8 WATER (HYDROLOGY AND HYDROGEOLOGY)

8.1 INTRODUCTION

This section assesses the potential impacts on Water (hydrology and hydrogeology) arising from the proposed Laois-Kilkenny Reinforcement Project. This evaluation follows a Stage 1 and Stage 2 Lead Consultant's Report, which included the production of a study area constraints report and a consideration of substation and route corridor options in terms of water. This section has been prepared by Brian Tiernan BSc (Hons) MSc MCIWM MCIWEM, Senior Environmental Consultant with AWN Consulting.

The project includes a number of components which are broken down into units for ease of description (Units 1 - 8). A description of each unit is presented in Section 2 of this Report.

8.2 METHODOLOGY

The assessment of the potential impact of the proposed developments on the water environment was carried out according to the methodology specified in the following guidance documents:

- Guidelines on the Information to be Contained in Environmental Impact Statements (Environmental Protection Agency (EPA))[1]
- Advice Notes on Current Practice (in the Preparation of Environmental Impact Statements) (EPA)[2]

The collection of baseline data was undertaken by focusing upon a review of the following sources:

- South Eastern River Basin District (SWRBD) Management Plan[3]
- SWRBD Management Plan Water Management Units[4]
- The Geological Survey of Ireland (GSI) well and groundwater records, with reference to hydrology and hydrogeology[5]
- Laois-Kilkenny Reinforcement Project - Stage 2 Lead Consultants Report, ESBi (2012)[6]
- Laois-Kilkenny Reinforcement Project - Phase 1 Lead Consultants Report, ESBi (2011)[7]
- Office of Public Works flood mapping data (www.floodmaps.ie)[8]
- Groundwater Protection Scheme Guidelines' Department of the Environment, Heritage and Local Government (DoEHLG), EPA & GSI (1999)[9]
- Intrusive Site Investigation Reports, Proposed Coolnabacky and Ballyragget Substations, Soil Mechanics (2012)[10]
- ESBi (2012), Drainage & Infrastructure Report, Proposed Coolnabacky 400/110kV Substation, Timahoe, Co. Laois[11]
- ESBi (2012), Drainage & Infrastructure Report, Proposed Ballyragget 110kV/38kV/MV Substation, Ballyragget, Co. Kilkenny[12]

An extensive walkover of the proposed substations and line routes and windscreen surveys were carried out in October 2011 – June 2012 by AWN Consulting Ltd, in order to assess the baseline water environment in the study area and confirm the findings of the desk study.

The quality, magnitude and duration of potential impacts are defined in accordance with the criteria provided in the EPA publication *"Guidelines on the Information to be contained in Environmental Impact Statements"* (2002)[1], outlined in Tables 8.1, 8.2 and 8.3:

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 8.1 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 8.2 Impact Assessment Criteria (Magnitude)

Duration of Impact	Description
Short-term Impact	Impact lasting one to seven years.
Medium-term Impact	Impact lasting seven to fifteen years.
Long-term Impact	Impact lasting fifteen to sixty years.
Permanent Impact	Impact lasting over sixty years.
Temporary Impact	Impact lasting for one year or less.

Table 8.3 Impact Assessment Criteria (Duration)

With respect to the construction of an overhead transmission line the impact on water is considered low with respect to other environmental criteria. The EPA Advice Notes on *Current Practice in the preparation of Environmental Impact Statements* (2003)[2] categorises 'Construction of overhead power lines' as 'Project Type 20'. The advice notes state that, in terms of Project Type 20, the potential impacts on the water environment is restricted to interference with water courses during construction and ground/surface water quality impairment due to leakages[2].

8.3 RECEIVING ENVIRONMENT

8.3.1 GENERAL

The Laois-Kilkenny Reinforcement Project is located within the South Eastern River Basin District (SERBD) as defined under the *S.I. 722 of 2003, European Communities (Water Policy) Regulations, 2003,* the enabling legislation of the European Communities Water Framework Directive (WFD) - Directive 2000/60/EC - establishing a framework for Community action in the field of water policy.

The WFD updates all existing water legislation in the EU by setting common objectives for water. The legislation provides for the protection of the status of all waters (surface and groundwater), the establishment of River Basin Districts (RBDs), co-ordination of actions by all relevant public authorities for

water quality management in an RBD including cross-border RBDs, characterisation of each RBD, establishment of environmental objectives and the development of programmes of measures and River Basin Management Plans (RBMP).

8.3.1.1 Water Quality

The South Eastern River Basin Management Plan (2009 - 2015)[3], published in July 2010 establishes four core environmental objectives to be achieved generally by 2015:

- prevent deterioration;
- restore good status;
- reduce chemical pollution; and
- achieve water-related protected areas objectives.

The Plan also includes the objective to maintain water status for High and Good status waters and to restore to at least "Good Status" all waters by 2015.

The regulations set standards for biological quality elements and physico-chemical conditions, supporting biological elements (e.g. temperature, oxygen balance, pH, salinity, nutrient concentrations and specific pollutants), which must be complied with. These parameters establish the 'Ecological Status' of a water body. The 'Chemical Status' of a water body is assessed based on thresholds set for certain chemical pollutants, known as priority and priority hazardous substances. A water body must achieve both 'Good Ecological Status' and 'Good Chemical Status' before it can be considered to be at 'Good Status' for the purposes of the WFD. Figure 8.1 shows a graphical overview of how results for different quality elements are combined to classify ecological status, chemical status and overall surface water status.

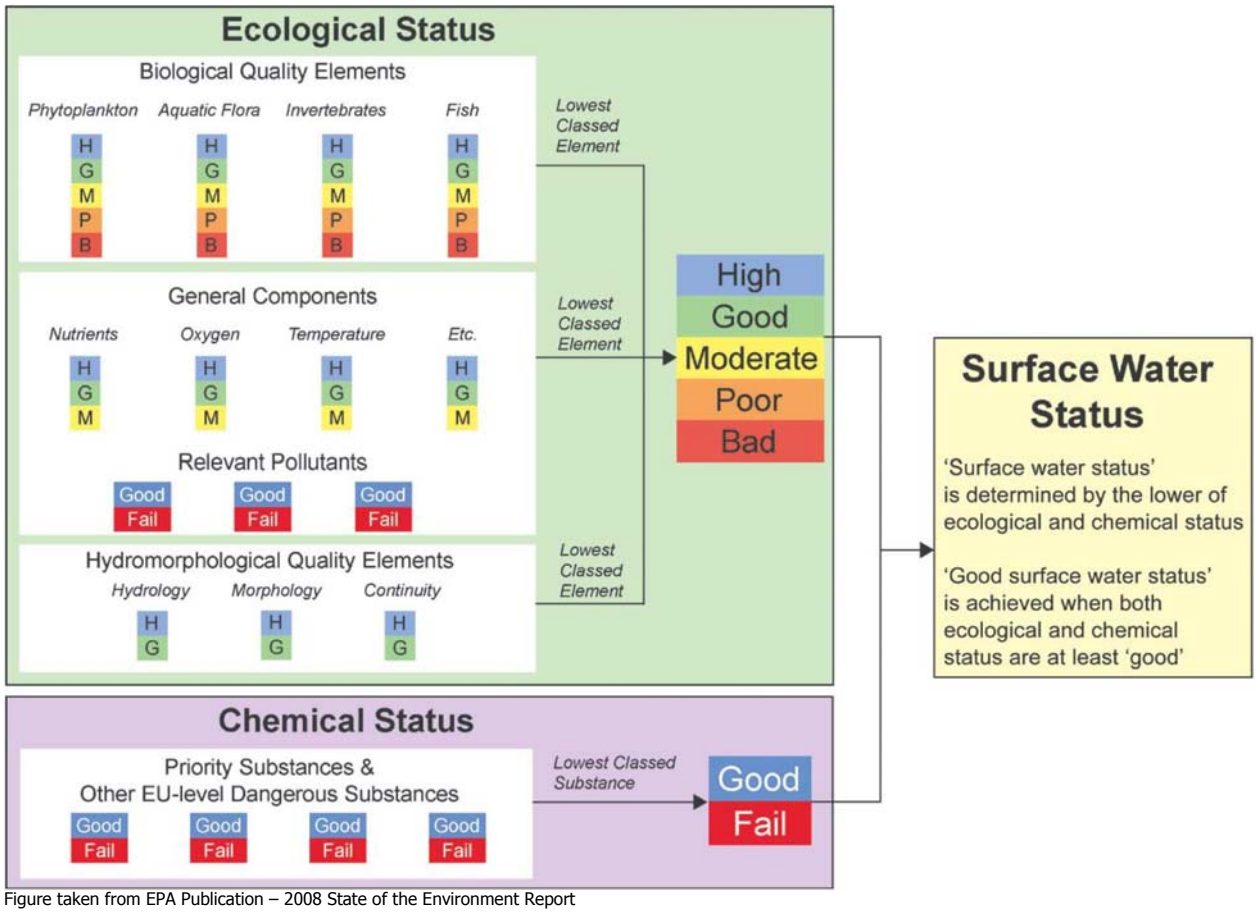


Figure taken from EPA Publication – 2008 State of the Environment Report

Figure 8.1 Overview of Ecological Status, Chemical Status and Overall Surface Water Status

The River Basin Districts are further delineated into a number of Water Management Units (WMU) [4], which are defined as 'a geographical sub-unit of a river basin district consisting of a number of water bodies relevant to a particular catchment'. The water bodies which comprise the water management unit consist of groundwater aquifers, rivers, lakes, transitional and coastal water bodies. In accordance with the requirements of the WFD, each water body has been 'characterised' describing the water status of the water body and the pressures (anthropogenic and others) on each water body. As part of the Plan each river catchment within the RBD was assessed and a WMU Action Plan detailing the programme of measures was put in place for each.

The strategies and objectives of the WFD in Ireland have influenced a range of national legislation and regulations, since its inception in the year 2000. The following legislation further transposed the WFD into Irish law. These Regulations place a legal obligation on public authorities to aim to achieve those objectives in the context of their statutory functions:

- *SI No. 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations 2009*
  These regulations have been devised to implement the requirements of the WFD and establish Environmental Quality Standards for the purpose of assessing the status of surface waters. These regulations supersede all previous water quality regulations. These Surface Waters Regulations apply to all surface waters - including lakes, rivers, canals, transitional waters, and coastal waters. The purpose of the regulations is to establish legally binding quality objectives for all surface waters and environmental quality standards for pollutants.

- *SI No. 9 of 2010 European Communities Environmental Objectives (Ground Waters) Regulations 2010 as amended*
  These regulations establish environmental objectives to be achieved in groundwater bodies, groundwater quality standards and threshold values for the classification of groundwater and the protection of groundwater against pollution and deterioration in groundwater quality.

In addition, Irish legislation which predates the WFD also still has an input to the protection of the water environment. These include the following:

- *SI No. 293 of 1988 European Communities (Quality of Salmonid Waters) Regulations 1988*
  The Salmonid Regulations set water quality standards for salmonid waters, with identification of salmonid waters, water quality standards, and frequencies of sampling and methods of analysis and inspection.

- *Local Government (Water Pollution) Acts 1977-2007*
  These Acts are the main legislation for the prevention and control of water pollution. In terms of surface water, these Acts has been largely superseded by the 2009 regulations, however, current impact assessment and management must still be cognisant of the Acts.

- *SI No. 258 of 1998 Water Quality Standards for Phosphorus Regulations 1998*
  These regulations require water quality to be maintained or improved with reference to the biological quality river rating system assigned by the EPA. These Regulations have been largely superseded by the 2009 regulations; however, current impact assessment and management must still be cognisant of the legislation.

8.3.1.2 Hydrogeology

Groundwater can be defined as water that is stored in, or moves through, pores and cracks in sub-soils or bedrock. Aquifers are quaternary deposits or rocks that contain sufficient void spaces and which are permeable enough to allow water to flow through them in significant quantities. The potential of rock to store and transport water is governed by permeability of which there are two types, intergranular and fissure permeability. Intergranular permeability is found in sediments, sands, gravels and clays and fissure permeability is found in bedrock, where water moves through (and is stored in) cracks, fissures, planes and solution openings.

In order to assess the environmental impacts of the proposed works on hydrogeology, consideration has been given to the following:

- Nature of the underlying aquifer;
- Aquifer vulnerability; Groundwater quality;
- Classification and objectives in accordance with the WFD; and
- Groundwater wells.

The GSI has defined Source Protection Zones (SPZs) in Ireland and these areas are recognised to be particularly important in terms of protection of potable water use and pollutant control. If groundwater resources support designated ecological sites or protected species they are also recognised to be particularly important and sensitive.

The importance of any groundwater resource is also dependent on the presence and productivity of aquifers. GSI has identified bedrock aquifers in Ireland and classified them in terms of productivity (groundwater yield, based upon porosity and permeability characteristics). The following classification system is used by GSI:

- Regionally important aquifers: good (100 to 400 m^3/day) to excellent (>400m^3/day) productivity;
- Locally important aquifers: moderate (40 to 100 m^3/day) productivity; and
- Poor aquifers: poor (<40 m^3/day) productivity.

The GSI, EPA and the DoEHLG developed a programme of Groundwater Protection Schemes[9], 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 Groundwater Protection Scheme divides a chosen area into a number of Groundwater Protection Zones, according to the degree of protection required for the aquifer. These zones are based on both aquifer vulnerability and the degree of importance the aquifer holds; regional, local or not important.

This protection scheme outlines the degree of vulnerability of the aquifers in the relevant county, and provide guidance on how to protect them. Under the WFD, the aquifer classification part of the scheme has been carried out for all of Ireland.

The DoEHLG, EPA and GSI vulnerability mapping guidelines allow for the assignment of vulnerability ratings from "extreme" to "low", depending upon the subsoil type and thickness. With regard to sites where low permeability subsoils are present, the following thicknesses of unsaturated zone are specified in Table 8.4. The classifications are also dependant on the vulnerability of an aquifer. Aquifer vulnerability is classed in the guidelines according to the ease at which the aquifer can be contaminated due to surface development or activities.

Vulnerability Rating	Hydrogeological Conditions				
	Subsoil Permeability (Type) and thickness			Unsaturated Zone	Karst Features
	High Permeability (Sand and Gravel)	Medium Permeability (Sandy subsoil)	Low Permeability (Clayey Subsoil/peat)	Sand and Gravel aquifers only	<30 radius
Extreme	0 – 3.0m	0 – 3.0m	0 – 3.0m	0 – 3.0m	-
High	>3.0m	3.0 -10.0m	3.0 – 5.0m	> 3.0m	N/A
Moderate	N/A	>10.0m	5.0-10.0m	N/A	N/A
Low	N/A	N/A	>10m	N/A	N/A

Notes: N/A - Not Applicable. Precise Permabilities values cannot be given at present. Release point of contamination is assumed to be 1-2m below ground surface

Table 8.4 Groundwater Vulnerability Categories

The *S.I. 9 of 2010, EC Environmental Objectives (Groundwater) Regulations 2010* gives effect to the criteria and standards to be used for classifying groundwater in accordance with the requirements of the WFD.

8.3.2 UNIT 1' NEW 400/110KV GIS SUBSTATION, 'COOLNABACKY' NEAR PORTLAOISE CO. LAOIS'

8.3.2.1 Hydrology

8.3.2.1.1 Water Quality

The proposed Coolnabacky 400/110kV Substation is located within the Stradbally WMU and the River Barrow catchment.

No major surface water features were found at the proposed location substation. See Figure 8.2. However, there were streams (field drains) located adjacent to the site that are not identified on the OSI and EPA mapping. The Timahoe (Bauteogue) River was assessed as the proposed substation location is within this catchment.

The location of the proposed substation is currently well served by existing field drains on all boundaries. There are some minor culverts where there is access between fields. An un-named water course runs along the North Eastern boundary. The field drains at the site boundaries drain to this water course. The un-named watercourse is a tributary of the Timahoe River.

The proposed substation is located in the Stradbally River catchment in Hydrometric Area 14 and flows into the River Barrow. The Timahoe River is 14km long, rises in the town land of Garryglass which is situated approximately 8km southwest of Timahoe village between Ballintlea upper and Ballinaclogh upper. The Timahoe River is joined by a number of 1st and 2nd order streams from Fossy Hill upper and lower which flow in from the east and from Raheenduff Big and Raheenduff Little which flow in from the west. The river continues to flow in a north easterly direction through the village of Timahoe and through Timahoe esker (an NHA). Timahoe River confluences with the Honey stream which flows in from the east and the Bauteogue River approximately 1.5 river kilometres downstream of Timahoe esker. The Bauteogue River and the Timogue River confluence with the River Stradbally South of Stradbally town. Stradbally River flows in a north easterly direction for approximately 7km before confluencing with the Grand Canal – Barrow line.

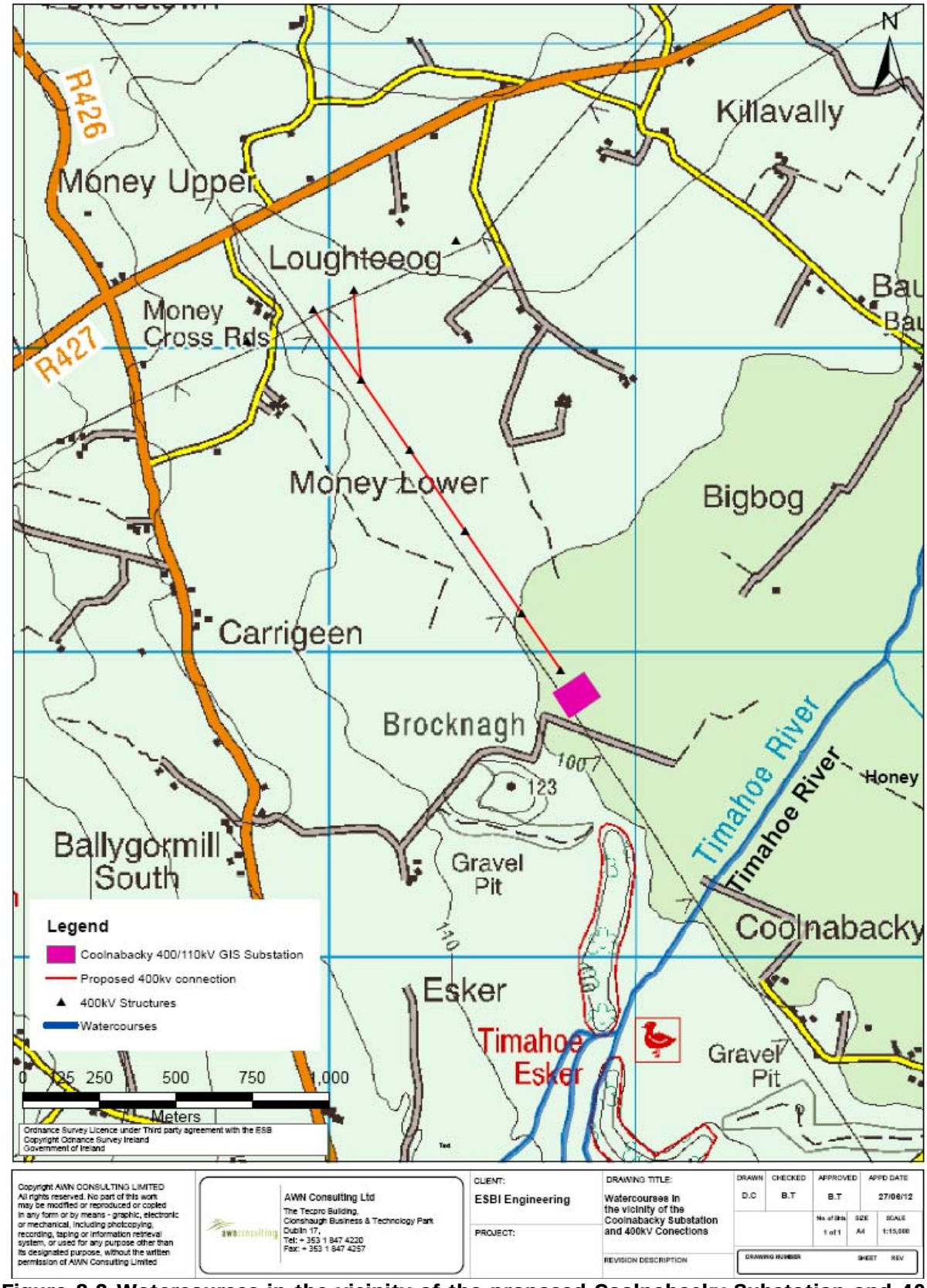


Figure 8.2 Watercourses in the vicinity of the proposed Coolnabacky Substation and 400kV Connections

For the purpose of the assessment the following rivers were assessed as the proposed substation is within the vicinity of the catchments of these rivers:

- Timahoe River
- Timogue River
- Bauteogue River

Any watercourses within the vicinity of these rivers are likely to be tributaries of one of these rivers. Table 8.5 shows the current status of the rivers monitored in the study area as part of the plan.

River	WFD Status*
Timahoe River	Moderate
Timogue River	Good
Bauteogue River	Moderate Q value range 4 to 4-5 over length of river (2011)#

*In accordance with the Environmental Quality Standards (EQS) or assessment of impacts for surface waters *S.I. 272 of 2009 (EC Environmental Objectives (Surface waters) Regulations 2009*

#EPA, (2012), Integrated Water Quality Report 2011 – South East Ireland, EPA.

Table 8.5 WFD Status of Rivers within Units 1,2 and 3

8.3.2.1.2 Flooding

Information relating to potential flooding was obtained from ESBI.[13] A site visit to the proposed site at Coolnabacky was undertaken in May 2012. In addition OPW indicative flood risk maps and www.floodmaps.ie were reviewed.

The site lies within the catchment of the Timahoe River. Preliminary indications are that there is a minimal risk of flooding to the site at Coolnabacky. It is reasonable to say that the site lies within Flood Zone C as defined by the guideline document to Planning Authorities in relation to Flood Risk Management[14]. Essential infrastructure, including electricity substations should be located within Flood Zone C. Zone C is at low risk. In any one year, Zone C has less than 1 in 1,000 year (<0.1%) chance of flooding.

8.3.2.2 Hydrogeology

8.3.2.2.1 Aquifer Classification

The GSI online maps and publications[5] were consulted in relation to the occurrence of bedrock aquifers in the study area. Regionally Important Karstified (diffuse) bedrock aquifer and a locally important sand/gravel aquifer underlie the proposed substation. The bedrock aquifer is classified as a Regionally Important Aquifer (RKd); referring to the Ballyadams Formation, see Figure 8.3. Gravel deposits are also present in the area which will also act as an aquifer when sufficiently thick, permeable, saturated and extensive. The proposed substation is located on the boundary of defined Locally Important sand and gravel aquifer, see Figure 8.4. Tufa deposits are present to the East of the substation are also on the boundary of the gravel aquifer.[15] The closest tufa deposit to the site is located over 100m from the boundary of the proposed excavation. Given the ground conditions at the site, the tufa deposits are expected to be fed from seepages from the gravel aquifer. The thickness of the sand and gravel deposits is variable, and across the site ranges from 0.9 to 1.9m.[10] See Appendix 7.1 - The Coolnabacky 400kV Substation - Factual Report on Ground Investigation. See Appendix 8.1 for the desktop hydrogeological report in relation to the proposed Coolnabacky substation.

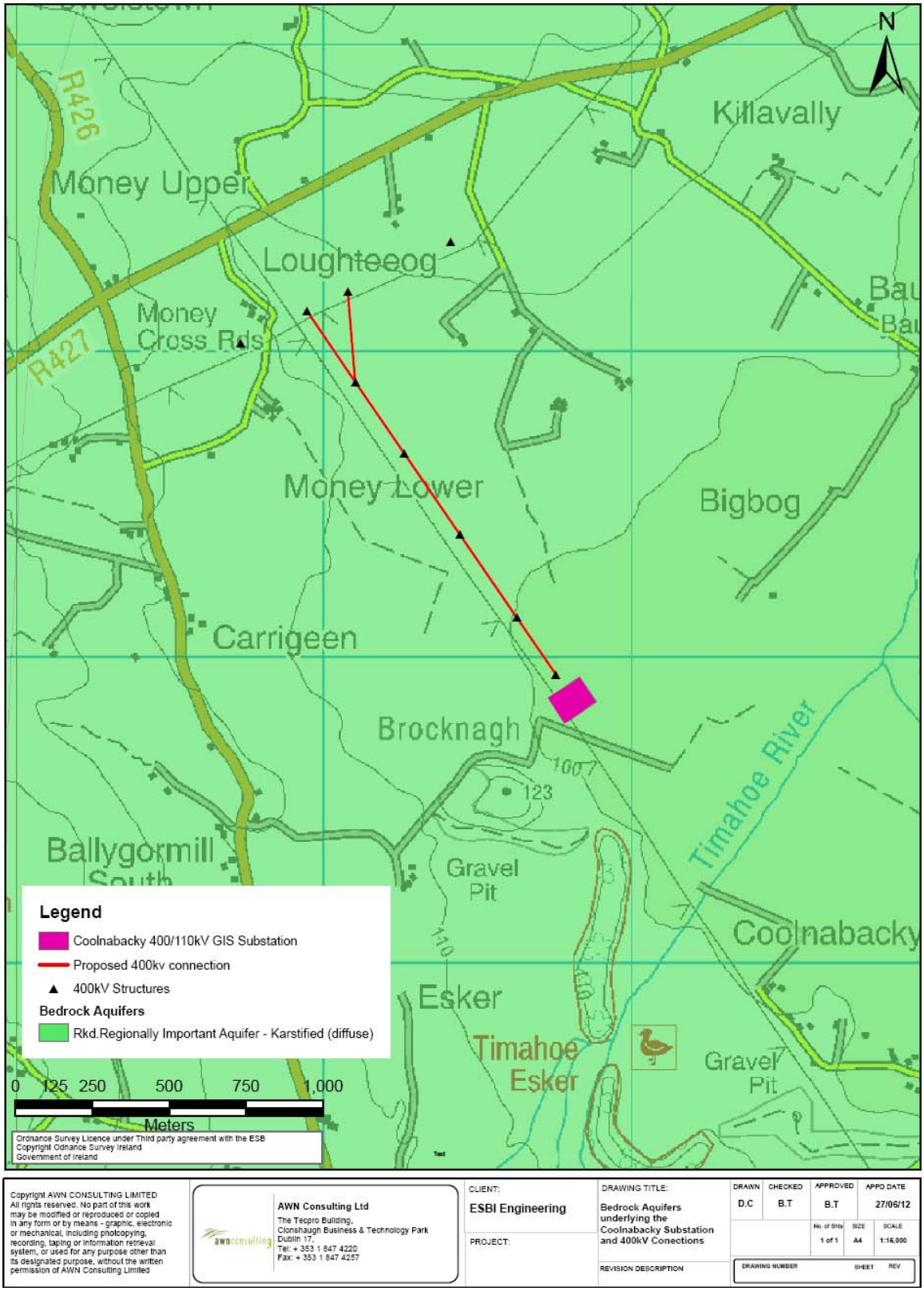


Figure 8.3 Bedrock Aquifers underlying the proposed Coolnabacky Substation and 400kV Connections

Figure 8.4 Gravel Aquifers underlying the proposed Coolnabacky Substation and 400kV Connections

The gravel aquifer is shown to extend to the south west of the site. The presence of eskers and gravel pits to the south west of the site further indicates that a greater thickness of Sand and Gravel deposits is expected in this area. Both tufa deposits are located at or near the boundary of the gravel aquifer and are thus associated with discharge zones at the gravel aquifer boundary.

However, the sand and gravel deposits at the site were not found to be saturated during the site investigation[10]. In most cases, groundwater strikes were not recorded in the Sand and Gravel deposits. It is noted that, due to the presence of low permeability Clay deposits beneath the sand and gravel, the inflow volumes of groundwater encountered during drilling was minimal. As the sand and gravel was not saturated, this indicates that the quantities of groundwater present are not significant.

The GSI Well Card Index[5] shows the occurrence of recorded wells within the vicinity of the proposed substation, information regarding the well use, yield class; yield and water strike is noted for a large number of the wells. Two wells were located in the townlands of Killavalley and Bauteogue (1km North East of the proposed substation location) however there is no information in relation to the depth to groundwater, the yield or the use of each well. See Figure 7.3 for well locations.

In relation to the assessment of impacts for groundwaters *S.I. 9 of 2010, EC Environmental Objectives (Groundwater) Regulations 2010*, all groundwater bodies at the proposed substation have been designated 'Good'.

8.3.2.2.2 Groundwater Flow Direction

In general terms it would be expected that the groundwater gradient would follow the topographic variation in an area. Flow paths and distance is dependent on the characteristics of the aquifer type. Most groundwater flow is confined to the upper 10m of weathered bedrock (if present) and gravel aquifers and will discharge to the nearest watercourse. The nearest large river is the Timahoe river, approximately 600m to the south east of the site (see Figure 8.2). The groundwater flow direction is assumed to also be to the south east.

Although for the wider groundwater body hydraulic continuity exists between the Sand and Gravel deposits and the bedrock aquifer, within the localised site area any groundwater in the sand and gravel deposits is not expected to be in hydraulic continuity with the bedrock aquifer underlying the site.[15] This is due to the presence of a proved significant thickness of low permeability Clay deposits, with between 2.7m to 6.8m of clay proved beneath the Sand and Gravel deposits.[10] The clay encountered during the site investigations is described as stiff to very stiff at depth, and this stiff clay will impede any vertical groundwater flow.[10]

8.3.2.2.3 Water Usage

Water usage is primarily supplied by groundwater abstraction boreholes. There are also a number of private wells within the general vicinity of the proposed substation site used by individual landowners. A search of the GSI well database was undertaken. The GSI recorded 2 no. wells within the vicinity of the proposed substation, see Figure 7.3 however there is no information in relation to the depth to groundwater, the yield or the use of each well.

8.3.2.2.4 Groundwater Vulnerability

Figure 8.5 shows the level of vulnerability for the underlying aquifers. Groundwater vulnerability underlying the proposed substation site varied from "Moderate" to "High". Table 8.4 explains the groundwater vulnerability categories.

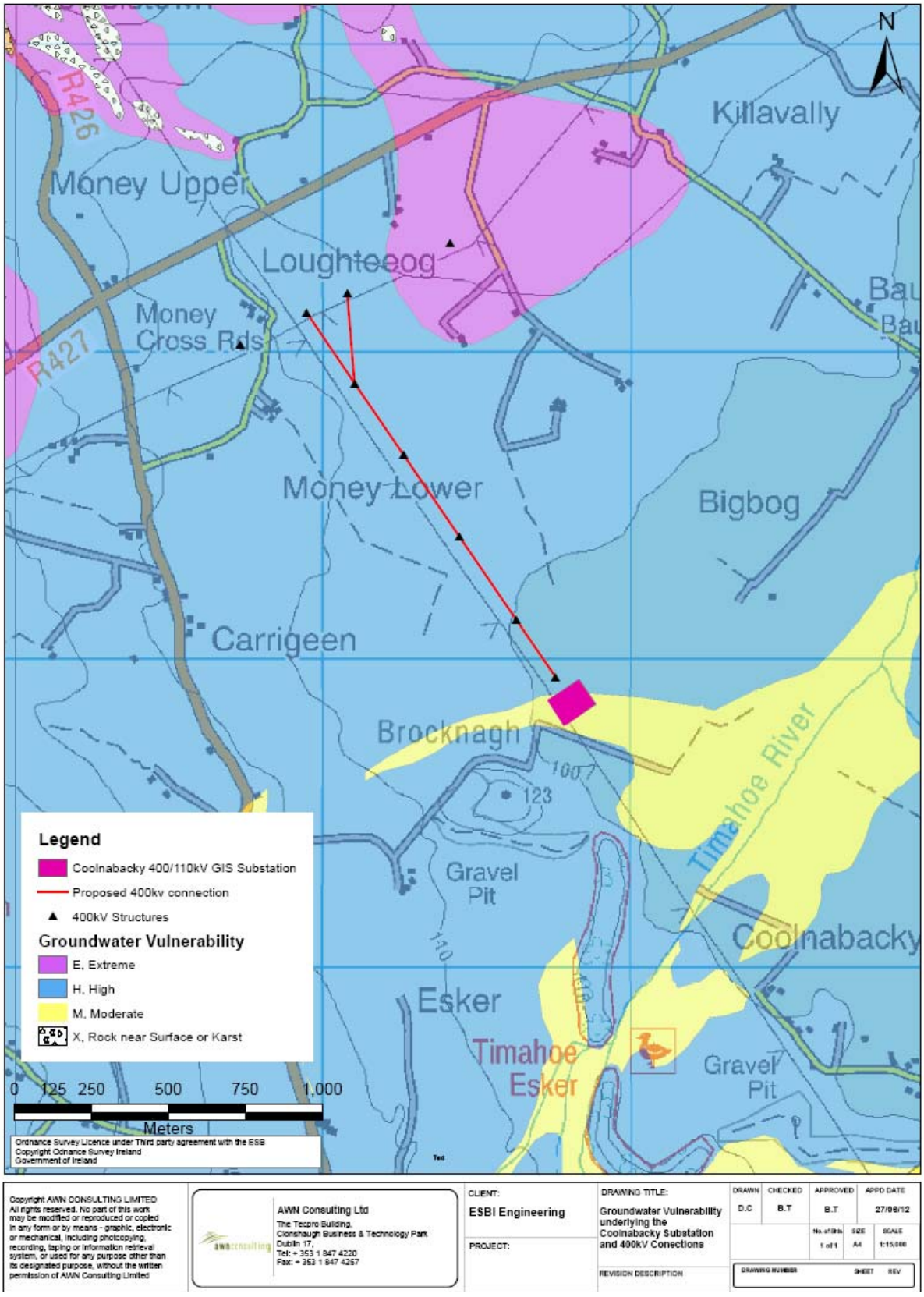


Figure 8.5 Groundwater Vulnerability underlying the proposed Coolnabacky Substation and 400kV Connections

8.3.3 UNIT 2 'NEW 400KV LINE CONNECTION TO COOLNABACKY FROM THE EXISTING MONEYPOINT-DUNSTOWN 400KV LINE'

8.3.3.1 Hydrology

8.3.3.1.1 Water Quality

The proposed Dunstown - Moneypoint - Coolnabacky 400kV line route is located within the SERBD. Surface water features in the vicinity of the proposed line route are shown in Figure 8.2. For the purpose of the assessment the following rivers were assessed as the proposed route is within the vicinity of the catchments of these rivers:

- Timahoe River
- Timogue River
- Bauteogue River

Any watercourses within the study area are likely to be tributaries of one of these rivers. Table 8.5 shows the current status of the rivers monitored as part of the SERBD Management Plan[3].

8.3.3.1.2 Flooding

The OPW Flood Hazard Database[8] 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. No flooding events have been recorded by the OPW along the proposed Dunstown - Moneypoint - Coolnabacky 400kV line route.

8.3.3.2 Hydrogeology

8.3.3.2.1 Aquifer Classification

The GSI Online maps[5] were consulted in relation to the occurrence of bedrock and quaternary aquifers along the proposed Dunstown - Moneypoint - Coolnabacky 400kV line route. Regionally Important Karstified (diffuse) bedrock aquifers underlie the proposed line route, see Figure 8.3. Locally Important sand and gravel aquifers underlie proposed substation location however are not present along the proposed line route, see Figure 8.4 for locations of sand and gravel aquifers.

The GSI Well Card Index[5] shows the occurrence of recorded wells within the vicinity of the proposed substation, information regarding the well use, yield class; yield and water strike is noted for a large number of the wells. Two wells were located in the townlands of Killavalley and Bauteogue (1km North East of the proposed substation location) however there is no information in relation to the depth to groundwater, the yield or the use of each well. See Figure 7.3 for well locations.

In relation to the assessment of impacts for groundwater's *S.I. 9 of 2010, EC Environmental Objectives (Groundwater) Regulations 2010*, all groundwater bodies along the proposed line route have been designated 'Good'.

8.3.3.2.2 Groundwater Flow Direction

In general terms it would be expected that the groundwater gradient would follow the topographic variation in an area. The proposed route passes through areas that are largely agricultural and 100-120m AOD. The route lies in the townlands of Coolnabacky, Brocknagh, Money Lower and Loughteeog (at Money Cross Roads) where it connects with the existing Moneypoint-Dunstown 400kV line. Flow paths and distance is dependent on the characteristics of the aquifer type. Most groundwater flow is confined to the upper 10m of weathered bedrock (if present) and will discharge to the nearest watercourse.

8.3.3.2.3 Water Usage

Water usage is primarily supplied by groundwater abstraction boreholes. There are also a number of private wells within the general vicinity of the proposed substation site used by individual landowners. A search of the GSI well database was undertaken. The GSI recorded 2 no. wells within the vicinity of the

proposed substation, see Figure 7.3 however there is no information in relation to the depth to groundwater, the yield or the use of each well.

8.3.3.2.4 Groundwater Vulnerability

Aquifer vulnerability is classed by the GSI as High for the proposed line route. See Figure 8.5.

8.3.4 UNIT 3 'NEW CONNECTION TO COOLNABACKY FROM THE EXISTING ATHY-PORTLAOISE 110KV LINE'

8.3.4.1 Hydrology

8.3.4.1.1 Water Quality

The proposed connection to the Coolnabacky Substation (Unit 1) from the existing Athy-Portlaoise 110kV line is located within the SERBD. Surface water features in the vicinity of the proposed line route are shown in Figure 8.2. For the purpose of the assessment the following rivers were assessed as the proposed route is within the vicinity of the catchments of these rivers:

- Timahoe River
- Timogue River
- Bauteogue River

Any watercourses within the study area are likely to be tributaries of one of these rivers. Table 8.5 shows the current status of the rivers monitored as part of the SERBD Management Plan[3].

8.3.4.1.2 Flooding

Information relating to potential flooding was obtained from ESBi.[13] A site visit to the site of the proposed connection was undertaken in May 2012. In addition OPW indicative flood risk maps and www.floodmaps.ie were reviewed.

The site lies within the catchment of the Timahoe River. Preliminary indications are that there is a minimal risk of flooding to the site at Coolnabacky. It is reasonable to say that the site lies within Flood Zone C as defined by the guideline document to Planning Authorities in relation to Flood Risk Management[14]. Essential infrastructure, including electricity substations should be located within Flood Zone C. Zone C is at low risk. In any one year, Zone C has less than 1 in 1,000 year (<0.1%) chance of flooding.

8.3.4.2 Hydrogeology

8.3.4.2.1 Aquifer Classification

The GSI online maps and publications[5] were consulted in relation to the occurrence of bedrock aquifers in the study area. Regionally Important Karstified (diffuse) bedrock aquifer and a locally important sand/gravel aquifer underlie the proposed substation. The bedrock aquifer is classified as a Regionally Important Aquifer (RKd); referring to the Ballyadams Formation, see Figure 8.3. Gravel deposits are also present in the area which will also act as an aquifer when sufficiently thick, permeable, saturated and extensive. The proposed substation is located on the boundary of defined Locally Important sand and gravel aquifer, see Figure 8.4. Tufa deposits are present to the East of the substation are also on the boundary of the gravel aquifer.[15] The closest tufa deposit to the site is located over 100m from the boundary of the proposed excavation. Given the ground conditions at the site, the tufa deposits are expected to be fed from seepages from the gravel aquifer. The thickness of the sand and gravel deposits is variable, and across the site ranges from 0.9 to 1.9m.[10]

The gravel aquifer is shown to extend to the south west of the site. The presence of eskers and gravel pits to the south west of the site further indicates that a greater thickness of Sand and Gravel deposits is expected in this area. Both tufa deposits are located at or near the boundary of the gravel aquifer and are thus associated with discharge zones at the gravel aquifer boundary.

However, the sand and gravel deposits at the site were not found to be saturated during the site investigation[10]. In most cases, groundwater strikes were not recorded in the Sand and Gravel deposits. It is noted that, due to the presence of low permeability Clay deposits beneath the sand and gravel, the inflow volumes of groundwater encountered during drilling was minimal. As the sand and gravel was not saturated, this indicates that the quantities of groundwater present are not significant.

The GSI Well Card Index[5] shows the occurrence of recorded wells within the vicinity of the proposed substation, information regarding the well use, yield class; yield and water strike is noted for a large number of the wells. Two wells were located in the townlands of Killavalley and Bauteogue (1km North East of the proposed substation location) however there is no information in relation to the depth to groundwater, the yield or the use of each well. See Figure 7.3 for well locations.

In relation to the assessment of impacts for groundwater's *S.I. 9 of 2010, EC Environmental Objectives (Groundwater) Regulations 2010*, all groundwater bodies at the proposed substation have been designated 'Good'.

8.3.4.2.2 Groundwater Flow Direction

In general terms it would be expected that the groundwater gradient would follow the topographic variation in an area. Flow paths and distance is dependent on the characteristics of the aquifer type. Most groundwater flow is confined to the upper 10m of weathered bedrock (if present) and gravel aquifers and will discharge to the nearest watercourse. The nearest large river is the Timahoe river, approximately 600m to the south east of the site (see Figure 8.2). The groundwater flow direction is assumed to also be to the south east.

Although for the wider groundwater body hydraulic continuity exists between the Sand and Gravel deposits and the bedrock aquifer, within the localised site area any groundwater in the sand and gravel deposits is not expected to be in hydraulic continuity with the bedrock aquifer underlying the site.[15] This is due to the presence of a proved significant thickness of low permeability Clay deposits, with between 2.7m to 6.8m of clay proved beneath the Sand and Gravel deposits.[10] The clay encountered during the site investigations is described as stiff to very stiff at depth, and this stiff clay will impede any vertical groundwater flow.[10]

8.3.4.2.3 Water Usage

Water usage is primarily supplied by groundwater abstraction boreholes. There are also a number of private wells within the general vicinity of the proposed substation site used by individual landowners. A search of the GSI well database was undertaken. The GSI recorded 2 no. wells within the vicinity of the proposed substation, see Figure 7.3 however there is no information in relation to the depth to groundwater, the yield or the use of each well.

8.3.4.2.4 Groundwater Vulnerability

Figures 8.5 show the level of vulnerability for the underlying aquifers. Groundwater vulnerability underlying the site of the proposed connection varied from "Moderate" to "High".

8.3.5 UNIT 4 'A NEW 110KV / 38KV / MV SUBSTATION IN BALLYRAGGET, CO. KILKENNY ADJACENT TO AND REPLACING THE EXISTING 38KV / MV SUBSTATION WHICH WILL BE DECOMMISSIONED'

8.3.5.1 Hydrology

8.3.5.1.1 Water Quality

The proposed Ballyragget 110kV/38kV/MV substation is located within the Nore Main WMU and the River Nore catchment.

The site consists of a large roughly rectangular field where the proposed substation is planned to be constructed and an adjacent field through which the proposed access route is planned. The area is level and is presently being used as agricultural land.

No major surface water features or field drains were found at the proposed substation location. See Figure 8.6. The River Nore is located 350m West from the site boundary. The River Nore was assessed as the proposed substation location is within this catchment.

The River Nore rises in Co. Tipperary just outside Roscrea and flows due east through Co Laois where outside of Abbeyleix it turns in a due South-east direction through County Kilkenny for approx. 90km. It continues in this course as far as New Ross where it flows into the River Barrow. Most of the Nore tributaries join the river on the upper reach, the principal ones being the Gully and Erkina Rivers which join from the west near Durrow and the Owenbeg River with join from the north near Ballyragget. On its lower reaches the main tributaries are the Dinin River which join from the east and the King's river from the west before flowing into the Waterford Estuary.

Figure 8.6 Watercourses in the vicinity of the proposed Ballyragget Substation

In accordance with the Environmental Quality Standards (EQS) or assessment of impacts for surface waters *S.I. 272 of 2009 (EC Environmental Objectives (Surface waters) Regulations 2009* the River Nore at the nearest point to the proposed substation location have been designated 'Moderate'.

8.3.5.1.2 Flooding

Information relating to potential flooding was obtained from ESBi.[16] A site visit to the proposed site at Ballyragget was undertaken by ESBi in May 2012. In addition OPW indicative flood risk maps and www.floodmaps.ie were reviewed.

Based on the ESBi assessment[16] preliminary indications are that the site lies within Flood Zone C as defined by the Flood Planning Guidelines.[14] The edge of the site lies within a short distance of the indicative Flood Zone B. In the assessment it was recommended to locate the new substation at the eastern end of the site close to the boundary of the existing substation.

8.3.5.2 Hydrogeology

8.3.5.2.1 Aquifer Classification

Regionally Important Karstified (diffuse) bedrock aquifer and a locally important sand/gravel aquifer underlie the proposed substation. The bedrock aquifer is classified as a Regionally Important Aquifer (RKd); referring to the Ballyadams Formation, see Figure 8.7.

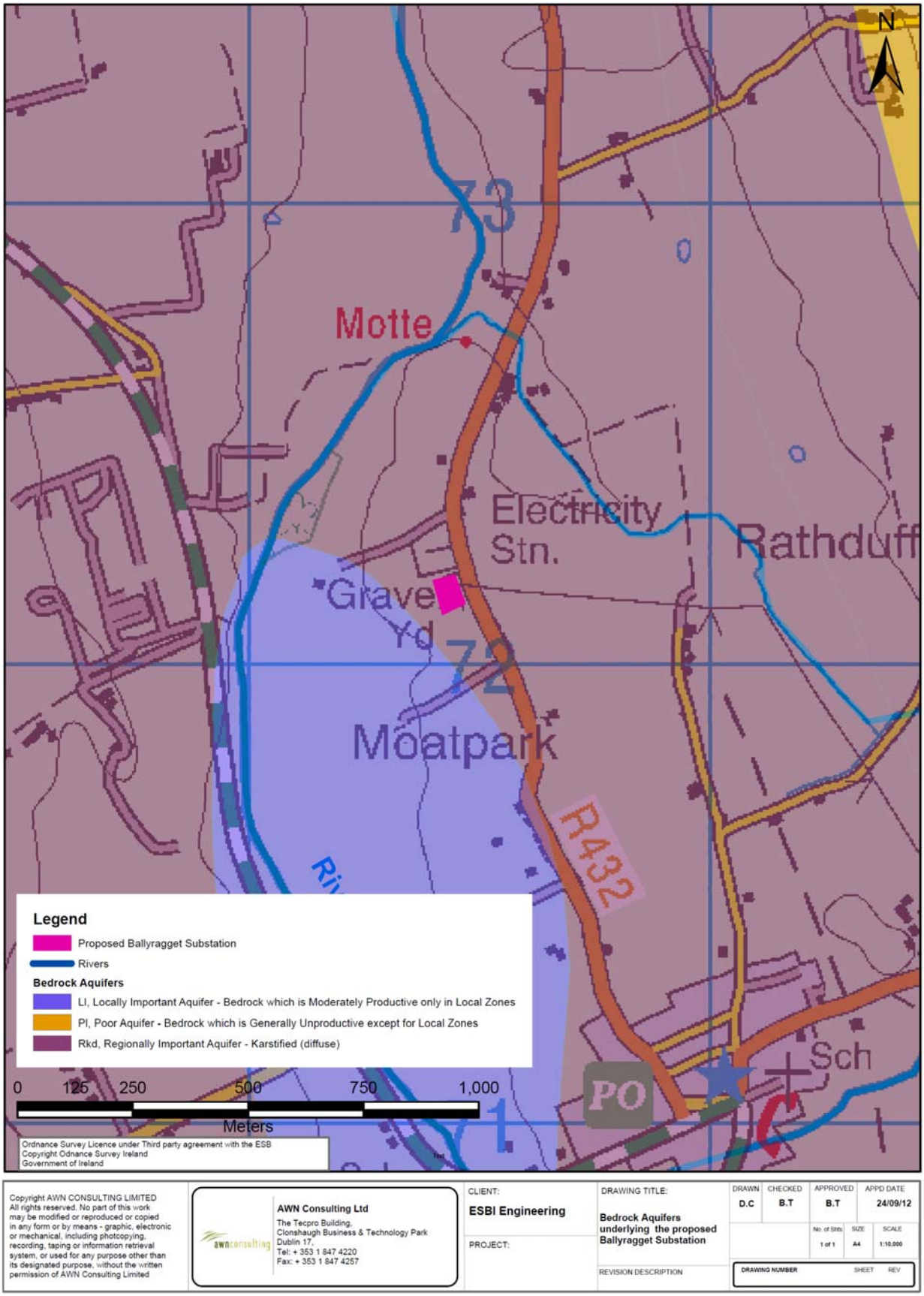


Figure 8.7 Bedrock Aquifers underlying the proposed Ballyragget Substation

Gravel deposits are also present in the area which will also act as an aquifer when sufficiently thick, permeable, saturated and extensive. The proposed substation is located on a Regionally Important, extensive Sand/Gravel Aquifer, see Figure 8.8.

Figure 8.8 Gravel Aquifers underlying the proposed Ballyragget Substation

The intrusive site investigation[10] (Appendix 7.1) at the site consisted of 13 no. trial pits to a depth of 3.0m and 5 no. boreholes to a depth of 9.74m. No groundwater strikes were encountered in both the trial pits and the boreholes. Based on these findings it can be concluded that dewatering will not be required during the construction phase.

The GSI Well Card Index[5] shows a number of wells in the vicinity of the proposed substation. Well card data for the wells in the vicinity of the site were reviewed. Table 8.6 details the information in relation to each well. The majority of wells were found at the Glanbia site, located west of the proposed substation site across the River Nore. See Figure 7.7 for well locations.

The wells were installed into the underlying bedrock at depths in the range of 5.0m to 27.0m bgl The groundwater yield from these wells ranged from poor to excellent with recorded yields from as little as 5.0m^3/day in wells drilled to 30.5m and 61.0m bgl up to 1190m^3/day in a well drilled to 9.8m bgl. Groundwater yields are associated with fissures in the underlying bedrock.

GSI Code	Easting	Northing	Townland	Depth (m)	Yield Class	Yield m^{3}d	DTB	Water Strike
2317SWW443	243420	171760	Ballyconra	61.0	Poor	5.0	9.4	15.4
2317SWW444	243360	171900	Ballyconra	30.5	Poor	5.0	13.1	-
2317SWW445	243620	171970	Ballyconra	30.5	Poor	5.0	14.8	-
2317SWW446	243280	172240	Ballyconra	27.5	Poor	19.5	19.5	21.4
2317SWW447	243910	172310	Ballyconra	18.0	Good	196	12.2	6.7
2317SWW449	244000	172250	Ballyconra	9.8	Excellent	1190	5.0	5.0
2317SWW450	243970	172240	Ballyconra	68.6	Excellent	842	5.0	-
2317SWW451	243980	172180	Ballyconra	45.7	Poor	30.0	6.7	7.6
2317SWW454	243670	171710	Ballyconra	18.8	Moderate	66.0	-	9.1
2317SWW455	243960	171600	Ballyconra	61.0	Good	327.0	21.5	11.0
2317SWW456	243730	171660	Ballyconra	30.0	Moderate	50.0	10.0	-
2317SWW420	243500	171730	Ballyconra	33.5	Excellent	4500	27.0	-

Table 8.6 GSI Well Data for Unit 4

In relation to the EQS or assessment of impacts for groundwater's *S.I. 9 of 2010, EC Environmental Objectives (Groundwater) Regulations 2010*, all groundwater bodies at the proposed substation have been designated 'Good'.

8.3.5.2.2 Groundwater Flow Direction

In general terms it would be expected that the groundwater gradient would follow the topographic variation in an area. Flow paths and distance is dependent on the characteristics of the aquifer type. Most groundwater flow is confined to the upper 10m of weathered bedrock (if present) and sand and gravel aquifers and will discharge to the nearest watercourse i.e. the River Nore located 350m. West of the site boundary.

The groundwater flow direction in the Sand and Gravel deposits is expected to be in the direction of the closest watercourse, i.e. to the south east.

8.3.5.2.3 Water Usage

Water usage at the proposed substation is primarily supplied by either Kilkenny County Council from their surface water abstractions and supplemented by groundwater abstraction boreholes or private wells used by landowners individually or as part of a group water scheme. A search of the GSI well database shows that the majority of wells in the area are associated with the Glanbia plant. The yield varies from Poor to Excellent. Refer to Table 8.6 for details.

8.3.5.2.4 Groundwater Vulnerability

Figure 8.9 show the level of vulnerability for the underlying aquifers. Groundwater vulnerability underlying the proposed substation site is "High".

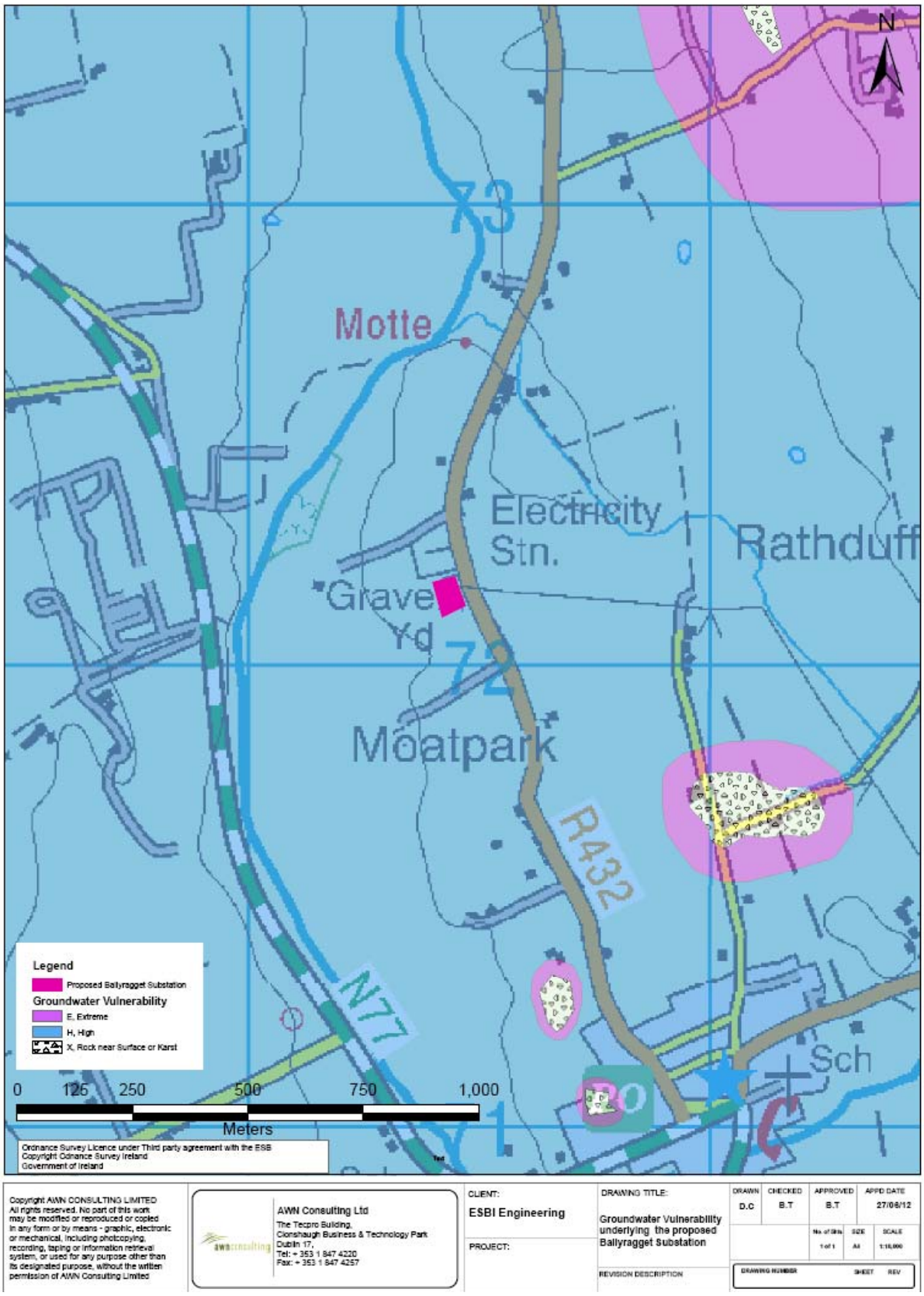


Figure 8.9 Groundwater Vulnerability underlying the proposed Ballyragget Substation

8.3.6 UNIT 5 'A NEW 110KV OVERHEAD LINE BETWEEN BALLYRAGGET AND COOLNABACKY'

8.3.6.1 Hydrology

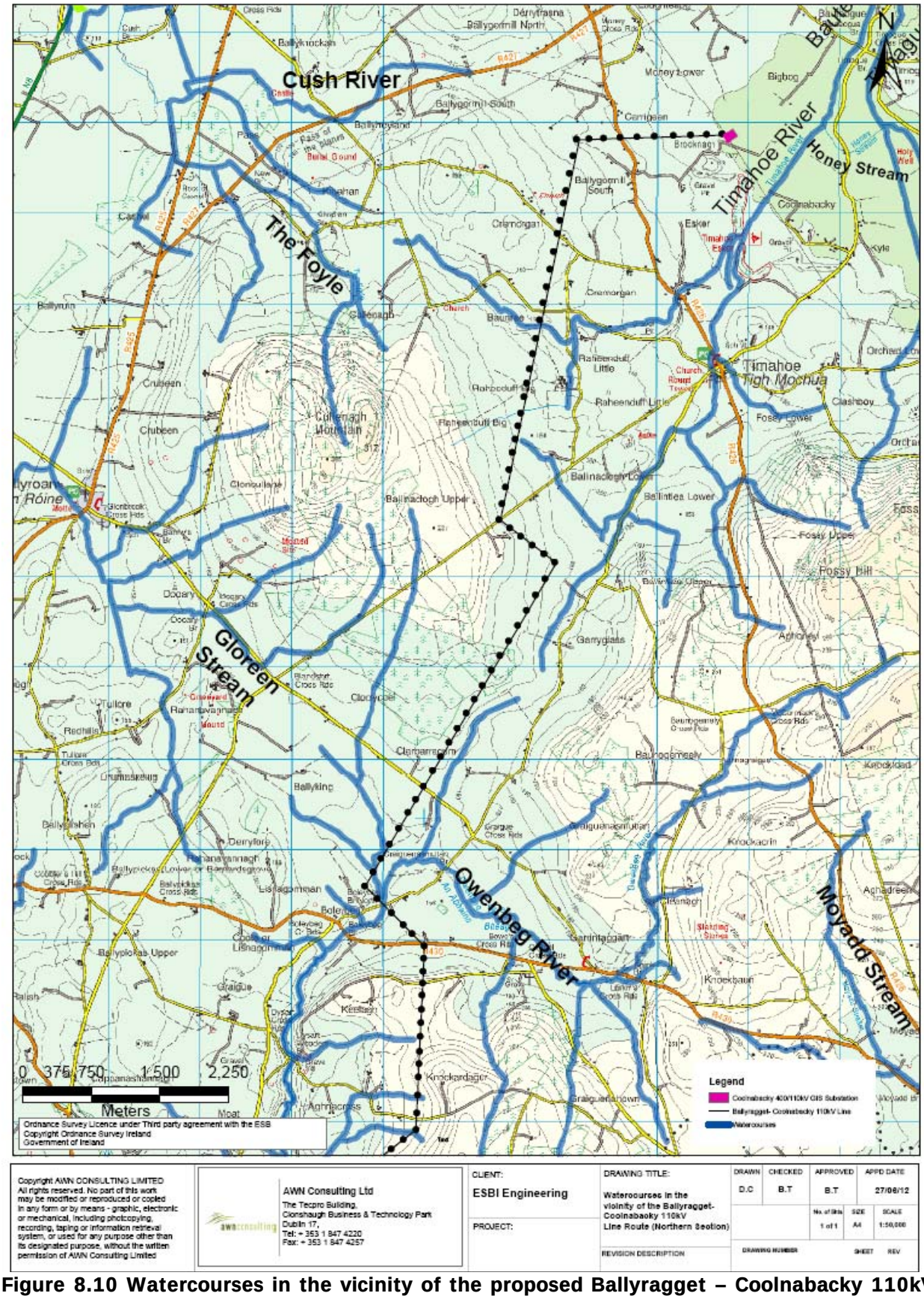
8.3.6.1.1 Water Quality

The proposed line route is located within the SERBD. The proposed line route traverses two separate catchments – The River Barrow (Hydrometric Area 14) and the River Nore (Hydrometric Area 15).

The River Nore rises in Co. Tipperary just outside Roscrea and flows due east through Co Laois where outside of Abbeyleix it turns in a due South-east direction through County Kilkenny for approx. 90km. It continues in this course as far as New Ross where it flows into the River Barrow. Most of the Nore's tributaries join it on the upper reach, the principal ones being the Gully and Erkina Rivers which join from the west near Durrow and the Owenbeg River which join from the east near Ballyragget. On its lower reaches the main tributaries are the Dinin River which join from the east and the King's River from the west before flowing into the Waterford Estuary. The Nore has a catchment area of 2,461 km^2 and traverses through counties Tipperary, Laois, Kilkenny and Waterford.

The Barrow River Rises on the north face of the Slieve Bloom Mountains in Co. Laois where it flows for approx. 140km. It flows due north till it reaches Killeigh where it begins to flow on an easterly direction. It begins to turn to the south-east and pass through Athy, Co. Kildare and continues due south where is passes through Carlow town. It proceeds to flow in a southerly direction and discharges into Waterford Harbour. The tidal estuary extends from Waterford City to Ballyhack, which is around 5km.

Figures 8.10 and 8.11 show the relevant water courses in the vicinity of the proposed line route.



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PROJECT:

DRAWING TITLE: Watercourses in the vicinity of the Ballyragget-Coolnabacky 110kV Line Route (Northern Section)

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Figure 8.10 Watercourses in the vicinity of the proposed Ballyragget – Coolnabacky 110kV Line Route (Northern Section)

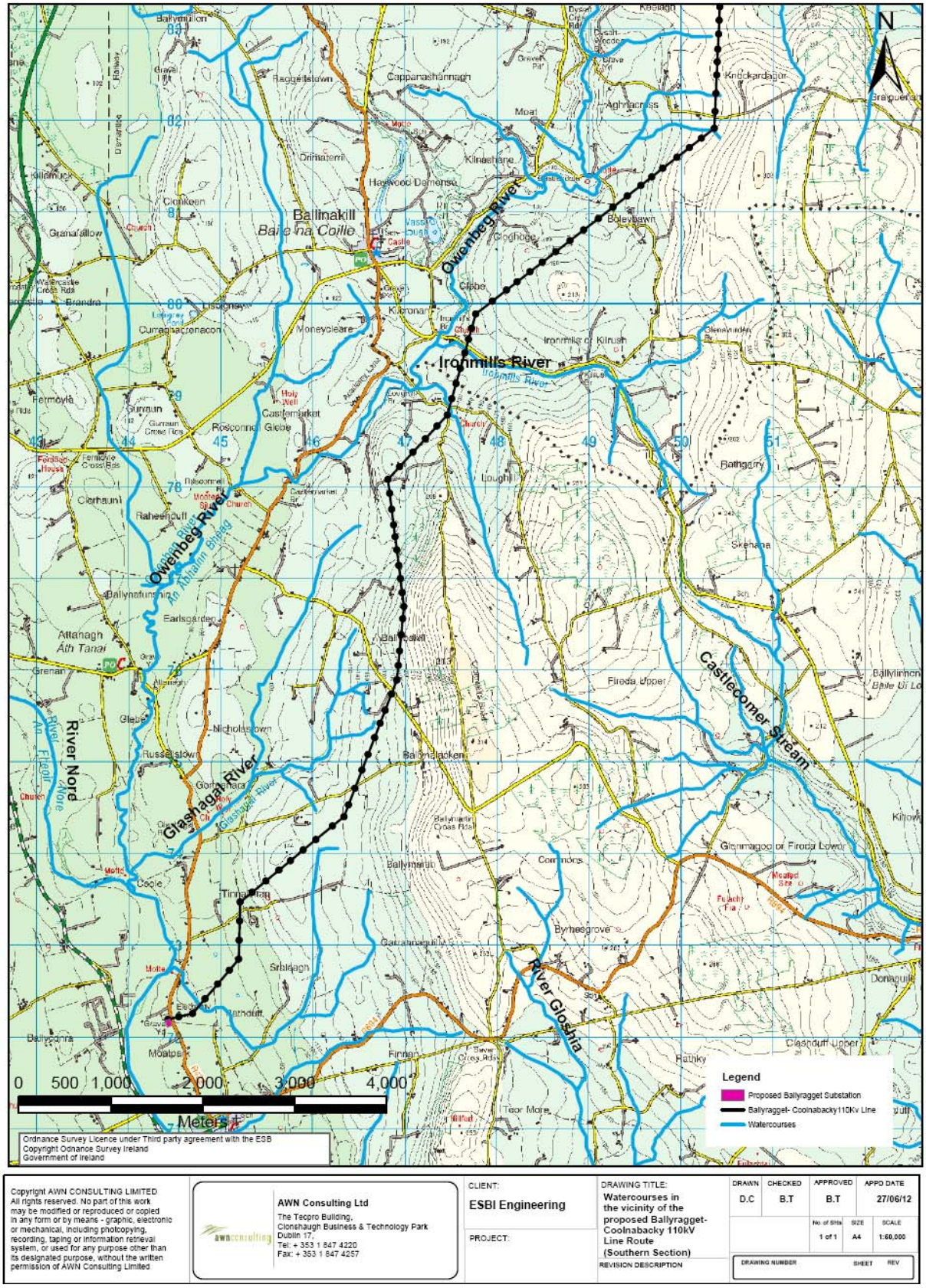


Figure 8.11 Watercourses in the vicinity of the proposed Ballyragget – Coolnabacky 110kV Line Route (Southern Section)

The proposed line route (North to South) traverses and/or is located within the vicinity of the following watercourses:

- Timahoe
- Timogue
- Bauteogue River
- Owenbeg River
- Ironmills
- Glashagal
- Nore

Table 8.7 shows the current status of the rivers monitored along the proposed line route as part of the WFD monitoring program.

Hydrometric Area	WFD Catchment WMU	Watercourse	Current WFD Status*
Nore (No. 15)	Nore Main	Nore	Moderate Q value range 3 to 4 (4*) (2010)#
		Owenbeg	Good (0.5km East of Ballinakill) Q 4 over length of river (2010)#
		Owenbeg	Moderate Q 4 over length of river (2010)#
		Ironmills	Not monitored
		Glashagal	Not monitored
Barrow (No. 14)	Stradbally	Timahoe River	Moderate
		Timogue River	Good
		Bauteogue River	Moderate Q value range 4 to 4-5 over length of river (2011)#

*In accordance with the Environmental Quality Standards (EQS) or assessment of impacts for surface waters *S.I. 272 of 2009 (EC Environmental Objectives (Surface waters) Regulations 2009*

#EPA, (2012), Integrated Water Quality Report 2011 – South East Ireland, EPA.

Table 8.7 WFD Status of Rivers within Unit 5

Stradbally WMU

Timahoe River – This is a tributary of the River Barrow. It rises in the townland of Raheenduff Little near Timahoe, Co. Laois and flows in a northeast direction for approx. 5km where it joins the Stradbally River near Stradbally town. Under the WFD it is classified as Moderate

Bauteogue River- The Bauteogue continues on from the Timahoe River and flows in a north-easterly direction for approx. 4km where at Stradbally town it becomes the Stradbally River. Under the WFD it is classified as Moderate

Timogue River- This is a tributary of the Bauteogue River. It rises in the townland of Clondoolagh and flows in a northerly direction for approx. 7km where it joins the Bauteogue River near Stradbally town. Under the WFD it is classified as Good.

Nore Main WMU

River Nore- This is the main water body in the study area. It rises in north-east of Tipperary around the townland of Ballycrine and flows South-South East direction for approx. until it reaches Now Ross. The Nore River is classified as Good until it is joined by the Owenbeg river after which it is classified as Moderate The River was assessed in 2008 by the WFD monitoring programme and was assigned a status of 'High'.

Owenbeg River- This is a tributary of the Nore River. It rises in the townland of Aghoney near Fossy Mountain and flows on a South-South Westerly direction for approx. 25km where it joins the Nore River. Under the WFD it is classified as Moderate.

Ironmills River- This is a tributary of the Owenbeg River and rises in the townland of Rathgarry, Co. Kilkenny and flows in a westerly direction for approx. 4km where it joins the Owenbeg River. Under the WFD it is classified as High.

Glashagal River- This is a tributary of the Owenbeg River and rises in the townland of Ballyoskill, Co. Kilkenny. It flows in a south westerly direction for approx. 4km where it joins the Owenbeg River. As of yet it has no status under the WFD.

8.3.6.1.2 Flooding

The OPW Flood Hazard Database was used in order to obtain information on historical flooding events along the proposed line route. This information was used to establish the current baseline conditions in terms of sections of the proposed line route that are liable to flood. Only one major flood event was recorded in the vicinity of the proposed line route. This occurred in November 2000 and resulted in the closure of the N77 near Ballyragget due to the River Nore bursting its banks. The proposed line route and substation on Ballyragget is located on the R432, 0.5km East of the N77.

8.3.6.2 Hydrogeology

8.3.6.2.1 Aquifer Classification

Bedrock Aquifers

The GSI online maps and publications[5] were consulted in relation to the occurrence of bedrock aquifers along the proposed line route. The proposed line route has the following aquifer classifications:

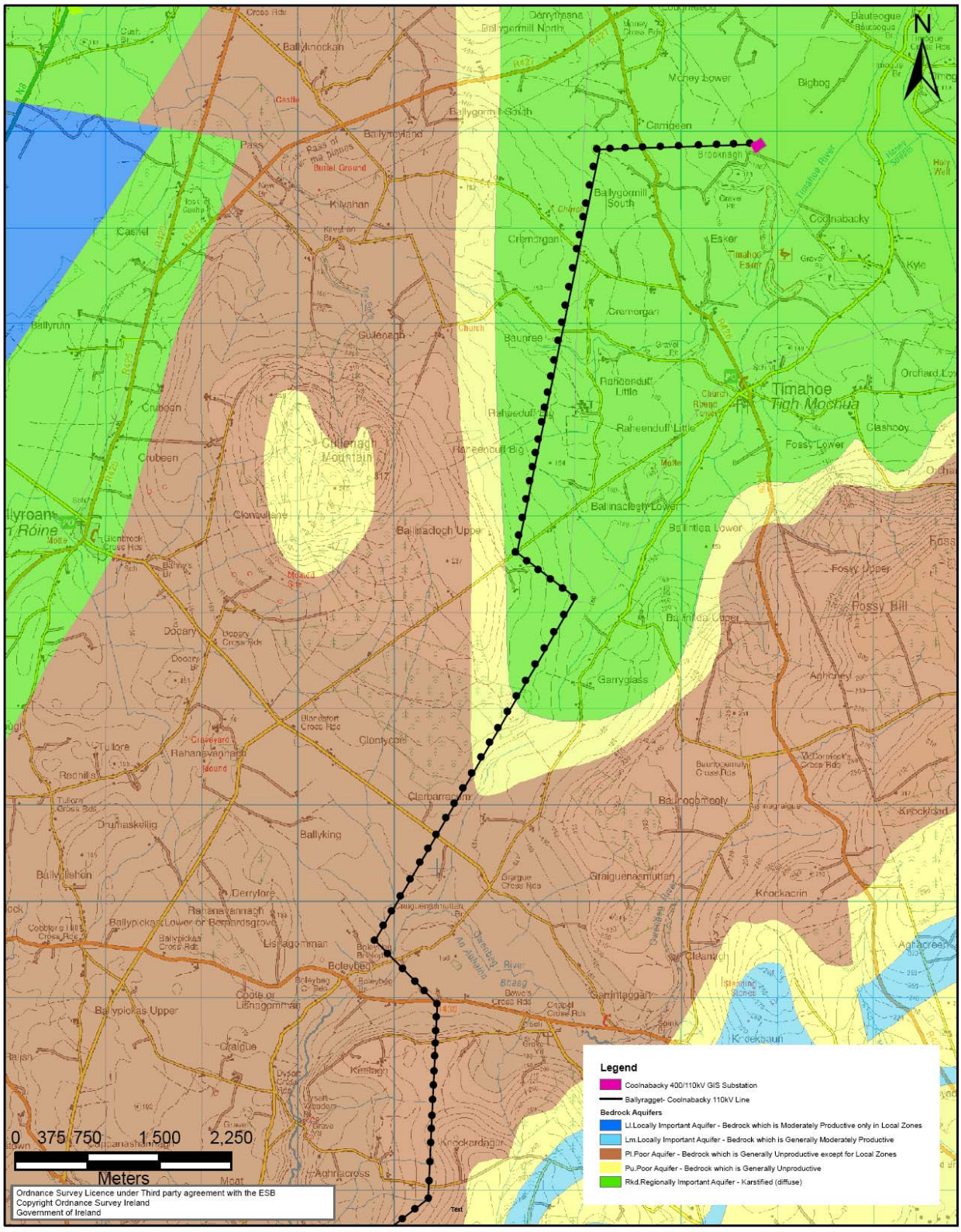
- PI – Poor aquifer, bedrock which is generally unproductive, except in local zones
- Pu- Poor Aquifer - Bedrock which is Generally Unproductive
- Rkd- Regionally Important Aquifer- Karstified (diffuse)

Table 8.8 shows the percentage (%) of typical angle masts/polesets located within each aquifer type.

Aquifer Code	Aquifer Description	% of Angle Masts located within Aquifer type
Pl	Poor Aquifer Bedrock which is generally unproductive except for local zones	60.6
Pu	Poor Aquifer - Bedrock which is Generally Unproductive	3.4
Rkd	Regionally Important Aquifer- Karstified (diffuse)	36.0

Table 8.8 % of Typical Angle Masts/Polesets located within Aquifer Type

Figures 8.12 and 8.13 shows the bedrock aquifers underlying the proposed line route.



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PROJECT:

DRAWING TITLE: **Bedrock Aquifers underlying the Ballyragget-Coolnabacky 110kV Line Route (Northern Section)**

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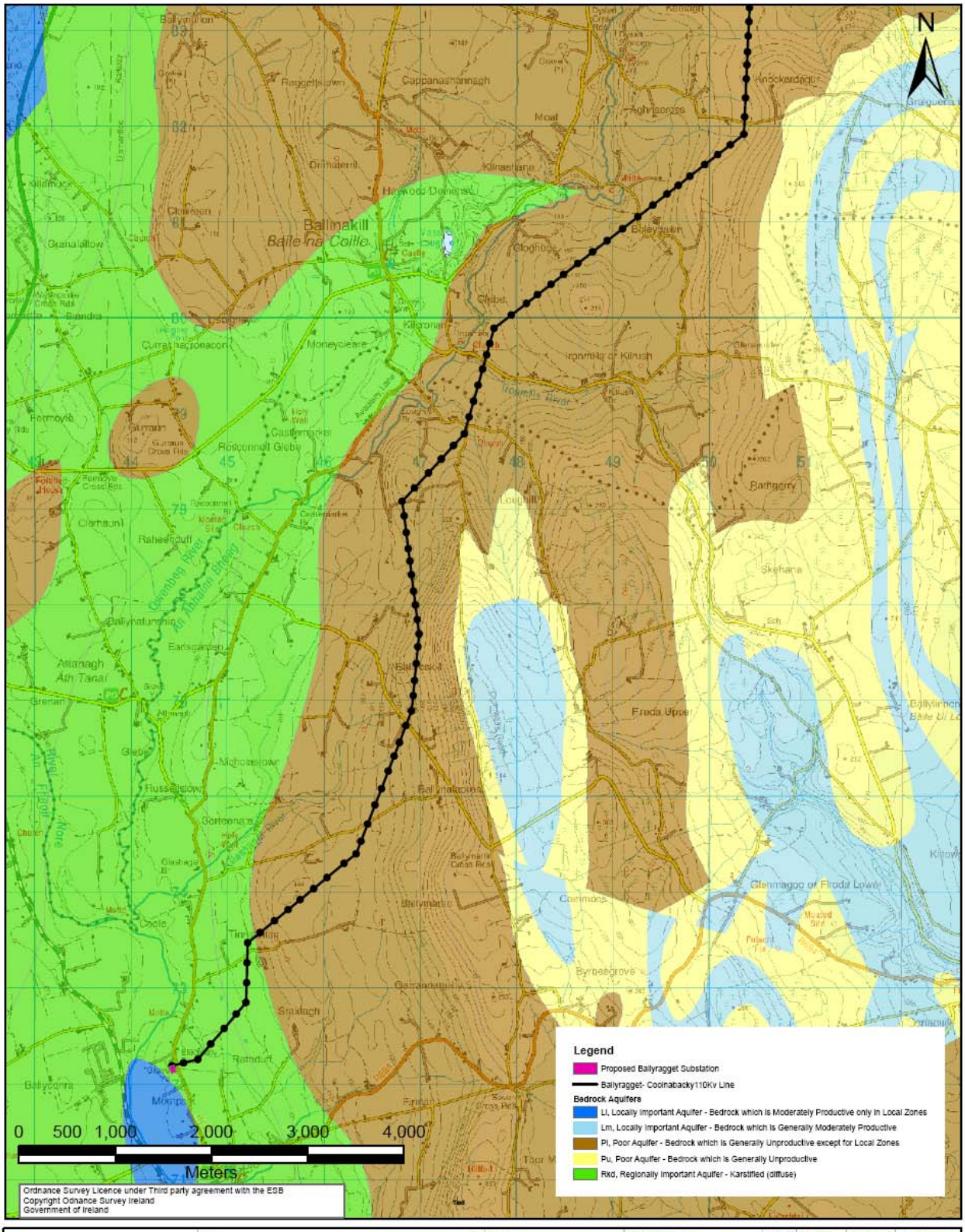
Figure 8.12 Bedrock Aquifers underlying the proposed Ballyragget – Coolnabacky 110kV Line Route (Northern Section)



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PROJECT:

DRAWING TITLE: Bedrock Aquifers underlying the proposed Ballyragget-Coolnabacky 110kV Line Route (Southern Section)

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Figure 8.13 Bedrock Aquifers underlying the proposed Ballyragget – Coolnabacky 110kV Line Route (Southern Section)

Gravel Aquifers

There are sand/gravel aquifers present in the study area. The main Gravel Aquifer runs along the entire eastern section of the study area and extends from Ballyragget through Attanagh, Ballinakill and onto Abbeyleix (Freshford 1&2 Gravel Aquifer). There is also a gravel aquifer surrounding the town of Timahoe (Timahoe Gravel Aquifer).

Freshford 1&2 Gravel aquifer- This is classified as a Regionally Important Gravel Aquifer. A high percentage of the aquifer is near the surface and the water level can vary between 2-20m below ground level. The flow pattern is to the Nore River and its tributaries and can contribute base flow to these rivers.

Timahoe Gravel Aquifer- This is classified as locally important aquifer where a high percentage of the aquifer is near the surface. Water levels are considered to be in the region of between 3.0-7.0m bgl. Groundwater flow direction is expected to be towards the River Barrow catchment to the north

Table 8.9 shows the percentage (%) of typical angle masts/polesets located within each aquifer type.

Aquifer Code	Aquifer Description	% of Angle Masts located within Aquifer type
Lg-	Locally Important Sand/Gravel Aquifers	0.7
Rg	Regionally Important, extensive Sand/Gravel Aquifers	2.7

Table 8.9 % of Typical Angle Masts/Polesets located within Aquifer Type

Figures 8.14 and 8.15 shows the gravel aquifers underlying the proposed line route.

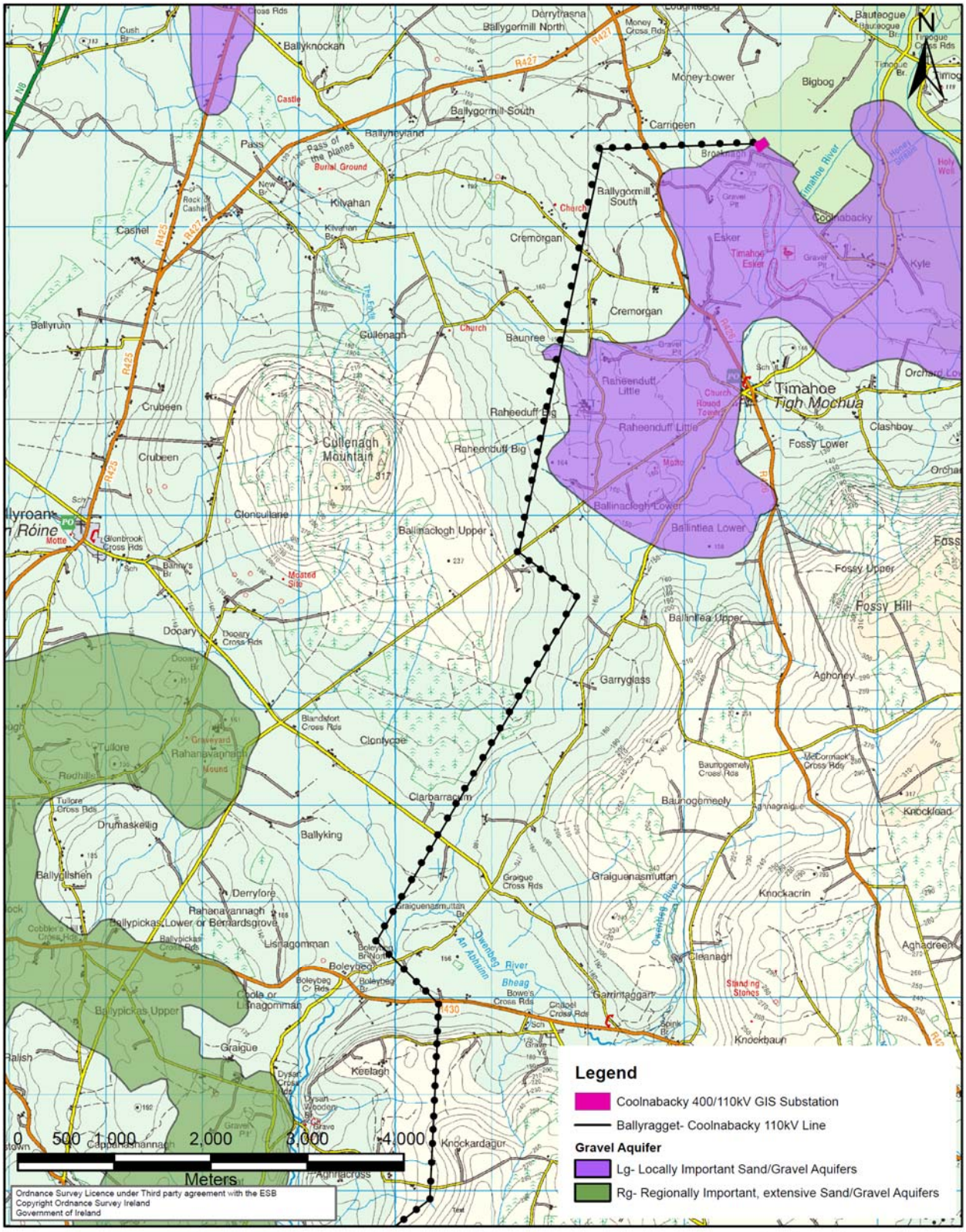

Figure 8.14 Gravel Aquifers underlying the proposed Ballyragget – Coolnabacky 110kV Line Route (Northern Section)

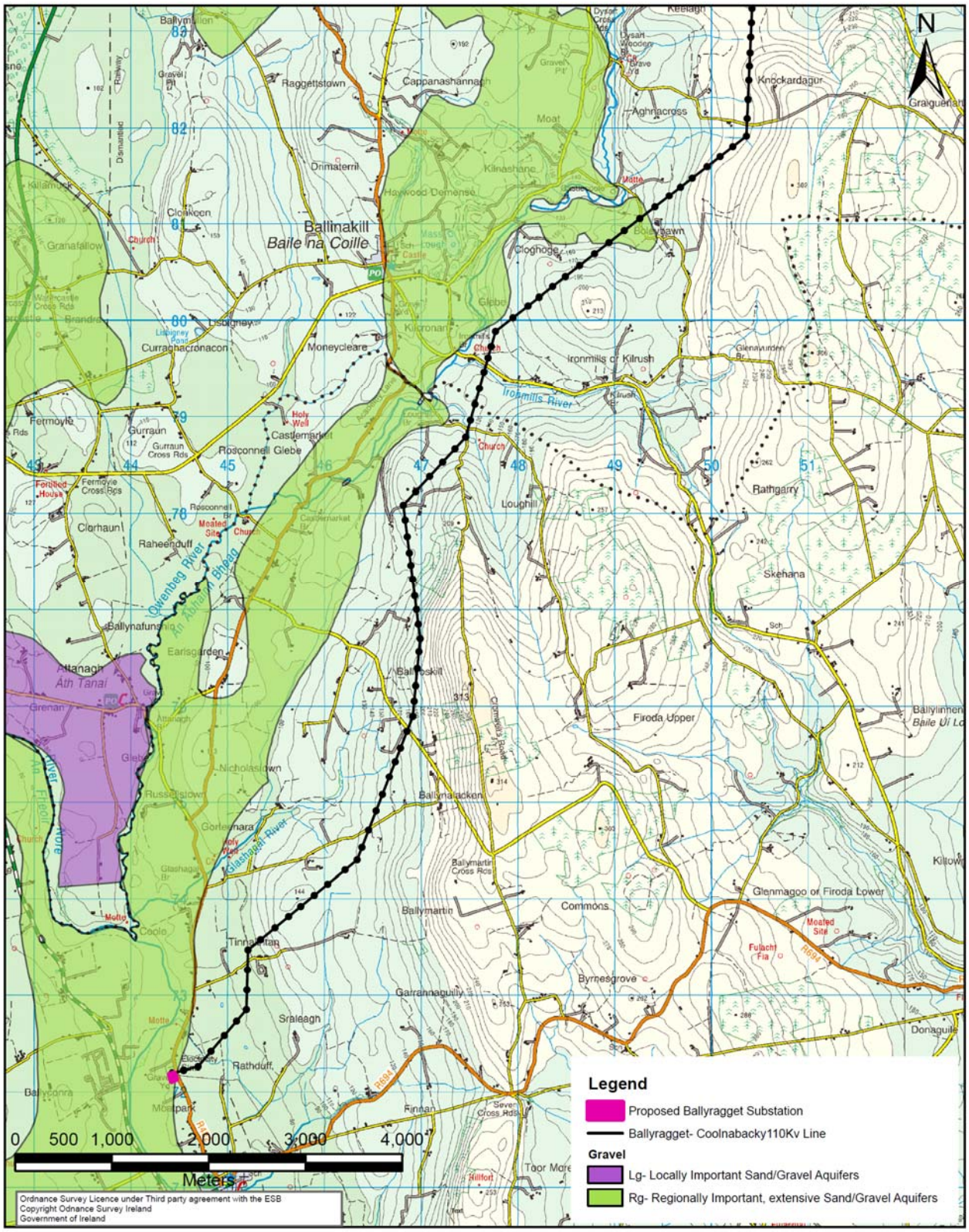

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Figure 8.15 Gravel Aquifers underlying the proposed Ballyragget – Coolnabacky 110kV Line Route (Southern Section)

The GSI Well Card Index presented in Table 8.10 shows the occurrence of recorded wells within the study area, information regarding the well use, yield class; yield and water strike is noted for a large number of the wells. This index shows a number of wells in the vicinity of 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 shows there are a large number of wells in the area with uses varying from domestic to agricultural use. It shows that water strikes recorded in the vicinity of the proposed line route range from surface level to 103.6m bgl. The groundwater yield also varies throughout the study area; the majority of yield is classed by the GSI as poor. Figures 7.13 and 7.14 on the Soils and Geology section show the recorded groundwater wells in the vicinity of the proposed line.

No.	GSI Code	Easting	Northing	Townland	Well Use	Depth (m)	Yield Class	Yield m^3d
1	2315NEW209	246630	169720	DONAGHMORE	-	1.3	-	-
2	2317NEW050	247260	186320	DRUMASHELLIG	Pub	6	P	-
3	2317NEW051	249570	184040	BOLEYBEG	I	10.2	-	-
4	2317NEW052	249680	183990	BOLEYBEG	I	91.4	P	-
5	2317NEW053	245920	184070	RALISH	Pub	-	I. Spring	-
6	2317NEW201	251650	180120	CRUTT	-	4.3	-	-
7	2317NEW202	253170	180170	CRUTT	-	5	-	-
8	2317NEW203	253240	181670	CHATSWORTH	B	3.7	-	-
9	2317NEW204	253400	181080	CHATSWORTH	B	5.6	-	-
10	2317NEW208	253710	180670	CHATSWORTH	-	-	-	-
11	2317NWW186	252760	183400	ABBEYLEIX DEMESNE	Dom	5.4	-	-
12	2317NWW300	242930	180150	WATERCASTLE	-	20.3	-	-
13	2317NWW301	242430	180120	WATERCASTLE	Agri	-	-	-
14	2317SEW017	250000	179700	KILRUSH	-	44.2	G	152.4
15	2317SEW101	247850	178540	LOUGHILL	-	12.2	-	-
16	2317SEW102	245810	178310	CASTLEMARKET	-	7.4	-	-
17	2317SEW103	245750	178180	CASTLEMARKET	-	6	-	-
18	2317SEW104	245880	178530	CASTLEMARKET	B	14	P	-
19	2317SEW105	246340	178180	CASTLEMARKET	Dom	21.5	-	-
20	2317SEW106	246400	178160	CASTLEMARKET	-	11.8	-	-
21	2317SEW107	246300	178560	CASTLEMARKET	-	15	-	-
22	2317SEW108	246400	178920	CASTLEMARKET	-	6	-	-
23	2317SEW109	247000	178920	LOUGHILL	-	15.7	P	-
24	2317SEW110	247400	178450	LOUGHILL	-	18	-	-
25	2317SEW111	251680	178450	MOYHORA	-	7.2	-	-
26	2317SEW112	251440	178820	MOYHORA	Agri	8.8	-	-
27	2317SEW113	251360	179180	MOYHORA	-	3.6	-	-
28	2317SEW114	252050	179320	CRUTT	-	7.9	-	-
29	2317SEW115	251750	179960	CRUTT	B	2	-	-
30	2317SEW116	253450	179010	CRUTT	-	5	-	-
31	2317SEW117	253250	178830	CRUTT	-	5.3	-	-
32	2317SEW118	253000	178140	CRUTT	Agri	4.6	-	-
33	2317SEW122	254150	179750	CRUTT	-	4	-	-
34	2317SEW134	245400	177340	CASTLEMARKET	B	8	-	-
35	2317SEW135	245550	177040	BALLYOSKILL	B	4.3	-	-
36	2317SEW136	246520	176820	BALLYOSKILL	-	7.3	-	-
37	2317SEW137	246150	176290	BALLYOSKILL	-	10	-	-
38	2317SEW138	245990	175350	BALLYOSKILL	-	4	-	-
39	2317SEW139	246640	176280	BALLYOSKILL	-	1.5	-	-
40	2317SEW140	248260	176590	BALLYOSKILL	B	75	-	-
41	2317SEW141	248220	175370	BALLYNALACKEN	B	2	-	-
42	2317SEW142	247120	175320	BALLYNALACKEN	-	20.6	-	-
43	2317SEW143	247100	175250	BALLYNALACKEN	-	5.1	-	-
44	2317SEW144	247200	175000	BALLYNALACKEN	-	3	-	-
45	2317SEW145	246820	175000	BALLYNALACKEN	-	18	-	-
46	2317SEW146	245980	174480	BALLYMARTIN	-	1.2	-	-
47	2317SEW147	248090	174100	BALLYMARTIN	-	2	-	-
48	2317SEW148	248250	173000	BYRNESGROVE	-	3.8	-	-
49	2317SEW149	248710	172790	BYRNESGROVE	-	6	-	-

No.	GSI Code	Easting	Northing	Townland	Well Use	Depth (m)	Yield Class	Yield m^3d
50	2317SEW150	248110	172220	BYRNESGROVE	-	7.1	-	-
51	2317SEW151	247640	172250	FINNAN	B	4.3	-	-
52	2317SEW152	246840	172220	FINNAN	Dom	16.5	-	-
53	2317SEW153	245480	173510	TINNALINTAN	B	3.8	-	-
54	2317SEW154	248150	171860	TOOR MORE	-	17.7	-	-
55	2317SEW155	248760	172070	RATHKYLE	-	33	-	-
56	2317SEW156	249270	172190	RATHKYLE	-	4.3	-	1.4
57	2317SEW157	249180	172380	BYRNESGROVE	B	28.6	-	-
58	2317SEW216	247330	170530	DONAGHMORE	-	25.6	-	-
59	2317SEW241	251470	178890	CRUTT	B	41.1	-	-
60	2317SEW254	246630	170170	DONAGHMORE	-	7.6	-	-
61	2317SWW062	243390	178420	CLORHAUN	B	50.9	-	-
62	2317SWW063	243550	178430	CLORHAUN	Dom	3.4	-	-
63	2317SWW064	243800	178380	CLORHAUN		6.7	-	-
64	2317SWW065	243990	178330	GURRAUN	Dom	1.8	-	-
65	2317SWW066	244010	178280	GURRAUN	Dom	4.9	-	-
66	2317SWW067	244370	179130	GURRAUN	-		-	-
67	2317SWW068	244300	179050	GURRAUN	B	9.1	-	-
68	2317SWW069	242350	178710	CASTLEWOOD	Dom	15.5	-	-
69	2317SWW070	242280	178600	CASTLEWOOD	-	85.3	-	-
70	2317SWW071	242280	178300	CASTLEWOOD	-	23.5	-	-
71	2317SWW072	242510	177900	CASTLEWOOD	B	10.7	-	-
72	2317SWW073	243200	177770	GRENAN	B	2.1	-	-
73	2317SWW074	243200	177650	GRENAN	Dom	3.4	-	-
74	2317SWW075	243410	177620	CLORHAUN	-	5.2	-	-
75	2317SWW076	243420	177440	GRENAN	Dom	3.4	-	-
76	2317SWW077	243250	177240	GRENAN	B	4.9	-	-
77	2317SWW078	243520	177280	CLORHAUN	Dom	4.3	-	-
78	2317SWW079	243500	177120	GRENAN	Dom	1.8	-	-
79	2317SWW080	243700	179030	FERMOYLE	Dom	6.1	-	-
80	2317SWW081	243570	179390	BRANDRA	B	7.5	-	-
81	2317SWW082	243520	179400	BRANDRA	B	7.6	-	-
82	2317SWW083	243350	179540	BRANDRA	B	22.9	-	-
83	2317SWW084	243350	179680	BRANDRA	B	28	-	-
84	2317SWW103	241530	179930	DUNMORE	B	51.8	-	-
85	2317SWW104	242850	179100	FERMOYLE	Pub	26.7	E	1506
86	2317SWW105	242930	179070	FERMOYLE	-	6.6	-	-
87	2317SWW106	242810	179100	FERMOYLE	Pub	24.4	G	168
88	2317SWW182	243790	176750	BALLYNAFUNSHIN	-	3	-	-
89	2317SWW183	243750	176840	BALLYNAFUNSHIN	-	12	-	-
90	2317SWW184	243850	176500	BALLYNAFUNSHIN	-	3.1	-	-
91	2317SWW185	244150	175880	GLEBE	-	3	-	-
92	2317SWW186	243750	175920	GRENAN	-	6.3	-	-
93	2317SWW187	243500	175830	GRENAN	-	9.2	-	-
94	2317SWW188	243050	175610	GRENAN	-	10.2	-	-
95	2317SWW189	243050	176140	GRENAN	-	37	P	-
96	2317SWW190	243000	176150	GRENAN	-	13.9	-	-
97	2317SWW191	242130	176250	TINWEAR	Pub	11.5	P	-
98	2317SWW192	241670	176030	TINWEAR	-	3.2	-	-
99	2317SWW208	242740	176120	GRENAN	-	10.4	-	-

No.	GSI Code	Easting	Northing	Townland	Well Use	Depth (m)	Yield Class	Yield m^3d
100	2317SWW209	244000	176270	GRENAN	-	3	G	218.2
101	2317SWW415	242620	174820	BALLYNASLEE	B	63.7	P	20.1
102	2317SWW416	242640	174750	BALLYNASLEE	-	63.7	P	5.5
103	2317SWW417	243280	173100	BALLYCONRA	B	20.2	P	-
104	2317SWW418	243630	172820	BALLYCONRA	-	30.1	P	-
105	2317SWW419	242880	172390	BALLYCONRA	B	5.1	-	-
106	2317SWW420	243500	171730	BALLYCONRA	I	33.5	E	4500
107	2317SWW421	243580	171680	BALLYCONRA	I	27.4	-	-
108	2317SWW422	243500	171610	BALLYCONRA	I	26.5	E	-
109	2317SWW423	243880	172040	BALLYCONRA	-	152	-	-
110	2317SWW424	244870	176550	EARLSGARDEN	B	3.7	-	-
111	2317SWW425	244920	176200	BALLYOSKILL	B	6.3	-	-
112	2317SWW426	244340	175480	RUSELLSTOWN	B	4	-	-
113	2317SWW427	244740	175080	RUSSELLSTOWN	-	24	-	-
114	2317SWW428	244590	174070	RUSSELLSTOWN	B	4.1	-	-
115	2317SWW429	244590	174070	COOLE	Dom	1.8	-	-
116	2317SWW436	240700	170920	LISDOWNEY	B	5.5	-	-
117	2317SWW437	241030	170950	LISDOWNEY	Dom	5.8	-	-
118	2317SWW438	242200	170930	SESKIN SOUTH	-	5.5	P	-
119	2317SWW439	243650	171140	PARKSGROVE	-	8.3	-	-
120	2317SWW443	243420	171760	BALLYCONRA	I	61	P	5
121	2317SWW444	243360	171900	BALLYCONRA	I	30.5	P	5
122	2317SWW445	243620	171970	BALLYCONRA	I	30.5	P	5
123	2317SWW446	243280	172240	BALLYCONRA	I	27.5	P	19.5
124	2317SWW447	243910	172310	BALLYCONRA	I	18	G	196
125	2317SWW448	243560	172510	BALLYCONRA	I	2.7	-	-
126	2317SWW449	244000	172250	BALLYCONRA	I	9.8	E	1190
127	2317SWW450	243970	172240	BALLYCONRA	I	68.6	E	842
128	2317SWW451	243980	172180	BALLYCONRA	I	45.7	P	30
129	2317SWW452	243930	172050	BALLYCONRA	I	5.5	-	-
130	2317SWW453	243570	171720	BALLYCONRA	I	12.8	-	-
131	2317SWW454	243670	171710	BALLYCONRA	I	18.8	M	66
132	2317SWW455	243960	171600	BALLYCONRA	I	61	G	327
133	2317SWW456	243730	171660	BALLYCONRA	I	30	M	50
134	2317SWW461	242150	170700	SESKIN SOUTH	B	2.6	-	-
135	2317SWW462	242730	170580	BALLYCONRA	Dom	5.3	-	-
136	2317SWW463	242920	170730	BALLYCONRA	-	9.1	-	-
137	2317SWW465	244380	170790	BALLYRAGGET	-	4.5	-	-
138	2317SWW466	244720	179790	BALLYRAGGET	I	42.7	G	-
139	2317SWW468	244800	176210	EARLSGARDEN	Dom	42.1	G	327.3
140	2319SEW098	256020	190610	ORCHARD LOWER	Pub		L.Spring	-
141	2319SEW117	255970	193950	TIMOGUE	B	32.3	M	90.5
142	2319SEW118	256350	194590	TIMOGUE	B	29	M	-
143	2319SEW119	255070	195350	KILLALOOGHAN	-	13.7	-	-
144	2319SEW120	254450	194600	KILLAVALLY	-	7.9	-	-
145	2319SEW121	254720	194110	LOUGHTEEOG	-	7	-	
146	2319SEW125	255210	191800	KYLE	-	6.1	-	-
147	2319SEW126	255090	191520	KYLE	-	5.5	Failure	-
148	2319SEW127	254410	190250	TIMAHOE	-	2.4	-	-
149	2319SEW128	254770	190060	CLASHBOY	-	14.6	-	-

No.	GSI Code	Easting	Northing	Townland	Well Use	Depth (m)	Yield Class	Yield m^3d
150	2319SEW140	256200	192350	BALLYCOOLAN	-	29.3	-	-
151	2319SEW146	255450	192230	KYLE	Pub	-	I. Spring	1337
152	2319SEW147	248710	195780	RATHLEAGUE	Dom	9.3	-	-

Table 8.10 GSI Well Data for Unit 5

I- Industrial
Agri- Agricultural Use Only
B – Agricultural & domestic Use
M – Moderate (40– 100m^3/d)
P – Poor (<40m^3/d)
Pub – Public Water Supply
Dom – Domestic use only
G – Good (>1000m^3/d)
I. Spring- Intermediate Spring
L. Spring- Low Spring

In relation to the assessment of impacts for groundwater's *S.I. 9 of 2010, EC Environmental Objectives (Groundwater) Regulations 2010*, all groundwater bodies along the proposed line route have been designated 'Good'. The groundwater bodies along are route are as follows:

- Bagenalstown
- Timahoe
- Ballingarry
- Durrow
- Freshford

8.3.6.2.2 Groundwater Flow Direction

In general terms it would be expected that the groundwater gradient would follow the topographic variation in an area. Flow paths and distance is dependent on the characteristics of the aquifer type. Most groundwater flow is confined to the upper 10m of weathered bedrock (if present) and gravel aquifers and will discharge to the nearest watercourse.

8.3.6.2.3 Water Usage

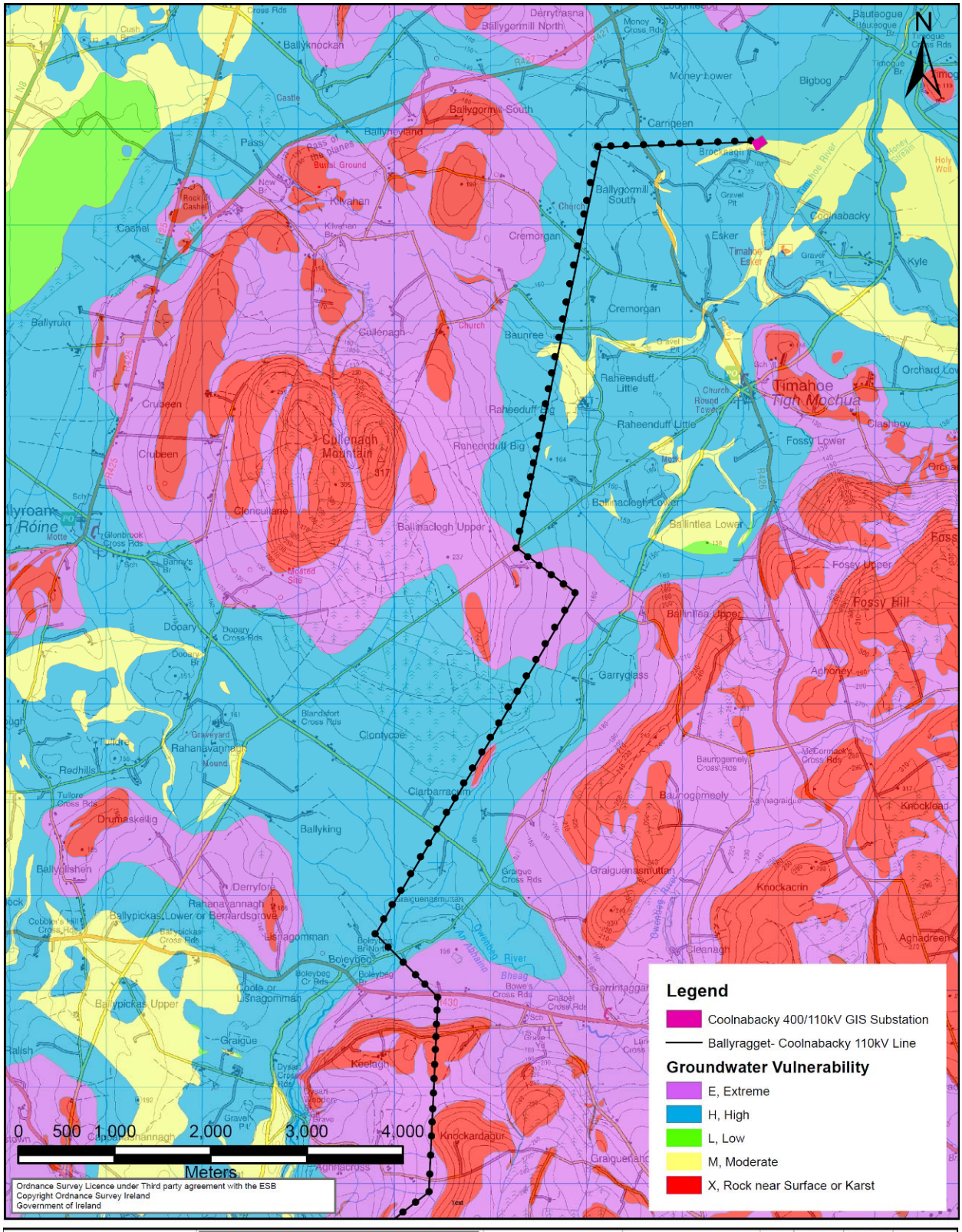
Water usage along the proposed line route is primarily supplied by either Laois/Kilkenny County Council from their surface water abstractions and supplemented by groundwater abstraction boreholes or private wells used by landowners individually or as part of a group water scheme. A search of the GSI well database shows there are a number of wells in the area with uses varying from domestic to agricultural use with mainly poor yields. Refer to Table 8.10 for details.

8.3.6.2.4 Groundwater Vulnerability

Figures 8.16 and 8.17 shows the level of vulnerability for the underlying aquifers along the proposed line route. Groundwater vulnerability was varied throughout the proposed line route but was largely classed as high (48.4% of proposed line route) extreme (41.5%). The upland areas are largely classed as 'Extreme – Rock near Surface'. In the northern section it is predominately classed as 'High' and in the central and southern section it is predominately classed as 'Extreme'. Table 8.11 shows the percentage (%) of typical length of the 110kv line and associated groundwater vulnerability.

Groundwater Vulnerability	No. of Polesets/ Angle Masts	%
Extreme	62	41.5
Extreme Vulnerability with rock at Surface	14	9.45
High	72	48.4
Moderate	1	0.65
TOTAL	**149**	**100**

Table 8.11 % Typical Angle Masts/Polesets and associated Groundwater Vulnerability



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PROJECT:

DRAWING TITLE: Groundwater Vulnerability underlying the proposed Ballyragget-Coolnabacky 110kV Line Route (Northern Section)

REVISION DESCRIPTION

DRAWN	CHECKED	APPROVED	APPD DATE
D.C	B.T	B.T	24/09/12

No. of Shts	SIZE	SCALE
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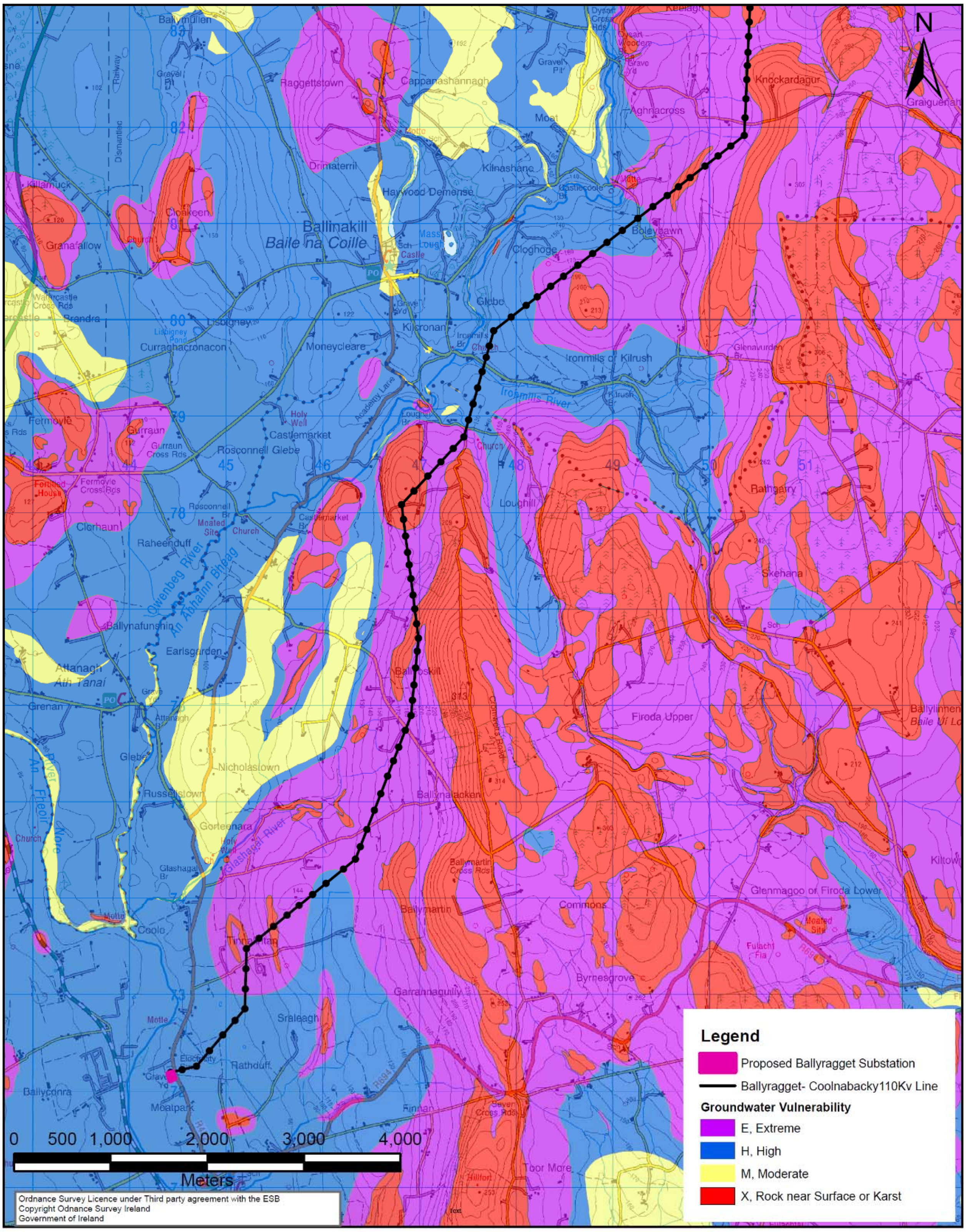
Figure 8.16 Groundwater Vulnerability underlying the proposed Ballyragget – Coolnabacky 110kV Line Route (Northern Section)



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	REVISION DESCRIPTION	DRAWING NUMBER		SHEET	REV

Figure 8.17 Groundwater Vulnerability underlying the proposed Ballyragget – Coolnabacky 110kV Line Route (Southern Section)

8.3.7 UNIT 6 'AN UPRATE TO THE EXISTING BALLYRAGGET-KILKENNY 110KV OVERHEAD LINE'

8.3.7.1 Hydrology

8.3.7.1.1 Water Quality

The proposed line route is located within the SERBD. The proposed line route traverses the River Nore (Hydrometric Area 15) catchment. See Section 8.3.6.1.1 for a description of the River Nore catchment.

In terms of the SERBD management plan and assessment, the river catchments located within the area where the proposed line routes traverses are the Nore River (northern and southern sections of the study area) and the Dinin River catchment located in the Northern section. Figures 8.18 and 8.19 show the relevant water courses in the vicinity of the proposed line route.

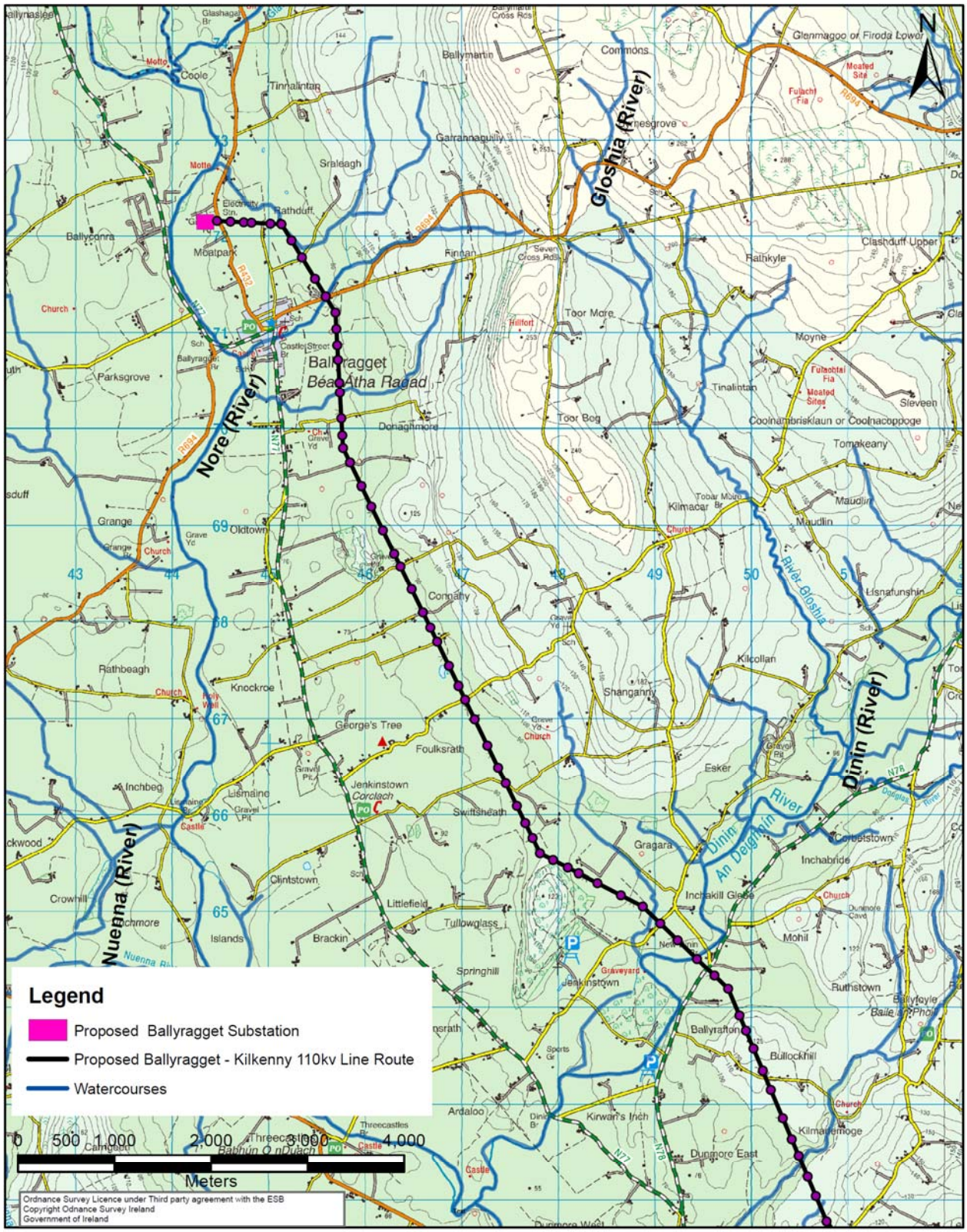


Figure 8.18 Watercourses in the vicinity of the Ballyragget – Kilkenny 110kV Line Route (Northern Section)

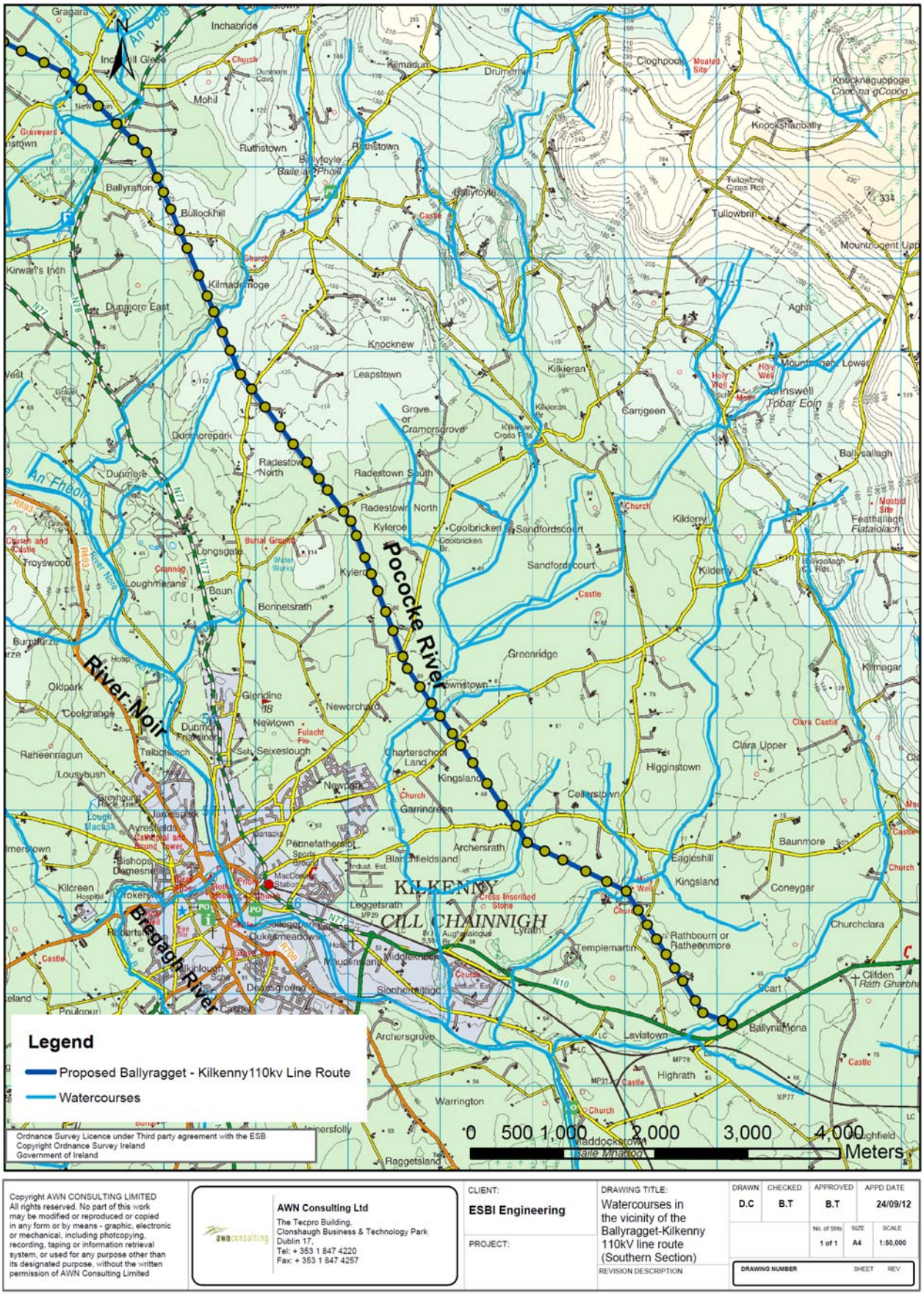


Figure 8.19 Watercourses in the vicinity of the Ballyragget – Kilkenny 110kV Line Route (Southern Section)

The proposed line route (North to South) traverses and/or is located within the vicinity of the following watercourses:

- River Nore
- Dinin River
- Pococke River
- Lyrath
- Scart

Table 8.12 shows the current status of the rivers monitored in the study area as part of the WFD monitoring program.

Hydrometric Area	WFD Catchment WMU	Watercourse	Current WFD Status*
Nore	Nore Main	River Nore (at Ballyragget)	Moderate Q value range 3 to 4 (4*) (2010)#
		River Nore	Moderate Q value range 3 to 4 (4*) (2010)#
		River Nore (at Kilkenny City)	Poor Q value range 3 to 4 (4*) (2010)#
		Pococke River	Good Q 3-4* (2010)
		Lyrath	Not monitored
		Scart	Not monitored
	Dinin	Dinin River	Good Q value range 3-4 to 4-5 over length of river (2010)

*In accordance with the Environmental Quality Standards (EQS) or assessment of impacts for surface waters *S.I. 272 of 2009 (EC Environmental Objectives (Surface waters) Regulations 2009*

#EPA, (2012), Integrated Water Quality Report 2011 – South East Ireland, EPA.

Table 8.12 WFD Status of Rivers within Unit 6

Nore Main WMU

River Nore- This is the main water body in the study area. It rises in north-east of Tipperary around the townland of Ballycrine and flows South-South East direction for approx. until it reaches New Ross. The Nore River is classified as 'Moderate' at Ballyragget and continues to be 'Moderate' until it reaches Kilkenny City where the classification is currently 'Poor'.

Pococke River – This is a tributary of the River Nore which rises in the townland of Carrigeen. It flows in a southerly direction for approx. 7km. The River was assessed in 2008 by the WFD monitoring programme and was assigned a status of 'Good'.

Lyrath - This is a tributary of the River Nore which rises in the townland of Ballysallagh. It flows in a southerly direction for approx. 7km. As of yet it has no status under the WFD.

Scart- This is a tributary of the River Nore which rises in the townland of Feathallagh. It flows in a southerly direction for approx. 6.5km. As of yet it has no status under the WFD.

Dinin River WMU

Dinin River – This is a tributary of the River Nore. It rises in the townland of Clogrenan were it flows in a S.S. West direction. For approx. 25km until it joins the River Nore. Under the WFD it is classified as 'Good'.

8.3.7.1.2 Flooding

The OPW Flood Hazard Database was used in order to obtain information on historical flooding events along the proposed line route. This information was used to establish the current baseline conditions in terms of sections of the proposed line route that are liable to flood.

No flooding events were recorded along the proposed line route from Ballyragget to Kilkenny City. Here several flooding events have been recorded in relation to the Nore and the River Breagagh however none in the vicinity of the proposed line route.

8.3.7.2 Hydrogeology

8.3.7.2.1 Aquifer Classification

Bedrock Aquifers

The GSI online maps and publications[5] were consulted in relation to the occurrence of bedrock aquifers in the study area. The proposed line route has the following aquifer classifications:

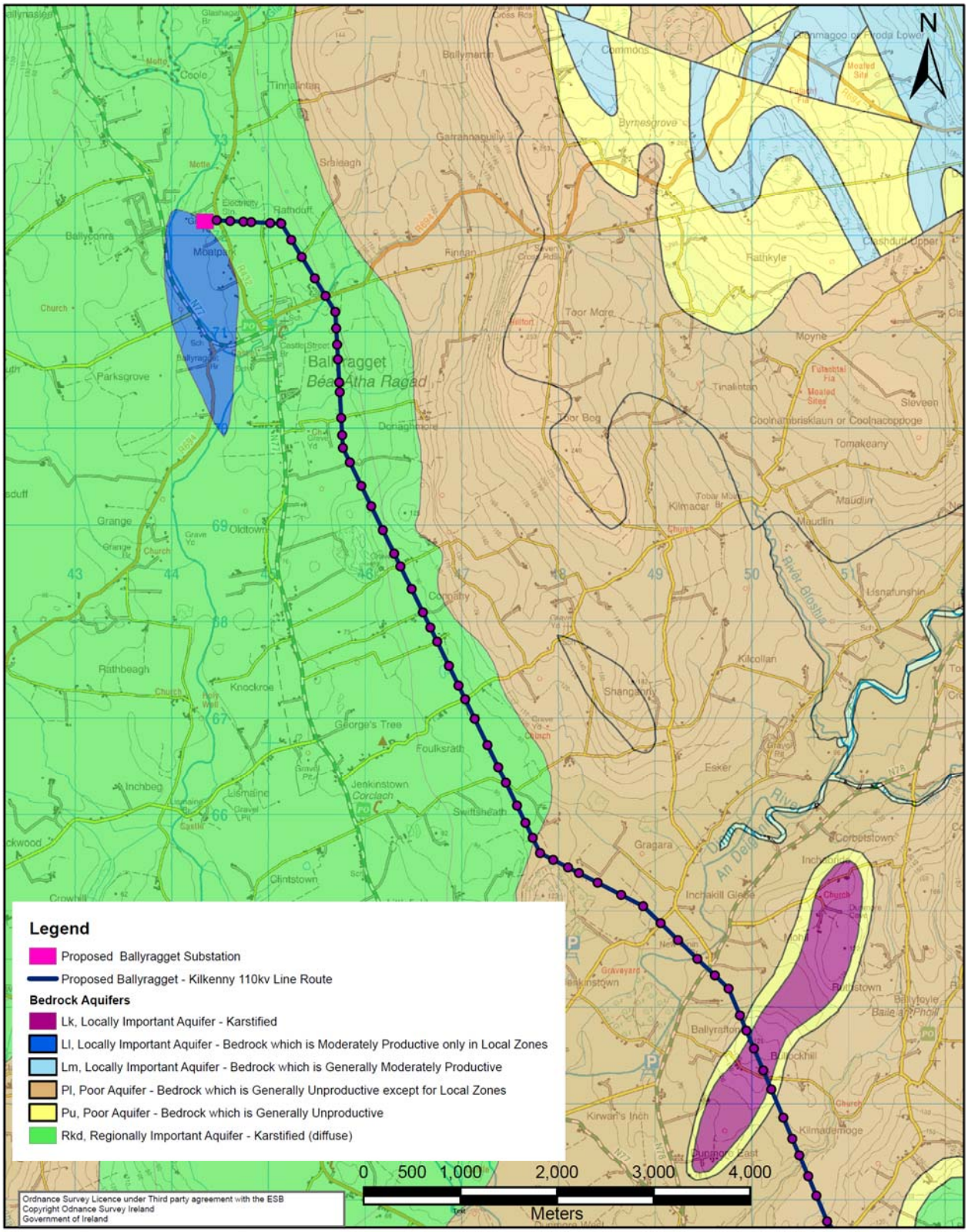
- Pi – Poor aquifer, bedrock which is generally unproductive, except in local zones
- LI - Locally important aquifer, which is Moderately Productive only in Local Zones
- Pu- Poor Aquifer - Bedrock which is Generally Unproductive
- Rkd- Regionally Important Aquifer- Karstified (diffuse)

Table 8.13 shows the % of angle masts/polesets located within each aquifer type.

Aquifer Code	Aquifer Description	% of Angle Masts located within Aquifer type
Pl	Poor Aquifer Bedrock which is generally unproductive except for local zones	28.7
Ll	Locally important aquifer, which is Moderately Productive only in Local Zones	16.5
Pu	Poor Aquifer - Bedrock which is Generally Unproductive	5.3
Rkd	Regionally Important Aquifer- Karstified (diffuse)	49.5

Table 8.13 % of Typical Angle Masts/Polesets located within Aquifer Type

Figures 8.20 and 8.21 show the bedrock aquifers underlying the proposed line route.



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PROJECT:				No. of Shts: 1 of 1	SIZE: A3
REVISION DESCRIPTION					SCALE: 1:50,000
		DRAWING NUMBER		SHEET	REV

Figure 8.20 Bedrock Aquifers underlying the Ballyragget – Kilkenny 110kV Line Route (Northern Section)

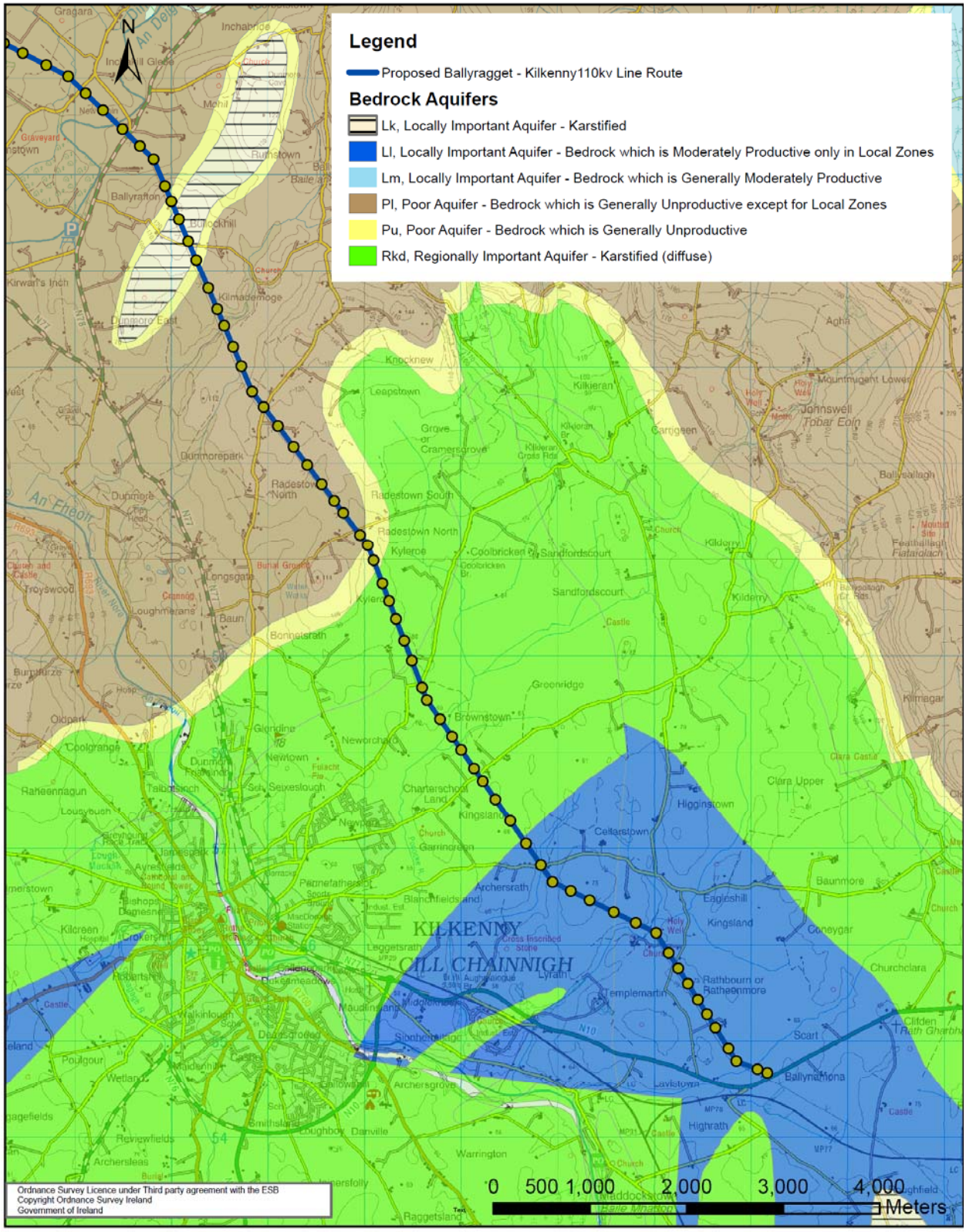

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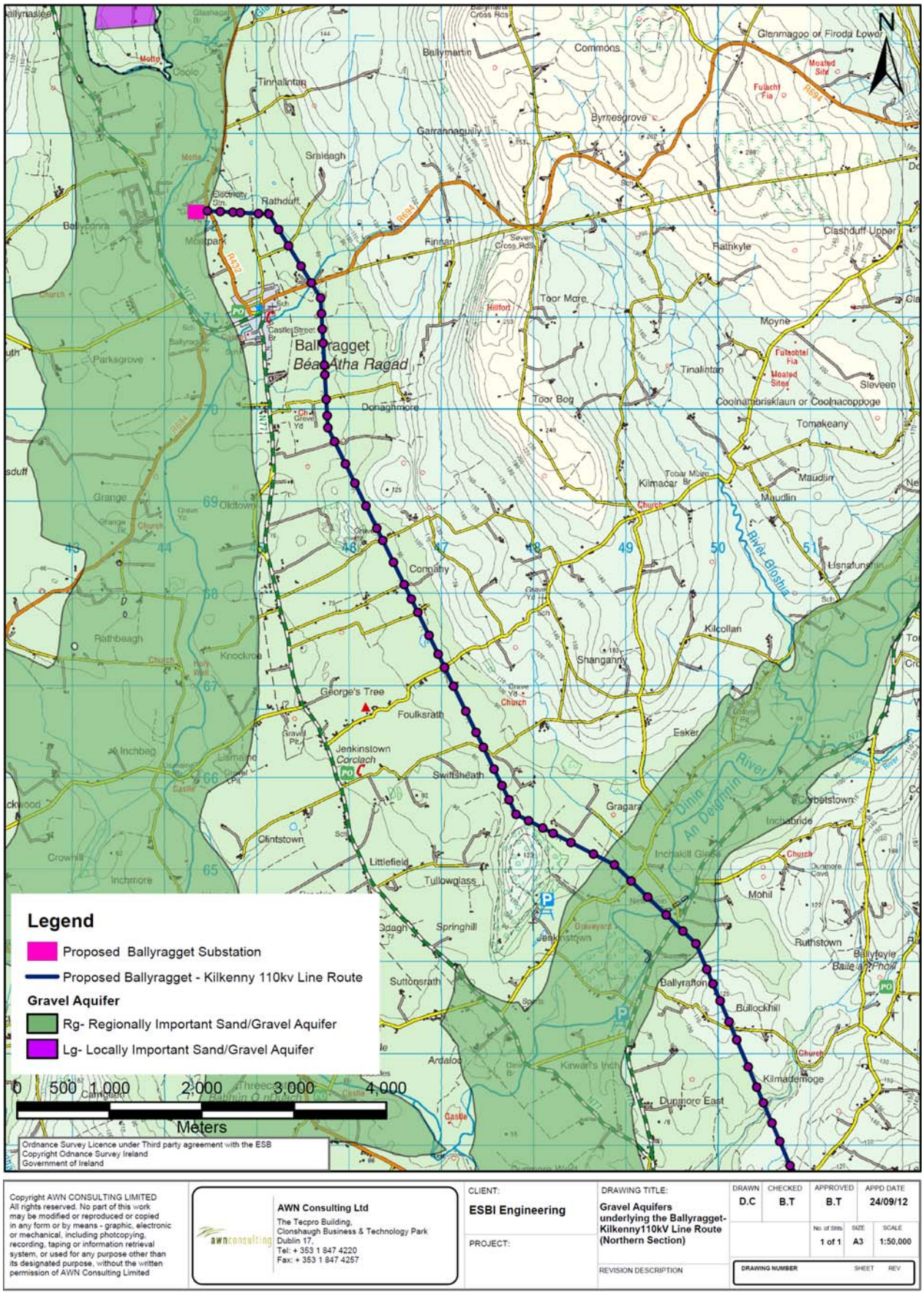
Figure 8.21 Bedrock Aquifers underlying the Ballyragget – Kilkenny 110kV Line Route (Southern Section)

Gravel Aquifers

There are two separate sand/gravel aquifers present in the study area. These aquifers underlie approx. 6.4% of the proposed line route and are found at the proposed Ballyragget substation and within the Dinin River catchment. See Figures 8.22 and 8.23.

Ballyragget Gravel aquifer- This is classified as a Regionally Important Gravel Aquifer. A high percentage of the aquifer is near the surface and the water level can vary between 2.0m-20.0m bgl. The flow pattern is to the Nore River and its tributaries and can contribute base flow to this river.

Dinin River Gravel Aquifer - This is classified as a Regionally Important Gravel Aquifer. A high percentage of the aquifer is near the surface and the water level can vary between 2.0m-20.0m bgl. The flow pattern is to the Dinin River and its tributaries and can contribute base flow to this river.



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REVISION DESCRIPTION

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No. of Shts	SIZE	SCALE
1 of 1	A3	1:50,000

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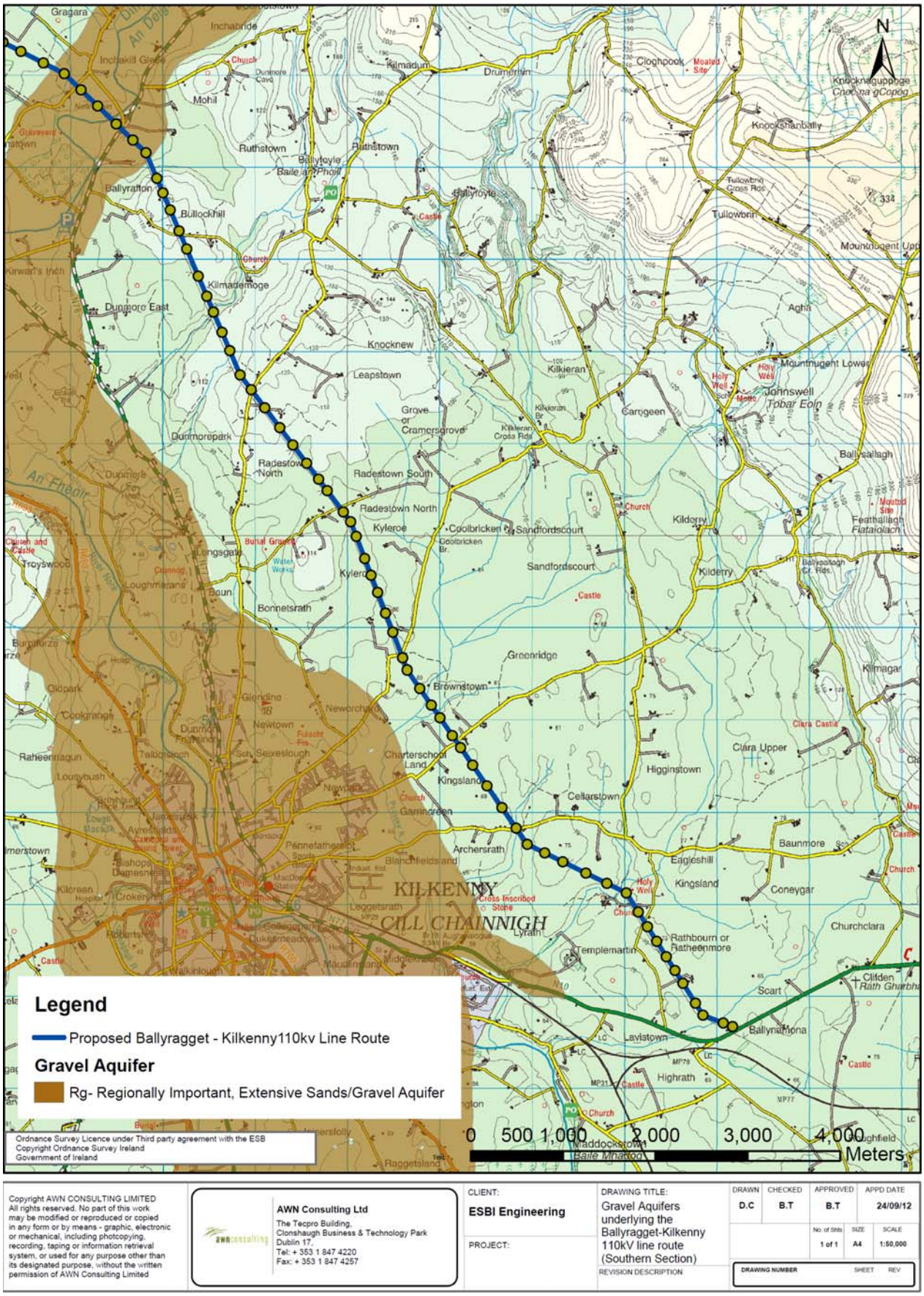
Figure 8.22 Gravel Aquifers underlying the Ballyragget – Kilkenny 110kV Line Route (Northern Section)



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1 of 1	A4	1:50,000

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Figure 8.23 Gravel Aquifers underlying the Ballyragget – Kilkenny 110kV Line Route (Southern Section)

The GSI Well Card Index presented in Table 8.14 shows the occurrence of recorded wells in the vicinity of the proposed line route, information regarding the well use, yield class; yield and water strike is noted for a large number of the wells. The well card data shows there are a large number of wells in the area with uses varying from domestic to agricultural use. It shows that water strikes recorded range from surface level to 25.6m bgl. The groundwater yield also varies throughout the study area; the majority of yield is classed by the GSI as poor. Figures 7.21 and 7.22 in the Soils and Geology section show the location of the recorded groundwater wells in the vicinity of the proposed line.

No.	GSI Code	Easting	Northing	Townland	DTB	Well Use	Depth (m)	Yield Class	Yield m^3d	Water Strike
13	2317SEW254	246630	170170	DONAGHMORE	7.6	Unknown	7.6	-	-	-
14	2315NEW209	246630	169720	DONAGHMORE	1.3	Unknown	1.3	-	-	-
15	2315NEW102	246700	168940	CONNAHY	36.6	Unknown	36.6	Good	109	25.6
16	2315NEW103	246690	168890	CONNAHY	48.6	Agri & domestic use	48.6	Poor	-	18.3
17	2315NEW210	246980	168430	CONNAHY	4.1	Unknown	4.1	-	-	-
18	2315NEW100	247850	167700	CONNAHY	23.3	-	-	-	-	-
19	2315NWW111	246300	167470	CLONTUBBRID	23	-	-	-	-	-
20	2315NEW104	246300	166750	FOULKSRATH	6.7	-	-	-	-	-
21	2315NEW212	246210	166710	FOULKSRATH	6.6	-	-	-	-	-
22	2315NEW213	246580	166670	FOULKSRATH	2.4	-	-	-	-	-
23	2315NEW094	249440	165670	GRAGARA	17.7	Domestic use only	17.7	-	-	-
24	2315NEW095	249480	165640	GRAGARA	12.2	Domestic use only	12.2	-	-	-
25	2315NEW093	249450	165600	GRAGARA	13.8	Domestic use only	13.8	-	-	-
26	2315NEW092	249410	165510	GRAGARA	6.1	Unknown	6.1	-	-	-
27	2315NEW136	246980	165060	TULLOWGLASS	34.2	-		-	-	-
28	2315NEW144	250100	164700	MOHIL	6.8	Agri & domestic use	15	-	-	-
29	2315NEW133	248460	164610	JENKINSTOWN	15	Agri & domestic use	36.5	-	-	-
30	2315NEW145	249600	164500	MOHIL	36.5	Domestic use only	22.9	Moderate	82	-
31	2315NEW256	248460	164420	JENKINSTOWN	22.9	-	-	-	-	-
32	2315NEW139	249300	164150	BALLYRAFTON	NA	Domestic use only	54.9	-	-	-
33	2315NEW246	249440	164050	BALLYRAFTON	54.9	Agri & domestic use	36.5	Poor	-	-
34	2315NEW141	249850	163460	BALLYRAFTON	36.5	-	-	-	-	-
35	2315NEW140	249510	163440	BALLYRAFTON	NA	Agri & domestic use	3.8	-	-	-
36	2315NEW142	250490	163260	BULLOCKHILL	3.8	Agri & domestic use	13.1	Moderate	54.5	-
37	2315NEW143	250990	162760	KILMADEMOGE	13.1	Agri & domestic use	5.8	Poor	21.8	-
38	2315NEW023	251250	161270	RADESTOWN NORTH	5.8	-	1.5	-	-	-
39	2315NEW065	250170	161000	DUNMOREPARK	1.5	-		-	-	-
40	2315NEW017	250860	160700	DUNMOREPARK	3.2	Agri & domestic use	12.5	-	-	-

No.	GSI Code	Easting	Northing	Townland	DTB	Well Use	Depth (m)	Yield Class	Yield m^3d	Water Strike
41	2315NEW022	250750	160690	DUNMOREPARK	12.5	Domestic use only	30.5	Poor	-	-
42	2315NEW016	250874	160494	RADESTOWN NORTH	30.5	Domestic use only	31	Moderate	-	-
43	2315NEW006	250768	160505	DUNMOREPARK	31	Domestic use only	21.3	Poor	-	4
44	2315NEW251	252040	160320	RADESTOWN SOUTH	21.3	Domestic use only	24.4	-	-	-
45	2315NEW003	250860	160320	RADESTOWN NORTH	24.4	Agri & domestic use	2	Poor		-
46	2315NEW250	251540	160240	RADESTOWN SOUTH	2	Domestic use only	51.8	-	-	-
47	2315NEW252	251848	160155	RADESTOWN SOUTH	51.8		36.6	Failure	-	-
48	2315SEW029	252400	159860	RADESTOWN SOUTH	36.6	Agri & domestic use	4.4	-	-	-
49	2315SEW033	252620	159840	BROWNSTOWN	4.4	Agri & domestic use	39.6	-	-	33.5
50	2315SEW026	251840	159200	BONNETSRATH	39.6	Agri & domestic use	44.2	-	-	-
51	2315SEW028	252240	159140	KYLEROE	44.2	Domestic use only	15.9	-	-	-
52	2315SEW027	252200	159020	KYLEROE	15.9	Agri & domestic use	76.2	Moderate	99	9.1
53	2315SEW032	252610	158991	BROWNSTOWN	76.2	Agri & domestic use	41.1	Poor	-	9.1
54	2315SEW031	252540	158990	BROWNSTOWN	41.1	Agri & domestic use	28.9	-	-	13.7
55	2315SEW030	252540	158920	BROWNSTOWN	28.9	Agri & domestic use	21.3	-	-	-
56	2315SEW111	252504	158377	BROWNSTOWN	21.3	Agri & domestic use	36.6	-	-	-
57	2315SEW126	254017	158240	CELLARSTOWN WEST	36.6	Agri & domestic use	3.1	-	-	-
58	2315SEW125	253600	158190	BROWNSTOWN	3.1	Agri use only	4.6	-	-	-
59	2315SEW127	253950	158160	CELLARSTOWN WEST	4.6	Agri & domestic use	9.4	-	-	-
60	2315SEW110	252380	158010	NEWORCHARD	9.4	Agri & domestic use	38.4	Poor	27	-
61	2315SEW104	251827	157965	NEWORCHARD	38.4	-	2.3	-	-	-
62	2315SEW121	253600	157930	ARCHERSRATH	2.3	Agri & domestic use	55.8	Moderate	65.5	13.7
63	2315SEW120	253594	157965	ARCHERSRATH	55.8	Public supply (Co Co)	31	-	-	-
64	2315SEW105	252000	157860	NEWORCHARD	31	Agri & domestic use	36.6	Moderate	65.5	-
65	2315SEW118	253245	157774	KINGSLAND	36.6	Agri & domestic use	8.8	-	-	-
66	2315SEW117	252990	157450	KINGSLAND	8.8	Agri & domestic use	30.5	Poor	32.7	-

No.	GSI Code	Easting	Northing	Townland	DTB	Well Use	Depth (m)	Yield Class	Yield m^3d	Water Strike
67	2315SEW116	252938	157435	KINGSLAND	30.5	Domestic use only	30.6	-	-	-
68	2315SEW113	252610	157430	CHARTERSCHOOLLAND	30.6	Industrial use	36	-	-	-
69	2315SEW112	252500	157380	CHARTERSCHOOLLAND	36	Agri & domestic use	23.8	Moderate	65.5	
70	2315SEW221	254462	156991	CELLARSTOWN UPPER	23.8	Agri use only	30.4	-	-	
71	2315SEW122	253500	156870	ARCHERSRATH	30.4	Public supply (Co Co)	-	-	-	
72	2315SEW123	253540	156840	ARCHERSRATH	NA	Agri & domestic use	6.4	-	-	
73	2315SEW128	253920	156800	CELLARSTOWN LOWER	6.4	Agri & domestic use	48.8	Poor	32.7	36.6
74	2315SEW119	253340	156747	ARCHERSRATH	48.8	Domestic use only	6.1	-	-	
75	2315SEW115	252885	156726	ARCHERSRATH	6.1	Agri & domestic use	36	Poor	27.3	
76	2315SEW124	253550	156650	LEGGETSRATH EAST	36	Agri & domestic use	12.2	Poor	-	
77	2315SEW223	254680	156500	HIGGINSTOWN	12.2	Agri & domestic use	25.9	-	-	
78	2315SEW224	254748	156472	HIGGINSTOWN	25.9	-	-	-	-	
79	2315SEW226	255080	156160	TEMPLEMARTIN	NA	Agri & domestic use	8.3	-	-	
80	2315SEW225	254820	156080	TEMPLEMARTIN	8.3	Agri & domestic use	16.5	Poor	10.9	
81	2315SEW254	255170	155440	TEMPLEMARTIN	16.5	Domestic use only	30.5	-	-	
82	2315SEW246	254450	155400	LYRATH	30.5	Domestic use only	22.9	Moderate	54.5	
83	2315SEW255	255030	154830	LAVISTOWN	22.9	Public supply (Co Co)	-	-	-	
84	2315SEW253	254820	154800	LAVISTOWN	NA	-	-	-	-	
85	2315SEW256	255720	154360	HIGHRATH	7.8	-	-	-	-	
86	2315SEW351	256010	154010	MADDOCKSTOWN	NA	-	-	-	-	
87	2315SEW258	256314	153795	MADDOCKSTOWN	21.3	-	-	-	-	

Table 8.14 GSI Well Data for Unit 6

In relation to the assessment of impacts for groundwater's *S.I. 9 of 2010, EC Environmental Objectives (Groundwater) Regulations 2010*, all groundwater bodies along the proposed line route have been designated 'Good'. The groundwater bodies along are route are as follows:

- Ballingarry
- Durrow A
- Kilkenny
- Clifden

8.3.7.2.2 Groundwater Flow Direction

In general terms it would be expected that the groundwater gradient would follow the topographic variation in an area. Flow paths and distance is dependent on the characteristics of the aquifer type. Most groundwater flow is confined to the upper 10m of weathered bedrock (if present) and gravel aquifers and will discharge to the nearest watercourse.

8.3.7.2.3 Water Usage

Water usage along the proposed line route is primarily supplied by either Kilkenny County Council from their surface water abstractions and supplemented by groundwater abstraction boreholes or private wells used by landowners individually or as part of a group water scheme. A search of the GSI well database shows there are a number of wells in the area with uses varying from domestic to agricultural use with. Refer to Table 8.14 for details.

8.3.7.2.4 Groundwater Vulnerability

Figures 8.24 and 8.25 show the level of vulnerability for the underlying aquifers along the proposed line route. Groundwater vulnerability was varied throughout the proposed line route but was largely classed as High (36.7% along the proposed line route) and Extreme (30.7%). The upland areas are largely classed as 'Extreme – Rock near Surface'. In the Ballyragget area it is predominately classed as 'High' and in the central section it is predominately classed as 'Extreme' with the vulnerability being 'High' in the vicinity of the Dinin River. The vulnerability is 'Moderate' North East of Kilkenny City to 'High' at the Kilkenny 110kV Substation. Table 8.15 shows the percentage (%) of typical length of the 110kv line and associated groundwater vulnerability.

Groundwater Vulnerability	No. of Polesets/ Towers	%
Extreme	32	30.7
Extreme Vulnerability with rock at Surface	16	15.3
High	38	36.7
Moderate	17	16.3
Low	1	1
TOTAL	**104**	**100**

Table 8.15 % Typical Angle Masts/Polesets and associated groundwater vulnerability

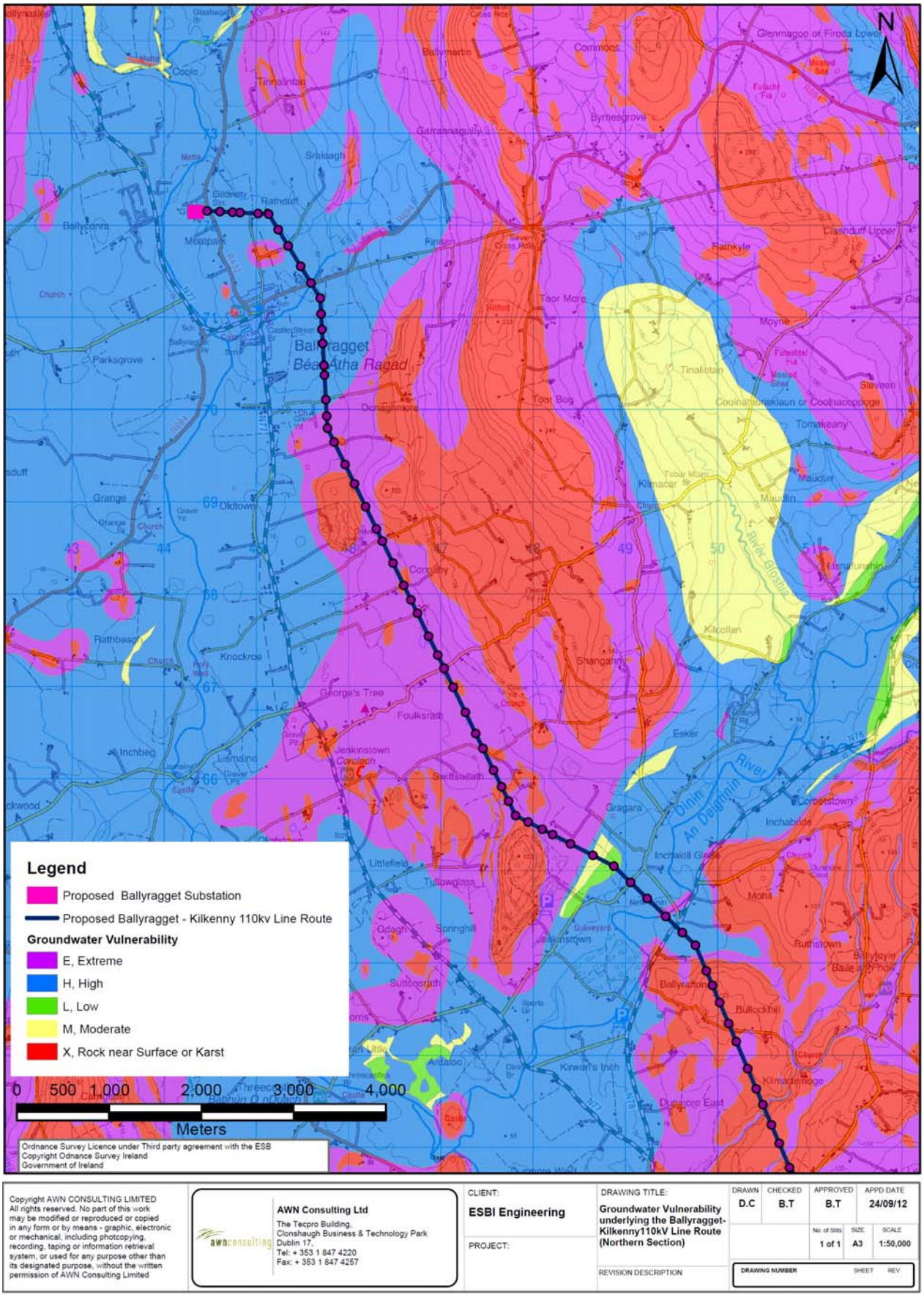
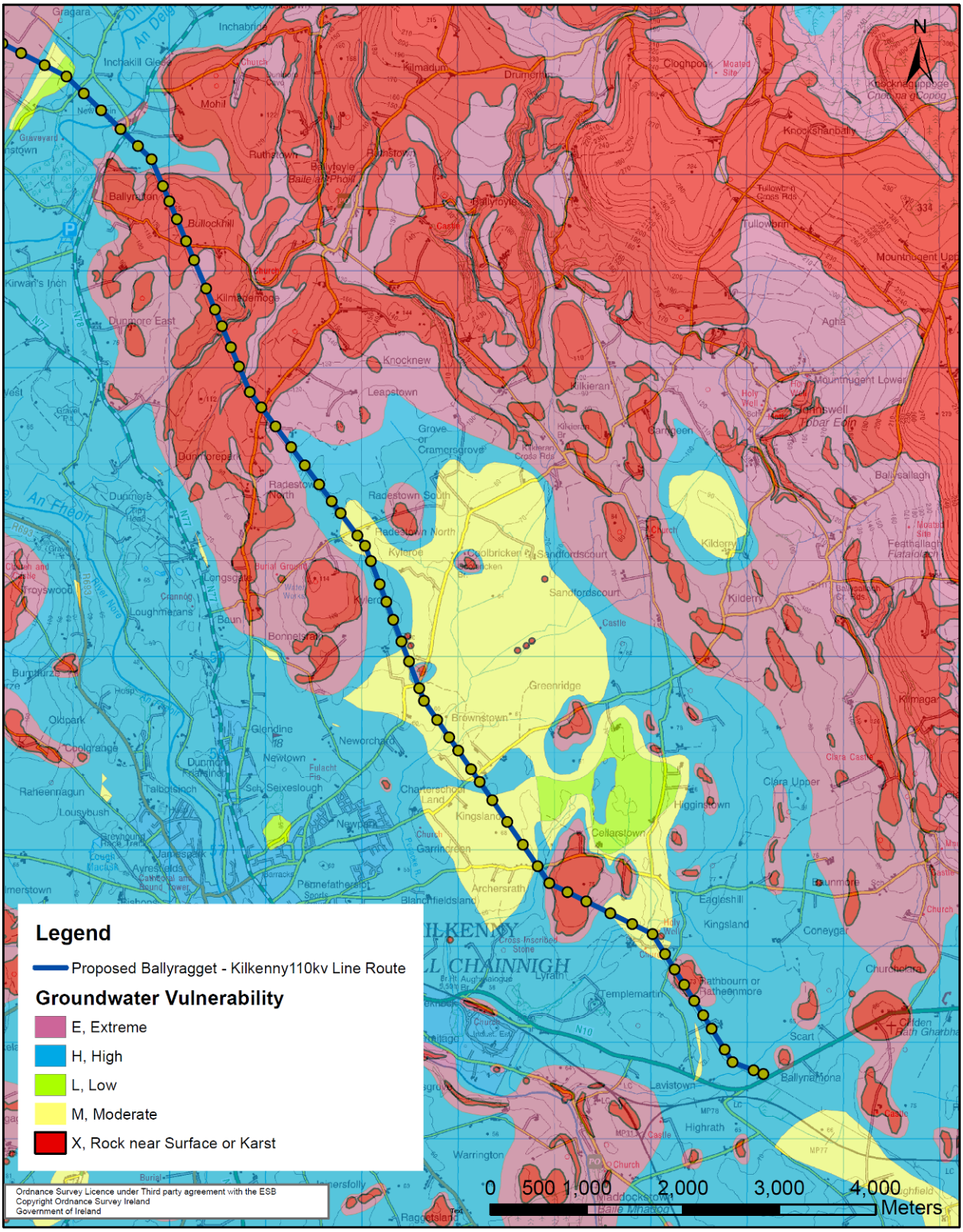


Figure 8.24 Groundwater Vulnerability underlying the Ballyragget – Kilkenny 110kV Line Route (Northern Section)



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DRAWING TITLE: Groundwater Vulnerability underlying the Ballyragget-Kilkenny 110kV line route (Southern Section)

REVISION DESCRIPTION

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D.C	B.T	B.T	24/09/12

No. of Shts	SIZE	SCALE
1 of 1	A4	1:50,000

DRAWING NUMBER SHEET REV

Figure 8.25 Groundwater Vulnerability underlying the Ballyragget – Kilkenny 110kV Line Route (Southern Section)

8.3.8 UNIT 7 'A NEW 110KV BAY IN THE EXISTING KILKENNY 110KV STATION'

8.3.8.1 Hydrology

8.3.8.1.1 Water Quality

The existing Kilkenny 110kV Substation is located within the Nore Main WMU and the River Nore catchment. No major surface water features or field drains were found at the substation location. An unnamed tributary of the River Nore is located 150m to the North of the proposed works at the substation. This stream flows East to West towards the River Nore. See Figure 8.19.

In accordance with the EQS or assessment of impacts for surface waters *S.I. 272 of 2009 (EC Environmental Objectives (Surface waters) Regulations 2009* the current status of the stream was reviewed however no monitoring takes places at this stream. The status of the River Nore at the location nearest to the substation (1.8km. to the West) is currently 'Moderate'.

8.3.8.1.2 Flooding

Information relating to potential flooding was obtained from ESBi.[17] The Kilkenny 110KV Substation is sited in the townland of Scart within approximately 150m of an unnamed tributary of the River Nore. The catchment upstream is approximately 9km² in area. The OPW Web site www.floodmaps.ie shows no records of a historic flood in the vicinity of the substation.

The draft CFRAM PFRA mapping indicates that the substation site lies outside both the Indicative 1% Annual Exceedance Probability (AEP) (100-yr) Event and Indicative Extreme Event zones. The magnitude of the Extreme Event is not defined on these preliminary PFRA maps but is likely to be generally representative of the 0.1% AEP (1,000-yr) event.

Anecdotal evidence from ESB Networks [16] confirmed that no known flood events have occurred at the Kilkenny substation.

8.3.8.2 Hydrogeology

8.3.8.2.1 Aquifer Classification

A Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones underlies the existing substation, see Figure 8.21. No gravel aquifers are present under the existing substation.

The GSI Well Card Index[5] shows a number of wells in the vicinity of the substation. Table 8.16 details the information in relation to each well. See Figure 7.22 for well locations.

The wells were installed into the underlying bedrock at depths in the range of 1.5m bgl at Lyrath to 25.9m bgl at Higginstown. The groundwater yield from these wells ranged from poor to good with recorded yields from as little as 10.9m^3/day in wells drilled to 16.5m bgl at Templemartin and 61.0m bgl up to 140m^3/day at Maddockstown. Groundwater yields are associated with fissures in the underlying bedrock.

No.	GSI Code	Easting	Northing	Townland	Depth (m)	Yield Class	Yield m^3d	DTB
108	2315SEW223	254680	156500	HIGGINSTOWN	12.2	Poor	-	12.2
109	2315SEW224	254740	156490	HIGGINSTOWN	25.9	-	-	25.9
110	2315SEW225	254820	156080	TEMPLEMARTIN	8.3	-	-	-
111	2315SEW226	255080	156160	TEMPLEMARTIN		-	-	-
112	2315SEW246	254450	155400	LYRATH	30.5	-	-	1.5
113	2315SEW254	255170	155440	TEMPLEMARTIN	16.5	Poor	10.9	12.8
114	2315SEW255	255030	154830	LAVISTOWN	22.9	Moderate	54.5	6.4
115	2315SEW256	255720	154360	HIGHRATH	7.8	-	-	-
116	2315SEW258	256330	153820	MADDOCKSTOWN	21.3	Poor	27.3	8.2
117	2315SEW351	256010	154010	MADDOCKSTOWN	-	Good	140	-

Table 8.16 GSI Well Data for Unit 7

In relation to the EQS or assessment of impacts for groundwater's *S.I. 9 of 2010, EC Environmental Objectives (Groundwater) Regulations 2010*, all groundwater bodies at the existing substation have been designated 'Good'.

8.3.8.2.2 Groundwater Flow Direction

In general terms it would be expected that the groundwater gradient would follow the topographic variation in an area. Flow paths and distance is dependent on the characteristics of the aquifer type. Most groundwater flow is confined to the upper 10m of weathered bedrock (if present) and sand and gravel aquifers and will discharge to the nearest watercourse i.e. the River Nore tributary located 150m. North of the proposed works.

The groundwater flow direction in the Sand and Gravel deposits is expected to be in the direction of the closest watercourse, i.e. to the North.

8.3.8.2.3 Water Usage

Water usage at the substation is primarily supplied by either Kilkenny County Council from their surface water abstractions and supplemented by groundwater abstraction boreholes or private wells used by landowners individually or as part of a group water scheme. A search of the GSI well database shows that the majority of wells in the area are associated with agricultural or domestic. The yield varies from Poor to Good. Refer to Table 8.16 for details.

8.3.8.2.4 Groundwater Vulnerability

Figures 8.25 show the level of vulnerability for the underlying aquifers. Groundwater vulnerability underlying the existing substation site is "High".

8.3.9 UNIT 8 'MODIFICATIONS TO EXISTING ATHY-PORTLAOISE 110KV LINE'

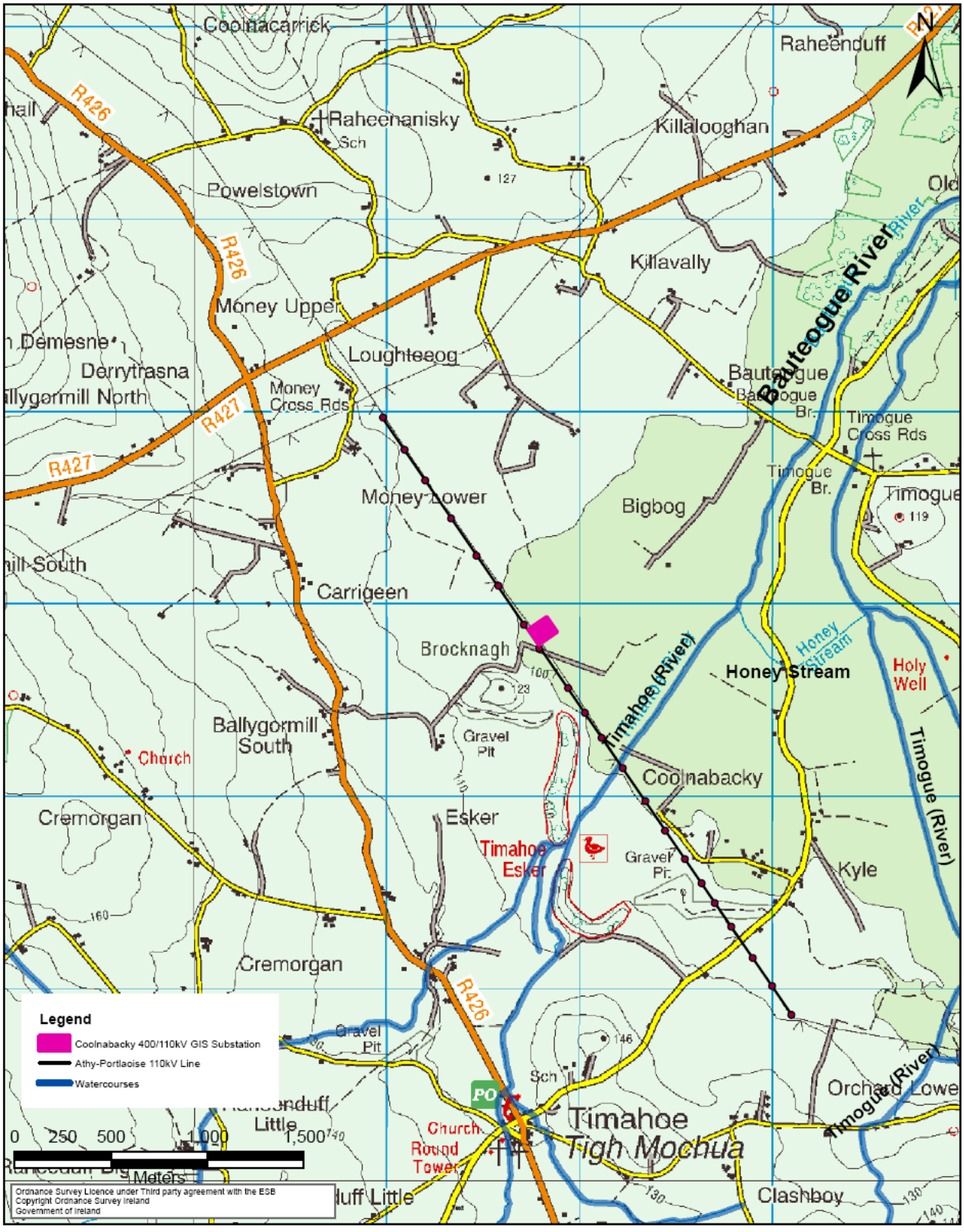
8.3.9.1 Hydrology

8.3.9.1.1 Water Quality

The proposed retrofit of earth wire to existing Athy - Portlaoise 110kV line is located within the SERBD. Surface water features within the vicinity of the proposed line route are shown in Figure 8.26. For the purpose of the assessment the following rivers were assessed as the proposed route is within the vicinity of the catchments of these rivers:

- Timahoe River
- Timogue River
- Bauteogue River

Any watercourses within the vicinity of the proposed line route are likely to be tributaries of one of these rivers. Table 8.5 shows the current status of the rivers monitored in the study area as part of the SERBD Management Plan.



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DRAWING TITLE: Watercourses underlying the Athy-Portlaoise 110kV line

REVISION DESCRIPTION

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1 of 1	A4	1:26,000

DRAWING NUMBER SHEET REV

Figure 8.26 Watercourses in the vicinity of the Athy-Portlaoise 110kV line

8.3.9.1.2 Flooding

The OPW Flood Hazard Database[8] 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. No flooding events have been recorded by the OPW along the proposed retrofit of earth wire to existing Athy - Portlaoise 110kV line.

8.3.9.2 Hydrogeology

8.3.9.2.1 Aquifer Classification

The GSI Online maps[5] were consulted in relation to the occurrence of bedrock and quaternary aquifers along the proposed retrofit of earth wire to existing Athy - Portlaoise 110kV line. Regionally Important Karstified (diffuse) bedrock aquifers underlie the proposed line route, see Figure 8.27. Locally Important sand and gravel aquifers underlie 45% of the proposed line route; these are found along the route until it reaches the proposed Coolnabacky substation, see Figure 8.28 for locations of sand and gravel aquifers.

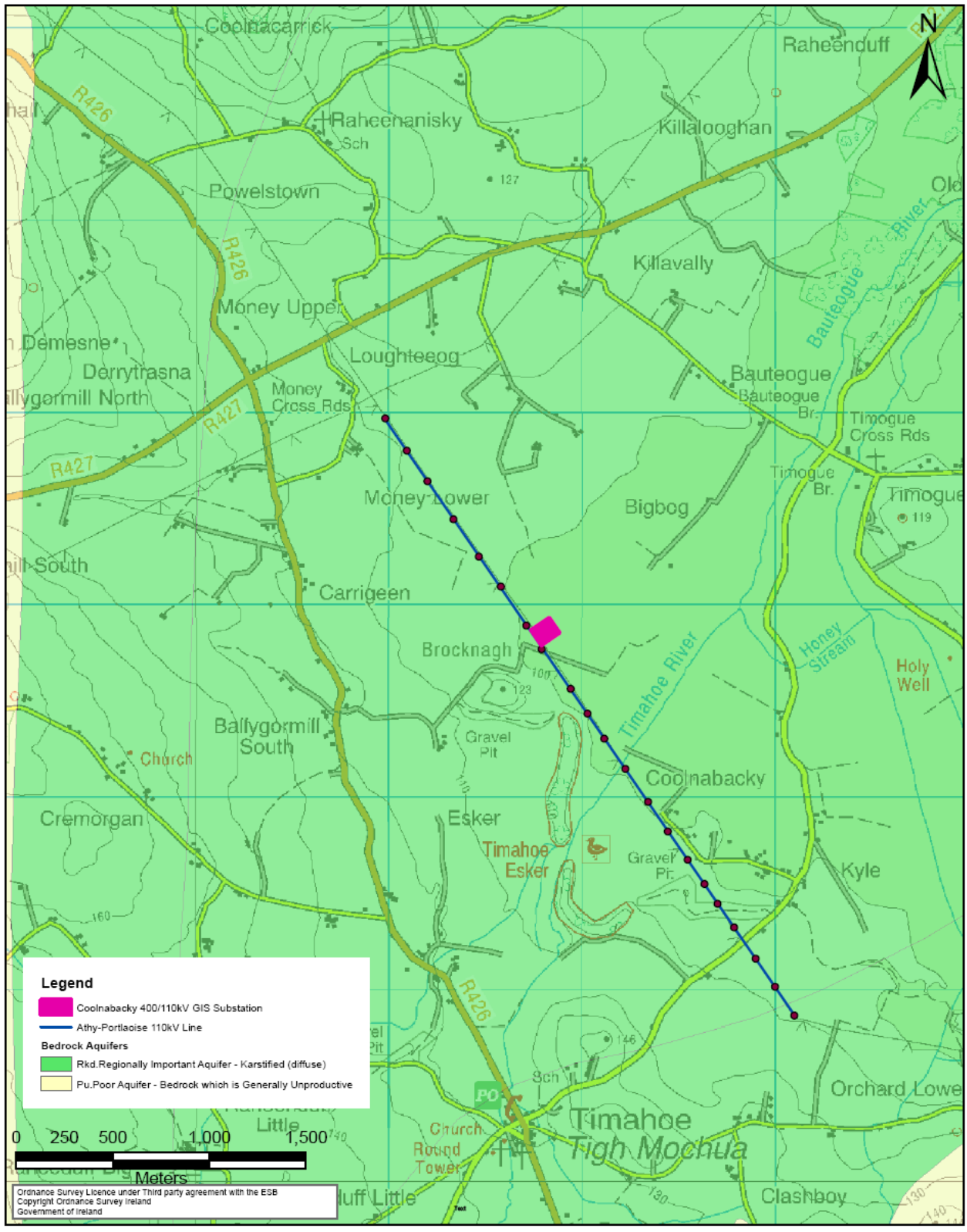
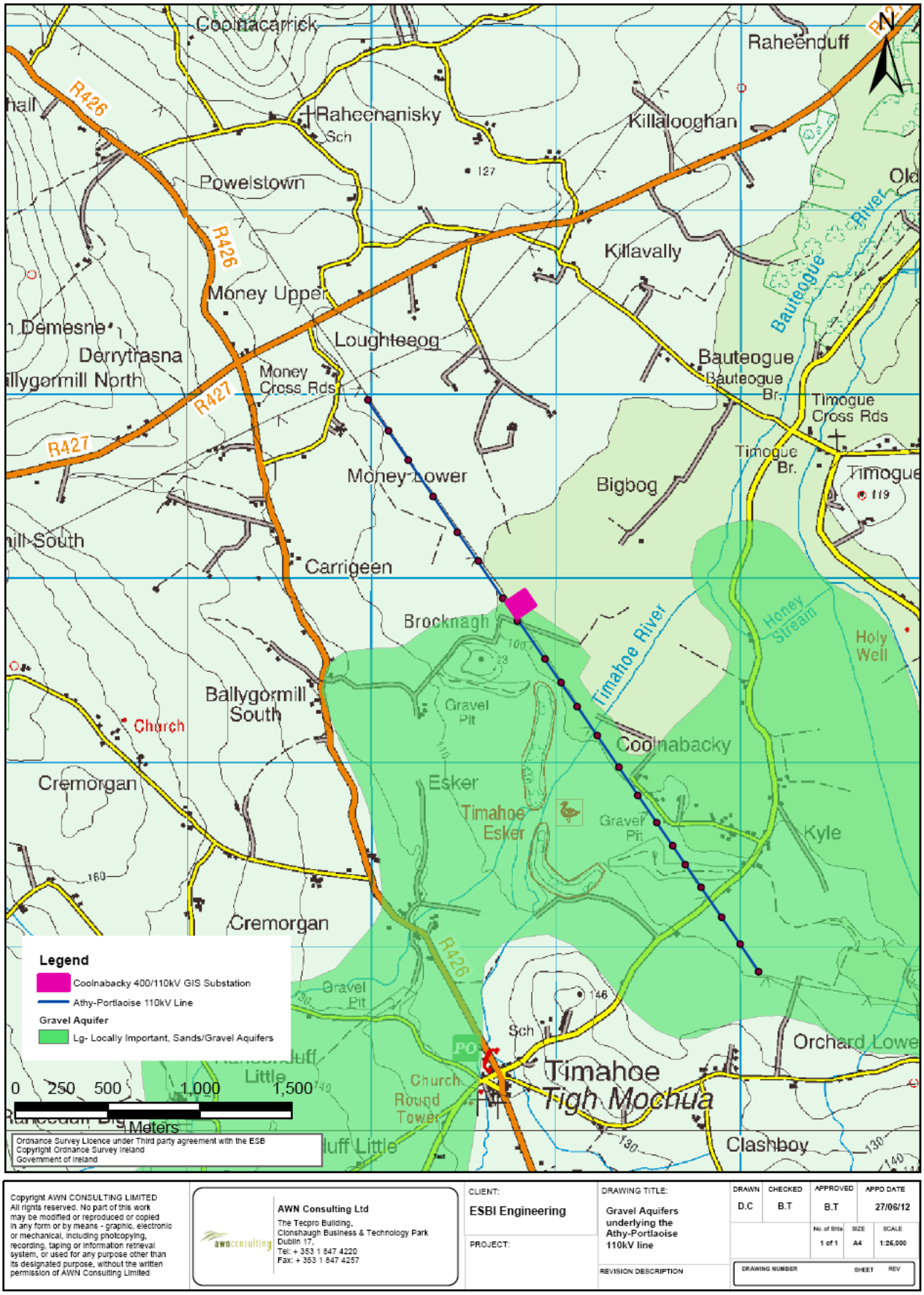


Figure 8.27 Bedrock Aquifers underlying the Athy-Portlaoise 110kV line



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CLIENT:	DRAWING TITLE:	DRAWN	CHECKED	APPROVED	APPD DATE
ESBI Engineering	Gravel Aquifers underlying the Athy-Portlaoise 110kV line	D.C	B.T	B.T	27/06/12
PROJECT:				No. of Shts: 1 of 1	SIZE: A4
REVISION DESCRIPTION					SCALE: 1:26,000
		DRAWING NUMBER		SHEET	REV

Figure 8.28 Gravel Aquifers underlying the Athy-Portlaoise 110kV line

The GSI Well Card Index[5] shows the occurrence of recorded wells within the vicinity of the proposed substation, information regarding the well use, yield class; yield and water strike is noted for a large number of the wells. Eight wells were located in the vicinity of the proposed line route however there is no information in relation to the depth to groundwater, the yield or the use of each well. See Figure 7.27 for well locations.

In relation to the assessment of impacts for groundwater's *S.I. 9 of 2010, EC Environmental Objectives (Groundwater) Regulations 2010*, all groundwater bodies along the proposed line route have been designated 'Good'.

8.3.9.2.2 Groundwater Flow Direction

In general terms it would be expected that the groundwater gradient would follow the topographic variation in an area. Flow paths and distance is dependent on the characteristics of the aquifer type. Most groundwater flow is confined to the upper 10m of weathered bedrock (if present) and gravel aquifers and will discharge to the nearest watercourse.

8.3.9.2.3 Water Usage

Water usage along the proposed line route is primarily supplied by either Laois County Council from their surface water abstractions and supplemented by groundwater abstraction boreholes or private wells used by landowners individually or as part of a group water scheme. A search of the GSI well database was undertaken. The GSI recorded 8 wells within the vicinity of the proposed line route however there is no information in relation to the depth to groundwater, the yield or the use of each well.

8.3.9.2.4 Groundwater Vulnerability

Aquifer vulnerability is varied along the proposed line route. Table 8.17 shows the % vulnerability. See Figure 8.29 for locations.

Groundwater Vulnerability	No. of Polesets/ Angle Masts	%
Extreme	2	6.5
Extreme Vulnerability with rock at Surface	2	6.5
High	25	80.5
Moderate	2	6.5
TOTAL	**31**	**100**

Table 8.17 % Typical Angle Masts/Polesets and associated groundwater vulnerability

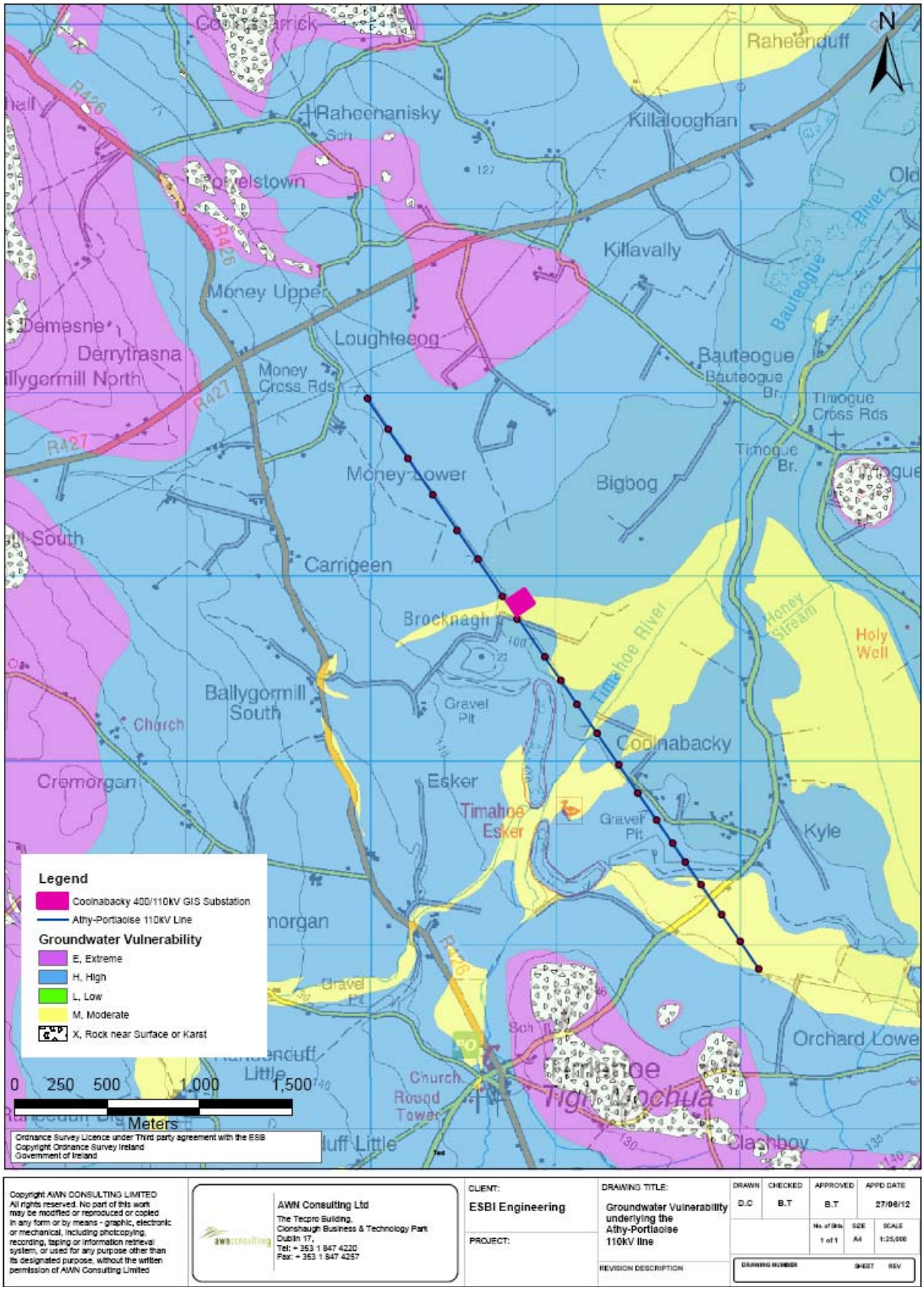

Figure 8.29 Groundwater Vulnerability underlying the Athy-Portlaoise 110kV line

8.4 POTENTIAL IMPACT

The potential impacts of the construction and operational phases of the proposed Reinforcement Project on the water environment are outlined in the following sections. The potential impacts will be common to both hydrology and hydrogeology.

8.4.1 UNIT 1 'NEW 400/110KV GIS SUBSTATION, 'COOLNABACKY' NEAR PORTLAOISE CO. LAOIS'

8.4.1.1 Construction Phase

The key civil engineering works at the proposed Coolnabacky 400/110kV Substation will involve the excavation of material for foundations to a depth of maximum 2.0m bgl and deliveries of imported engineering fill, crushed stone, concrete, reinforcement and other construction materials. An access road will also be upgraded from the R426 Secondary Road to the substation site. Other construction activities will include site storage of cement and concrete materials, oils and fuels. Existing access tracks will be utilised. The potential impacts in relation to water have been assessed under the following headings:

- Increased runoff and sediment loading
- Contamination of local water courses and groundwater
- Flood Risk
- Dewatering
- Localised alteration of groundwater flow, rate and direction

Increased Runoff and Sediment Loading

Surface water runoff during the construction phase may contain increased silt levels or become polluted from construction activities. Runoff containing large amounts of silt can cause damage to surface water systems and receiving watercourses. Silt water can arise from dewatering excavations, exposed ground, stockpiles and access roads.

During the construction phase there is potential for a slight increased runoff due to the introduction of impermeable surfaces and the compaction of soils. This will reduce the infiltration capacity and increase the rate and volume of direct surface runoff. The potential impact of this is a slight increase in confined flow rates, leading to increases in surface water runoff and sediment loading which could potentially impact local drainage patterns and/or cause siltation of the existing surrounding watercourses.

In relation to increased runoff and sediment loading the potential impact is considered to be ***Medium term - Moderate.***

Contamination of local water courses and groundwater

During the construction phase, there is a risk of accidental pollution incidences from the following sources:

- Spillage or leakage of oils and fuels stored on site.
- Spillage or leakage of oils and fuels from construction machinery or site vehicles.
- Spillage of oil or fuel from refuelling machinery on site.
- The use of concrete and cement

Machinery on site during the construction phase may result in contamination of the surface water. The potential impacts could derive from accidental spillage of fuels, oils, paints and solvents, which could impact surface water and groundwater quality if allowed to infiltrate to runoff to surface water systems and/or receiving watercourses.

Concrete operations carried out near surface water bodies during construction activities could lead to a discharge of wastewaters to a watercourse. Concrete (specifically, the cement component) is highly alkaline and any spillage to a local watercourse would be detrimental to water quality and local fauna and flora.

Wastewater discharges from sanitary facilities provided have the potential to contaminate surface water if they were accidentally discharged to the water courses.

In relation to the contamination of local watercourses and groundwater the potential impact is considered to be ***Medium term – Significant*** for all works located within sand/gravel aquifers. The potential impact is considered ***Medium term – Moderate*** for at all other locations.

Flood Risk

Construction of the proposed substation will lead to hard standing surfaces and therefore increase the surface water runoff from the site.

There is a potential localised impact on flow regimes in existing watercourses and this could lead to flooding of adjacent lands.

In relation to flood risk the potential impact is considered to be ***Short term - Slight.***

Dewatering

If excavations encounter groundwater, it may need to be pumped, resulting in localised short-term drawdown of the water table.

The excavations will extend through the sand and gravel deposits into the underlying clay deposits. However, the Site Investiagtion[10] and hydrogeological report[15] indicates that the sand and gravel deposits are not saturated. Therefore, groundwater inflow from the sand and gravel deposits and thus dewatering is expected to be limited. Due to the presence of low permeability clay at the base of the excavations, any groundwater in the more permeable sand and gravel deposits can be isolated during dewatering if necessary.

Other impacts from the proposed construction works include the increase in groundwater vulnerability arising from the removal of subsoil cover, the increase in flow to surface water systems from dewatering discharges and change of groundwater quality. Water, which may have accumulated during dewatering activities, could contain substances such as oil, silt and dissolved chemicals.

In relation to dewatering the potential impact is considered to be ***Short term - Slight.***

Localised alteration of groundwater flow, rate and direction

The construction of proposed substation will temporarily change the groundwater regime should excavations extend below the water table and should pumping be required to enable the pouring of concrete. Based on the findings of the Site Investigation[10] minimal dewatering is expected.

In relation to localised alteration of groundwater flow, rate and direction the potential impact is considered to be ***Short term - Slight.***

8.4.1.2 Operational Phase

During the operational phase there will be some sewage effluent arising from sanitary facilities on site. This can give rise to water pollution if not adequately treated using appropriate technology suitable for the site.

There is potential for leakage from the transformers on site, which could cause localised contamination if it enters the water environment.

Due to the nature of the development, there will be machinery periodically on the site at a given time. This may lead to occasional accidental emissions, in the form of oil, petrol or diesel leaks, which could cause contamination of groundwater if they enter the underlying soils or landscaped areas within the substation compound.

In relation to the operational phase the potential impact on the water is considered to be ***Long term – Moderate.***

8.4.2 UNIT 2 'NEW 400KV LINE CONNECTION TO COOLNABACKY FROM THE EXISTING MONEYPOINT-DUNSTOWN 400KV LINE'

8.4.2.1 Construction Phase

The key civil engineering works at the proposed connection to Coolnabacky from the existing Moneypoint-Dunstown 400kV line will involve the excavation of material for the foundations of the angle masts and deliveries of imported engineering fill, crushed stone, concrete, reinforcement and other construction materials.

Other construction activities will include machinery movement, traversing of watercourses, dewatering of excavations, some tree felling site storage of cement and concrete materials and hydrocarbons and construction of access tracks, if required. The potential impacts in relation to water have been assessed under the following headings:

- Increased runoff and sediment loading
- Contamination of local water courses and groundwater
- Diversion/Erosion of local watercourses
- Flood Risk
- Localised alteration of groundwater flow, rate and direction

Increased Runoff and Sediment Loading

Surface water runoff during the construction phase may contain increased silt levels or become polluted from construction activities. Runoff containing large amounts of silt can cause damage to surface water systems and receiving watercourses. Silt water can arise from dewatering excavations, exposed ground, stockpiles and site roads.
During the construction phase there is potential for a slight increased runoff due to the introduction of impermeable surfaces such as temporary access routes, and the compaction of soils. This will reduce the infiltration capacity and increase the rate and volume of direct surface runoff. The potential impact of this is a slight increase in confined flow rates, leading to increases in surface water runoff and sediment loading which could potentially impact local drainage patterns and/or cause siltation of the existing surrounding watercourses.

In relation to increased runoff and sediment loading the potential impact is considered to be ***Medium term - Moderate.***

Contamination of local water courses and groundwater

During the construction phase, there is a risk of accidental pollution incidences from the following sources:

- Spillage or leakage of oils and fuels stored on site.
- Spillage or leakage of oils and fuels from construction machinery or site vehicles.
- Spillage of oil or fuel from refuelling machinery on site.
- The use of concrete and cement

Concrete operations carried out near surface water bodies during construction activities could lead to a discharge of wastewaters to a watercourse. Concrete (specifically, the cement component) is highly alkaline and any spillage to a local watercourse would be detrimental to water quality and local fauna and flora.

Machinery on site during the construction phase may result in contamination of the surface water. The potential impacts could derive from accidental spillage of fuels and oils which could impact surface water and groundwater quality if allowed to infiltrate to runoff to surface water systems and/or receiving watercourses.

Wastewater discharges from sanitary facilities provided have the potential to contaminate surface water if they were accidentally discharged to the water courses.

If excavations encounter groundwater, it may need to be pumped, resulting in localised drawdown of the water table.

Other impacts from the proposed construction works include the increase in groundwater vulnerability arising from the removal of subsoil cover, the increase in flow to surface water systems from dewatering discharges and change of groundwater quality. Water, which may have accumulated during dewatering activities, could contain substances such as oil, silt and dissolved chemicals.

In relation to the contamination of local watercourses and groundwater the potential impact is considered to be ***Medium term - Moderate.***

Diversion/Erosion of local watercourses

The diversion of ditches/watercourses may have the following impacts:

- Improperly designed or installed temporary and permanent watercourse crossing structures can result in insufficient water depth in culverts or culverts with perched inlets, outfalls and excessive slope.
- Physical alteration of stream channels resulting in altered hydraulic characteristics and/or changes in stream profile, particularly in width, depth, gradient and current speed.
- Erosion of a watercourse and/or floodplain being initiated or accelerated due to constriction in a watercourse increasing flow velocity.

In relation to the diversion/erosion of local watercourses the potential impact is considered to be ***Short term - Moderate.***

Flood Risk

The diversion of ditches/watercourses will be required during the construction phase for the access roads and machinery. There is a potential impact on flow regimes in existing watercourses and this could lead to flooding of adjacent lands. Increased flood levels upstream can occur due to the creation of blockages in watercourses from drainage ditches.

In relation to flood risk the potential impact is considered to be ***Short term - Slight.***

Localised alteration of groundwater flow, rate and direction

The construction of proposed angle masts will temporarily change the groundwater regime should excavations extend below the water table and should dewatering be required to enable the pouring of concrete.

In relation to localised alteration of groundwater flow, rate and direction the potential impact is considered to be ***Short term - Slight.***

8.4.2.2 Operational Phase

There will be no direct discharges to the water environment during the operational phase.

Due to the nature of the development, there will be machinery periodically on the site at a given time. This may lead to occasional accidental emissions, in the form of oil of fuel leaks, which could cause contamination if they enter the water environment.

The angle masts use concrete for foundations; these have a potential impact on the water environment.

In relation to the operational phase the potential impact on the water is considered to be ***Long term – Moderate.***

8.4.3 UNIT 3 'NEW CONNECTION TO COOLNABACKY FROM THE EXISTING ATHY-PORTLAOISE 110KV LINE'

8.4.3.1 Construction Phase

The key civil engineering works at the proposed cable connection to Coolnabacky from the existing Athy-Portlaoise 110kV line will involve the excavation of material for the underground cable and the foundations of the cable interface masts and deliveries of imported engineering fill, crushed stone, concrete, reinforcement and other construction materials. Other construction activities will include site storage of cement and concrete materials and hydrocarbons.

The potential impacts in relation to water have been assessed under the following headings:

- Increased runoff and sediment loading
- Contamination of local water courses and groundwater
- Flood Risk
- Localised alteration of groundwater flow, rate and direction

Increased Runoff and Sediment Loading

Surface water runoff during the construction phase may contain increased silt levels or become polluted from construction activities. Runoff containing large amounts of silt can cause damage to surface water systems and receiving watercourses. Silt water can arise from dewatering excavations, exposed ground, stockpiles and site roads.

During the construction phase there is potential for a slight increased runoff due to the introduction of impermeable surfaces, such as access roads and the compaction of soils. This will reduce the infiltration capacity and increase the rate and volume of direct surface runoff. The potential impact of this is a slight increase in confined flow rates, leading to increases in surface water runoff and sediment loading which could potentially impact local drainage patterns and/or cause siltation of the existing surrounding watercourses.

In relation to increased runoff and sediment loading the potential impact is considered to be ***Medium term - Moderate.***

Contamination of local water courses and groundwater

During the construction phase, there is a risk of accidental pollution incidences from the following sources:

- Spillage or leakage of oils and fuels stored on site.
- Spillage or leakage of oils and fuels from construction machinery or site vehicles.
- Spillage of oil or fuel from refuelling machinery on site.
- The use of concrete and cement

Concrete operations carried out near surface water bodies during construction activities could lead to a discharge of wastewaters to a watercourse. Concrete (specifically, the cement component) is highly alkaline and any spillage to a local watercourse would be detrimental to water quality and local fauna and flora.

Machinery on site during the construction phase may result in contamination of the surface water. The potential impacts could derive from accidental spillage of fuels, oils, paints and solvents, which could impact surface water and groundwater quality if allowed to infiltrate to runoff to surface water systems and/or receiving watercourses.

Wastewater discharges from sanitary facilities, if provided, have the potential to contaminate surface water if they were accidentally discharged to the water courses.

If excavations encounter groundwater, it may need to be pumped, resulting in localised drawdown of the water table. However, the Site Investiagtion[10] and hydrogeological report[15] indicate that minimal dewatering is required.

Other impacts from the proposed construction works include the increase in groundwater vulnerability arising from the removal of subsoil cover, the increase in flow to surface water systems from dewatering discharges and change of groundwater quality. Water may have accumulated during dewatering activities (if carried out) may contain substances such as oil, silt and dissolved chemicals.
In relation to the contamination of local watercourses and groundwater the potential impact is considered to be ***Medium term – Significant*** for all works located within sand/gravel aquifers. The potential impact is considered ***Medium term – Moderate*** for at all other locations.

Flood Risk

There is a potential impact on flow regimes in existing watercourses and this could lead to flooding of adjacent lands. Increased flood levels upstream can occur due to the creation of blockages in watercourses from drainage ditches.

In relation to flood risk the potential impact is considered to be ***Short term - Slight.***

Localised alteration of groundwater flow, rate and direction

The construction of proposed cable interface masts will temporarily change the groundwater regime should excavations extend below the water table and should pumping be required to enable the pouring of concrete. Based on the Site Investiagtion[10] and hydrogeological report[15] minimal dewatering is required.

In relation to localised alteration of groundwater flow, rate and direction the potential impact is considered to be ***Short term - Slight.***

8.4.3.2 Operational Phase

There will be no direct discharges to the water environment during the operational phase.

Due to the nature of the development, there will be machinery periodically on the site at a given time. This may lead to occasional accidental emissions, in the form of oil, petrol or diesel leaks, which could cause contamination if they enter the water environment.

The cable interface masts use concrete for foundations; these have a potential impact on the water environment.

In relation to the operational phase the potential impact on the water is considered to be ***Long term – Moderate.***

8.4.4 UNIT 4 'A NEW 110KV / 38KV / MV SUBSTATION IN BALLYRAGGET, CO. KILKENNY ADJACENT TO AND REPLACING THE EXISTING 38KV / MV SUBSTATION WHICH WILL BE DECOMMISSIONED'

8.4.4.1 Construction Phase

The key civil engineering works at the proposed 110kV / 38kV / MV substation in Ballyragget, Kilkenny will involve the excavation of material for foundations to a depth of maximum 2.0m bgl and deliveries of imported engineering fill, crushed stone, concrete, reinforcement and other construction materials. Other construction activities will include site storage of cement and concrete materials and hydrocarbons and the decommissioning of the existing substation. The potential impacts in relation to water have been assessed under the following headings:

- Increased runoff and sediment loading
- Contamination of local water courses and groundwater
- Flood Risk
- Localised alteration of groundwater flow, rate and direction

Increased Runoff and Sediment Loading

Surface water runoff during the construction phase may contain increased silt levels or become polluted from construction activities. Runoff containing large amounts of silt can cause damage to surface water systems and receiving watercourses. Silt water can arise from dewatering excavations, exposed ground, stockpiles and site roads.

During the construction phase there is potential for a slight increased runoff due to the introduction of impermeable surfaces and the compaction of soils. This will reduce the infiltration capacity and increase the rate and volume of direct surface runoff. The potential impact of this is a slight increase in confined flow rates, leading to increases in surface water runoff and sediment loading which could potentially impact local drainage patterns and/or cause siltation of the existing surrounding watercourses.

In relation to increased runoff and sediment loading the potential impact is considered to be ***Medium term - Moderate.***

Contamination of local water courses and groundwater

During the construction phase, there is a risk of accidental pollution incidences from the following sources:

- Spillage or leakage of oils and fuels stored on site.
- Spillage or leakage of oils and fuels from construction machinery or site vehicles.
- Spillage of oil or fuel from refuelling machinery on site.
- The use of concrete and cement

Concrete operations carried out near surface water bodies during construction activities could lead to a discharge of wastewaters to a watercourse. Concrete (specifically, the cement component) is highly alkaline and any spillage to a local watercourse would be detrimental to water quality and local fauna and flora.

Machinery on site during the construction phase may result in contamination of the surface water. The potential impacts could derive from accidental spillage of fuels, oils, paints and solvents, which could impact surface water and groundwater quality if allowed to infiltrate to runoff to surface water systems and/or receiving watercourses.

Wastewater discharges from sanitary facilities have the potential to contaminate surface water if they were accidentally discharged to the water courses.

Other impacts from the proposed construction works include the increase in groundwater vulnerability arising from the removal of subsoil cover, the increase in flow to surface water systems from dewatering discharges and change of groundwater quality. Water may have accumulated during dewatering activities (if carried out) may contain substances such as oil, silt and dissolved chemicals.

If excavations encounter groundwater, it may need to be pumped, resulting in localised drawdown of the water table. Based on the findings of the Site Investigation[10] no dewatering is required.

In relation to the contamination of local watercourses and groundwater the potential impact is considered to be ***Medium term – Significant*** for all works located within sand/gravel aquifers. The potential impact is considered ***Medium term – Moderate*** for at all other locations.

Flood Risk

Construction of the proposed substation will lead to hard standing surfaces and therefore increase the surface water runoff from the site.
In relation to flood risk the potential impact is considered to be ***Short term - Slight.***

Localised alteration of groundwater flow, rate and direction

The construction of proposed substation will temporarily change the groundwater regime should excavations extend below the water table and should pumping be required to enable the pouring of concrete. Based on the findings of the Site Investigation[10] no dewatering is expected.

In relation to localised alteration of groundwater flow, rate and direction the potential impact is considered to be ***Short term - Slight.***

8.4.4.2 Operational Phase

During the operational phase there will be some sewage effluent arising from sanitary facilities on site. This can give rise to water pollution if not adequately treated using appropriate technology suitable for the site.

There is potential for leakage from the transformers on site, which could cause localised contamination if it enters the water environment.

Due to the nature of the development, there will be machinery periodically on the site at a given time. This may lead to occasional accidental emissions, in the form of oil, petrol or diesel leaks, which could cause contamination of groundwater if they enter the underlying soils or landscaped areas within the substation compound.

In relation to the operational phase the potential impact on the water is considered to be ***Long term – Moderate.***

8.4.5 UNIT 5 'A NEW 110KV OVERHEAD LINE BETWEEN BALLYRAGGET AND COOLNABACKY'

8.4.5.1 Construction Phase

The key civil engineering works at the proposed 110kV line from Ballyraggett to Coolnabacky will involve the excavation of material for the foundations of the angle masts and polesets and deliveries of imported engineering fill, crushed stone, concrete, reinforcement and other construction materials.

Other construction activities will include machinery movement, traversing of watercourses, dewatering of excavations, some tree felling site storage of cement and concrete materials and hydrocarbons and construction of access tracks, if required. The potential impacts in relation to water have been assessed under the following headings:

- Increased runoff and sediment loading
- Contamination of local water courses and groundwater
- Diversion/Erosion of local watercourses
- Flood Risk
- Localised alteration of groundwater flow, rate and direction

Increased Runoff and Sediment Loading

Surface water runoff during the construction phase may contain increased silt levels or become polluted from construction activities. Runoff containing large amounts of silt can cause damage to surface water systems and receiving watercourses. Silt water can arise from dewatering excavations, exposed ground, stockpiles and site roads.

During the construction phase there is potential for a slight increased runoff due to the introduction of impermeable surfaces and the compaction of soils. This will reduce the infiltration capacity and increase the rate and volume of direct surface runoff. The potential impact of this is a slight increase in confined flow rates, leading to increases in surface water runoff and sediment loading which could potentially impact local drainage patterns and/or cause siltation of the existing surrounding watercourses.

In relation to increased runoff and sediment loading the potential impact is considered to be ***Medium term - Moderate.***

Contamination of local water courses and groundwater

During the construction phase, there is a risk of accidental pollution incidences from the following sources:

- Spillage or leakage of oils and fuels stored on site.
- Spillage or leakage of oils and fuels from construction machinery or site vehicles.
- Spillage of oil or fuel from refuelling machinery on site.
- The use of concrete and cement for angle mast foundation.
- The leaching of creosote used as a timber preservative for the polesets

Concrete operations carried out near surface water bodies during construction activities could lead to a discharge of wastewaters to a watercourse. Concrete (specifically, the cement component) is highly alkaline and any spillage to a local watercourse would be detrimental to water quality and local fauna and flora.

Machinery on site during the construction phase may result in contamination of the surface water. The potential impacts could derive from accidental spillage of fuels, oils, paints and solvents, which could impact surface water and groundwater quality if allowed to infiltrate to runoff to surface water systems and/or receiving watercourses.

Wastewater discharges from sanitary facilities provided have the potential to contaminate surface water if they were accidentally discharged to the water courses.

Other impacts from the proposed construction works include the increase in groundwater vulnerability arising from the removal of subsoil cover, the increase in flow to surface water systems from dewatering discharges and change of groundwater quality. Water may have accumulated during dewatering activities (if carried out) may contain substances such as oil, silt and dissolved chemicals.

In relation to the contamination of local watercourses and groundwater the potential impact is considered to be ***Medium term – Significant*** for all works located within sand/gravel aquifers. The potential impact is considered ***Medium term – Moderate*** for at all other locations.

Diversion/Erosion of local watercourses

The diversion of ditches/watercourses may have the following impacts:

- Improperly designed or installed temporary and permanent watercourse crossing structures can result in insufficient water depth in culverts or culverts with perched inlets, outfalls and excessive slope.
- Physical alteration of stream channels resulting in altered hydraulic characteristics and/or changes in stream profile, particularly in width, depth, gradient and current speed.
- Erosion of a watercourse and/or floodplain being initiated or accelerated due to constriction in a watercourse increasing flow velocity.
- Deposition of material in the watercourse or on the floodplain due to a change in flow velocity

In relation to the diversion/erosion of local watercourses the potential impact is considered to be ***Short term - Moderate.***

Flood Risk

The diversion of ditches/watercourses will be required during the construction phase for the access tracks and machinery. There is a potential impact on flow regimes in existing watercourses and this could lead to flooding of adjacent lands. Increased flood levels upstream can occur due to the creation of blockages in watercourses from drainage ditches.

In relation to flood risk the potential impact is considered to be ***Short term - Slight.***

Localised alteration of groundwater flow, rate and direction

Should the angle mast bases extend to below the unsaturated zone into the groundwater, the presence of the bases would have the potential to affect local shallow flows, potentially leading to barriers or the creation of preferential pathways. If excavations for the angle mast bases and polesets encounter groundwater, dewatering may be required during construction, resulting in a slight localised drawdown of the water table.

There is the potential for the release of sediments into watercourses as a consequence of dewatering of excavations for typical angle mast/poleset foundations.

Construction works adjacent to watercourses have the potential to impact on groundwater flow towards the water course. The magnitude of this impact in the absence of mitigation is assessed as low due to the short-term duration of the works as well as the shallow depth of works.

In relation to localised alteration of groundwater flow, rate and direction the potential impact is considered to be ***Short term - Slight.***

8.4.5.2 Operational Phase

There will be no direct discharges to the water environment during the operational phase.

Due to the nature of the development, there will be machinery periodically on the site at a given time. This may lead to occasional accidental emissions, in the form of oil, petrol or diesel leaks, which could cause contamination if they enter the water environment.

The polesets and angle masts use products that have a potential impact on the water environment. The timber used in the polesets is treated with creosote as a preservative. Angle masts use concrete for foundations.

In relation to the operational phase the potential impact on the water is considered to be ***Long term – Moderate.***

8.4.6 UNIT 6 'AN UPRATE TO THE EXISTING BALLYRAGGET-KILKENNY 110KV OVERHEAD LINE'

8.4.6.1 Construction Phase

The key civil engineering works at the proposed uprate of the existing Ballyragget-Kilkenny 110kV overhead line will involve the excavation of material for the foundations of the angle masts and polesets and deliveries of imported engineering fill, crushed stone, concrete, reinforcement and other construction materials.

Other construction activities will include machinery movement, traversing of watercourses, dewatering of excavations, some tree felling site storage of cement and concrete materials and hydrocarbons and construction of access tracks, if required. The potential impacts in relation to water have been assessed under the following headings:

- Increased runoff and sediment loading
- Contamination of local water courses and groundwater
- Diversion/Erosion of local watercourses
- Flood Risk
- Localised alteration of groundwater flow, rate and direction

Increased Runoff and Sediment Loading

Surface water runoff during the construction phase may contain increased silt levels or become polluted from construction activities. Runoff containing large amounts of silt can cause damage to surface water systems and receiving watercourses. Silt water can arise from dewatering excavations, exposed ground, stockpiles and site roads.

During the construction phase there is potential for a slight increased runoff due to the introduction of impermeable surfaces and the compaction of soils. This will reduce the infiltration capacity and increase the rate and volume of direct surface runoff. The potential impact of this is a slight increase in confined flow rates, leading to increases in surface water runoff and sediment loading which could potentially impact local drainage patterns and/or cause siltation of the existing surrounding watercourses.

In relation to increased runoff and sediment loading the potential impact is considered to be ***Medium term - Moderate.***

Contamination of local water courses and groundwater

During the construction phase, there is a risk of accidental pollution incidences from the following sources:

- Spillage or leakage of oils and fuels stored on site.
- Spillage or leakage of oils and fuels from construction machinery or site vehicles.
- Spillage of oil or fuel from refuelling machinery on site.
- The use of concrete and cement for angle mast foundation.
- The leaching of creosote used as a timber preservative for the polesets

Concrete operations carried out near surface water bodies during construction activities could lead to a discharge of wastewaters to a watercourse. Concrete (specifically, the cement component) is highly alkaline and any spillage to a local watercourse would be detrimental to water quality and local fauna and flora.

Machinery on site during the construction phase may result in contamination of the surface water. The potential impacts could derive from accidental spillage of fuels, oils, paints and solvents, which could impact surface water and groundwater quality if allowed to infiltrate to runoff to surface water systems and/or receiving watercourses.

Wastewater discharges from sanitary facilities provided have the potential to contaminate surface water if they were accidentally discharged to the water courses.

Other impacts from the proposed construction works include the increase in groundwater vulnerability arising from the removal of subsoil cover, the increase in flow to surface water systems from dewatering discharges and change of groundwater quality. Water may have accumulated during dewatering activities (if carried out) may contain substances such as oil, silt and dissolved chemicals.

In relation to the contamination of local watercourses and groundwater the potential impact is considered to be ***Medium term – Significant*** for all works located within sand/gravel aquifers. The potential impact is considered ***Medium term – Moderate*** for at all other locations.

Diversion/Erosion of local watercourses

The diversion of ditches/watercourses may have the following impacts:

- Improperly designed or installed temporary and permanent watercourse crossing structures can result in insufficient water depth in culverts or culverts with perched inlets, outfalls and excessive slope.
- Physical alteration of stream channels resulting in altered hydraulic characteristics and/or changes in stream profile, particularly in width, depth, gradient and current speed.
- Erosion of a watercourse and/or floodplain being initiated or accelerated due to constriction in a watercourse increasing flow velocity.
- Deposition of material in the watercourse or on the floodplain due to a change in flow velocity

In relation to the diversion/erosion of local watercourses the potential impact is considered to be ***Short term - Moderate.***

Flood Risk

The diversion of ditches/watercourses will be required during the construction phase for the access tracks and machinery. There is a potential impact on flow regimes in existing watercourses and this could lead to flooding of adjacent lands. Increased flood levels upstream can occur due to the creation of blockages in watercourses from drainage ditches.
In relation to flood risk the potential impact is considered to be ***Short term - Slight.***

Localised alteration of groundwater flow, rate and direction

Should the angle mast bases extend to below the unsaturated zone into the groundwater, the presence of the bases would have the potential to affect local shallow flows, potentially leading to barriers or the creation of preferential pathways. If excavations for the angle mast bases and polesets encounter groundwater, dewatering may be required during construction, resulting in a slight localised drawdown of the water table.

There is the potential for the release of sediments into watercourses as a consequence of dewatering of excavations for typical angle mast/poleset foundations.

Construction works adjacent to watercourses have the potential to impact on groundwater flow towards the water course. The magnitude of this impact in the absence of mitigation is assessed as low due to the short-term duration of the works as well as the shallow depth of works.

In relation to localised alteration of groundwater flow, rate and direction the potential impact is considered to be ***Short term - Slight.***

8.4.6.2 Operational Phase

There will be no direct discharges to the water environment during the operational phase.

Due to the nature of the development, there will be machinery periodically on the site at a given time. This may lead to occasional accidental emissions, in the form of oil, petrol or diesel leaks, which could cause contamination if they enter the water environment.

The polesets and angle masts use products that have a potential impact on the water environment. The timber used in the polesets is treated with creosote as a preservative. Angle masts use concrete for foundations.

In relation to the operational phase the potential impact on the water is considered to be ***Long term – Moderate.***

8.4.7 UNIT 7 'A NEW 110KV BAY IN THE EXISTING KILKENNY 110KV STATION'

8.4.7.1 Construction Phase

The key civil engineering works at the existing Kilkenny 110kV Substation will involve the excavation of material for foundations to a depth of maximum 2.0m bgl and deliveries of imported engineering fill, crushed stone, concrete, reinforcement and other construction materials. Other construction activities will include site storage of cement and concrete materials, oils and fuels. The potential impacts in relation to water have been assessed under the following headings:

- Increased runoff and sediment loading
- Contamination of local water courses and groundwater
- Flood Risk
- Dewatering
- Localised alteration of groundwater flow, rate and direction

Increased Runoff and Sediment Loading

Surface water runoff during the construction phase may contain increased silt levels or become polluted from construction activities. Runoff containing large amounts of silt can cause damage to surface water systems and receiving watercourses. Silt water can arise from dewatering excavations, exposed ground, stockpiles and access roads.

During the construction phase there is potential for a slight increased runoff due to the introduction of impermeable surfaces and the compaction of soils. This will reduce the infiltration capacity and increase the rate and volume of direct surface runoff. The potential impact of this is a slight increase in confined flow rates, leading to increases in surface water runoff and sediment loading which could potentially impact local drainage patterns and/or cause siltation of the existing surrounding watercourses.

In relation to increased runoff and sediment loading the potential impact is considered to be ***Medium term - Moderate.***

Contamination of local water courses and groundwater

During the construction phase, there is a risk of accidental pollution incidences from the following sources:

- Spillage or leakage of oils and fuels stored on site.
- Spillage or leakage of oils and fuels from construction machinery or site vehicles.
- Spillage of oil or fuel from refuelling machinery on site.
- The use of concrete and cement

Machinery on site during the construction phase may result in contamination of the surface water. The potential impacts could derive from accidental spillage of fuels, oils, paints and solvents, which could impact surface water and groundwater quality if allowed to infiltrate to runoff to surface water systems and/or receiving watercourses.

Concrete operations carried out near surface water bodies during construction activities could lead to a discharge of wastewaters to a watercourse. Concrete (specifically, the cement component) is highly alkaline and any spillage to a local watercourse would be detrimental to water quality and local fauna and flora.

Wastewater discharges from sanitary facilities provided have the potential to contaminate surface water if they were accidentally discharged to the water courses.

In relation to the contamination of local watercourses and groundwater the potential impact is considered to be ***Medium term - Moderate.***

Flood Risk

Construction at the existing Kilkenny substation will lead to hard standing surfaces and therefore increase the surface water runoff from the site.

The diversion of ditches/watercourses will be required during the construction phase for the access roads and machinery. There is a potential impact on flow regimes in existing watercourses and this could lead to flooding of adjacent lands. Increased flood levels upstream can occur due to the creation of blockages in watercourses from drainage ditches.

In relation to flood risk the potential impact is considered to be ***Short term - Slight.***

Dewatering

If excavations encounter groundwater, it may need to be pumped, resulting in localised drawdown of the water table.

Other impacts from the proposed construction works include the increase in groundwater vulnerability arising from the removal of subsoil cover, the increase in flow to surface water systems from dewatering discharges and change of groundwater quality. Water, which may have accumulated during dewatering activities, could contain substances such as oil, silt and dissolved chemicals.

In relation to dewatering the potential impact is considered to be ***Medium term - Slight.***

Localised alteration of groundwater flow, rate and direction

The construction at the existing Kilkenny substation will temporarily change the groundwater regime should excavations extend below the water table and should pumping be required to enable the pouring of concrete.

In relation to localised alteration of groundwater flow, rate and direction the potential impact is considered to be ***Short term - Slight.***

8.4.7.2 Operational Phase

During the operational phase there will be some sewage effluent arising from sanitary facilities on site. This can give rise to water pollution if not adequately treated using appropriate technology suitable for the site.

There is potential for leakage from the transformers on site, which could cause localised contamination if it enters the water environment.

Due to the nature of the development, there will be machinery periodically on the site at a given time. This may lead to occasional accidental emissions, in the form of oil, petrol or diesel leaks, which could cause contamination of groundwater if they enter the underlying soils or landscaped areas within the substation compound.

In relation to the operational phase the potential impact on the water is considered to be ***Long term – Moderate.***

8.4.8 UNIT 8 'MODIFICATIONS TO EXISTING ATHY-PORTLAOISE 110KV LINE'

8.4.8.1 Construction Phase

The key civil engineering works at the proposed Modifications to existing Athy-Portlaoise 110kV line will involve the excavation of material for the foundations of the angle masts and polesets and deliveries of imported engineering fill, crushed stone, concrete, reinforcement and other construction materials.

Other construction activities will include machinery movement, traversing of watercourses, dewatering of excavations, some tree felling site storage of cement and concrete materials and hydrocarbons and construction of access tracks, if required. The potential impacts in relation to water have been assessed under the following headings:

- Increased runoff and sediment loading
- Contamination of local water courses and groundwater
- Diversion/Erosion of local watercourses
- Flood Risk
- Localised alteration of groundwater flow, rate and direction

Increased Runoff and Sediment Loading

Surface water runoff during the construction phase may contain increased silt levels or become polluted from construction activities. Runoff containing large amounts of silt can cause damage to surface water systems and receiving watercourses. Silt water can arise from dewatering excavations, exposed ground, stockpiles and site roads.

During the construction phase there is potential for a slight increased runoff due to the introduction of impermeable surfaces and the compaction of soils. This will reduce the infiltration capacity and increase the rate and volume of direct surface runoff. The potential impact of this is a slight increase in confined flow rates, leading to increases in surface water runoff and sediment loading which could potentially impact local drainage patterns and/or cause siltation of the existing surrounding watercourses.

In relation to increased runoff and sediment loading the potential impact is considered to be ***Medium term - Moderate.***

Contamination of local water courses and groundwater

During the construction phase, there is a risk of accidental pollution incidences from the following sources:

- Spillage or leakage of oils and fuels stored on site.
- Spillage or leakage of oils and fuels from construction machinery or site vehicles.
- Spillage of oil or fuel from refuelling machinery on site.
- The use of concrete and cement for angle mast foundation.
- The leaching of creosote used as a timber preservative for the polesets

Concrete operations carried out near surface water bodies during construction activities could lead to a discharge of wastewaters to a watercourse. Concrete (specifically, the cement component) is highly

alkaline and any spillage to a local watercourse would be detrimental to water quality and local fauna and flora.

Machinery on site during the construction phase may result in contamination of the surface water. The potential impacts could derive from accidental spillage of fuels, oils, paints and solvents, which could impact surface water and groundwater quality if allowed to infiltrate to runoff to surface water systems and/or receiving watercourses.

Wastewater discharges from sanitary facilities provided have the potential to contaminate surface water if they were accidentally discharged to the water courses.

Other impacts from the proposed construction works include the increase in groundwater vulnerability arising from the removal of subsoil cover, the increase in flow to surface water systems from dewatering discharges and change of groundwater quality. Water may have accumulated during dewatering activities (if carried out) may contain substances such as oil, silt and dissolved chemicals.

In relation to the contamination of local watercourses and groundwater the potential impact is considered to be ***Medium term – Significant*** for all works located within sand/gravel aquifers. The potential impact is considered ***Medium term – Moderate*** for at all other locations.

Diversion/Erosion of local watercourses

The diversion of ditches/watercourses may have the following impacts:

- Improperly designed or installed temporary and permanent watercourse crossing structures can result in insufficient water depth in culverts or culverts with perched inlets, outfalls and excessive slope.
- Physical alteration of stream channels resulting in altered hydraulic characteristics and/or changes in stream profile, particularly in width, depth, gradient and current speed.
- Erosion of a watercourse and/or floodplain being initiated or accelerated due to constriction in a watercourse increasing flow velocity.
- Deposition of material in the watercourse or on the floodplain due to a change in flow velocity

In relation to the diversion/erosion of local watercourses the potential impact is considered to be ***Short term - Moderate.***

Flood Risk

The diversion of ditches/watercourses will be required during the construction phase for the access tracks and machinery. There is a potential impact on flow regimes in existing watercourses and this could lead to flooding of adjacent lands. Increased flood levels upstream can occur due to the creation of blockages in watercourses from drainage ditches.

In relation to flood risk the potential impact is considered to be ***Short term - Slight.***
Localised alteration of groundwater flow, rate and direction

Should the angle mast bases extend to below the unsaturated zone into the groundwater, the presence of the bases would have the potential to affect local shallow flows, potentially leading to barriers or the creation of preferential pathways. If excavations for the angle mast bases and polesets encounter groundwater, dewatering may be required during construction, resulting in a slight localised drawdown of the water table.

There is the potential for the release of sediments into watercourses as a consequence of dewatering of excavations for typical angle mast/poleset foundations.

Construction works adjacent to watercourses have the potential to impact on groundwater flow towards the water course. The magnitude of this impact in the absence of mitigation is assessed as low due to the short-term duration of the works as well as the shallow depth of works.

In relation to localised alteration of groundwater flow, rate and direction the potential impact is considered to be ***Short term - Slight.***

8.4.8.2 Operational Phase

There will be no direct discharges to the water environment during the operational phase.

Due to the nature of the development, there will be machinery periodically on the site at a given time. This may lead to occasional accidental emissions, in the form of oil, petrol or diesel leaks, which could cause contamination if they enter the water environment.

The polesets and angle masts use products that have a potential impact on the water environment. The timber used in the polesets is treated with creosote as a preservative. Angle masts use concrete for foundations.

In relation to the operational phase the potential impact on the water is considered to be ***Long term – Moderate.***

8.5 MITIGATION

The design of the proposed Laois-Kilkenny Reinforcement Project has taken account of the potential impacts of the development and the risks to the water environment local to the area where construction is taking place. Measures have been developed to mitigate the potential effects on the local water environment. These measures seek to avoid or minimise potential effects in the main through the implementation of best practice construction methods and adherence to all relevant legislation.

A project-specific Construction and Environmental Management Plan will be established and maintained by the contractors during the construction and operational phases of the proposed Project. The Plan will cover all potentially polluting activities and include an emergency response procedure. All personnel working on the site will be trained in the implementation of the procedures. As a minimum, the manual will be formulated in consideration of the standard best international practice including but not limited to:

- National Roads Authority (NRA), Guidelines for the Crossing of Watercourses during the Construction of National Road Line routes.[18]
- NRA (2008) Guidelines and Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Roads Schemes. Dublin: National Roads Authority.[19]
- Construction Industry Research and Information Association (CIRIA) Environmental Good Practice on Site (C650), 2005[20]
- BPGCS005, Oil Storage Guidelines.[21]
- Eastern Regional Fisheries Board, (2006), Fisheries Protection Guidelines: Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites. [22]
- CIRIA 697, The SUDS Manual, 2007.[23]
- CIRIA Control of water pollution from linear construction projects. Technical guidance (C648), 2006[24]
- CIRIA, (2001), Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors[25]
- UK Pollution Prevention Guidelines (PPG) UK Environment Agency, 2004[26]
- The Forest Service (2000), Forest and Water Quality Guidelines, Department of the Marine and Natural Recourses.[27]

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

The mitigation measures for decommissioning would be the same as the measures highlighted for the construction phase.

8.5.1 UNIT 1 'NEW 400/110KV GIS SUBSTATION, 'COOLNABACKY' NEAR PORTLAOISE CO. LAOIS'

8.5.1.1 Construction Phase

In relation to the proposed Coolnabacky 400/110kV Substation, the control of site runoff will be critical to minimising the potential for impact from this site. In particular the site drainage works and settlement ponds proposed will be developed in the first phase of construction activity and all surface water will be directed to the settlement ponds.

Surface water runoff will be managed in the form of settlement ponds. 2 no. settlement ponds will be constructed at the site. Pond 1, located to the North of the substation will have a capacity to treat approx. the first 20mm of rainfall on the 400kV substation building and the stone area of the site. Pond 2 will have capacity to treat the first 33mm of rainfall generated from the transformers bund and the 110kV Substation building. These will be installed before site clearance and earthworks. The settlement ponds will be comprised of a system of check dams which will further divide the ponds into primary, secondary and tertiary pond. The settlement ponds will be lined with geotextile material on a bed of 200mm of single size clean stone. The settlement ponds will have a permanent water depth of 300mm and a combined treatment volume of 180m^3. The pond will provide suitable attenuation for the 100 year rainfall return period. The permanent water depth and treatment volume can be increased during the construction phase when silt generation is at its highest. Temporary drainage from the site berms will be provided via French Drains until the berms are vegetated. The berms will be surrounded by silt fences until vegetated.

During the construction phase the mitigation measures have been applied for the following potential impacts:

- Increased Runoff and Sediment Loading
- Contamination of local water courses and groundwater
- Dewatering
- Flood Risk
- Localised alteration of groundwater flow, rate and direction

The mitigation measures will ensure that no sediment contamination, contaminated runoff or untreated wastewater will enter any watercourses during the construction of the proposed substation.

Increased Runoff and Sediment Loading

During the construction phase any drains carrying a high sediment load will be diverted through the settlement ponds. The settlement ponds will be located between the area of construction and the nearest field drain. Surface water runoff will not be discharged directly to local watercourses.

The following mitigation measures will be adopted:

- A drainage plan has been drawn up and submitted. The drainage system and settlement ponds will be constructed as a first step before major site clearance activities occur.
- Excavations will remain open for as little time as possible before the placement of fill. This will help to minimise potential for groundwater ingress into excavations.
- Silt traps, such as geotextile membrane, will be placed in the existing drainage network around the substation site and along the proposed access road prior to the establishment of the settlement ponds and access road construction to minimise silt loss. These should be inspected and cleaned regularly.
- Swales will be located along the access road.

- Weather conditions will be taken into account when planning construction activities to minimise risk of run off from the site.

Contamination of local water courses and groundwater

To minimise any impact on the underlying subsurface strata from material spillages, all oils, solvents, paints and fuels used during construction will be stored within temporary bunded areas and each of these areas will be bunded to a volume of 110% of the capacity of the largest tank/container within it (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.

No concrete batching facility will be required at the site. All concrete will be brought to site by truck. Wet concrete operations adjacent to watercourses will be avoided where possible. A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated storm water to groundwater.

The contractor will be required to make provision for removal of any concrete wash waters, most likely by means of tankering off-site and no such wash waters will be discharged to groundwater.

Any effluent generated by temporary onsite sanitary facilities will be taken off-site for appropriate treatment.

To minimise the vulnerability of groundwater during the removal of the soil and/or subsoil during construction of the proposed substation, all ground works will be completed in an appropriately managed manner. A procedure for managing this activity will be included as part of the Construction & Demolition Waste Management Plan, for the proposed substation. See Section 9.2 Material Assets – Waste.

Some construction works on site may take place in the vicinity of watercourses in the riparian zone. The riparian zone is the land immediately adjoining the aquatic zone and influenced by it. A buffer area will be established to protect the riparian and aquatic zones from disturbance. The buffer area generally extends beyond the riparian zone. The width of a buffer area will be determined by the guidance set out by the Department of the Marine and Natural Recourses [27], which are shown in Table 8.18:

Average slope leading to aquatic zone	Buffer zone width on each side of the aquatic zone	Buffer zone width for highly erodable soils
Moderate (even to 1in 7 / 0-15%)	10 m	15 m
Steep (1 in 7 to 1 in 3 / 15-30%)	15 m	20 m
Very steep (1 in 3 / >30%)	20 m	25 m

Table 8.18 Buffer Zone Guidelines

Re-fuelling of construction equipment and the addition of hydraulic oil or lubricants to vehicles/ equipment will take place in designated bunded areas where possible. Re-fuelling will be avoided in so far as possible at the other work sites but where necessary will take place within appropriately bunded areas at a designated distance away from watercourses (>10m). This is in accordance with the buffer zone guidelines in Table 8.18.

If it is not possible to bring a machine to the refuelling point, fuel will be delivered in a double-skinned mobile fuel bowser. A drip tray will be used beneath the fill point during refuelling operations in order to contain any spillages that may occur. The vehicles and equipment will not be left unattended during refuelling. Spill kits and hydrocarbon absorbent packs will be stored in the cab of each vehicle and operators will be fully trained in the use of this equipment.

The generation of runoff from stockpiles of soils, excavated during construction, will be prevented from entering watercourses by diverting runoff to the settlement ponds on site, and removing the material off-site as soon as possible to designated storage areas.

It is recommended that a 25m buffer zone is applied around the tufa deposits to ensure protection of the deposits. No works during construction and operation will occur within this area, including re-fuelling, batching of concrete or storage of fuels and soil stockpiles. See desktop hydrogeological report in Appendix 8.1.

Guidelines stated at the beginning of this section will be adhered to, thus ensuring that the impact on the water environment during the construction phase of the proposed substation is minimised. In particular, the ESB Construction and Environmental Management Plan, which sets out methods for minimising the environmental risks associated with construction works, will be referred to in the planning of any construction works in the vicinity of watercourses.

Dewatering

The Site Investigation[10] indicates that the sand and gravel deposits are not saturated and groundwater flow into the excavation during construction is expected to be limited. However, should on-going dewatering be required during excavations it is recommended that a low-permeability barrier be installed around the excavation walls. This will ensure that any potential for drawdown that could affect the water environment is minimised.

Flood Risk

Measures to prevent localised flooding will be implemented by proper design of the construction works and maintenance of existing drainage within the proposed substation. The surface water drainage system proposed ensures that there is no increase in surface water runoff from the proposed substation, as Greenfield run-off rates will be maintained during operation. See the Drainage and Infrastructure Report (ESBI Report Ref: PE687-F0261-R261-016) for details.

Localised alteration of groundwater flow, rate and direction

The construction of the proposed substation will temporarily change the groundwater regime should excavations extend below the water table and should pumping be required to enable the pouring of concrete. The following mitigation measures will be adopted:

- Time for excavations being open will be minimised as far as possible.
- Lowering of groundwater table, if required, will be mitigated by avoiding unnecessary pumping and dewatering of excavations. Where possible, groundwater exclusion techniques will be used such as drainage or sheet piling which will reduce the need for dewatering and will avoid unnecessary drawdown of the water table outside of the excavations.
- Locally excavated material will be reinstated surrounding the foundation base immediately following construction to allow recovery of any potential groundwater level change as quickly as possible.
- Aggregate will be imported rather than quarried on site

8.5.1.2 Operational Phase

Oil storage and the transformers 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.

Water from this bunded area will be pumped out by an oil sensitive pump ensuring that only non-contaminated water enters the site drainage network. The surface water generated in the bunded areas will discharge to the ponds via a Class 1 Full Retention Oil Separator. The ponds will provide filtration through the check dams and exposure to sunlight will provide a further breakdown of hydrocarbons (if present).

On site sanitary facilities will be provided on site. These are fitted with the required proprietary system.

Re-fuelling of equipment and the addition of hydraulic oil or lubricants to vehicles/ equipment will take place off site, where possible. If it is not possible to bring machinery off-site to a refuelling point, fuel will be delivered in a double-skinned mobile fuel bowser. A drip tray will be used beneath the fill point during refuelling operations in order to contain any spillages that may occur. Spill-kits and hydrocarbon absorbent packs will be stored in the cabin of each vehicle and operators will be fully trained in the use of this equipment.

All associated hazardous waste residuals will also be appropriately stored prior to removal by a licensed waste management contractor for off-site treatment/recycling/disposal.

8.5.2 UNIT 2 'NEW 400KV LINE CONNECTION TO COOLNABACKY FROM THE EXISTING MONEYPOINT-DUNSTOWN 400KV LINE'

8.5.2.1 Construction Phase

In relation to the proposed new connection to Coolnabacky from the existing Moneypoint-Dunstown 400kV line, the control of site runoff will be critical to minimising the potential for impact from this route. In particular the site drainage works will be developed in the first phase of construction activity at each mast location.

The erection of the masts require minimal disturbance to the ground and with good construction practice there will be little risk of sediment loss. Construction activity is also spread out along the line route with a small footprint at each location. Duration on site is expected to be no more than one week for angle mast. A work method statement will be developed and implemented by construction crews for each angle mast.

During the construction phase the mitigation measures have been applied for the following potential impacts:

- Increased runoff and sediment loading
- Contamination of local water courses and groundwater
- Diversion/Erosion of local watercourses
- Flood Risk
- Localised alteration of groundwater flow, rate and direction

The mitigation measures will ensure that no sediment contamination, contaminated runoff or untreated wastewater will enter any watercourses during the construction of the proposed line route.

Increased Runoff and Sediment Loading

During the construction phase any drains carrying a high sediment load will be diverted through a settlement trap. The settlement trap will be located between the area of construction and the nearest watercourse. A settlement trap works by channelling the runoff specifically to allow any suspended solids to settle before discharge. Types of settlement traps include straw bales, silt fences, settlement ponds and pumps. The settlement traps will be inspected regularly and immediately after heavy rainfall events.

Surface water runoff will not be discharged directly to local watercourses.

The following mitigation measures will be adopted:

- Where access tracks are excavated to bedrock/rock the fill material used will have sufficient permeability to allow cross drainage and not provide a barrier to flow
- Excavations will remain open for as little time as possible before the placement of fill. This will help to minimise potential for groundwater ingress into excavations.
- Weather conditions should be taken into account when planning construction activities to minimise risk of run off from the site.

Contamination of local water courses and groundwater

To minimise any impact on the underlying subsurface strata from material spillages, all oils, solvents, paints and fuels used during construction will be stored within temporary bunded areas and each of these areas will be bunded to a volume of 110% of the capacity of the largest tank/container within it (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.

No concrete batching facility will be required at the work site. All concrete will be brought to site by truck. Wet concrete operations adjacent to watercourses will be avoided where possible. A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated storm water to groundwater.

The pouring of concrete for typical angle mast bases will take place within a designated area using a geosynthetic material to prevent concrete runoff into the soil/groundwater media.

The contractor will be required to make provision for removal of any concrete wash waters, most likely by means of tankering off-site and no such washwaters will be discharged to groundwater.

Any effluent generated by temporary onsite sanitary facilities will be taken off-site for appropriate treatment.

To minimise the vulnerability of groundwater during the removal of the soil and/or subsoil during construction of the proposed line route, all ground works will be completed in an appropriately managed manner. A procedure for managing this activity will be included as part of the Construction & Demolition Waste Management Plan, for the proposed line route. See Section 9.2 Material Assets – Waste.

Some construction works on site may take place in the vicinity of watercourses in the riparian zone. A buffer area will be established to protect the riparian and aquatic zones from disturbance. The buffer area generally extends beyond the riparian zone. The width of a buffer area will be determined by the guidance set out by the Department of the Marine and Natural Recourses [27], which are shown in Table 8.18.

Re-fuelling of construction equipment and the addition of hydraulic oil or lubricants to vehicles/ equipment will take place in designated bunded areas where possible. Re-fuelling will be avoided in so far as possible at the work sites but where necessary will take place within appropriately bunded areas at a designated distance away from watercourses (>10m). This is in accordance with the buffer zone guidelines (see Table 8.18) be carried out within appropriately bunded areas away from surface water gullies or drains. If it is not possible to bring a machine to the refuelling point, fuel will be delivered in a double-skinned mobile fuel bowser. A drip tray will be used beneath the fill point during refuelling operations in order to contain any spillages that may occur. The vehicles and equipment will not be left unattended during refuelling. Spill kits and hydrocarbon absorbent packs will be stored in the cab of each vehicle and operators will be fully trained in the use of this equipment.

The generation of runoff from stockpiles of soils, excavated during construction, will be prevented by the installation of temporary bunds around the stockpile, and removing the material off-site as soon as possible to designated storage areas.

In the event of any in-stream works taking place during the construction phase the following mitigation measures apply.

- In salmonid catchments, all in-stream works will be carried out during the period May to September. In the event that these waters contain Lamprey the National Parks and Wildlife Service (NPWS) will be contacted for the relevant advice.
- No in-stream works will be carried out without the written approval of the IFI[22]. A method statement will be agreed in advance of works.

- Any machines working in the watercourse will be protected against leakage or spillage of fuels, oils, greases and hydraulic fuels.
- In-stream earthworks will be executed so as to minimise the suspension of solids.

The above measures will in conjunction with the ESB Construction and Environmental Management Plan, submitted by the appointed contractor for review by the IFI, Laois County Council and other relevant consultees.

Guidelines stated at the beginning of Section 8.5 will be adhered to, thus ensuring that the impact on the water environment during the construction phase of the proposed line route is minimised. In particular, the ESB Construction and Environmental Management Plan, which sets out methods for minimising the environmental risks associated with construction works, will be referred to in the planning of any construction works in the vicinity of watercourses.

Diversion/Erosion of local watercourses

As far as is possible, the temporary access roads will be developed to minimise the number of watercourse crossings. Access roads will be developed only when no other access route can be identified.

If required, culverts beneath the temporary access roads will be located at or close to the locations of natural flow paths to allow existing flows to continue. Lateral drainage will be within shallow geotextile and rock lined ditches to avoid the drainage of surrounding soils.

All watercourse crossings will be planned in consultation with Laois County Council, and in accordance with guidelines issued by the IFI and other applicable guidelines.

Any diversions of watercourses will be designed to replicate the existing natural watercourse. The creation of the new watercourse will be carried out in the dry, in isolation from the existing watercourse. Diversion will only take place during the period May to October unless otherwise agreed with the IFI.

To avoid siltation of watercourses from crossing point locations, silt traps will be placed beside temporary crossing points with an associated buffer strip. Silt-traps will be maintained and cleaned regularly during the construction phase.

Flood Risk

During the entire construction phase, the works will be programmed and phased so that any blocking of the existing drainage network will be avoided so as to prevent localised flooding.

Localised alteration of groundwater flow, rate and direction

The construction of angle mast bases will temporarily change the groundwater regime should excavations extend below the water table and should pumping be required to enable the pouring of concrete. The following mitigation measures will be adopted:

- Machinery will be operated from access tracks, where possible.
- Time for excavations being open will be minimised as far as possible.
- Lowering of groundwater table, if required, will be mitigated by avoiding unnecessary pumping and dewatering of excavations. Where possible, groundwater exclusion techniques will be used such as drainage or sheet piling which will reduce the need for dewatering and will avoid unnecessary drawdown of the water table outside of the excavations.
- Locally excavated material will be reinstated surrounding the angle mast base immediately following construction to allow recovery of any potential groundwater level change as quickly as possible.
- Aggregate will be imported rather than quarried on site

8.5.2.2 Operational Phase

Apart from the general maintenance of the masts there will be few on-site activities during the operational phase.

All watercourse crossings will be planned in consultation with Laois County Council, and in accordance with the necessary guidelines.

The construction of the angle mast foundations would be from concrete that is sulphate resistant and appropriate for the site conditions. This would ensure that there will be little corrosion of the angle mast bases during the operational phase.

The risk of polluting the local hydrological and hydrogeological regime from the operating equipment is limited. As part of the standard operations procedures, routine monitoring and maintenance will be carried out to minimise these risks to acceptably low levels of likelihood and severity.

Re-fuelling of equipment and the addition of hydraulic oil or lubricants to vehicles/ equipment will take place off site, where possible, and not on-site. If it is not possible to bring machinery off-site to a refuelling point, fuel will be delivered in a double-skinned mobile fuel bowser. A drip tray will be used beneath the fill point during refuelling operations in order to contain any spillages that may occur. Spill-kits and hydrocarbon absorbent packs will be stored in the cabin of each vehicle and operators will be fully trained in the use of this equipment.

All associated hazardous waste residuals will also be appropriately stored prior to removal by a licensed waste management contractor for off-site treatment/recycling/disposal.

8.5.3 UNIT 3 'NEW CONNECTION TO COOLNABACKY FROM THE EXISTING ATHY-PORTLAOISE 110KV LINE'

8.5.3.1 Construction Phase

In relation to the proposed new connection to Coolnabacky from the existing Moneypoint-Dunstown 400kV line, the control of site runoff will be critical to minimising the potential for impact from this route. During the construction phase the mitigation measures have been applied for the following potential impacts:

- Increased runoff and sediment loading
- Contamination of local water courses and groundwater
- Flood Risk
- Localised alteration of groundwater flow, rate and direction

The mitigation measures will ensure that no sediment contamination, contaminated runoff or untreated wastewater will enter any watercourses during the construction of the proposed connection.

Increased Runoff and Sediment Loading

During the construction phase any drains carrying a high sediment load will be diverted through a settlement trap. The settlement trap will be located between the area of construction and the nearest watercourse. A settlement trap works by channelling the runoff specifically to allow any suspended solids to settle before discharge. Types of settlement traps include straw bales, silt fences, settlement ponds and pumps. The settlement traps will be inspected regularly and immediately after heavy rainfall events.

Surface water runoff will not be discharged directly to local watercourses.

The following mitigation measures will be adopted:

- Where tracks are excavated to bedrock/rock the fill material used will have sufficient permeability to allow cross drainage and not provide a barrier to flow

- Excavations will remain open for as little time as possible before the placement of fill. This will help to minimise potential for groundwater ingress into excavations.
- Weather conditions should be taken into account when planning construction activities to minimise risk of run off from the site.

Contamination of local water courses and groundwater

To minimise any impact on the underlying subsurface strata from material spillages, all oils, solvents, paints and fuels used during construction will be stored within temporary bunded areas and each of these areas will be bunded to a volume of 110% of the capacity of the largest tank/container within it (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.

No concrete batching facility will be required at any site works location. All concrete will be brought to site by truck. Wet concrete operations adjacent to watercourses will be avoided where possible. A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated storm water to groundwater. The pouring of concrete for typical angle mast bases will take place within a designated area using a geosynthetic material to prevent concrete runoff into the soil/groundwater media.

The contractor will be required to make provision for removal of any concrete wash waters, most likely by means of tankering off-site and no such washwaters will be discharged to groundwater.

Any effluent generated by temporary onsite sanitary facilities will be taken off-site for appropriate treatment.

To minimise the vulnerability of groundwater during the removal of the soil and/or subsoil during construction of the proposed substation, all ground works will be completed in an appropriately managed manner. A procedure for managing this activity will be included as part of the Construction & Demolition Waste Management Plan, for the proposed line route. See Section 9.2 Material Assets – Waste.

Some construction works on site may take place in the vicinity of watercourses in the riparian zone. A buffer area will be established to protect the riparian and aquatic zones from disturbance. The buffer area generally extends beyond the riparian zone. The width of a buffer area will be determined by the guidance set out by the Department of the Marine and Natural Recourses [27], which are shown in Table 8.18.

Re-fuelling of construction equipment and the addition of hydraulic oil or lubricants to vehicles/ equipment will take place in designated bunded areas where possible. Re-fuelling will be avoided in so far as possible at the other work sites but where necessary will take place within appropriately bunded areas at a designated distance away from watercourses (>10m). This is in accordance with the buffer zone guidelines (see Table 8.18) be carried out within appropriately bunded areas away from surface water gullies or drains. If it is not possible to bring a machine to the refuelling point, fuel will be delivered in a double-skinned mobile fuel bowser. A drip tray will be used beneath the fill point during refuelling operations in order to contain any spillages that may occur. The vehicles and equipment will not be left unattended during refuelling. Spill kits and hydrocarbon absorbent packs will be stored in the cab of each vehicle and operators will be fully trained in the use of this equipment.

The generation of runoff from stockpiles of soils, excavated during construction, will be prevented by the installation of temporary bunds around the stockpile, and removing the material off-site as soon as possible to designated storage areas.

In the event of any in-stream works taking place during the construction phase the following mitigation measures apply.

- In salmonid catchments, all in-stream works will be carried out during the period May to September. In the event that these waters contain Lamprey the NPWS will be contacted for the relevant advice.
- No in-stream works will be carried out without the written approval of the IFI[22]. A method statement will be agreed in advance of works.
- Any machines working in the watercourse will be protected against leakage or spillage of fuels, oils, greases and hydraulic fuels.
- In-stream earthworks will be executed so as to minimise the suspension of solids.

The above measures will in conjunction with the ESB Construction and Environmental Management Plan, submitted by the appointed contractor for review by the IFI, Laois County Council and other relevant consultees.

Guidelines stated at the beginning of this section will be adhered to, thus ensuring that the impact on the water environment during the construction phase of the proposed substation is minimised. In particular, the ESB Construction and Environmental Management Plan, which sets out methods for minimising the environmental risks associated with construction works, will be referred to in the planning of any construction works in the vicinity of watercourses.

Flood Risk

During the entire construction phase, the works will be programmed and phased so that any blocking of the existing drainage network will be avoided so as to prevent localised flooding.

Localised alteration of groundwater flow, rate and direction

The construction of proposed cable route and the angle masts will temporarily change the groundwater regime should excavations extend below the water table and should pumping be required to enable the pouring of concrete. The following mitigation measures will be adopted:

- Machinery will be operated from access tracks, where possible.
- Time for excavations being open will be minimised as far as possible.
- Lowering of groundwater table, if required, will be mitigated by avoiding unnecessary pumping and dewatering of excavations. Where possible, groundwater exclusion techniques will be used such as drainage or sheet piling which will reduce the need for dewatering and will avoid unnecessary drawdown of the water table outside of the excavations.
- Locally excavated material will be reinstated surrounding the typical angle mast base immediately following construction to allow recovery of any potential groundwater level change as quickly as possible.
- Aggregate will be imported rather than quarried on site

8.5.3.2 Operational Phase

Apart from the general maintenance of the masts there will be few on-site activities during the operational phase.

All watercourse crossings will be planned in consultation with Laois County Council, and in accordance with the necessary guidelines.

The construction of the angle mast foundations would be from concrete that is sulphate resistant and appropriate for the site conditions. This would ensure that there will be little corrosion of the angle mast bases during the operational phase.

The risk of polluting the local hydrological and hydrogeological regime from the operating equipment is limited. As part of the standard operations procedures, routine monitoring and maintenance will be carried out to minimise these risks to acceptably low levels of likelihood and severity.

Re-fuelling of equipment and the addition of hydraulic oil or lubricants to vehicles/ equipment will take place off site, where possible, and not on-site. If it is not possible to bring machinery off-site to a refuelling point, fuel will be delivered in a double-skinned mobile fuel bowser. A drip tray will be used beneath the fill point during refuelling operations in order to contain any spillages that may occur. Spill-kits and hydrocarbon absorbent packs will be stored in the cabin of each vehicle and operators will be fully trained in the use of this equipment.

All associated hazardous waste residuals will also be appropriately stored prior to removal by a licensed waste management contractor for off-site treatment/recycling/disposal.

8.5.4 UNIT 4 'A NEW 110KV / 38KV / MV SUBSTATION IN BALLYRAGGET, CO. KILKENNY ADJACENT TO AND REPLACING THE EXISTING 38KV / MV SUBSTATION WHICH WILL BE DECOMMISSIONED'

8.5.4.1 Construction Phase

In relation to the proposed 110kV / 38kV / MV substation in Ballyragget, Kilkenny, the control of site runoff will be critical to minimising the potential for impact from this site. No major surface water features or field drains were found at or adjacent to the proposed substation location therefore in relation to surface water runoff no mitigation measures are proposed.

During the construction phase the mitigation measures have been applied for the following potential impacts:

- Increased runoff and sediment loading
- Contamination of groundwater
- Flood Risk
- Localised alteration of groundwater flow, rate and direction

The mitigation measures will ensure that no sediment contamination, contaminated runoff or untreated wastewater will enter any watercourses during the construction of the proposed substation.

Increased Runoff and Sediment Loading

- A drainage plan has been drawn up and submitted. The drainage system will be constructed as a first step before major site clearance activities occur.
- Excavations will remain open for as little time as possible before the placement of fill. This will help to minimise potential for groundwater ingress into excavations.
- Silt traps, such as geotextile membrane, will be placed in the existing drainage network around the substation site and along the proposed access road, if necessary. These will be inspected and cleaned regularly.
- Weather conditions will be taken into account when planning construction activities to minimise risk of run off from the site.

Contamination of local water courses and groundwater

To minimise any impact on the underlying subsurface strata from material spillages, all oils, solvents, paints and fuels used during construction will be stored within temporary bunded areas and each of these areas will be bunded to a volume of 110% of the capacity of the largest tank/container within it (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.

No concrete batching facility will be required at the site. All concrete will be brought to site by truck. Wet concrete operations adjacent to watercourses will be avoided where possible. A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated storm water to groundwater.

The contractor will be required to make provision for removal of any concrete wash waters, most likely by means of tankering off-site and no such wash waters will be discharged to groundwater.

Any effluent generated by temporary onsite sanitary facilities will be taken off-site for appropriate treatment.

To minimise the vulnerability of groundwater during the removal of the soil and/or subsoil during construction of the proposed substation, all ground works will be completed in an appropriately managed manner. A procedure for managing this activity will be included as part of the Construction & Demolition Waste Management Plan, for the proposed substation. See Section 9.2 Material Assets – Waste.

Re-fuelling of construction equipment and the addition of hydraulic oil or lubricants to vehicles/ equipment will take place in designated bunded areas where possible. Re-fuelling will be avoided in so far as possible at the other work sites but where necessary will take place within appropriately bunded areas at a designated distance away from watercourses (>10m). This is in accordance with the buffer zone guidelines in Table 8.18.

If it is not possible to bring a machine to the refuelling point, fuel will be delivered in a double-skinned mobile fuel bowser. A drip tray will be used beneath the fill point during refuelling operations in order to contain any spillages that may occur. The vehicles and equipment will not be left unattended during refuelling. Spill kits and hydrocarbon absorbent packs will be stored in the cab of each vehicle and operators will be fully trained in the use of this equipment.

The generation of runoff from stockpiles of soils, excavated during construction, will be prevented by the installation of temporary bunds around the stockpile, and removing the material off-site as soon as possible to the proposed Coolnabacky substation location.

The Site Investigation[10] indicates that no groundwater was found at the site therefore no dewatering is expected.

Guidelines stated at the beginning of this section will be adhered to, thus ensuring that the impact on the water environment during the construction phase of the proposed substation is minimised. In particular, the ESB Construction and Environmental Management Plan, which sets out methods for minimising the environmental risks associated with construction works, will be referred to in the planning of any construction works in the vicinity of watercourses.

Flood Risk

Measures to prevent localised flooding will be implemented by proper design of the construction works and maintenance of existing drainage within the proposed substation. The surface water drainage system proposed ensures that there is no increase in surface water runoff from the proposed substation, as Greenfield run-off rates will be maintained during operation. See the Drainage and Infrastructure Report (ESBI Report Ref: PE687-F0261-R261-017) for details.

Localised alteration of groundwater flow, rate and direction

The construction of the proposed substation will temporarily change the groundwater regime should excavations extend below the water table and should pumping be required to enable the pouring of concrete. The findings of the Site Investigation[10] suggest this will not occur however, if required the following mitigation measures will be adopted:

- Time for excavations being open will be minimised as far as possible.
- Lowering of groundwater table, if required, will be mitigated by avoiding unnecessary pumping and dewatering of excavations. Where possible, groundwater exclusion techniques will be used such as drainage or sheet piling which will reduce the need for dewatering and will avoid unnecessary drawdown of the water table outside of the excavations.

- Locally excavated material will be reinstated surrounding the foundation base immediately following construction to allow recovery of any potential groundwater level change as quickly as possible.
- Aggregate will be imported rather than quarried on site

8.5.4.2 Operational Phase

Oil storage and the transformers 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.

Water from this bunded area will be pumped out by an oil sensitive pump ensuring that only non-contaminated water enters the site drainage network. The surface water generated in the bunded areas will discharge to a soakaway via a Class 1 Full Retention Oil Separator.

On site sanitary facilities will be provided on site. These are fitted with the required proprietary system.

Re-fuelling of equipment and the addition of hydraulic oil or lubricants to vehicles/ equipment will take place off site, where possible. If it is not possible to bring machinery off-site to a refuelling point, fuel will be delivered in a double-skinned mobile fuel bowser. A drip tray will be used beneath the fill point during refuelling operations in order to contain any spillages that may occur. Spill-kits and hydrocarbon absorbent packs will be stored in the cabin of each vehicle and operators will be fully trained in the use of this equipment.

All associated hazardous waste residuals will also be appropriately stored prior to removal by a licensed waste management contractor for off-site treatment/recycling/disposal.

8.5.5 UNIT 5 'A NEW 110KV OVERHEAD LINE BETWEEN BALLYRAGGET AND COOLNABACKY'

8.5.5.1 Construction Phase

In relation to the proposed new 110kV overhead line between Ballyragget Substation and Coolnabacky, the control of site runoff will be critical to minimising the potential for impact from this route. In particular the site drainage works will be developed in the first phase of construction activity at each site works location.

The erection of the polesets and angle masts require minimal disturbance to the ground and with good construction practice there will be little risk of sediment loss. Construction activity is also spread out along the line route with a small footprint at each location. Duration on site is expected to be no more than a half day for each poleset and one week for angle mast. A work method statement will be developed and implemented by construction crews for each poleset/angle mast.

During the construction phase the mitigation measures have been applied for the following potential impacts:

- Increased runoff and sediment loading
- Contamination of local water courses and groundwater
- Diversion/Erosion of local watercourses
- Flood Risk
- Localised alteration of groundwater flow, rate and direction

The mitigation measures will ensure that no sediment contamination, contaminated runoff or untreated wastewater will enter any watercourses during the construction of the proposed line route.

Increased Runoff and Sediment Loading

During the construction phase any drains carrying a high sediment load will be diverted through a settlement trap. The settlement trap will be located between the area of construction and the nearest watercourse. A settlement trap works by channelling the runoff specifically to allow any suspended solids to settle before discharge. Types of settlement traps include straw bales, silt fences, settlement ponds and pumps. The settlement traps will be inspected regularly and immediately after heavy rainfall events.

Surface water runoff will not be discharged directly to local watercourses.

The following mitigation measures will be adopted:

- Where tracks are excavated to bedrock/rock the fill material used will have sufficient permeability to allow cross drainage and not provide a barrier to flow
- Excavations will remain open for as little time as possible before the placement of fill. This will help to minimise potential for groundwater ingress into excavations.
- Weather conditions should be taken into account when planning construction activities to minimise risk of run off from the site.

Contamination of local water courses and groundwater

To minimise any impact on the underlying subsurface strata from material spillages, all oils, solvents, paints and fuels used during construction will be stored within temporary bunded areas and each of these areas will be bunded to a volume of 110% of the capacity of the largest tank/container within it (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.

No concrete batching facility will be required at any site works location. All concrete will be brought to site by truck. Wet concrete operations adjacent to watercourses will be avoided where possible. A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated storm water to groundwater. The pouring of concrete for angle mast bases will take place within a designated area using a geosynthetic material to prevent concrete runoff into the soil/groundwater media.

The contractor will be required to make provision for removal of any concrete wash waters, most likely by means of tankering off-site and no such washwaters will be discharged to groundwater.

Any effluent generated by temporary onsite sanitary facilities will be taken off-site for appropriate treatment.

To minimise the vulnerability of groundwater during the removal of the soil and/or subsoil during construction of the proposed substation, all ground works will be completed in an appropriately managed manner. A procedure for managing this activity will be included as part of the Construction & Demolition Waste Management Plan, for the proposed line route. See Section 9.2 Material Assets – Waste.

Some construction works on site may take place in the vicinity of watercourses in the riparian zone. A buffer area will be established to protect the riparian and aquatic zones from disturbance. The buffer area generally extends beyond the riparian zone. The width of a buffer area will be determined by the guidance set out by the Department of the Marine and Natural Recourses [27], which are shown in Table 8.18.

Re-fuelling of construction equipment and the addition of hydraulic oil or lubricants to vehicles/ equipment will take place in designated bunded areas where possible. Re-fuelling will be avoided in so far as possible at the other work sites but where necessary will take place within appropriately bunded areas at a designated distance away from watercourses (>10m). This is in accordance with the buffer zone guidelines (see Table 8.18) be carried out within appropriately bunded areas away from surface water

gullies or drains. If it is not possible to bring a machine to the refuelling point, fuel will be delivered in a double-skinned mobile fuel bowser. A drip tray will be used beneath the fill point during refuelling operations in order to contain any spillages that may occur. The vehicles and equipment will not be left unattended during refuelling. Spill kits and hydrocarbon absorbent packs will be stored in the cab of each vehicle and operators will be fully trained in the use of this equipment.

The generation of runoff from stockpiles of soils, excavated during construction, will be prevented by the installation of temporary bunds around the stockpile, and removing the material off-site as soon as possible to designated storage areas.

The requirement for any in-stream works is minimal however, in the event of any in-stream works taking place during the construction phase the following mitigation measures apply.

- In salmonid catchments, all in-stream works will be carried out during the period May to September. In the event that these waters contain Lamprey the National Parks and Wildlife Service will be contacted for the relevant advice.
- No in-stream works will be carried out without the written approval of the Inland Fisheries Ireland[22]. A method statement will be agreed in advance of works.
- Any machines working in the watercourse will be protected against leakage or spillage of fuels, oils, greases and hydraulic fuels.
- In-stream earthworks will be executed so as to minimise the suspension of solids.

The above measures will in conjunction with the ESB Construction and Environmental Management Plan, submitted by the appointed contractor for review by the IFI, Laois County Council, Kilkenny County Council and other relevant consultees.

In relation to the use of creosote oil, the timber poles used will be treated with Creosote to maintain their integrity in use.

Creosote oil is composed of a mixture of hydrocarbons but primarily Polycyclic Aromatic Hydrocarbons (PAHs).

The suppliers of wood-poles will be required to ensure that the moisture content of poles prior to creosote impregnation is between 20% to 25%. At this moisture content, the wood cells are void of water. In addition, a negative back vacuum must be applied to all treated poles at the end of the treating process. This is to ensure that any excess creosote is removed from the pole before it emerges from the treatment cylinder. This leads to a dry pole. The pole remains at the facility for at least 4 weeks before use.

When required, the poles will be transported directly to the work location. All poles will be provided pre-treated.

Guidelines stated at the beginning of this section will be adhered to, thus ensuring that the impact on the water environment during the construction phase of the proposed line route is minimised. In particular, the ESB Networks Construction and Environmental Management Plan, which sets out methods for minimising the environmental risks associated with construction works, will be referred to in the planning of any construction works in the vicinity of watercourses.

Diversion/Erosion of local watercourses

As far as is possible, the temporary access roads will be developed to minimise the number of watercourse crossings. Access roads will be developed only when no other access route can be identified.

If required, culverts beneath the temporary access roads will be located at or close to the locations of natural flow paths to allow existing flows to continue. Lateral drainage will be within shallow geotextile and rock lined ditches to avoid the drainage of surrounding soils.

All watercourse crossings will be planned in consultation with Laois County Council and/or Kilkenny County Council, and in accordance with guidelines issued by the IFI and other applicable guidelines.

Any permanent diversions of watercourses will be designed to replicate the existing natural watercourse. The creation of the new watercourse will be carried out in the dry, in isolation from the existing watercourse. Diversion will only take place during the period May to October unless otherwise agreed with the IFI.

To avoid siltation of watercourses from crossing point locations, silt traps will be placed beside temporary crossing points with an associated buffer strip. Silt-traps will be maintained and cleaned regularly during the construction phase.

The above measures will in conjunction with the ESB Construction and Environmental Management Plan.

Flood Risk

During the entire construction phase, the works will be programmed and phased so that any blocking of the existing drainage network will be avoided so as to prevent localised flooding.

Measures to prevent localised flooding will be implemented by proper design of the construction works and maintenance of existing drainage within the proposed substation.

Localised alteration of groundwater flow, rate and direction

The construction of angle mast and poleset bases will temporarily change the groundwater regime should excavations extend below the water table and should pumping be required to enable the pouring of concrete. The following mitigation measures will be adopted:

- Machinery will be operated from access tracks, where possible.
- Time for excavations being open will be minimised as far as possible.
- Lowering of groundwater table, if required, will be mitigated by avoiding unnecessary pumping and dewatering of excavations. Where possible, groundwater exclusion techniques will be used such as drainage or sheet piling which will reduce the need for dewatering and will avoid unnecessary drawdown of the water table outside of the excavations.
- Locally excavated material will be reinstated surrounding the base immediately following construction to allow recovery of any potential groundwater level change as quickly as possible.
- Aggregate will be imported rather than quarried on site

8.5.5.2 Operational Phase

Apart from the general maintenance of the angle masts and polesets there will be few on-site activities during the operational phase.

All watercourse crossings will be planned in consultation with Laois County Council and/or Kilkenny County Council, and in accordance with the necessary guidelines.

The construction of the typical angle mast foundations would be from concrete that is sulphate resistant and appropriate for the site conditions. This would ensure that there will be little corrosion of the typical angle mast bases during the operational phase.

All polesets will be provided pre-treated.

The risk of polluting the local hydrological and hydrogeological regime from the operating equipment is limited. As part of the standard operations procedures, routine monitoring and maintenance will be carried out to minimise these risks to acceptably low levels of likelihood and severity.

Re-fuelling of equipment and the addition of hydraulic oil or lubricants to vehicles/ equipment will take place off site, where possible, and not on-site. If it is not possible to bring machinery off-site to a refuelling point, fuel will be delivered in a double-skinned mobile fuel bowser. A drip tray will be used beneath the fill point during refuelling operations in order to contain any spillages that may occur. Spill-kits and hydrocarbon absorbent packs will be stored in the cabin of each vehicle and operators will be fully trained in the use of this equipment.

All associated hazardous waste residuals will also be appropriately stored prior to removal by a licensed waste management contractor for off-site treatment/recycling/disposal.

8.5.6 UNIT 6 'AN UPRATE TO THE EXISTING BALLYRAGGET-KILKENNY 110KV OVERHEAD LINE'

8.5.6.1 Construction Phase

In relation to the proposed uprate to the existing Ballyragget-Kilkenny 110kV overhead line, the control of site runoff will be critical to minimising the potential for impact from this route. In particular the site drainage works will be developed in the first phase of construction activity at each poleset/mast location.

The erection of the polesets and angle masts require minimal disturbance to the ground and with good construction practice there will be little risk of sediment loss. Construction activity is also spread out along the line route with a small footprint at each location. Duration on site is expected to be no more than a half day for each poleset and one week for angle mast. A work method statement will be developed and implemented by construction crews for each poleset/angle mast.

During the construction phase the mitigation measures have been applied for the following potential impacts:

- Increased runoff and sediment loading
- Contamination of local water courses and groundwater
- Diversion/Erosion of local watercourses
- Flood Risk
- Localised alteration of groundwater flow, rate and direction

The mitigation measures will ensure that no sediment contamination, contaminated runoff or untreated wastewater will enter any watercourses during the construction of the proposed line route.

Increased Runoff and Sediment Loading

During the construction phase any drains carrying a high sediment load will be diverted through a settlement trap. The settlement trap will be located between the area of construction and the nearest watercourse. A settlement trap works by channelling the runoff specifically to allow any suspended solids to settle before discharge. Types of settlement traps include straw bales, silt fences, settlement ponds and pumps. The settlement traps will be inspected regularly and immediately after heavy rainfall events.

Surface water runoff will not be discharged directly to local watercourses.

The following mitigation measures will be adopted:

- Where tracks are excavated to bedrock/rock the fill material used will have sufficient permeability to allow cross drainage and not provide a barrier to flow
- Excavations will remain open for as little time as possible before the placement of fill. This will help to minimise potential for groundwater ingress into excavations.

- Weather conditions should be taken into account when planning construction activities to minimise risk of run off from the site.

Contamination of local water courses and groundwater

To minimise any impact on the underlying subsurface strata from material spillages, all oils, solvents, paints and fuels used during construction will be stored within temporary bunded areas and each of these areas will be bunded to a volume of 110% of the capacity of the largest tank/container within it (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.

No concrete batching facility will be required at any site works location. All concrete will be brought to site by truck. Wet concrete operations adjacent to watercourses will be avoided where possible. A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated storm water to groundwater. The pouring of concrete for angle mast bases will take place within a designated area using a geosynthetic material to prevent concrete runoff into the soil/groundwater media.

The contractor will be required to make provision for removal of any concrete wash waters, most likely by means of tankering off-site and no such washwaters will be discharged to groundwater.

Any effluent generated by temporary onsite sanitary facilities will be taken off-site for appropriate treatment.

To minimise the vulnerability of groundwater during the removal of the soil and/or subsoil during construction of the proposed substation, all ground works will be completed in an appropriately managed manner. A procedure for managing this activity will be included as part of the Construction & Demolition Waste Management Plan, for the proposed line route. See Section 9.2 Material Assets – Waste.

Some construction works on site may take place in the vicinity of watercourses in the riparian zone. A buffer area will be established to protect the riparian and aquatic zones from disturbance. The buffer area generally extends beyond the riparian zone. The width of a buffer area will be determined by the guidance set out by the Department of the Marine and Natural Recourses [27], which are shown in Table 8.18.

Re-fuelling of construction equipment and the addition of hydraulic oil or lubricants to vehicles/ equipment will take place in designated bunded areas where possible. Re-fuelling will be avoided in so far as possible at the other work sites but where necessary will take place within appropriately bunded areas at a designated distance away from watercourses (>10m). This is in accordance with the buffer zone guidelines (see Table 8.18) be carried out within appropriately bunded areas away from surface water gullies or drains. If it is not possible to bring a machine to the refuelling point, fuel will be delivered in a double-skinned mobile fuel bowser. A drip tray will be used beneath the fill point during refuelling operations in order to contain any spillages that may occur. The vehicles and equipment will not be left unattended during refuelling. Spill kits and hydrocarbon absorbent packs will be stored in the cab of each vehicle and operators will be fully trained in the use of this equipment.

The generation of runoff from stockpiles of soils, excavated during construction, will be prevented by the installation of temporary bunds around the stockpile, and removing the material off-site as soon as possible to designated storage areas.

The requirement for any in-stream works is minimal however, in the event of any in-stream works taking place during the construction phase the following mitigation measures apply.

- In salmonid catchments, all in-stream works will be carried out during the period May to September. In the event that these waters contain Lamprey the National Parks and Wildlife Service will be contacted for the relevant advice.

- No in-stream works will be carried out without the written approval of the Inland Fisheries Ireland[22]. A method statement will be agreed in advance of works.
- Any machines working in the watercourse will be protected against leakage or spillage of fuels, oils, greases and hydraulic fuels.
- In-stream earthworks will be executed so as to minimise the suspension of solids.

The above measures will in conjunction with the ESB Construction and Environmental Management Plan, submitted by the appointed contractor for review by the IFI, Kilkenny County Council and other relevant consultees.

In relation to the use of creosote oil, the timber poles used will be treated with Creosote to maintain their integrity in use.

Creosote oil is composed of a mixture of hydrocarbons but primarily Polycyclic Aromatic Hydrocarbons (PAHs).

The suppliers of wood-poles will be required to ensure that the moisture content of poles prior to creosote impregnation is between 20% to 25%. At this moisture content, the wood cells are void of water. In addition, a negative back vacuum must be applied to all treated poles at the end of the treating process. This is to ensure that any excess creosote is removed from the pole before it emerges from the treatment cylinder. This leads to a dry pole. The pole remains at the facility for at least 4 weeks before use.

When required, the poles will be transported directly to the work location. All poles will be provided pre-treated.

Guidelines stated at the beginning of this section will be adhered to, thus ensuring that the impact on the water environment during the construction phase of the proposed line route is minimised. In particular, the ESB Networks Construction and Environmental Management Plan, which sets out methods for minimising the environmental risks associated with construction works, will be referred to in the planning of any construction works in the vicinity of watercourses.

Diversion/Erosion of local watercourses

As far as is possible, the temporary access roads will be developed to minimise the number of watercourse crossings. Access roads will be developed only when no other access route can be identified.

If required, culverts beneath the temporary access roads will be located at or close to the locations of natural flow paths to allow existing flows to continue. Lateral drainage will be within shallow geotextile and rock lined ditches to avoid the drainage of surrounding soils.

All watercourse crossings will be planned in consultation with Kilkenny County Council, and in accordance with guidelines issued by the IFI and other applicable guidelines.

Any permanent diversions of watercourses will be designed to replicate the existing natural watercourse. The creation of the new watercourse will be carried out in the dry, in isolation from the existing watercourse. Diversion will only take place during the period May to October unless otherwise agreed with the IFI.

To avoid siltation of watercourses from crossing point locations, silt traps will be placed beside temporary crossing points with an associated buffer strip. Silt-traps will be maintained and cleaned regularly during the construction phase.

The above measures will in conjunction with the ESB Construction and Environmental Management Plan.

Flood Risk

During the entire construction phase, the works will be programmed and phased so that any blocking of the existing drainage network will be avoided so as to prevent localised flooding.

Measures to prevent localised flooding will be implemented by proper design of the construction works and maintenance of existing drainage within the proposed substation.

Localised alteration of groundwater flow, rate and direction

The construction of angle mast and poleset bases will temporarily change the groundwater regime should excavations extend below the water table and should pumping be required to enable the pouring of concrete. The following mitigation measures will be adopted:

- Machinery will be operated from access tracks, where possible.
- Time for excavations being open will be minimised as far as possible.
- Lowering of groundwater table, if required, will be mitigated by avoiding unnecessary pumping and dewatering of excavations. Where possible, groundwater exclusion techniques will be used such as drainage or sheet piling which will reduce the need for dewatering and will avoid unnecessary drawdown of the water table outside of the excavations.
- Locally excavated material will be reinstated surrounding the base immediately following construction to allow recovery of any potential groundwater level change as quickly as possible.
- Aggregate will be imported rather than quarried on site

8.5.6.2 Operational Phase

Apart from the general maintenance of the angle masts and polesets there will be few on-site activities during the operational phase.

All watercourse crossings will be planned in consultation with Kilkenny County Council, and in accordance with the necessary guidelines.

The construction of the typical angle mast foundations would be from concrete that is sulphate resistant and appropriate for the site conditions. This would ensure that there will be little corrosion of the typical angle mast bases during the operational phase.

All polesets will be provided pre-treated.

The risk of polluting the local hydrological and hydrogeological regime from the operating equipment is limited. As part of the standard operations procedures, routine monitoring and maintenance will be carried out to minimise these risks to acceptably low levels of likelihood and severity.

Re-fuelling of equipment and the addition of hydraulic oil or lubricants to vehicles/ equipment will take place off site, where possible, and not on-site. If it is not possible to bring machinery off-site to a refuelling point, fuel will be delivered in a double-skinned mobile fuel bowser. A drip tray will be used beneath the fill point during refuelling operations in order to contain any spillages that may occur. Spill-kits and hydrocarbon absorbent packs will be stored in the cabin of each vehicle and operators will be fully trained in the use of this equipment.

All associated hazardous waste residuals will also be appropriately stored prior to removal by a licensed waste management contractor for off-site treatment/recycling/disposal.

8.5.7 UNIT 7 'A NEW 110KV BAY IN THE EXISTING KILKENNY 110KV STATION'

8.5.7.1 Construction Phase

In relation to works at the existing Kilkenny 110kV Substation, the control of site runoff will be critical to minimising the potential for impact from this site. In particular the site drainage works proposed will be developed in the first phase of construction activity and all surface water will be directed to a silt trap or similar.

During the construction phase the mitigation measures have been applied for the following potential impacts:

- Increased Runoff and Sediment Loading
- Contamination of local water courses and groundwater
- Dewatering
- Flood Risk
- Localised alteration of groundwater flow, rate and direction

The mitigation measures will ensure that no sediment contamination, contaminated runoff or untreated wastewater will enter any watercourses during the construction of the proposed substation.

Increased Runoff and Sediment Loading

During the construction phase any drains carrying a high sediment load will be diverted through a silt trap, or similar. The silt trap will be located between the area of construction and the nearest watercourse. Surface water runoff will not be discharged directly to local watercourses.

The following mitigation measures will be adopted:

- A drainage plan has been drawn up and submitted.
- Excavations will remain open for as little time as possible before the placement of fill. This will help to minimise potential for groundwater ingress into excavations.
- Silt traps, such as geotextile membrane, will be placed in the existing drainage network around the substation site and along the proposed access road, if required.
- Weather conditions should be taken into account when planning construction activities to minimise risk of run off from the site.

Contamination of local water courses and groundwater

To minimise any impact on the underlying subsurface strata from material spillages, all oils, solvents, paints and fuels used during construction will be stored within temporary bunded areas and each of these areas will be bunded to a volume of 110% of the capacity of the largest tank/container within it (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.

No concrete batching facility will be required at the site. All concrete will be brought to site by truck. Wet concrete operations adjacent to watercourses will be avoided where possible. A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated storm water to groundwater.

The contractor will be required to make provision for removal of any concrete wash waters, most likely by means of tankering off-site and no such washwaters will be discharged to groundwater.

Any effluent generated by temporary onsite sanitary facilities will be taken off-site for appropriate treatment.

To minimise the vulnerability of groundwater during the removal of the soil and/or subsoil during construction of the proposed substation, all ground works will be completed in an appropriately managed manner. A procedure for managing this activity will be included as part of the Construction & Demolition Waste Management Plan, for the substation. See Section 9.2 Material Assets – Waste.

Some construction works on site may take place in the vicinity of watercourses in the riparian zone. A buffer area will be established to protect the riparian and aquatic zones from disturbance. The buffer area generally extends beyond the riparian zone. The width of a buffer area will be determined by the guidance set out by the Department of the Marine and Natural Recourses [27], which are shown in Table 8.18:

Re-fuelling of construction equipment and the addition of hydraulic oil or lubricants to vehicles/ equipment will take place in designated bunded areas where possible. Re-fuelling will be avoided in so far as possible at the other work sites but where necessary will take place within appropriately bunded areas at a designated distance away from watercourses (>10m). This is in accordance with the buffer zone guidelines (see Table 8.18) be carried out within appropriately bunded areas away from surface water gullies or drains. If it is not possible to bring a machine to the refuelling point, fuel will be delivered in a double-skinned mobile fuel bowser. A drip tray will be used beneath the fill point during refuelling operations in order to contain any spillages that may occur. The vehicles and equipment will not be left unattended during refuelling. Spill kits and hydrocarbon absorbent packs will be stored in the cab of each vehicle and operators will be fully trained in the use of this equipment.

The generation of runoff from stockpiles of soils, excavated during construction, will be prevented by the installation of temporary bunds around the stockpile, and removing the material off-site as soon as possible to designated storage areas.

Guidelines stated at the beginning of this section will be adhered to, thus ensuring that the impact on the water environment during the construction phase of the proposed substation is minimised. In particular, the ESB Construction and Environmental Management Plan, which sets out methods for minimising the environmental risks associated with construction works, will be referred to in the planning of any construction works in the vicinity of watercourses.

Dewatering

Should dewatering be required during excavations it is recommended that a low-permeability barrier be installed around the excavation walls. This will ensure that any potential for drawdown that could affect the water environment is minimised.

Flood Risk

During the construction phase, the works will be programmed and phased so that any blocking of the existing drainage network will be avoided so as to prevent localised flooding.

Measures to prevent localised flooding will be implemented by proper design of the construction works and maintenance of existing drainage within the proposed substation. The surface water drainage system proposed ensures that there is no increase in surface water runoff from the proposed substation, as Greenfield run-off rates will be maintained during operation.

Localised alteration of groundwater flow, rate and direction

The construction at the Kilkenny substation will temporarily change the groundwater regime should excavations extend below the water table and should pumping be required to enable the pouring of concrete. The following mitigation measures will be adopted:

- Time for excavations being open will be minimised as far as possible.
- Lowering of groundwater table, if required, will be mitigated by avoiding unnecessary pumping and dewatering of excavations. Where possible, groundwater exclusion techniques will be used

such as drainage or sheet piling which will reduce the need for dewatering and will avoid unnecessary drawdown of the water table outside of the excavations.
- Locally excavated material will be reinstated surrounding the foundation base immediately following construction to allow recovery of any potential groundwater level change as quickly as possible.
- Aggregate will be imported rather than quarried on site

8.5.7.2 Operational Phase

On site sanitary facilities are available on site. These are fitted with the required proprietary system.

Oil storage and the transformers 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.

Water from this bunded area will be pumped out by an oil sensitive pump ensuring that only non-contaminated water enters the site drainage network. The surface water generated in the bunded areas will discharge via a Class 1 Full Retention Oil Separator.

Re-fuelling of equipment and the addition of hydraulic oil or lubricants to vehicles/ equipment will take place off site, where possible. If it is not possible to bring machinery off-site to a refuelling point, fuel will be delivered in a double-skinned mobile fuel bowser. A drip tray will be used beneath the fill point during refuelling operations in order to contain any spillages that may occur. Spill-kits and hydrocarbon absorbent packs will be stored in the cabin of each vehicle and operators will be fully trained in the use of this equipment.

All associated hazardous waste residuals will also be appropriately stored prior to removal by a licensed waste management contractor for off-site treatment/recycling/disposal.

8.5.8 UNIT 8 'MODIFICATIONS TO EXISTING ATHY-PORTLAOISE 110KV LINE'

8.5.8.1 Construction Phase

In relation to the proposed Modifications to existing Athy-Portlaoise 110kV line, the control of site runoff will be critical to minimising the potential for impact from this route. In particular the site drainage works will be developed in the first phase of construction activity at each poleset/mast location.

The erection of the polesets and angle masts require minimal disturbance to the ground and with good construction practice there will be little risk of sediment loss. Construction activity is also spread out along the line route with a small footprint at each location. Duration on site is expected to be no more than a half day for each poleset and one week for angle mast. A work method statement will be developed and implemented by construction crews for each poleset/angle mast.

During the construction phase the mitigation measures have been applied for the following potential impacts:

- Increased runoff and sediment loading
- Contamination of local water courses and groundwater
- Diversion/Erosion of local watercourses
- Flood Risk
- Localised alteration of groundwater flow, rate and direction

The mitigation measures will ensure that no sediment contamination, contaminated runoff or untreated wastewater will enter any watercourses during the construction of the proposed line route.

Increased Runoff and Sediment Loading

During the construction phase any drains carrying a high sediment load will be diverted through a settlement trap. The settlement trap will be located between the area of construction and the nearest watercourse. A settlement trap works by channelling the runoff specifically to allow any suspended solids to settle before discharge. Types of settlement traps include straw bales, silt fences, settlement ponds and pumps. The settlement traps will be inspected regularly and immediately after heavy rainfall events.

Surface water runoff will not be discharged directly to local watercourses.

The following mitigation measures will be adopted:

- Where tracks are excavated to bedrock/rock the fill material used will have sufficient permeability to allow cross drainage and not provide a barrier to flow
- Excavations will remain open for as little time as possible before the placement of fill. This will help to minimise potential for groundwater ingress into excavations.
- Weather conditions should be taken into account when planning construction activities to minimise risk of run off from the site.

Contamination of local water courses and groundwater

To minimise any impact on the underlying subsurface strata from material spillages, all oils, solvents, paints and fuels used during construction will be stored within temporary bunded areas and each of these areas will be bunded to a volume of 110% of the capacity of the largest tank/container within it (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.

No concrete batching facility will be required at any site works location. All concrete will be brought to site by truck. Wet concrete operations adjacent to watercourses will be avoided where possible. A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated storm water to groundwater. The pouring of concrete for angle mast bases will take place within a designated area using a geosynthetic material to prevent concrete runoff into the soil/groundwater media.

The contractor will be required to make provision for removal of any concrete wash waters, most likely by means of tankering off-site and no such washwaters will be discharged to groundwater.

Any effluent generated by temporary onsite sanitary facilities will be taken off-site for appropriate treatment.

To minimise the vulnerability of groundwater during the removal of the soil and/or subsoil during construction of the proposed substation, all ground works will be completed in an appropriately managed manner. A procedure for managing this activity will be included as part of the Construction & Demolition Waste Management Plan, for the proposed line route. See Section 9.2 Material Assets – Waste.

Some construction works on site may take place in the vicinity of watercourses in the riparian zone. A buffer area will be established to protect the riparian and aquatic zones from disturbance. The buffer area generally extends beyond the riparian zone. The width of a buffer area will be determined by the guidance set out by the Department of the Marine and Natural Recourses [27], which are shown in Table 8.18.

Re-fuelling of construction equipment and the addition of hydraulic oil or lubricants to vehicles/ equipment will take place in designated bunded areas where possible. Re-fuelling will be avoided in so far as possible at the other work sites but where necessary will take place within appropriately bunded areas at a designated distance away from watercourses (>10m). This is in accordance with the buffer zone

guidelines (see Table 8.18) be carried out within appropriately bunded areas away from surface water gullies or drains. If it is not possible to bring a machine to the refuelling point, fuel will be delivered in a double-skinned mobile fuel bowser. A drip tray will be used beneath the fill point during refuelling operations in order to contain any spillages that may occur. The vehicles and equipment will not be left unattended during refuelling. Spill kits and hydrocarbon absorbent packs will be stored in the cab of each vehicle and operators will be fully trained in the use of this equipment.

The generation of runoff from stockpiles of soils, excavated during construction, will be prevented by the installation of temporary bunds around the stockpile, and removing the material off-site as soon as possible to designated storage areas.

The requirement for any in-stream works is minimal however, in the event of any in-stream works taking place during the construction phase the following mitigation measures apply.

- In salmonid catchments, all in-stream works will be carried out during the period May to September. In the event that these waters contain Lamprey the National Parks and Wildlife Service will be contacted for the relevant advice.
- No in-stream works will be carried out without the written approval of the Inland Fisheries Ireland[22]. A method statement will be agreed in advance of works.
- Any machines working in the watercourse will be protected against leakage or spillage of fuels, oils, greases and hydraulic fuels.
- In-stream earthworks will be executed so as to minimise the suspension of solids.

The above measures will in conjunction with the ESB Construction and Environmental Management Plan, submitted by the appointed contractor for review by the IFI, Laois County Council and other relevant consultees.

In relation to the use of creosote oil, the timber poles used will be treated with Creosote to maintain their integrity in use.

Creosote oil is composed of a mixture of hydrocarbons but primarily Polycyclic Aromatic Hydrocarbons (PAHs).

The suppliers of wood-poles will be required to ensure that the moisture content of poles prior to creosote impregnation is between 20% to 25%. At this moisture content, the wood cells are void of water. In addition, a negative back vacuum must be applied to all treated poles at the end of the treating process. This is to ensure that any excess creosote is removed from the pole before it emerges from the treatment cylinder. This leads to a dry pole. The pole remains at the facility for at least 4 weeks before use.

When required, the poles will be transported directly to the work location. All poles will be provided pre-treated.

Guidelines stated at the beginning of this section will be adhered to, thus ensuring that the impact on the water environment during the construction phase of the proposed line route is minimised. In particular, the ESB Networks Construction and Environmental Management Plan, which sets out methods for minimising the environmental risks associated with construction works, will be referred to in the planning of any construction works in the vicinity of watercourses.

Diversion/Erosion of local watercourses

As far as is possible, the temporary access roads will be developed to minimise the number of watercourse crossings. Access roads will be developed only when no other access route can be identified.

If required, culverts beneath the temporary access roads will be located at or close to the locations of natural flow paths to allow existing flows to continue. Lateral drainage will be within shallow geotextile and rock lined ditches to avoid the drainage of surrounding soils.

All watercourse crossings will be planned in consultation with Laois County Council and in accordance with guidelines issued by the IFI and other applicable guidelines.

Any permanent diversions of watercourses will be designed to replicate the existing natural watercourse. The creation of the new watercourse will be carried out in the dry, in isolation from the existing watercourse. Diversion will only take place during the period May to October unless otherwise agreed with the IFI.

To avoid siltation of watercourses from crossing point locations, silt traps will be placed beside temporary crossing points with an associated buffer strip. Silt-traps will be maintained and cleaned regularly during the construction phase.

The above measures will in conjunction with the ESB Construction and Environmental Management Plan.

Flood Risk

During the entire construction phase, the works will be programmed and phased so that any blocking of the existing drainage network will be avoided so as to prevent localised flooding.

Measures to prevent localised flooding will be implemented by proper design of the construction works and maintenance of existing drainage within the proposed substation.

Localised alteration of groundwater flow, rate and direction

The construction of angle mast and poleset bases will temporarily change the groundwater regime should excavations extend below the water table and should pumping be required to enable the pouring of concrete. The following mitigation measures will be adopted:

- Machinery will be operated from access tracks, where possible.
- Time for excavations being open will be minimised as far as possible.
- Lowering of groundwater table, if required, will be mitigated by avoiding unnecessary pumping and dewatering of excavations. Where possible, groundwater exclusion techniques will be used such as drainage or sheet piling which will reduce the need for dewatering and will avoid unnecessary drawdown of the water table outside of the excavations.
- Locally excavated material will be reinstated surrounding the base immediately following construction to allow recovery of any potential groundwater level change as quickly as possible.
- Aggregate will be imported rather than quarried on site.

8.5.8.2 Operational Phase

Apart from the general maintenance of the angle masts and polesets there will be few on-site activities during the operational phase.

All watercourse crossings will be planned in consultation with Laois County Council and in accordance with the necessary guidelines.

The construction of the typical angle mast foundations would be from concrete that is sulphate resistant and appropriate for the site conditions. This would ensure that there will be little corrosion of the typical angle mast bases during the operational phase.

All poles will be provided pre-treated.

The risk of polluting the local hydrological and hydrogeological regime from the operating equipment is limited. As part of the standard operations procedures, routine monitoring and maintenance will be carried out to minimise these risks to acceptably low levels of likelihood and severity.

Re-fuelling of equipment and the addition of hydraulic oil or lubricants to vehicles/ equipment will take place off site, where possible, and not on-site. If it is not possible to bring machinery off-site to a refuelling point, fuel will be delivered in a double-skinned mobile fuel bowser. A drip tray will be used beneath the fill point during refuelling operations in order to contain any spillages that may occur. Spill-kits and hydrocarbon absorbent packs will be stored in the cabin of each vehicle and operators will be fully trained in the use of this equipment.

All associated hazardous waste residuals will also be appropriately stored prior to removal by a licensed waste management contractor for off-site treatment/recycling/disposal.

8.6 RESIDUAL IMPACT

This section describes the predicted impact of the proposed development following the implementation of the mitigation measures.

8.6.1 CONSTRUCTION PHASE

The implementation of the construction phase remedial and mitigation measures highlighted in Section 8.5 will ensure that the water environment is not adversely impacted during normal and/or emergency conditions in the construction phase and that the impact will be ***Short Term - Imperceptible.***

8.6.2 OPERATIONAL PHASE

The implementation of the operational phase remedial and mitigation measures highlighted in Section 8.5 and ESB's Construction and Environmental Management Plan will ensure that the water environment is not adversely impacted during normal and/or emergency conditions in the operational phase and that the impact will be ***Long Term - Imperceptible.***

8.6.3 MONITORING

Monitoring during the Construction Phase will consist of the following:-

- Normal quality control inspection of the works
- Adherence to the Construction and Environmental Management Plan
- All excavations will be visually assessed for signs of possible contamination such as staining or strong odours.
- All silt traps and settlement ponds will be inspected regularly and in particular after heavy rainfall events to ensure that they are not blocked or overflowing and to carry out regular maintenance

8.6.4 REINSTATEMENT

Reinstatement at completion of the works will involve restoring areas to their original condition, where practical, leaving the area in a neat and clean condition, removing all deleterious materials that may have been deposited during construction works. Generally this work is carried in accordance with the relevant IFI and Irish Farming Association (IFA) agreements and in consultation with the individual landowner.