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**WATER FRAMEWORK DIRECTIVE ASSESSMENT
REDROCK QUARRY AT CLOGRENNANE,
CO. CARLOW**

FINAL REPORT

Prepared for:
MILFORD QUARRIES LTD

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1. INTRODUCTION

1.1 BACKGROUND

Hydro-Environmental Services (HES) were requested by Tom Phillips and Associates (TPA), on behalf of Milford Quarries Ltd, to complete a Water Framework Directive (WFD) Compliance Assessment for the effects of the quarrying activities at Redrock Quarry, Clogrennane, Co. Carlow.

The purpose of this WFD Compliance Assessment is to determine whether any specific components or activities associated with the quarrying activities at the Development Site have compromised WFD objectives or have resulted in a deterioration of the status of any waterbodies in the vicinity or downstream of the Development Site. This assessment will determine the water bodies with the potential to be impacted, describe the control measures and determine if the quarry activities have been in compliance with the objectives of the WFD.

This WFD Compliance Assessment is intended to supplement the remedial Environmental Impact Assessment Report (EIAR) submitted as part of the substitute consent application.

This WFD Compliance Assessment report has been compiled using the following data sources:

- Environmental Protection Agency database (www.epa.ie);
- Observation recorded during various site visits as described in Section 8.3.1 of the rEIAR;
- Drainage mapping as described in Section 8.3.3.1 of the rEIAR;
- Surface water flow monitoring as described in Section 8.3.3.2 of the rEIAR; and,
- Surface water quality sampling (EPA biological Q-monitoring and HES surface water sampling) as described in Section 8.3.3.3 of the rEIAR.

1.2 STATEMENT OF AUTHORITY

Hydro-Environmental Services (HES) are a specialist hydrological, hydrogeological and environmental practice that delivers a range of water and environmental management consultancy services to the private and public sectors across Ireland and Northern Ireland. HES was established in 2005, and our office is located in Dungarvan, County Waterford. We routinely complete impact assessments for hydrology and hydrogeology for a large variety of project types including wind farms.

This WFD assessment was prepared by Michael Gill, Conor McGettigan and Nitesh Dalal.

Michael Gill (BA, BAI, Dip Geol., MSc, MIEI) is a Civil/Environmental Engineer, Hydrologist and Hydrogeologist with 22 years' environmental consultancy experience in Ireland. Michael has a degree in Civil and Environmental Engineering, a MSc in Engineering hydrology from TCD and a MSc in Applied Hydrogeology from Newcastle University. Michael has completed numerous (60+) hydrological and hydrogeological assessments relating to bedrock quarries and sand and gravel pits. Recent examples include Ardfert quarry in County Kerry, Middleton Quarry in County Cork, and Rathcore and Clonard Quarries in County Meath.

Conor McGettigan (BSc, MSc) is an Environmental Scientist, with over 5 years' experience in the environmental sector in Ireland. Conor holds an MSc in Applied Environmental Science and a BSc in Geology from University College Dublin. Conor routinely completes hydrological and hydrogeological assessments for a wide range of developments including sand and gravel pits and bedrock quarries.

Nitesh Dalal (B.Tech, PG Dip., MSc) is an Environmental Scientist with over 7 years' experience in environmental consultancy and environmental management in India. Nitesh holds a M.Sc.

in Environmental Science from University College Dublin (2024), a PG Diploma in Health, Safety and Environment from Annamalai University, India (2021) and B.Tech. in Environmental Engineering (2016) from Guru Gobind Singh Indraprastha University, India (2016).

1.3 WATER FRAMEWORK DIRECTIVE

The EU Water Framework Directive (2000/60/EC), as amended by Directives 2008/105/EC, 2013/39/EU and 2014/101/EU ("WFD"), was established to ensure the protection of the water environment. The Directive was transposed in Ireland by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003), as amended.

The WFD requires that all member states protect and improve water quality in all waters, with the aim of achieving good status by 2027 at the latest. Any new development must ensure that this fundamental requirement of the WFD is not compromised.

The WFD is implemented through the River Basin Management Plans (RBMP) which comprises a six-yearly cycle of planning, action and review. RBMPs include identifying river basin districts, water bodies, protected areas and any pressures or risks, monitoring and setting environmental objectives. In Ireland the first RBMP covered the period from 2009 to 2015 with the second cycle plan covering the period from 2016 to 2021, and the third cycle covers the period from 2022 to 2027. The RBMPs are forward looking.

The Water Action Plan 2024 is Ireland's 3rd River Basin Management Plan (2022 - 2027). The objectives of the Water Action Plan 2024 have been integrated into the design of the Development and include:

- Ensure full compliance with relevant EU legislation;
- Prevent deterioration;
- Meet the water standards and objectives for designated protected areas;
- Protect high-status waters; and,
- Implement targeted actions and pilot schemes in focus sub-catchments aimed at (i) targeting waterbodies close to meeting their objectives and (ii) addressing more complex issues that will build knowledge for future cycles.

2. WATERBODY IDENTIFICATION & CLASSIFICATION

2.1 INTRODUCTION

This section identifies those surface waterbodies (SWBs), groundwater bodies (GWBs) and protected areas with potential to be affected by the historic quarrying activities and reviews any available WFD information.

2.2 SURFACE WATERBODY IDENTIFICATION

Regionally, the majority of the Development Site is located within the River Barrow surface water catchment and Hydrometric Area 14 of the Southeastern River Basin District. A small portion in the west of the Development site is located within the River Nore surface water catchment and Hydrometric Area 15 of the Southeastern River Basin District.

More locally within the River Barrow surface water catchment, the Development Site is mapped within the Barrow_SC_110 sub-catchment and Barrow_170 WFD river sub-basin. Within the Barrow_170 WFD river sub-basin, the EPA map a small 1st order stream, referred to by the EPA as the Raheendoran Stream (EPA Code: 14R41) to flow through the centre of the Development Site. This stream is also recorded on local historic 6" and 25" basemaps. The stream is mapped to flow from northwest to southeast across the existing quarry void before continuing to the south, crossing the L7134, flowing to the east through Clogrennane Woods for ~3km, before discharging into the River Barrow. However, as described in Section 8.3.3.1.1 of the rEIAR, the upper reaches of the Raheendoran Stream, in the area of the existing quarry, have been altered by the previous quarrying activities. The existing quarry void discharge flows to the east for ~630m before it discharges into the EPA mapped Mortarstown Stream. This stream is a tributary of the Fushoge River, discharging into the Fushoge River just upstream of its confluence with the River Barrow. Both the Raheendoran Stream and the Mortarstown Stream form part of the Barrow_170 SWB. Further downstream, the River Barrow (Barrow_240 SWB) drains out into Upper Barrow Estuary transitional waterbody. All waterbodies downstream of the Development Site in the River Barrow Catchment are listed in **Table B**.

More locally within the River Nore surface water catchment, the Development Site is mapped within Dinin[South]_SC_010 sub-catchment and Dinin (South)_010 WFD river sub-basin. Within the Dinin (South)_010 WFD river sub-basin the closest EPA mapped stream is an unnamed stream located ~1.3km west of the Development Site. This stream, which forms part of the Dinin (South)_010 SWB, flows for ~1km before discharging into Dinin (South) River. Inspection of local 6" and 25" basemaps for the local area shows that this watercourse, referred to on these maps as the Dinin River, rises ~500m west of the Development Site. There is no existing discharge from the quarry within the River Nore catchment. The existing extraction area is located entirely within the River Barrow catchment. Therefore, the Development had no potential to cause significant effects in the River Nore catchment.

Figure A below is a local hydrology map of the area.

Table A presents the total catchment area of each river waterbody downstream of the Development Site. Within River Barrow surface water catchment, the Barrow_170 SWB has a significant upstream catchment area of ~2,314km². The catchment area increases further downstream along the River Barrow.

Within River Nore surface water catchment, the Dinin (South)_010 has a much smaller catchment area (~21km²). The catchment area increases downstream of the Dinin (South)_010 SWB with the Dinin (South)_020 SWB having a catchment area of ~87km². However, as stated above, whilst the landholding is mapped within the River Nore catchment, no extraction works extended into this catchment. Therefore, there was no potential for effects on the Dinin (South)_010 SWB.

Table A: Downstream Catchment Size for River Waterbodies

WFD River Sub-Basin	Total Upstream Catchment Area (km ²)
Barrow_170	~2,314
Barrow_180	~2,377
Barrow_190	~2,407
Barrow_200	~2,420
Barrow_210	~2,524
Barrow_220	~2,607
Barrow_230	~2,805
Barrow_240	~2,812
Dinin (South)_010	~21
Dinin (South)_020	~87
Dinin (Main Channel)_010	~246
Dinin (Main Channel)_020	~300
Nore_160	~1,562

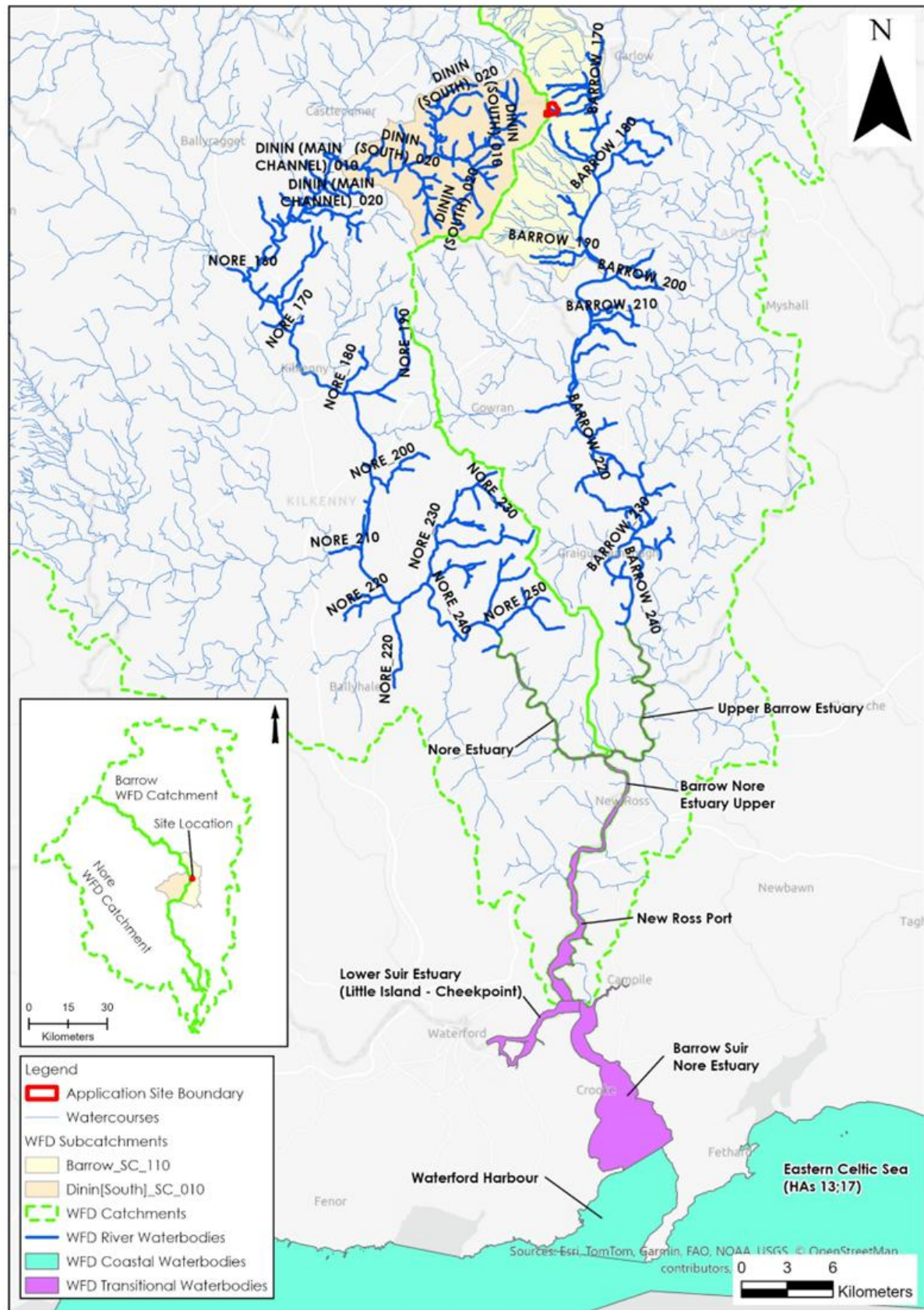


Figure A: Local Hydrology Map

2.3 SURFACE WATER BODY CLASSIFICATION

A summary of the WFD status and risk result for Surface Water Bodies (SWBs) downstream of the Development Site are shown in **Table B**. The overall status of SWBs is based on the ecological, chemical and quantitative status of each SWB.

Local Groundwater Body (GWB) and Surface water Body (SWB) status information is available from (www.catchments.ie).

Within the River Barrow regional surface water catchment, the River Barrow downstream of the Development Site (Barrow_170 to Barrow_240 SWBs) typically achieved "Moderate" status in the latest WFD cycle (2019-2024) with the exception of the Barrow_210 and Barrow_230 SWBs which achieved "Poor" status. In the vicinity of the Development Site, the Barrow_170 SWB achieved "Moderate" status in all WFD cycles.

All segments of the River Barrow (Barrow_170 to Barrow_240 SWBs) are "at risk" of failing to meet their WFD objectives except for Barrow_190 and Barrow_240 SWBs who's risk status are "under review". Further downstream the Upper Barrow Estuary achieved "moderate" status in the latest WFD cycle and is at risk of failing to meet its WFD objectives.

Within the River Nore regional surface water catchment, the Dinin (South)_010 and Dinin (South)_020 SWBs have achieved "Good" status in the latest WFD cycle and are "not at risk" of failing to meet their WFD objectives. Further downstream, the Dinin (Main Channel)_010 and Dinin (Main Channel)_020 SWBs have achieved "Good" and "Moderate" status respectively. The Dinin (Main Channel)_020 SWB flows down into River Nore which achieved "Good" status.

Within the River Barrow catchment, agriculture is listed as a significant pressure on 4 no. river waterbodies downstream of the Development Site (Barrow_170, _180, _200 and _220 SWBs). Hydromorphology is identified as a significant pressure on 3 no. river waterbodies (Barrow_170, _210 and _230 SWBs). Urban run-off is the significant pressure on 3 no. river waterbodies (Barrow_180, _200 and _210 SWBs) whilst urban wastewater is the significant pressure identified on 1 no. river waterbody (Barrow_200 SWB). Finally, industry is listed as a significant pressure on the Barrow_210 SWB. Within the River Nore catchment, agriculture is listed as a significant pressure on the Dinin (Main Channel)_010 and _020 SWBs, whilst abstractions and mines and quarries are significant pressures impacting the Dinin (Main Channel)_020 SWB.

In regard to transitional waterbodies, the Upper Barrow Estuary is "at risk" of failing to meet its WFD objectives. Agriculture and urban runoff are the listed pressures.

The SWB status for the 2016-2021 WFD cycle are shown on **Figure B**.

Table B: Summary WFD Information for Surface Water Bodies

SWB	Overall Status (2013-2018)	Overall Status (2016-2021)	Overall Status (2019-2024)	Risk Status (3 rd Cycle)	Pressures
River Barrow Catchment					
Barrow_170	Moderate	Moderate	Moderate	At risk	Hydromorphology and agriculture
Barrow_180	Moderate	Moderate	Moderate	At risk	Urban run-off and agriculture
Barrow_190	Unassigned	Moderate	Moderate	Under review	None
Barrow_200	Good	Moderate	Moderate	At risk	Urban run-off, agriculture and urban wastewater
Barrow_210	Poor	Poor	Poor	At risk	Urban run-off, hydromorphology and industry
Barrow_220	Moderate	Moderate	Moderate	At risk	Agriculture
Barrow_230	Poor	Poor	Poor	At risk	Hydromorphology
Barrow_240	Moderate	Moderate	Moderate	Under review	None
River Nore Catchment					
Dinin (South)_010	Moderate	Good	Good	Not at risk	None
Dinin (South)_020	Good	Good	Good	Not at risk	None
Dinin (Main Channel)_010	Moderate	Moderate	Good	At risk	Agriculture
Dinin (Main Channel)_020	Moderate	Moderate	Moderate	At risk	Agriculture, abstractions and mines and quarries
Nore_160	Good	Good	Good	Not at risk	None
Transitional Waterbodies					
Upper Barrow Estuary	Good	Moderate	Moderate	At risk	Urban run-off and agriculture

2.4 GROUNDWATER BODY IDENTIFICATION

The southwest and some areas in the east of the Development Site are underlain by the Bregaun Flagstone Formation described as thick flaggy sandstone and siltstone. The majority of the Development Site is underlain by Moyadd Coal Formation described as shale, siltstone and minor sandstone.

The Bregaun Flagstone Formation is classified as being a Poor Bedrock Aquifer - Bedrock which is Generally Unproductive except for Local Zones (PI). Meanwhile, the Moyadd Coal Formation is classified as a Poor Aquifer - Bedrock which is Generally Unproductive (Pu).

In terms of GWBs, the Development Site is underlain by the Shanragh GWB (IE_SE_G_124).

2.5 GROUNDWATER BODY CLASSIFICATION

The Shanragh GWB (IE_SE_G_124) achieved “Good” status in all WFD cycles which is defined based on the quantitative status and chemical status of the GWB. This GWB is “not at risk” and there are no significant pressures identified to be impacting on this GWB.

The GWB status for the 2016-2021 WFD cycle is shown on **Figure B**.

Table C: Summary WFD Information for Groundwater Bodies

GWB	Overall Status (2013-2018)	Overall Status (2016-2021)	Overall Status (2019-2024)	Risk Status (3 rd Cycle)	Pressures
Shanragh	Good	Good	Good	Not at risk	None

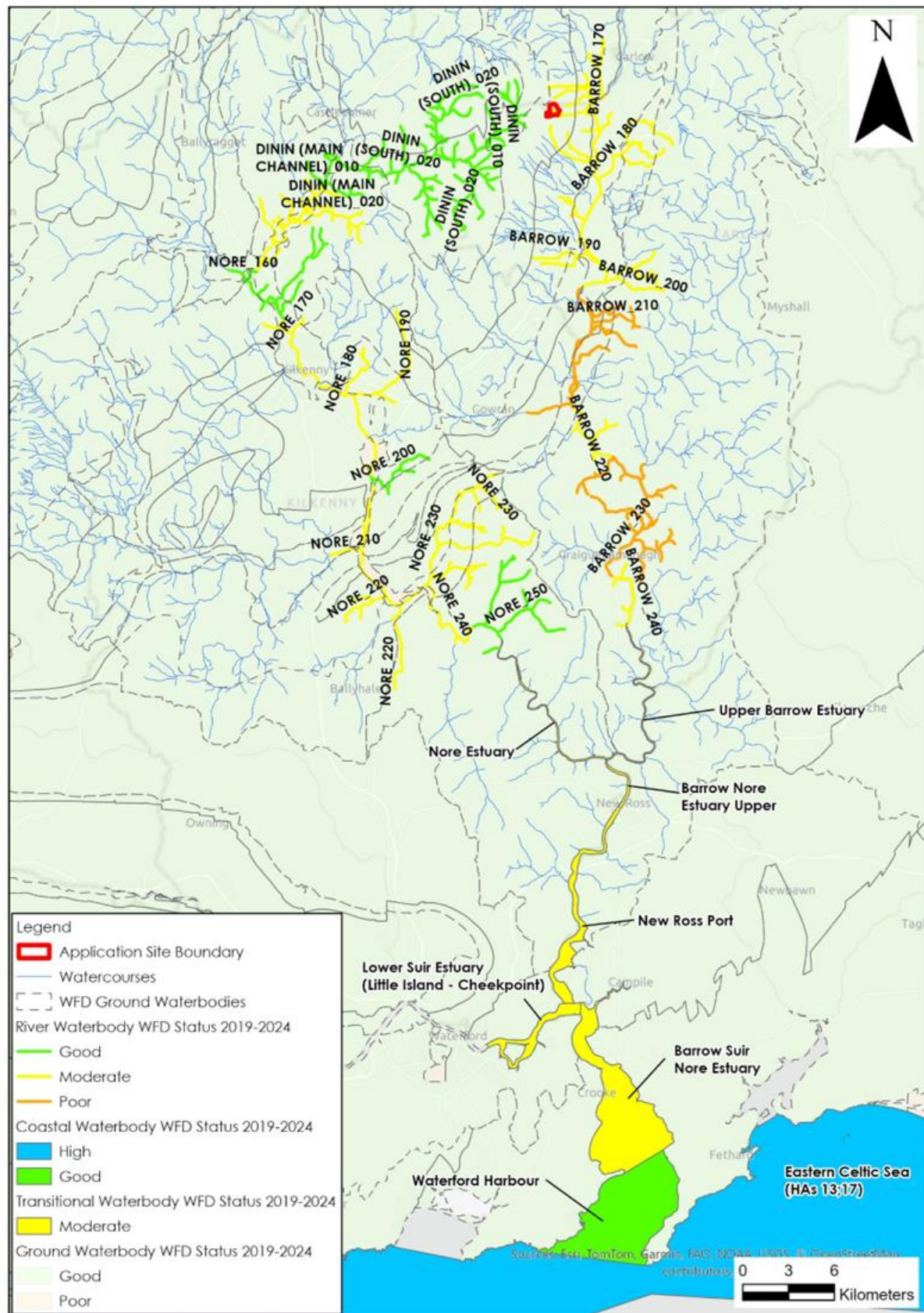


Figure B: WFD Groundwater and Surface Waterbody Status (2019-2024)

2.6 ZONE OF INFLUENCE

The Zone of Influence (Zoi) of the Development extends to the following river waterbodies, GWB, and transitional and coastal water bodies:

- River SWBs – River Barrow (Barrow_170 to Barrow_240), Dinin (South)_010 & 020, Dinin (Main Channel)_010 and _020 and River Nore (Nore_160)
- GWBs – Shanragh GWB.
- Transitional– Upper Barrow Estuary.

2.7 PROTECTED AREAS

The WFD requires that activities are also in compliance with other relevant legislation, as considered below.

The potential effect of the Development on nature conservation designations, bathing waters, nutrient sensitive areas (NSAs), shellfish areas and drinking water protected area's (DWPAs) are also included as part of the WFD Compliance Assessment.

2.7.1 Nature Conservation Designations

Within the Republic of Ireland designated sites include Natural Heritage Areas (NHAs), Proposed Natural Heritage Areas (pNHAs), Special Areas of Conservation (SACs), candidate Special Areas of Conservation (cSAC) and Special Protection Areas (SPAs).

Ramsar sites are wetlands of international importance designated under the Ramsar Convention (adopted in 1971 and came into force in 1975), providing a framework for the conservation and wise use of wetlands and their resources.

The Development Site is not located within a Ramsar site or a designated site of national (Natural Heritage Area (NHA) / Proposed Natural Heritage Area (pNHA)) or European importance (Special Area of Conservation (SAC) / Special Protection Area (SPA).

However, there are downstream hydrological connections with some Natura 2000 sites within the River Barrow surface water catchment. Designated sites that lie downstream of the Development Site include:

- River Barrow and River Nore SAC (Site Code: 002162): The Development Site is hydrologically (~2.7km) connected to this SAC via the Mortarstown Stream which receives the discharge from the Development Site. The lower reaches of this stream and the Fushoge River form part of the SAC.
- Cloghrick Wood pNHA (Site Code: 000806): The Cloghrick Wood pNHA is located on the eastern banks of the River Barrow downstream of the Development Site. The length of the hydrological flowpath between the Development Site and this pNHA is ~6.3km. The pNHA includes some wet woodland adjacent to the river.
- River Nore SPA (Site Code: 004233): Within the River Nore catchment, the River Nore SPA is located downgradient of the Development Site via the Dinin River. However, extraction did not encroach upon this catchment and there was no discharge within the River Nore catchment.

Other protected sites located within 10km of the Development Site but are not directly linked via surface water pathways are considered below:

- Coan Bogs NHA (Site Code: 002382) located ~5km west of the Development site.

2.7.2 Bathing Waters

Bathing waters are those designated under the Bathing Water Directive (76/160/EEC) or the later revised Bathing Water Directive (2006/7/EC).

There are no designated bathing water sites located in the Zol. Duncannon bathing water (IESEBWT100_0100_0100) is the closest mapped bathing water downstream of the Development Site, located ~65km to the south.

2.7.3 Nutrient Sensitive Areas

Nutrient Sensitive Areas (NSA) comprise Nitrate Vulnerable Zones and polluted waters designated under the Nitrates Directive (91/676/EEC) and areas designated as sensitive areas under the Urban Wastewater Treatment Directive (UWWTD)(91/271/EEC).

The River Barrow (Barrow_170 to Barrow_240 SWBs, and several transitional waterbodies downstream of the Development Site (Upper Barrow Estuary, Nore Estuary, Barrow Nore Estuary Upper, New Ross Port, Lower Suir Estuary (Little Island - Cheekpoint)) are listed as NSAs. Note that many of these are located outside the Zol i.e. downstream of the Upper Barrow Estuary.

2.7.4 Shellfish Area

The Shellfish Waters Directive (2006/113/EC) aims to protect or improve shellfish waters in order to support shellfish life and growth.

There are no designated shellfish areas located in the Zol. The Waterford Harbour (Cheekpoint/Arthurstown/Creadon) shellfish area (IE_SE_100_0100) is the nearest protected shellfish area downstream of the Development Site, located ~58km to the south of the Development Site.

2.7.5 Salmonid Waters

The Salmonid Regulations (S.I. 293 / 1988) identifies the protected river that are designated as Designated Salmonid Waters under S.I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations 1988, 14th August 1988. The Council Directive 78/659/EEC of 18th July 1978 on the quality of fresh waters needing protection or improvement in order to support fish life and the Council Directive 92/42/EEC of 21st May 1992 on the conservation of natural habitats and of wild fauna and flora was transposed into Irish law under the Fish Directive S.I. 293/1988 and Habitats Directive S.I. 477/2011.

The River Nore (Nore_160 to Nore_250 SWBs) is identified as designated Salmonid Waters. As stated previously the extraction area did not encroach upon the River Nore catchment and there was no discharge to surface waters within this catchment.

2.7.6 Drinking Water

According to the 3rd Cycle River Barrow and River Nore Catchment Reports (EPA, 2024) there are 6 no. SWBs in the River Barrow catchment and 6 no. SWBs in River Nore catchment which are identified as Drinking Water Protected Areas (DWPAs).

No sections of the River Barrow downstream of the Development Site are identified as Drinking Water Protected Areas (DWPAs) (www.catchments.ie).

Meanwhile, within the River Nore catchment, the closest downstream DWPA is located on the Dinin (Main Channel)_020 SWB. This surface water abstraction is associated with the Public Water Scheme Supply for Kilkenny City. This DWPA is distant from the Development Site. Whilst a section of the overall landholding is located in the River Nore catchment, the extraction areas did not encroach into the River Nore catchment, nor was there any discharge of

surface water within this catchment. Therefore, the Development would have had no potential to impact this DWPA.

3. WFD SCREENING

3.1 SURFACE WATER BODIES

With consideration for the historic quarrying activities and the proposed restoration plan, it is considered that the Barrow_170 SWB will be carried through to the WFD Compliance Assessment due to the location of the Development Site within this WFD river sub-basin. The Barrow_180 SWB has also been included in the assessment as it is located directly downstream of the Barrow_170 SWB.

The Barrow_190 to _240 SWBs have been screened out of the assessment due to the large volumes of water within the River Barrow (associated with the large catchment area) and their distant location from the Development Site. Furthermore, all transitional and coastal waterbodies downstream of the Development Site have been screened out of further assessment due to the large volumes of water within these SWBs and the saline nature of these waters. The historic extraction activities, and all ancillary works, and the proposed restoration plan have no potential to cause a deterioration in the status of these screened out SWBs and/or jeopardise their attainment of good surface water status.

Similarly, all SWBs within the River Nore catchment have been screened out as the extraction works did not encroach upon this catchment. Furthermore, there was no discharge to surface waters within the River Nore catchment. The historic extraction activities, and all ancillary works, and the proposed restoration have no potential to cause a deterioration in the status of these screened out SWBs and/or jeopardise their attainment of good surface water status.

3.2 GROUNDWATER BODIES

The Shanragh GWB has been screened in due to its location directly underlying the Development Site.

3.3 PROTECTED AREAS

The Development Site is hydrologically connected to the River Barrow and River Nore SAC via the discharge to the Mortarstown Stream. With consideration for the historic quarrying activities and the proposed restoration plan, it is considered that the River Barrow and River Nore SAC is carried through into the WFD Compliance Assessment.

Cloghristrick Wood pNHA is located ~3.48km southeast of the Development Site and is associated with Barrow_180 SWB. Cloghristrick Wood pNHA is included for the purposes of a conservative assessment.

River Nore SPA is located ~22km southwest of the Development Site and has been screened out as no extraction occurred within the River Nore catchment.

The majority of the Development Site is located within the Barrow_170 river sub-basin. The Barrow_170 NSA downstream of the Development Site has been screened in due to the existing surface water connections between the Development Site and the Barrow_170 SWB. Therefore, an assessment is required to consider the potential effects that the historic quarrying activities and the proposed restoration plan may have had or will have on this NSA.

All other downstream NSAs, shellfish areas, bathing waters, and drinking water protected areas are screened out of the WFD Compliance Assessment due to their distant location from the Development Site. The historic quarrying activities and the proposed restoration plan would have no potential to impact these protected areas.

3.4 WFD SCREENING SUMMARY

A summary of WFD Screening discussed above is shown in **Table D**.

Table D: Screening of WFD Waterbodies

Type	WFD Classification	Waterbody Name/ID	Inclusion in Assessment	Justification
Surface Water Body	River	Barrow_170	Yes	The majority of the Development Site is located within the Barrow_170 river sub-basin. An assessment is required to consider the potential effects that the historic quarrying activities have had on this SWB. Similarly, an assessment is required to consider the potential effects of the proposed restoration on this SWB.
	River	Barrow_180	Yes	The Barrow_180 SWB has been included in the assessment as it is located directly downstream of the Barrow_170 SWB. An assessment is required to consider the potential effects that the historic quarrying activities have had on this SWB. Similarly, an assessment is required to consider the potential effects of the proposed restoration on this SWB.
	River	Barrow_190	No	The Barrow_190 SWB has been screened out due to its large upstream catchment (~2,407km ²), the large volumes of water within this SWB and its distant location from the Development Site. The historic quarrying activities had no potential to impact the status of this SWB. Furthermore, the proposed restoration has no potential to impact this SWB.
	River	Barrow_200	No	The Barrow_200 SWB has been screened out due to its large upstream catchment (~2,420km ²), the large volumes of water within this SWB and its distant location from the Development Site. The historic quarrying activities had no potential to impact the status of this SWB. Furthermore, the proposed restoration has no potential to impact this SWB.
	River	Barrow_210	No	The Barrow_210 SWB has been screened out due to its large upstream catchment (~2,524km ²), the large volumes of water within this SWB and its distant location from the Development Site. The historic quarrying activities had no potential to impact the status of this SWB. Furthermore, the proposed restoration has no potential to impact this SWB.
	River	Barrow_220	No	The Barrow_220 SWB has been screened out due to its large upstream catchment (~2,607km ²), the large volumes of water within this SWB and its distant location from the Development Site. The historic quarrying activities had no potential to impact the status of this SWB. Furthermore, the proposed restoration has no potential to impact this SWB.
	River	Barrow_230	No	The Barrow_230 SWB has been screened out due to its large upstream catchment (~2,805km ²), the large volumes of water within this SWB and its distant location from the Development Site. The historic quarrying activities had no potential to impact the status of this SWB. Furthermore, the proposed restoration has no potential to impact this SWB.

	River	Barrow_240	No	The Barrow_240 SWB has been screened out due to its large upstream catchment (~2,812km ²), the large volumes of water within this SWB and its distant location from the Development Site. The historic quarrying activities had no potential to impact the status of this SWB. Furthermore, the proposed restoration has no potential to impact this SWB.
	River	Dinin (South)_010	No	The historic extraction area does not encroach upon the Nore Catchment and the existing quarry void is located entirely in the River Barrow catchment. Therefore, the historic quarrying activities had no potential to impact the status of this SWB. Furthermore, the proposed restoration has no potential to impact this SWB.
	River	Dinin (South)_020	No	The Dinin (South)_020 is located directly downstream of the Dinin (South)_010. Therefore, the historic quarrying activities had no potential to impact the status of this SWB. Furthermore, the proposed restoration has no potential to impact this SWB.
	River	Dinin (Main Channel)_010	No	The Dinin (Main Channel)_010 has been screened out due to no historic extraction in Nore Catchment, large upstream catchment (~246km ²), the large volumes of water within this SWB and its distant location from the Development Site. The historic quarrying activities had no potential to impact the status of this SWB. Furthermore, the proposed restoration has no potential to impact this SWB.
	River	Dinin (Main Channel)_020	No	The Dinin (Main Channel)_020 has been screened out due to no historic extraction in Nore Catchment, large upstream catchment (~300km ²), the large volumes of water within this SWB and its distant location from the Development Site. The historic quarrying activities had no potential to impact the status of this SWB. Furthermore, the proposed restoration has no potential to impact this SWB.
	River	Nore_160	No	The Nore_160 has been screened out due to no historic extraction in Nore Catchment, large upstream catchment (~1,562km ²), the large volumes of water within this SWB and its distant location from the Development Site. The historic quarrying activities had no potential to impact the status of this SWB. Furthermore, the proposed restoration has no potential to impact this SWB.
	Transitional	Upper Barrow Estuary	No	The Upper Barrow Estuary has been screened out due to distant location and large volume of water. The historic quarrying activities had no potential to impact the status of this SWB. Furthermore, the proposed restoration has no potential to impact this SWB.
Groundwater Body	Groundwater	Shanragh	Yes	The Development Site directly overlies the Shanragh GWB. An assessment is required to consider potential effects of the historic quarrying activities on this GWB.
Protected Areas	Nature Conservation Designations	River Barrow and River Nore SAC	Yes	The Development Site is hydrologically connected to the River Barrow and River Nore SAC via the River Barrow. An assessment is required to consider the potential effects that the historic quarrying activities have had on this SAC. Similarly, an assessment is required to consider the potential effects of the proposed restoration on this SAC.

		Cloghistrick Wood pNHA	No	Cloghistrick Wood pNHA is associated with Barrow_180 river and has been screened out due to large upstream catchment area (~2,377km ²) of the Barrow_180 SWB. Therefore, the historic quarrying activities had no potential to impact the pNHA. Furthermore, the proposed restoration has no potential to impact this pNHA.
		River Nore SPA	No	River Nore SPA has been screened out due to distant location and large upstream catchment area of the River Nore. Therefore, the historic quarrying activities had no potential to impact the SPA. Furthermore, the proposed restoration has no potential to impact this SPA.
		Coan Bogs NHA	No	Coan Bogs NHA has been screened out due to the lack of hydrological and hydrogeological connections between the Development Site and the NHA. Therefore, the historic quarrying activities had no potential to impact the NHA. Furthermore, the proposed restoration has no potential to impact this NHA.
	Nutrient Sensitive Areas	Barrow_170 and _180	Yes	The majority of the Development Site is located within the Barrow_170 river sub-basin. An assessment is required to consider the potential effects that the historic quarrying activities have had on this NSA. Similarly, an assessment is required to consider the potential effects of the proposed restoration on this NSA.
		Barrow_190 to 240	No	The Barrow_180 to 240 NSA has been screened out due to its large upstream catchment, the large volumes of water within these NSA and its distant location from the Development Site. The historic quarrying activities had no potential to impact the status of this NSA. Furthermore, the proposed restoration has no potential to impact this NSA.
		Upper Barrow Estuary	No	The Upper Barrow Estuary NSA has been screened out due to distant location and large volume of water. The historic quarrying activities had no potential to impact the status of this NSA. Furthermore, the proposed restoration has no potential to impact this NSA.
		Nore Estuary	No	The Nore Estuary NSA has been screened out due to no historic extraction in Nore Catchment, distant location and large volume of water. The historic quarrying activities had no potential to impact the status of this NSA. Furthermore, the proposed restoration has no potential to impact this NSA.
		Barrow Nore Estuary Upper	No	The Barrow Nore Estuary Upper NSA has been screened out due to distant location and large volume of water. The historic quarrying activities had no potential to impact the status of this NSA. Furthermore, the proposed restoration has no potential to impact this NSA.
		New Ross Port	No	The New Ross Port NSA has been screened out due to distant location and large volume of water. The historic quarrying activities had no potential to impact the status of this NSA. Furthermore, the proposed restoration has no potential to impact this NSA.

		Lower Suir Estuary (Little Island - Cheekpoint)	No	The Lower Suir Estuary (Little Island - Cheekpoint) NSA has been screened out due to distant location and large volume of water. The historic quarrying activities had no potential to impact the status of this NSA. Furthermore, the proposed restoration has no potential to impact this NSA.
	Shellfish Areas	The Waterford Harbour (Cheekpoint / Arthurstown / Creadon)	No	The Waterford Harbour (Cheekpoint/Arthurstown/Creadon) shellfish area has been screened out due to its distal location from the Development Site. The historic quarrying activities had no potential to impact this Shellfish Area. Furthermore, the proposed restoration has no potential to impact this shellfish area.
	Salmonid Waters	Nore_160	No	The Nore_160 Salmonid Waters has been screened out due to no historic quarrying activities in Nore Catchment. The historic quarrying activities had no potential to impact the status of these Salmonid Waters. Furthermore, the proposed restoration has no potential to impact these Salmonid Waters.
	DWPAs	Dinin (Main Channel)_020	No	The Dinin (Main Channel)_020 DPWA has been screened out due to no historic quarrying activities in Nore Catchment. The historic quarrying activities had no potential to impact the status of this DPWA. Furthermore, the proposed restoration has no potential to impact this DPWA.
		River Nore (Nore_160)	No	The Nore_160 DPWA has been screened out due to no historic quarrying activities in Nore Catchment. The historic quarrying activities had no potential to impact the status of this DPWA. Furthermore, the proposed restoration has no potential to impact this DPWA.

4. WFD COMPLIANCE ASSESSMENT

A full description of the Development and all works completed at the Development Site post-dating the 1995 baseline are described in full in Chapter 3 of this rEiAR.

4.1 EXTRACTION PHASE (1995 BASELINE TO 2023)

During this Extraction Phase quarrying, specifically the extraction of sandstone rock, occurred at the Development Site. Rock extraction was completed by rock breaking and no blasting was completed at the Development Site. All rock was crushed and processed with mobile plant on-site and spoil was stored in large spoil heaps within and surrounding the quarry void.

The extraction of bedrock in the greenfield areas was proceeded by site preparation works comprising of vegetation removal and soil/subsoils stripping. This material was used in the construction of boundary berms and will be used in the phased restoration of the Development Site.

The discharge licence granted by Carlow County Council in November 2011 (DL/S4/2011/2) with the purpose of licensing discharges to waters. Previously the quarry had 18 no. conditions imposed in 2007 by Carlow Co. Co. which sought assurance in relation to prohibiting surface water runoff to discharge to the public road, prohibiting wastewater discharge, restricting the construction of ancillary buildings, requiring unsoiled surface water run-off collection and disposal.

The final extraction area in 2023 was 8.66 Ha.

4.2 CURRENT PHASE (2023 TO PRESENT DAY)

The Current Phase of the Development includes all activities carried out at the Development Site from the time that the Applicant took ownership of the Development Site in 2023 to the present day.

There was limited activity at the Development Site during this period, limited to environmental monitoring. The quarry has remained inactive throughout the duration of the Applicant's ownership. All plant and machinery were removed off-site once quarrying ceased. The drainage infrastructure, settlement pond, wet areas and discharge locations continue to be in operation.

4.3 RESTORATION PHASE

The Development will also include for a restoration plan to agricultural grassland using excavated materials from an existing infill area at the western portion of the site. This will be achieved by placing a thin layer of crushed rock across the floor of the extraction area followed by the material from the infill area. Revegetation will be allowed to occur naturally whilst hedgerows and stone walls will be inserted across the Development Site to reinstate the original field boundaries.

The site restoration also includes the diversion of water from the site back into the Raheendoran Stream. This will be achieved by constructing a diversion channel from the existing settlement pond to the stream. The restoration plan also includes a wildlife pond which will provide additional attenuation of water.

This will have a positive effect on the local hydrological regime by reinstating the catchment of the Raheendoran Stream.

4.4 EFFECTS

4.4.1 Water Quality

4.4.1.1 Baseline Water Quality

As the 1st WFD cycle was completed in 2010-2015, no WFD status reports exist prior to this period.

However, the EPA have been completing ecological monitoring on watercourses since the 1970s. The Biological Q-Value is a water quality rating system based on both the habitat and the invertebrate community assessment and is divided into status categories¹ (Q-values) ranging from 0-1 (Poor) to 4-5 (Good/High) (refer to Error! Reference source not found.). These historic Q-values guide our estimates of the health of the waterbodies during the period which predates the WFD.

The results of the EPA monitoring provides an indication of water quality trends in the streams and rivers downstream of the Development Site. However, the EPA have not completed recent or historic monitoring on the Raheendoran or Mortarstown streams in the vicinity of the Development Site. The closest available downstream monitoring data is on the Fushoge River and the River Barrow.

Table E: EPA Q-Rating System

EPA Q-Rating	EPA Q-Status	Pollution Status	Waterbody Condition
Q5/Q4-5	High Q-Status	Unpolluted	Satisfactory
Q4	Good Q-Status	Unpolluted	Satisfactory
Q3-4	Moderate Q-Status	Slightly Polluted	Unsatisfactory
Q3/Q2-3	Poor Q-Status	Moderately Polluted	Unsatisfactory
Q2/Q1-2/Q1	Bad Q-Status	Seriously Polluted	Unsatisfactory

1995 Baseline

Biological Q-rating data for EPA monitoring points upstream and downstream of the Development Site for the 1995 baseline environment are detailed in **Table F** below.

Prior to the quarrying activities at the Development Site, historic Q-data is available for the Fushoge River and the River Barrow, both upstream and downstream of the Development Site. Upstream of the Mortarstown Stream, at a bridge south of Crockaun, the Fushoge River achieved a Q3-4 rating (i.e. 'Moderate' Q-status) in 1993. Meanwhile, downstream of the Development Site and the Mortarstown Stream, the Fushoge River achieved a Q4 rating (i.e. 'Good' Q-status) upstream of its confluence with the River Barrow in 1993. Upstream of the Fushoge River, the River Barrow achieved a Q3 rating (i.e. 'Poor' Q-status) at the Dolmen Hotel. Downstream of the Development Site at Milford Bridge, the Barrow achieved a Q3-4 rating in 1994.

¹ Referred to hereinafter as 'Q-status' in order to differentiate between the EPA Q-Rating status, which is based solely on ecological parameters, and the WFD status which is a combination of ecological and chemical parameters.

Table F: Baseline EPA Water Quality Monitoring Q-Values

River	EPA Station (ID)	Year	EPA Q-Rating Status
River Barrow Surface Water Catchment			
Fushoge River	Bridge South of Crockaun (RS14F030250)	1993	Q3-4 (Moderate)
Fushoge River	Bridge upstream of Barrow confluence (RS14F030300)	1993	Q4 (Good)
River Barrow	Dolmen Hotel (RS14B012450)	1994	Q3 (Poor)
River Barrow	Milford Bridge (RS14B012600)	1994	Q3-4 (Moderate)

Early Extraction Phase (1995 Baseline to 2014)

Biological Q-rating data for EPA monitoring points upstream and downstream of the Development Site during the Extraction Phase are detailed in **Table G** below.

Upstream of the Mortarstown Stream, the Fushoge River achieved a Q4-rating at Fushoge Bridge across 3 no. monitoring rounds (2003, 2006 and 2011). Further upstream at Crockaun Bridge the Fushoge River was also generally of Good Q-status but achieved Moderate status in 2011. Meanwhile, downstream of the Development Site at Milford Bridge, the Q-status of the River Barrow ranged from Poor to Moderate Q-status throughout this phase.

In the River Nore surface water catchment, the Dinin (South) River generally achieved a Q4 rating at Black Bridge. However in 2010, the Dinin River achieved a Q4-5 rating at this location.

Table G: Early Extraction Phase EPA Water Quality Monitoring Q-Values

River	EPA Station (ID)	Year	EPA Q-Rating Status
Fushoge River	Bridge South of Crockaun (RS14F030250)	2009 – 2014 (3 no. monitoring events)	Q3-4 – Q4 (Moderate to Good)
Fushoge River	Fushoge Bridge (RS14F030290)	2003 – 2001 (3 no. monitoring events)	Q4 (Good)
Fushoge River	Bridge upstream of Barrow confluence (RS14F030300)	2003-2011 (3 no. monitoring events)	Q4 (Good)
River Barrow	Milford Bridge (RS14B012600)	1997 – 2014 (6 no. monitoring events)	Q3 (Poor) to Q3-4 (Moderate)

Later Extraction Phase (2014-2023)

The most recent biological Q-rating data for EPA monitoring points in the vicinity of the Development Site are shown in **Table H** below.

Within the River Barrow catchment, no recent biological monitoring has been completed on the Mortarstown Stream or the Fushoge River downstream of the Development Site. Meanwhile, the River Barrow downstream of the Development Site achieved a Q3-4 rating ('Moderate' Q-status) at Milford Bridge in 2018, 2020 and 2023. Upstream of the Development Site, the River Barrow also achieved a Q3-4 rating at the Dolmen Hotel in 2023.

Table H: Later Post Extraction Phase EPA Water Quality Monitoring Q-Values

River	EPA Station (ID)	Year	EPA Q-Rating Status
River Barrow	Dolmen Hotel (RS14B012450)	2023	Q3-4 (Moderate)
River Barrow	Milford Bridge (RS14B012600)	2018 – 2023 (3 no. monitoring rounds)	Q3-4 (Moderate)

Current Phase (2023 to Present)

No EPA monitoring data is available for the Current Phase apart from the 2023 monitoring presented in **Table H** above. No effects would have been anticipated due to the limited activity at the Development Site which was limited to environmental monitoring. The quarry remained inactive throughout this phase.

Summary of Biological Q-Monitoring Data

Historic Q-values for SWBs upstream and downstream of the Development Site are presented graphically in Error! Reference source not found. Error! Reference source not found. Error! Reference source not found. **Figure C**.

In summary:

- Biological Q-monitoring was only completed on the River Fushoge downstream of the Development Site up until 2000. This monitoring pre-dated the Extraction Phase, alteration of the hydrological regime at the Development Site and the diversion of water from the Development Site towards this Mortarstown Stream, a tributary of the Fushoge River.
- No biological Q-monitoring has been completed on the Raheendoran Stream downstream of the Development Site.
- The closest downstream EPA monitoring station for which data is available is along the River Barrow at Milford Bridge. The baseline Q-rating at the River Barrow at this location was Q3-4 (i.e. Moderate). There was a brief deterioration in Q-rating during the Extraction Phase (pre-2005)). A similar pattern of Q-ratings was recorded upstream of the Development Site on the River Barrow near the Dolmen Hotel. Therefore, this slight deterioration in water quality during the late 1990s is associated with wider issues in the catchment.
- The Q-rating of the River Barrow at Milford Bridge throughout the Extraction Phase remained constant at Q3-4 (i.e. Moderate status). There was no deterioration in the Q-rating status of the River Barrow downstream of the Development Site during or post-dating the extraction activities.
- Based on the Q-ratings the River Barrow is therefore considered to be of unsatisfactory condition downstream of the Development Site during the Extraction Phase. However, this condition cannot be attributed to the Development for the following reasons:
 - Similar Q-ratings were recorded upstream of the Development Site.
 - The Q-ratings during the Extraction Phase are the same or greater than those recorded during as part of the 1995 Baseline.
 - The Q-ratings on the River Barrow reflect wider issues within the Barrow Catchment rather than those associated with a very small quarry which accounts for less than 0.004% of the catchment of the Barrow River at Milford Bridge (~2,314km²).

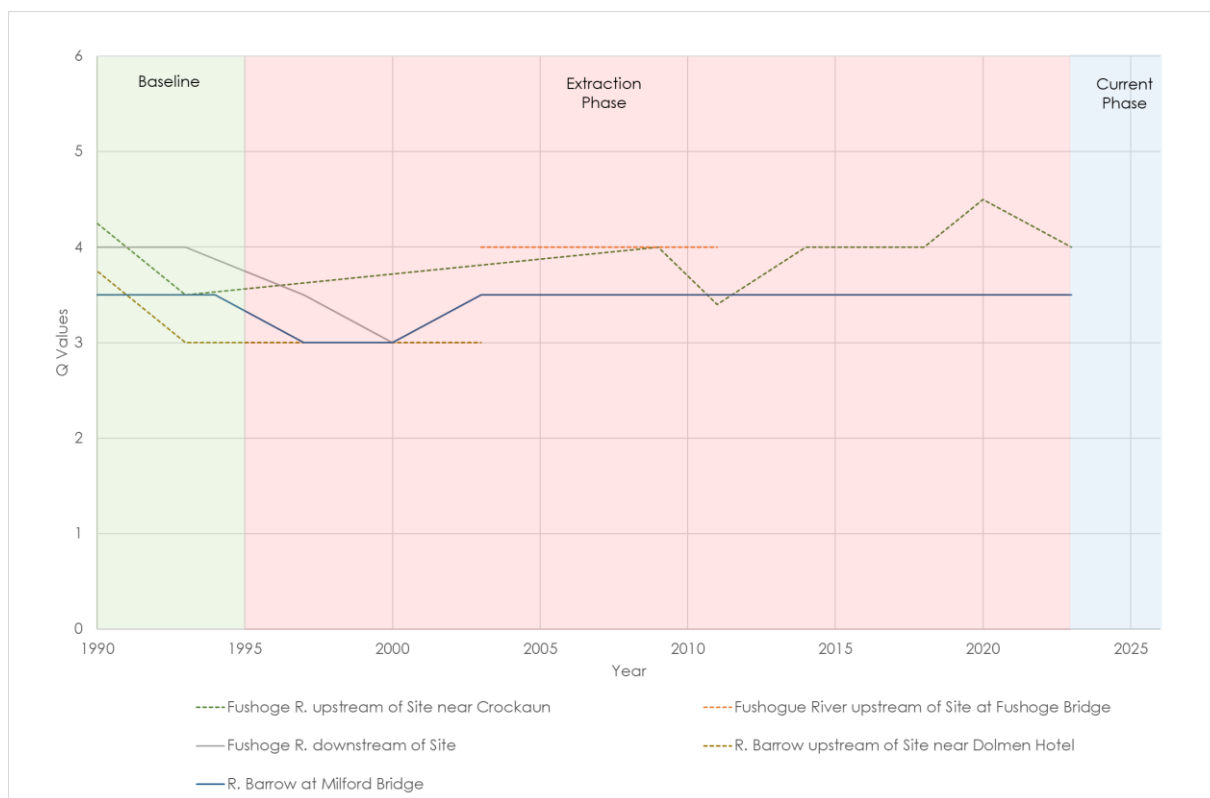


Figure C: Biological Q-Ratings Changes in the Barrow Catchment

4.4.2 Extraction Phase (1995 Baseline to 2023)

4.4.2.1 Effects on Surface Water Quality

There was a requirement to strip and store overburden from the extraction area. Earthworks, the stripping of soil/subsoil, the creation of boundary berms, was a potential source of sediment laden water. This had the potential to impact water quality in both the Raheendoran Stream and the Mortarstown Stream. During rock extraction and the subsequent processing of materials, there was the potential for the generation of suspended sediment in surface water runoff. Suspended sediment may have been entrained in surface waters on the floor of the quarry. In the absence of any mitigation measures, there would have been the potential for negative effects on downstream surface water quality.

All works were completed using machinery and any leakage of spillage of hydrocarbons would have had the potential to impact downstream surface water quality.

The potential for surface water quality effects on the Raheendoran Stream were only short-term and were associated with all works which preceded the alteration of the drainage regime. The Mortarstown Stream became a receptor once the drainage had been altered and redirected towards this watercourse. Both of these streams form part of the Barrow_170 SWB.

Due to the large flow volumes in the overall Barrow_170 SWB there was no potential for effects on this SWB (even in the absence of mitigation measures). Note that the Development did not in any way rely upon the dilution/assimilative capacity of any downstream watercourse. Control measures were implemented during the Extraction Phase for the protection of downstream surface water quality.

A summary of potential status change to SWBs arising from surface water quality effects during the Extraction Phase are outlined in **Table I**.

Table I: Surface Water Quality Effects During the Extraction Phase (Unmitigated)

SWB	WFD Code	Status (2005 – 2010)	WFD Cycle 1 (2010 – 2015)	WFD Cycle 2 (2013 – 2018)	WFD Cycle 3 (2016 – 2019)
Barrow_170	IE_SE_14B01260 0	Moderate	Moderate	Moderate	Moderate
Barrow_180	IE_SE_14B01270 0	Moderate	Moderate	Moderate	Moderate

4.4.2.2 Effects on Surface Water Quantity

Due to the alteration of the drainage patterns within the Development Site and the redirection of runoff to the Mortarstown Stream, the Development had the potential to alter surface water flow volumes in downstream watercourses. The alteration of drainage patterns resulted lower flow volumes in the Raheendoran Stream and increased flows in the Mortarstown Stream. Furthermore, the quarrying activity had the potential to increase the volume of water being discharge from the site due to increased volumes of surface and shallow groundwater being generated within the quarry void and leaving the site as surface water runoff. Any unmitigated or uncontrolled increase in discharge volumes had the potential to adversely impact downstream hydromorphology, water quality and increase the downstream flood risk.

However, the local hydrological and hydrogeological setting ensured that there was no significant effects on downstream surface water flow volumes in the Mortarstown Stream. Flow monitoring of the existing 2 no. surface water discharges from the Development Site show that the combined discharge flow volume is ~1-2l/s. This flow volume is small as the Development Site is located on a topographic high at the margin of the River Barrow catchment. Furthermore, due to the hydrogeological setting of the Development Site, located on a topographic high and underlain by Poor Bedrock Aquifers, little groundwater ingress will have occurred into the quarry void. Most of the water discharged from the quarry comprised of rainfall falling within the quarry void or on the adjacent upgradient lands. Also note that the flow volumes increased gradually as the extraction area expanded.

In terms of WFD SWBs, the Development has limited potential to alter the quantitative status of the overall Barrow_170 SWB due to the large volumes of water within this SWB.

A summary of potential status change to SWBs arising from surface water quantity effects during the Extraction Phase are outlined in **Table J**.

Table J: Surface Water Quantity Effects During the Extraction Phase (Unmitigated)

SWB	WFD Code	Status (2005 – 2010)	WFD Cycle 1 (2010 – 2015)	WFD Cycle 2 (2013 – 2018)	WFD Cycle 3 (2016 – 2019)
Barrow_170	IE_SE_14B01260 0	Moderate	Moderate	Moderate	Moderate
Barrow_180	IE_SE_14B01270 0	Moderate	Moderate	Moderate	Moderate

4.4.2.3 Groundwater Quality/Quantity Effects

Quarrying activities below the groundwater table had the potential to impact local groundwater levels in the vicinity of the Development. Once the quarrying operations extended below the groundwater table, groundwater levels in the surrounding area were lowered as the groundwater flows towards the void. Drawdown may have a negative impact on local private groundwater wells.

Groundwater monitoring had revealed the presence of a shallow groundwater system which lies above the final floor level of the quarry (300mOD). During the site investigations (borehole drilling) all water strikes were minor and described typically as seepages. Furthermore, inspections of the quarry void faces and footprint does not suggest any significant inflows of groundwater. No significant groundwater inflows would be expected at elevations of 300mOD. The groundwater present at the Development Site is hosted in bedrock that has a low permeability and groundwater flowpaths were short. Therefore, based on the hydrogeological and topographic setting of the Development Site there was no significant effects on groundwater levels. Due to the low permeability of the bedrock aquifer any minor effects were localised.

Quarrying activities also had the potential to impact local groundwater quality in the event of spills or leaks of hydrocarbons. However, it is understood that no significant pollution events occurred at the site.

Furthermore, the potential for the Development to impact the overall status of this GWB is limited given the scale of the Development in comparison to the scale of the overall GWB (148km²).

A summary of potential status change to the underlying GWB arising during the Extraction Phase is outlined in **Table K**.

Table K: Groundwater Quality/Quantity Effects During the Extraction Phase (Unmitigated)

GWB	WFD Code	Status (2005 – 2010)	WFD Cycle 1 (2010 – 2015)	WFD Cycle 2 (2013 – 2018)	WFD Cycle 3 (2016 – 2021)
Shanragh	IE_SE_G_124	Good	Good	Good	Good

4.4.2.4 Protected Areas

During the Extraction Phase, the surface water connections from the Development Site to the Barrow_170 SWB could transfer poor quality surface water that may impact the conservation objectives of the River Barrow and River Nore SAC and the River_170 Barrow NSA. However, the potential for effects was very limited given the large volumes of water within the River Barrow and the small volumes being discharged from the Development Site.

4.4.3 Current Phase (2023 to Present)

4.4.3.1 Effects on Surface Water Quality/Quantity

During this period the site drainage system still operated as described for the Extraction Phase. Therefore, discharge volumes from the Development Site will be comparable to surface water discharges during the Extraction and Post Extraction phases. The effects were limited given the relatively small discharge volumes and the large volumes of water within the Barrow_170 SWB.

During the Current Phase, there was very limited activity at the Development Site associated with environmental monitoring and site inspections. The risks to surface water quality are the same as those described for the extraction phase but of a much lesser extent due to the lower number of vehicles and workers attending the site.

A summary of potential status change to SWBs during the Current Phase are outlined in **Table L**.

Table L: Surface Water Quality Effects During the Current Phase (Unmitigated)

SWB	WFD Code	WFD Cycle 3 (2016-2021)	WFD Cycle 4 (2019-2024)
Barrow_170	IE_SE_14B012600	Moderate	Moderate
Barrow_180	IE_SE_14B012700	Moderate	Moderate

4.4.3.2 Groundwater Quality/Quantity Effects

The risks to the underlying GWB were the same as those described for the Post Extraction Phase. A summary of potential status change to the underlying GWB arising during the Current Phase are outlined in **Table M**.

Table M: Groundwater Quality/Quantity Effects During Extraction Phase (Unmitigated)

GWB	WFD Code	WFD Cycle 3 (2016-2021)	WFD Cycle 4 (2019-2024)
Shanragh	IE_SE_G_124	Good	Good

4.4.3.3 Effects on Protected Areas

The effects on downstream protected areas, including the River Barrow and River Nore SAC and the River_170 Barrow NSA, was significantly reduced in comparison with the Extraction Phase.

4.5 MITIGATION MEASURES

In order to mitigate against the potential negative effects on surface and groundwater quality, quantity and flow patterns, mitigation measures implemented during the Development. These are outlined below.

4.5.1 Extraction Phase (2005-2023)

4.5.1.1 Effects on Groundwater Vulnerability

The removal of overburden from the extraction area resulted in a slight increase in the groundwater vulnerability rating.

The main mitigation with respect to groundwater quality which was employed during the extraction phase was the employment of best practice mitigation measures with respect to oil usage and refuelling of plant and machinery. These mitigation measures are described in full below.

All operations on-site were completed in accordance with a comprehensive Environmental Management Plan (EMP) which was updated as a working document and oversaw all activities at the site.

4.5.1.2 Alteration of Drainage Patterns

The unintended rerouting of the upper reaches of the Raheendoran Stream as a result of the previous extraction activities and the redirection of this water towards the Mortarstown Stream had a profound negative effect. The hydromorphology of the Raheendoran Stream within the extraction area has been erased and the drainage patterns permanently altered as a result of the Development. No specific mitigation measures were implemented with respect to

preserving the Raheendoran Stream within the site. Note that the proposed restoration plan includes measures to redirect water back into the Raheendoran Stream.

4.5.1.3 Effects on Downstream Surface Water Flow Volumes

The Development included the provision of a water management system. There was no discharge of untreated or unattenuated waters from the extraction area.

The water management system comprises of the following:

- Water entering the quarry void largely comprises largely of rainfall or runoff from the lands immediately upgradient of the quarry. There is no significant inflow of groundwater which reduces the volume of water to be attenuated and subsequently discharged;
- Due to the low permeability of the underlying bedrock aquifer, this water gathers on the floor of the quarry;
- There are 2 main flooded areas (one in the north and one in the south) on the quarry floor which provide significant attenuation of water; and,
- A suitably sized settlement pond was also constructed downgradient of the quarry and provides additional attenuation of water from the southern section of the quarry.

The constructed settlement pond and the large, flooded areas on the quarry floor served to attenuate and restrict runoff rates from the site. Based on the flow monitoring, discharge volumes from the quarry are likely to have been small and comparable to greenfield runoff rates.

4.5.1.4 Earthworks Resulting in Suspended Solids Entrainment in Surface Waters

The discharge licence granted by Carlow County Council in November 2011 (DL/S4/2011/2) with the purpose of licensing discharges to waters. Previously the quarry had 18 no. conditions imposed in 2007 by Carlow Co. Co. which sought assurance in relation to prohibiting surface water runoff to discharge to the public road, prohibiting wastewater discharge, restricting the construction of ancillary buildings, requiring unsoiled surface water run-off collection and disposal. The operation of the quarry in accordance with these conditions would have been effective in addressing any potential negative effects on downstream water quality from the entrainment of suspended solids. Whilst no annual environmental reports are available, EPA Q-ratings on the watercourses downstream of the Development Site do not indicate any deterioration in water quality over this time period in the Fushoge River, indicating that the Development Site was largely compliance with the conditions and that all water was being attenuated and treated prior to discharge.

The Development utilised a water management system designed to prevent contamination of local surface waters with elevated concentrations of suspended solids. All water within the quarry void was directed to flooded areas on the quarry floor or suitably sized settlement ponds in the floor of the quarry (and downgradient of the quarry) which allowed for the settlement of suspended solids.

Management of Drainage from Spoil Storage Areas: Excavated soil/subsoil material was used for landscaping throughout the Development Site and in the construction of boundary berms. Berms were sealed with a digger bucket and vegetated as soon possible to reduce sediment entrainment in drainage water. Once re-vegetated and stabilised berms were no longer be a potential source of silt laden drainage water.

The topsoil/overburden was removed incrementally as the quarry expanded. This limited the potential for effects as only small volumes of material were disturbed at any one time.

Timing of Site Preparation Works: The removal of soil/subsoil from the other extraction area was carried out during periods of low rainfall. This minimised the risk of entrainment of suspended sediment in drainage water.

No other mitigation measures were required.

4.5.1.5 Effects on Groundwater Levels

The extraction only extended to a depth of 304mOD, thereby significantly limiting the potential for effects on groundwater levels.

The Development did not include any active dewatering.

Site investigations and groundwater level monitoring at the site have revealed that the rock underlying the Development Site is of low permeability. No significant groundwater inflows are occurring into the existing quarry void.

The Development had no potential to significantly impact local groundwater levels.

Furthermore, there was no significant alteration of local groundwater recharge or surface water runoff rates as a result of the Development.

No specific mitigation measures were required.

4.5.1.6 Contamination by Leakages and Spills

Whilst there is no record of the mitigation measures implemented at the site with respect to hydrocarbons there is no evidence of pollution or spillages at the site. Furthermore the downstream Q-ratings do not record any deterioration in water quality. Based on the above, the highest standards of site management were likely maintained and utmost care and vigilance followed to prevent accidental contamination or unnecessary disturbance to the site during the operation of the quarry. These measures would have been tried and tested, best practice measures and would have been the same as those which are implemented at quarries across the country. No additional mitigation measures with respect to hydrocarbons would have been required.

4.5.1.7 Mitigation for Protected Areas

There was no potential for effects on the River Barrow and River Nore SAC or Cloghristick Wood pNHA for the following reasons:

- Whilst the Development is hydrologically connected to the River Barrow and these designated sites, the Development is in excess of 2km from the Barrow;
- The length of the hydrological flowpath between the Development Site and the SAC is >2.5km whilst the flowpath to the pNHA is ~6km;
- There was limited potential for effects due to the volume of water within the River Barrow in comparison to the small discharge volumes;
- However, the Development does not rely on the dilution or assimilative capacity of any downstream watercourse;
- The Development utilised a water management system designed to prevent contamination of local surface waters with hydrocarbons or suspended solids;

- Compliance with the conditions issued by Carlow Co. Co. in 2007 and the discharge licence would have been effective in addressing any potential negative effects on local water quality; and,
- By ensuring the protection of watercourses proximal to the site, the status of all downstream designated sites was also protected.

4.5.2 Current Phase (2023 to Present)

4.5.2.1 Effects on Downstream Surface Water Flow Volumes

The water management system comprising of settlement ponds and flooded areas on the quarry floor continued to operate during the Current Phase. Surface water from the quarry was attenuated on the floor of the quarry and in the suitably sized settlement ponds. There was no discharge of untreated or unattenuated water.

4.5.2.2 Contamination of Groundwater by Leakages and Spills

During the Current Phase, there was very limited activity at the Development Site. No refuelling occurred on site and all plant and machinery associated with the quarrying were removed from the site. No specific mitigation measures were required with respect to hydrocarbons.

4.5.2.3 Contamination of Surface Water by Leakages and Spills

Due to the limited activity on-site, no specific mitigation measures were required with respect to hydrocarbons.

4.5.2.4 Effects on Downstream Designated Sites

There was no discharge of untreated or unattenuated waters during the Current Phase. All water within the quarry void is attenuated in the flooded areas on the floor of the quarry or in the suitably sized settlement ponds. These features also allow for the settlement of suspended solids from solution, therefore, protecting downstream surface water quality. No additional mitigation measures were required.

4.5.3 Restoration Phase

The potential effects associated with the restoration phase are similar to those outlined during the operational phase. The mitigation measures outlined for the operational phase in order to protect against contamination of soils and bedrock will be implemented throughout the restoration phase.

With the implementation of the mitigation measures no negative effects on the hydrological and hydrogeological environments are expected during the restoration or post restoration phase. The restoration will have a positive effect in terms of returning the site back to scrubland and in terms of redirecting water back into the Raheendoran Stream.

4.5.4 Potential Effects with the Implementation of Mitigation

In all instances, the mitigation measures described in **Section 4.5** are sufficient to meet the WFD Objectives. The assessment of WFD elements for the WFD waterbodies is in **Table N** below.

Table N: Summary of WFD Status for Development

WFD Waterbody	Pre-WFD Cycle	WFD cycle 1 (2010 – 2015)	WFD cycle 2 (2013 – 2018)	WFD Cycle 3 (2016 – 2021)	WFD Cycle 4 (2019-2024)
Barrow_170	Moderate	Moderate	Moderate	Moderate	Moderate
Barrow_180	Moderate	Moderate	Moderate	Moderate	Moderate
Shanragh GWB	Good	Good	Good	Good	Good

4.6 CUMULATIVE EFFECTS

Other land use activities in the surrounding area comprise mainly of agricultural land and coniferous forestry plantations. Several other quarries are also located in the local area.

Due to the local hydrogeological regime, the greatest potential for cumulative or in-combination effects with other developments or land use practices will be in terms of surface water quantity and surface water quality. However, the Development and other quarries in the local area operated under strict conditions set out in their respective Environmental Management Plans and IPC Licences designed for the protection of surface water quality and quantity. Due to the lack of any significant residual effects from the Development that would affect the wider hydrological environment, there were no significant cumulative effects on downstream surface watercourses.

Similarly, in terms of groundwater, the Development had no significant effect on groundwater quantity (groundwater levels) or groundwater quality due to the nature of the local hydrogeological regime with short groundwater flowpaths and bedrock of low permeability.

Therefore, no significant hydrological and/or hydrogeological cumulative effects occurred.

5. WFD ASSESSMENT CONCLUSION

WFD status for SWBs (Surface Water Bodies) and GWBs (Groundwater Bodies) hydraulically linked to the Development Site are defined in **Section 2** above.

The Development Site (41.86 Ha) consisted of quarrying including rock extraction by mechanical means including extraction areas, stockpiling areas, surface water management and ancillary works. The quarry included a final extraction footprint of c. 8.66 Ha within a wider landholding of c.45.68 Ha and involved extraction of c. 650,000 m³ of material over a c. 14-year period. The Development will also include a restoration plan to agricultural grassland using excavated materials from an existing infill area at the western portion of the site.

Historic extraction activities at the Site would have had the potential to impact on the status of downstream SWBs and the underlying GWB. However, due to the operation of the site in accordance with best-practice measures for the protection of the local hydrological and hydrogeological environment, there has been no change in GWB or SWB status in the underlying GWB or downstream SWBs resulting from the Development. The mitigation measures have ensured that there was no change in quantitative (volume) or qualitative (chemical) status, and the underlying GWB, downstream SWBs and downstream protected areas have been protected from any potential deterioration.

As such, the Extraction Phase (1995 Baseline to 2023) and the Current Phase (2023-Present):

- Have not caused a deterioration in the status of all surface and groundwater bodies assessed;
- Have not jeopardised the objectives to achieve 'Good' surface water/groundwater status;
- Have not jeopardised the attainment of 'Good' surface water/groundwater chemical status;
- Have not jeopardised the attainment of 'Good' surface water/groundwater quantity status;
- Have not permanently excluded or compromised the achievement of the objectives of the WFD in other waterbodies within the same river basin district;
- Have been compliant with the requirements of the Water Framework Directive (2000/60/EC); and,
- Have been consistent with other Community Environmental Legislation including the EIA Directive (2014/52/EU), the Habitats Directive (92/43/EEC) and the Birds Directive (2009/147/EC) (Note that a full list of legislation complied with in relation to hydrology and hydrogeology is included in Section 8.1.4 of rEIAR Chapter 8).

Furthermore, the restoration plan will be completed in accordance with best practice and will not impact on the status of any waterbody. In addition, there will be no potential effects on any downstream protected areas as a result of the restoration plan.

As such, the Restoration Phase:

- will not cause a deterioration in the status of all surface and groundwater bodies assessed;
- will not jeopardise the objectives to achieve 'Good' surface water/groundwater status;
- does not jeopardise the attainment of 'Good' surface water/groundwater chemical status;
- does not jeopardise the attainment of 'Good' surface water/groundwater quantity status;
- does not permanently exclude or compromise the achievement of the objectives of the WFD in other waterbodies within the same river basin district;

- is compliant with the requirements of the Water Framework Directive (2000/60/EC); and,
- is consistent with other Community Environmental Legislation including the EIA Directive (2014/52/EU), the Habitats Directive (92/43/EEC) and the Birds Directive (2009/147/EC) (Note that a full list of legislation complied with in relation to hydrology and hydrogeology is included in Section 8.1.4 of rEIAR Chapter 8).

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Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.

Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption.

Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy.

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