

# Lower Shannon Sedimentation

Constraints Report

April 2024

Project number: 2022s0491

Office of Public Works

Final

A large, abstract geometric pattern in the bottom right corner of the page. It consists of several overlapping triangular and quadrilateral shapes. The primary colors are light blue and lime green. The pattern is created using parallel lines of varying thicknesses, some solid and some forming a grid or cross-hatch effect.

# JBA Project Manager

Michael O'Donoghue  
24 Grove Island  
Corbally  
Limerick  
Ireland

## Revision History

Revision Ref / Date Issued	Amendments	Issued to
S3-P01/ 24.08.23	Draft Report	OPW
S3-P02/ 29.09.23	Draft Report	OPW
S3-P03/ 17.10.23	Draft Report	OPW
S3-P04/ 06.02.24	Draft Report	OPW
S3-P05/ 26.03.24	Draft Report	OPW
S4-C01/ 17.04.24	Draft Report	OPW

## Contract

This report describes work commissioned by the Office of Public Works (OPW) as part of the Lower Shannon Feasibility Works.

Prepared by ..... Jemima Kivikoski BSc (Hons)  
Assistant Environmental Analyst

Mark Desmond BSc MSc  
Ecologist

Conor O'Neill B.A. (Mod) M.Sc. Adv. Dip.  
Project Environmental Scientist

Reviewed by ..... Patricia Byrne BSc PhD Dip  
Principal Environmental Scientist

## Purpose

This document has been prepared as a Draft Report for OPW ('the Client'). JBA Consulting accepts no responsibility or liability for any use that is made of this document other than by the Client for the purposes for which it was originally commissioned and prepared.

JBA Consulting has no liability regarding the use of this report except to OPW.

## Copyright

© JBA Consulting Engineers and Scientists Limited 2024

## Carbon Footprint

A printed copy of the main text in this document will result in a carbon footprint of 115g if 100% post-consumer recycled paper is used and 147g if primary-source paper is used. These figures assume the report is printed in black and white on A4 paper and in duplex.

JBA is aiming to reduce its per capita carbon emissions.

# Contents

1	Introduction .....	1
2	Environmental Constraints.....	2
2.1	Methodology.....	2
2.2	Status.....	3
3	Population and Human Health.....	4
3.1	Development Plans and Development Pressures .....	4
3.2	Community Facilities .....	7
3.3	Recreational Amenities .....	7
3.4	Potential Constraints .....	8
4	Material Assets (Utilities, Traffic, and Waste).....	10
4.1	Road Network .....	10
4.2	Utilities .....	10
4.3	Waste Management .....	11
4.4	Mineral Deposits .....	13
4.5	Potential Constraints .....	19
5	Waterbodies.....	20
5.1	WFD Compliance.....	20
5.2	Surface Water .....	20
5.3	Groundwater .....	25
5.4	Aquifers .....	26
5.5	Aquifer Vulnerability .....	27
5.6	River Basin Management Plan 2022-2027.....	28
5.7	WFD Areas for Action .....	28
5.8	Arterial Drainage .....	28
5.9	Potential Constraints .....	28
6	Biodiversity .....	30
6.1	Sites of Conservation Concern.....	30
6.2	Other Important Habitats .....	44
6.3	Protected Species .....	44
6.4	Invasive non-native species .....	47
6.5	Potential Constraints .....	47
7	Soils and Geology.....	49
7.1	Geological Bedrock.....	49
7.2	Geological Heritage Sites.....	51
7.3	Soils and Subsoils.....	52
7.4	Contaminated Land.....	55
7.5	Potential Constraints .....	55
8	Landscape and Visual Amenity .....	56
8.1	Visually Sensitive Receptors .....	56
8.2	Landscape Receptors .....	56
8.3	Potential Constraints .....	57
9	Cultural Heritage .....	58
9.1	Archaeological Heritage .....	58
9.2	Architectural Heritage.....	58
9.3	Undesignated Sites .....	58
9.4	Potential Constraints .....	58
10	Air, Noise, and Climate .....	59
10.1	Air Monitoring Sites .....	59
10.2	Noise Pollution .....	59
10.3	Climate.....	59
10.4	Potential Constraints .....	59

# Contents

11      References ..... 60

## List of Figures

Figure 2.1: Constraints Study Area .....	3
Figure 3.1: Towns and settlements in the study area.....	7
Figure 3.2 Land use (Corine 18) within the study area. ....	9
Figure 3.3 Distribution of land use types over the study area. ....	9
Figure 4.1: Major road and rail infrastructure .....	10
Figure 4.2 EPA Licensed Facilities, WWTP and discharge locations within the study area .....	12
Figure 4.3: Active quarries in the study area .....	13
Figure 5.1: The Lower Shannon Catchment and sub catchments relevant to the study area. .....	22
Figure 5.2: WFD river waterbodies within the scope of the study. ....	23
Figure 5.3: WFD ecological status of river network in the study area. ....	24
Figure 5.4: Groundwater bodies within the scope of the study .....	26
Figure 5.5 Aquifer classification.....	27
Figure 5.6 Groundwater vulnerability.....	28
Figure 6.1: Special Areas of Conservation (SACs) within Study Area .....	30
Figure 6.2: Special Protection areas found within the study area. ....	35
Figure 6.3: NHAs and pNHAs found within the study area. ....	38
Figure 7.1: Bedrock geology and fault lines .....	51
Figure 7.2: Subsoil distribution .....	54
Figure 7.3 Subsoil permeability .....	55
Figure 8.1: Scenic routes and national trails falling within the study scope .....	56
Figure 8.2 Landscape characters within the study area .....	57
Figure 9.1 NMS and NIAH sites in the study area.....	58

## List of Tables

Table 3-1 Settlement categories, population ranges and groupings for map illustration ...	4
Table 4-1 Wastewater Treatment Plants in the study area .....	11
Table 4-2 IPPC Licensed Facilities.....	11
Table 4-3 Minerals, locations and description .....	14
Table 5-1 Sub catchments, associated river waterbodies and their WFD risk status. ....	20
Table 5-2 Groundwater waterbodies, area included in the study are, total area of waterbody, WFD status and WFD risk. ....	25
Table 6-1: List of Special Areas of Conservation (SACs) found with the study area. ....	31
Table 6-2 List of Special Protection Areas (SPAs) found with the study area. ....	36
Table 6-3: List of Natural Heritage Areas (NHAs) within the study area .....	39
Table 6-4: List of potential Natural Heritage Areas (pNHAs) within the study area .....	40
Table 7-1 Bedrock geology and percentage of total study area.....	49
Table 7-2: Geological Heritage Sites .....	51

Table 7-3: Subsoils and their relative percentage over the study area ..... 52

## Abbreviations

AA -	Appropriate Assessment
CEMP -	Construction Environmental Management Plan
EIAR -	Environmental Impact Assessment Report
LAP -	Local Area Plan
LCCC -	Limerick City and County Council
NIAH -	National Inventory of Architectural Heritage
NMS -	National Monuments Service
QI -	Qualifying Interest
SFRA -	Strategic Flood Risk Assessment
WFD -	Water Framework Directive

# 1 Introduction

JBA Consulting was commissioned by the Office of Public Works (OPW) on behalf of the Shannon Flood Risk State Agency Co-ordination Working Group to prepare a Constraints Report for any feasible sedimentation management options on the River Mulkear and Lower Shannon reach as identified in the Study Area (See Figure 2.1 below).

Both the Lower Shannon, the Mulkear and the confluence of both have large deposits of fluvial borne sediment. The objective of this project is to *identify feasible options for the management of sediment and vegetation to prevent further reduction in, and if possible, increase, conveyance and/or channel capacity of the Old Shannon between Clareville Water Treatment Plant and St Thomas Island*. As part of this feasibility exercise, it is required to identify opportunities to bring wider environmental, water quality and amenity benefits to the Study Area.

This Constraints Study is the first step in determining both the viability of any potential options, as well as informing on the quantum of opportunity that might be possible as part of the project. This report determines what constraints (physical, procedural, legal, environmental, etc.) need to be considered when considering the viability of potential options for any proposed sediment management within the Study Area.

No measures or options have currently been considered. However, given the objective of assessing sediment accumulations within both the Mulkear and the lower Shannon, the constraints have been considered in the context of significant in-stream works and riverside works (sediment removal, geometric realignment of bank profiles, encouragement of flood plain connectivity). These represent the most intrusive of interventions that will be considered as part of the optioneering assessment.

The findings of the Constraints Study will help the engineers and environmental specialists to design and fully assess all options, either providing limitations or identifying opportunities to enhance existing habitats or amenities.

## 2 Environmental Constraints

The following sections address the constraints, designations, and features in relation to:

- Section 3 - Population and Human Health
- Section 4 - Material Assets
- Section 5 - Watercourses
- Section 6 - Biodiversity
- Section 7 - Soils and Geology
- Section 8 - Landscape and Visual Amenity
- Section 9 - Archaeology and Cultural Heritage
- Section 10 - Air and Noise.

Each section evaluates the baseline for a variety of environmental aspects and contains the following information:

- Existing environment within the Study Area for the Environmental Aspect
- Potential constraints, designations, and features.

While the Constraints Study is not a statutory document, we have used the EPA's Guidelines on the Preparation of Environmental Impact Assessments as a template for our study (EPA, 2022).

### 2.1 Methodology

The information necessary to identify existing conditions in the study area has been gathered from:

- Desktop studies of existing and historical information; and
- Site surveys: note that surveys will continue throughout the works duration when and where required, as dictated by relevant legislation, guidance documents, and recommendations from specialist advisors on the project. The Constraints Report will be updated where necessary to reflect survey results as they become available.
- The Study Area for this Constraints Report is the Mulkear Catchment and a section of the Lower Shannon, shown below in Figure 2.1. As the project develops and more certainty is available on where works will take place, the study area for constraints can be further narrowed down.



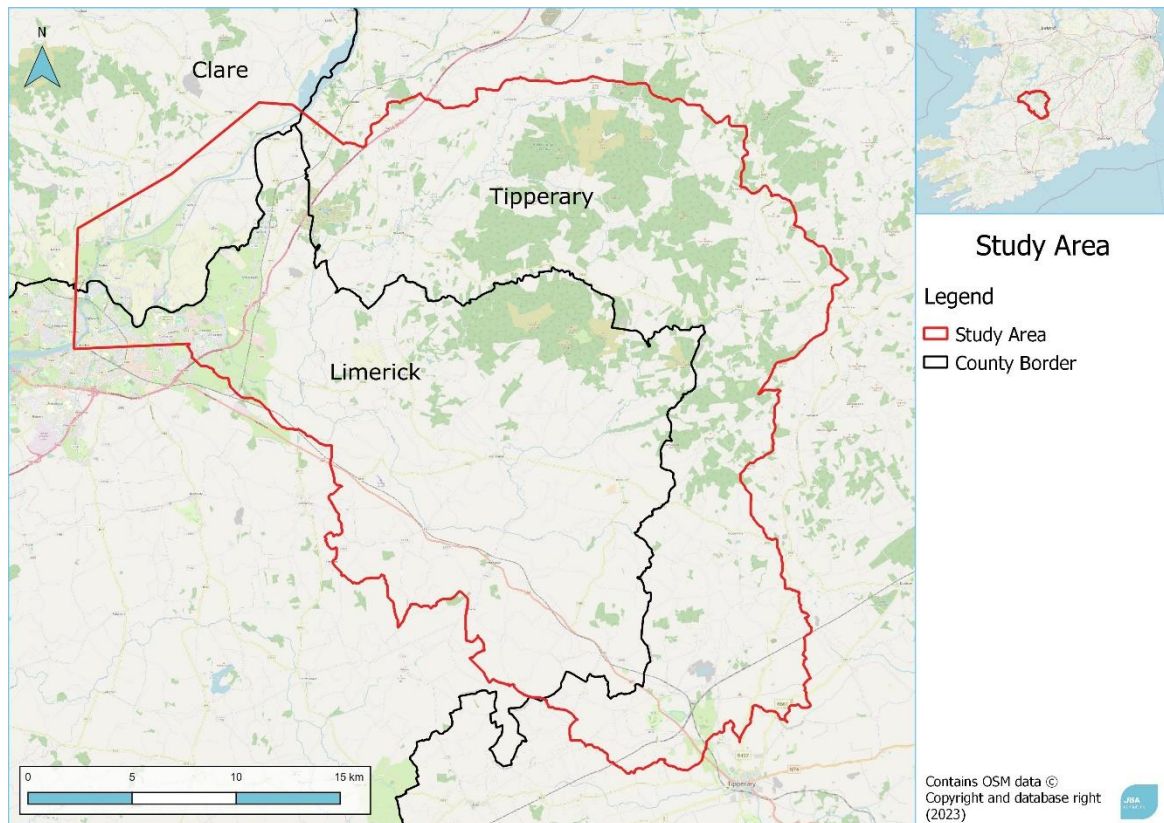


Figure 2.1: Constraints Study Area

## 2.2 Status

The Constraints Report will be used as a baseline document to inform the viability of options in the context of ecological and environmental impacts and opportunities.

When options have been developed, further studies and assessments may be required in order to progress through any planning or detailed design stages.

These further assessments will be identified as part of the Options Report and are likely to include the need for Screening for Appropriate Assessment and Environmental Impact Assessment Screening.

## 3 Population and Human Health

### 3.1 Development Plans and Development Pressures

The study area encompasses an extensive area of approximately 74695ha extending from east Limerick across the county border into western parts of northern and southern Tipperary and southeastern parts of Clare. Therefore, the Limerick, Tipperary, and Clare County Development Plans will be relevant in assessing the constraints of the study area.

Limerick City lies just outside of the study area to the east and Tipperary town lies just south of the study area. The N24 connects Tipperary town to Limerick City and runs through the study area from the south exiting at the western boundary. The M7 runs through northwestern parts of the study area and connects Limerick City to Nenagh and Portlaoise both outside of the study area to the northeast. Limerick Junction is situated north of Tipperary town within the southern boundary of the study area. It is an important confluence of the Limerick-Waterford and Dublin-Cork rail services.

Generally, the area is rural, mixed landscape of agricultural lowlands and plains, uplands and mountains, forests, foothills, peatlands and fens across both counties. Lough Derg is located north of the study area and the Shannon Estuary lies to the west.

Several national walking trails fall within the boundary including the Slieve Felim Way and Keeper Hill summit walk, The Glenstal Woods loop, The Clare Glens loop, The Multeen Way and The Kilcommon Pilgrim Loop, trails within the University of Limerick (UL) and the active travel route along the Shannon, in addition to a number of scenic routes see Chapter 8.

Each county has established and growing tourism sectors afforded from the beautiful native landscape and natural features. Each CDP includes chapters outlining objectives for the protection, promotion and development of new and existing green and blue infrastructure.

Communities residing in the scope of the study are predominantly rural. Each CDP has categorised settlements based on several criteria including population size and number of services. Tipperary has defined four categories; Local Towns, Service Centres, Local Service Centres and Settlement nodes. Limerick has defined six categories; Limerick City and Suburbs, Key Towns, Towns, Large Villages, Small Villages and Rural Clusters. Clare has also defined six categories in the settlement hierarchy; Key Towns, Service Towns, Small Towns, Large Villages, Small Villages, and Clusters. These categories are not equivalent to each other and so for illustrative purposes, some categories have been grouped together.

Table 3-1 Settlement categories, population ranges and groupings for map illustration

Map Legend Population	CDP Category (County)	Towns	CDP Ranges	Population
>2500	City Suburb (L)	Annacotty	>2500	
	Large Village (C)	Athlunkard		
>1500	Local Town (T)	Newport	>1500	
<1500	Large Village (L)	Cappamore	500 - 1400	
		Doon		
		Murroe		
		Pallagreen		
	Town (L)	Castleconnell		
	Large Village (C)	Parteen		
		Clonlara		
	Small Village (C)	Ardnacrusha		
<500	Small Village (L)	Nicker	150 - 500	
		Oola		
	Service Centre (T)	Cappawhite	<400	

		Limerick Junction	
	Small Village (C)	O'Briensbridge	
<150	Rural Cluster (L)	Caherline	<150
		Old Pallas	
	Local Service Centre (T)	Cullen	50 - 100
		Donohill	
		Monard	
		Rearcross	
<50	Settlement Node (T)	Ballinahinch	<50
		Kilcommon	
		Killoscully	
		Solohead	
		Toem	

### 3.1.1 Tipperary County Development Plan

Volume 2 of the Tipperary CDP outlines specific objectives regarding settlement plans, development constraints and zoning maps. Settlement areas identified in the Tipperary County Development Plan 2022-2028 that fall within the study area are expected to see an increase in residential and urban development and subsequently an increased population density over the life of the Plan.

Newport in Co. Tipperary has been identified as an important local town. Situated in the southwestern foothills of Keeper Hill with Slieve Felim mountains and Silvermines to the east, Lough Derg to the north and Clare Glens to the South there is significant tourism potential which is projected to offer employment opportunities and increase economic growth for the town. It is within the zone of influence of Limerick City and has experienced a population growth of 128% between 1996 - 2016.

Cappawhite is a designated Service Centre situated in the foothills of the Slieve Felim Mountains and at the head to the Multeen Way trail. It has experienced population growth and decline between 2006-2016 with a net increase of 5.5%. It is identified as another important opportunity to enhance and foster tourism in the area and develop services to support residents and the local community.

The following areas have also been recognized as Service Centres, Local Service Centres and Settlement nodes, respectively; Limerick Junction, Cullen, Donohill, Monard, Rearcross, Ballinahinch, Kilcommon, Killoscully, Solohead and Toem.

Newport is the only settlement within the study area included in the Strategic Flood Risk Assessment of the CDP. The protective measures currently in place pertain to the Ballymakeogh (Newport) Flood Relief Scheme and the Shannon Upper and Lower River Basin (UOM25- 26) Flood Risk Management Plan. There are no new major works planned under these schemes for Newport. Future measures will involve ongoing maintenance.

Chapter 8 of the CDP addresses objectives regarding Enterprise and Rural Development and Chapter 11 of the CDP deals with environmental objectives and natural assets.

### 3.1.2 Limerick County Development Plan

The Limerick County Development Plan has selected a number of suburbs, large villages and rural clusters for future residential and economic development. The Annacotty suburb lies just within the northwestern border of the study area and several areas have been zoned for new residential developments. Larger villages within the study area include Cappamore, Doon, Murroe and Pallasgreen. In addition, small villages of Nicker and Oola also lie within the boundary and rural clusters of Caherline and Old Pallas lie along the study area boundary within Limerick. A key aim of the CDP is improved connectivity between communities.

A Strategic Flood Risk Assessment was undertaken as part of the CDP 2022-2028. Policies bearing relevance to this study include:

- Catchment Flood Risk Assessment and Management Studies;
- Green Infrastructure;
- Maintenance of rivers.

All settlement areas mentioned above are included in the Limerick CDP SFRA apart from Murroe. Northern, western and eastern parts of Annacotty fall within Flood Zones A and B and are zoned accordingly. Similarly, southern and eastern parts of Pallasgreen lie within Flood Zones A and B and are zoned for Open Space and Recreation which is unlikely to change. The extent of Flood Zones A and B across Cappamore and Doon are minimal and land use zoning is in line with Flood Zones.

Limerick has outlined many housing objectives in Chapter 4 of the CDP. In particular they have emphasised the desire to stem the decline in rural populations and support development in rural communities. Therefore, population growth and density in rural areas is likely to grow over the course of the proposed scheme.

### 3.1.3 Clare County Development Plan

Volume 3b of the Clare CDP identifies and outlines objectives regarding settlements located within the Shannon Municipal District which includes the Limerick-Shannon Metropolitan Area. Each of the five settlements included within the study area are part of the Limerick-Shannon Metropolitan Area. Athlunkard, Clonlara and Parteen are defined as Large Villages while Ardnacrusha and O'Briensbridge are defined as Small Villages.

The projected population for the Limerick-Shannon Metropolitan Area in 2026 is estimated at 159,136, an increase of over 20% within a ten-year period. Population growth and the required infrastructure, such as adequate wastewater treatment plants, to meet the increased demand have been highlighted in the CDP.

A SFRA was conducted which is discussed in Volume 10c of the CDP. All five settlements in County Clare within the study area have been identified as lying partly within Flood Zones A and B. Zoning objectives for each settlement reflect the flooding risk.

Ardnacrusha Hydroelectric Power Station lies within the northwestern boundary of the study area. It currently provides electricity to over 46,000 homes. Development Plan Objective CDP2.22 declares the Council's objective to increase the power input into the National Energy Grid through support of the existing infrastructure.



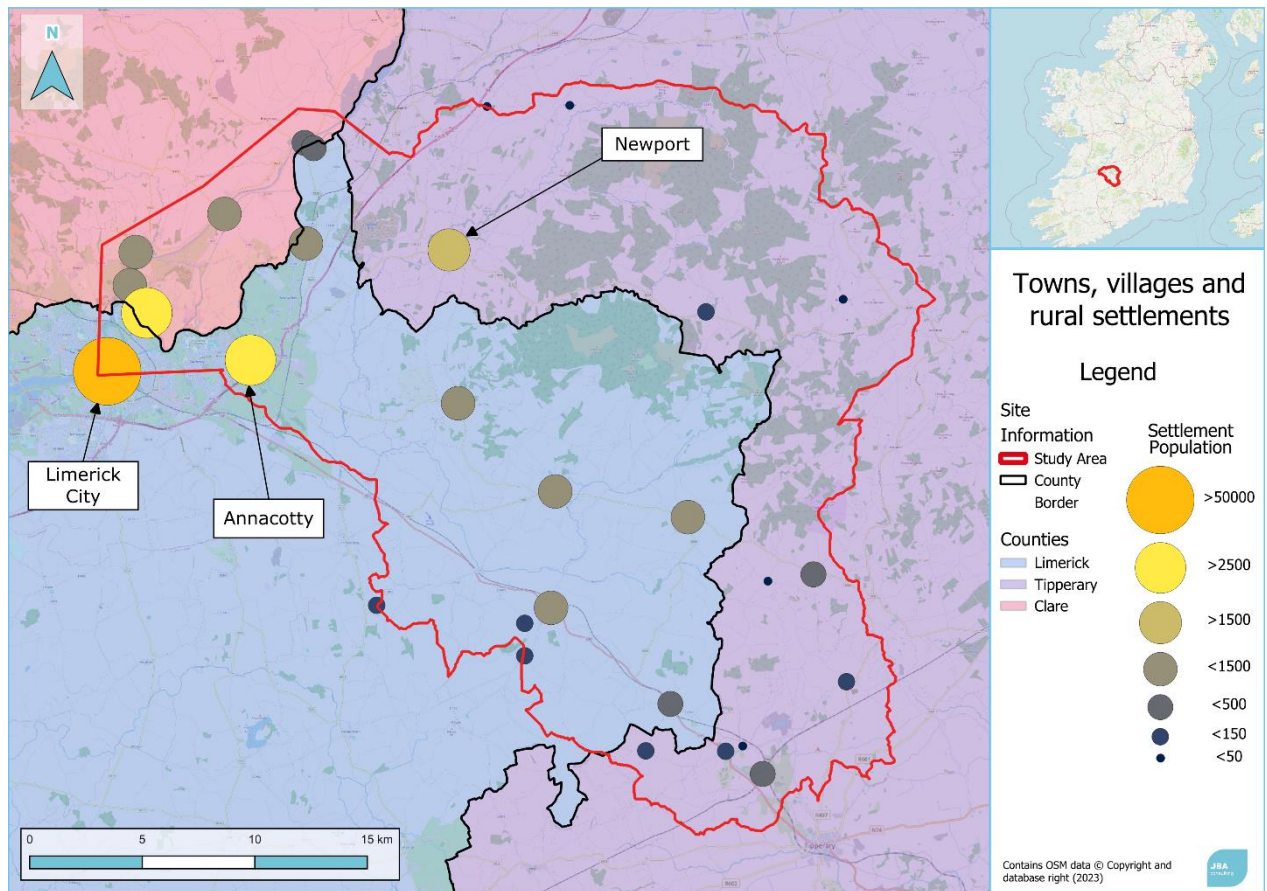


Figure 3.1: Towns and settlements in the study area

### 3.2 Community Facilities

Community facilities located within the identified towns, villages, and rural clusters include:

- A racecourse, golf club and hotel;
- University of Limerick;
- Community centres;
- GAA, rugby, soccer and handball playing fields and clubs;
- Primary and Secondary schools;
- Churches and convents;
- Graveyards;
- Garda and fire stations;
- Hotels and B&Bs;
- Post offices;
- Public houses;
- Shops;
- Parks.

Specific details on these facilities will be gathered when more detail on the proposed work sites is known. The presence of these and the need to maintain access for community use may pose a constraint.

### 3.3 Recreational Amenities

The department of Tourism, Transport and Sport published its 'Strategy for the Future Development of National and Regional Greenways and Blueways' in 2018, which recognises the potential of greenways and blueways and associated outdoor activities to foster overseas tourism. This will additionally benefit local areas economically.

Investment and development into these valuable assets and collaboration across local authorities and relevant stakeholders will accomplish aims set out in the strategy. The Strategy has informed both Limerick and Tipperary's CDPs.

### 3.3.1 Tipperary

The Tipperary County Council was a partner in the EU INTERREG Europe 'SWARE' (Sustainable Heritage Management of Waterways Regions) project. The TCC has outlined plans to protect and promote a number of national trails falling within their jurisdiction, seven of which fall within the study area.

The Newport Enhancement Plan aims to attract new business and tourism. Lands along the Limerick road have been zoned for development. Newport boasts a rich cultural heritage with history dating back to the 19th century. Main Street and the town square are both ACA (Architectural Conservation Areas) sites. The Mulkear and Cully rivers provide an important natural amenity and the 'Riverside Area' is a recognised opportunity to develop and benefit the town.

### 3.3.2 Limerick

Greenways and blueways identified in the Limerick CDP do not fall within the study area.

## 3.4 Potential Constraints

Agricultural land use is the most prevalent within the study area, see Figure 3.2 and Figure 3.3. Certain agricultural and forestry activities may be exempted from planning permission and are classified as exempted developments. The criterion for such developments is outlined in Schedule 2 Part 3 Article 6 of the Planning and Development Regulations, 2001. These include:

- Class 11 - Development consisting of the carrying out, on land which is used only for the purpose of agriculture or forestry, of any of the following works-
  - (a) field drainage,
  - (b) land reclamation,
  - (c) the removal of fences,
  - (d) the improvement of existing fences,
  - (e) the improvement of hill grazing, or
  - (f) the reclamation of estuarine marsh land or of callows, where the preservation of such land or callows is not an objective of a development plan for the area.
- Class 14 - The use of uncultivated land or semi-natural areas for intensive agricultural purposes-
  - The area involved shall be less than 100 hectares.
- Class 15 - Afforestation - initial afforestation.
- Class 16 - Replacement of broadleaf forest by conifer species-
  - The area involved shall be less than 10 hectares.

These activities could take place within the study area and measures and options may be constrained by landowner consent and cooperation.

Forestry makes up the second largest land use type in the study area. Concentrated in the uplands of Keeper Hill and Silvermines in Tipperary and Slieve Felim in eastern Limerick are many commercial and privately owned plantations at various stages (clear fell, afforestation and thinning). Clearfell and thinning dominate in the study area (<https://flv.apps.services.agriculture.gov.ie/#>). The fluvial audit conducted by JBA Consulting identified headwaters of rivers in the catchment located in the uplands as the main sources of fine and coarse sediment which is then transported through the catchment and deposited in rivers located in the low-lying plains. Forest landowner consent and cooperation may also be a constraint for the options for this scheme.

'Our Rural Future: A Rural Development Policy' 2021-2025 (DRCD, 2021) outlines aims to enhance and develop rural communities. Given the study area covers a relatively rural environment, objectives and actions from this policy may impose constraints to potential measures in the future.

Specific sectors such as agriculture, forestry and extractive industries are acknowledged in both county CDPs both of which express the objectives to develop these industries so as to benefit the population economically while doing so in an environmental manner. Development and increase of these industries may impose constraints on the works. Tourism seasons may also need to be taken into account when devising the options for this scheme.

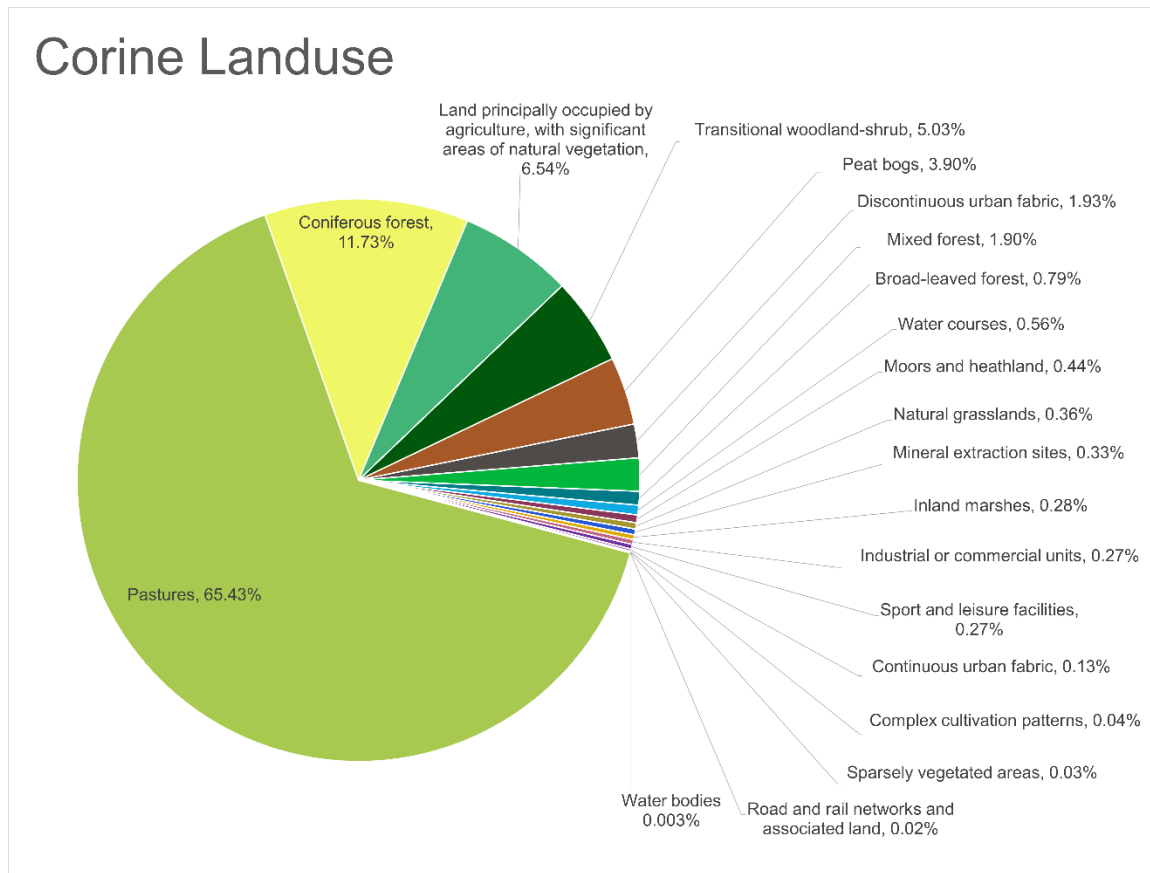


Figure 3.2 Land use (Corine 18) within the study area.

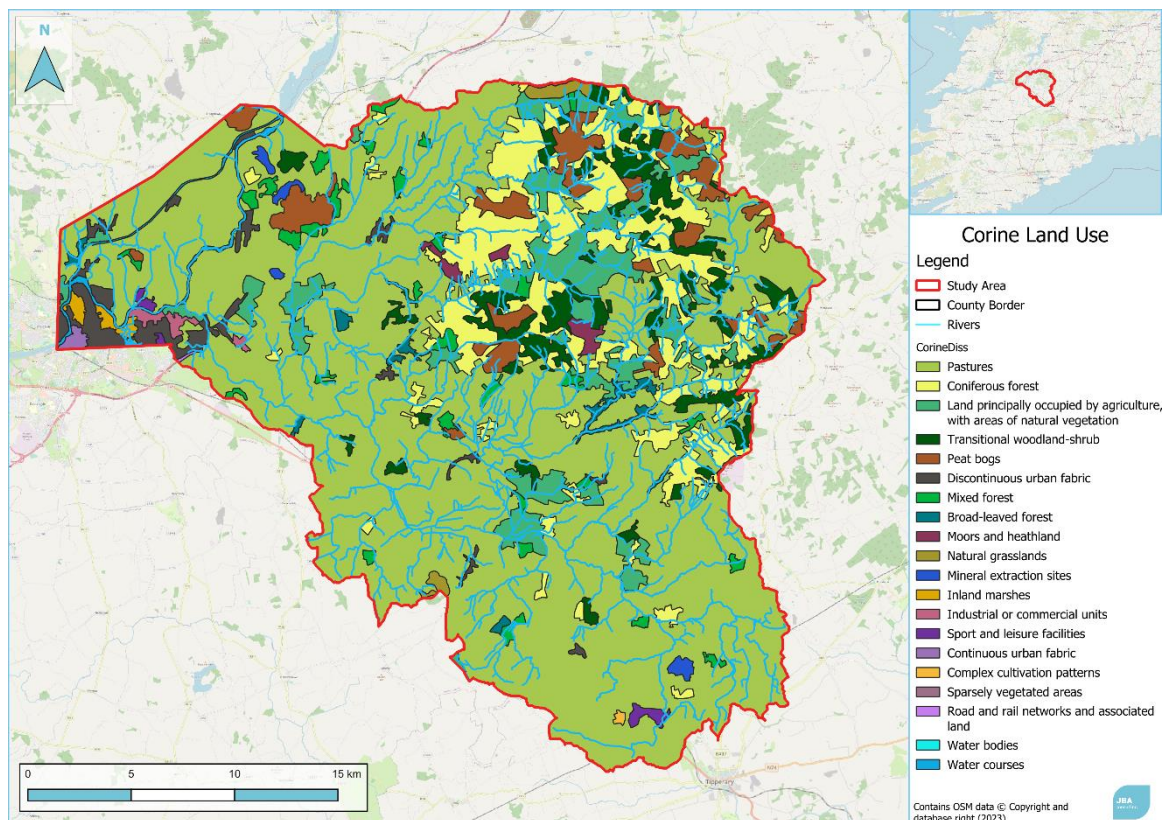


Figure 3.3 Distribution of land use types over the study area.



## 4 Material Assets (Utilities, Traffic, and Waste)

### 4.1 Road Network

The majority of the road network across the study area is small local and tertiary roads. The M7 runs through the northern and northwestern parts of the study area where it becomes the Limerick Southern Ring Road encompassing Limerick city and suburbs. The N24 connects Tipperary town with Limerick City, also providing an important connection for Pallasgreen and Oola which are situated along its route. It enters the study area to the south and exits west of Cappamore.

Newport is serviced by the R503 which runs along the county borders north of Slieve Felim and south of Keeper Hill. Several rural roads link the Kilcommon settlement to the R503 and R497. The R505 runs through the county border connecting Cappawhite in Co. Tipperary to Doon and Cappamore in Co. Limerick. It forks west of Cappamore into the R506 which services Murroe. Bus route 391 (Limerick - Thurles) operates along the stretch of R503 across the study area and route 855 (Limerick Junction - Bohercrowe) operates along a small stretch of N24 from Limerick Junction before exiting the study area to the south towards Tipperary town.

Other TFI Local link bus services serve the following areas in Tipperary only:

- Newport;
- Rearcross;
- Kilcommon;
- Cappawhite;
- Limerick Junction.

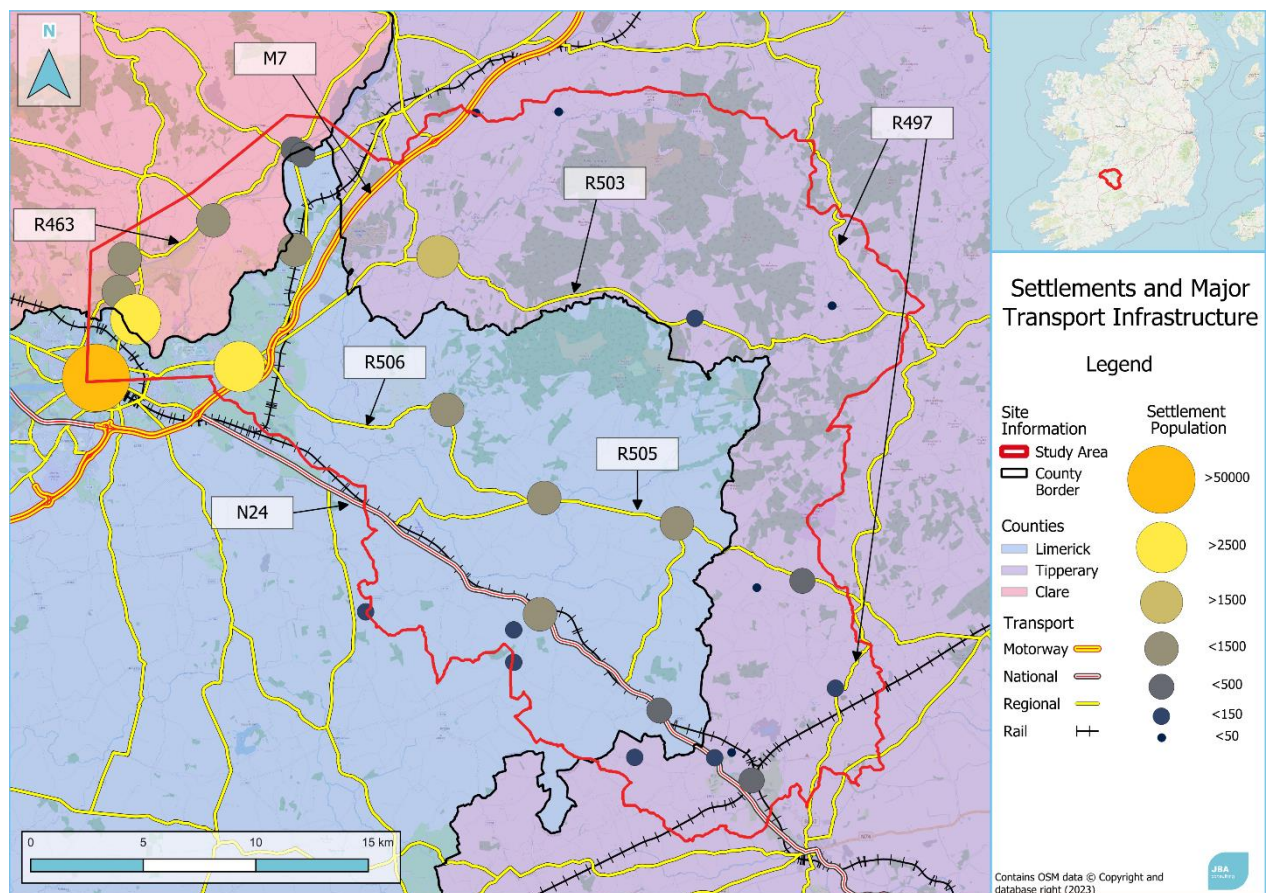


Figure 4.1: Major road and rail infrastructure

### 4.2 Utilities

Drinking and foul water supply networks are likely to be present across the study area considering the number of Wastewater Treatment Plants located within the area, all of which are operated by Irish Water (see Section 4.3).



Electricity and phone lines are likely to be present throughout the study area also, details of which will be obtained from relevant authorities and service providers when and if appropriate during the course of the constraints study. A wind farm is located at Cappawhite, operated by Cappawhite Wind Ltd, a subsidiary of ESB.

### 4.3 Waste Management

The following wastewater treatment plants and emission points are within the study area.

Table 4-1 Wastewater Treatment Plants in the study area

	Name	Local Auth	Licence	PE capacity (actual)	Notes
Tipperary	Rearcross	Irish Water	A0180-01	<500 (205)	Secondary treatment
	Cappawhite	Irish Water	D0440-01	500-1000 (445)	Tertiary P removal
	Monard	Irish Water	A0508-01	<500 (24)	Primary treatment
	Donohill	Irish Water	A0514-01	<500 (33)	Secondary treatment
	Newport	Irish Water	D0325-01	2001-10,000 (2440)	Secondary treatment
	Limerick Junction	Irish Water	D0457-01	500-1000 (175)	Secondary treatment
	Cullen	Irish Water	A0417-01	<500 (125)	Secondary treatment
Limerick	Murroe	Irish Water	D0306-01	1001-2000 (1502)	Secondary treatment
	Doon	Irish Water	D0309	1001-2000 (683)	Tertiary P removal
	Cappamore	Irish Water	D0310-01	1001-2000 (692)	Tertiary P removal
	Pallasgreen	Irish Water	D0503-01	500-1000 (502)	Tertiary P removal
	Oola	Irish Water	D0505-01	500-1000 (374)	Tertiary P removal
	Castletroy	Irish Water	D0019-01	> 10,000 (37928)	Tertiary P removal
	Brookhaven, Montpelier	Irish Water	A0499-01	<500 (49)	Primary treatment

Table 4-2 IPPC Licensed Facilities

Name	Licence	Address	Notes
Spaight Timber Preservatives Limited	P0331-01	Monard, Tipperary	Treatment or protection of wood involving the use of preservatives, with a capacity exceeding 10 tonnes per day.  Debarking, kiln drying of fencing wood, post pointing, pole dressing, preservation (creosote and tanalith).
Marrow Meats Limited	P0042-02	Dromkeen, Limerick	Wastewater treated in-house and discharged to Mulcair River.

Info-Lab Limited	P0141-03	Annacotty Industrial Estate, Limerick	The manufacture or use of coating materials, predominantly varnishes and inks, in processes with a capacity to make or use at least 10 tonnes per year of organic solvents.
Cook Ireland Ltd	P0973-01	National Technology Park, Limerick	The manufacture or use of coating materials in processes with a capacity to make or use at least 10 tonnes per year of organic solvents.  Coating of metal and plastic stents for medical use.
Johnson & Johnson Vision Care (Ireland) Limited trading as Vistakon Ireland	P0818-02	National Technology Park, Plassey, Limerick	The development, manufacture and distribution of a range of soft, disposable contact lenses.

There is a landfill at Donohill, licence no. W0074-03. The total capacity of waste over life of facility specified in the licence is 200,000 m<sup>3</sup>. Waste handled at this facility appears to predominantly be non-hazardous.

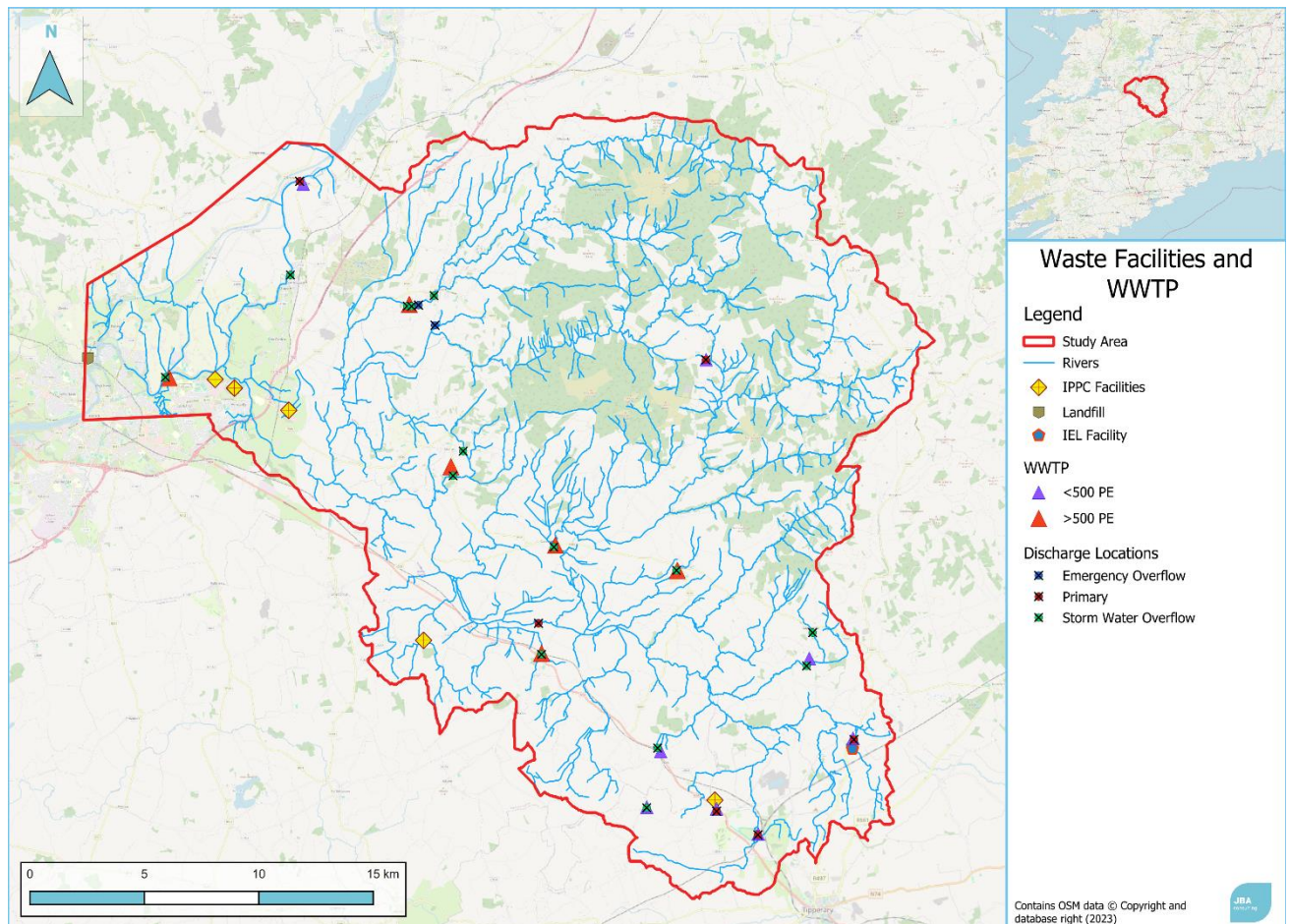


Figure 4.2 EPA Licensed Facilities, WWTP and discharge locations within the study area

#### 4.3.1 Seveso/COMAH Sites

Grassland Agro, an industrial fertilizer plant, is located on the southwestern outskirts of Limerick City. It is an upper tier notified Seveso Establishment. South of Grassland Agro is Analog Devices (wafer fabrication) which is a lower tier Seveso Establishment. Neither lie within the study area.

[https://www.hsa.ie/eng/your\\_industry/chemicals/legislation\\_enforcement/comah/list\\_of\\_establishments/](https://www.hsa.ie/eng/your_industry/chemicals/legislation_enforcement/comah/list_of_establishments/)

#### 4.4 Mineral Deposits

There is a diversity of minerals present across the study area with higher concentrations located around Keeper Hill and Silvermines in Tipperary.

Four quarries are marked as active by the GSI (Figure 4.3); Toor Pit and Gortdrum in Co. Tipperary, and Eyon Cross Quarry and Gooig Pit in Co. Limerick. Neither Toor Pit nor Gortdrum appears in any Geological Survey documents regarding mines or quarries, and no further information on their activities is available.

Eyon Cross Quarry in Limerick is an active quarry located within a narrow band of Waulsortian Limestones. Materials produced include stone for aggregates, chippings, railway ballast, lime dust, screenings, and drainage stone. Gooig Pit produces fine sand for road-making, plastering and mortar sand applications.

Mineral extraction sites are noted in the Fluvial Audit (IAY-JBAI-XX-XX-RP-HM-0016-Fluvial\_Audit) as having a moderate contribution to fine sediment input into the Mulkear catchment.

The Limerick CDP has identified mineral extraction (ECON09) as having the potential to positively benefit Limerick's economy while acknowledging the need to apply rigorous environmental standards to ensure that any current and future extractive and mining developments incur minimal environmental impact. Similarly, the Tipperary CDP outlines policies in Chapter 8 and Chapter 11 regarding new extractive developments and redevelopment, rehabilitation, or reuse of historical mines and quarries, of which there are several. It is not known at this time whether future developments will occur at deposits located within the study area.

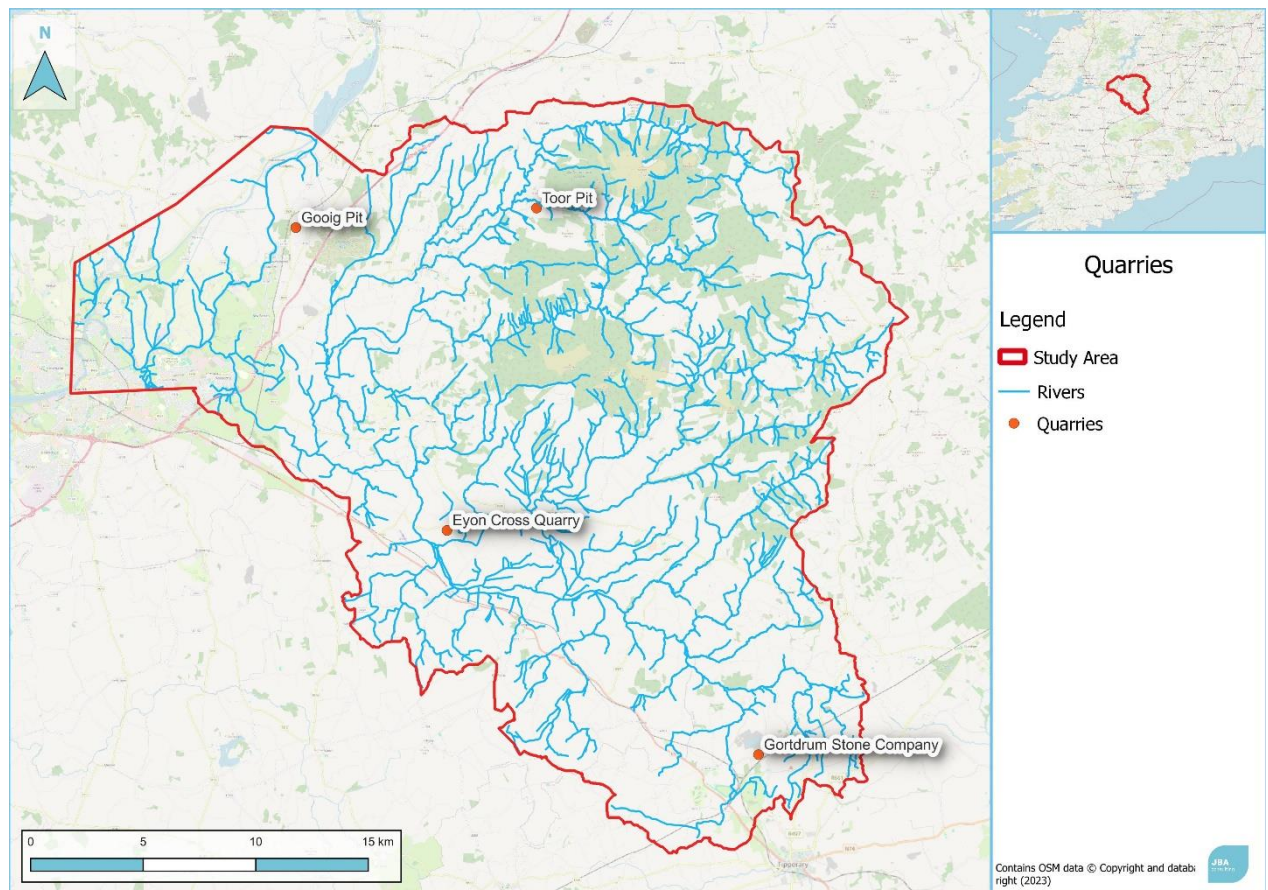


Figure 4.3: Active quarries in the study area



Table 4-3 Minerals, locations and description

Location	Mineral	Townland	Description
Tipperary	Quartz	Foilduff	Non-metallic. Irregular quartz veining in massive grey siltstones with mudstone and sandstone.
		Lackabrack	Metallic. Pyrite mineralisation in quartz veins reported in
		Bunkimalta	Metallic. Specks of chalcopyrite in veinlets of quartz and siderite.
		Baurglanna/Lack'	Non-metallic. Quartz veins trending N-S & WNW in siltstones and mudstones.
			Non-metallic. Quartz veins irregular and discontinuous, brecciated.
			Metallic. Quartz veins with pyrite.
		Knockfune	Non-metallic. N-S quartz veining and fractures.
		Killeen	Non-metallic. Quartz veins in NE-SW fractures.
		Bealaclave	Non-metallic. Prominent quartz veining in sandstone, siltstone and mudstone.
		Glenduff	Non-metallic. Quartz veins in massive sandstone.
	Sand and gravel	Kilcommon	Non-metallic. GSI records note a sand and gravel quarry here, 2 miles SE of Mother Mountain peak.
		Knockshanbrittas	Non-metallic. Sand and gravel quarry at this site.
		Gooig (Limerick)	Non-metallic. Inactive sand and gravel pit.
		Montpelier (Limerick)	Non-metallic. Active pit producing chippings & washed sand.
	Lead	Knockmeale	Metallic. Lead indicated in east part of townland.
		Leugh	Metallic. Copper and lead recorded on GSI 1in. map 144. Possible Cu occurrence shown on GSI 6in. map 44 in quarry in grit and shaly flags.
Limerick		Dromsallagh	Non-metallic. Solution cavity yielding ball clay of possibly Tertiary age. Size 500x400x50m. Two bore holes were put down in this area in 1990. The clays intercepted appeared to be lime rich and probably of glacial origin
		Tuogh	Metallic. Lead said to have been got in a quarry at this location according to a note on the old GSI 6in. map.
		Coolbaun	Metallic. Trial made for lead ore here which proved successful.

		Oolahills East	Metallic. Lodes of copper and lead at site of disused mine. Also cross course of lead and pyrite. Lodes approx. 2ft. wide. Other shafts present in townland.
		Oolahills West	Metallic. Boulder of lead and limestone in a dyke of yellow tenacious clay about 6ft. wide. Strikes E-W and dips 80 degrees S.
	Zinc	Birdhill (Tipperary)	Metallic. Lead is said to have been found in a quarry in yellow grits either in 1845 or 1846.
		Dromsallagh	Metallic.
Tipperary	Copper	Leugh	Metallic. Copper and lead recorded on GSI 1in. map 144. Possible Cu occurrence shown on GSI 6in. map 44 in quarry in grit and shaly flags.
		Tooreenbrien Up	Metallic. Trial made for copper seeking extension of Lackamore lode.
		Lackamore	Metallic. Various copper minerals with some pyrite, calcite, quartz and barytes in one main lode on fault plane trending W15
		Gortdrum	Metallic. Location of Gortdrum copper mine now disused. Mineralisation occurs along a fault in the Pale Limestones. Carboniferous volcanics are associated.
		Ballyhourigan	Metallic.
		Caherconlish	Metallic. Lode of copper in grey limestone said to be here.
Limerick		Doon South	Metallic. Small specks of yellow copper seen in conglomerate outcrop.
		Oolahills East	Metallic. Lodes of copper and lead at site of disused mine. Also cross course of lead and pyrite. Lodes approx. 2ft. wide. Other shafts present in townland.
Tipperary	Pyrite	Conygaheen/aug'	Metallic. Some pyrite in a zone of NW-SE fractures. Thin pinkish sandstones, some with hairline N-S fractures with pyrite and chalcopyrite, which also occur as crystals in the sandstones.
		Maryglen	Non-metallic. Pyrite and barite mineralisation reported.
		Foilduff/curree'	Metallic. Disseminated pyrite in mudstone.
		Lackabrack	Metallic. Pyrite mineralisation in quartz veins reported in Lackabrack townland.
		Ballynаноose	Metallic. Working made on vein of iron pyrite. Heavily pyritised mudstones and shales seen here in stream sections. Also pyrite in thin irregular quartz veins and disseminated in sandstones.
		Bunkimalta	Metallic. Pyrite in irregular veins in sandstone.

		Baurglanna/lack'	Metallic. Quartz veins with pyrite.
		Knocknamoheragh	Metallic. Disseminated pyrite in siltstones and mudstones. Pyrite in NE-SW quartz veins also.
		Churchquarter	Metallic. Quartz vein on joint with traces of pyrite, chalcopryrite, galena.
		Coolruntha	Metallic. Two copper lodes once worked. Veins of copper and iron and barytes in one main lode on fault plane trending W15 veining nearby.
		Lackamore	Metallic. Various copper minerals with some pyrite, calcite, quartz and barytes in one main lode on fault plane trending W15 degrees N. Mine closed in 1859.
		Barnabaun	Metallic. Old workings for copper, now flooded. Loose blocks show veinlets of siderite and barytes with minor pyrite and chalcopryrite. Small barytes veinlets in nearby stream section.
		Lackagh	Metallic. Barytes veins containing argentiferous galena and pyrite. Reported to produce 50oz silver per ton of lead. Veins are in Old Red Sandstone.
Limerick		Cluggin	Metallic. Specks of iron pyrite in decomposed dyke - 3ft. wide, striking SE.
		Park	Metallic. Outcrop of green ash with a vein of iron pyrites.
Tipperary	Chalcopryrite	Lackamore	Metallic. Various copper minerals with some pyrite, calcite, quartz and barytes in one main lode on fault plane trending W15 degrees N. Mine closed in 1859.
		Killeen	Metallic. Chalcopryrite veins associated with siderite and barytes. Galena with barytes less common. Pyrite uncommon. 2 lodes less than 3ft wide worked for 300ft and 200ft. Mines closed 1909.
		Coolruntha	Metallic. Two copper lodes once worked. Veins of copper and iron pyrite seen in quartz breccia. Minor pyrite and barytes veining nearby.
		Clonygaheen/aug'	Metallic. Thin pinkish sandstones, some with hairline N-S fractures with pyrite and chalcopryrite, which also occur as crystals in the sandstones.
		Churchquarter	Metallic. Quartz vein on joint with traces of pyrite, chalcopryrite, galena.
		Bunkimalta	Metallic. Specks of chalcopryrite in veinlets of quartz and siderite.
		Barnabaun	Metallic. Old workings for copper, now flooded. Loose blocks show veinlets of siderite and barytes with minor pyrite and chalcopryrite. Small barytes veinlets in nearby stream section.
		Ballnahinch	Metallic. Minute specks of chalcopryrite in quartz strings in grey grits and shales.
	Galena	Lackagh	Non-metallic. A 10m wide zone of massive and irregular veins of barytes. Also veins of barytes and lead striking NNW at Lackagh and Shallee boundary.

			Metallic. Barytes veins containing argentiferous galena and pyrite. Reported to produce 50oz silver per ton of lead. Veins are in Old Red Sandstone.
			Metallic. Trial made for lead, result unknown.
		Killeen	Metallic. Chalcopyrite veins associated with siderite and barytes. Galena with barytes less common. Pyrite uncommon. 2 lodes less than 3ft wide worked for 300ft and 200ft. Mines closed 1909.
	Barytes	Churchquarter	Metallic. Quartz vein on joint with traces of pyrite, chalcopyrite, galena.
		Lackagh	Non-metallic. A 10m wide zone of massive and irregular veins of barytes. Shallee boundary.
			Metallic. Barytes veins containing argentiferous galena and pyrite. Reported to produce 50oz silver per ton of lead. Veins are in Old Red Sandstone.
		Killeen	Metallic. Chalcopyrite veins associated with siderite and barytes. Galena with barytes less common. Pyrite uncommon. 2 lodes less than 3ft wide worked for 300ft and 200ft. Mines closed 1909.
		Lackamore	Metallic. Various copper minerals with some pyrite, calcite, quartz and barytes in one main lode on fault plane trending W15 degrees N. Mine closed in 1859.
		Barnabaun	Metallic. Old workings for copper, now flooded. Loose blocks show veinlets of siderite and barytes with minor pyrite and chalcopyrite. Small barytes veinlets in nearby stream section.
		Maryglen	Pyrite and barite mineralisation reported.
	Siderite	Killeen	Metallic. Chalcopyrite veins associated with siderite and barytes. Galena with barytes less common. Pyrite uncommon. 2 lodes less than 3ft wide worked for 300ft and 200ft. Mines closed 1909.
		Bunkimalta	Metallic. Specks of chalcopyrite in veinlets of quartz and siderite.
		Barnabaun	Metallic. Old workings for copper, now flooded. Loose blocks show veinlets of siderite and barytes with minor pyrite and chalcopyrite. Small barytes veinlets in nearby stream section.
	Sandstone	Leugh	Metallic. Copper and lead recorded on GSI 1in. map 144. Possible Cu occurrence shown on GSI 6in. map 44 in quarry in grit and shaly flags.
		Knockmeale	Non-metallic. Quarry in thick graded greenish sandstones with siltstones and mudstones.
		Garraunbeg	Non-metallic. Bright red coarse to medium sandstones which were widely used in buildings in the area such as Kilbsailly Chapel.
Limerick		Longstone	Non-metallic. Extensive quarrying in worn tracked flagstones once took place here - now disused.
	Iron	Gleno/gleno kno'	Both. Veins of bog iron ore found over 2 x 1km area.

Tipperary		Gannavane upper	Metallic. Brecciated gossan lode.
		Drombane	Metallic. Small veins and crystals of haematite in outcrop of volcanics.
		Ballyvorneen	Metallic. Outcrop of blue limestone with red haematite veins.
	Clay ball	Dromsallagh	Non-metallic. Solution cavity yielding ball clay of possibly Tertiary age Size 500x400x50m. Two bore holes were put down in this area in 1990. The clays intercepted appeared to be lime rich and probably of glacial origin.
	Haematite	Ballyvorneen	Metallic. Outcrop of blue limestone with red haematite veins.
		Foilaclug/inchi'	Both. A bed of red haematite, 3ft thick, in red grits and variegated shales.
	Silver	Lackagh	Metallic. Barytes veins containing argentiferous galena and pyrite. Reported to produce 50oz silver per ton of lead. Veins are in Old Red Sandstone.
		Gortdrum	Location of Gortdrum copper mine now disused. Mineralisation occurs along a fault in the Pale Limestones. Carboniferous volcanics are associated.
	Mercury		Location of Gortdrum copper mine now disused. Mineralisation occurs along a fault in the Pale Limestones. Carboniferous volcanics are associated.
Limerick	Greenstone	Non-metallic	Quarry in basic intrusive rocks providing aggregate for roadstone.



## 4.5 Potential Constraints

Material assets which could constrain the development are, principally, the road network and traffic, and underground utilities i.e., sewers, electricity, water, and telephone networks. The location of most utilities is not known at present and will require consultation with service providers when detailed works areas are known. There are approximately 789 road and river intersections throughout the study area, with almost half being between small, rural roads. This may impose constraints regarding construction traffic, diversions, road access and road closures as well as options for works areas.

The N24 corridor is part of the Limerick-Waterford Transport and Economic Network and forms part of the strategic link between Shannon Foynes Port, Rosslare Europort and the Port of Waterford. Major upgrades to this road are outlined as part of the RSES, NPF and Tipperary and Limerick CDPs. This may impact access to site locations within the study area and impede scheme activity. Route 391 operating along most of the R503 in study area may also be a potential constraint.

JBA conducted a fluvial audit of the catchment and determined that extractive industries were moderate sources of fine and coarse sediment to surface waterways within the catchment<sup>1</sup>. Future developments in extractive industries are expected over the life of the works which are objectives of the Limerick and Tipperary CDPs. Close monitoring of new developments arising in the area and careful liaising with all relevant stakeholders and organisations will be required.

---

<sup>1</sup> JBA Consulting (2023) "Lower Shannon Hydromorphology: Fluvial Audit". IAY-JBAI-XX-XX-RP-HM-0016-Fluvial\_Audit, Appendix A Section 8.1

## 5 Waterbodies

This section discusses the main waterbodies in the area, covering rivers, surface water, and groundwater.

The total study area is 746.95 km<sup>2</sup> which covers 71.5% of the Lower Shannon (25D) catchment. The scope of the study is defined by the entirety of the sub catchments listed in Table 5-1, apart from the Lower Shannon sub catchments 080, 090, and 100.

### 5.1 WFD Compliance

Under the Water Framework Directive (WFD), all waterbodies should aim to achieve their specific environmental objective which is typically to achieve 'Good' or 'High' status. The waterbodies in the study area are generally Moderate to Good status, with some Poor, for the latest reporting period (2016-2021), see Figure 5.3. Each measure or option should aim to improve the waterbodies at Poor and Moderate status to Good.

Forty three percent of rivers in the study area are at risk of failing to meet their WFD objectives for 2027.

### 5.2 Surface Water

Table 5-1 Sub catchments, associated river waterbodies and their WFD risk status.

Sub catchment	WFD waterbody	Risk	Status	High Objective?	Status
Newport(Tipperary)_SC_010	Doonane_010	At risk	Good	Yes	
	Newport(Tipperary)_010	Not at risk	Good	No	
	Newport(Tipperary)_020	At risk	Good	Yes	
	Newport(Tipperary)_030	Not at risk	Good	No	
	Newport(Tipperary)_040	Not at risk	Good	No	
	Small (Tipperary)_010	At risk	Moderate	No	
Dead_SC_010	Cauteen_010	At risk	Poor	No	
	Cappawhite Stream_010	At risk	Poor	No	
	Dead_010	At risk	Poor	No	
	Dead_020	At risk	Poor	No	
	Toem Stream_010	At risk	Poor	No	
Bilboa_SC_010	Bilboa_010	At risk	Moderate	No	
	Bilboa_020	Not at risk	Good	No	
	Glashacloonaraveela_010	Not at risk	Good	No	
	Gortnageragh_010	Not at risk	Good	No	
	Inch(Bilboa)_010	At risk	Poor	No	
Kileendarrif_SC_010	Annagh(Tipperary)_010	Not at risk	Good	No	
	Annagh(Tipperary)_020	Not at risk	Good	No	
	Annagh(Tipperary)_030	Not at risk	Good	No	
	Ballyard_010	Not at risk	Good	No	
	Ballyard_020	Review	Moderate	No	
	Killeengariff_010	Not at risk	Good	No	
Mulkear_SC_010	Cahernahallia_010	Not at risk	Good	No	
	Cahernahallia_020	Not at risk	Good	No	

	Doon Stream_010	At risk	Moderate	No
	Mulkear(Limerick)_010	At risk	Moderate	No
Mulkear_SC_020	Dooglasha (Cappamore)_010	Review	Poor	No
	Mulkear(Limerick)_020	At risk	Moderate	No
	Mulkear(Limerick)_030	Review	Moderate	No
	Mulkear(Limerick)_040	At risk	Moderate	No
Shannon(Lower)_SC_090	Mulkear(Limerick)_050	Not at risk	Good	No
	Shannon(Lower)_060 (Limerick)	Review	Moderate	No
Shannon(Lower)_SC_100	Shannon(Lower)_060 (Clare)	Review	Moderate	No
	North Ballycannan_010 (Clare)	Not at risk	Good	No
	Blackwater_020 (Clare)	At risk	Moderate	No
Shannon(Lower)_SC_080	Shannon(Lower)_050	At risk	Poor	No
	Bridgetown (Clare)_010	Not at risk	Good	No

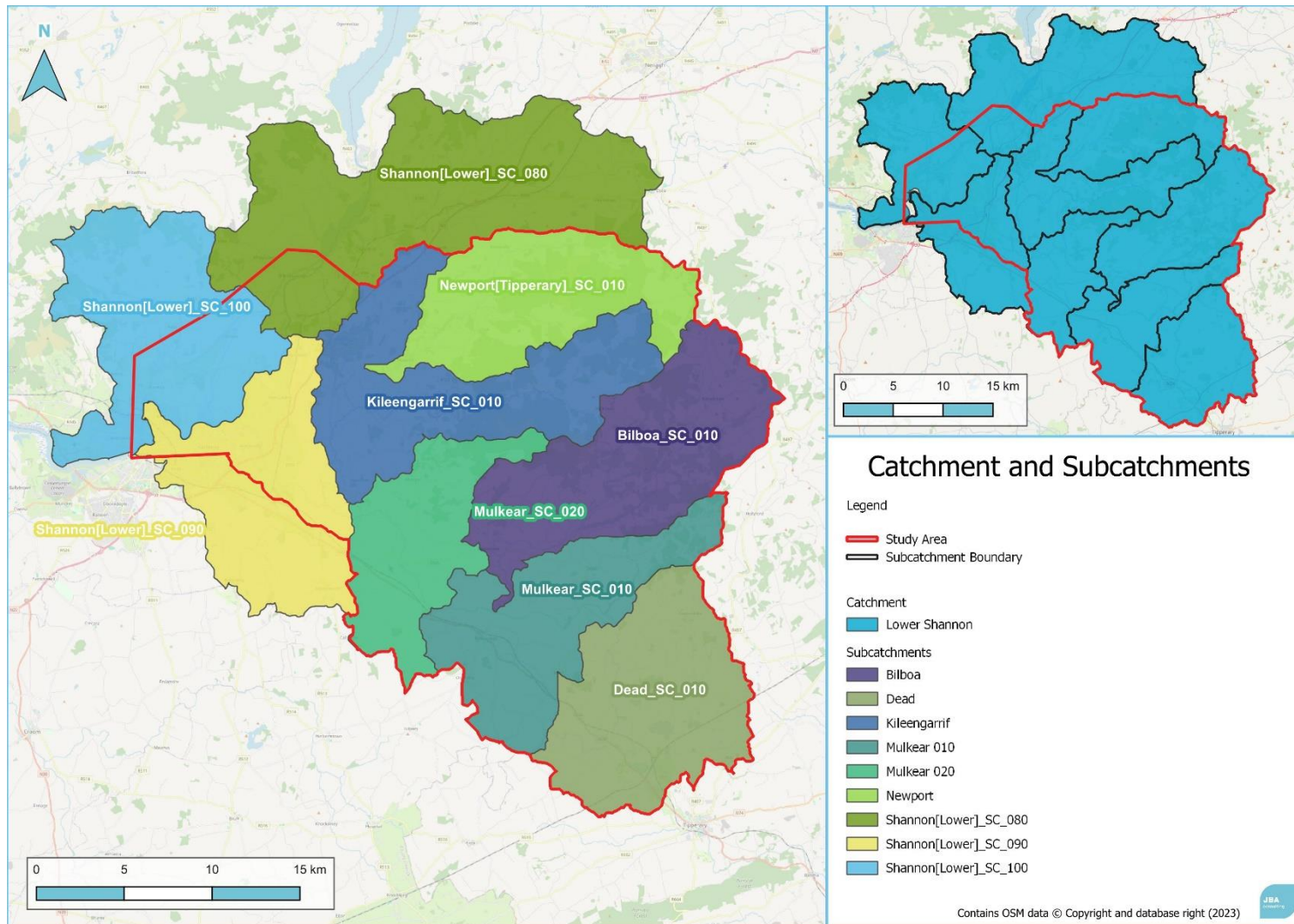


Figure 5.1: The Lower Shannon Catchment and sub catchments relevant to the study area.



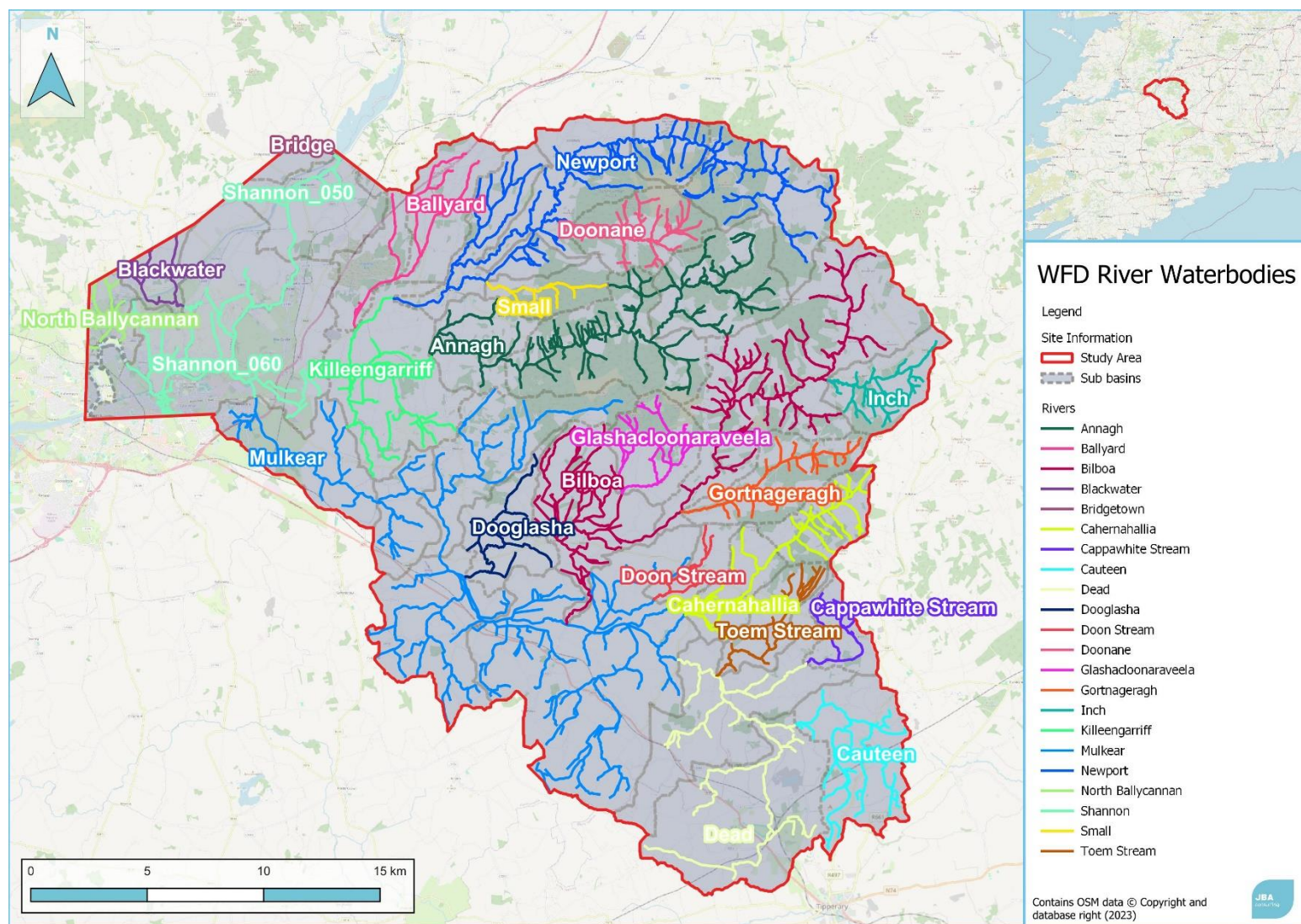


Figure 5.2: WFD river waterbodies within the scope of the study.



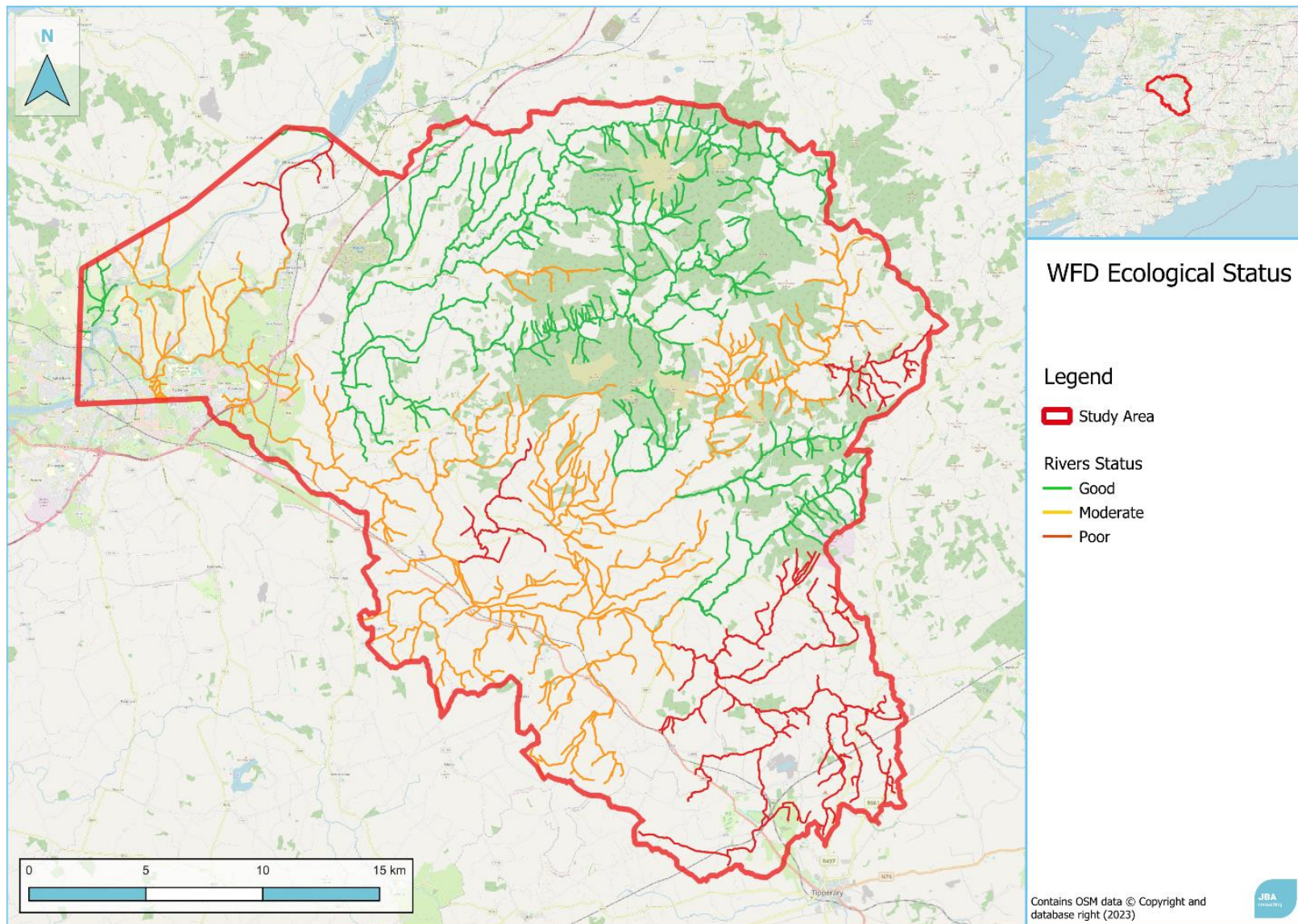


Figure 5.3: WFD ecological status of river network in the study area.

### 5.3 Groundwater

A total of 18 groundwater bodies were identified during the desktop study. The main groundwater body, Slieve Phelim (SH\_G\_213) is of Good WFD status and is not at risk of failing to meet WFD targets for 2027.

Table 5-2 Groundwater waterbodies, area included in the study are, total area of waterbody, WFD status and WFD risk.

Name	Description	Area km <sup>2</sup> (total area)	WFD status	Risk
Slieve Phelim SH_G_213	Poorly productive bedrock	537 (547)	Good	Not at risk
O'Briensbridge Gravels SH_G_257	Gravel	1.6 (6.6)	Good	Not at risk
Castleconnell SH_G_052	Karstic (associated perfectly with Waulsortian limestones)	7.1 (23.1)	Good	Not at risk
Limerick City East SH_G_138	Productive fissured bedrock (adjacent to Castleconnell)	2.5 (46)	Good	At risk
Ballyneety SH_G_036	Karstic	46 (69)	Good	Not at risk
Knockroe East SH_G_129	Poorly productive bedrock	22 (22)	Good	Not at risk
Pallas Green SH_G_196	Productive fissured bedrock	15.8 (16)	Good	At risk
Knockseefin- Longstone East SH_G_133	Poorly productive bedrock	9.7 (9.8)	Good	Not at risk
Knockseefin- Longstone West SH_G_134	Poorly productive bedrock	1.836 m <sup>2</sup> (15.94)	Good	Not at risk
Industrial Facility (P0331-01) SH_G_219	Poorly productive bedrock	4.5 (4.5)	Poor	At risk

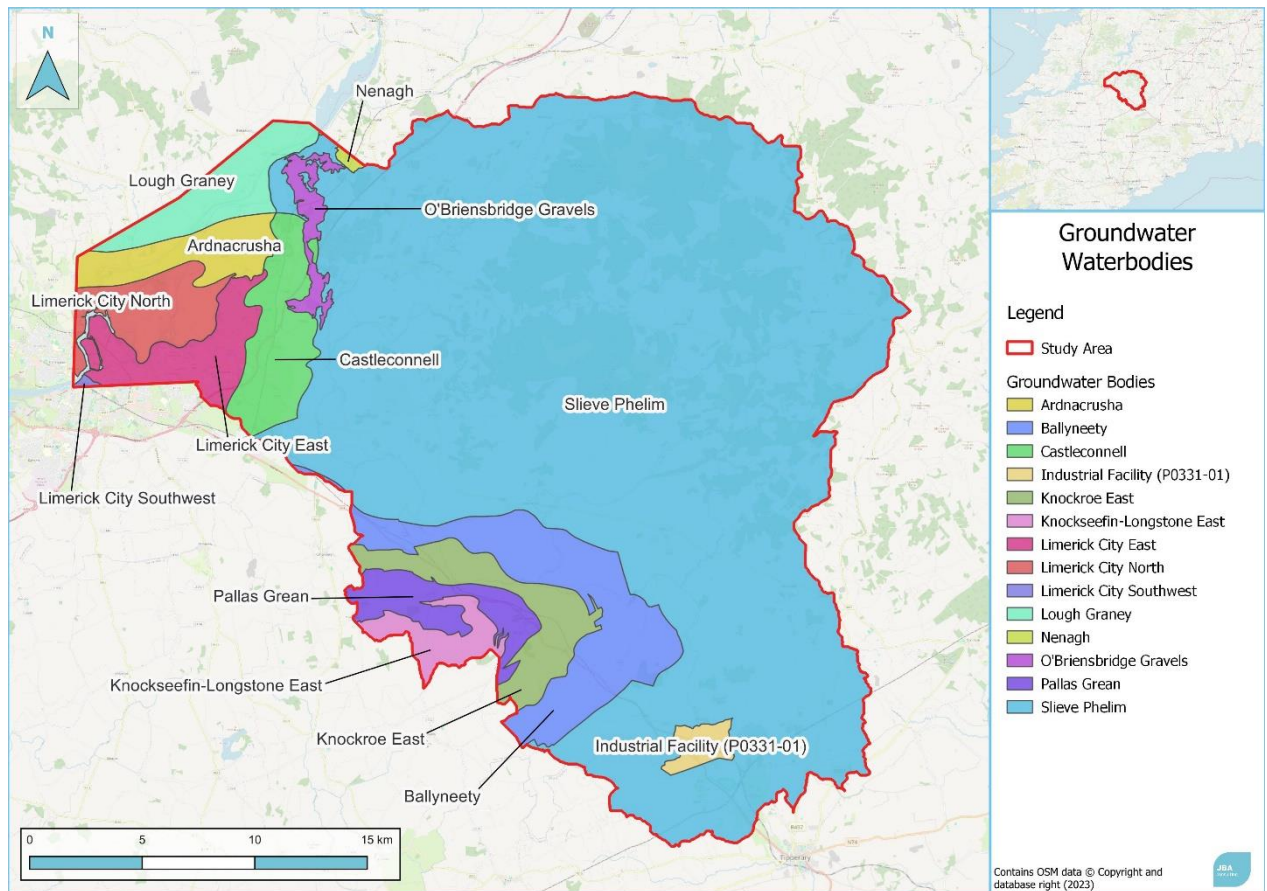


Figure 5.4: Groundwater bodies within the scope of the study

## 5.4 Aquifers

Aquifer productivity is relatively low across most of the study area or moderately productive locally. Some aquifers associated with Waulsortian Limestones are regionally important in Limerick, see Figure 5.5.



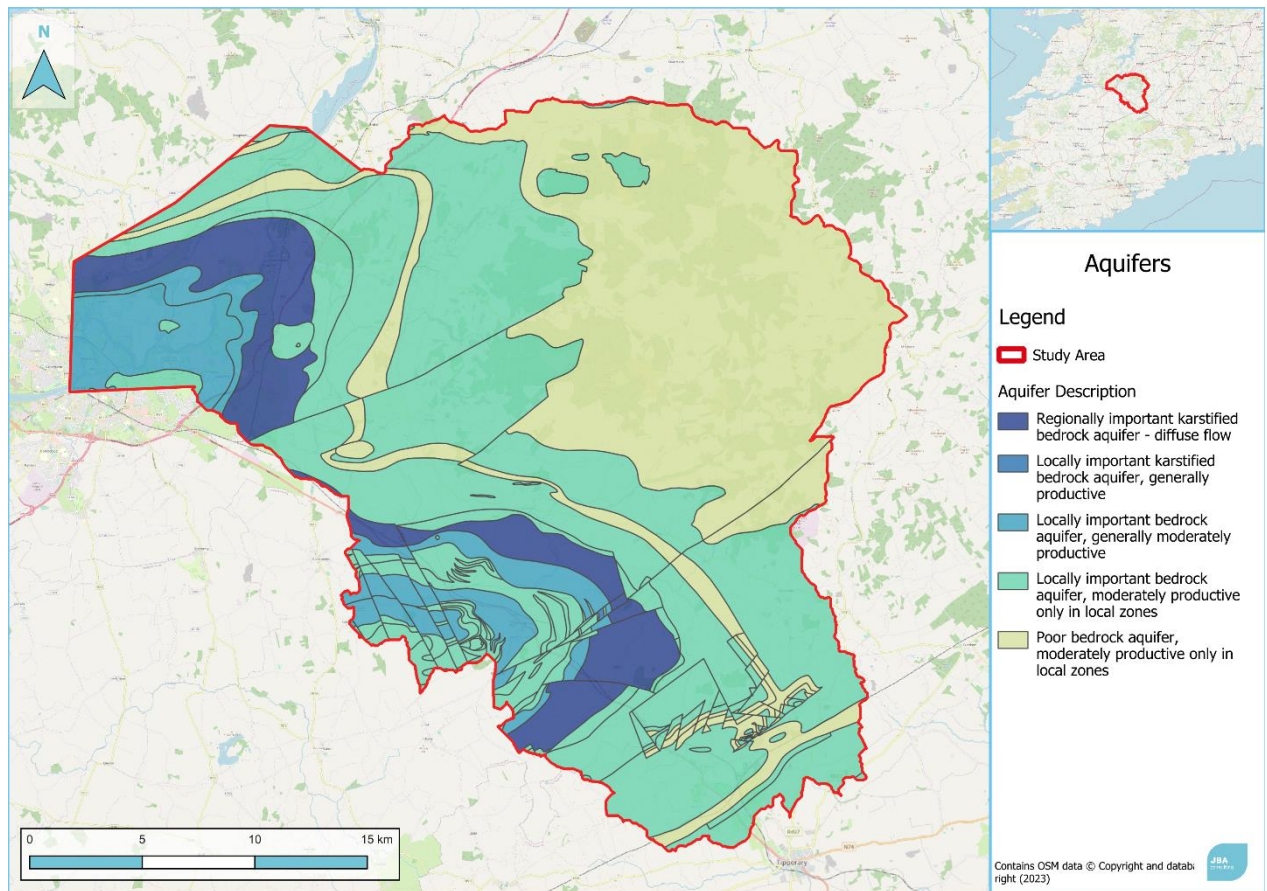


Figure 5.5 Aquifer classification

## 5.5 Aquifer Vulnerability

Groundwater vulnerability is highly varied across the study area. Broadly, the northeast is dominated by extreme vulnerability and rock at or near the surface while the southwest has a larger area of low vulnerability with areas at the southern and western boundary of the project bearing a higher vulnerability. The southwestern section is speckled with many areas of rock at or near the surface with associated extreme vulnerability.

Notably, no karst features have been identified in the northeastern section, while all karst features, almost all of which are springs, are concentrated in the southwestern section in Limerick.

Several terrestrial ecosystems are dependent on the Slieve Felim GWB while the remaining GWBs have no identified terrestrial ecosystem associations or dependencies.

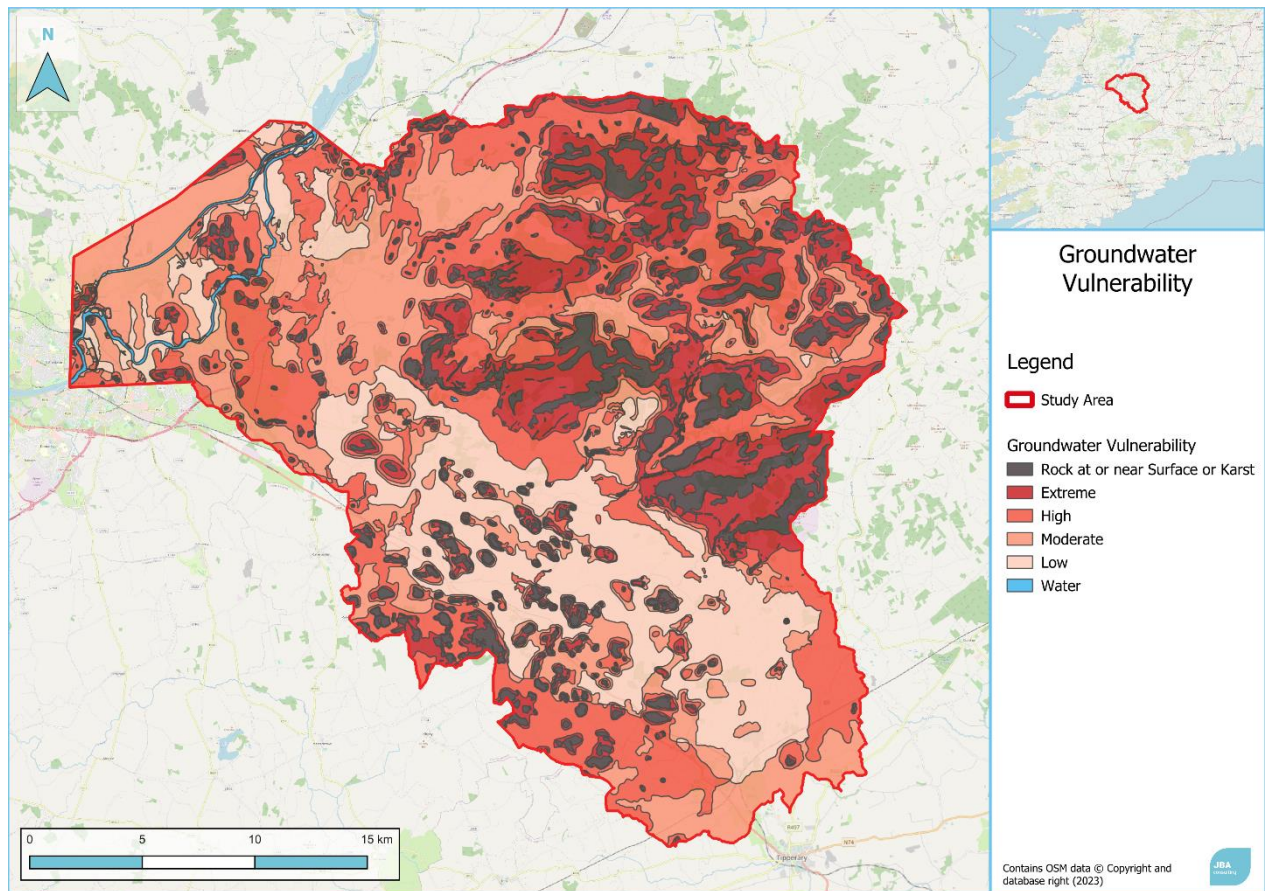


Figure 5.6 Groundwater vulnerability

## 5.6 River Basin Management Plan 2022-2027

Inland Fisheries Ireland has identified Annacotty Weir as a 'significant barrier' to salmonids and resident fish populations. With appropriate mitigation works it has the potential to greatly benefit these populations. It falls just within the study scope at the northwest corner.

## 5.7 WFD Areas for Action

The WFD Areas for Action are areas where works will be carried out under the WFD and River Basin Management Plans by the Local Authorities Water Programme (LAWPRO). Three Areas for Action from the WFD Cycle 3, at the Blackwater, are within the Study Area. A further 15 areas from Cycle 2 are also in the Study Area (Mulkear, Inch (Bilboa), Toem and Cappawhite, and Dead and Cauten). Early assessments and initial public engagements have been carried out on these areas.

## 5.8 Arterial Drainage

The Bilboa and the lower part of the Mulkear are OPW Arterial Drainage Scheme channels, under the Arterial Drainage Acts 1945 (as amended). The OPW are therefore obliged to regularly maintain these channels as part of their Arterial Drainage Maintenance programme. Drainage maintenance activities and the use of heavy machinery associated with that is likely to contribute to sedimentation on these waterbodies and downstream of them.

## 5.9 Potential Constraints

Rivers located in the uplands and foothills generally tend towards having a good WFD status. These rivers are also located in forested areas that have been identified in the fluvial audit as having a large fine and coarse sediment potential. Changes to the hydromorphology and hydraulics of these rivers by reducing flow velocity, blocking transport pathways or increasing upland deposition could negatively impact their water quality and thus result in a failure to meet their WFD objectives.

Works on Annacotty Weir may impose constraints on timing, nature and location of works areas that may be outlined in the options.

The management of the Shannon by the ESB in terms of extraction volumes needs also to be considered as a constraint. The sediment carrying capacity of the Shannon has a ceiling whilst this limiting of flow exists.

The presence of Arterial Drainage Channels and their maintenance by the OPW is a constraint as this maintenance will continue outside the scope of this study, and the OPW is obliged to continue maintenance under the Arterial Drainage Acts.



## 6 Biodiversity

There are a number of statutory and non-statutory designated sites within the study area which include a variety of Qualifying Interests (QIs). There are also a number of locally sensitive habitats and species which are not always included in this list of sites but must be considered in the context of the proposed measures, as they are protected under legislation such as the Wildlife Act 1976 and amended Wildlife Act 2000. These sites have previously been surveyed as part of Appropriate Assessment for the Mulkear Arterial Drainage Scheme (JBA 2019, MKO 2021) and the Lower Shannon Arterial Drainage Scheme (JBA, 2018) and ecology walkover spot check surveys were conducted by JBA Ecologist Mark Desmond and Damien McAndrew between the 16th and the 18th of August 2022 in association with the Fluvial Audit (JBA, 2023) conducted for this project.

### 6.1 Sites of Conservation Concern

The statutory designated sites include Special Areas of Conservation (SACs) as defined in the Habitats Directive (92/43/EEC), Special Protection Areas as defined in the Birds Directive (79/409/EEC) and Natural Heritage Areas (NHAs) as defined in the Wildlife Act 1976 (amended 2000).

Non statutory designated sites include potential Natural Heritage Areas (pNHAs) which were published on a non-statutory basis in 1995 as areas of significance for wildlife and habitats which may be formally designated as NHAs in the future once resurveyed.

Any scheme/project that has the potential to impact on Sites of Conservation concern will require at a minimum an Appropriate Assessment Screening report and will likely require an Ecological Impact Assessment (EIA) if there is an impact on locally important habitats/species.

#### 6.1.1 Special Areas of Conservation

SACs found within the study area are shown below in Figure 6.1 and are listed in Table 6-1 with a description, list of Qis, listed threats and pressures, and project specific potential threats.

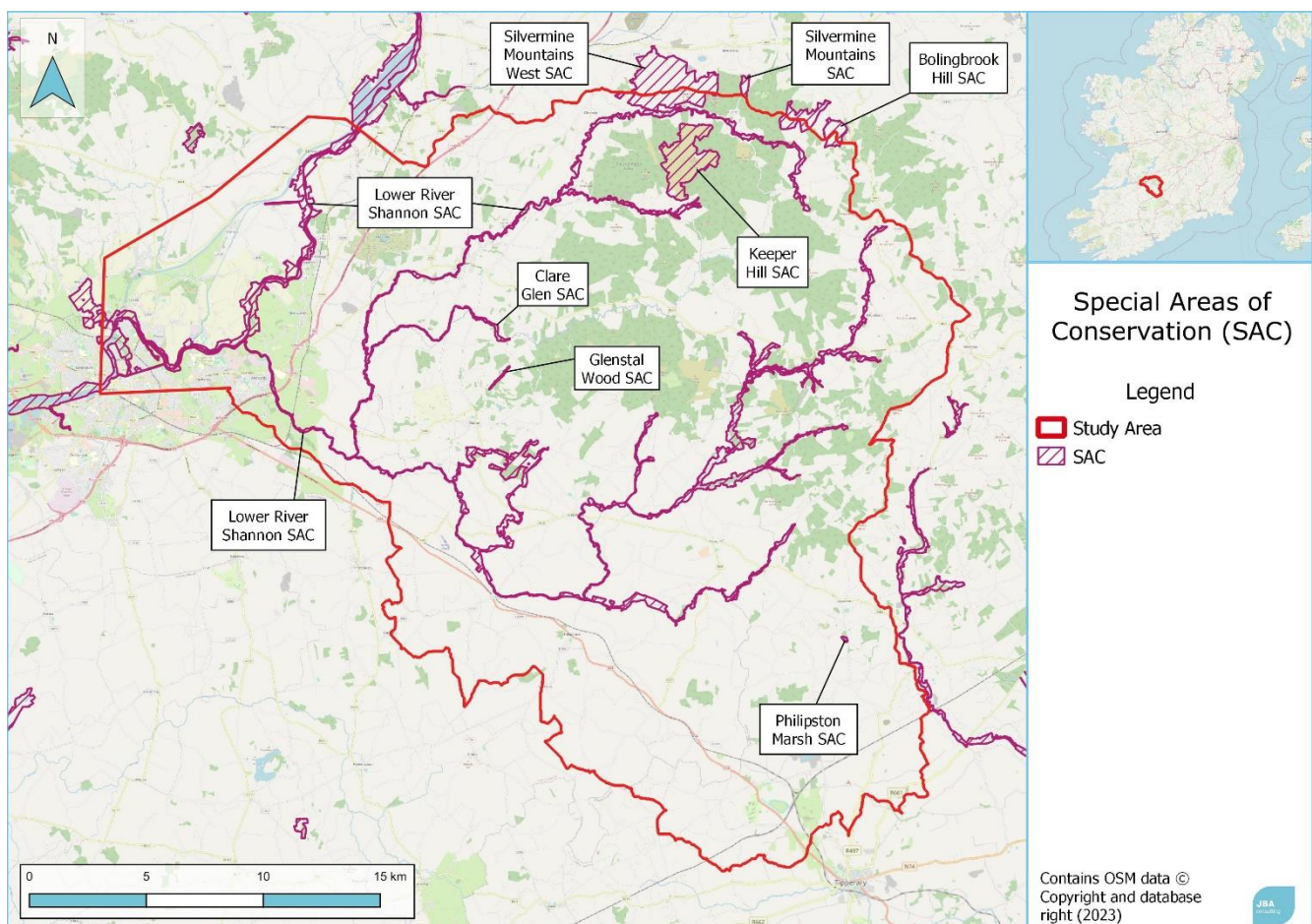


Figure 6.1: Special Areas of Conservation (SACs) within Study Area

Table 6-1: List of Special Areas of Conservation (SACs) found with the study area.

Name & Site Code	Description	Qualifying Interests within site area	Listed Threats and Pressures	Project Specific Potential Threats
Lower River Shannon SAC - 002165	<p>This very large site stretches along the Shannon valley from Killaloe in Co. Clare to Loop Head/ Kerry Head, a distance of some 120 km. The site thus encompasses the Shannon, Feale, Mulkear and Fergus estuaries, the freshwater lower reaches of the River Shannon (between Killaloe and Limerick), the freshwater stretches of much of the Feale and Mulkear catchments and the marine area between Loop Head and Kerry Head. Rivers within the sub-catchment of the Feale include the Galey, Smearlagh, Oolagh, Allaughun, Owveg, Clydagh, Caher, Breanagh and Glenacorney.</p> <p>Rivers within the sub-catchment of the Mulkear include the Killeenagarrieff, Annagh, Newport, the Dead River, the Bilboa, Glashacloonaraveela, Gortnageragh and Cahernahallia.</p> <p>In the context of any proposed sedimentation management project, those QIs present within the River Mulkear and below the confluence of the River Mulkear and Lower River Shannon are considered to be of higher significance.</p>	<p>[1110] Sandbanks [1130] Estuaries# [1140] Tidal Mudflats and Sandflats [1150] Coastal Lagoons* [1160] Large Shallow Inlets and Bays [1170] Reefs [1220] Perennial Vegetation of Stony Banks [1230] Vegetated Sea Cliffs [1310] Salicornia Mud# [1330] Atlantic Salt Meadows# [1410] Mediterranean Salt Meadows# [3260] Floating River Vegetation# [6410] Molinia Meadows# [91E0] Alluvial Forests*# [1029] Freshwater Pearl Mussel (Margaritifera margaritifera)# [1095] Sea Lamprey (Petromyzon marinus)# [1096] Brook Lamprey (Lampetra planeri)# [1099] River Lamprey (Lampetra fluviatilis)# [1106] Atlantic Salmon (Salmo salar)# [1349] Bottle-nosed Dolphin (Tursiops truncatus) [1355] Otter (Lutra lutra)#</p> <p>Those in italics are largely associated with the marine or estuarine environment, and downstream of Limerick City, but are retained on the precautionary principle.</p>	<ul style="list-style-type: none"> <li>- Invasive non-native species</li> <li>- Fertilisation</li> <li>- Grazing</li> <li>- Air pollution, air-borne pollutants</li> <li>- Fertilisation</li> <li>- Urbanised areas, human habitation</li> <li>- Paths, tracks, cycling tracks</li> <li>- Eutrophication (natural)</li> <li>- Nautical sports</li> <li>- Sylviculture, forestry</li> <li>- Marine and Freshwater Aquaculture</li> <li>- Hunting</li> <li>- Removal of beach materials</li> <li>- Hand cutting of peat</li> <li>- Discharges</li> <li>- Polderisation</li> <li>- Management of aquatic and bank vegetation for drainage purposes</li> <li>- Discharges</li> <li>- Reclamation of land from sea, estuary or marsh</li> <li>- Sea defense or coast protection works, tidal barrages</li> </ul>	<ul style="list-style-type: none"> <li>- Direct destruction of habitats and/or species associated with proposed work.</li> <li>- Pollution events associated with construction works</li> <li>- Alterations to groundwater and surface water flow regimes.</li> <li>- Changes to instream sediment load which may alter instream and riparian habitats.</li> <li>- Disturbance to breeding, foraging and resting behaviour of QI Species associated with construction works and any proposed structures.</li> <li>- Spread of INNS</li> </ul>

Name & Site Code	Description	Qualifying Interests within site area	Listed Threats and Pressures	Project Specific Potential Threats
Philipston Marsh SAC - 001847	Philipston Marsh is a small wetland near Philipston House, south of Cappagh White in Co. Tipperary. It represents one of only two examples of calcareous fen and mire vegetation in the Mulkear River catchment and is thus a rare habitat type in this locality	[7140] Transition Mires	<ul style="list-style-type: none"> <li>- Grazing</li> <li>- Fertilisation</li> <li>- Grazing</li> <li>- Sylviculture, forestry</li> </ul>	<ul style="list-style-type: none"> <li>- Direct habitat removal from associated works.</li> <li>- Changes to water flow regimes and instream sediment load as a result of management infrastructure upstream of the site.</li> <li>- Pollution events associated with construction works</li> <li>- Spread of INNS</li> </ul>
Clare Glen SAC - 000930	Clare Glen lies on the Limerick - Tipperary border, in the western foothills of the Slievefelim Mountains, about 10 km north-west of Cappamore. The glen was formed by the action of the Clare River cutting into the Old Red Sandstone. The site comprises the wooded river valley about 2 km above the Clare Bridge.	[91A0] Old Oak Woodlands # [1421] Killarney Fern (Trichomanes speciosum) #	<ul style="list-style-type: none"> <li>- Invasive non-native species</li> <li>- Forestry clearance</li> <li>- Outdoor sports and leisure activities, recreational activities</li> <li>- Removal of dead and dying trees</li> <li>- Siltation rate changes, dumping, depositing of dredged deposits</li> </ul>	<ul style="list-style-type: none"> <li>- Siltation rate changes, dumping, depositing of dredged deposits</li> <li>- Direct habitat removal from associated works.</li> <li>- Changes to water flow regimes and instream sediment load as a result of management infrastructure upstream of the site.</li> <li>- Pollution events associated with construction works</li> <li>- Spread of INNS</li> </ul>
Bolingbrook Hill SAC - 002124	Situated approximately 6 km south-east of Silvermines village in Co. Tipperary, this upland site comprises Bolingbrook Hill and the nearby eastern slopes of Silvermine Mountains in Curryquin and Mucklin townlands. Most of the land is above 270 m and the highest point is at 404 m. The site is north of the Newport River, the most northerly tributary in the River Mulkear Catchment. This is a small site which contains a range of habitats, and species. It is of particular importance for the good quality examples of species-rich, unimproved upland grassland found.	[4010] Wet Heath [4030] Dry Heath [6230] Species-rich Nardus Grassland*	<ul style="list-style-type: none"> <li>- Paths, tracks, cycling tracks</li> <li>- Fire and fire suppression</li> <li>- Forest and Plantation management &amp; use</li> <li>- Removal of hedges and copses or scrub</li> <li>- Missing or wrongly directed conservation measures</li> </ul>	<ul style="list-style-type: none"> <li>- Direct habitat removal from associated works.</li> <li>- Spread of INNS</li> </ul>
Silvermine Mountains SAC - 000939	This small site is situated on the northern slopes of the Silvermine Mountains, 1 km south-east of Silvermines village in Co. Tipperary. It slopes steeply uphill from 240 m in the north-west corner to 400 m at the southern boundary. The site is	[4010] Wet Heath [4030] Dry Heath [6130] Calaminarian Grassland	<ul style="list-style-type: none"> <li>- Habitat shifting and alteration</li> <li>- Intensive grazing</li> </ul>	<ul style="list-style-type: none"> <li>- Direct habitat removal from associated works.</li> <li>- Spread of INNS</li> </ul>

Name & Site Code	Description	Qualifying Interests within site area	Listed Threats and Pressures	Project Specific Potential Threats
	found to the north of the Newport River, the most northern tributary of the Mulkear River. The site is dominated by heath with some species-rich <i>Nardus</i> grasslands on siliceous substrates. The occurrence of the rare Small-white Orchid adds significantly to the value of the site			
Silvermine Mountains West SAC - 002258	Silvermines Mountains West SAC is situated to the north of Keeper Hill, about 10 km south of Nenagh in Co. Tipperary. Reaching an altitude of 489 m, this rather steep ridge of Old Red Sandstone is visibly very prominent in the landscape when viewed from the Nenagh to Limerick road. The site is found to the north of the Newport River, the most northern tributary of the Mulkear River. The site includes the summit and slopes, mostly above 200 m, to the west of an extensively afforested area south of the town of Silvermines. The site is of conservation importance for its heath and grassland vegetation, and as a foraging area for Hen Harrier, and is one of the only extensive unplanted uplands remaining in north Tipperary.	[4010] Wet Heath [4030] Dry Heath [6130] Calaminarian Grassland	- Fire and fire suppression - Paths, tracks, cycling tracks - Mines - Non intensive goat grazing - Non intensive horse grazing - Walking, horse-riding and non-motorised vehicles - Motorised vehicles	- Direct habitat removal from associated works. - Spread of INNS
Glenstal Wood SAC - 001432	Glenstal Wood, which is associated with Glenstal Abbey, lies in the western foothills of the Slievefelim Mountains, about 8 km north-west of Cappamore, Co. Limerick. The glen has been cut into Old Red Sandstone and runs in a north-easterly direction for about 2 km, eventually becoming a steep-sided rocky ravine. At Glenstal Wood, oak ( <i>Quercus</i> sp.) woodland remnants occur which support a rich fern, bryophyte and lichen flora.	[1421] Killarney Fern ( <i>Trichomanes speciosum</i> ) #	- Invasive non-native species - Removal of forest undergrowth	- Direct habitat removal from associated works. - Spread of INNS - Pollution events associated with construction works
Keeper Hill SAC - 001197	Keeper Hill, or Slievekimalta, is situated between the Silvermines and Slieve Felim Mountains, 13 km south of Nenagh in Co. Tipperary. Reaching an altitude of 695 m, this rounded, rather steep peak of Old Red Sandstone is notably higher than any of the surrounding upland areas. The site	[4010] Wet Heath [7130] Blanket Bogs (Active)* #	- Communication masts and antennas - Paths, tracks, cycling tracks - Erosion - Off-road motorized driving	- Direct habitat removal from associated works. - Spread of INNS - Pollution events associated with construction works

Name & Site Code	Description	Qualifying Interests within site area	Listed Threats and Pressures	Project Specific Potential Threats
	includes the summit and slopes above 250 m which have not yet been afforested. This site contains mountain blanket bog and heath, as well as upland grassland. Peregrine Falcon (Annex I - Birds Directive) breed within the site.		- Regular motorized driving	- Disturbance to breeding bird population.

All Qis of each Natura 2000 site are listed above however those with a Hash (#) are considered to be of significance in relation to any proposed sedimentation management project. Those Qis marked with an Asterix (\*) are considered priority habitats.



### 6.1.2 Special Protection Areas

Two SPAs are found within the study area. These are the Slievefelim to Silvermines Mountains SPA, and the River Shannon and River Fergus Estuaries SPA.

The locations of these SPAs are shown below in Figure 6.1 and they are listed in Table 6-1 with a description, list of Qis, listed threats and pressures, and project specific potential threats.

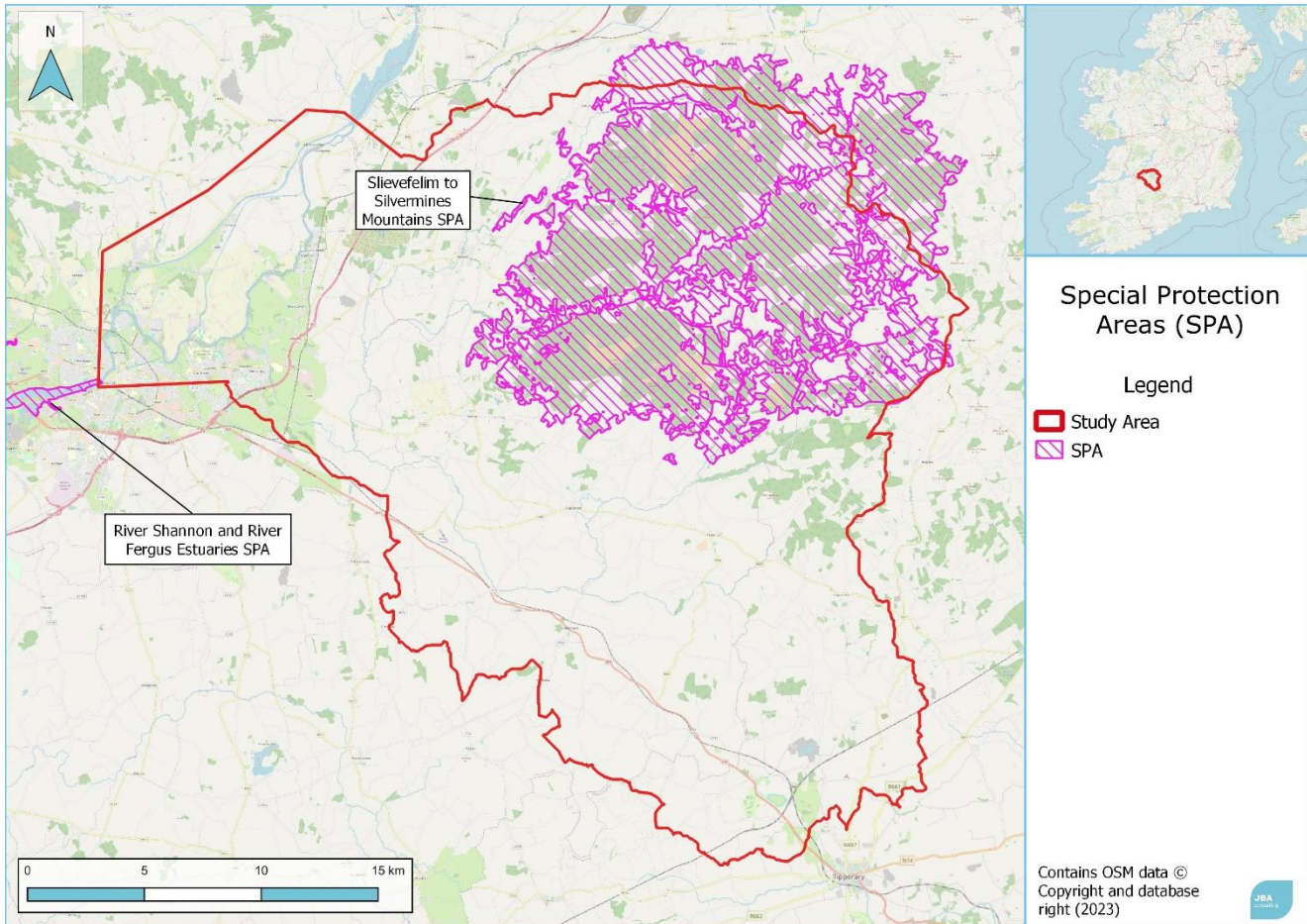


Figure 6.2: Special Protection areas found within the study area.

Table 6-2 List of Special Protection Areas (SPAs) found with the study area.

Name & Site Code	Description	Qualifying Interests within site area	Listed Threats and Pressures	Project Specific Potential Threats
Slievefelim to Silvermines Mountains SPA-004165	<p>The Slievefelim to Silvermines Mountains SPA is an extensive upland site located in Counties Tipperary and Limerick. Much of the site is over 200 m in altitude and rises to 694 m at Keeper Hill. Other peaks included in the site are Slieve Felim, Knockstanna, Knockappul, Mother Mountain, Knockteige, Cooneen Hill and Silvermine Mountain. The site is underlain mainly by sandstones of Silurian age. Several important rivers rise within the site, including the Mulkear, bilboa and Clare.</p> <p>The site consists of a variety of upland habitats, though approximately half is afforested. The coniferous forests include first and second rotation plantations, with both pre-thicket and post-thicket stands present. Substantial areas of clear-fell are also present at any one time. The principal tree species present are Sitka Spruce (<i>Picea sitchensis</i>) and Lodgepole Pine (<i>Pinus contorta</i>). Roughly one-quarter of the site is unplanted blanket bog and heath, with both wet and dry heath present. The remainder of the site is mostly rough grassland that is used for hill farming. This varies in composition and includes some wet areas with rushes (<i>Juncus</i> spp.) and some areas subject to scrub encroachment. Some stands of deciduous woodland also occur, especially within the river valleys.</p> <p>The site is one of the strongholds for Hen Harrier in the country. A survey in 2005 recorded five breeding pairs in the SPA, while nine pairs had been recorded in the 1998-2000 period. These numbers recorded in 2005 represent 3.7 % of the all-Ireland total. The mix of forestry and open areas provides optimum habitat conditions for this rare bird</p> <p>The site is also a traditional breeding site for a pair of Peregrine. Merlin has been recorded within the site but further survey is required to determine its status. Red Grouse is found on some of the unplanted areas of bog and heath – this is a species that has declined in Ireland and is now Red-listed.</p>	<p>[4010] Wet Heath</p> <p>[7130] Blanket Bogs (Active)*</p>	<ul style="list-style-type: none"> <li>- Communication masts and antennas</li> <li>- Paths, tracks, cycling tracks</li> <li>- Erosion</li> <li>- Off-road motorized driving</li> <li>- Regular motorized driving</li> </ul>	<ul style="list-style-type: none"> <li>- Direct habitat removal from associated works.</li> <li>- Spread of INNS</li> <li>- Pollution events associated with construction works</li> <li>- Disturbance to breeding bird population.</li> </ul>
River Shannon and River Fergus Estuaries SPA	<p>The estuaries of the River Shannon and River Fergus form the largest estuarine complex in Ireland. The site comprises the entire estuarine habitat from Limerick City westwards as far as Doonaha in Co. Clare and Dooneen Point in Co. Kerry.</p> <p>The site has vast expanses of intertidal flats which contain a diverse macroinvertebrate community, e.g. <i>Macoma</i>-<i>Scrobicularia</i>-<i>Nereis</i>,</p>	<p>[A017] Cormorant (<i>Phalacrocorax carbo</i>)</p> <p>[A038] Whooper Swan (<i>Cygnus cygnus</i>)</p> <p>[A046] Light-bellied Brent Goose (<i>Branta bernicla hrota</i>)</p>	<ul style="list-style-type: none"> <li>- Discharges</li> <li>- Fertilisation</li> <li>- Industrial or commercial areas</li> <li>- Urbanised areas, human habitation</li> </ul>	<ul style="list-style-type: none"> <li>- Direct habitat removal from associated works.</li> <li>- Pollution events associated with construction works</li> </ul>

	<p>which provides a rich food resource for the wintering birds. Salt marsh vegetation frequently fringes the mudflats and this provides important high tide roost areas for the wintering birds. Elsewhere in the site the shoreline comprises stony or shingle beaches.</p> <p>The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Cormorant, Whooper Swan, Lightbellied Brent Goose, Shelduck, Wigeon, Teal, Pintail, Shoveler, Scaup, Ringed Plover, Golden Plover, Grey Plover, Lapwing, Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Greenshank and Black-headed Gull. It is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland &amp; Waterbirds</p>	<p>[A048] Shelduck (<i>Tadorna tadorna</i>)</p> <p>[A050] Wigeon (<i>Anas penelope</i>)</p> <p>[A052] Teal (<i>Anas crecca</i>)</p> <p>[A054] Pintail (<i>Anas acuta</i>)</p> <p>[A056] Shoveler (<i>Anas clypeata</i>)</p> <p>[A062] Scaup (<i>Aythya marila</i>)</p> <p>[A137] Ringed Plover (<i>Charadrius hiaticula</i>)</p> <p>[A140] Golden Plover (<i>Pluvialis apricaria</i>)</p> <p>[A141] Grey Plover (<i>Pluvialis squatarola</i>)</p> <p>[A142] Lapwing (<i>Vanellus vanellus</i>)</p> <p>[A143] Knot (<i>Calidris canutus</i>)</p> <p>[A149] Dunlin (<i>Calidris alpina</i>)</p> <p>[A156] Black-tailed Godwit (<i>Limosa limosa</i>)</p> <p>[A157] Bar-tailed Godwit (<i>Limosa lapponica</i>)</p> <p>[A160] Curlew (<i>Numenius arquata</i>)</p> <p>[A162] Redshank (<i>Tringa totanus</i>)</p> <p>[A164] Greenshank (<i>Tringa nebularia</i>)</p> <p>[A179] Black-headed Gull (<i>Chroicocephalus ridibundus</i>)</p> <p>[A999] Wetland and Waterbirds</p>	<ul style="list-style-type: none"> <li>- Marine and Freshwater Aquaculture</li> <li>- Nautical sports</li> <li>- Shipping lanes</li> </ul>	<ul style="list-style-type: none"> <li>- Disturbance to bird population.</li> </ul>
--	--	--	--	---

Those Qis marked with an Asterix (\*) are considered priority habitats.



### 6.1.3 Natural Heritage Areas (NHAs) and potential Natural Heritage Areas (pNHAs)

There are three NHAs found within the study area, each of which include bog habitats. The location of these NHAs are shown in Figure 6.3 below and a description of the sites with a list of sensitive ecological receptors and associated potential threats is provided in Table 6-3.

There are a total of fifteen pNHAs found within the study area, the locations of which are shown in Figure 6.3. These sites make up a variety of habitats and support various ecological receptors. A brief description of each of these pNHAs, ecological receptors and potential threats is provided in Table 7-3

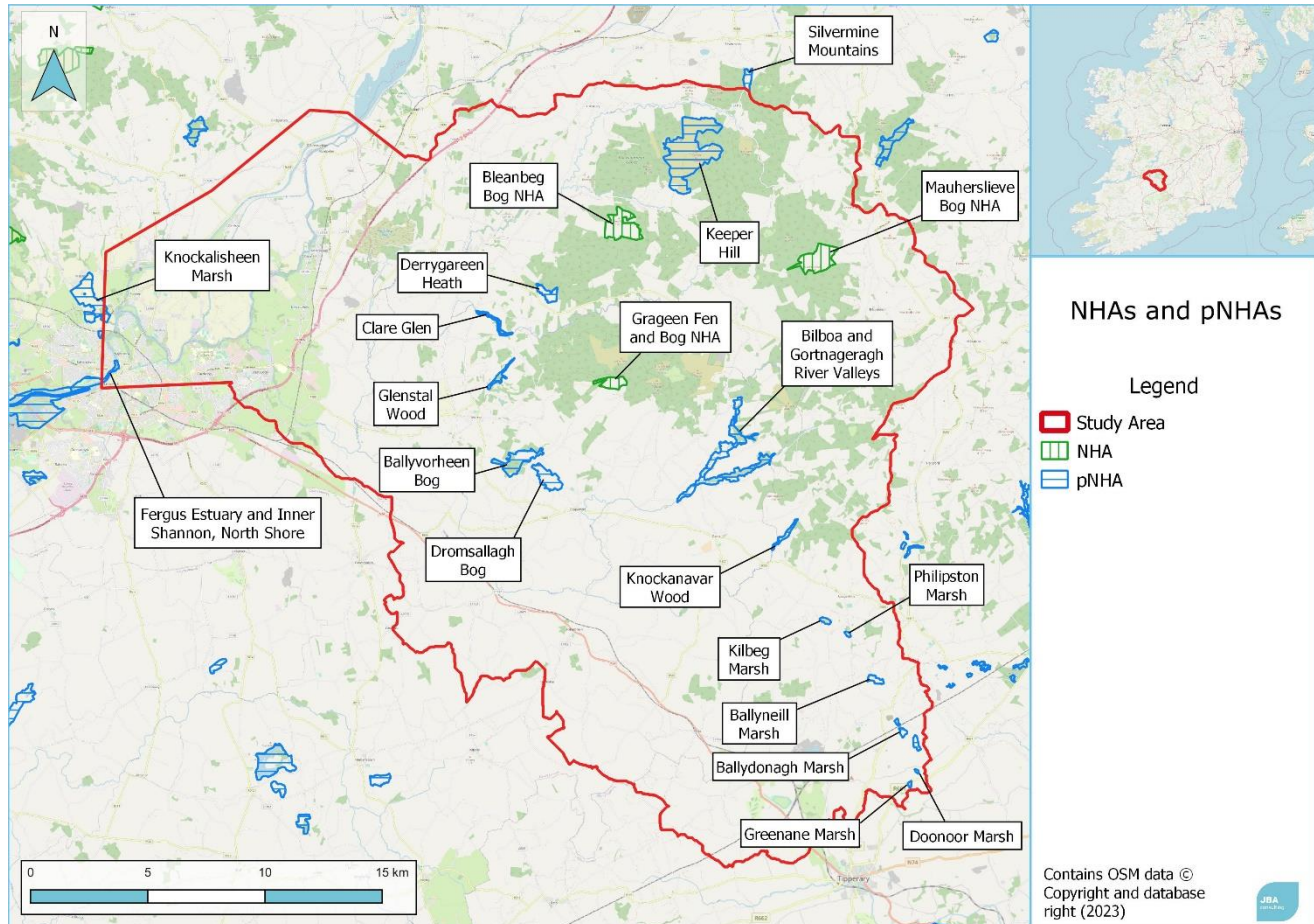


Figure 6.3: NHAs and pNHAs found within the study area.



Table 6-3: List of Natural Heritage Areas (NHAs) within the study area

Site Name	Description	Ecological Receptor	Project Specific Potential Threats
Bleanbeg Bog NHA	<p>Bleanbeg Bog NHA consists primarily of upland blanket bog and is located approximately 7 km east of Newport in south Tipperary. The site is situated in the townlands of Bleanbeg, Glencroe, Fiddane and Castlewaller. It incorporates a broad plateau of upland blanket bog habitat that grades into heath, upland grassland on peaty soil, and cutover bog.</p> <p>Several Red Data Book species, including Red Grouse and Irish Hare, have been recorded on the site. Hen Harrier (Annex I - Birds Directive) have been recorded nesting within 1km of the site and are known to forage over the site.</p>	<ul style="list-style-type: none"> <li>- Blanket Bog</li> <li>- Wet Heath</li> <li>- Red Grouse <i>Lagopus lagopus hibernicus</i></li> <li>- Hen Harrier <i>Circus cyaneus</i></li> <li>- Irish Hare <i>Lepus timidus hibernicus</i></li> </ul>	<ul style="list-style-type: none"> <li>- Direct habitat removal from associated works.</li> <li>- Disturbance to breeding, foraging and resting behaviour of sensitive species associated with construction works and any proposed structures.</li> </ul>
Grageen Fen and Bog NHA	<p>Grageen Fen and Bog NHA is an upland bog and alkaline fen located on the southern side of the Slievefelim Mountains, approximately 6 km east of Moroe and 7 km south-east of Newport, Co. Limerick. It lies in the townlands of Moher, Ballyvorheen and Portnard. The Dooglasha River forms the northern boundary of the site. A mature conifer plantation forms the eastern boundary, while a young conifer plantation forms part of the western boundary. The southern boundary and remainder of the western boundary are defined by the transition from intact blanket bog to cutover bog habitat. The north-eastern corner of the site supports a small alkaline fen with a well-developed hummock and watertrack topography.</p>	<ul style="list-style-type: none"> <li>- Alkaline Fen</li> <li>- Blanket Bog</li> </ul>	<ul style="list-style-type: none"> <li>- Direct habitat removal from associated works.</li> <li>- Disturbance to breeding, foraging and resting behaviour of sensitive species associated with construction works and any proposed structures.</li> </ul>
Mauherslieve Bog NHA	<p>Mauherslieve Bog NHA is an upland blanket bog located on the south-eastern part of the Silvermine Mountains range approximately 17 km due south of Nenagh, Co. Tipperary. The site is almost entirely surrounded by plantation forestry on its northern, western, and southern boundaries. In general, the eastern half of the site incorporates commonage land that still remains undamaged. The boundary on the north-east is delineated partly by a trackway. The remainder of the south-eastern boundary follows the margin of a commonage which runs adjacent to forestry land. While a river drains the forestry on the western side, there are no rivers or streams draining the actual slopes of the site. The site features a good example of a sloping mountain blanket bog with a low lying plateau of blanket bog at the base of the eastern slopes. Irish Hare are known to occur on site</p>	<ul style="list-style-type: none"> <li>- Blanket bog</li> <li>- Irish Hare <i>Lepus timidus hibernicus</i></li> </ul>	<ul style="list-style-type: none"> <li>- Direct habitat removal from associated works.</li> <li>- Disturbance to breeding, foraging and resting behaviour of sensitive species associated with construction works and any proposed structures.</li> </ul>

Table 6-4: List of potential Natural Heritage Areas (pNHAs) within the study area

Site Name	Description	Ecological Receptor	Project Specific Potential Threats
Clare Glen pNHA	See Clare Glen SAC description.	See above	See above
Derrygareen Heath pNHA	Situated to the north-west of the Slievefelim Mountains, about 4km south-east of Newport. This is a rocky area of shallow peaty soils over Old Red Sandstone geology. The vegetation is that of un-reclaimed heathland, dominated by Heather <i>Calluna vulgaris</i> with Cross-leaved Heath <i>Erica tetralix</i> , and grasses such as Common Bent <i>Agrostis capillaris</i> .	- Wet heath	- Direct habitat removal from associated works.
Silvermine Mountains pNHA	See Silvermines Mountains SAC description.	See above	See above
Knockanavar Wood pNHA	Included in Lower River Shannon SAC Riparian woodland east of Doon, Co. Limerick.	- Riparian Woodland	- Direct habitat removal from associated works.
Keeper Hill pNHA	See Keeper Hill SAC description.	See above	See above
Glenstal Wood pNHA	See Glenstal Wood SAC description.	See above	See above
Ballydonagh Marsh pNHA	Three small basin fens, relatively poor in calcium judging by the ecology of the flora. The basins are situated approximately 5km north-north-east of Tipperary Town. The largest and most important fen is Ballydonagh Marsh itself, which contains a mosaic of poor-fen and swamp communities and several patches of open water. Several rare species are found at this site, including Greater Spearwort ( <i>Ranunculus lingua</i> ), Slender Sedge ( <i>Carex lasiocarpa</i> ), Tufted-sedge <i>C. elata</i> , Lesser Tussock sedge <i>C. diandra</i> , Skullcap <i>Scutellaria galericulata</i> , Blunt-flowered Rush <i>Juncus subnodulosus</i> and the only station in the catchment for the nationally rare liverwort <i>Ricciocarpos natans</i>	- Poor-Fen - Swamp Communities - Rare flora	- Direct habitat removal from associated works. - Spread of INNS - Pollution events associated with construction works

Site Name	Description	Ecological Receptor	Project Specific Potential Threats
Doonoor Marsh pNHA	This is a small field-corner marsh in the upper part of the Mulkear catchment northeast of Tipperary. Although the underlying rock is limestone it is thickly covered by glacial till from the Silvermine Mountains to the north. The result is a heavy soil where marshes form easily in depressions. Two rare liverworts <i>Riccia fluitans</i> and <i>Ricciocarpus natans</i> were recorded on site.	- Marsh habitat with rare liverworts	- Direct habitat removal from associated works. - Spread of INNS - Pollution events associated with construction works
Ballyneil Marsh pNHA	A series of small kettle-hole depressions about 10km north of Tipperary town, occupied by open water, and fen communities, mainly as floating scraw vegetation. Examples of both rich-fen and poor-fen communities are found here	- Rich-fen - Poor-fen	- Direct habitat removal from associated works. - Spread of INNS - Pollution events associated with construction works
Philipston Marsh pNHA	See Philipstown Marsh SAC description	See above	- Direct habitat removal from associated works. - Spread of INNS - Pollution events associated with construction works
Kilbeg Marsh pNHA	It supports a fine stand of Alder <i>Alnus glutinosa</i> fen carr woodland with large tussocks of Greater Tussock-sedge <i>Carex paniculata</i> beneath the canopy, on its eastern margin. The western part appears to have been cutaway in the past and is now dotted with small, shallow stonewort ( <i>Chara</i> spp.) dominated pools. Open swards of rich fen communities occupy the "islands", from which the following rarities were recorded – Broad-leaved Cottongrass <i>Eriophorum latifolium</i> , Marsh Helleborine <i>Epipactis palustris</i> , Lesser Tussock-sedge <i>Carex diandra</i> and Long-stalked Yellow-sedge <i>C. lepidocarpa</i> .	- Rich-fen - Alder Carr Woodland	- Direct habitat removal from associated works. - Spread of INNS - Pollution events associated with construction works

Site Name	Description	Ecological Receptor	Project Specific Potential Threats
Ballyvorheen Bog pNHA	Included in Lower River Shannon SAC. Cutaway raised bog bordered by woodland; dominant Heather <i>Calluna vulgaris</i> , Purple Moor-grass <i>Molinia caerulea</i> , and many self-sown Scots Pine <i>Pinus sylvestris</i> ; Sphagnum patches with abundant Cranberry <i>Vaccinium oxycoccos</i>	- Cutover Raised Bog	- Direct habitat removal from associated works. - Spread of INNS - Pollution events associated with construction works
Dromsallagh Bog pNHA	Dromsallagh Bog is a small site of cutaway raised bog and its associated habitats. It is situated approximately 2km north-west of Cappamore, north-east Limerick. Dromsallagh Bog is regenerating and supports a variety of acidophile communities. Dromsallagh Bog demonstrates good Sphagnum regeneration and supports tall Heather <i>Calluna vulgaris</i> dwarf shrubs. Several bog pools and cutaway pools occur at this site, adding to its diversity. The site is being invaded by Downy Birch <i>Betula pubescens</i> woodland with isolated Rhododendron <i>Rhododendron ponticum</i> seen in places. Species of note include Cranberry <i>Vaccinium oxycoccos</i> and White Sedge <i>Carex curta</i> .	- Regenerating cut over bog.	- Direct habitat removal from associated works. - Spread of INNS - Pollution events associated with construction works
Bilboa and Gortnageragh River Valleys pNHA	Included in Lower River Shannon SAC, these valleys are rich in Bryophytes and have well developed riparian woodlands. Floating River Vegetation habitat [3260] is present within the valleys.	- Bryophyte rich rivers - Floating River Vegetation - Riparian Woodland	- Direct habitat removal from associated works. - Spread of INNS - Pollution events associated with construction works - Infrastructure reducing quality of natural hydromorphology - Disturbance to breeding, foraging and resting behaviour of sensitive species associated with construction works and any proposed structures
Greenane Marsh pNHA	Wet Alder carr with marginal swamp communities.	- Alder carr woodland - Swamp Communities	- Direct habitat removal from associated works. - Spread of INNS - Pollution events associated with construction works
Knockalisheen Marsh pNHA	Marsh, wet grassland and the potential Annex I habitats Hydrophilous Tall Herb habitat, Transitional mire and Alluvial Woodland found along the Knockalisheen stream.	- Alluvial Woodland - Marsh and wet grassland communities - Transitional mire	- Direct habitat removal from associated works. - Spread of INNS - Pollution events associated with construction works



Site Name	Description	Ecological Receptor	Project Specific Potential Threats
Fergus Estuary and Inner Shannon, North Shore pNHA	See Lower River Shannon SAC description and River Shannon and River Fergus Estuaries SPA.	See above	

## 6.2 Other Important Habitats

### 6.2.1 Alluvial Woodland Islands

Alluvial woodlands are present on fine sediment bars that have developed at the confluence of the Mulkear River and the Lower River Shannon, as well as mid channel bars and both banks of the River Shannon downstream of Parteen Weir. The habitat type on these islands is associated with Annex I habitat [91E0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*.

Alterations to sediment deposition levels within sections of the Lower River Shannon where alluvial woodland is present has the potential to impact on the growth of these woodlands where the sediment throughput would be reduced.

Any measures which would result in the reduction in the overall area of this habitat would be in direct opposition to the conservation objectives of for Annex I Alluvial forests within the Lower River Shannon SAC. This is a key constraint to the project. This may be the case if flow rates were increased to create sufficient erosive conditions that would result in potential loss or reduction of these habitats.

### 6.2.2 Grassland Habitats.

Locally important grassland habitats may be present within the confines of the study area and may be present along access routes to measure locations , or within the zone of influence of proposed measures. Any grassland within a measures zone that has been left to develop into a meadow should be surveyed by a suitably qualified ecologist in advance of any work to ensure there is no adverse impact.

### 6.2.3 Wetland habitats

The majority of significant wetland habitats within the study area is included in the Sites of Conservation Concern above, however there are small pockets of raised/lowland blanket bog, swamp, marsh, fen, wet woodland and marginal riparian habitat across the study area which are not currently mapped within conservation site boundaries and must be considered as locally important habitats. A number of these wetland habitats have been mapped by Wetland Surveys Ireland, with details published on their web page (Wetland Survey Ireland, 2023).

## 6.3 Protected Species

### 6.3.1 Otter

Otter *Lutra lutra* is a QI for the Lower River Shannon SAC and is found throughout the study area. Any scheme within the confines of the SAC or ex situ sites within the Mulkear catchment should not hinder the conservation objectives for this species.

Otter holts and resting areas (couches) are protected under the Wildlife Act 1976 (amended 2000). and derogations are required for any works likely to cause disturbance (e.g. piling and blasting) to active breeding holts (when present within c.150m of a scheme). The act also makes it an offense to:

- deliberately capture, injure or kill an Otter
- deliberately disturb an Otter such as to affect local populations or breeding success
- damage or destroy an Otter holt, possess or transport an Otter or any part of an Otter
- sell or exchange an Otter.
- Otters also receive protection under the Wildlife Act 1976 (amended 2000). this makes it an offence to:
  - intentionally or recklessly disturb any Otter whilst within a holt
  - intentionally or recklessly obstruct access to a holt.

### 6.3.2 Badger

Badger *Meles meles* are found throughout the study area. Badger are present in a range of habitats, and usually create underground setts in deciduous or mixed woodlands which are near open grassland/ farmland where they can forage. This includes a large extent of the study area. Badger and their setts are protected under the Wildlife Act 1976 (amended 2000). It is illegal to intentionally kill, capture, injure or ill-treat any Badger. It is also an offence to obstruct, destroy or damage a

Badger sett or disturb Badger within a sett. Disturbance is defined, for development purposes, as any activity that could damage a sett or be greater than what Badgers commonly tolerate.

### 6.3.3 Other small ground dwelling mammals

Other small mammals are legally protected in Ireland through the Wildlife Act 1976 (amended 2000), which include Hedgehog *Erinaceus europaeus*, Pygmy Shrew *Sorex Minutus*, Red Squirrel *Sciurus vulgaris*, and Stoat *Mustela erminea*. Pine Marten *Martes martes* and Irish Hare *Lepus timidus* are also protected under the Wildlife Act 1976 (amended 2000) and under Annex V of the EU Habitats Directive. Given the wide range of habitats found across the site area, it is likely that each of these species are present.

### 6.3.4 Bats

The range of woodland, grassland and aquatic habitats found across the study area provide plenty of opportunity for foraging and roosting bats. It is likely that bats roost within the trees, bridges and natural/artificial structures found throughout the study area. Lesser Horseshoe Bats are known to be present in the Mulkear Catchment area, as improving their conservation was an objective of the Mulkear LIFE project. Lesser Horseshoe Bats are the only Annex II listed bat species of the EU Habitats Directive found in Ireland. All other bats in Ireland are listed as Annex V species under the habitats directive. This makes it an offense to:

- deliberately capture, injure or kill a bat
- intentionally or recklessly disturb a bat in its roost or deliberately disturb a group of bats
- damage or destroy a bat roosting place (even if bats are not occupying the roost at the time)
- intentionally or recklessly obstruct access to a bat roost.

### 6.3.5 Birds

Almost all resident wild birds are protected under the Wildlife Act 1976 (amended 2000). Additionally, there are restrictions on the cutting, grubbing, burning or destruction by other means of vegetation growing on uncultivated land or in hedges or ditches during the nesting and breeding season for birds and wildlife, from 1 March to 31 August. This will provide a seasonal constraint on some works e.g., clearing vegetation to facilitate works.

Annex I of the Birds Directive lists species which are:

- in danger of extinction;
- vulnerable to specific changes in their habitat;
- considered rare because of small populations or restricted local distribution;
- requiring particular attention for reasons of the specific nature of habitat.

Additionally, the vulnerability of Irish birds is assessed through the “Birds of Conservation Concern (BoCCI)”. These birds would require special consideration at the impact assessment stage to help prevent impact. NRA 2009 provides for the characterisation of populations of species e.g., resident or regularly occurring populations (assessed to be important at the national level) of the following:

- Species protected under the Wildlife Act 1976 (amended 2000) ; and/or
- Species listed on the relevant Red List i.e., the BoCCI list.

A number of protected Annex I species are found throughout the catchment such as Kingfisher *Alcedo atthis*, Hen Harrier *Circus cyaneus* and Peregrine Falcon *Falco peregrinus*. Hen Harrier are also a QI of the Slievefelim to Silvermines Mountains SPA.

It is likely that Hen Harrier actively nest in immature forestry and open scrubland within the site area and could potentially be affected by any construction works in these areas.

Peregrine Falcon nest on cliff sides overlooking grass and scrub and are unlikely to be affected by any instream works, however loud noise associated with construction may impact on this species, as well as any other nesting bird species in the vicinity.

Riparian bird species have a variety of nesting behaviours with some such as Kingfisher and Sand Martins *Riparia riparia* burrowing into river bankside. Other species such as Mallard *Anas platyrhynchos*, Moorhen *Gallinula chloropus* or Little Grebe *Tachybaptus ruficollis* etc. create nests in covered banksides and tall herb/reed habitat. There is high likelihood that there are nesting birds

within proximity to any proposed works, and as such mitigation measure must be put into place for their protection.

Any works along banks of a river must be informed by riparian bird surveys. Works within scrubland, woodland and/or forestry must include surveys for sensitive bird species such as Red Grouse, Snipe, Woodcock and Hen Harrier.

Works involving the removal of vegetation should be conducted outside the bird nesting season (1st March - 31st of August inclusive).

### 6.3.6 Amphibians and Reptiles

Common Frog *Rana temporaria* and Smooth Newt *Lissotriton vulgaris* are relatively common in wetland (and wetland adjacent) habitats across Ireland and are certainly present within the study area, particularly near wetlands and backwaters along the Mulkear and Lower River Shannon. Both species are also present in upland bogs and fens.

The Common Lizard *Zootoca vivipara* is common across a range of habitats in Ireland and is likely to be found across the study area in habitats such as damp tussock grassland, scrub, woodland tracks, peat bogs, heath and dry grasslands.

Each of these species are protected under the Wildlife Act 1976 (amended 2000) and provisions must be made to prevent destruction of their habitat and reduction of populations.

### 6.3.7 Fish and Aquatic Invertebrates

A number of fish and aquatic invertebrate species are found throughout the rivers within the study area and are listed as QIs of the Lower River Shannon SAC. These species include Salmon, Sea Lamprey *Petromyzon marinus*, Brook Lamprey *Lampetra planeri*, River Lamprey *Lampetra fluviatilis* and the invertebrate Freshwater Pearl Mussel *Margaritifera margaritifera*. Other species such as Brown Trout *Salmo trutta* and smaller freshwater species such as Three-spined Stickleback *Gasterosteus aculeatus*, Minnow *Phoxinus phoxinus*, Stoneloach *Barbatula barbatula* etc. are also found throughout the catchment. Salmonid and lamprey movement is hampered throughout the Mulkear and Lower River Shannon catchments due to the presence of artificial instream structures.

Freshwater Pearl Mussel (FWPM) is an IUCN Critically Endangered Species. FWPM continues to decline due to reduced water quality, increased siltation and to physical interference with its habitat. Of the remaining Irish populations only a handful are recruiting young and at least 90% have such depleted water quality and river-bed conditions that they will probably never breed successfully again. There are no official NPWS records of FWPM in the Mulkear catchment however records have been submitted by members of the public as recently as April 2022 with evidence of FWPM present in the lower reaches of the catchment. Water quality within the majority of the catchment is likely too poor to support a viable breeding population, however sections of the upper catchment may offer suitable conditions if strong salmonid population was paired with higher water quality conditions and suitable substrate (gravel to coarse sand with no silt). Due to their sensitivity a viable population would pose significant constraints to any hard engineering at this site. Their presence may also constitute an opportunity for biodiversity net gain through prevention or enhancement of water quality.

White-clawed Crayfish *Austropotamobius pallipes* are recorded as present within the Mulkear catchment according to the National Biodiversity Data Centre (August 2023). White-clawed Crayfish is listed on Annex II and Annex V of the Habitats Directive and the species is protected in Ireland under the Wildlife Act 1976 (amended 2000). Proposed works must ensure there are no adverse impact on this species preferred habitat or population.

Any instream work proposed in relation to the sedimentation management works must first be informed with comprehensive fisheries surveys using electrofishing efforts. If works involve dry celling or temporary river diversions, fish translocation may be required. Each of these services will require a licensed authorisation under Section 14 of the Fisheries (Consolidation) Act 1959.

Any alteration of the hydromorphology (instream infrastructure, embankment alteration) of the rivers within the catchment must be conducted in association with fisheries breeding habitat surveys and impact reports to ensure there will be no adverse impacts on breeding gravels and lamprey ammocoete silt beds.

Instream works must be carried out within the restricted season of July - September inclusive in order to minimise impact on fisheries.



### 6.3.8 Invertebrates

Marsh Fritillary *Euphydryas aurinia* is the only legally protected insect in Ireland and has been recorded within the study area. It is protected under Annex II of the Habitats Directive. Marsh Fritillary has a restricted diet in Ireland where the caterpillars are 'monophagous' meaning that they only feed on one plant, Devil's-bit Scabious *Succisa pratensis*. There are number of habitats which support the presence of Devil's-bit scabious, particularly in the northern extent of the study area where there is exposed heath, fen and peat habitats which may support populations of this butterfly.

There are eight species of the tiny whorl snails in Ireland, and three are protected under Annex II of the Habitats Directive, *Vertigo geyeri*, *V. angustior* and *V. moulinsiana*. None of these species have been recorded within the study area, however there are examples of calcareous wetland habitats throughout the study area with local flora that may support these species (reed grasses and sedges).

### 6.3.9 Protected Flora

Killarney Fern is an Annex IV species, protected under the Habitats Directive, and at least two known locations are present within the Mulkear Catchment, at Glenstal and at Clare Glens (where is a QI of both SACs). Due to the sensitivity of the species, no exact locations are known at this time. A sensitive data request for will provide further detail on the exact locations of the species if required at the next phase. Any works in these areas would require the highest sensitivity, due to the potential for direct disturbance. Works hydrologically would require detail on hydrological impacts in the vicinity of Killarney fern, as it is frequently located within the splash zone of waterfalls, or in close proximity to rivers/streams.

A full overview of Protected Flora is not provided at this stage of the process, but cognisance of the presence of protected flora (Flora Protection Order) or rare species (those on the Irish Vascular Data Red List) which may be reliant on hydrological regimes is noted.

## 6.4 Invasive non-native species

Certain invasive non-native animals and plants are listed under the Third Schedule of S.I. No. 477/2011 – (see Section 6.2). This makes it an offence to cause them to disperse, spread or otherwise cause them to grow. If these species occur on a site proposed for development or other work which may disturb the ground, control of these species is likely to be required.

Various non-native species have been recorded across the Mulkear catchment, with the extensive presence of Giant Hogweed *Heracleum mantegazzianum*, Himalayan Balsam *Impatiens glandulifera* and Japanese Knotweed *Reynoutria japonica*. It is highly likely that one or more of these species would be present inside or within close proximity to any proposed zone of works. Specialist removal and/or treatment of these species would be required, and certain procedures such as biosecurity control measures should be followed to prevent the spread of these species.

Crayfish plague *Austropotamobius pallipes* has been recorded in each of the bordering catchments but not recorded in the Mulkear catchment. This means that the Mulkear catchment may act as an important refuge for White-clawed Crayfish, and as such all efforts should be made to prevent the spread of Crayfish plague within the catchment.

## 6.5 Potential Constraints

The following is a summary of key constraints related to Sections 6.1 - 6.4

- Any proposed works within the study area must go through the Appropriate Assessment process in advance of works, to ensure that there is no impact on conservation objectives of the Natura 2000 sites within the proposed projects zone of influence.
- An Ecological Impact Assessment (EclA) should be conducted to assess impact on non-statutory designated sites (pNHAs) and ecological receptors outside of the statutory designated sites, or those receptors that are not listed as Qualified Interests of the statutory designated sites. Mitigation measures must be put in place to reduce impact, with the goal to have a net positive gain for the local ecology.
- Alterations to fine sediment deposition may result in a reduction of Alluvial Woodland islands and vegetated banks/bars of the Lower River Shannon, downstream of Parteen Weir. This would oppose conservation objectives of the Lower River Shannon SAC. Works should either compensate for this or avoid it.

- If the area of proposed works aligns with preferred species habitats described in Section 6.3, specific species surveys must be conducted to ensure any proposed scheme does not impact on those sensitive species. Required timings are as follows:
  - Breeding bird surveys must be conducted between March and June inclusive
  - Amphibian surveys must be conducted between February and March for Frogs and March to May for Smooth Newt.
  - Electrofishing surveys must be conducted between July and September inclusive.
  - Marsh Fritillary surveys should be conducted in late August to early September.
  - Bat surveys should take place between May and September.
- Works to remove vegetation must be conducted outside the bird nesting season, May - August inclusive.
- Instream works must take place between July and September inclusive.

## 7 Soils and Geology

### 7.1 Geological Bedrock

The study area has complex geology dominated by sedimentary rock formations. Volcanic and igneous intrusions are also present, although comprise a very small percentage of the total area. Shape and fragmentation of formations generally follow along the many fault lines that are present. A synclinal axis is present in the southwestern region of the study area at the centre of rock formations in a circular shape likely to be a sedimentary basin. The Hollyford and Keeper Hill formations are older rocks dating to the Silurian and Devonian periods respectively. Other rock formations date back to the later Carboniferous period.

Subsoils are comprised largely of calcareous till and gravels.

Table 7-1 Bedrock geology and percentage of total study area.

Unit	Description	Location
Hollyford Formation	Greywacke, siltstone and grit	Northeastern quarter of the project.
Keeper Hill Formation	Pale and red sandstone, grit and claystone	Adjacent to Hollyford (east) with some pockets embedded within the north of Hollyford.
Lower Limestone Shale	Sandstone, mudstone and thin limestone	Thin vein running north to south of the project extent with a kink to the west within Limerick. Thin band located south running east to west.
Ballysteen Formation	Dark muddy limestone, shale	Thicker vein running alongside Lower Shale vein, also the southern tip of the project extent.
Ballynash Formation	Wavy-bedded cherty limestone, thin shale	Band in northwest, arc hugging Ballysteen F in the west. Very thin vein.
Tuff	n/a	Falls within the border northeast of Annacotty.
Waulsortian Limestones	Massive unbedded lime-mudstone	Northwest, following same curve as Keeper Hill, Lower Limestone shale and Ballysteen to the west.
Lough Gur Formation	Pale cherty crinoidal limestone	North and mid-west following curve of the same above.
Visean Limestones	Undifferentiated limestone	Underlying Annacotty.
Knockroe Vitric-Lithic Tuff Member	Vitric-lithic tuff & agglomerate	Northeast of Caherline and southeast of Old Pallas (following curve roughly).
Knockroe Trachyte Lava Flow Member	Trachytic lava flows	Small veins within Knockroe Vitric-Lithic Tuff Member.
Cappagh White Sandstone	Red & white sandstone, conglomerate	Underlying and to the northeast of Limerick Junction.
Knockroe Basalt Lava Flow Member	Basaltic lava flows	Curving in an easterly direction. East and northeast of Old Pallas and Caherline.
Herbertstown Formation	Blue-grey limestone & interbedded ash	Curving in an easterly direction. East and northeast of Old Pallas and Caherline.

Dromkeen Limestone Formation	Pale thick-bedded bioclastic limestone	East of Caherline, northwest of Old Pallas.
Longstone Shale Member	Olive, flaggy & mudstone shale	Between Caherline and Old Pallas, northwest of Old Pallas.
Longstone Flagstone Member	Parallel laminated fine sandstone	Patches between Caherline and Old Pallas, northwest of Old Pallas.
Ballysteen Formation	Dark muddy limestone, shale	Vein in northeast-southwest direction north of Tipperary town. Fragmented vein and fragments north and northwest of Limerick Junction.
Knockroe Lithic Tuff Member	Lithic tuff & agglomerate	Multi directional veins south and east of Pallasgreen and Old Pallas.
Transition Beds	Sandstone, limestone, calcareous shale	Fragmented vein north of Limerick Junction.
Ringmoylan Formation	Calcareous shale & crinoidal limestone	Frgmented veins separated by the Transition Beds.
Old Red Sandstone (undifferentiated)	Red conglomerate, sandstone & mudstone	North of keeper hill along the northern boundary of the study area.
Knockseefin Lava Flow Member	Ankaramitic lava flows (alkali basalt)	Irregular patches northwest of Old Pallas.
Knockseefin Volcanic Formation	Ankaramitic lavas, tuffs & intrusions	Irregular veins and fragments north and west of Old Pallas.
Knockseefin Vitric Tuff Member	Ankaramitic vitric tuffs (alkali basalt)	Veins embedded within and alongside the Knockseefin Volcanic Formation.
Knockseefin Lithic Tuff Member	Ankaramitic lithic tuffs (alkali basalt)	Veins embedded within the Knockseefin Volcanic Formation.
Volcanics	Mafic & felsic volcanic tuff	Small veins north of Cappamore and northwest of Limerick Junction.
Volcaniclastic Rocks	n/a	West of Annacotty.
Trachyte	n/a	Falls just within the study area southwest of Cullen.
Syenite	n/a	Oval shaped patch southwest of Murroe.
Trachyte Breccias	n/a	Very small oval southwest of Cappamore north of the N24.



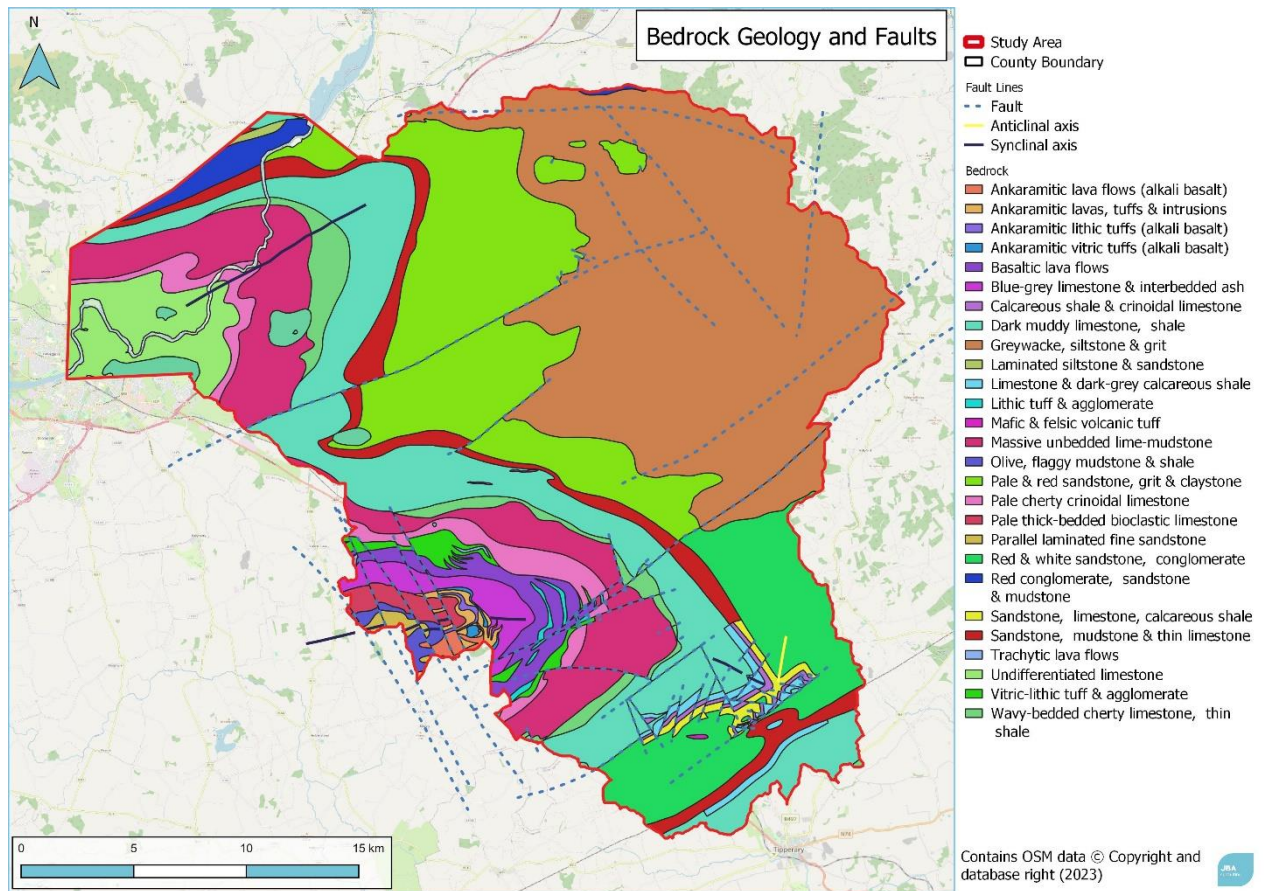


Figure 7.1: Bedrock geology and fault lines

## 7.2 Geological Heritage Sites

Geological Heritage Sites in the study area are listed in Table 7-2.

Table 7-2: Geological Heritage Sites

Site Code	Name	Description	Geological Significance
TY069	Tourknockane M7 Road Cut	A short road cutting on the M7 Motorway approximately 2km southwest of Junction 27	Natural exposures of limestone are relatively scarce so the cut is a good representative section
TY058	Owenbeg Moraines	The features comprise a set of cross-valley moraines, marking ice recession along a glacial valley	The features are important in understanding of the geomorphology and glacial history of the region
TY033	Gortdrum	A very large (150 ha) abandoned modern mine site surrounded by relatively flat pasture land	A significant modern mine, with large-scale features typical of mines from the end of 20th century

TY020	Clare Glens	Clare Glens is a deep river gorge over about 2.5km long	The Clare Glens provide a good representative section of Devonian rocks, otherwise not well exposed
TY015	Birdhill M7 Road Cut	A long cutting for the M7 Motorway northeast of Junction 27 Birdhill	This is a rare representative example of the Slieve Felim Silurian rocks
LK023	Linfield Quarry	A small, partly overgrown abandoned quarry on working farm.	This site is the best exposure of columnar jointing in the Limerick Volcanics, and contains an apparently unique example of radial columnar jointing in basalt.
LK021	Knockseefin	A former quarry, now church grotto, at base of large hill.	This site provides excellent exposure of Knockseefin Formation lava and limestone of the underlying Herbertstown Limestone Formation. More importantly, it is perhaps the best exposures of the contact between volcanic rock and limestone in the district.
LK011	Eyon Cross Quarry	This site comprises a long, narrow, working quarry cut deep into the limestones of eastern Limerick.	This County Geological Site is an important representative site exhibiting fresh and extensive exposures of Waulsortian Limestones, as well as the overlying Lough Gur Formation limestones.
LK008	Clare Glens	The Clare Glens comprise a deep river gorge over 2.5 km long along the boundary between County Tipperary and County Limerick.	The Clare Glens provide a good representative section of Devonian rocks that are otherwise not well exposed.

### 7.3 Soils and Subsoils

Soil and subsoil information was obtained through the Teagasc and Geological Survey of Ireland websites and interactive mapping portals (Teagasc, 2023; GSI, 2023)

There is great variance in soil composition covering the study area. Alluvial soils are generally found along the river corridors in the study area. Much of the soil in the southern and northeastern parts of the study area is fertile and suitable for agriculture, however there are large areas which are infertile or generally saturated soils. Soil distribution is highly varied throughout the study area. Based on the results of the Fluvial Audit<sup>2</sup>, the highest sediment contributions by land cover type are from coniferous forest and sparsely vegetated areas, with agricultural lands contributing a moderate amount.

#### 7.3.1 Subsoils

In general, majority of the subsoils within the area are derived from calcareous material such as limestone, sandstone and shale. These have a relatively high erodibility potential.

Table 7-3: Subsoils and their relative percentage over the study area

Subsoil Material	Area (km <sup>2</sup> )	% Total Area
------------------	-------------------------	--------------

<sup>2</sup> JBA Consulting (2023) "Lower Shannon Hydromorphology: Fluvial Audit". IAY-JBAI-XX-XX-RP-HM-0016-Fluvial\_Audit, Appendix A Section 8.1

Sandstone till (Devonian)	221.67	29.67
Sandstone and shale till (Lower Palaeozoic)	134.78	18.04
Bedrock at surface	74.07	9.91
Sandstone till (Lower Palaeozoic/Devonian)	75.78	10.15
Alluvium (undifferentiated)	48.09	6.44
Blanket peat	45.011	6.03
Cut peat	36.74	4.92
Limestone till	34.09	4.56
Basic igneous till	8.65	1.16
Sandstone sands and gravels (Devonian)	4.884	0.75
Lake sediments (undifferentiated)	4.226	0.65
Made Ground	3.76	0.58
Limestone sands and gravels (Carboniferous)	3.548	0.55
Shale and sandstone till (Namurian)	3.221	0.50
Scree	3.085	0.48
Sandstone sands and gravels (Lower Palaeozoic/Devonian)	3.062	0.47
Karstified limestone bedrock at surface	1.655	0.26
Sandstone and shale sands and gravels (Lower Palaeozoic)	1.133	0.18
Fen peat	1.021	0.16
Water	0.076	0.01
Acidic esker sands and gravels	0.072	0.01

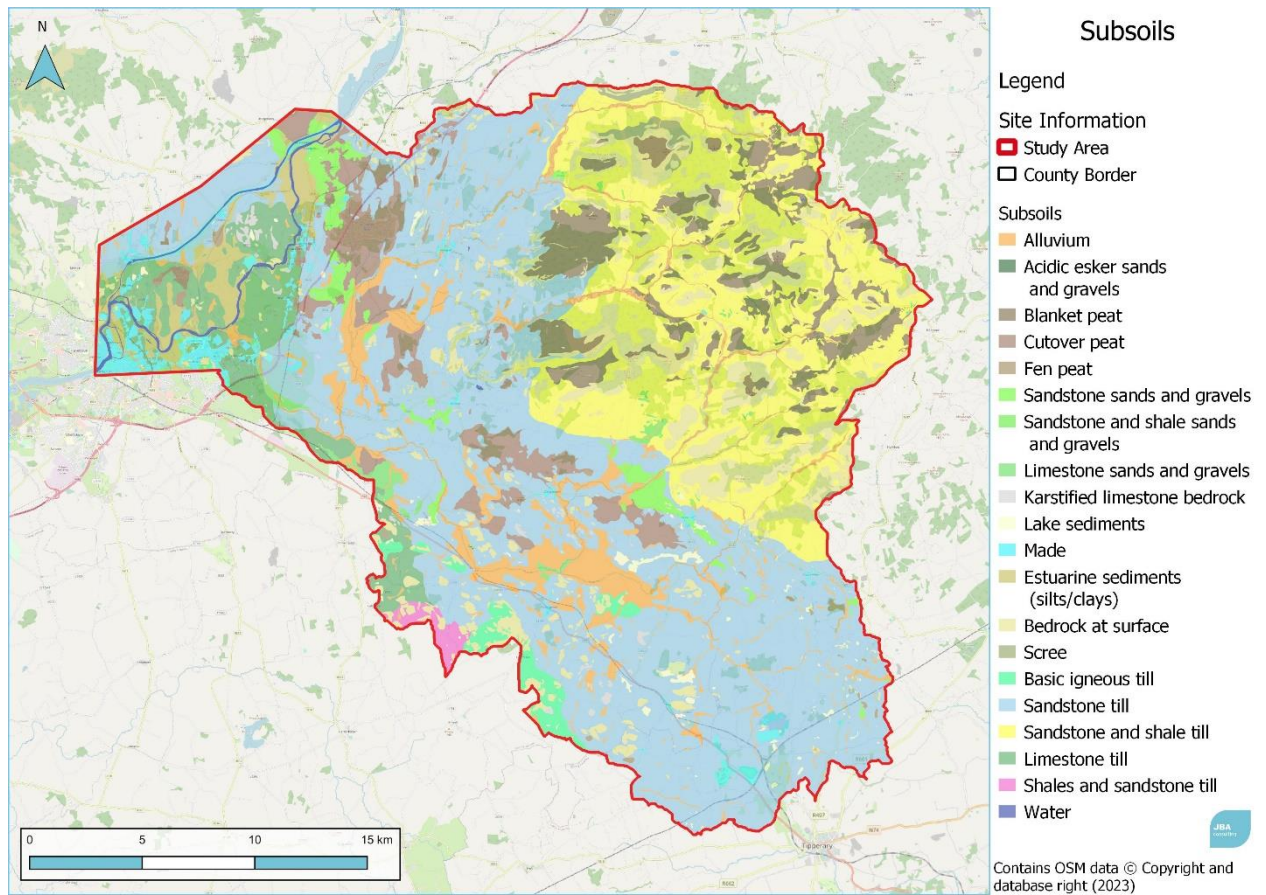


Figure 7.2: Subsoil distribution

### 7.3.2 Subsoil Permeability

Subsoil permeability is varied across the study area, however, a general trend of low permeability can be observed across the south western half while higher permeability is associated with the north eastern half. This matches closely with the groundwater vulnerability. Areas where subsoil permeability is not mapped overlie areas of extreme vulnerability or areas where bedrock is at or near the surface, see Figure 5.6 and Figure 7.3.



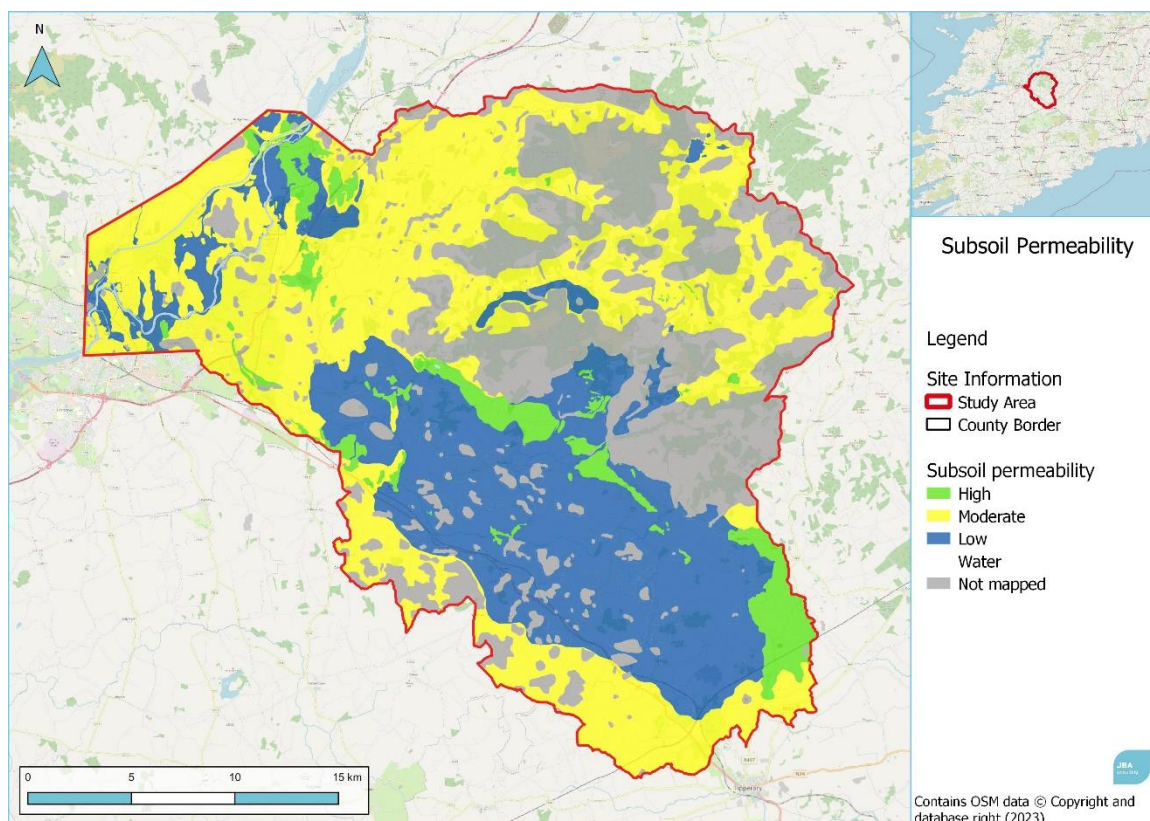


Figure 7.3 Subsoil permeability

## 7.4 Contaminated Land

Donohill landfill (W0074-03) is located south of Cappawhite and northeast of Limerick Junction. The landfill has been operational for over 30 years and accepts a variety of non-hazardous waste. Leachate is treated at Donohill wastewater treatment plant. Several compliance reports for Donohill noted contamination of surface and groundwater that was hypothesised to have originated from agricultural runoff and septic tanks.

Gortdrum Quarry is a historic mine north of Limerick Junction. According to the EPA the commodities mined at this site were Copper, Mercury and Silver. There may be residual contamination from the facility or large tailings ponds located within the site.

There are 12 wastewater treatment plants in the study area as outlined in Section 4.3.

## 7.5 Potential Constraints

Constraints relating to soils and geology may involve the erodibility of materials in areas where measures are planned and changes to sediment can also affect the hyporheic water exchange (movement between the waterbody and its stream bed) which may have implications for aquifers, particularly those which are productive at regional or local scales.



## 8 Landscape and Visual Amenity

### 8.1 Visually Sensitive Receptors

There are several scenic routes and national trails that fall within the study area.

The Tipperary CDP has identified four scenic routes within the study area

- V55 - North and South of the R503 from Newport to Ballycahill;
- V56 - East and West of the R497;
- V57 - View west on the Cork Road approach to Newport;
- V59 - Views of surrounding landscape from M7 including Annaholty and Rossfinch.

There is also one unlabelled route in Limerick forming a small arc just within the county border.

Newtown is included in the TCC Green and Blue Infrastructure Masterplan Road Map.

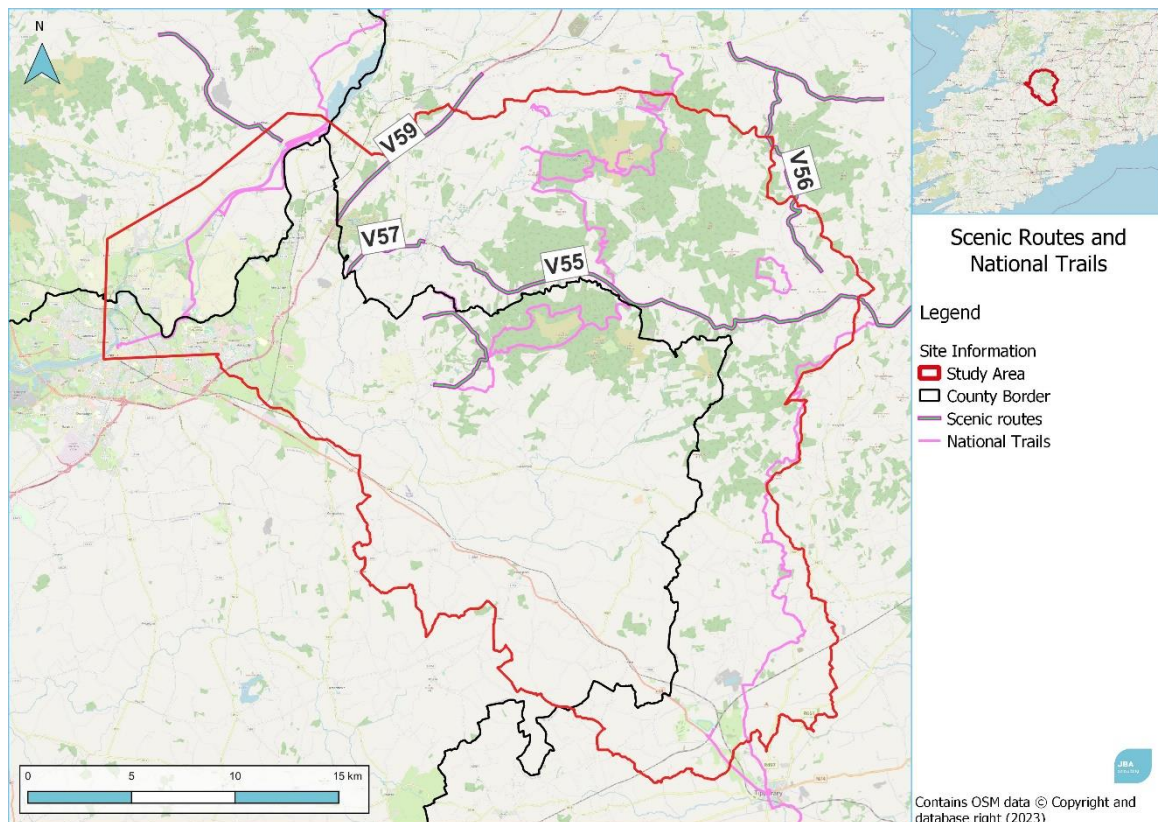


Figure 8.1: Scenic routes and national trials falling within the study scope

### 8.2 Landscape Receptors

The Limerick CDP has identified several landscape character types across the county. It has not designated a sensitivity rating framework for these categories, however, it has outlined a number of qualitative objectives for each landscape character type.

- Agricultural Lowland - majority of the county landscape has been assigned this landscape character. It is described as having a well-developed hedgerow network which separates the flat pastures into a mosaic of fields. Retention of landscape features such as trees and hedgerows into new developments will be encouraged.
- Shannon Coastal Zone - this landscape character type is also largely described as agricultural, dominated by hedgerows and fields. The defining features are the Shannon estuary and neighbouring irregular field patterns. Preference to development of existing settlements rather than development of new settlements is reiterated.
- Slieve Felim Uplands - the Slieve Felim Hills are the defining feature of this landscape character which emerge from the low-lying landscape as dominant features despite their relatively low peaks. Developments are not permitted above 220m elevation to protect the

scenic continuity and amenity of the hills. New agricultural developments are encouraged to be constructed as part of existing developments.

Tipperary County Council has created a hierarchy of landscapes in their CDP which identifies 4 broad landscape character archetypes, 7 landscape character types and 23 landscape character areas. A range of sensitivity ratings and classes based on sensitive features, capacity for change and compatibility with land use have been devised. The dominant sensitivity ratings of the archetypes within the study area are outlined below.

- The Plains - comprised of working landscapes including agricultural lands and settlements. The sensitivity ratings allow for developments that continue and enhance established developments, with localised higher sensitivities linked with waterways and visual amenity.
- The Lakelands - comprised of working landscapes including settlements, historic sites and areas of national importance for tourism and recreation. Sensitivities generally trend higher with a lower capacity for change.
- The Foothills - described as a complex mixture of landscapes including agricultural lands and settlements, forestry and semi-upland vegetation. Forested mosaics are regarded as sensitive while farmland mosaics are of moderate sensitivity. Developments should aim to continue and enhance established landscape patterns and implement wise use and best choices where higher sensitivity is present.
- The Uplands - includes mountainous landscapes with the highest sensitivities. Settlement and road densities are low. Landscapes are unique and changes would alter the landscape character.

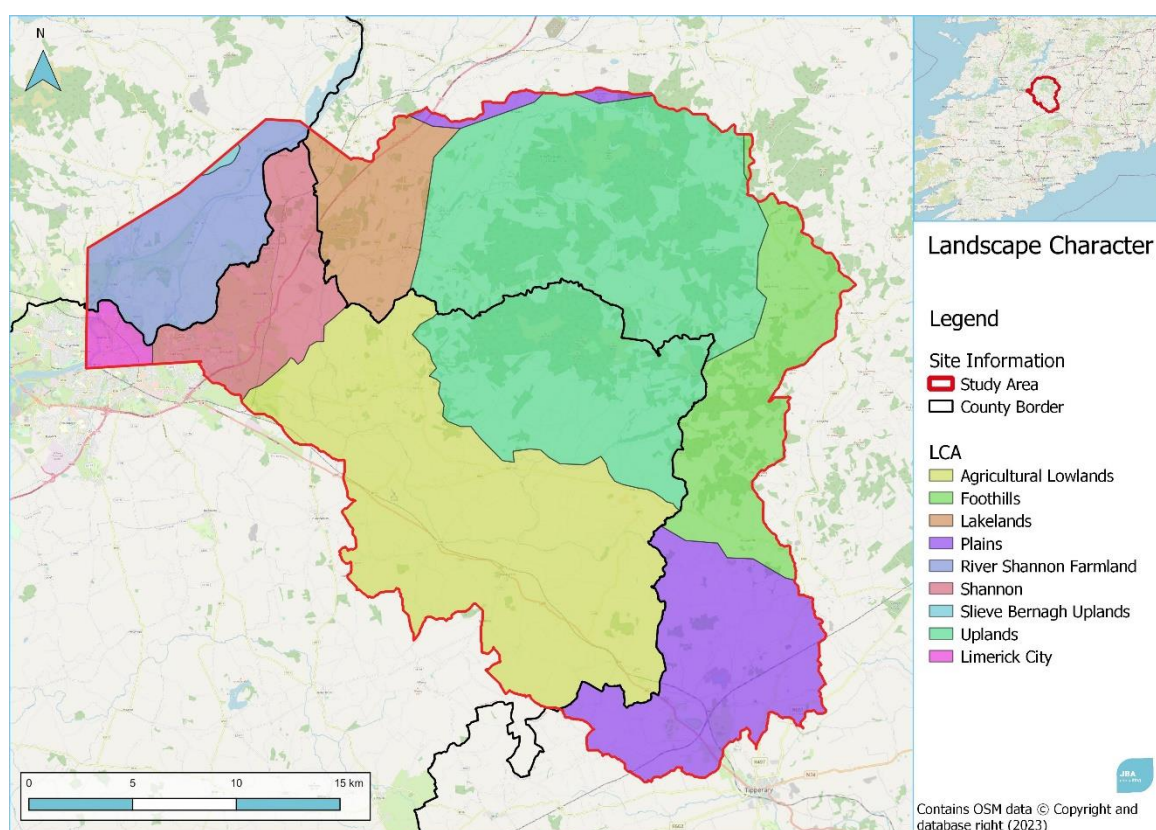


Figure 8.2 Landscape characters within the study area

### 8.3 Potential Constraints

Landscape character in the northeastern part of the study area is generally more sensitive than the low-lying plains to the southwest. These sensitive areas are associated with the headwaters of many of the rivers that may be points for increased sediment retention. The visual characteristics of the areas must be taken into account when forming the options for this scheme.



## 9 Cultural Heritage

### 9.1 Archaeological Heritage

There are 1498 NMS sites within the study area categorised by over 100 distinct classes including ringforts, castles, standing stones, earthworks, bridges, fulachta fiadh, enclosures and mounds.

### 9.2 Architectural Heritage

There are 660 NIAH sites within the study area. A higher concentration is notable in the south and western parts of the study area where a higher number of settlements are located in the lowlands of the Slieve Felim, Silvermines and Keeper Hill mountains.

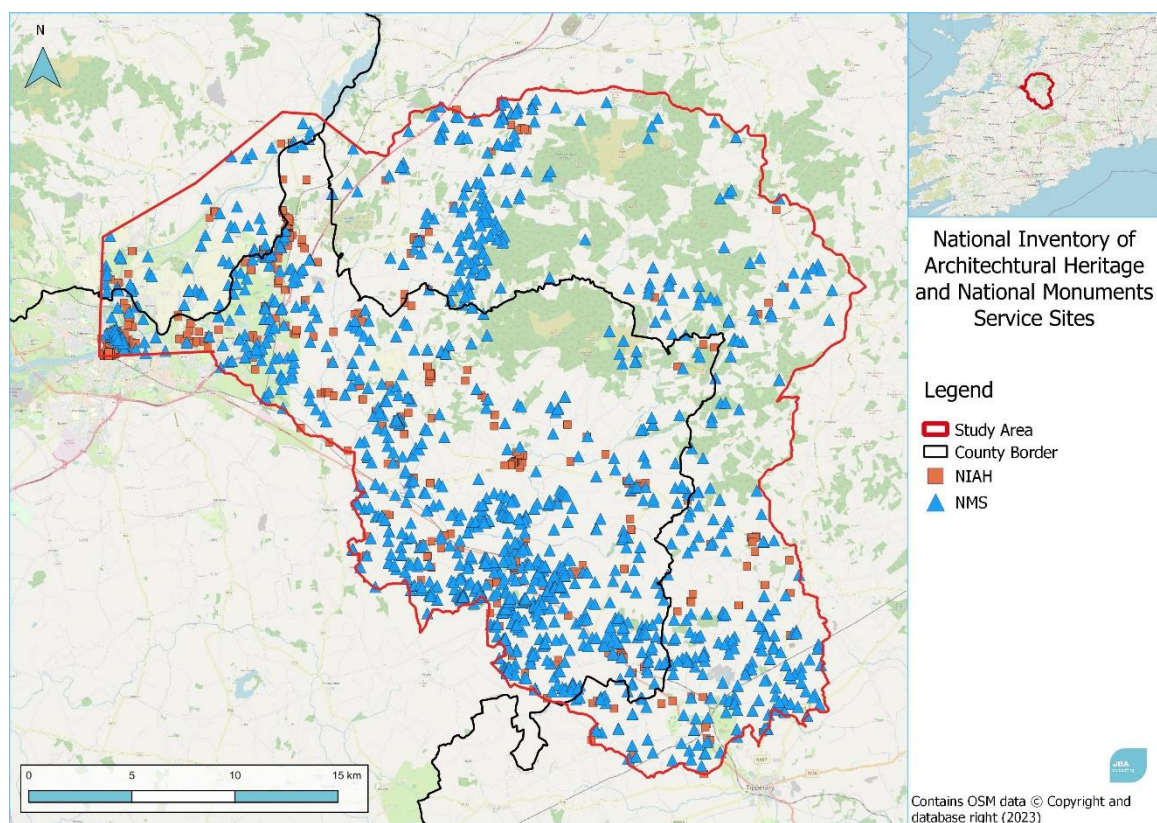


Figure 9.1 NMS and NIAH sites in the study area

### 9.3 Undesignated Sites

Investigation into the presence of undesignated sites will be undertaken in due course once sites where measures are planned have been selected.

### 9.4 Potential Constraints

Due to the large study area a substantial number of sites appear within the scope. Detailed analysis of such sites will be undertaken at a smaller scale on specific work areas. However, in general, sites located within water courses or the riparian zone of watercourses such as fulachta fiadh or bridges may impose constraints on the nature of actions that can be undertaken.

## 10 Air, Noise, and Climate

### 10.1 Air Monitoring Sites

There is one air monitoring site located within the study area at Castletroy, on the western boundary of Annacotty (Station TNO3840). The site is an indicative monitoring site operated by Limerick City and County Council.

### 10.2 Noise Pollution

Noise pollution in the study area is confined to section of the N24 passing through the southern boundary from Tipperary town moving up along the west to Limerick City.

Rail networks passing through the study area at Limerick Junction alongside the N24 have not been designated a noise level by the EPA. Noise pollution from rail is unlikely to be significant.

### 10.3 Climate

The carbon footprint of sediment management options across the catchment will be considered.

### 10.4 Potential Constraints

Machinery and vehicles that may be required over the lifetime of any of the proposed options, and may impose temporary disturbances such as dust and noise. Construction works could contribute increased particulate matter pollution and negatively impact air quality in the area.

## 11 References

JBA Consulting 2019, Office of Public Works Arterial Drainage Maintenance Works - Lower Shannon Arterial Drainage Scheme 2019-2023

JBA Consulting 2023, Lower Shannon Hydromorphology, Fluvial Audit Including Site Visit Walkover and Conceptual Model Development.

MKO 2021, Natura Impact Statement - Maintenance to Flood Defence Embankments, Ballymakeogh, Newport, Co. Tipperary. Available online at: <https://www.gov.ie/en/collection/ea868-2021-opw-site-specific-appropriate-assessments/>

NBDC 2023, National Biodiversity Data Centre Biodiversity Maps Viewer, Available online at: <https://maps.biodiversityireland.ie/Map>

Wetland Surveys Ireland, 2023. Interactive Map of Irish Wetland in Conjunction with Foss Consulting, Available online at: <https://www.wetlandsurveys.ie/miw-intro>





Offices at

[Dublin](#)

[Limerick](#)

Registered Office

[24 Grove Island](#)

[Corbally](#)

[Limerick](#)

[Ireland](#)

t: +353 (0) 61 345463

e: [info@jbaconsulting.ie](mailto:info@jbaconsulting.ie)

[JBA Consulting Engineers and  
Scientists Limited](#)

Registration number 444752

JBA Group Ltd is certified to:

ISO 9001:2015

ISO 14001:2015

OHSAS 18001:2007



Visit our website  
[www.jbaconsulting.ie](http://www.jbaconsulting.ie)