NATURE-VISTA

Galmoy Mine

Natura Impact Statement

Client	Shanoon Resources Ltd.
Job Name	Recommencement of Mining at Galmoy Mine
Report Title	Natura Impact Statement
Author **Date**	Freddy Brookes, MSc MCIEEM September 2023
Our Ref	01092023

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Executive Summary

Nature-Vista Ltd. was requested by Shanoon Resources Limited to carry out a Stage 1 Screening and Stage 2 Natura Impact Statement (NIS) for the proposed recommencement of mining at the former Galmoy Mine, Garrylaun (the Project) located in in the townlands of Garrylaun, Castletown, Rathreagh, Rathpatrick, Whiteswall, Moneynamuck (Stopford), Rathbane and Waterland in Co. Kilkenny and in the townland of Kyle, Co. Laois (the 'Site' / 'Application Site').

The screening and NIS are required to determine the potential ecological impacts associated with the construction works and operational activities associated with the proposed reopening of the mine. This NIS was first drafted by Golder Associates Ireland Limited and submitted to statutory consultees including the Environmental Protection Agency (EPA). In accordance with Regulation 10(2)(b)(ii) of the EPA (Integrated Pollution Control) (Licensing) Regulations 2013 a formal request[1] concerning matters related to nitrogen (N) deposition and statutory protected (Natura 2000) sites was made by the EPA. Nature-Vista responded to this information request from the EPA by creating an addendum NIS that references an assessment of the impacts of NO_2, PM_{10} and SO_2 on human and biodiversity receptors undertaken by WSP (2023)[2]. The WSP study also included an assessment of the impact of dry nitrogen deposition (from nitrogen dioxide, NO_2) on Natura 2000 sites within the zone of influence of the Project.

The 2023 NIS herewith was undertaken in accordance with the requirements of the EU Habitats Directive (Directive 92/43/EEC) on the Conservation of Natural Habitats and Wild Fauna and Flora – the 'Habitats Directive'. The NIS identified potential impacts to the following Natura 2000 sites.

- Dust deposition to Galmoy Fen;
- Groundwater impacts (quality and quantity) to Galmoy Fen; and
- Surface water quality impacts to SAC and SPA qualifying species in the River Barrow and River Nore (SAC) and the River Nore (SPA).

WSP (2023) indicate that background rates of N deposition are all above the critical loads (CLo), it is concluded that all designated sites may currently be in a degraded state. In addition, as the maximum Project or process contribution (PC) relative to the CLo is predicted to be less than 0.1% of the CLo at all sites it is judged that the impact of N deposition from mine emissions on the assessed designated sites will be negligible and insignificant. Notwithstanding this fact, potential impacts to Natura 2000 sites were identified and in accordance with best practice mitigation has been designed and committed as described within this report. Given the implementation of this mitigation, and using best scientific evidence, no likely significant effects are predicted to the Natura 2000 sites in question.

[1] EPA letter dated 14 July 2023

[2] Ref: 70108242

1 Introduction

Nature-Vista Ltd. was requested by Shanoon Resources Limited to carry out a Stage 1 Screening and Stage 2 Natura Impact Statement (NIS) for the proposed recommencement of mining at the former Galmoy Mine, Garrylaun (the Project) located in in the townlands of Garrylaun, Castletown, Rathreagh, Rathpatrick, Whiteswall, Moneynamuck (Stopford), Rathbane and Waterland in Co. Kilkenny and in the townland of Kyle, Co. Laois (the 'Site' / 'Application Site').

The screening and NIS is required to determine the potential ecological impacts associated with the construction works and operational activities associated with the proposed reopening of the mine. The Application Site is located approximately 7 km south of Rathdowney, Co. Laois and approximately 7 km north of Johnstown, Co. Kilkenny. It is an area of former mining operations and contains associated built development that was associated with previous operations. The former Plant Site is currently occupied by an industrial user. As the majority of the Application Site has been drawn to encompass all areas of underground mining a large proportion of the surface Application Site comprises agricultural and single-house residential, that will remain unchanged. The lands surrounding the Application Site are predominantly used for agricultural purposes, the dominant agricultural use is livestock grazing, either by cattle or sheep. There is some sparse residential housing in the area, however this is primarily concentrated to linear ribbon settlements along local roads and the R435.

The Stage 1 and Sage 2 Appropriate Assessment comprised an appraisal of potential impacts on European designated conservation sites within a 15 km radius of the Site. This assessment has been prepared by Freddy Brookes MSc., MCIEEM – Director, Nature-Vista Ltd.

The terms of reference for this report are set out below.

1.1 Terms of Reference

This assessment has been undertaken in accordance with the requirements of the EU Habitats Directive (Directive 92/43/EEC). Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Fauna and Flora - the 'Habitats Directive' - provides legal protection for habitats and species of European importance. Article 2 of the Directive requires the maintenance or restoration of habitats and species of European Community interest, at a favourable conservation status. Articles 3 - 9 provide the legislative means to protect habitats and species of Community interest through the establishment and conservation of an EU-wide network of sites known as Natura 2000. Natura 2000 sites are Special Areas of Conservation (SACs) designated under the Habitats Directive and Special Protection Areas (SPAs) designated under the Conservation of Wild Birds Directive (79/409/EEC).

Articles 6(3) and 6(4) of the Habitats Directive set out the decision-making tests for plans or projects affecting Natura 2000 sites. Article 6(3) establishes the requirement for Appropriate Assessment: *"Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public."*

Article 6(4) deals with the steps that should be taken when it is determined, as a result of Appropriate Assessment, that a plan/project will adversely affect a European site. Issues dealing with alternative solutions, imperative reasons of overriding public interest and compensatory measures need to be addressed in this case.

Article 6(4) states:

"If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, the Member States shall take all

compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted.
Where the site concerned hosts a priority natural habitat type and/or a priority species, the only considerations which may be raised are those relating to human health or public safety, to beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest."

The requirements of Articles 6(3) and 6(4) of the Habitats Directive have been transposed into Irish legislation by means of the Habitats Regulations, 1997 (S.I. No. 94 of 1997) and the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011).

2 Methodology

2.1 Desktop Review and Data Collation

A desktop review was conducted of available published and unpublished information, together with a review of data available on the NPWS http://www.npws.ie/en/, National Biodiversity Data Centre http://maps.biodiversityireland.ie/, and Environment Protection Agency web-based databases. Notably, the WSP (2023) report provided key information specifically related to the request for further information from the EPA.

2.2 Appropriate Assessment

This report has been prepared with reference to the following documents:

- Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6 (3) and (4) of the Habitats Directive 92/43/EEC (European Communities, 2002);
- Managing Natura 2000 sites: the provisions of Article of the 'Habitats Directive' 92/43/EC; and
- Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities. (DOE, 2009, Revision Notes 2010).

Appropriate Assessment is carried out in stages, as recommended by the above-referenced Guidance Documents. There are four stages as follows.

2.2.1 Stage 1 Screening

This initial stage aims to identify the likely impacts of the project on a Natura 2000 site, either alone or in combination with other projects or plans. The impacts are examined to establish whether these impacts are likely to be significant. Assessment of the significance of effects is carried out in consultation with the relevant nature agencies.

2.2.2 Stage 2 Natura Impact Statement

The aim of this stage is to identify the conservation objectives of the site and to assess whether or not the project, either alone or in combination with other projects or plans will result in adverse effects on the integrity of the site, as defined by the conservation objectives and status of the site. Stage 2 is carried out in consultation with the relevant nature agencies. Where it cannot be demonstrated that there will be no adverse effects on the site, it is necessary to devise mitigation measures to avoid, where possible, any adverse effects.

2.2.3 Stage 3 Assessment of Alternative Solutions

This stage examines alternative ways of implementing the project that, where possible, avoid any adverse impacts on the integrity of the Natura 2000 site. If alternative solutions have been identified that will either avoid any adverse impacts or result in less severe impacts on the site, it will be necessary to assess their potential impact by recommencing the assessment at Stage One or Stage Two as appropriate. However, if it can be reasonably and objectively concluded that there is an absence of alternatives, it will be necessary to proceed to Stage Four of this assessment methodology.

2.2.4 Stage 4 Assessment where adverse impacts remain

For sites that host priority habitats and species, it is necessary to consider whether or not there are human health or safety considerations or environmental benefits flowing from the project. If such considerations do exist, then it will be necessary to carry out the Stage Four assessments of compensatory measures. If no such considerations exist, then establish whether there are other imperative reasons of overriding public interest (IROPI) before carrying out the Stage Four assessments. Where IROPI exist, an assessment to consider whether compensatory measures will or will not effectively offset the damage to the site will be necessary before the project or plan can proceed.

This report is for stages 1 and 2 Appropriate Assessment only.

3 Project Description and Location

The Application Site comprises an area of ca. 442 ha. Surface works are concentrated at the main Plant Site, six ventilation shafts and River Goul discharge point, as indicated on Figure 1.

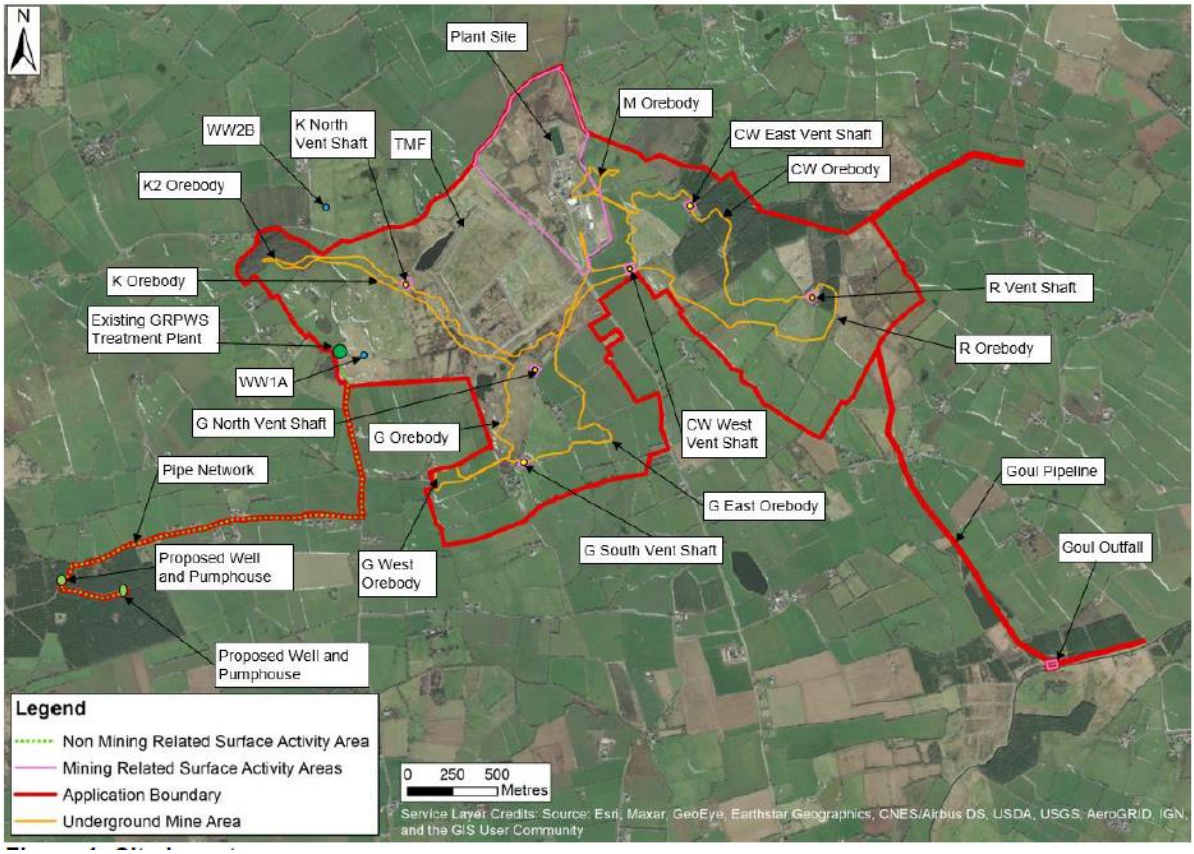

Figure 1: Site Layout of the Project Area

These areas of surface works remain from previous mining operations which were carried out at the site between 1997 and 2012. The main Plant Site is currently occupied by an industrial, environmental and drainage services provider, as its administrative and logistics base. It includes areas of hardstanding, an internal loop road, buildings and other infrastructure associated with past uses. The pervious underground mine access, located within the Plant Site, has been sealed and is grassed over. The R435 regional road dissects the Application Site. To the immediate west of the Plant Site, across the R435, is the Tailings Management Facility (TMF) where the long-term storage of mineral waste (tailings) related to former mining operations is managed under IPC licence P0517-02. The ventilation shafts have been sealed with concrete and rock material since the cessation of mining activities in 2012.

The remainder of the Application Site is characterised by agricultural fields and single residential dwellings, which sit above the proposed areas of underground mining. The underground workings will be up to 150 m below ground level (bgl).

Construction activities associated with reopening the mine will include construction of a new Mine Water Treatment Plant (MWTP), backfill plant, materials handling system and excavation of material from the main mine access portal within the Plant Site and from the six ventilation shafts as indicated on Figure 1. An underground pumping system will be installed to dewater the underground areas to enable mining activities and the MWTP will be used to manage water for discharge throughout the life of the mine. There will be some refurbishment of existing infrastructure and there will be limited new building as part of the Proposed Development. The existing internal road will be used to accommodate mine related excavators, dumper trucks and HGV operations and all plant will be accommodated within the existing Plant Site.

3.1 Description of the Site, Baseline Conditions

A Phase 1 habitat and flora assessment was carried out by Eamonn Delaney on 25 May 2021 in accordance with the Heritage Council's guidelines. The dominant habitats present were classified according to Fossitt (2000) and key botanical species were identified. Any other records of interest (e.g. invasive plant species) were also marked on field maps and/or locations were recorded.

Additionally, aerial photographs (satellite imagery) and Site mapping assisted the habitat survey.
A description of the habitats within the study area are presented in Table 1. Habitat maps have been prepared to illustrate and classify habitats identified within the footprint of the proposed development and its immediate environs and are presented within the biodiversity chapter (Chapter 6) of the EIAR.
The habitats within the Application Site are dominated by a patchwork of improved and semi-improved grassland fields bounded by hedgerows and occasional woodland. Arable (cultivated) habitat occurs occasionally, and areas of inundated wetland were also noted.
The River Goul is situated at the southern extent of the Site and flows in a west to east direction toward the River Barrow and River Nore SAC.

Table 1: Habitats Recorded on Site

Habitat	Habitat Code	Location and Prevalence	Evaluation
Improved Agricultural Grassland	GA1	Southern and Northern/ North-western boundaries of Application Site	Local Importance – Lower Value
Amenity Grassland	GA2	Around Plant Site	Negligible
Dry Neutral and Calcareous Grassland	GS1	Areas of recently reinstated or established improved grassland such as those areas located to the north of the Plant Site	Local Importance – Lower Value

Dry Meadows and Grassy Verge Grassland	GS2	Throughout	Local Importance – Lower Value
Wet Grassland	GS4	Around Plant Site	Local Importance – Lower Value
Spoil and Bare Ground	ED2	Around Plant Site	Local Importance – Lower Value
Recolonising Bare Ground	ED3	Around Plant Site	Local Importance – Lower Value
Other Artificial Lakes and Ponds	FL8	Around Plant Site	Local Importance – Higher Value
Reed and Large Sedge swamp	FS1	Southwest corner of Plant Site	Local Importance – Higher Value
Mixed Broadleaved Woodland	WD1	Between Plant Site and R435	Local Importance – Lower Value
Conifer Plantation	WD4	Between Plant Site and R435	Local Importance – Lower Value
Scrub	WS1	Throughout	Local Importance – Lower Value
Drainage Ditches	FW4	Throughout	Local Importance – Lower Value
Hedgerows	WL1	Throughout	Local Importance – Lower Value
Treelines	WL2	Along boundaries of Plant Site	Local Importance – Lower Value

3.2 Fauna Survey Methods and Preliminary Results

Baseline surveys have taken place for bats, other mammals and breeding birds. Results are summarised below.

3.2.1 Bat Surveys

Initial results indicate that the Site exhibits a number of buildings with low, medium and high bat roosting potential as defined by Collins (2016). Full external assessments of the buildings have been undertaken by suitably experienced and licensed bat workers. This work has served to identify potential access points or roosting sites and evidence of current or past bat roosts, in the form of bats, droppings, staining, feeding signs and/or remains of bats.

The buildings and structures present within the study area are generally of low likelihood to support roosting bats due to their construction and location within a site which currently experiences high level of artificial light pollution at night. A total of 10 trees within the surface working areas were assessed as having some potential for bats, 9 of which were considered to have moderate potential and one to have low potential. A number of Potential Roosting Features (PRF's) were identified in trees, and it is likely that some of these features will be used at least occasionally by day-roosting bats.

Active bat surveys were carried out on 18 May and 25 May 2021 following Collins (2016) to characterise bat activity in the area and to seek to identify any behaviour indicative of bat roosting. A low to moderate level of bat activity was recorded overall.

No evidence of any bat roosting was observed. A passive detector survey undertaken for six consecutive nights recorded a low to moderate level of activity overall, from a relatively low diversity of species.

3.2.2 Mammal Surveys

The River Goul has some ‘fair’ to ‘good’ otter habitat, with a plentiful supply of trout as prey. Otter activity along the river is very evident as further documented in Appendix 6.1 (EIAR, Chapter 6). An otter holt is located approximately 20 m downstream of the primary discharge on the opposite (right-hand) bank (Figure 2 below). There is a well-worn track along the riverbank where spraints are found, and otter prints can be seen in bankside mud.

Figure 2: Otter holt observed on Site (P. Sweeney, 2021)

No evidence of badger was recorded during the Site surveys.

3.2.3 Winter, Spring and Breeding Bird Surveys

Much of the Site is characterised by the presence of common and widespread bird assemblages. These parts of the Site can be specifically described as the main mine/plant area, Goul outfall and R ventilation shaft. However, the restored TMF contains ‘a highly diverse’ and ‘impressive’ species list including ‘many’ red and amber-listed bird species confirmed or likely to be breeding including Meadow Pipit, Snipe, Skylark, Lapwing, Black-headed Gull. Of note, particularly high densities of breeding Skylark. The overall species diversity, plus importance for species of high conservation concern such as Lapwing - may result in the TMF site being valued of 'regional' importance in terms of ecological value’ Lesley Lewis, Pers. Com. June 2021.

3.3 Aquatic Receptors and Off site Receptors

3.3.1 Aquatic Ecology – Natura 2000 Qualifying Species and Habitats

The full results of this assessment are presented in the Biodiversity Chapter (6) of the EIAR (Appendix 6.1). Table 2 below presents a summary of presence or likely absence of Natura 2000 qualifying species related to SAC's 002162 (River Barrow and Nore) and SPA 004233 (River Nore) which have connectivity with the Site as evaluated thereafter.

Table 2: Natura 2000 species and habitats presence or likely absence (up to 20 km from the Site)

SAC 002162 Qualifying Interest	Definitely or Probably Present	Possibly Present	Not Present
Old sessile oak woods with Ilex and Blechnum in British Isles	-	-	✓
Taxus baccata woods of the British Isles	-	-	✓
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (*Alno- Padion, Alnion incanae, Salicion albae)*	-	-	✓
Water courses of plain to montane levels with the *Ranunculion fluitantis and Callitricho- Batrachion* vegetation	✓	-	-
Salicornia and other annuals colonizing mud and sand	-	-	✓
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	-	-	✓
Mediterranean salt meadows (*Juncetalia maritimi*)	-	-	✓
Mudflats and sandflats not covered by seawater at low tide	-	-	✓
Perennial vegetation of stony banks	-	-	✓
Estuaries	-	-	✓
European dry heaths	-	-	✓

Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels.	-	-	✓
Petrifying springs with tufa formation	-	-	✓
Pearl mussel *Margaritifera margaritifera*	-	-	✓
Nore pearl mussel *Margaritifera margaritifera durrovensis*	-	✓	-
Sea Lamprey *Petromyzon marinus*	-	✓	-
Brook lamprey *Lampetra planeri*	✓	-	-
River lamprey *Lampetra fluviatilis*	✓	-	-
Allis shad *Alosa alosa*	-	-	✓
Twiate shad *Alosa fallax*	-	-	✓
Atlantic salmon *Salmo salar*	✓	-	-
Otter *Lutra lutra*	✓	-	-
White-clawed crayfish *Austropotamobius pallipes*	✓	-	-
Killarney fern *Trichomanes speciosum*	-	-	✓
SPA 004233 Feature of Interest			
Kingfisher *Alcedo atthis*	✓	-	-

3.4 Aquatic Macro-invertebrates

Full results are available in Appendix 6.1 of the Biodiversity chapter of the EIAR. The following summary is presented verbatim from the Aquens Ltd. (2021) report. '*Results showed sample sites to be impacted by moderate pollution as evidenced by the Q3-4 rating at all sites except FKS which is upstream of the mine Site outfall* (Figure 3 below) *which had poorer ecological water quality (Q3). Composite sediment samples were collected at each site and analysed for cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), lead (Pb), zinc (Zn), arsenic (As), total phosphorus (TP) and organic*

matter (OM). None of the mean zinc or lead sediment concentrations at any of the sites sampled exceeded the EPA guideline limits.'

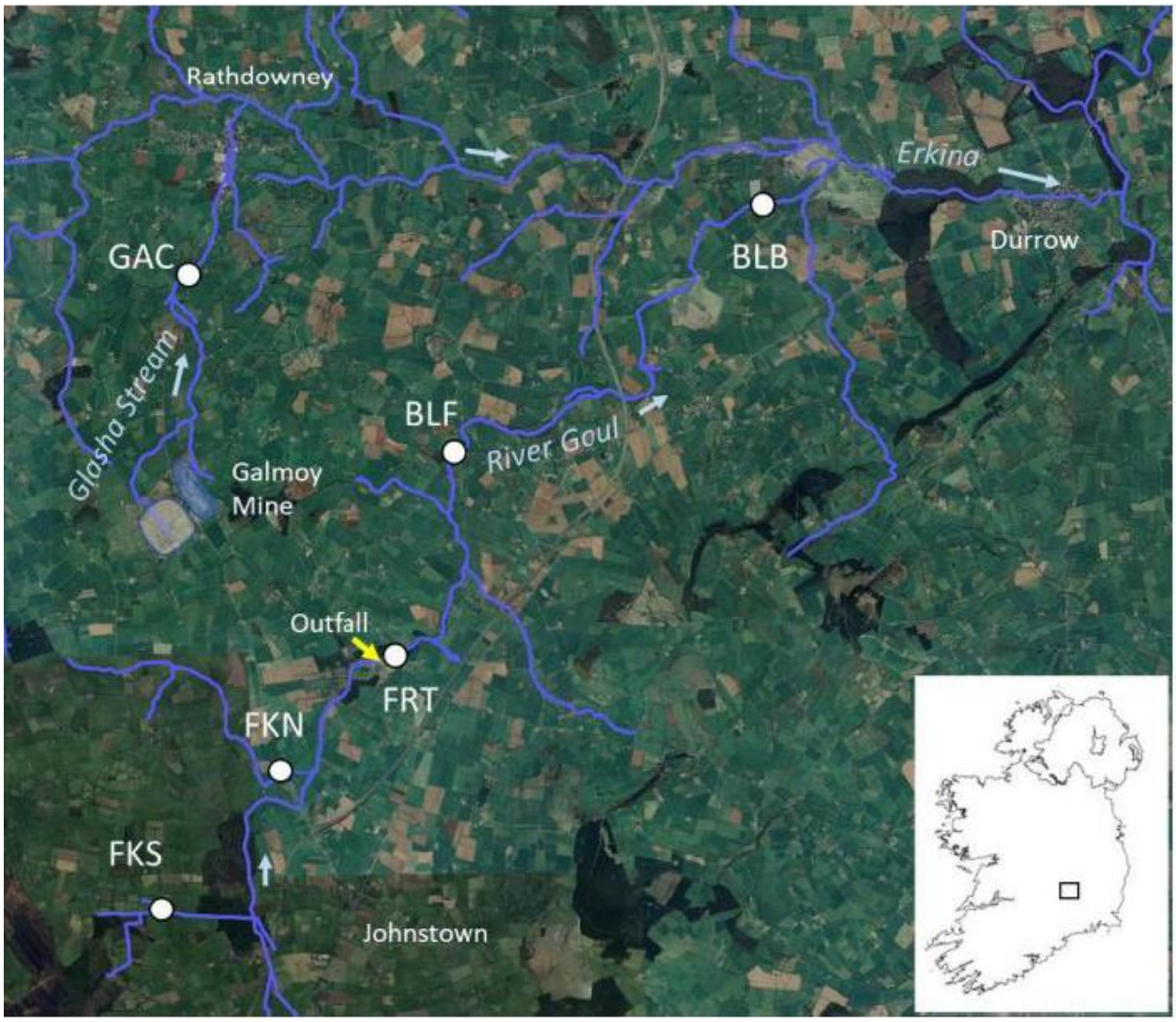

Figure 3: Map showing the sampling locations of the five sites along the Goul River and one site on the Glasha Stream and proximity to the Galmoy mine site and point of outfall. Insert shows the location within Ireland. Arrows indicate the direction of flow

The data were also reviewed with respect to the Canadian Sediment Quality Guidelines for the Protection of Aquatic Life. With the exception of lead at BLF, zinc was the only heavy metal that exceeded the Canadian probable effect levels (PELs) at a number of the sites such as GAC on the Glasha Stream and FRT, BLF and BLB on the River Goul. The highest concentrations occurred in the site on the Glasha Stream (GAC) and at BLF on the Goul (ca. 3.6km downstream of Fertagh Bridge - old location of mine outfall). It should also be noted the Canadian PELs refer to concentration using the whole sediment sample and not the <.15 mm fraction recommended by the EPA. The concentrations of the four metals in the Gammarus tissue were within the ranges recorded between 1996 and 2014 but were generally higher than pre-mining operations with the exception of lead at GAC (Aquens Ltd. June 2021 – Appendix 6.1).

3.4.1 Aquatic Habitat – On and Off-Site Receptors

Aquatic receptors are the key focus for this assessment process. The Project will afford negligible new land take and the re-opening of the mine and any associated discharges to aquatic features are the drivers for this assessment from a screening and NIS perspective.

The Water chapter of the EIAR (Chapter 8) indicates that '*the Site and broader area is drained by small headwaters streams that flow northward to the Glasha Stream and eventually join the Erkina River. The local stream baseflows are mostly fed by groundwater, much of which is from the surficial alluvial deposits, but also from small bedrock springs in the project area and further to the north. The south and east side of the project area is drained by the River Goul. The Goul flows through Counties Kilkenny, Tipperary and Laois from its source in the Slieveardagh Hills, approximately six kilometres south of Urlingford. It flows north between Johnstown and Galmoy into County Laois, where it joins the River Erkina, a tributary of the River Nore, several kilometres from Durrow. The River Nore extends for 141 km, draining an area of about 2,530 km2, making it one of the major rivers in the South East'.*

The existing mine outfall pipe is situated on the River Goul (Figure 4). The River Goul is not subject to statutory designations at this location. However, hydrological connectivity is noted with the River Nore downstream (ca. 5.4 km). The River Barrow and Nore at this location is designated as an SAC.

Figure 4: The River Goul at the Mine outfall site

The River Goul is typical of rivers in the local area. The baseline attribute of the river is understood as a consequence of the baseline monitoring that has been undertaken in association with the former Galmoy Mine commencing in 1995.

These biological studies are well documented within, amongst other reports, the '*Environmental Monitoring of Rivers in the Galmoy Area. Report Number 21',* Aquens Ltd. (December 2015). The Aquens (2015) report indicates that *'ecological baseline surveys commenced in 1995 to establish the baseline ecological conditions prior to commencement of mining activities. Since then the same environmental monitoring has continued annually as part of IPC licensing requirements. The methodologies have been maintained to allow for direct comparisons to be made between each annual survey and to establish trends over time. The annual survey also ensured early detection of any possible contamination, due to the discharge of water from the Galmoy Mine, into the River Goul at Fertagh'.*

Baseline surveys confirmed the presence of white-clawed crayfish in the River Goul at Fertagh Bridge – grid reference 52.782979, -7.549029, and Ballinafrase site - 52.811838, -7.533694. The presence of this species was outside the scope of specific white-clawed crayfish surveys and occurred incidentally during macro- invertebrate surveys (Aquens Ltd. 2021). Habitat assessment indicates that salmonids

(including Atlantic Salmon), lamprey species, eel and pearl mussel may also be present within the Goul catchment.

3.5 Nitrogen Deposition Modelling

Surveys undertaken by WSP (2023) used the EPA's AG4 guidance which requires detailed dispersion modelling to be carried out based on local sensitive receptors. For ecological sites, Special protection areas (SPAs) and Special areas of conservation (SACs) within 15 km of the installation. The predominant route by which emissions will affect land in the vicinity of a process is by deposition of atmospheric emissions. Ecological receptors can potentially be sensitive to the deposition of pollutants, particularly nitrogen and sulphur compounds, which can affect the character of the habitat through eutrophication and acidification (WSP, 2023).

The CLos in ecologically sensitive areas such as SPAs, SACs and NHAs were determined using the methodology outlined in the UK publication "*AQTAG06 – Technical Guidance On Detailed Modelling Approach For An Appropriate Assessment For Emissions To Air"* (Environment Agency, 2014)(64). The approach is based on using the maximum annual average ground level concentration within the ecologically sensitive area and converting this concentration into a deposition flux based on a chemical species-specific deposition velocity (m/s).

In order to assess the impacts of deposition, habitat-specific critical loads have been created. These are generally defined as (e.g. Nilsson and Grennfelt, 1988);

> "*...a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge."*

As stated by WSP (2023) It is important to distinguish between a critical load (CLo) and a critical level. The CLo relates to the quantity of a material deposited from air to the ground, whilst critical levels refer to the concentration of a material in air. The UK Air Pollution Information System (APIS) provides CLo data for ecological sites in the UK.

The CLos used to assess the impact of compounds deposited to land which result in eutrophication and acidification are expressed in terms of kilograms of nitrogen deposited per hectare per year (kg N ha−1 y−1) and kilo-equivalents deposited per hectare per year (keq ha−1 y−1). The unit of 'equivalents' (eq) is used for the purposes of assessing acidification, rather than a unit of mass. The unit eq (1 keq ≡ 1,000 eq) refers to molar equivalent of potential acidity resulting from e.g. sulphur, oxidised and reduced nitrogen, as well as base cations. Essentially, it means 'moles of charge' and is a measure of how acidifying a particular chemical species can be (WSP, 2023).

With respect to wet deposition, the UK Environment Agency guidance AQTAG06) states:

> *"It is considered that wet deposition of SO_2, NO_2 and NH_3 is not significant within a short range."*

Therefore, the WSP assessment only considers dry deposition of nutrifying and acidifying N compounds. The results of this study are referenced as part of the NIS process.

3.6 Natura 2000 Sites

Sites of international importance including Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) are collectively known as Natura 2000 sites. These sites contain examples of some of the most important natural and semi-natural ecosystems in Europe. The designated search area was 15 km from the Project for Natura 2000 sites. There are five SACs and one SPA within 15 km of the Application Site. Table 3 details the sites identified during the desk study and describes their proximity to the Site. Natura 2000 sites highlighted in red have potential aquatic or terrestrial connectivity with the Project and the Stage 2 NIS process focuses on these sites in terms of potential source/pathway effects.

Table 3: Natura 2000 sites within the Desk Study Area

Site	Approximate Distance from the Application Site	Approximate Distance from the nearest surface works
Galmoy Fen SAC	Crosses Red line – red line marks an easement	ca. 460 m – R vent shaft
Cullahill Mountain SAC	ca. 3.5 km – Red line from Goul outfall	ca. 4 km – Goul outfall
Spahill and Clomantagh Hill SAC	ca. 3.5 km – Goul outfall	ca. 3.5 km – Goul outfall
River Barrow and River Nore SAC	ca. 5.4 km – Red line marks an easement	ca. 6.7 km – R vent shaft
The Loughans SAC	ca. 6.3 km – Goul outfall	ca. 6.3 km – Goul outfall
River Nore SPA	ca. 11.9 km – Red line marks an easement	ca. 13.2 km – R vent shaft

Figure 5 presents the Natura 2000 designated sites detailed in Table 3 and their relative proximity to the Project Site. Citations[3] for the statutory protected sites within 15 km of the Application Site as detailed above are provided below.

[3] Protected Sites in Ireland | National Parks & Wildlife Service (npws.ie)

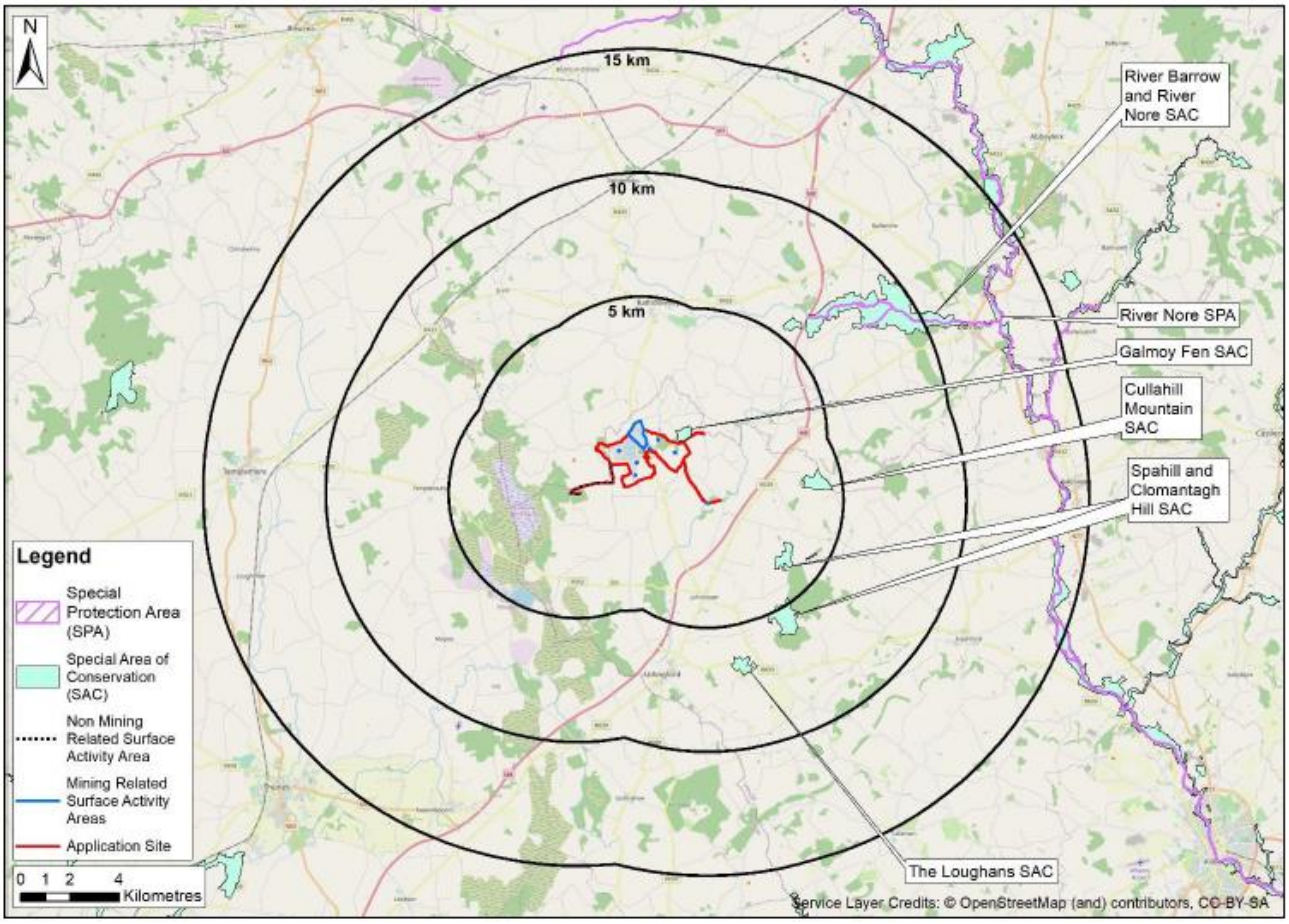

Figure 5: Map showing Natura 2000 within 15 km of the Site (NPWS, 2023)

Site Name: Galmoy Fen SAC – Site Code 001858

Galmoy Fen is situated 7 km north of Johnstown in Co. Kilkenny, close to the boundary with Co. Laois. It comprises a cutover raised bog that has become flooded with base-rich groundwater and that now supports alkaline fen vegetation. It lies in a depression and is underlain by Carboniferous limestone. The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (= priority; numbers in brackets are Natura 2000 codes):*

- (7230) Alkaline Fens.

Site Name: Cullahill Mountain SAC – Site Code 000831

Cullahill Mountain SAC lies on a western outlier of the Castlecomer plateau, 6 km north-east of Johnstown in Co. Kilkenny. In this area, the underlying limestone has been exposed relatively recently by erosion of the higher shales. The rock is in the form of an escarpment, with a steep side facing the central plain (and the Cork Dublin road) and more gradual slopes to the south-east where the shale soon appears. The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (= priority; numbers in brackets are Natura 2000 codes):*

- (6210) Orchid-rich Calcareous Grassland*

Site Name: Spahill and Clomantagh Hill SAC – Site Code 000849

Spahill and the adjacent hills form part of an escarpment which links the Slieve Ardagh Hills with the Castlecomer Plateau in Co. Kilkenny. The hills are of limestone overlain by shales and/or sandstones, and so the surface geology is variable, with different rock types supporting different vegetation types. This particular site is mostly limestone, exposed as small ledges or as flat sheets. When the latter occurs it is often weathered into a pavement pattern, similar to that found in the Burren, Co. Clare. The hills are generally low and rounded - they rise relatively steeply from the central plain but drop

south-eastwards more gently. Their surface is grassy in appearance but the soil is shallow, especially on the upper parts, and the rock breaks through frequently. The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (= priority; numbers in brackets are Natura 2000 codes):*

- (6210 Orchid-rich Calcareous Grassland*

Site Name: River Barrow and River Nore SAC – Site Code 002162

This site consists of the freshwater stretches of the Barrow and Nore River catchments as far upstream as the Slieve Bloom Mountains, and it also includes the tidal elements and estuary as far downstream as Creadun Head in Waterford. The site passes through eight counties – Offaly, Kildare, Laois, Carlow, Kilkenny, Tipperary, Wexford and Waterford. Major towns along the edge of the site include Mountmellick, Portarlington, Monasterevin, Stradbally, Athy, Carlow, Leighlinbridge, Graiguenamanagh, New Ross, Inistioge, Thomastown, Callan, Bennettsbridge, Kilkenny and Durrow. The larger of the many tributaries include the Lerr, Fushoge, Mountain, Aughavaud, Owenass, Boherbaun and Stradbally Rivers of the Barrow, and the Delour, Dinin, Erkina, Owveg, Munster, Arrigle and King's Rivers on the Nore. The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (= priority; numbers in brackets are Natura 2000 codes):*

- (1130) Estuaries;
- (1140) Tidal Mudflats and Sandflats;
- (1170) Reefs;
- (1310) Salicornia Mud;
- (1330) Atlantic Salt Meadows;
- (1410) Mediterranean Salt Meadows;
- (3260) Floating River Vegetation;
- (4030) Dry Heath;
- (6430) Hydrophilous Tall Herb Communities;
- (7220) Petrifying Springs*;
- (91A0) Old Oak Woodlands;
- (91E0) Alluvial Forests* ;
- (1016) Desmoulin's Whorl Snail (*Vertigo moulinsiana*);
- (1029) Freshwater Pearl Mussel (*Margaritifera margaritifera*);
- (1092) White-clawed Crayfish (*Austropotamobius pallipes*);
- (1095) Sea Lamprey (*Petromyzon marinus*);
- (1096) Brook Lamprey (*Lampetra planeri*);
- (1099) River Lamprey (*Lampetra fluviatilis*);
- (1103) Twaite Shad (*Alosa fallax*);
- (1106) Atlantic Salmon (*Salmo salar*);
- (1355) Otter (*Lutra lutra*);
- (1421) Killarney Fern (*Trichomanes speciosum*); and
- (1990) Nore Freshwater Pearl Mussel (*Margaritifera durrovensis*).

Site Name: The Loughans SAC – Site Code 000407

T*he Loughans is a turlough situated in flat land about 3 km east of Urlingford, below the Slieve Ardagh Hills, in Co. Kilkenny. The basin is slightly undulating, with banks and hummocks of glacial drift around which the water rises. It has a level floor for the most part, but swallow holes and subsidence hollows are present. The turlough floods regularly, despite some drainage. In summer, it retains a permanent central pond and there are several subsidiary wet hollows at the eastern end. The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):*

- (3810) Turloughs.* .

Site Name: River Nore SPA – Site Code 004233

The River Nore SPA is a long, linear site that includes the following river sections: the River Nore from the bridge at Townparks, (north-west of Borris in Ossory) to Coolnamuck (approximately 3 km south of Inistioge) in Co. Kilkenny; the Delour River from its junction with the River Nore to Derrynaseera bridge (west of Castletown) in Co. Laois; the Erkina River from its junction with the River Nore at Durrow Mills to Boston Bridge in Co. Laois; a 1.5 km stretch of the River Goul upstream of its junction with the Erkina River; the Kings River from its junction with the River Nore to a bridge at Mill Island, Co. Kilkenny. The site includes the river channel and marginal vegetation. For a large part of its course the River Nore traverses Carboniferous limestone plains; it passes over a narrow band of Old Red Sandstone rocks below Thomastown. The site is a Special Protection Area (SPA) under the E.U. Birds Directive of special conservation interest for the following species:

- Kingfisher.

4 Stage 1 Screening Assessment Criteria

4.1 Describe any likely direct, indirect or secondary impacts of the Project (either alone or in combination with other plans or projects) on the Natura 2000 sites by virtue of:

Size and Scale	Extraction of mineral ore at a rate of ca. 310,000 tonnes per annum (less intense than previous annual extraction of the mine)
Land-take	None from Natura 2000 sites. The closest Natura 2000 abuts the Application site
Distance from Natura 2000 site or key features of the site	• Galmoy Fen SAC (abuts the Site to the east); • Cullahill Mountain SAC (3.5 km); • Spahill and Clomantagh SAC (3.5 km); • Rive Barrow and River Nore SAC (5.4 km); • The Loughans SAC (6.3 km); and • River Nore SPA (11.9 km).
Resource requirements (water abstraction etc.)	No resources from a Natura site are required.
Emissions (disposal to land, water or air)	**Air Emissions** Based on the magnitude of dust effects and the mitigation employed on Site, an overall significance of the effects of dust was assigned to key sources: excavation, transfer on haul roads, transfer on public roads, and dust from on-site processing. For each of these sources, the significance was defined as 'slight adverse' in the absence of mitigation. WSP (2023) indicate that background rates of N deposition are all above the critical loads (CLo), it is concluded that all designated sites may currently be in a degraded state. In addition, as the maximum Project or process contribution (PC) relative to the CLo is predicted to be less than 0.1% of the CLo at all sites it is judged that the impact of N deposition from mine emissions on the assessed designated sites will be negligible and insignificant. **Groundwater** During operational dewatering, there will be no discharge to groundwater and dewatering will induce a hydraulic gradient

	towards the mine workings. All 'contamination' at the Site from oxidation of ore to hydrocarbon spills will be captured by the mine dewatering system. Therefore, no sources of potential impact will develop. During closure, as water levels recover and natural (baseline) groundwater flow gradients re-establish, there is the potential for poor quality water in the workings to be discharged to the surrounding groundwater system. Therefore, discharge to groundwater as a potential effect is only considered for the mine closure phase. **Surface Water** The zinc / lead orebodies being mined are also naturally elevated in other metals, primarily iron, arsenic, cadmium and nickel; as well as sulphate. Along with blasting residues from mining (nitrite and ammonia), these have the potential, without treatment, for being discharged to surface water as a result of mine dewatering.
Excavation requirements	There are no excavation requirements within the Natura 2000 sites.
Transportation requirements	No traffic movements will affect Natura 2000 sites.
***Duration of construction, operation, decommissioning etc*.**	The Proposed Development will entail ca. 12 months construction and 7 to 10 years of operation, following which the Site will be rehabilitated and opportunities for long-term ecological enhancements such as those observed at the (TMF) will be sought.

4.2 Describe any Likely Changes to the Site as a Result of:

Reduction of habitat area	None to Natura 2000 sites.
Disturbance to key species	Disturbance to Natura qualifying species is considered to be possible in the absence of mitigation.
Habitat or species fragmentation	Habitat or species fragmentation is unlikely. The Site is not part of the Natura 2000 sites in question and no resources are required from it. Designated habitats and species of the SAC are unlikely to be impacted given their distance from the existing Site. The NIS that follows this section addresses this issue further.
Reduction in species density	No reduction in species density is anticipated.
Changes in key indicators of conservation value (water quality etc.	In the absence of embedded design parameters and mitigation there is potential for water quality to be affected.
Climate change	No measurable contribution.

4.3 Describe any Likely Impacts on the Natura 2000 sites as a whole in terms of:

Interference with the key relationships that define the structure of the site:	No impacts are likely.
Interference with key relationships that define the function of the site	No impacts are likely.

4.4 Provide Indicators of Significance as a Result of the Identification of Effects Set Out in Terms of:

Loss (Estimated percentage of lost area of habitat)	There will be no habitat loss.
Fragmentation	Habitat fragmentation (aquatic) is considered unlikely and non-significant.
Loss (Estimated percentage of lost area of habitat)	There will be no habitat loss.
Disruption and disturbance	Disturbance and disruption to species is considered unlikely, but not impossible, in the absence of mitigation (refer NIS sections). Species for which the Natura 2000 sites have been designated for are unlikely to utilise the Site per se though downstream receptors and connectivity with Natura 2000 sites are noted and this is discussed further in the following sections.
Change to key elements of the site (e.g. water quality etc.)	In the absence of embedded design parameters and mitigation there is potential for water quality to be affected. The magnitude change of water quality would relate to the level of significance (impact) on Natura 2000 receptors.

4.5 Describe from the above those elements of the project or plan, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is unknown

Within this Stage 1 assessment it is considered unlikely, but not impossible, that the proposed Project will impact on the Natura 2000 sites. Specifically, Galmoy Fen (SAC), River Barrow and River Nore (SAC) and the River Nore (SPA) have proximal, habitat synergy and ecological connectivity that requires assessment and mitigation to minimise the likelihood of significant effects being afforded to the respective sites.

As such, it is recommended that a Stage 2 Natura Impact assessment is undertaken. The aim of this stage is to identify the conservation objectives of the statutory site (s) and to assess whether or not the Project, either alone or in combination with other projects or plans will result in adverse effects on the integrity of the Site, as defined by the conservation objectives and status of the Site. Stage 2 is carried out in consultation with the relevant nature agencies where possible. Where it cannot be

demonstrated that there will be no adverse effects on the Site, it is necessary to devise mitigation measures to avoid, where possible, any adverse effects.

5 APPROPRIATE ASSESSMENT – STAGE 2 NATURA IMPACT STATEMENT

This section assesses the screened in Natura 2000 sites in more detail and examines where potentially adverse impacts may arise from the sources of impact. Where potentially adverse impacts are identified, avoidance and mitigation measures are proposed to offset these impacts.

5.1 Identification of Potential Sources of Impact

- Dust deposition to Galmoy Fen;
- Groundwater impacts (quality and quantity) to Galmoy Fen; and
- Surface water quality impacts to SAC and SPA qualifying species in the River Barrow and River Nore (SAC) and the River Nore (SPA).

Ecological pathways that may impact on Natura 2000 sites and their qualifying features have been determined previously. The Site abuts Galmoy Fen SAC and is ca. 5.4 km away from the River Barrow and Nore SAC and ca. 11.9 km from the River Nore SPA. Dust and surface water and groundwater impacts have the potential to occur during the development, operational and closure phases of the proposed development and impact upon the qualifying interests of the Galmoy Fen SAC, River Barrow and River Nore SAC and River Nore SPA, and so are considered in this assessment.

Dust deposition, surface and groundwater impacts have been screened into this assessment as potential sources of impacts on Galmoy Fen plus surface and groundwater dependent species of the River Barrow and River Nore SAC, and River Nore SPA. Any negative changes in indicators of conservation value (e.g. water quality) in the River Nore must be considered. The main potential impact is on water quality including trophic status and therefore those qualifying interests that occur in the zone of influence that are water dependent (either directly or indirectly) are considered below.

6 Impacts and Mitigation

6.1 Do Nothing Impact

If the 'do nothing' approach is adopted, the committed management and monitoring (detailed below) will not be obliged. This may hinder the attainment of the conservation objectives for water dependent species of the River Nore SPA and River Barrow, and River Nore SAC; in particular the freshwater pearl mussel, due to prolonging the poor condition of the freshwater pearl mussel habitat and its potential further deterioration within the River Nore.

6.2 Impact Evaluation

In all cases, Natura 2000 qualifying species and habitats that are certain, or likely to be affected by source/pathway effects are discussed.

6.2.1 Impacts Through Surface Pathways

Given the nature of the discharge from the proposed development the potential impact from the discharge is focussed on metal contamination and nutrient loading from a sewage treatment plant. This has the potential to impact water quality and also contribute to levels of fine sediment in the River Nore, which would be contrary to the conservation objectives of the River Barrow and River Nore SAC.

Freshwater pearl mussel are sensitive to elevated suspended solids in a river, as they are filter feeders that remove particulate matter from the water column. The ingestion of silt by mussels places stress on mussels, which can cause adult mussels to clam up and lead to their death. Silt entering a river may also affect mussels at various stages in their life cycle. The movement of sediment through rivers and its settlement onto the river bed means that clean gravels become clogged with fine sediment. This prevents oxygen movement into the waters in the river bed that feed the juvenile mussels, which have to burrow into the river substratum to prevent being washed downstream, and they quickly die. In these depleted juvenile mussel populations, adult mussels may still be present, however when the older mussels die-off, they will not be replaced by a younger generation.

If the habitat of the river bed is not restored, these populations will inevitably go extinct. Silt release may degrade or cause loss of habitat for salmonid species, which act as hosts in the lifecycle of freshwater pearl mussel. Siltation of the substrate can also provide a habitat for rooting macrophytes and encourage nutrients to accumulate in the river substrate, which can promote the growth of algae. These factors can also exacerbate a stressful environment for adult and juvenile mussels (Moorkens, 1999).

Given the requirement of freshwater pearl mussel for High status waters and their restoration to favourable status, there should be no additional pressure placed on the water quality of the River Nore and the habitat requirements of the freshwater pearl mussel by the discharge from the proposed development. These habitat requirements are set out in the SAC's conservation objectives through the restoration of substrate quality (i.e.no artificially elevated levels of fine sediment) and the restoration of water quality (i.e. attainment of macroinvertebrates: EQR greater than 0.90; phytobenthos: EQR greater than 0.93), of which the River Nore failed both water quality standards during 2009 sampling for the Sub-basin Management Plan. This will ensure that there will be no significant impact to the River Nore freshwater pearl mussel population and the other water dependent species of the of the River Barrow and River Nore SAC, and River Nore SPA.

Taking into consideration the mobile nature of some of the qualifying features, including Salmon, Otter and Lamprey, it can be assumed that their natural range could extend beyond the physical borders of the designated sites. Release of suspended solids can block respiratory organs (i.e. gills of fish), cause stress to adults and juveniles, reduce availability of important food chain species (including macro-invertebrates for fish and fish for otter) and displace protected species from their natural range.

Habitats that are protected under the Habitats Directive, such as Water courses of plain to montane levels with the R. fluitantis and Callitricho-Batrachion vegetation can be dependent on good water quality and specific substratum conditions. Alluvial forests require specific hydrological regimes that may be impacted by the deposition or movement of suspended sediments. The conservation status of all habitats protected under the Habitats Directive, are assessed based on their range, area, structure and functions and future prospects. These parameters are measured across the whole national territory, not just within the designated sites. Many of these habitats are found across Ireland and are not limited in their distribution to the designated sites. Any impacts that may affect the parameters defining their conservation status, can be considered adverse and should be avoided where practical. Given that none of these habitats have been identified directly adjacent to the proposed Site, any impacts are likely to be indirect.

Mitigation measures that will be put in place to prevent any discharges to ground and surface water, will prevent any adverse impacts to these habitats. Mitigation measures are proposed in order to reduce the potential impact from the discharge Section 6.3 below.

6.2.2 Impacts Through Groundwater Pathways

The area of previous drawdown was localised to the defined Galmoy block. The final area of drawdown from previous mining is shown in Figure 8.32 (Chapter 8 EIAR). The characterisation of impacts in the absence of mitigation uses the ‘worst case’ impact magnitude scenario in all cases. Impacts would potentially be mitigated by seasonal fluctuations in water level. Modelling undertaken previously indicates that effects attributed to de-watering will be minimal and localised to the defined Galmoy block. The effects are considered highly unlikely to adversely affect the valued ecological features or effect WFD ground or surface water status.

During previous mining operations at the Site two bedrock springs within the immediate area of the Plant Site were affected. Both springs occur at a topographic elevation of about 130 m OD, and both formed part of the natural groundwater discharge system for the Galmoy block. It is predicted that both of these springs will also dry up during the proposed recommencement of mining. As dewatering progresses, the water-table will drop below the invert level of the springs, so the groundwater discharge and spring flow will cease.

There were no other observed impacts to springs or bogs during the previous period of mining. There were no changes to the Galmoy Fen or to other wetland areas to the north and east of the mine Site. No impacts to other springs, wetlands or bogs are expected as a result of the proposed future Site mining operation (Chapter 8).

Modelling undertaken previously indicates that two bedrock springs would be adversely affected. The effects are considered highly unlikely to adversely affect the valued ecological features or effect WFD ground or surface water status. Furthermore, it is considered highly unlikely that Galmoy Fen would experience adverse impacts.

6.2.3 Impacts to Groundwater Chemistry

As described within Chapter 8, during the past period of mining operations at the Site, the mine itself becomes a hydrogeological sink. All local groundwater flow paths are towards the mine. There are no groundwater flow paths away from the mine. Therefore, there is no potential for the mine to significantly affect the surrounding water quality. This has been demonstrated by the previous monitoring programme. The previous monitoring has shown that dewatering does not cause any adverse changes to water quality in the surrounding groundwater system.

6.2.4 Impacts Through Land and Air Pathways

Otter are listed under Annex IV of the Habitats Directive and are therefore legally protected, both within and outside of the Natura 2000 network. Adverse impacts that may prevent the achievement of the conservation objectives of otter, that occur within or outside of designated sites, can be considered significant. Impacts that may occur to otter through land and air pathways include those related to disturbance at the canal which it uses for foraging, commuting, resting and possibly for breeding.

Otter require lying up areas throughout their territory where they are secure from disturbance which can include couches or holts. Impacts that reduce the availability or quality of, or cause disturbance to these habitats are likely to affect otters. These factors may be direct or indirect. Direct impacts that may occur through these works could include the direct mortalities as a result of machinery traversing on land near the Goul outfall where a holt was identified but this is considered unlikely.

Indirect impacts can occur if prey species of otter become disturbed from increased noise levels and move to alternative locations. Disturbance at Goul outfall could result in a reduction in the number of suitable couching sites and holts in this area, restricting their distribution within the area.

Based on the magnitude of dust effects (Chapter 10 EIAR) and the mitigation employed on Site, an overall significance of the effects of dust was assigned to key sources: excavation, transfer on haul roads, transfer on public roads, and dust from on-site processing. For each of these sources, the significance was defined as ‘slight adverse’ without mitigation, and ‘negligible’ with mitigation. Dust effects would have the potential to alter species composition at the Galmoy Fen site in the absence of mitigation.

6.2.5 Deposition Modelling

The identified sensitive receptors (Natura 2000 sites) represent locations of specific human and ecological exposure. However, predictions were also made on a 25m * 25m grid at which the maximum predictions are all located within the Natura 2000 sites. Therefore, compliance with the Maximum Allowable Concentration and AQS at the maximum gridded receptor provides extra reassurance that compliance will occur at the off-site sensitive receptors because the maximum gridded receptor is closer to the Project source (WSP, 2023).

For long-term exposures (annual mean), at all receptors the PC is predicted to be below the Maximum Allowable PC, and the predicted environmental concentration (PEC) below the AQS. Similarly, for the gridded receptors at which the maximum prediction is the highest across the entire model domain, compliance with the Project Criteria will be achieved. The maximum annual mean concentrations occur within the site boundary 25-50m downwind of the boiler and generator cluster and are predicted to be significantly lower off-site (WSP, 2023).

For short-term exposures of NO_2 and SO_2, for the gridded receptors, the maximum annual mean PC is below the Maximum Allowable PC for NO_2 and SO_2 and the PEC compliant with the AQS. Although this is not the case for PM_{10}, the non-compliant grid point lies inside the site boundary, and so no non-occupational short-term human exposure occurs at this point. For all off-site receptors, PC is less than of the AQS and below the maximum allowable PC and so full compliance is predicted.

As background rates of N deposition are all above the LCo, it is concluded that all designated sites may currently be in a degraded state. However, as the maximum PC relative to the LCo is predicted to be less than 0.1% of the LCo at all sites it is judged that the impact of N deposition from mine emissions on the assessed designated sites will be negligible and insignificant.

6.3 Cumulative Impacts

6.3.1 Projects

Various projects may impact on the water quality of the River Nore such as diffuse sources from agriculture (e.g. farm intensification), land spreading of slurry, forestry and also from point sources such as WWTPs, Local Authority Section 4 Discharge Licences and septic tanks. However, all of these are difficult to quantify, in particular diffuse discharges, in terms of cumulative impacts. Therefore, the current baseline of the River Nore, the WFD status and the assimilative capacity are used to assess the in combination effects of the discharge in combination with other projects, given the WFD status is Moderate and there is potential for cumulative impact.

Significance of Cumulative Impacts

There is potential for the existing diffuse and point sources of pollution to significantly impact on the water quality of the River Nore and therefore on the designated features of the River Barrow and River Nore SAC, and River Nore SPA, in combination with the proposed discharge from combined proposed development.

Given the requirement for high water quality status in order to sustain species such as white-clawed crayfish and Atlantic salmon, a precautionary approach is taken to ensure that the proposed discharge does not significantly impact on the designated features through cumulative impacts as required under the Habitats Directive in relation to the Natura 2000 site of the River Nore and downstream River Barrow and River Nore SAC, and River Nore SPA.

6.4 Mitigation Measures

A number of measures which follow generic best practice are proposed to mitigate the impacts of the proposed Project on the ecological environment at the Site, including:

- All Site construction will be undertaken in accordance with the CIRIA (2010) Environmental Good Practice;.
- Very little vegetation clearance is likely to be required. However, any vegetation clearance will be undertaken outside of the bird nesting season (March to August). If there is a necessity for vegetation clearance within this period, a suitably qualified ecologist will carry out a series of nesting bird checks in advance of any works to ascertain breeding activity in affected areas; and.
- Lighting will be minimised during hours of darkness and will not illuminate peripheral mature trees and vegetation to ensure no adverse effects on bats and other nocturnal species.

Committed Water Treatment Requirements

As described in Chapter 8 (EIAR) a new mine water treatment plant (MWTP) will be commissioned based on the same technology as previously used at Galmoy and Lisheen mines: pH adjustment and precipitation. Settlement of precipitates will be completed in a clarifier and a settlement pond prior to environmental discharge. This will remove trace metals from the dewatering stream but not nitrogen species (nitrate, nitrite and ammonia) or sulphate. The goal of the treatment system will be to reduce

values of lead, zinc, arsenic, nickel and iron in the water to below surface water quality regulations, prior to discharge into the river system.

The MWTP will treat mine dewatering water and runoff from the processing/administration area. The Site does not have a water storage facility available to buffer large inflows of water (Galmoy and Lisheen used their TMF supernatant ponds to do this). Therefore, the new treatment plant will be designed to treat up to 24 MLD (mega litres per day or 24,000 m_3/d) – the maximum 'worst case' predicted treatment requirement from underground, and the Plant Site. The existing backfill thickener tank will be refurbished as a balancing tank to provide a buffer for mine water inflow on a sort-term basis. The water quality of discharge from the treatment plant will meet future ELVs to be imposed by the EPA.

Domestic Sewage

A proprietary sewage effluent treatment system will be installed to meet the needs of the Site (see Appendix 3.2). The treated effluent will be pumped into the MWTP Storm Water Pond for discharge through the Goul pipeline.

Discharge of the Pumped Water

The primary route for treated mine water discharge will be through the existing pipeline into the River Goul.

Water Quality Commitments

Maintaining good housekeeping during operations and by adhering to best mining practices will significantly reduce the potential effects on the surrounding water environment. It is committed that the following mitigation measures will be used at the Site.

- A water management system will be maintained and an MWTP constructed for the purposes of water treatment and management on, and from, the Site;
- All topsoil, subsoil and overburden stockpiles shall be covered (i.e. vegetated) to minimise the risk of rain / wind erosion;
- Chemical, fuel and oil stores will be bunded as per regulatory requirements;
- Mobile plant will use refuelling facilities. Static plant or tracked excavators will refuel over a drip tray with an absorbent mat;
- All mobile plant shall be regularly maintained, and where plant is damaged or leaking it will be fixed or replaced immediately, as part of the ongoing operational management of the mine to reduce the risk of leaks;
- No storage of hydrocarbons will take place in underground settings;
- Emergency spill kits (including absorbers) will be available for use in the event of an accidental spill underground or in the ore storage areas;
- All Site sewage water will be treated by a dedicated sewage treatment plant and the treated water discharged to Goul via the existing pipeline;
- Regular monitoring of groundwater (levels and quality) will continue to take place using monitoring boreholes based on best practice and in compliance with EPA licence requirements; and
- Regular monitoring of surface (mine) water discharge to the Goul will be undertaken to address compliance with EPA licence requirements.

Future mitigation for the mine water discharge will consist of sediment removal (as required), water treatment and monitoring. Following the start of the proposed future mining operation, all mine water will be routed through the MWTP to ensure compliance with metals and suspended solids for discharge. The operating plan for the MWTP will be based on Galmoy and Lisheen plants (pH adjustment and clarification), with the associated 'lessons learned' from both operations. Settlement of precipitates will be completed in a clarifier and a settlement pond prior to environmental discharge. The goal of the treatment system will be to reduce values of lead, zinc, arsenic, nickel and iron in the water to below surface water quality regulations, prior to discharge into the river system. The water quality of discharge from the treatment plant will meet the ELVs to be set by the EPA.

An average assimilative capacity study was completed for the Goul (Figures 6 and 7 below). This shows that all parameters downstream of the discharge comply with surface water regulations. It is noted that ammonia may be naturally elevated in both surface water and groundwater of the area but is also elevated due to agricultural and wastewater discharges in the area. Long-term monitoring of

the Goul by Galmoy (Figure 8) shows that the average reported value of ammonia (as N) upstream of the discharge was 0.06 mg/L. Initial baseline values were variable ranging from below detection limit of 0.03 mg/L to a high of 0.58 mg/L. The reported concentrations appear to follow a seasonal cycle in the river, generally highest in the spring and dropping later in the year. In order to minimise ammonia contribution the Project has reduced annual volume mining values.

The mining rate at Garrylaun (ca. 310,000 t/a) will be considerably lower than it was previously (ca. 500,000 t/a), and this will have a positive impact on the quality of mine water being pumped from the mine, as there will be less explosives used, and therefore less ammonia being produced from blasting. Evidence for this can be seen in the improvement in water quality data from 2009 onwards as mining rates where reduced (see Figure 8.10 of Garrylaun EIAR).

Parameter	Unit	Surface Water Regs SI 272 of 2009	Maximum Treated Discharge Quality for 75% Standard Compliance	Receiving Water Quality [Median, 2013-23]
Median Flow	**MLD**		**15.8**	**109.6**
pH	pH units	6 to 9	8.7	8.0
As	mg/L	0.025	0.14	0.0005
Cd	mg/L	0.25	1.4	0.00001
Cr	mg/L	0.0034	0.016	0.0005
Cu	mg/L	0.03	0.17	0.0012
Hg	mg/L	0.00005	0.00022	0.00001
Ni	mg/L	0.02	0.11	0.0005
Pb	mg/L	0.0072	0.041	0.0001
Zn	mg/L	0.1	0.55	0.0048
NH_3 as N	mg/L	0.065	0.21	0.024
MRP as P*	mg/L	0.035	0.16	0.006

Figure 6; Annual average assimilative capacity study based on predicted MWTP flows and water quality

Parameter	Unit	Surface Water Regs SI 272 of 2009	Maximum Treated Discharge Quality for 75% Standard Compliance	Receiving Water Quality [Median, 2013-23]
Q95 Flow	**MLD**		**11.8**	**23**
pH	pH units	6 to 9	8.7	8.0
As	mg/L	0.025	0.053	0.0005
Cd	mg/L	0.25	0.54	0.00001
Cr	mg/L	0.0034	0.0063	0.0005
Cu	mg/L	0.03	0.062	0.0012
Hg	mg/L	0.00005	0.000088	0.00001
Ni	mg/L	0.02	0.042	0.0005
Pb	mg/L	0.0072	0.015	0.0001
Zn	mg/L	0.1	0.21	0.0048
NH_3 as N	mg/L	0.14	0.25	0.024
MRP as P*	mg/L	0.035	0.064	0.006

* SRL baseline data (2020-21), EPA WFD values not available

Figure 7; Predicted Goul water quality downstream of the discharge at Q95 flow

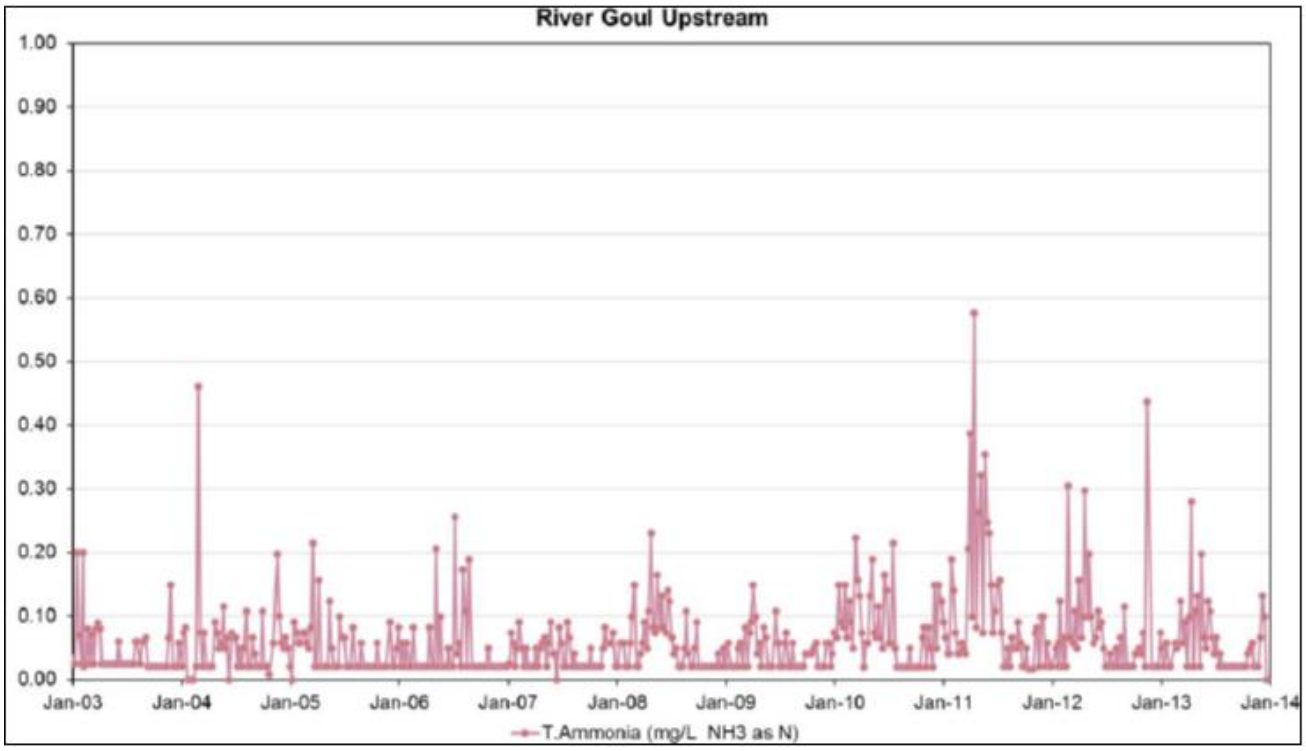

Figure 8: Ammonia (as N) concentrations in the Goul upstream of the Galmoy discharge

Monitoring

A comprehensive monitoring programme was undertaken throughout the entire period of previous mining. The primarily objective was to determine the potential impacts to the surface and groundwater system, and to local receptors and to ensure that mitigation plans could be implemented thereby ensuring no actual impact. A committee has been set up to allow the communication of monitoring information between the mine, regulators and other third parties.

The previous monitoring has shown that there are only a limited number of potentially elevated water quality parameters in the mine water system. Future monitoring will therefore focus on the key parameters, which are considered to be pH, total dissolved solids (TDS), total suspended solids (TSS), sulphate, nitrate, ammonia, lead, zinc, arsenic and nickel. These parameters would form the proposed indicator suite.

Components of the Monitoring Plan

The key components of the monitoring plan for the development are:

- Groundwater flowing from each active mining zone; flow, chemistry, suspended solids (underground monitoring);
- The overall mine dewatering rate; flow, chemistry and suspended solids;
- Input and output (overflow and underflow) to the water treatment plant; flow and chemistry;
- Mine water discharge; flow, chemistry and suspended solids;
- Upstream and downstream surface water locations in the River Goul and Erkina River (as necessary), for stage, chemistry and suspended solids; and
- Groundwater levels and water quality in existing wells.

Sampling Suites

The monitoring programme will utilise two sampling suites, as follows.

Indicator suite:

- Field measurement – temperature, electrical conductivity, pH, dissolved oxygen and redox; and

- Laboratory measurement – total dissolved solids (TDS), total suspended solids (TSS), sulphate, nitrate, ammonia, lead, zinc, arsenic and nickel.

Full Suite:

- Field measurement – temperature, electrical conductivity, pH, dissolved oxygen and redox; and
- Laboratory measurement – TDS, TSS, sodium, potassium, calcium, magnesium, sulphate, nitrate, nitrite, ammonia, alkalinity, plus the standard suite of trace metals.

All samples will be analysed for the dissolved fraction and will therefore be field-filtered. Surface water samples will be analysed for both total and dissolved fractions.

The plan for future mining does not include any mineral processing, addition of reagents or tailings deposition. Therefore, the sampling suites do not include any organic parameters, biological oxygen demand, or chemical oxygen demand.

Mine, Dewatering and Treatment

Underground Monitoring

Inflows to active mining zones will be monitored as follows:

- Instantaneous pumping rate measured at least daily;
- Cumulative pumped volume totaled weekly;
- Weekly sampling for the indicator suite; and
- Daily sampling for any identified parameters of concern based on interactive analysis of the monitoring results.

Overall Dewatering Flow

The overall mine dewatering flow will be monitored as follows:

- Instantaneous pumping rate measured at least daily;
- Cumulative pumped volume totaled weekly;
- Daily sampling of any key parameters;
- Weekly sampling for the indicator suite, plus suspended solids; and
- Monthly sampling for the full suite.

Water Treatment Plant

Inflows and outflows (overflow and underflow) to the MWTP will be monitored daily for flow and chemistry, as required.

Mine Water Discharge

The mine water discharge will be monitored at the outfalls as follows:

- Instantaneous pumping rate measured daily;
- Cumulative pumped volume totalled weekly;
- Daily sampling for the indicator suite; and
- Monthly sampling for the full suite.

Surface Waters

Discharge Points

The Goul discharge will be monitored with one upstream monitoring point, and one downstream monitoring point (Figure 8) monitoring frequency will be as follows:

- River stage continuously;
- Weekly sampling for the indicator suite; and
- Monthly sampling for the full suite.

Other Surface Waters

Monitoring will be undertaken for additional surface water monitoring points shown in Figure 8. The monitoring frequency will be as follows:

- Monthly river stage;
- Monthly sampling for the indicator suite; and
- Six-monthly sampling for the full suite during summer low flow period.

All required monitoring of the TMF wetland discharge will continue to be undertaken by the owner of the facility.

Groundwater Monitoring

The proposed general groundwater monitoring locations are shown in Figure 9. The locations have been chosen based upon their historic monitoring record, use as baseline locations and suitability for providing representative data. Monitoring will be at least monthly for water level, quarterly for the indicator suite and annually for the full suite. All required monitoring of the Rathdowney Water Supply Scheme (RWSS)/ wells will continue to be undertaken by Irish Water.

Location	Area (relative to mine site)	TM65 Irish Grid		Water Source	Measurement Frequency
		Easting	Northing		
G South	Mine workings	227152	171367	Groundwater	Monthly
CW West	Mine workings	227670	172478	Groundwater	Monthly
K Vent	Mine workings	226446	172323	Groundwater	Monthly
TMW8	Mine workings	226858	172746	Groundwater	Monthly
TMW13	Mine workings	226994	171905	Groundwater	Monthly
PD	Northern district well	228610	173695	Groundwater	Monthly
KN	Northern district well	228092	173614	Groundwater	Monthly
GM	Western district well	225410	170950	Groundwater	Monthly
KS	Southern district well	227211	170851	Groundwater	Monthly
JP	Eastern district well	229982	172612	Groundwater	Monthly
Goul upstream	Surface water	228762	168547	Surface water	Monthly
Goul downstream	Surface water	230610	170304	Surface water	Monthly
Duggans Bridge	Surface water	226952	173719	Surface water	Monthly
Glasha Crossroads	Surface water	227102	176013	Surface water	Monthly
Whiteswall	Surface water	228809	172915	Surface water	Monthly

Figure 9: Proposed general monitoring locations (as presented in Chapter 8 of the EIAR)

6.5 Monitoring and Management Continued

Further to the measures detailed above, additional committed monitoring and management measures are provided below:

Aquatic Ecological Monitoring

It is proposed to undertake full presence absence surveys of white-clawed crayfish and freshwater pearl mussel during mining operations. Furthermore, the aquatic invertebrate studies consolidated by Aquens (2021) will be implemented annually during mine life within the optimal survey windows of either April or September. The re-commencement of this data set will ensure a continuity of data that has recently ceased. This work will inform the ecological status and health of the River Goul which is hydrologically linked to the River Barrow and River Nore SAC, and River Nore SPA.

Surface and Groundwater Monitoring

Surface and ground water monitoring will address:

- Groundwater flowing from each active mining zone; flow, chemistry, suspended solids (underground monitoring);
- The overall mine dewatering rate; flow, chemistry and suspended solids;

- Input and output to the water treatment plant; flow and chemistry;
- Mine water discharge; flow, chemistry and suspended solids;
- Upstream and downstream surface water locations in the River Goul and Erkina River (as necessary), for stage, chemistry and suspended solids; and
- Groundwater levels and water quality in existing wells.

Underground Monitoring
Inflows to active mining zones will be monitored as follows:

- Instantaneous pumping rate measured at least daily;
- Cumulative pumped volume totalled weekly;
- Weekly sampling for the indicator suite, plus suspended solids; and
- Daily sampling for any identified parameters of concern based on interactive analysis of the monitoring results.

Overall Dewatering Flow
The overall mine dewatering flow will be monitored as follows:

- Instantaneous pumping rate measured at least daily;
- Cumulative pumped volume totalled weekly;
- Daily sampling of any key parameters;
- Weekly sampling for the indicator suite, plus suspended solids; and
- Monthly sampling for the full suite.

Mine Water Discharge
The mine water discharge will be monitored at the outfall as follows:

- Instantaneous pumping rate measured daily; and
- Cumulative pumped volume totalled weekly.

Receiving Surface Waters
Upstream and downstream monitoring will be carried out for all receiving waters. There will be one upstream monitoring point, and one downstream monitoring point. The sampling locations on the River Goul will be consistent with the previous sampling locations. The monitoring frequency will be as follows:

- River stage continuously;
- Weekly sampling for the indicator suite, plus suspended solids; and
- Monthly sampling for the full suite.

Other Surface Waters
Monitoring will be continued for the existing surface water monitoring points (Chapter 8). River stage will be measured monthly. Sampling for the indicator suite will be monthly. There will be two full samples per year during summer baseflow period.

Hydrocarbons/Chemicals
Proposed mitigation measures are outlined as follows (much of these were previously implemented at the mine and will be defined within the Site's EMS):

- All plant and machinery will continue to be regularly serviced before being used on Site;
- Refuelling will be take place in the existing refuelling area;
- Procedures and contingency plans will be set up to deal with emergency accidents or spills;
- An emergency spill kit with oil boom, absorbers etc. will be kept on-Site for use in the event of an accidental spill.

Dust Suppression
Dust suppression will be implemented in accordance with best practice guidance (CIRIA, 2010).

6.6 Residual Impacts

Potential impacts on the attributes of the designated features of the River Barrow and River Nore SAC, Galmoy Fen SAC, and River Nore SPA along with the mitigation measures and residual impacts are presented below.

6.6.1 River Barrow and River Nore SAC and River Nore SPA

Freshwater Pearl Mussel Margaritifera margaritifera
Reduction in water quality could lead to death of mussels, reducing their distribution, number of adults present, ability to recruit juveniles, percentage of adult mortality, extent of suitable habitat, EQR, substratum quality regarding the percentage of algae and occurrence of sediment, oxygen availability and host variability. Cumulative impacts could occur with discharges from diffuse and direct sources.

Mitigation measures required: Water quality controls for sediment deposition and pollution prevention during development and operation via implementation of the MWTP.

Residual impacts: None.

White clawed crayfish *Austropotamobius pallipes*
Reduction in water quality through nutrient enrichment or other sources, could lead to an impact on the EPQ Q value or impact could occur through eutrophication, changing the occurrence of typical vegetative species. Cumulative impacts could occur with discharges from diffuse and direct sources.

Mitigation measures required: Water quality controls for sediment deposition and pollution prevention during development and operation via implementation of the MWTP.

Residual impacts: None.

Brook Lamprey *Lampetra planeri*
Increased sediment loading during operation could alter water levels, reducing the percentage of river accessible, effecting the distribution of lamprey. The Juvenile density in fine sediment, Extent and distribution of spawning habitat and availability of juvenile habitat, could be impacted from increased turbidity and changes to hydrological regime during operation. Cumulative impacts could occur with discharges from diffuse and direct sources.

Mitigation measures required: Water quality controls for sediment deposition and pollution prevention during development and operation via implementation of the MWTP.

Residual impacts: None.

River Lamprey *Lampetra fluviatilis*
Increased sediment loading during operation could alter water levels, reducing the percentage of river accessible, effecting the distribution of lamprey. The Juvenile density in fine sediment, Extent and distribution of spawning habitat and availability of juvenile habitat, could be impacted from increased turbidity and changes to hydrological regime during operation. Cumulative impacts could occur with discharges from diffuse and direct sources.

Mitigation measures required: Water quality controls for sediment deposition and pollution prevention during development and operation via implementation of the MWTP.

Residual impacts: None.

Atlantic Salmon *Salmo salar* (only in fresh water)
Increased sediment loading could alter water levels, reducing accessibility. Impacts may occur from increased turbidity and changes to hydrological regimes including quality as a result of same. Impacts

may occur to water quality during construction and operation. Cumulative impacts could occur with discharges from diffuse and direct sources.

Mitigation measures required: Water quality controls for sediment deposition and pollution prevention during development and operation via implementation of the MWTP.

Residual impacts: None.

Otter *Lutra Lutra*

Disturbance during operation of the mine could discourage usage from current sites. Water quality and sediment deposition related impacts may reduce extent of suitable freshwater habitat and decrease fish biomass availability. Cumulative impacts could occur with discharges from diffuse and direct sources, and through disturbance from anthropogenic sources.

Mitigation measures required: Water quality controls for sediment deposition and pollution prevention during operation. Disturbance prevention measures include avoidance of riparian works.

Residual impacts: None.

Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho- Batrachion* vegetation

Indirect impacts may occur through unmitigated sediment deposition over time, effecting the distribution of this habitat, the area of the habitat, the hydrological regime, substrate composition, water quality and vegetative composition. Cumulative impacts could occur with discharges from diffuse and direct sources.

Mitigation measures required: Water quality controls for sediment deposition and pollution prevention during development and operation via implementation of the MWTP.

Residual impacts: None.

Kingfisher *Alcedo atthis*

Although there are no conservation objectives set for the River Nore SPA, previous studies have identified pressures and threats to Kingfisher regarding available habitat suitability, food availability and disturbance (Cummins *et al*., 2010). The discharge from the mine potentially poses an indirect impact to the availability of food supply for Kingfisher through surface water pathways and the potential impact on water quality of the River Nore. The design and mitigation measures will ensure that there will be no additional pressure on the water quality of the River Nore as a result of the discharge to the Goul.

Mitigation measures required: Water quality controls for sediment deposition and pollution prevention during development and operation via implementation of the MWTP. Avoidance of all physical riparian impacts.

Residual impacts: None.

7 Summary and Conclusions

A Natura Impact Statement (NIS) has been prepared to provide information to Kilkenny County Council and Laois County Council to complete a Stage 2 NIS for the Proposed Development. The Proposed Development is identified as occurring within the Zone of Influence (15 km) of the following Natura 2000 sites:

- Galmoy Fen SAC (abuts the Site to the east);
- Cullahill Mountain SAC (ca. 3.5 km);
- Spahill and Clomantagh (ca. 3.5 km);
- River Barrow and River Nore SAC (ca. 5.4 km);
- The Loughans SAC (ca. 6.3 km); and
- River Nore SPA (ca. 11.9 km).

Three of the sites have been screened out as not having any direct pathways to the Proposed Development site (namely, Cullahill Mountain, Spahill and Clomantagh and the Loughans).

Potential impacts from the Proposed Development on the terrestrial, surface water and groundwater environments are deemed not significant as the design measures of the Proposed Development including the MWTP will control quality and monitoring will ensure that standards are maintained. In addition, the mining rate at Garrylaun (ca. 310,000 t/a) will be considerably lower than it was previously (ca. 500,000 t/a), and this will have a positive impact on the quality of mine water being pumped from the mine, as there will be less explosives used, and therefore less ammonia being produced from blasting.

Evidence for this can be seen in the improvement in water quality data from 2009 onwards as mining rates where reduced. Concerns from the EPA concerning nitrogen deposition have been addressed and WSP (2023) indicate that background rates of N deposition are all above the critical loads (CLo); it is concluded that all designated sites may currently be in a degraded state. In addition, as the maximum Project or process contribution (PC) relative to the CLo is predicted to be less than 0.1% of the CLo at all sites it is judged that the impact of N deposition from mine emissions on the assessed designated sites will be negligible and insignificant.

The findings of this assessment, given the best scientific knowledge indicate that there will not be a significant adverse effect on the integrity of the Natura 2000 sites in view of their conservation objectives.

It is also concluded that no significant effects are likely from the Project, in combination with other project and plans on the following Natura 2000 sites:

- Galmoy Fen SAC;
- River Barrow and River Nore SAC; and
- River Nore SPA.

8 References

E. A. Moorkens (1999) Conservation Management of the Freshwater Pearl Mussel *Margaritifera margaritifera*. Part 1: Biology of the species and its present situation in Ireland. Irish Wildlife Manuals, No. 8.

Collins J (2016) *Bat Surveys: Good Practice Guidelines*. 3rd Edition. London: Bat Conservation Trust.

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

Nilsson, J. and Grennfelt, P. (1988) Critical Loads for Sulphur and Nitrogen. Report from Skokloster Workshop. Skokloster. https://doi.org/10.1007/978-94-009-4003-1_11