at or in relation to a recorded monument must give notice in writing to the Minister (Environment, Heritage and Local Government) and shall not commence the work for a period of two months after having given the notice. All proposed works, therefore, within or around any archaeological monument are subject to statutory protection and legislation (National Monuments Acts 1930-2004).

Under the Heritage Act (1995) architectural heritage is defined to include 'all structures, buildings, traditional and designed, and groups of buildings including street-scapes and urban vistas, which are of historical, archaeological, artistic, engineering, scientific, social or technical interest, together with their setting, attendant grounds, fixtures, fittings and contents...'. A heritage building is also defined to include 'any building, or part thereof, which is of significance because of its intrinsic architectural or artistic quality or its setting or because of its association with the commercial, cultural, economic, industrial, military, political, social or religious history of the place where it is situated or of the country or generally'.

5.3.6 County Development Plans

The Kilkenny County Development Plan 2008-2014 outlines a number of policies and objectives relating to archaeology and architectural heritage.

Built Heritage

'H93 Ensure the protection of the architectural heritage of County Kilkenny by including all structures considered to be of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest in the Record of Protected Structures.

H94 To have regard to the Architectural Heritage Protection Guidelines issued by the Department of the Environment Heritage and Local Government in 2004 when assessing proposals for development affecting a protected structure.

H100 To protect elements of designed landscapes of special interest located within the attendant grounds of Protected Structures, including boundary features.'

Archaeology

'H79 To ensure the preservation in-situ, or preservation by record of:

(a) The archaeological monuments included in the Record of Monuments and Places as established under section 12 of the National monuments (Amendment) Act, 1994 and in the Urban Archaeological Survey of County Kilkenny.

(b) Any other sites and features of historical or archaeological interest.

(c) Any subsurface archaeological features that may be discovered during the course of infrastructural/development works.'

'H82 To require an appropriate archaeological assessment to be carried out in respect of any proposed development likely to have an impact on a Recorded Monument, a Zone of Archaeological Potential, or their settings.'

'H90 To ensure that development in the vicinity of a Recorded Monument or Zone of Archaeological Potential does not seriously detract from the setting of the feature, and is sited and designed appropriately.'

The Kilkenny County Development Plan also includes the Record of Protected Structures (RPS) for the county which lists all buildings or structures with protected structure status at the time of publication. A protected structure may be defined as a structure that a planning authority considers to be of special interest in a number of ways including architectural, historical and archaeological. The concept of protected structures was introduced through the Local Government (Planning and Development) Act 1999 and is now legislated by the Planning and Development Act 2000.

Items of street furniture are included in Kilkenny County Development Plan as part of the built and cultural heritage of the county. Such items include seats, post-boxes, horse troughs, milestones, plaques and other monuments. The following policy relates to the protection of these features:

'H113 Protect and enhance historic items of street furniture and roadside features, as appropriate.'

Laois County Development Plan 2006-2012

Laois County Development Plan 2006-2012 also outlines a number of policies and objectives relating to archaeology and architectural heritage.

Those relating to archaeology include:

BH3 Archaeology

It is the policy of the Council to:

- Ensure the preservation (either preservation in-situ or, exceptionally, preservation by record) of all archaeological monuments included in the Record of Monuments and Places as established under Section 12 of the National Monuments (Amendment) Act, 1994, and of sites, features and objects of archaeological interest generally.
- Ensure the protection and conservation of heritage objects and their setting where settings are appropriate.

BH4 Zones of Archaeological Potential.

It is the policy of Laois County Council to:

- Ensure protection of Zones of Archaeological Potential, as identified in the Record of Monuments and Places;
- Regard to archaeological heritage when considering proposed **infrastructure developments** (including transport, telecommunications, sewerage and water) located in close proximity to Recorded Monuments or Zones of Archaeological Potential, and
- All archaeological excavations are undertaken to the highest standard and the resultant information made publicly available. Developers will be required to have regard for Archaeology & Development: Guidelines for Good Practice for Developers (ICOMOS, 2000) in planning and executing development in sensitive areas.

Specific Objectives

The following are the specific objectives in relation to Archaeology and may be relevant for this project to:

- Secure the preservation (*in-situ* or by record) of all sites and features of historical and archaeological interest.
- Ensure that development in the vicinity of a site of archaeological interest shall not be detrimental to the character of the archaeological site or its setting by reason of its location, scale, bulk or detailing.
- Require the preparation and submission of an archaeological assessment detailing the potential impact of any development on both upstanding monuments, and buried structures and deposits.

The report will also include a visual impact assessment to ensure adequate consideration of any potential visual impact the proposed development may have on any upstanding remains.

Industrial Archaeology

The industrial archaeology of Laois was the subject of a major survey by the Laois Heritage Forum in 2003. The results of this survey and future field surveys will be used to inform the implementation of the County Development plan and the formulation of future policies. Laois County Council will afford appropriate protection to such industrial archaeological sites as may come to light following future surveys. In considering the protection of the industrial heritage of the county ancillary heritage e.g. millraces will also be protected.

5.3.7 Desktop Assessment

5.3.7.1 Documentary and Archival Sources

Documentary sources were used to assess the archaeological landscape potential of the study area and to compile an archaeological and historical framework for the identified cultural heritage sites. All documentary sources used for this purpose are listed in **5.3.3 References**.

Archival sources were used to identify and map cultural heritage sites. The following archival sources were consulted:

- **Sites and Monuments Record (SMR) and Record of Monuments & Places (RMP) and www.archaeology.ie National Monuments Service website**

A primary cartographic source and base-line data for the assessment was the consultation of the Sites and Monuments Record (SMR) and Record of Monuments and Places (RMP) for Counties Laois, Kilkenny and Kildare. All known recorded archaeological monuments are indicated on 6 inch Ordnance Survey (OS) maps and are listed in this record. The SMR/RMP is not a complete record of all monuments as newly discovered sites may not appear in the list or accompanying maps. In conjunction with the consultation of the SMR and RMP the electronic database of recorded monuments which may be accessed at www.archaeology.ie was also consulted.

- **Record of Protected Structures**

The Record of Protected Structures in each County Development Plan was consulted for any cultural heritage sites that exist within the study area. No spatial data or grid references are available for the protected structures for Kilkenny or Laois therefore this information is not presented in the report. As previously mentioned many of the protected structures within the study area are already listed in the NIAH.

- **List of Monuments covered by Preservation Orders and List of National Monuments in the ownership / guardianship of the Minister for the Environment, Heritage and Local Government**

National Monuments in the ownership / guardianship of the Minister for the Environment, Heritage and Local Government are listed on the Department of the Environment, Heritage and Local Government's website www.archaeology.ie.

- **Archaeological Inventory of County Laois**

Further information on archaeological sites may be obtained in the published County Archaeological Inventory series prepared by the Department of the Environment, Heritage and Local Government. The archaeological inventories present summarised information on sites listed in the SMR/RMP and include detail such as the size and location of particular monuments as well as any associated folklore or local information pertaining to each site. The inventories, however, do not account for all sites or items of cultural heritage interest which are as yet undiscovered. The inventory series for Kildare and Kilkenny has not yet been published.

- **County Development Plans**

The County Development Plans were consulted for the schedule of buildings (Record of Protected Structures) and items of cultural, historical or archaeological interest which may be affected by the proposed development. The development plans also outline policies and objectives relating to the protection of the archaeological, historical and architectural heritage landscape of Counties Laois and Kilkenny.

- **National Inventory of Architectural Heritage**
www.buildingsofireland.ie

This source lists some of the architecturally significant buildings and items of cultural heritage and is compiled on a county by county basis by the Department of the Environment, Heritage and Local Government. The NIAH has been undertaken for all counties and all the relevant sites within the study area are included in this report.

- **Excavations Bulletins (www.excavations.ie)**

Excavations' Bulletin is an annual account of all excavations carried out under license. The database is available on line at www.excavations.ie and includes excavations from 1985 to 2005. This database was consulted as part of the desktop research for this assessment to establish if any archaeological excavations had been carried out within the study area.

5.3.7.2 Cartographic Sources

Cartographic sources were examined to identify any other cultural heritage sites and assess the landscape potential of the study area. The following cartographic sources were consulted:

- OS Digital Raster Discovery Series mapping, County Laois, Kilkenny and Kildare 1:50,000. Date 2006
- Record of Monuments and Places – 6 inch OS mapping, Counties Laois and Kilkenny

5.4 Receiving Environment

5.4.1 General Environment

A number of factors influence the location and density of known and unknown archaeological remains. A paper examination of these factors can provide a broad assessment of the archaeological landscape potential of the area and potentially highlight areas of archaeological sensitivity where hidden or sub-surface archaeological remains may exist. These factors include:

- Soils
- Present land use
- Topography
- Wetlands
- Archaeological Artefacts
- Townland names.

The study area is dominated by several rivers namely the Timogue River, River Nore, Owenbeg River, the River Douglas, Kileen River, Ironmills River, Erkina River, Dinin River and the Gioshia River. A number of small streams also occur within the study area. A number of upland areas also occur such as Cullenagh Mountain and Fossy Mountain.

The bedrock geology in the study area consists of a sandstone conglomerate and siltstone extending in places into the Carboniferous strata. The area has mostly brown podzolics soils with small areas of grey podzols. The study area is comprised mainly of rolling lowland with carboniferous shales and pockets of limestone with some hills (Geological Survey of Ireland).

Watercourses and their banks are prime localities for many types of cultural heritage sites such as mills, fords, old bridges, habitation sites, or *fulachta fiadh*, and river beds can yield archaeological artefacts such as wooden boats and metal objects. The rolling lowland topography would also have been ideal for early farming communities.

Peaty, marsh, bog and waterlogged areas frequently located close to watercourses are often archaeologically rich and their preservation qualities of organic materials create a unique archaeological resource. In this regard these areas may be regarded as areas of archaeological potential.

Townland names can provide an indication of the importance of certain topographical features within an area that potentially would have attracted or inhibited settlement in the past. Other topographical words incorporated into townland names refer to prominent locations or specific characteristics of an area.

The element 'bally' or 'balli' is common in place names throughout the study area. It is an anglicised version of the Irish *baile* and is the most common settlement term in Irish place names (Flanagan and Flanagan 2002, 20). It is generally assumed to denote town or townland and is documented from the 12th century onwards. Examples within the study area include Ballyconra, Ballyoskill and Ballyragget, Co. Kilkenny and Ballyking, Ballyroan and Ballymaddock, Co. Laois.

Other place names are clearly derived from archaeological monuments in the locality. Place name elements such as 'lis', 'rath' and 'kil' are anglicised versions of the Irish *lios*, *ráth* and *cill*. *Lios* in Old Irish literally means 'the space about a dwelling-house or houses enclosed by a bank or rampart' but is used in place names to refer to the dwelling unit in its entirety, i.e. a fort (*ibid.*, 112). In Irish writing *lios* names do not have the same prestige as *ráth* which is translated as 'an earthen rampart surrounding the residence of a chief...' (*ibid.*, 132). Both rath and lis place names occur within the study area, for example Rathduff, Co. Kilkenny and Lisnagommon, Co. Laois.

Kil means church and is derived from the Latin *cella*. In place names it has a range of associated meanings including church, monastic settlement or graveyard (*ibid.*, 50). Examples of such place names within the study area include Kilvahan and Kilcronan, Co. Laois and Kilmacar, Co. Kilkenny.

Route A is located along the regional road R427 at the north and joins the R425 north of Ballyroan village. It then turns in a south-easterly direction along a minor road, crosses the R430 and then joins the R432 south-east of Abbeyleix. The route continues along the R432 from Ballinakill to Ballyragget at the south of the cable route. The following townlands are included:

Route A:

Killavally, Loughteog, Derrytrasna, Ballygormill North, Ballygormil South, Ballyheyland, Pass, Kilvahan, Cashel, Ballyruin, Crubeen, Glenbrook, Ballyroan Village, Dooary, Blardsfort, Rahanavannagh, Ballypickas Upper, Ballypikas Lower, Rahlis, Cappanashannagh, Drimaterril, Heywood Demesne, Kilcronan, Moneyclare, Loughill, Castlemarket, Rosconnell, Earls garden, Nicholastown, Russeltown, Gorteenara, Coole, Tinnalintan, Rathduff, Moatpark and Ballyragget.

5.4.2 National Monuments Specific to the Route Corridor

No National Monuments occur within the Route A corridor.

5.4.3 Recorded Monuments Specific to the Route Corridor

5.4.3.1 Route A

A total of 62 recorded archaeological monuments are located within **Route A** corridor (500m on either side of the proposed cable route) (*Table 5.1*). The most numerous monument types are enclosures which account for 12 of the total. Numerous monument types are represented in the study area many of which have only one occurrence and include the following:

Bawns (2), bridges (2), buildings (1), burial grounds (1), burial mounds (1), mottes (4), tower houses (3), unclassified castles (5), churches and chapels (5), designed landscape feature (1), earthworks (1), ecclesiastical enclosures (1), enclosures (12), field systems (1), fonts (1), fords (1), graveyards, (4), historic towns (Ballyragget and Ballinakill) (2), 16th / 17th century houses (1), inscribed stones (2), mills (1), moated sites (3), quarries (1), ringforts (3), holy wells (1) and deserted medieval settlements (2).

SMRS	Easting	Northing	Townland	Site Type
KK001-005001-	245210	177968	CASTLEMARKET	CHURCH
KK001-005002-	245204	177952	CASTLEMARKET	GRAVEYARD
KK001-005003-	245210	177950	CASTLEMARKET	INSCRIBED STONE
KK001-006001-	245594	178165	CASTLEMARKET	CASTLE - UNCLASSIFIED
KK001-006002-	245594	178165	CASTLEMARKET	CASTLE - MOTTE

SMRS	Easting	Northing	Townland	Site Type
KK001-006003-	245590	178150	CASTLEMARKET	SETTLEMENT DESERTED - MEDIEVAL
KK001-007----	245770	178080	CASTLEMARKET	BRIDGE
KK004-014----	244200	172970	BALLYCONRA	ENCLOSURE
KK004-021----	244010	172370	BALLYCONRA	INSCRIBED STONE
KK005-001----	245236	176469	BALLYOSKILL	RINGFORT - RATH
KK005-011001-	244858	174433	GORTEENARA	CHURCH
KK005-011002-	244845	174422	GORTEENARA	GRAVEYARD
KK005-011003-	244850	174421	GORTEENARA	ECCLESIASTICAL ENCLOSURE
KK005-012001-	245003	174436	TINNALINTAN	RITUAL SITE - HOLY WELL
KK005-012002-	245010	174429	TINNALINTAN	MOATED SITE
KK005-013----	244320	173630	COOLE (FASSADININ BY.)	EARTHWORK
KK005-023001-	244465	172696	MOATPARK	CASTLE - MOTTE
KK005-023002-	244464	172697	MOATPARK	CASTLE - UNCLASSIFIED
KK005-023003-	244434	172687	MOATPARK	CHAPEL
KK005-083----	244927	175167	NICHOLASTOWN (KILKEA AND MOONE BY.)	ENCLOSURE
KK005-094----	244924	172580	RATHDUFF (FASSADININ BY.)	ENCLOSURE
KK005-095----	244994	172669	RATHDUFF (FASSADININ BY.)	FIELD SYSTEM
KK005-096----	245011	172202	RATHDUFF (FASSADININ BY.)	ENCLOSURE
KK010-001----	244971	171010	BALLYRAGGET	HISTORIC TOWN
KK010-001001-	244894	170814	BALLYRAGGET	CASTLE - TOWER HOUSE
KK010-001002-	244920	170780	BALLYRAGGET	BAWN
KK010-001003-	244980	170800	BALLYRAGGET	ENCLOSURE
KK010-139001-	244529	170830	BALLYRAGGET, PARKSGROVE	FORD
KK010-139002-	244530	170830	BALLYRAGGET, PARKSGROVE	BRIDGE
LA018-005----	252690	194720	POWELSTOWN	ENCLOSURE
LA018-009----	253591	195358	RAHEENANISKY	ENCLOSURE
LA018-010----	248987	193269	BALLYKNOCKAN	CASTLE - TOWER HOUSE
LA018-012----	250433	193752	LAMBERTON DEMESNE	RINGFORT - RATH
LA018-013----	253469	194505	LOUGHTEEOG	ENCLOSURE
LA018-016----	248800	192520	PASS	HOUSE - 16TH/17TH CENTURY
LA018-025----	247150	190790	BALLYRUIIN	ENCLOSURE
LA018-027----	247310	190160	CRUBEEN	ENCLOSURE
LA018-049001-	253890	194620	LOUGHTEEOG	CASTLE - UNCLASSIFIED
LA024-006001-	246647	188800	BALLYROAN (CULLENAGH BY.)	CASTLE - MOTTE
LA024-006002-	246636	188794	BALLYROAN (CULLENAGH BY.)	CASTLE - UNCLASSIFIED
LA024-007----	247527	189755	CRUBEEN	ENCLOSURE
LA024-021----	248390	187760	DOOARY	MOATED SITE
LA024-024----	248206	186802	RAHANAVANNAGH	CASTLE - UNCLASSIFIED
LA024-035----	248195	186490	RAHANAVANNAGH	BURIAL MOUND
LA024-036----	248230	186260	RAHANAVANNAGH	DESIGNED LANDSCAPE FEATURE
LA024-059----	246771	188853	BALLYROAN (CULLENAGH BY.)	BUILDING
LA024-060----	246799	188849	BALLYROAN (CULLENAGH BY.)	SETTLEMENT DESERTED - MEDIEVAL
LA024-060001-	246733	188915	BALLYROAN (CULLENAGH BY.)	CHURCH
LA024-060002-	246734	188902	BALLYROAN (CULLENAGH BY.)	GRAVEYARD

SMRS	Easting	Northing	Townland	Site Type
LA030-007----	246427	182170	RAGGETTSTOWN	QUARRY
LA030-008----	246820	181950	HAYWOOD DEMESNE	CASTLE - MOTTE
LA030-009----	247070	182420	CAPPANASHANNAGH	MOATED SITE
LA030-017----	246143	181668	DRIMATERRIL	RINGFORT - RATH
LA030-018----	246697	180506	BALLINAKILL, HAYWOOD DEMESNE	HISTORIC TOWN
LA030-018001-	246692	180579	BALLINAKILL	CASTLE - TOWER HOUSE
LA030-018002-	246622	180660	BALLINAKILL	FONT
LA030-018003-	246628	180725	HAYWOOD DEMESNE	CHURCH
LA030-018004-	246634	180716	HAYWOOD DEMESNE	GRAVEYARD
LA030-018005-	246690	180571	BALLINAKILL	BAWN
LA030-018010-	246721	180086	BALLINAKILL	BURIAL GROUND
LA030-020----	247030	181090	HAYWOOD DEMESNE	ENCLOSURE
LA030-046----	246478	178527	UNKNOWN	MILL - UNCLASSIFIED
KK001-005001-	245210	177968	CASTLEMARKET	CHURCH

Table 5.1: Recorded monuments located along Route A corridor.

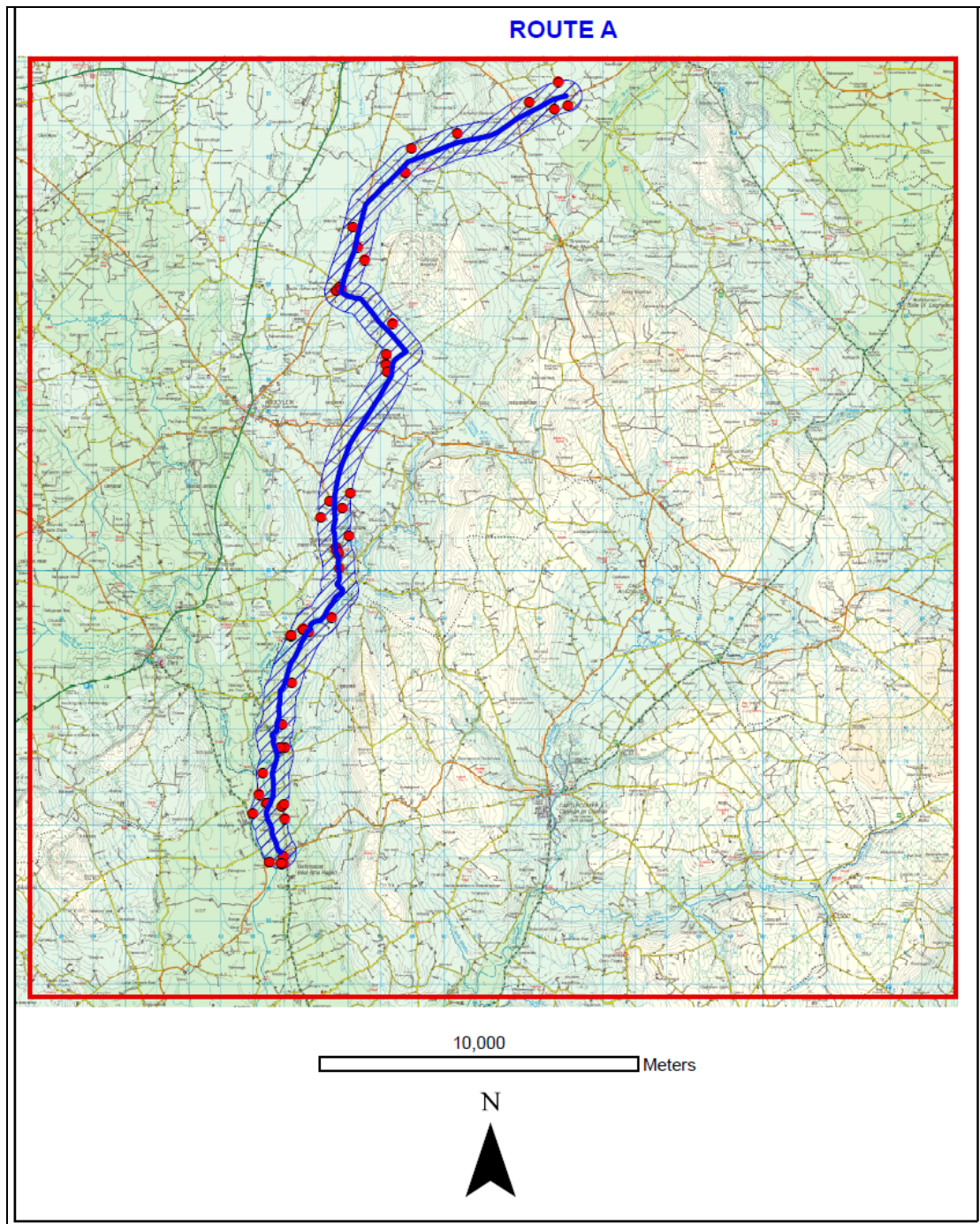


Figure 5.1: Recorded Monuments (in red) within study area (blue hachured area).

The cable route passes **directly** through a number of Archaeological Constraints which are Recorded Monuments. These are as follows:

Ballyroan Deserted Medieval Settlement LA024-060: The parish and town of Ballyroan are represented on Sir William Petty's Map of Cullenagh barony. A few houses mark the site of the town; and a considerable strip of bog is marked. Its town is represented by a group of seven detached houses near its celebrated moat (O'Hanlon and O'Leary 1907, vol. 1, 187). On the Old

Map of Leix and Ophaly Ballyroan is marked, as Tolouer, now Tullore, and Dromselege, now Drimashellig, a townland in this parish. Coulinleigh and Koulingh is marked on the old Map of Leix and Ophaly (O'Hanlon and O'Leary 1907, vol. 1, 186). A 17th-century house (LA024-059) running parallel to the main street may be all that survives above ground of the seventeenth century town of Ballyroan. A Church and graveyard at the north end of the village of Ballyroan may be located on site of an earlier church (LA024-06001) and graveyard (LA024-06002).

The constraints within the town consist of a church and graveyard, a 17th century house, a motte and a castle.

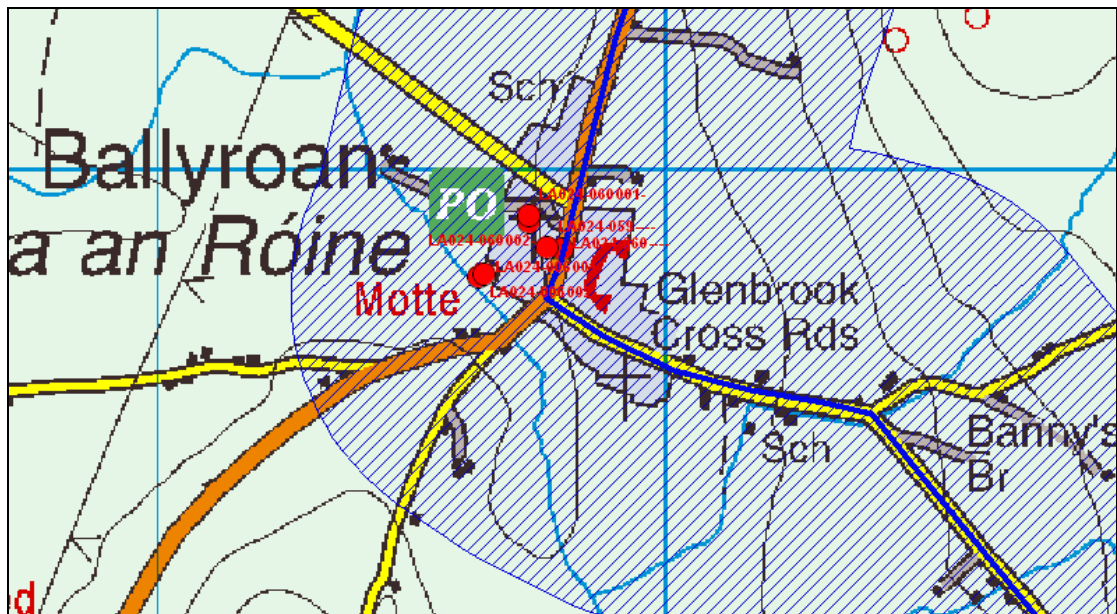


Figure 5.2: Ballyroan Deserted Medieval Settlement showing constraints in red.

Historic Town (Ballinakill) LA030-018

The earliest documentary references to Ballinakill occur in the late sixteenth century (Urban Survey 1986, 13). In 1570 the lands of 'Ballenekyll' were granted to Alexander Cosby and his wife Dorcas Sydney (12 RDKPRI, 19: no. 1623), a grant which was renewed in 1593 (16 RDKPRI, 238: no. 5825). In 1606 Sir T. Coatch was granted the right to hold a market and fair there (Erck 1846-52, ii, 307). An English colony was established soon after by Sir Thomas Ridgeway (O'Hanlon and O'Leary 1907-14, 234) and in 1613 the town was incorporated by a charter of James I (Ir Rec Comm 1830, 236). The borough owed its development primarily to the proximity of the ironworks at Kilrush located 1.3km south-east of Ballinakill (Feehan 1983, 378). On his death in 1641 Ridgeway, then Earl of Londonderry, was described as holding the manor of Gallenridgeway alias Balinekill, containing a large mansion or castle, one hundred messuages, a dovecot, two watermills, a fulling mill, an iron-mill (LA030-040), courts leet and baron, three fairs and two markets in the town (Ir Rec Comm 1826, com. Regine : 16 Car I). In 1642 the town was described as *'seated among woods in a place soe watered with springs as afforded the*

Earle convenience to make many fish ponds near the Castle hee built there; which hee liekwise fortified with a strong wall, and that with turrets and flankers; besides that the towne since it had been planted was well inhabited, the iron mill there kept many lustie men at work (Feehan 1983, 377). In 1659 it was still the third most populous town in Co. Laois with a population of 204, one quarter of which were English (Pender 1939). In the eighteenth century Ballinakill was one of the most important fair towns within county Laois and much of its present layout belongs to that period. The corporation and borough of Ballinakill were dissolved at the Act of Union in 1800 (Urban Survey 1986, 14).

The present settlement of Ballinakill is arranged around a rectangular square, on which three streets converge. Church Street lies to the north, Bride St. to the west and Stanhope St. to the south. The present configuration of streets, however, is largely the result of 18th century activity. The seventeenth century borough was laid out along the long axis formed by Graveyard St and Stanhope St., with Chapel Lane and Castle Lane running perpendicularly to the east. The Square, Church St. and Bride St. represent an 18th century addition (Urban Survey 1986, 14). There is a well defined burgage plot pattern on the east side of Stanhope St. and the Square but elsewhere it is not so apparent (Urban Survey 1986, 14). There are some stone built houses and sheds on the street front of these plots but they do not have any dateable features. Part of their fabric may be of seventeenth century date but it is impossible to be certain (Urban Survey 1986, 14).

The above description is derived from the published 'Archaeological Inventory of County Laois' (Dublin Stationery Office, 1995) compiled by P. David Sweetman, Olive Alcock and Bernie Moran.

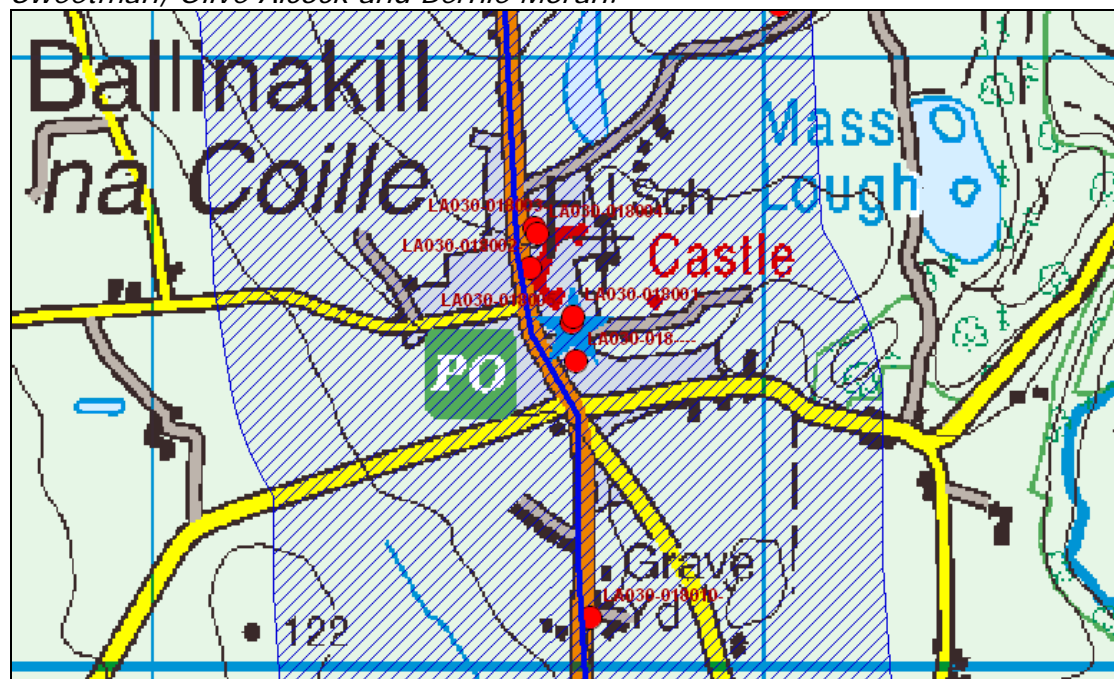


Figure 5.3: Historic town (Ballinakill) LA030-018 showing constraints in red.

The constraints consist of a church and graveyard, font, tower house and bawn.

Castlemarket Bridge KK001-007

This is a five-arch rubble limestone road bridge over a river and was built in c.1775. It is described in the NIAH as a '*Random rubble limestone walls with tooled cut-limestone triangular cut-waters to piers having rendered coping, and squared rubble limestone coping to parapets having sections of rounded coping. Series of five segmental arches with rubble limestone voussoirs, and rendered soffits. Sited spanning Ouveg River with grass banks to river. A well-composed middle-size bridge forming an important element of the mid to late eighteenth-century civil engineering heritage of Kilkenny. Distinguishing characteristics including the construction in unrefined locally-sourced rubble stone together with the non-uniform profile or scale of the arches produces a rustic quality integrating the composition pleasantly into the surrounding rural landscape.*

5.4.4 Architectural Environment Specific to Route Corridor A

Route A

Forty-eight (48) structures listed in the NIAH for Kilkenny and Laois occur within Route A corridor. Eighteen of these structures are located in Ballyragget which will not be traversed by the proposed cable route. All structures are outlined in *Table 5.2* below.

REG_NO	X_COORD	Y_COORD	SURVEY_ID	STRUCTURE	TOWNLAND
12802401	246912	188606	Laois	Saint Patrick's Roman Catholic Church	Ballyroan
12802402	246733	188913	Laois	Ballyroan Church of Ireland Church	Ballyroan
12802403	246774	188853	Laois	House, Ballyroan	Ballyroan
12802404	246790	188869	Laois	House, Ballyroan	Ballyroan
12802405	246798	188794	Laois	House, Ballyroan	Ballyroan
12802408	247603	188452	Laois	Glenbrook House, Glenbrook Cross Roads	Ballyroan
12802412	248203	186797	Laois	Blandsfort House	Rahanavannagh
12802413	246768	188825	Laois	House, Ballyroan	Ballyroan
12803001	246580	182114	Laois	Tower Cross Roads Lodge	Heywood Demesne
12803002	246732	181967	Laois	Obelisk, Heywood Gardens	Heywood Demesne
12803004	246961	181908	Laois	Folly, Heywood Gardens	Heywood Demesne
12803005	246974	181907	Laois	Folly, Heywood Gardens	Heywood Demesne
12803006	247041	181850	Laois	Summerhouse, Heywood Gardens	Heywood Demesne
12803008	247078	181722	Laois	Heywood Gardens	Heywood Demesne
12803009	246961	181815	Laois	Boat House, Heywood Gardens	Heywood Demesne
12901001	246695	181069	Laois	Claude's Seat, Heywood Demesne	Heywood Demesne
12901002	246636	180722	Laois	All Saints Church of Ireland Church	Heywood Demesne
12901003	246692	180691	Laois	Saint Brigid's Roman Catholic Church	Ballinakill
12901004	246577	180678	Laois	Ballinakill School	Ballinakill
12901005	246630	180657	Laois	Ballinakill School	Ballinakill
12901006	246633	180599	Laois	House, Ballinakill	Ballinakill
12901008	246589	180519	Laois	House, Ballinakill	Ballinakill

REG_NO	X_COORD	Y_COORD	SURVEY_ID	STRUCTURE	TOWNLAND
12901009	246621	180517	Laois	House, Ballinakill	Ballinakill
12901010	246683	180450	Laois	Stanhope Bridge	Ballinakill
12901011	246688	180453	Laois	Stanhope Arch	Ballinakill
12901012	246706	180586	Laois	Ballinakill Castle	Ballinakill
12400101	245119	177989	Kilkenny	Rosconnell Bridge	Castlemarket
12400102	245767	178090	Kilkenny	Castlemarket Bridge	Castlemarket
12400103	247106	179092	Kilkenny	Loughill Bridge, Castlemarket	Loughill
12400501	245137	177117	Kilkenny	Saint Mary's Catholic Church, Ballyoskill	Earlsgarden
12303016	244713	170919	Kilkenny	Outbuilding	Ballyragget
12303004	244811	170956	Kilkenny	House, Ballyragget	Ballyragget
12303005	244921	170975	Kilkenny	House, Ballyragget	Ballyragget
12303006	244958	170989	Kilkenny	House, Ballyragget	Ballyragget
12303007	244985	170998	Kilkenny	House, Ballyragget	Ballyragget
12303010	245028	171019	Kilkenny	Ballyragget Medical Hall	Ballyragget
12303009	245018	171015	Kilkenny	House, Ballyragget	Ballyragget
12303008	245008	171008	Kilkenny	House, Ballyragget	Ballyragget
12303011	245084	171050	Kilkenny	Phelan's Hotel (Butler House)	Ballyragget
12303012	245052	171017	Kilkenny	House, Ballyragget	Ballyragget
12303013	245187	171091	Kilkenny	Saint Patrick's Catholic Church	Ballyragget
12303017	244957	171028	Kilkenny	Water pump	Ballyragget
12303018	245112	171072	Kilkenny	Outbuilding, Phelan's Hotel (Butler House)	Ballyragget
12303019	245119	171060	Kilkenny	Gates/railings/walls, Saint Patrick's Catholic Church	Ballyragget
12303020	245230	171091	Kilkenny	Presbytery/parochial/curate's house, Saint Patrick's Catholic Church	Ballyragget
12303021	245063	170950	Kilkenny	No record in database	
12303022	245070	170792	Kilkenny	Vent pipe	Ballyragget
12303023	245094	170919	Kilkenny	House, Ballyragget	Ballyragget

Table 5.2: Architecturally significant structures located along cable Route A.

The majority of the structures listed above whilst located in close proximity to the proposed cable route would not be adversely impacted by the cabling process. The structures are mainly represented by buildings such as houses and schools and are located along the road in which the cable would be placed. A number of structures such as bridges however, may be impacted directly and these are described below. The level of impact on bridges is dependent on the methods adopted for attaching the cable and also relies on field inspection to fully assess potential impacts.

NIAH Reg. 12901010 Stanhope Bridge:

A single-arch road bridge over river, dated 1784, with lintel. Rubble stone parapet with concrete coping. Segmental-headed opening to arch with ashlar voussoirs. Sited spanning river; grass verges.



Plate 5.1: NIAH 12901010 Stanhope Bridge.

NIAH Reg. 12901011 Stanhope Arch

Single-arch bridge over stream, c.1815, with castellations and diamond-shaped panel. Roughcast rendered rubble stone walls, painted, with dressed limestone lintel and rubble stone castellated parapet. Sited spanning river; grass verges.

NIAH Reg. 12400102 Castlemarket Bridge

(Also Recorded Monument – see above for description).

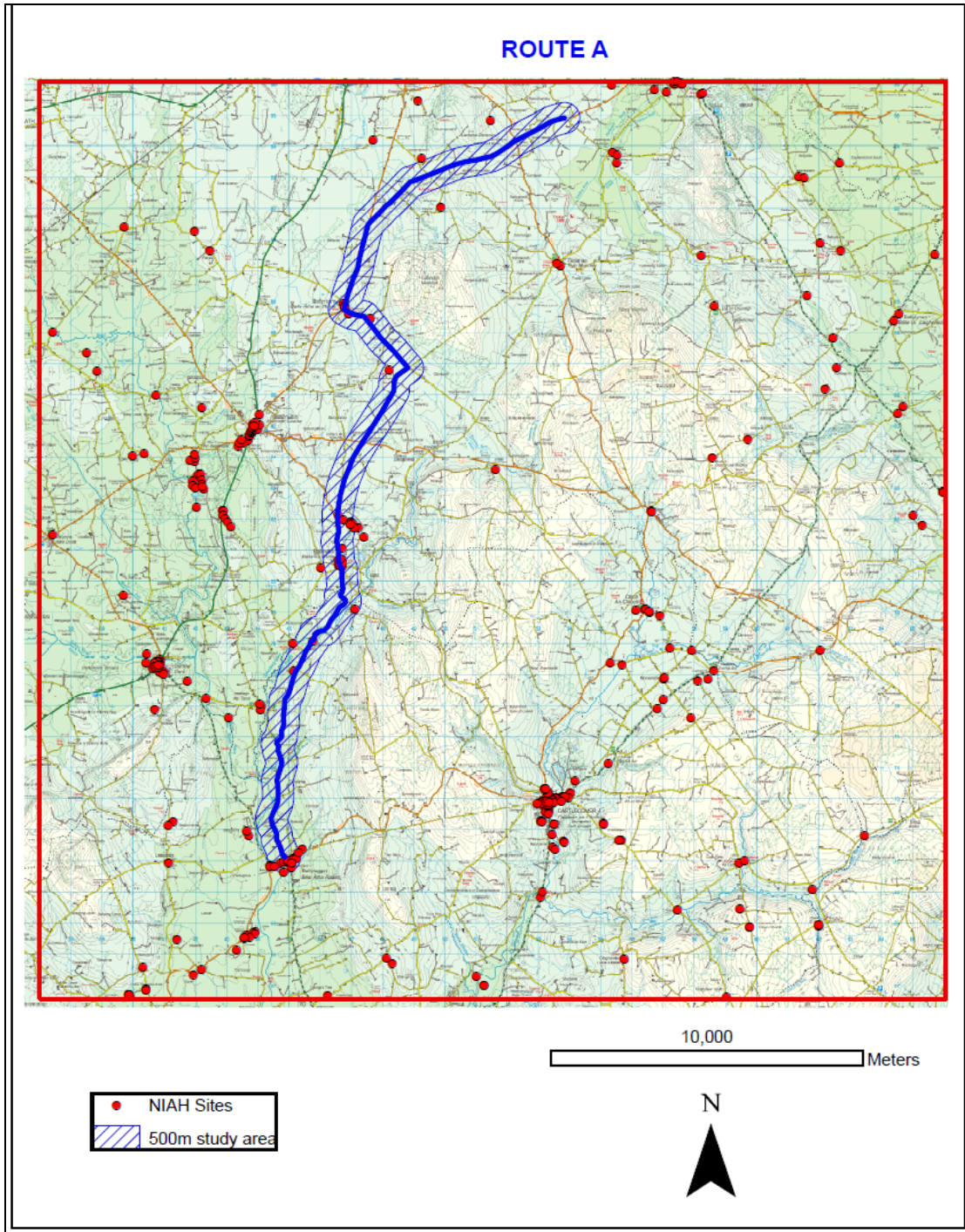


Figure 5.4: Route A showing architectural constraints located within the study area (NIAH).

5.5 Evaluation and Conclusions

5.5.1 Visual Impacts

The broad route corridor covers an area with a medium-high density of recorded archaeological monuments and architecturally significant structures. The construction of an underground cable will not have any visual impact on the archaeological heritage of the area.

The only potential instance of visual impact is where it is proposed to cross water courses such as bridges or culverts. Attaching a cable to the side of a bridge has the potential to visually impact on the structure. All bridges which occur within the study area are discussed in Section 5.4.4 above and are summarised below in *Table 5.3*. This includes sites listed in the NIAH and recorded monuments.

Route A

Route A contains 2 bridges one of which is a recorded monument. The potential impacts are assessed in *Table 5.3*.

RMP	NGR	NIAH REG.	Townland	Comment	Visual Impact
KK001-007	E245767, N178090	12400102	CASTLEMARKET	Cable route traverses bridge	Potential visual impact. Dependant on methods of attachment of cable.
N/A	E246688, N180453	12901010	BALLINAKILL Stanhope Bridge	Cable route traverses bridge	Potential visual impact. Dependant on methods of attachment of cable.

Table 5.3: Bridges within Route A corridor (Recorded Monument and Protected Structures)

5.5.2 Archaeological Impacts

The construction of an underground electricity cable has the potential to uncover previously unrecorded archaeological finds, features or deposits.

Cabling along Roads

Where electricity cables are laid along roads the potential for uncovering archaeological finds, features or deposits is low. This is due mainly to the level of disturbance that has already taken place along roads. Where a cable route traverses through an archaeological constraint zone, however, this increases the likelihood of archaeological features being uncovered during the excavation of cable trenches or joint bays. Two such examples occur where the cable route passes through 2 historic towns namely Ballinakill (LA030-

018) and Ballyroan (LA024-060). Both towns are archaeological zones of potential as defined by the Record of Monuments and Places. It is possible that sub-surface remains associated with the historic towns may be uncovered during cable trenching. In order to mitigate against potential damage to such sub-surface remains (if present), archaeological monitoring of all excavation works within the towns or marked zone of archaeological potential should be carried out (see below).



Figure 5.5: Extract from RMP map Sheet 30 (County Laois) showing Ballinakill historic town LA030-018.

Bridges

Whilst a number of bridges which are Recorded Monuments and/or listed in the NIAH are located along cable route A, the cables should not be attached to the side of any such bridges. An alternative method of cabling should be utilised therefore avoiding direct archaeological impacts. Where a bridge is a Recorded Monument ministerial consent would be required for any alterations to that structure (See section on statutory context above).

The 'Architectural Heritage Protection Guidelines for Planning Authorities' addresses issues in relation to potential alterations to non-habitable structures such as bridges (2004, chapter 14 page 209). This document should be consulted prior to any alterations or modifications arising as a result of cabling

along a bridge. Section 12 (3) of the 1994 Amendment Act states that any person proposing to carry out work at or in relation to a recorded monument must give notice in writing to the Minister (Environment, Heritage and Local Government) and shall not commence the work for a period of two months after having given the notice. All proposed works, therefore, within or around any archaeological monument are subject to statutory protection and legislation (National Monuments Acts 1930-2004). This applies to any bridges which are Recorded Monuments.

5.5.3 Mitigation Measures Required

In order to minimise the impact of the selected cable route on the archaeological, architectural and cultural heritage landscape the following is recommended.

- The selected cable route should, where possible, avoid all architecturally significant structures and buildings. Attaching cables to the side of protected bridges should be avoided and an alternative method of cabling sought. This is in the interest of preserving the architectural and archaeological heritage.
- A programme of field walking should be carried out along the selected route to assess the archaeological potential of the proposed route and to detect previously unrecorded monuments, if any. Particular attention should be given to areas where the cable route traverses an archaeological constraint zone.
- Any monuments within 50m of the selected route should be visited in order to assess the potential archaeological impact of the cable route on such monuments.
- Archaeological monitoring of the excavation of the cable trench and joint bays through the Historic Towns (Constraint zones) RMP LA024-060 and LA030-18 should be undertaken.

Section 6 Soils and Geology

6.1 Introduction

This section has been prepared by AWN Consulting Ltd. to assess the potential impact of the proposed underground cable circuit on soils and geology.

6.2 Study Area

The proposed route lies between Co. Laois and Ballyragget, Co. Kilkenny. The proposed route uses existing roads and passes through an area that is largely agricultural. Route Option A uses the existing roads R427 and R425 from Money Cross to Ballyroan, it then extends south to Ballinakill, Co. Laois and on to Ballyragget, Co. Kilkenny.

6.3 Methodology

The following list of maps and publications, together with databases, were reviewed as part of the assessment of constraints in relation to soils and geology:

- Ordnance Survey of Ireland Discovery Series 1:50,000 Map Series, Nos. 54, 55& 60
- Soil Map of Ireland, An Foras Taluntaisi, 1980
- Geological Survey of Ireland (GSI)/Teagasc Soils Map, Online Map Database
- GSI, Geology of Kildare-Wicklow, Sheet 16
- GSI, Geology of Galway - Offaly, Sheet 15
- GSI, Geology of Tipperary, Sheet 18
- Karst Database, GSIs
- Quaternary (Subsoils) Database, GSI
- Groundwater Well Database, GSI
- Landslides in Ireland, GSI Irish Landslides Working Group, 2006
- GSI Heritage Programme, Sites of Geological Interest

6.4 Existing Environment

6.4.1 Solid Geology

An inspection of the GSI records shows the proposed route to be underlain by sandstones shales and limestones of the Carboniferous Period. See *Figure 6.1* for bedrock geology. Different geological formations that make up the study area are the following:

- **Ballyadams Formation** - Grey thick bedded crinoidal calcarenitic wackstone and packstone limestone with clay wayboards towards the top.
- **Clogrenan Formation** - Cherty argillaceous grey calcarenitic wackstone and packstone limestones.
- **Luggacurren Shale Formation** - Dark-grey to black mudstones and shales with thin bedded muddy cherts and limestones and fossiliferous marine bands.
- **Killeshin Siltstone Formation** - Grey muddy siltstones or silty mudstones with subordinate sandstone.
- **Durrow Formation** - Fossiliferous grainstones, shales and oolites with a few micrites.

6.4.2 Drift Geology

With reference to the EPA (<http://maps.epa.ie/>), the subsoils comprise of till derived from sandstones, shales and limestones of the Carboniferous Period. See *Figure 6.2* for subsoils of the study area. Till is an unsorted sediment derived from the transportation and deposition of, by, or from, a glacier. Glacial till is composed of a heterogeneous mixture of clay, sand, gravel and boulders.

The following subsoil groups occur in the study area:

- Till derived chiefly from Limestone.
- Till derived chiefly from Namurian sandstones and shales
- Till derived chiefly from Devonian sandstones
- Blanket Peat
- Cut Peat
- Alluvium undifferentiated

The GSI Well Card Index is a record of wells drilled in Ireland. This Index shows a number of wells within the study area. While much useful information can be obtained from this Index, it is important to note that it is by no means exhaustive, as it requires individual drillers to submit details of wells in each area. The well card data presented in *Table 6.1* shows the occurrence of recorded wells along, and in the vicinity of, the proposed route options. It also shows information regarding the depth to bedrock, and hence the depth of overburden for each well.

GSI Code	Depth (meters)	Easting	Northing	Townland	County	DTB (m BGL)
2317SEW101	12.2	247850	178540	LOUGHILL	Kilkenny	11
2317SEW104	14	245880	178530	CASTLEMARKET	Kilkenny	6
2317SEW107	15	246300	178560	CASTLEMARKET	Kilkenny	14
2317SEW109	15.7	247000	178920	LOUGHILL	Kilkenny	0
2317SEW137	10	246150	176290	BALLYOSKILL	Kilkenny	7.5
2317SEW141	2	248220	175370	BALLYNALACKEN	Kilkenny	0
2317SEW151	4.3	247640	172250	FINNAN	Kilkenny	3.8
2317SEW152	16.5	246840	172220	FINNAN	Kilkenny	6
2317SWW418	30.1	243630	172820	BALLYCONRA	Kilkenny	27.4
2317SWW423	152	243880	172040	BALLYCONRA	Kilkenny	4.6
2317SWW424	3.7	244870	176550	EARLSGARDEN	Kilkenny	3.7
2317SWW425	6.3	244920	176200	BALLYOSKILL	Kilkenny	4.7
2317SWW426	4	244340	175480	RUSELLSTOWN	Kilkenny	3.9
2317SWW449	9.8	244000	172250	BALLYCONRA	Kilkenny	5
2317SWW468	42.1	244800	176210	EARLSGARDEN	Kilkenny	4.9
2317NWW192	122	243350	189150	CORBALLY	Laois	10.7
2317NWW193	15	243360	189100	CORBALLY	Laois	10.7
2317NWW300	20.3	242930	180150	WATERCASTLE	Laois	20.3
2317SEW017	44.2	250000	179700	KILRUSH	Laois	2.1
2317SWW073	2.1	243200	177770	GRENAN	Laois	2.1
2317SWW075	5.2	243410	177620	CLORHAUN	Laois	5.2
2317SWW078	4.3	243520	177280	CLORHAUN	Laois	4.3
2317SWW079	1.8	243500	177120	GRENAN	Laois	1.8
2317SWW083	22.9	243350	179540	BRANDRA	Laois	21.3
2317SWW084	28	243350	179680	BRANDRA	Laois	8.5
2317SWW104	26.7	242850	179100	FERMOYLE	Laois	8.2

Table 6.1 GSI Well Data for Study Area showing depth to bedrock (DTB)

The well card data shows that the wells recorded have depths of overburden ranging from ground level to 27.4m BGL.

6.4.3 Soils

The soils distribution across the study area is provided on the GSI/Teagasc Soils Map and the Soils Map of Ireland. The maps identified Gleys and Grey Brown Podzolics as the distinct soil types that exist in the general area with Basin Peat found at "the pass of the planes" located along the R427, 4km southwest of Loughteeog, at Ballyroan, Co. Laois and Bernardsgrove, Co. Laois. A description of each is as follows:

- **Gleys** - these are soils in which the effects of drainage impedance dominate and which have developed under the influence of permanent or intermittent water logging. The impedance may be due to a high water table, to a 'perched' water table caused by the impervious nature of the soil itself, or to seepage of runoff from slopes. Most gleys have poor physical conditions, which make them unsuitable for cultivation or for intensive grassland farming. Their productive capacity is also affected by restricted growth in spring and autumn.
- **Grey Brown Podzolics** - These soils are generally poor soils, depleted of nutrients by heavy rainfall leaching through an organic layer (the podzolisation process). The surface layer contains organic matter that is intimately mixed with mineral matter.
- **Basin Peat** - This was formed in lake basins, hollows and river valleys, or where the sub-soil is sufficiently impermeable to give a high water table. Variations in the concentration of component plant remains in fen as basin peat depend on the topographic situation and nutrient content of the water supply.

6.4.4 Karst Features

The Karst database held by the GSI was consulted. This database holds records of locations and types of reported Karst features. No recorded karst features from the GSI database exist within the study area.

6.4.5 Geotechnical and Slope Stability

In areas with sloping ground, the composition and extent of the subsoils is an influencing factor in the stability of slopes. The actual consolidation of deposits varies considerably based on a wide range of factors at a local level. Detailed information of the geotechnical capability of deposits can only be determined following intrusive site investigation.

The GSI has developed a database of historical landslides in Ireland. This database has been consulted and 1 recorded event was noted within the study area at Cullenagh Mountain, Co. Laois (Grid Reference 248000 189000). Route A does not traverse this location.

6.4.6 Areas of Geological Heritage Importance

The GSI was consulted in relation to any areas of geological heritage or interest located in the study area.

The GSI is in partnership with the National Parks and Wildlife Service (NPWS) to identify and select any important geological and geomorphological sites throughout the country for designation as NHAs (Natural Heritage Areas). This is addressed under 16 different geological themes. A large number of sites are currently being examined in order to identify the most significant scientifically. Sites that do not qualify as a proposed NHA, may qualify under the second tier of County Geological Sites (CGS), which would be included in County Development Plans and receive a measure of protection through inclusion in the planning system.

According to the GSI, there is 1 site of geological interest that lies within the study area, as follows:

- **Rock of Cashel, Co. Laois (Grid Reference – 247865 192334)** - deposition features, crinoids and brachiopods. This site is proposed for CGS. Small outcrop of limestone with characteristics of deposition in turbid environments. The rock is highly fossiliferous with crinoids and brachiopods.

6.5 Evaluation and Conclusions

6.5.1 Construction Phase

There are a number of different trench cross sections that may be used along the proposed route depending on the type of circuit being installed. The typical width of the trench is 0.7m. The maximum depth of excavation is 1.25m. There is a possible impact on the bedrock from excavations at locations where the bedrock is at or near ground level. There are joint bays every, on average, 750m along a cable route. These are normally on the road or set off the road though sometimes can be on private lands. The dimensions of this concrete box used to join cables is 6m long x 2.5m wide x 1.8m deep. These boxes are backfilled with gravel and sand and finished to the standard of the ground they are in situ (there will be no void in them when complete).

When cables are sited along public roads, the excavation work will involve some disturbance to topsoil, subsoil and bedrock. When cables are installed using trenchless technology, the site preparation works will include clearance of vegetation, walls etc, excavation and infill. The overall construction method statement will seek to ensure that earthworks are reduced to a minimum.

Excess excavated subsoil, although this is expected to be minimal, will require off-site disposal or recovery at a nearby licensed or permitted waste facility or site. Excavated subsoil, if loosely placed, is also prone to erosion by rainfall and / or surface water run-off. Left unmanaged, run-off over loosely placed peat or subsoil could be discharged to local watercourses.

Based on the fact that the study area is mainly used for agricultural purposes, the potential for existing soil contamination is considered to be low. However, localised areas of soil contamination may exist along the route, in particular in urbanised areas.

There will be a range of machinery and vehicles used on site during the construction phase. The potential impacts to the underlying soil, and geology, in areas that are not adequately protected by the overburden, from the construction of the proposed development could derive from accidental spillage of fuels and oils, which could impact soil and groundwater quality, if allowed to infiltrate to ground during storage and dispensing operations.

Due to the nature of the baseline environment, the trench locations and the construction methodology involved, the proposed route will have a short term – imperceptible impact on the soil and geology environment during the construction phase.

6.5.2 Operational Phase

During the operational phase potential impacts could include minor localised contamination (oil, fuels and sediment) during maintenance works.

The route is considered to have a long term - imperceptible impact on the soil and geological environment during the operational phase.

6.6 Mitigation Measures Required

The following mitigation measures are designed to address the impacts associated with the construction and operational phase of the development.

6.6.1 Construction Phase

In order to minimise the potential for erosion of exposed and stockpiled soil during the construction phase, it is necessary to establish and implement an active construction phase surface water management system. As well as minimising soil erosion, a surface water management plan will also minimise the volume of suspended solids (peat and silt / clay sized particles) transported by surface water run-off and discharged into local watercourses.

In order to minimise soil, peat and/or subsoil erosion and the potential discharge of sediment to local watercourses, the following measures will be implemented during the construction phase of the proposed route:

Minimising excavation, exposure time of open excavations and stockpiling of soil peat and/or soil, especially during wet weather periods;

Interception and channelling of surface water run-off over exposed soil or peat surfaces to silt traps or settlement lagoons thereafter; and

Construction of silt traps at sensitive outfalls at an early stage in the construction programme.

Planned construction works will be carried out in such a manner as to ensure the least feasible disturbance of soils. Contractors will be required to submit and adhere to a method statement indicating the extent of areas likely to be affected and demonstrating that this is the minimum disturbance necessary to achieve the required works. Where soil stripping occurs, the resulting excavated soil will be separated into topsoil, made ground/fill, subsoil and bedrock stockpiles. It is envisaged that all topsoil will be retained on site where possible and reused as fill material (if suitable). Some of the subsoil and bedrock excavated (if encountered) will be, where possible, retained for use on site.

All excavated materials will be visually assessed for signs of possible contamination such as staining or strong odours. Should any unusual staining or odour be noticed, samples of this soil will be analysed for the presence of possible contaminants in order to ensure that historical pollution of the soil has not occurred. Should it be determined that any of the soil excavated is contaminated, this will be dealt with appropriately as per the Waste Management Acts of 1996 – 2008 and associated Regulations.

Soils taken off site will be removed and disposed of by contractors licensed under the Waste Management Act of 1996 (as amended 2001), the Waste Management (Facility Permit & Registration) Regulations of 2007 and the Waste Management (Collection Permit) Regulations of 2007. The issuing of such a permit to contractors allows them to use such material for landscaping and land reclamation, subject to conditions defined in the permit, if the material has been classified as suitable for this use. Otherwise, the material will be classified for disposal at a suitably licensed landfill and removed off-site by a licensed waste contractor. In terms of surplus soil, any residuals will be stored within appropriately designed storage areas of sufficient capacity prior to removal by a suitably licensed waste management contractor for off-site treatment/recycling/disposal.

A construction and demolition waste management plan will be developed in accordance with the Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects (DoEHLG, 2006) to ensure that all construction waste is stored, managed, moved, reused or disposed of in an appropriate manner by appropriate contractors in accordance with all relevant waste legislation.

To minimise any impact on the underlying subsurface strata from material spillages, all oils, solvents and paints used during construction will be stored within specially constructed dedicated temporary bunded areas. Oil and fuel storage tanks will be stored in designated areas with an impervious base. These areas will be bunded to a volume of 110% of the capacity of the largest tank/container within the bunded area(s) (plus an allowance of 30 mm

for rainwater ingress). Filling and draw-off points will be located entirely within the bunded area(s). Drainage from the bunded area(s) will be diverted for collection and safe disposal.

Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in a designated area of hardstanding at the site, away from surface water gullies or drains. The vehicles will not be left unattended during refueling. Spill kits and hydrocarbon adsorbent packs will be stored in this area and operators will be fully trained in the use of this equipment.

Consultation would take place with the GSI before the construction phase to ensure that the proposed route will not compromise any area which is a designated area of Geological Heritage Importance.

The application of the mitigation measures highlighted above will help ensure that the residual impacts on the soils and geological environment at Route A are short term – imperceptible during the construction phase.

6.6.2 Operational Phase

As part of the standard operations procedures, routine monitoring and maintenance will be carried out to minimise risks to acceptably low levels of likelihood and severity. The mitigation measures highlighted previously will apply in the event of any maintenance works. This will ensure that the residual impacts are long term – imperceptible during the operational phase.

6.7 Recommendations

The magnitude of potential impacts is defined in accordance with the criteria provided in the EPA publication “Guidelines on the Information to be contained in Environmental Impact Statements” (2002), outlined in *Tables 6.2 and 6.3*:

Quality of Impacts	Description
Positive Impact	A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or removing nuisances or improving amenities).
Neutral Impact	A change which does not affect the quality of the environment.
Negative Impact	A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).

Table 6.2 Impact Assessment Criteria (Quality)

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

Table 6.3 Impact Assessment Criteria (Magnitude)

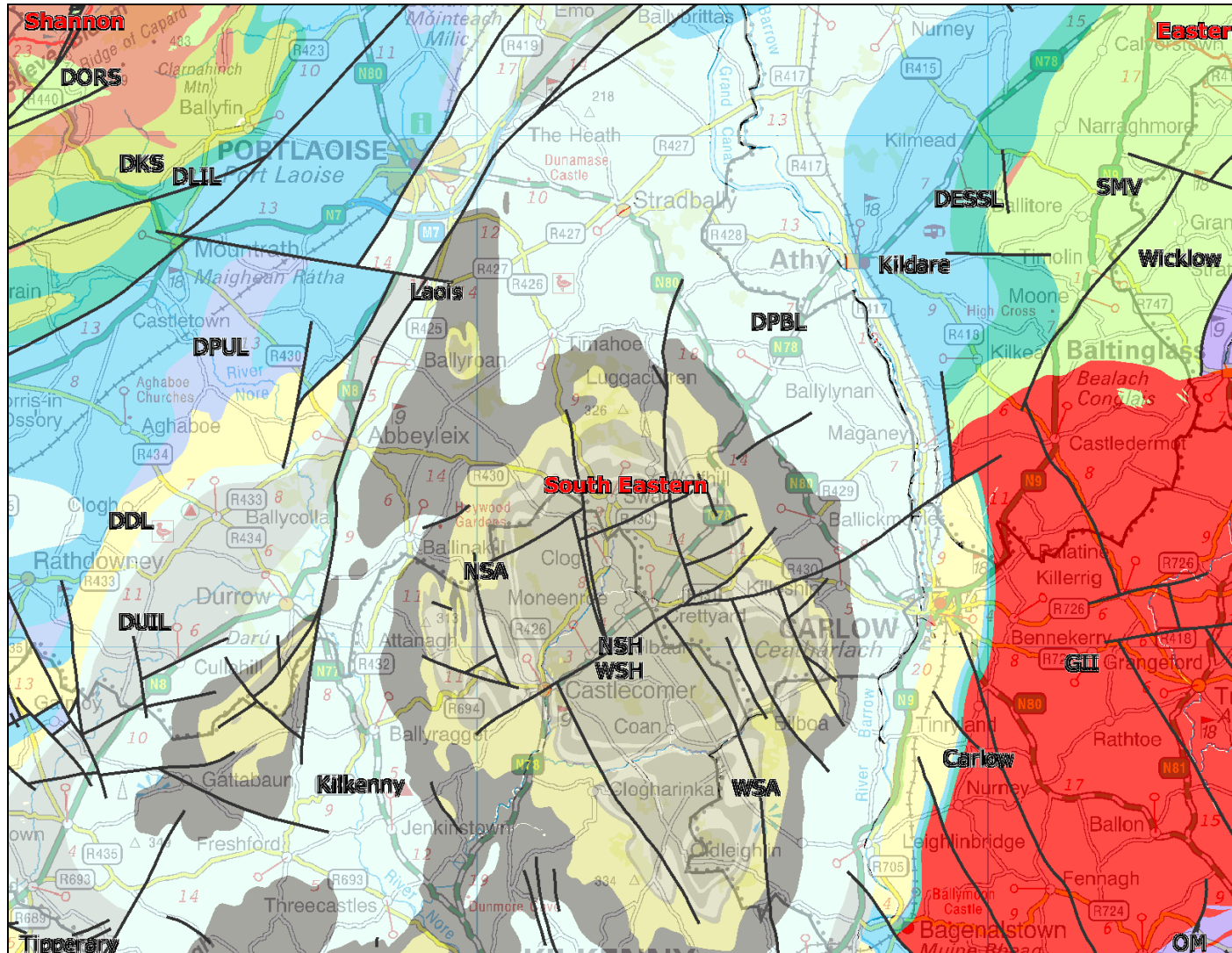
Route A is located adjacent to a CGS at the Rock of Cashel, Co. Laois. Route A is assessed to have a low impact on the geological regime because it passes over blanket peat at “the pass of the planes” located along the R427, 4km southwest of Loughteog, Co. Laois, at Ballyroan, Co. Laois and Bernardsgrove, Co. Laois. Excess excavated subsoil, although it is expected to be minimal, will require off-site disposal or recovery at a nearby licensed waste facility. The estimation of Magnitude of Impact on Soils & Geology for Route A is shown in *Table 6.4*.

Attribute	Attribute Importance	Impact	Level of Impact
Attribute has a high geological quality, significance or value on a regional or national scale	Very High	Geological feature rare on a regional or national scale (The Rock of Cashel, Co. Laois). Route is not located within area, however is located adjacent to the area.	Slight Negative
Degree or extent of soil contamination is minor on a local scale	Low	Irreversible loss of small proportion of local high fertility soils and/or high proportion of local low fertility soils	Slight Negative
Volume of peat and/or soft organic soil underlying route is small on a local scale	Low	Requirement to excavate and replace small proportion of peat, organic soils and/or soft mineral soils beneath alignment	Slight Negative

Table 6.4 Estimation of Magnitude of Impact on Soils & Geology (Route A)

The potential impacts relating to the soils and geology are assessed as slight negative related to the construction phase. The application of mitigation measures highlighted will help ensure that the residual potential impacts are imperceptible during the construction phase and the operational phase.

In terms of the route selection the level of impact identified was slight negative based on the location of the proposed route on existing roads, the desk study of the soils and geology and taking into consideration the assessment of the route. The northern section of Route A is less favourable as it is situated adjacent to an area of Geological Heritage Importance (Rock of Cashel) and there is blanket peat present at a section of the route.



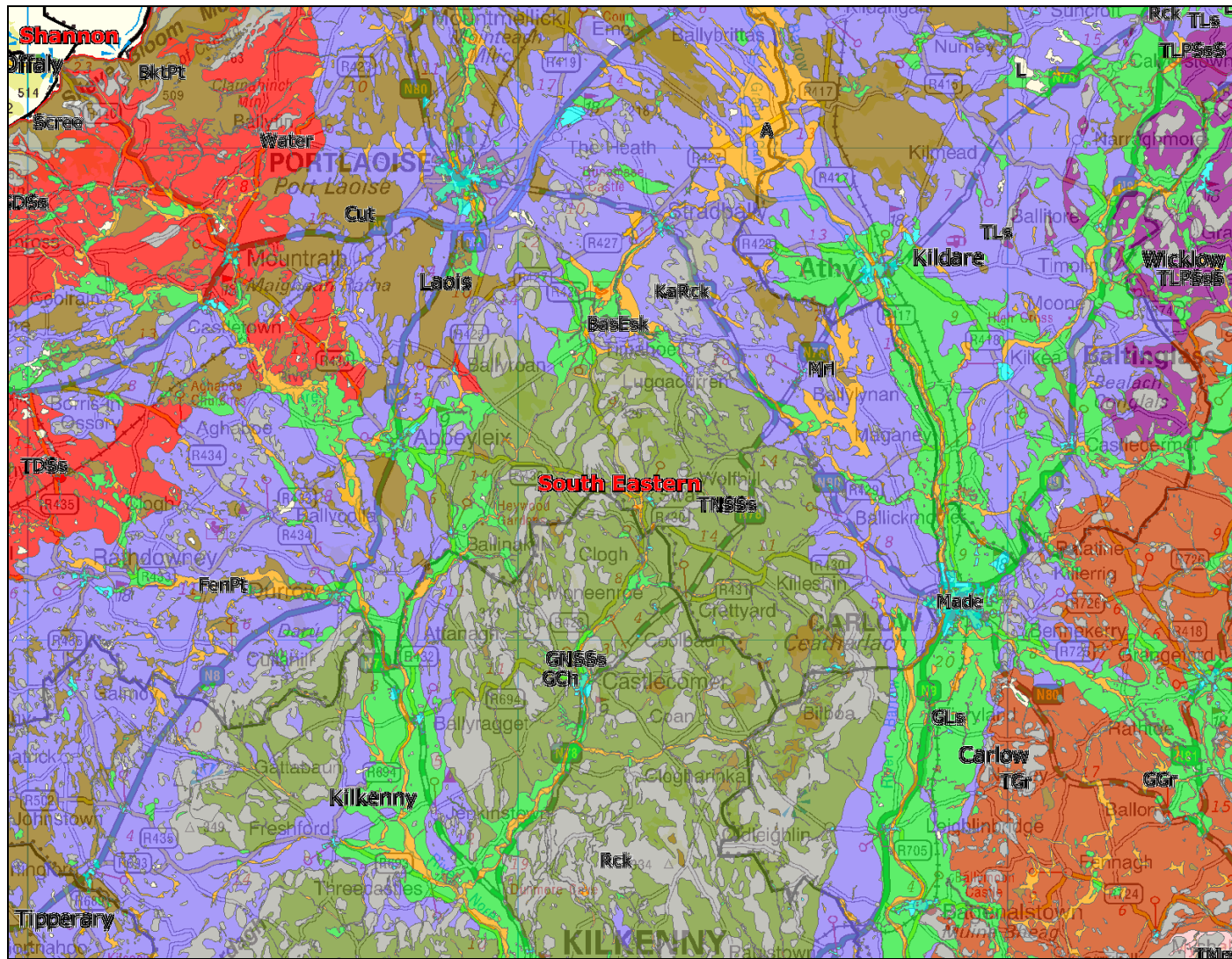
- BV - Basalts and other Volcanic rocks
- CM - Cambrian Metasediments
- DDL - Dinantian Dolomitised Limestones
- DESSL - Dinantian early Sandstones, Shales and Limestones
- DKS - Devonian Kiltoran type Sandstones
- DLIL - Dinantian Lower Impure Limestones
- DMSC - Dinantian Mudstones and Sandstones Cork Group
- MSSL - Dinantian Mixed Sandstones, Shales and Limestones
- DORS - Devonian Old Red Sandstones
- DPBL - Dinantian Pure Bedded Limestones
- DPUL - Dinantian Pure Unbedded Limestones
- DS - Dinantian Sandstones
- DSL - Dinantian Shales and Limestones
- DUIL - Dinantian Upper Impure Limestones
- GII - Granites and other Igneous Intrusive rocks
- NSA - Namurian Sandstones
- NSH - Namurian Shales
- NU - Namurian Undifferentiated
- OM - Ordovician Metasediments
- OV - Ordovician Volcanics
- PM - Precambrian Marbles
- PQGS - Precambrian Quartzites, Gneisses and Schists
- PTMG - Permo Triassic Mudstones and Gypsum
- PTS - Permo Triassic Sandstones
- SMV - Silurian Metasediments and Volcanic
- WSA - Westphalian Sandstones
- WSH - Westphalian Shales

- RBD Boundaries
- County Boundaries

Project
Laois - Kilkenny, 110kV
Underground Cable

Reference
09_4848

Figure 6.1
Bedrock Geology of Study Area



- Shannon RBD Subsoils**
- Alluvium
 - Beach sands and gravels
 - Bedrock outcrop and subcrop
 - Esker sands and gravels
 - Glaciofluvial sands and gravels
 - Lake sediments
 - Made ground
 - Marine/estuarine silts and clays
 - Marsh
 - Peat
 - Scree
 - Till derived chiefly from Devonian sandstones
 - Till derived chiefly from Lower Palaeozoic rocks
 - Till derived chiefly from Namurian rocks
 - Till derived chiefly from basic igneous rocks
 - Till derived chiefly from cherts
 - Till derived chiefly from granite
 - Till derived chiefly from limestone
 - Till derived from metamorphic rocks
 - Till derived from mixed Devonian and Carboniferous rocks
 - Water
 - Windblown sands

<p>Project Laois - Kilkenny, 110kV Underground Cable</p>
<p>Reference 09_4848</p>
<p>Figure 6.2 Subsoils of Study Area</p>

Section 7 Hydrology & Hydrogeology

7.1 Introduction

This section has been prepared by AWN Consulting Ltd. to assess the potential impact of the proposed underground cable connection in terms of surface water (hydrology) and groundwater (hydrogeology).

7.2 Study Area

The proposed route lies between Money Cross Roads, Co. Laois and Ballyragget, Co. Kilkenny. The study area and proposed route passes through an area that is largely agricultural. Route A uses the existing roads R427 and R425 from Money Cross to Ballyroan, it then extends south to Ballinakill, Co. Laois and on to Ballyragget, Co. Kilkenny.

In terms of surface water, the geographical scope of the assessment comprises any watercourses located within the area occupied by the proposed route and the river catchments within the study area. In terms of groundwater, the geographical scope of the assessment comprises any aquifers located within the area occupied by the proposed route option and aquifers that support the river catchments within the study area.

7.3 Methodology

The following list of maps and publications, together with the databases noted, were reviewed as part of the desk study:

- The Geological Survey of Ireland (GSI) well and groundwater records, with reference to hydrology and hydrogeology
- Ordnance Survey of Ireland Discovery Series 1:50,000 Map Series, Nos. 54, 55 and 60
- GSI, Geology of Kildare-Wicklow, Sheet 16
- GSI, Geology of Galway - Offaly, Sheet 15
- GSI, Geology of Tipperary, Sheet 18
- Department of Environment, Environmental Protection Agency (EPA) & GSI, Groundwater Protection Scheme Guidelines, 1999
- Water Framework Directive Monitoring Programme, EPA 2006
- South Eastern River Basin District Management Plan, SERBD 2009
- Office of Public Works flood mapping data (www.floodmaps.ie)
- Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes, Natura and the NRA, 2005)
- Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes, NRA 2008

7.4 Existing Environment

7.4.1 Hydrology

The study area is located within the South Eastern River Basin District (SERBD), as defined by European Communities Directive 2000/60/EC, establishing a framework for community action in the field of water policy, (commonly known as the Water Framework Directive [WFD]). There are a number of rivers within the study area. A river is defined in the Water Framework Directive as "a body of inland water flowing for the most part on the surface of the land but which may flow underground for part of its course".

7.4.2 Surface Water Features

For the purpose of the route option study the following rivers were assessed:

- River Nore (Upper) and the following tributaries located in the River Nore catchment:
 - Erkina and the following tributary:
 - Goul
 - Gully
 - Owenbeg (Ovbeg) and the following tributary:
 - Ironmills
 - Glashagal

The following rivers are located within the River Barrow catchment in the north eastern section of the study area.

- Cush
- Foyle
- Timahoe

Baseline data has been collected from the aforementioned information sources in order to form a comprehensive database of the water quality in the area. This will assist in the assessment of any potential impact(s) on the hydrological and hydrogeological environment from the route option.

7.4.3 Water Framework Directive Surface Water Quality Status

The European Water Framework Directive (2000/60/EC) (WFD) was implemented in Ireland by S.I. 722 of 2003, European Communities (Water Policy) Regulations 2003. These regulations established in Irish law a framework for community action in the field of water policy. The Water Framework Directive requires 'good water status' for all European waters by 2015, to be achieved through a system of river basin management planning and extensive monitoring. Significant water management issues are included in the SERBD within the water management action plans compiled as part of the SERBD Management Plan 2009 - 2015. *Table 7.1* shows the current status

of the rivers monitored in the study area as part of the plan. See *Figure 7.1* for water courses in the study area and associated water quality.

River	WFD Status
River Nore (Upper)	Moderate
Erkina	Moderate
Goul	Poor
Gully	Good
Owenbeg (Ovbeg)	Moderate
Ironmills	High
Glashagal	Moderate
Cush	Poor
Timahoe	Moderate
Timogue	Poor
Bauteogue River	Moderate
Crooked River	Moderate

Table 7.1 *WFD Status of rivers within the Study Area*

7.4.4 Water Supply

Water usage in the study area is primarily supplied by Laois and Kilkenny County Councils from their surface water abstractions of water courses and supplemented by groundwater abstraction boreholes. There are also a number of private wells that are used by individual landowners. A search of the GSI well database shows there are a number of wells in the area with uses varying from private to agricultural use. See *Table 7.2* for details.

7.4.5 Flooding Events

The Office of Public Works (OPW) Flood Hazard Database (www.floodmaps.ie) was used in order to obtain information on historical flooding events within the study area. This information was used to establish the current baseline conditions in terms of sections of the study area that are liable to flood.

A number of historical flood events were recorded within the study area. An Engineers Report in 2005 obtained from the OPW flood hazard database noted that there have been recurring floods on the River Nore at several locations within the study area. These have been recorded at Tallyho Bridge Durrow, Water Castle Bridge and Abbeyleix, Co. Laois.

7.5 Hydrogeology

7.5.1 Aquifer Classification

The GSI Online maps were consulted in relation to the occurrence of bedrock and quaternary aquifers in the study area. Regionally Important Karstified (diffuse) aquifers are located north of Ballyroan, Co. Laois and extend southwards along the River Nore catchment to Ballyragget, Co. Kilkenny and past. The remaining sections of the study area consist of poor aquifers, which are described as generally unproductive except in local zones. See *Figure 7.2* for bedrock aquifer classifications in the study area. Regionally Important extensive sand and gravel aquifers are present at Abbeyleix, Co. Laois where the aquifer extends southwards to Ballinakill and Ballyragget, Co. Kilkenny. See *Figure 7.3* for gravel aquifer classifications in the study area.

The GSI Well Card Index is a record of wells drilled in Ireland. This Index shows a number of wells within the study area. While much useful information can be obtained from this Index, it is important to note that it is by no means exhaustive, as it requires individual drillers to submit details of wells in each area. The well card data presented in *Table 7.2* shows the occurrence of recorded wells within the study area, information regarding the depth of each well, the groundwater yield (m³) and the yield class. Due to the extensive study area the yield class is varied ranging from poor to moderate and excellent.

GSI Code	Depth (m)	Easting	Northing	Townland	County	Well Use	Yield Class	Yield m ³ d
2317SEW104	14	245880	178530	CASTLEMARKET	Kilkenny	B	Poor	-
2317SEW109	15.7	247000	178920	LOUGHILL	Kilkenny	U	Poor	-
2317SEW156	4.3	249270	172190	RATHKYLE	Kilkenny	U	Failure	1.4
2317SWW466	42.7	244720	179790	BALLYRAGGET	Kilkenny	I	Good	-
2317SWW468	42.1	244800	176210	EARLSGARDEN	Kilkenny	D	Good	327.3
2317NEW049	-	245220	186760	TULLORE	Laois	Pub	Spring	818
2317NEW050	6	247260	186320	DRUMASHELLIG	Laois	Pub	Poor	-
2317NEW052	91.4	249680	183990	BOLEYBEG	Laois	I	Poor	-
2317NWW193	15	243360	189100	CORBALLY	Laois	I	Moderate	150
2317SEW017	44.2	250000	179700	KILRUSH	Laois	-	Good	152.4
2317SWW209	3	244000	176270	GRENAN	Laois	-	Good	218.2

Table 7.2 GSI Well Data for Study Area

A – Agricultural Use
 U – Unknown
 D – Domestic Use Only
 E – Excellent (>400m³/d)
 I – Industrial Use
 M – Moderate (40– 100m³/d)

Pub – Public Supply
 G – Good (100 – 400m³/d)
 Po – Poor (<40m³/d)
 DTB – Depth to Bedrock
 Dom – Domestic use only
 B – Agricultural & domestic Use

7.5.2 Groundwater Vulnerability

The GSI, EPA and DoE have developed a programme of Groundwater Protection Schemes, with the aim of maintaining the quantity and quality of groundwater in Ireland; in addition the programme aims, in some cases to improve groundwater quality by applying a risk assessment approach to groundwater protection and sustainable development. The vulnerability mapping guidelines allow for the assignment of vulnerability ratings from "extreme" to "low", depending upon the subsoil type and thickness. Aquifer vulnerability was varied throughout the study area but was largely classed by the GSI as High - Extreme. See *Figure 7.4* for GSI Vulnerability ratings of the study area.

7.6 Evaluation and Conclusions

Due to the interrelationship between the hydrology and hydrogeology, the potential impacts and mitigation measures will largely be common to both.

7.6.1 Construction Phase

The following activities during the construction stage have the potential to impact on the surface water environment:

- Excavation activities and storage of excavated materials;
- Storage of construction materials/equipment in stockpiles;
- Discharge of dewatered groundwater to surface water bodies; and
- Crossing of watercourses.

There is the potential for surface water pollution due to sediment release from excavated areas and in runoff from stockpiles of excavated materials, in particular excavated peat, during the construction phase. Runoff from stockpiled peat is high in suspended solids. It may be high in pH and have high concentrations of nutrients and metals. Such runoff could adversely affect the quality of receiving waters if discharged without prior treatment. The release of silt laden surface water runoff may occur if stockpiles of construction materials are located too close to water courses and from construction work being carried out next to, and beneath, watercourses.

Due to the use of machinery, equipment and vehicles, there is the potential for fuel spills or leaks, particularly during storage and dispensing operations, to enter the surface watercourses or underlying groundwater if allowed to infiltrate the ground. Accidental spillage of lubricants, paints and solvents, leakage from chemical storage areas and inappropriate disposal of construction waste materials could also occur on site and impact surface water quality.

Dewatering is likely to be required at some areas so that the cable can be laid under dry working conditions. As such, where the groundwater table is encountered, pumping or draining by gravity will be required. Other impacts from the proposed construction works include the increase in groundwater vulnerability arising from the removal of subsoil cover along the alignment, the increase in flow to surface water systems from dewatering discharges and potential change of groundwater quality.

When installing a cable route along a road it is likely that a number of water courses may be encountered along the route. These may take the form of a bridge over a river or a culvert.

Due to the nature of the baseline environment and proposed installation techniques for the cable, the proposed route is expected to have a short term – moderate impact on the water environment during the construction phase.

7.6.3 Operational Phase

During the operational phase potential impacts include contamination (oil, fuels and sediment) during maintenance works however this is highly unlikely due to the rare occurrence of maintenance. The proposed route is expected to have a long term – imperceptible impact on the water environment during the operational phase.

7.7 Mitigation Measures Required

The following preliminary mitigation measures are designed to address the impacts associated with the construction and operational phase of the development. They are fairly standard to most construction management plans.

The Department of the Marine and Natural Resources (2000) published Forest and Water Quality guidelines, which were designed to ensure the impact of construction work on the water environment is minimised. These guidelines were taken into account during the preparation of this report. The contractor will follow current guidance from the Fisheries Board (now Inland Fisheries Ireland), National Roads Authority, Construction Industry Research and Information Association (CIRIA) and the Department of the Marine and Natural Resources during the construction phase.

7.7.1 Construction Phase

The risk of surface water pollution will be minimised through the implementation of good construction practices as outlined in the publication by the Construction Industry Research and Information Association (CIRIA) *Control of Water Pollution from Construction-sites, Guidance from*

Consultants and Contractors (Master et al. 2001). An emergency response protocol for the management of pollution incidents that may occur during the construction phase will be established as part of the Environmental Operating Plan and regularly updated. Based on the guidance documents referred to above this protocol will include: containment measures; a list of appropriate clean-up materials and equipment; details on staff responsibilities and trained personnel; and contact details for pollution clean-up companies and Local Authorities.

Discharges to watercourses along the proposed route or from the temporary construction compounds during the construction phase will be controlled. It is expected that welfare facilities at the construction compounds would comprise port-a-loos and the release of foul effluent from the compounds into nearby watercourses will not occur.

In order to minimise impacts on surface water from material spillages, all oils, solvents and paints used during construction will be stored within suitably designed bunded areas at the temporary construction compounds, in accordance with the Guidance Note for the Control of Pollution (Oil Storage) (England) Regulations 2001 by the Department of the Environment, Food and Rural Affairs (DEFRA) in the UK. Oil and fuel storage tanks will be stored on designated areas of hard standing and these areas will be bunded to a volume of 110% of the capacity of the largest tank/container within the bunded area(s) (plus an allowance of 30 mm for rainwater ingress). Filling and draw-off points will be located entirely within the bunded area(s). Drainage from the bunded area(s) will be diverted for collection and safe disposal off-site in accordance with current waste management legislation.

Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles equipment will take place in designated areas of hard standing within the temporary construction compounds, away from surface water gullies or drains. The vehicles will not be left unattended during refuelling. Spill kits and hydrocarbon adsorbent packs will be stored in these areas and operators will be fully trained in the use of this equipment. An adequate supply of spill kits and hydrocarbon adsorbent packs will also be stored along the construction areas for the proposed route. All relevant personnel will be fully trained in the use of this equipment.

Should it not be possible for machinery or vehicles to return to the temporary construction compounds for refuelling or maintenance purposes, refuelling or maintenance may take place outside the temporary compounds. In this event, fuel will be transported in a mobile, double skinned tank and a spill tray will be used when refuelling is carried out in this manner. Spill kits will be available during such refuelling operations.

Control measures which limit the use and movement of potentially contaminated materials such as fuels and hydrocarbons will be identified, implemented and enforced by the Contractor. All associated hazardous waste

residuals will be stored within suitably designed bunded storage areas at the compounds prior to removal by an appropriate EPA or a Council approved waste management contractor for off-site treatment / recycling / disposal. All other waste material will be stored appropriately, removed and disposed of by contractors licensed under the Waste Management Acts 1996 - 2008 and the Waste Management (Collection Permit) Regulations, 2007 (as amended).

Silt traps or geotextile membrane barriers will be put in place to prevent sediment from stockpiles and excavated areas entering nearby watercourses. Geotextile membrane barriers, where used, will be erected between construction works and watercourses. This membrane barrier will be a minimum of 0.5m in height above ground and will be staked at 2.0m intervals and the trailing edge of the barrier will be buried with soil on the landward side of the barrier, to provide a seal with the ground surface. It is also important that the discharge of surface runoff from the proposed route during the construction phase is properly attenuated. In addition, construction of cut-off ditches to divert surface water run-off from entering excavations will be utilised.

De-watering may be required along some sections of the proposed route and dewatered groundwater will be discharged to surface water bodies. Water generated by dewatering operations (to remove surface water or groundwater from excavations) will be treated by means of a suitable silt trap prior to discharge to a holding tank/attenuation pond. Once the water is deemed to be of satisfactory quality with respect to the concentration of suspended solids and hydrocarbons, it will be discharged at a controlled rate to surface watercourses. This will also apply to any silty surface water runoff that may be generated within the temporary construction compounds. The temporary construction compounds may also require hydrocarbon interceptors should a risk of fuel or oil spills/leaks, be suspected or recorded.

The application of mitigation measures highlighted can ensure that the residual impacts at all route options are long term – slight during the construction phase.

7.7.2 Operational Phase

The risk of polluting the local hydrological and hydrogeological regime from the operating equipment is considered limited. The mitigation measures highlighted will apply in the event of any maintenance works. This will ensure that the residual impacts at all route options are long term – imperceptible during the operational phase.

7.8 Conclusions

The magnitude of impacts is defined in accordance with the criteria provided in the EPA publication "Guidelines on the Information to be Contained in Environmental Impact Statements" (2002), outlined in *Tables 7.3* and *7.4*:

Quality of Impacts	Description
Positive Impact	A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or removing nuisances or improving amenities).
Neutral Impact	A change which does not affect the quality of the environment.
Negative Impact	A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).

Table 7.3 Impact Assessment Criteria (Quality)

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

Table 7.4 Impact Assessment Criteria (Magnitude)

The proposed route was assessed in terms of the sensitivity of the existing water environment and potential impacts during the construction and operational phase of the project.

Numerous rivers are located along the proposed Route A. It also is located adjacent to the River Nore NHA. Regionally Important Karstified (diffuse) aquifers are located north of Ballyroan, Co. Laois and extend southwards along the River Nore catchment to Ballyragget, Co. Kilkenny and past. Regionally Important extensive sand and gravel aquifers are present at

Abbeyleix, Co. Laois where the aquifer extends southwards to Ballinakill and Ballyragget, Co. Kilkenny. The estimation of Magnitude of Impact on Water for route option A is shown in *Table 7.5*.

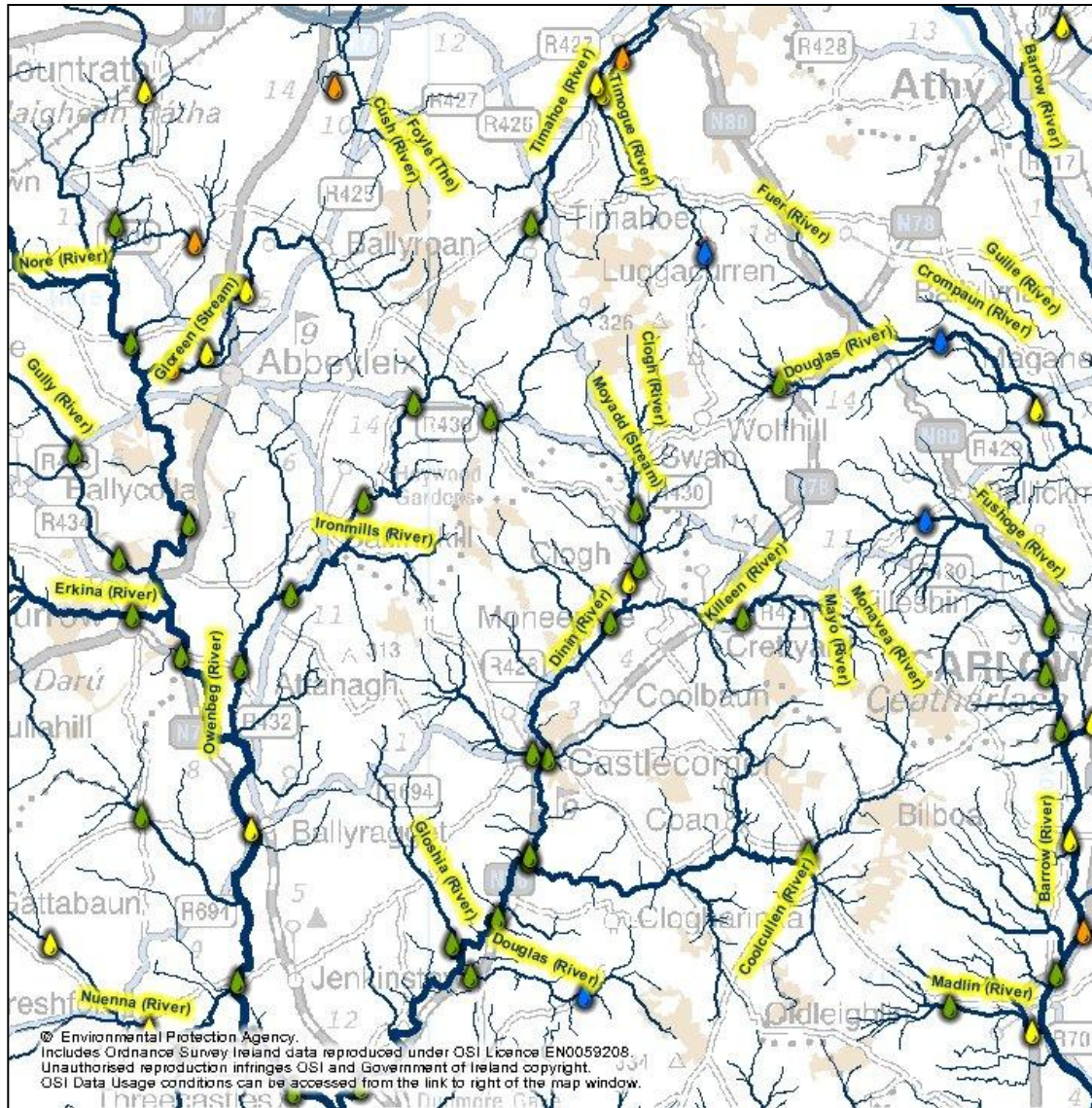
Attribute	Attribute Importance	Impact	Level of Impact
Current WFD Status of rivers along route: Cush, Foyle, Owenbeg, Ironmills, Glashagal and Nore.	Very High	Each river along route A has a varied WFD status. Any impact would result in a downgrade of the current status.	Slight Negative
Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – NHA status	Very High	The River Nore, to the north of Ballyraggett, Co. Kilkenny is a designated NHA. Route is not located within area, however is located adjacent to the area.	Slight Negative
Regionally Important Karstified (diffuse) Aquifer	Very High	Impact on groundwater abstraction rate and recharge	Slight Negative
Locally Important Bedrock Aquifer	Medium	Impact on groundwater abstraction rate and recharge	Slight Negative
Regionally Important extensive sand and gravel Aquifer	Very High	Impact on groundwater abstraction rate and recharge	Slight Negative
Aquifer Vulnerability - Extreme & High	High	Impact on groundwater quality and water supply quality	Slight Negative

Table 7.5 Estimation of Magnitude of Impact on Water (Route A)


The potential impacts of the proposed development relating to the water environment are considered imperceptible and are generally exclusively related to the construction phase. The application of the mitigation measures highlighted will help ensure that the residual impacts of the route option are imperceptible during the construction phase and the operational phase.

The level of impact identified for the route was slight negative based on the location of the proposed option on existing roads, and the desk study of the

baseline water. If trenchless installations along the preferred route are required it would be necessary to carry out site specific investigations at the crossing point before confirming specifically how an underground cable installation can be achieved.



River Water Quality

-  Q4-5, Q5 - High Status
-  Q4 - Good Status
-  Q3-4 - Moderate Status
-  Q2-3, Q3 - Poor Status
-  Q1, Q1-2, Q2 - Bad Status

River

-  Stream Order 1
-  Stream Order 2
-  Stream Order 3
-  Stream Order 4
-  Stream Order 5
-  Stream Order 6
-  Stream Order 7

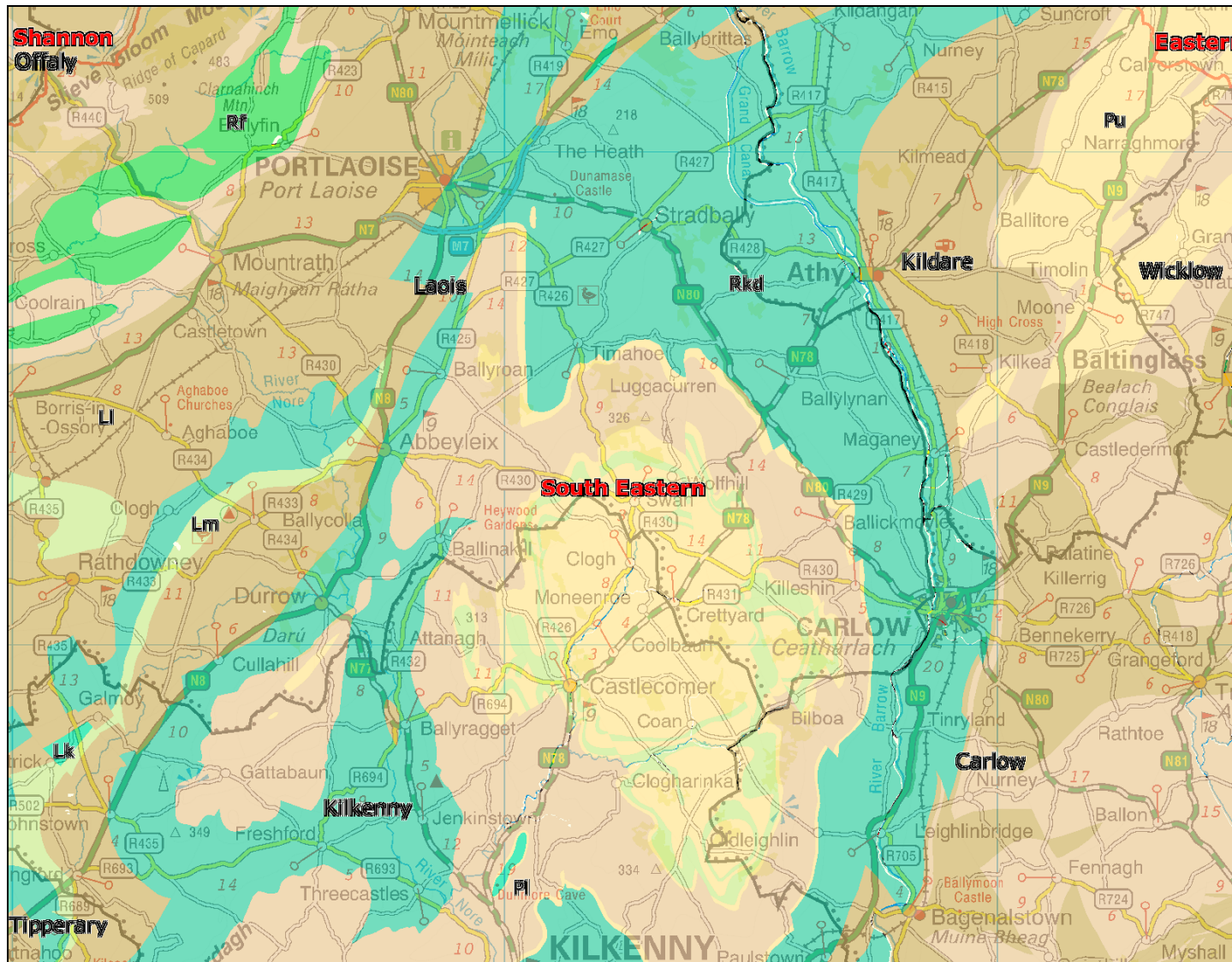
OSi Raster 450k

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Project
Laois - Kilkenny, 110kV
Underground Cable

Reference
09_4848

Figure 7.1
EPA Water Quality
Mapping



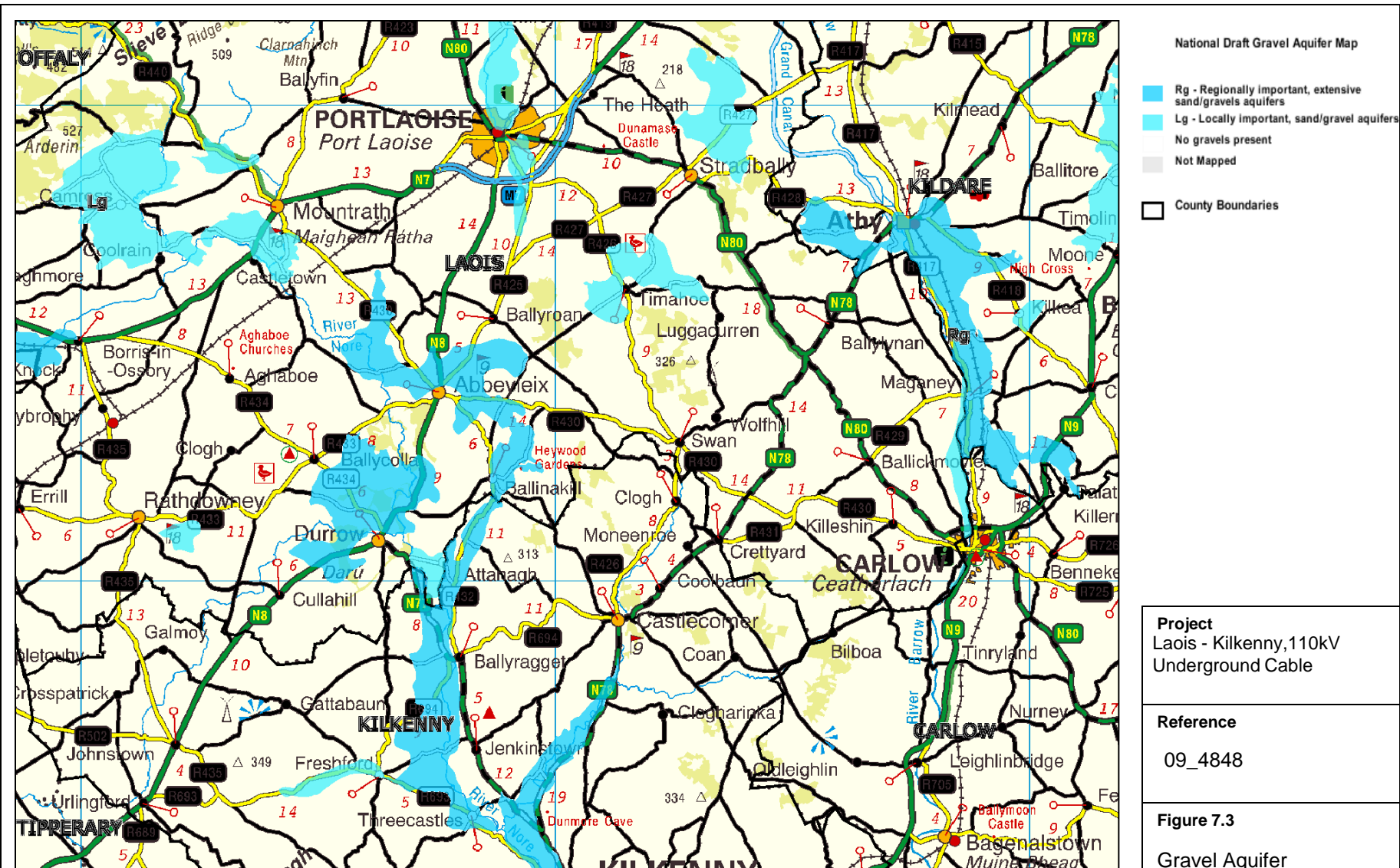
- Rf - Regionally important, fissured bedrock aquifer, good development potential
- Rk - Regionally important, karst aquifer, good development potential
- Rkd - Regionally important, diffuse karst aquifer, good development potential
- Rkc - Regionally important, conduit karst aquifer, development potential limited
- Lm - Locally important, generally moderately productive
- LI - Locally important, generally moderately productive in local zones
- PI - Poor aquifer, generally unproductive except in local zones
- Pu - Poor aquifer, bedrock which is generally unproductive

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Underground Cable

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Figure 7.2
Bedrock Aquifer
Classification

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National Draft Gravel Aquifer Map

- Rg - Regionally important, extensive sand/gravels aquifers
- Lg - Locally important, sand/gravel aquifers
- No gravels present
- Not Mapped
- County Boundaries

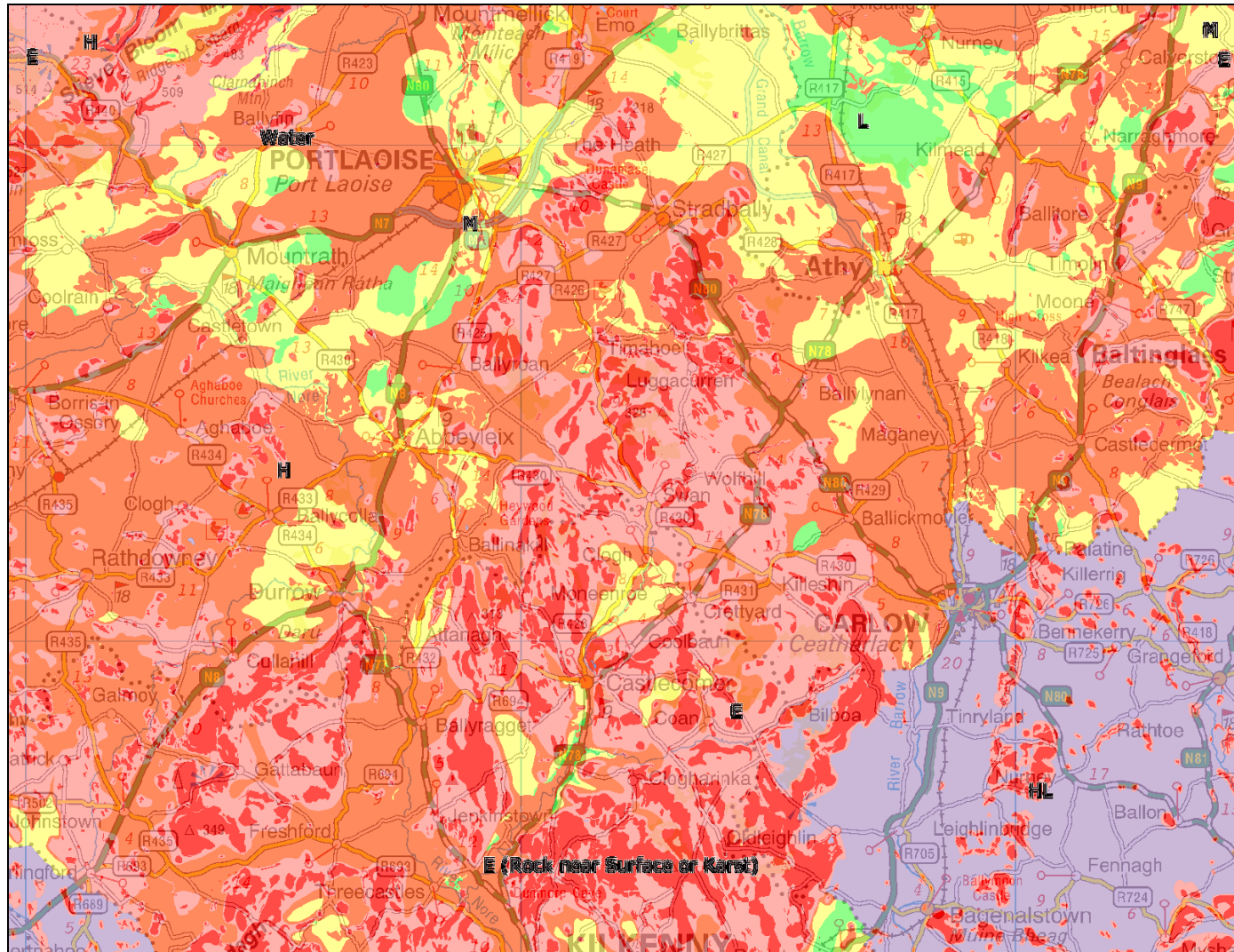
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Figure 7.3
Gravel Aquifer
Classification

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Legend

Shannon Interim Vulnerability

- E (Rock near Surface or Karst)
- E - Extreme
- H - High
- M - Moderate
- L - Low
- HL - High to Low. Only an interim study took place.
- Water
- RBD Boundaries
- County Boundaries

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Reference
09_4848
Figure 7.4
GSI Interim Vulnerability Rating

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Section 8 Conclusions

The development of an underground cable leads to minimal visual impact on the landscape and will minimise the potential for visual impacts at sites of archaeological/architectural interest. However, there are potential impacts during construction on other areas of the environment (Ecology, Cultural Heritage and Hydrology & Hydrogeology) and in particular where there are river crossings.

Route A passes through two 'Archaeological Zones of Potential', namely Ballinakill and Ballyroan and the broad route corridor covers an area with a medium-high density of recorded archaeological monuments and architecturally significant structures. Placing the circuit underground will eliminate the potential for visual impacts at sites of archaeological/architectural interest. However, the construction of a linear project underground over a distance of approximately 27.3km has the potential to disturb features of unrecorded archaeological interest. As the proposal is to place the underground cable primarily in an existing public road, the potential for discovering archaeological material is significantly reduced and if discovered, mitigation measures can be implemented.

Route A is assessed to have a low impact on the geological regime. However, the northern section of Route A is situated adjacent to an area of Geological Heritage Importance and there is blanket peat present at a section of the route which will have to be considered.

Route A is some distance away from most of the sites with ecological constraints in the study area. This minimises any potential impact of disturbance to wildlife using these sites. However, the route should minimise the number of river/stream crossings.

In conclusion, an underground cable does have the potential to cause some environmental impacts but with appropriate mitigation measures these can be minimised.

Appendix I Ecology

Site evaluation scheme is taken from NRA (2006).

A	<p>Internationally important Sites designated (or qualifying for designation) as SAC* or SPA* under the EU Habitats or Birds Directives. Undesignated sites containing good examples of Annex I priority habitats under the EU Habitats Directive. Major salmon river fisheries. Major salmonid (salmon, trout or char) lake fisheries.</p>
B	<p>Nationally important Sites or waters designated or proposed as an NHA* or statutory Nature Reserves. Undesignated sites containing good examples of Annex I habitats (under EU Habitats Directive). Undesignated sites containing significant numbers of resident or regularly occurring populations of Annex II species under the EU Habitats Directive or Annex I species under the EU Birds Directive or species protected under the Wildlife (Amendment) Act 2000. Major trout river fisheries. Water bodies with major amenity fishery value. Commercially important coarse fisheries.</p>
C	<p>High value, locally important Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or significant populations of locally rare species. Small water bodies with known salmonid populations or with good potential Salmonid habitat. Sites containing any resident or regularly occurring populations of Annex II species under the EU Habitats Directive or Annex I species under the EU Birds Directive. Large water bodies with some coarse fisheries value.</p>
D	<p>Moderate value, locally important Sites containing some semi-natural habitat or locally important for wildlife. Small water bodies with some coarse fisheries value or some potential salmonid habitat. Any water body with unpolluted water (Q-value rating 4-5).</p>
E	<p>Low value, locally important Artificial or highly modified habitats with low species diversity and low wildlife value. Water bodies with no current fisheries value and no significant potential fisheries value.</p>

Appendix II Route Map