CONTENTS

TABLES

CHARTS

FIGURES

APPENDICES

INTRODUCTION

Background

7.1 This chapter of the EIAR provides a description of the existing surface water and groundwater conditions within the application site and within the surrounding area.

7.2 The baseline surface water and groundwater conditions are identified and described, and the potential effects of the proposed development on surface water and groundwater are assessed, and if required, mitigation measures are proposed.

7.3 A full list of all legislation and guidance complied with in this EIAR chapter is included as **Appendix 7-A**.

Proposed Development

7.4 The development being applied for in this planning application consists of the following:

- The proposed development is described in detail in Chapter 2: Project Description of this EIAR and only those elements which relate to water and water management are presented here. The existing and proposed site layout is shown on **Figure 7-1**.
- The application is for quarry development and associated processing (previously permitted under P. Reg. Ref. No. 99/2042 and ABP Ref. PL09.123207) to include drilling, blasting, crushing and screening of rock; and lateral extension to same, with an overall extraction area of c. 6.2 hectares with no vertical deepening below the existing quarry floor. The appropriate period of planning register reference 99/2042 was extended by order dated 03/02/2017 by P. Reg. Ref. No. 16/1246;
- Importation of up to 35,000 tonnes per annum of processed fine aggregate, principally sand for use in readymix concrete production on site;
- Use of buildings and structures associated with the sand and gravel pit previously granted planning permission under P. Reg. Ref. No. 03/2754 comprising of the crushing, washing and screening plant with associated silt disposal lagoons; readymix concrete batching plant including powerhouse; prefabricated office; weighbridge; workshop building with concrete laboratory and bunded fuel tanks; aggregate storage bays; and one liquid effluent treatment system unit;
- Closure of the existing site entrance with provision of a new site entrance located to the north of the existing entrance; realignment of the main internal site access road from the new site entrance to the central processing area with provision of a new wheelwash system; acoustic fence screening (c.2m in height x 170m in length); and new screening berms along the western and northern site boundaries;
- Restoration of the site lands will be to a combination of beneficial agricultural and ecological after-uses;
- Provision is also made for 3 no. sections of road improvements (widening) along the haul route between the site entrance and the R148 regional road, covering a total site area of c. 960m^2. The proposals at the identified locations include for works in the public road and verge that aim

to achieve a consistent carriageway width of 6.0m along with provision of verge widening on the inside of the three bends to improve forward visibility and intervisibility for all opposed traffic including traffic generated by the proposed development.

- All associated site works within an overall planning application area of c. 51.7 hectares, including the proposed road works. The proposed operational period is for 10 years plus 2 years to complete restoration (total duration sought 12 years).

Existing and Proposed Water Management at the Site

7.5 The quarry area has been worked dry (with no groundwater ingress), and the proposed future extraction of bedrock will also comprise of dry working. There will be no extraction beyond the previously permitted levels and no groundwater dewatering will be required.

7.6 There will be no off-site discharge associated with the proposed lateral extension of the bedrock quarry at the proposed development site.

7.7 The existing water management measures will continue to be implemented; these include:

(i) Aggregate material is washed and the wash water goes to a series of inline closed settlement lagoons, located in the southwest of the proposed development site, where the water is circulated and reused in the wash plant;

(ii) Top up water for washing is provided from an existing onsite sump adjacent to the washing plant on a worked out part of the pit. Surface water runoff in the quarry area percolates to ground naturally. The recirculation of wash water will minimise the need for excessive take of groundwater for the operations;

(iii) There is an existing wastewater treatment system including septic tank with Bord na Mona Puraflo treatment system and associated percolation area at the site for the site office / canteen;

(iv) Bunded fuel storage is provided for, under cover in the existing workshop at the site and there is a hydrocarbon interceptor at the diesel filling point; and

(v) It is proposed to provide a new powered wheel wash at the new site entrance for all vehicles exiting the site onto the public road. The wheel wash will be topped up from the onsite well as required and will be cleaned out periodically with the dirty wash water being pumped up to the settlement lagoons for treatment.

7.8 It is not proposed to increase production across the overall site associated with the proposed lateral extension of the bedrock quarry. Therefore, there will be no change in water requirements at the proposed development site compared to the existing present-day situation.

7.9 Drainage from the new proposed site entrance will be routed away from the public road, ensuring that there will be no surface water discharge from the proposed development site to the existing local surface water drainage network. The proposed site entrance and access road will drain to a new proposed French drain which will be located immediately to the south of the new entrance and access road (Refer to Kilsaran Planning Drawing No: **KC2E**). The proposed French drain will redirect the surface water runoff to a suitably sized soakaway to be located to the southeast of the proposed access road.

7.10 A site characterisation test was undertaken at the site for the wastewater treatment system, see **Appendix 7-B**. The existing wastewater treatment system comprise a septic tank, Bord na Mona

Puraflo tertiary Wastewater Treatment System with associated percolation area. The site wastewater treatment system is serviced and maintained on a regular basis; see **Appendix 7-C**.

7.11 Kilsaran implements an Environmental Management System (EMS) at the site. A sample copy of a Kilsaran EMS implemented for an operational quarry is included in Chapter 2 of this EIAR, at **Appendix 2-C**.

7.12 The EMS is designed to improve management of environmental issues related to site operations and the EMS manual represents the environmental policy, structure of management system, EMS procedures and related documents.

7.13 The Kilsaran EMS is modelled, in a large part, after the requirements set forth by the ISO 14001 Standard. However, although the EMS manual is modelled on the ISO 14001 Standard, it is not intended for actual ISO 14001 certification and does not address every requirement of the standard.

Scope of Work

7.14 This EIAR chapter is based on a desk study and site investigation works in order to collect all relevant hydrological, hydrogeological and meteorological data for the proposed development site and the receiving water environment.

Project Team

7.15 This chapter of the EIAR was prepared by Michael Gill and Conor McGettigan of Hydro-Environmental Services. Hydro-Environmental Services (HES) are a specialist geological, hydrological, hydrogeological and environmental practice which 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. Our core areas of expertise and experience include hydrology and hydrogeology. We routinely complete environmental impact assessments for hydrology and hydrogeology for a large variety of project types including sand and gravel pits and bedrock quarries.

7.16 Michael Gill (BA, BAI, Dip Geol., MSc, MIEI) is an 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 and Middleton Quarry in County Cork.

7.17 Conor McGettigan (BSc, MSc) is an Environmental Scientist with 3 years' experience in the environmental sector. Conor holds an MSc in Applied Environmental Science and a BSc in Geology. Conor routinely completes hydrological and hydrogeological impact assessments for a variety of proposed developments including wind farms, residential and industrial developments, bedrock quarries and sand and gravel pits.

REGULATORY BACKGROUND

Legislation

7.18 This EIAR is prepared in accordance with the requirements of European Union Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the 'EIA Directive') as amended by Directive 2014/52/EU.

7.19 The requirements of the following legislation is complied with:

- S.I. No. 349/1989: European Communities (Environmental Impact Assessment) Regulations, and subsequent Amendments (S.I. No. 84/1994, S.I. No. 101/1996,
- S.I. No. 351/1998, S.I. No. 93/1999, S.I. No. 450/2000 and S.I. No. 538/2001,
- S.I. No. 134/2013 and the Minerals Development Act 2017), the Planning and Development Act, and S.I. No. 600/2001 Planning and Development Regulations and subsequent Amendments. These instruments implement EU Directive 85/337/EEC and subsequent amendments, on the assessment of the effects of certain public and private projects on the environment;
- Directives 2011/92/EU and 2014/52/EU on the assessment of the effects of certain public and private projects on the environment, including Circular Letter PL 1/2017: Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive);
- Planning and Development Acts, 2000 (as amended);
- Planning and Development Regulations, 2001 (as amended);
- S.I. No 296/2018: European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 which transposes the provisions of the EIA Directive as amended by the Directive 2014/52/EU into Irish Law;
- S.I. No. 94/1997: European Communities (Natural Habitats) Regulations, resulting from EU Directives 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive) and 79/409/EEC on the conservation of wild birds (the Birds Directive);
- S.I. No. 293/1988: Quality of Salmon Water Regulations;
- S.I. No. 272/2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009, as amended, and S.I. No. 722/2003 European Communities (Water Policy) Regulations, as amended, which implement EU Water Framework Directive (2000/60/EC) and provide for the implementation of 'daughter' Groundwater Directive (2006/118/EC). . Since 2000 water management in the EU has been directed by the Water Framework Directive (2000/60/EC) (as amended by Decision No. 2455/2011/EC; Directive 2008/32/EC; Directive 2008/105/EC; Directive 2009/31/EC; Directive 2013/39/EU; Council Directive 2013/64/EU; and Commission Directive 2014/101/EU ("WFD"). The WFD was given legal effect in Ireland by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722/2003);
- S.I. No: 122/2010: European Communities (Assessment and Management of Flood Risks) Regulations, resulting from EU Directive 2007/60/EC;

- S.I. No. 684/2007: Waste Water Discharge (Authorisation) Regulations, resulting from EU Directive 80/68/EEC on the protection of groundwater against pollution caused by certain dangerous substances (the Groundwater Directive);
- S.I. No. 9/2010: European Communities Environmental Objectives (Groundwater) Regulations 2010, as amended; and,
- S.I. No. 296/2009: European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009, as amended.

Planning Policy and Development Control

7.20 The Planning Policy and Development Control relating to water at the site in this EIAR is set out in the:

- Kildare County Development Plan 2023-2029.

7.21 The county development plan sets out conservation objectives in relation to the hydrological and hydrogeological environment.

Guidelines and Technical Standards

7.22 The water chapter of this EIAR is carried out in accordance with the guidance contained in the following:

- Guidance on the preparation of the EIA Report (Directive 2011/92/EU as amended by 2014/52/EU);
- Environmental Protection Agency (May 2022): Guidelines on the Information to be Contained in Environmental Impact Assessment Reports;
- Institute of Geologists Ireland (2013): Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements;
- National Roads Authority (2008): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters;
- PPG1 - General Guide to Prevention of Pollution (UK Guidance Note);
- PPG5 – Works or Maintenance in or Near Watercourses (UK Guidance Note);
- CIRIA (Construction Industry Research and Information Association) (2006): Guidance on 'Control of Water Pollution from Linear Construction Projects' (CIRIA Report No. C648, 2006);
- CIRIA 2006: Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors (CIRIA C532, 2006);
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (DoHPLG, 2018);
- Guidance on the preparation of the EIA Report (Directive 2011/92/EU as amended by 2014/52/EU), (European Union, 2017);

- Department of the Environment, Heritage and Local Government; Quarries and Ancillary Activities – Guidance for Authorities (April, 2014); and,
- Environmental Protection Agency (2006): Environmental Management in the Extractive Industry (Non-Scheduled Minerals).

RECEIVING ENVIRONMENT

Study Area

7.23 The potential Zone of Impact of the proposed development on the water environment is limited within surface and groundwater study areas.

7.24 In terms of the hydrological environment (i.e. surface water), the study area is limited within the WFD-river sub-basins within which the proposed development site is located. These include the Boyne_040 and Glash_020 river sub-basins. Due to the nature of the proposed development, lateral expansion of a bedrock quarry above the groundwater table, with no surface water discharges, any potential effects on the surface water environment will not extend any significant distance downstream of the proposed development site.

7.25 In terms of the hydrogeological environment (i.e. groundwater), the study area is limited to the extent of the groundwater bodies which underlie the proposed development site. These include the Trim and Kilrathmurry Gravels GWBs.

Baseline Study Methodology

7.26 Existing information on the geology, hydrology, and hydrogeology of the proposed development site and the surrounding area was collated and evaluated.

7.27 The methodology involved in the assessment of the hydrology and hydrogeology at the proposed development site can be summarised as follows:

- A desk study, in which existing data and relevant regional data sources for the area were examined;
- Site walkover surveys and hydrological mapping at the proposed development site by Michael Gill of HES on 26th April 2023 whereby water flow directions and drainage patters were recorded;
- CLS Laboratories completed surface water quality monitoring in the adjacent Annagh Stream and the Boyne River on 30th March 2023. This monitoring comprised of grab sampling in order to provide information on the baseline surface water quality in the vicinity of the proposed development site;
- Groundwater levels in 6 no. on-site boreholes were dipped on 43 no. occasions between July 2021 and April 2023;
- 2 no. water level monitoring devices and 1 no. barometric monitoring device were installed in 2 no. boreholes at the proposed development site on 28th June 2022 in order to provide continuous groundwater level monitoring data;
- CLS Laboratories groundwater sampling at 7 no. on-site boreholes on 30th March 2023 in order to provide information on the baseline groundwater quality at the proposed development site; and,

- Analysis of the information gathered.

Sources of Information

7.28 The following sources of information were consulted in order to gather all relevant geological, hydrological, hydrogeological and meteorological data for the study area.

- Environmental Protection Agency Databases (www.epa.ie);
- Geological Survey of Ireland – Groundwater Databases (www.gsi.ie);
- Met Eireann Meteorological Databases (www.met.ie);
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- Water Framework Directive Map Viewer (www.catchments.ie);
- Teagasc/GSI soil and subsoil mapping (www.gsi.ie);
- Bedrock Geology 1:100,000 Scale Map Series, Sheet 16. Geological Survey of Ireland (GSI, 1997);
- 3rd Cycle Boyne Catchment Report (EPA, 2021);
- Kildare County Development Plan 2023 – 2029;
- Geological Survey of Ireland - Groundwater Body Characterisation Reports; and,
- OPW Flood Mapping (www.floodmaps.ie).

Rainfall and Climate

7.29 The nearest rainfall gauging station is located at Edenderry, ~9km to the south of the proposed development site. The Long-Term Average (LTA) annual rainfall recorded at the Edenderry weather station is ~874mm/yr for the period 1981-2010 (Met Eireann, 2021). The LTA monthly rainfall for the period 1981-2010 are shown in **Table 7-1** below.

Table 7-1
LTA (1981-2010) Monthly Rainfall (mm) for Mullingar

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
81	59.2	68.2	60.9	60.1	66.9	73.1	83.7	67.6	93	80.6	80

7.30 The closest synoptic station where average potential evapotranspiration (PE) is recorded at is Mullingar, located ~25km to the northwest. The long-term average PE for this station is 445.8mm/yr. This value is used as a best estimate of the PE at the proposed development site. Actual Evapotranspiration (AE) is estimated as 423.5mm/yr (0.95 x PE).

7.31 The effective rainfall represents the water available for runoff and groundwater recharge and is calculated as:

$$\text{Effective Rainfall} = \text{LTA} - \text{AE}$$

$$= 874 - 423.5$$

$$= 450.5\text{mm/year}$$

7.32 Based on recharge coefficient estimates from the GSI, an estimate of 85% recharge is taken for the overall site. This groundwater recharge value is for sand and gravel aquifer overlain by well-drained soil and where rock is at the ground surface. Therefore, annual recharge and runoff rates at the proposed development site are estimated to be 383mm/yr and 67.5mm/yr respectively.

7.33 Climate change projections for Ireland are provided by Regional Climate Models (RCMs) downscaled from larger Global Climate Models (GCMs). Projections for the period 2041-2060 (id-century) are available from Met Eireann (www.met.ie). The data indicates a projected decrease in summer rainfall from 0 to 13% under the medium-low emission range scenario and an increase in the frequency of heavy precipitation events of ~20%. In total the projected annual reduction in rainfall near the site is modelled as ~8% under the medium-low emission scenario and ~6% under the high emission scenario. As stated above, the local average long-term rainfall data for the site is 874mm/year. Under the medium-low emission scenario this may reduce to ~804mm/yr, while under the high emission scenario this figure may reduce to ~822mm/yr.

Soils and Geology

7.34 Soils and geology are discussed in detail in Chapter 6 of this EIAR.

Soils and Subsoils

7.35 The Irish Soil Information System project has developed a national association soil map for Ireland, the project is co-funded by Teagasc and the Environmental Protection Agency (EPA).

7.36 The soils and subsoils in the proposed quarry extraction area have been mostly stripped due to the existing extraction and ancillary activities at the site. No further extraction of soils/subsoils is proposed with the exception of small sections of in-situ and stockpiled material. These material will be relocated within the site.

7.37 The soils at the majority of the site are classified as the Elton Soil Association(1000c and 1000x). Meanwhile, a small section in the southeast is mapped as the Mylerstown Soil Association (0650a). These soils are characterized as '*fine loamy drift with limestone'*. The Teagasc soils mapping indicates that the soils in the area comprise of Rendzinas and Lithosols which are shallow well-drained soils derived from calcareous parent material. The soils mapping also indicates the presence of lacustrine soils beneath a forested area to the east of the site. To the south of the site there is an area of grey-brown Podzolics *i.e*. deep well-drained soils. Meanwhile, to the west of the site, alluvium soils are mapped along the Annagh River. A local soils map is included as **Figure 6-1**.

Local Bedrock Geology

7.38 The GSI online map viewer (1:100,000 geology map) (www.gsi.ie) shows that the majority of the proposed development site is underlain by the limestone and shales of the Lucan Formation. A small area towards the centre of the proposed development site is underlain by the oolitic limestones of the Edenderry Oolite Member. A small section in the southeast of the site is underlain by massive, unbedded Waulsortian limestones.

7.39 There is a bedrock geological fault ~500m to the south of the proposed development site. The local bedrock geology is shown in **Figure 6-3**.

7.40 Previous site investigations comprised the drilling of 3 no. boreholes at the proposed development site in 2021. 3 no. boreholes were drilled in 2021 into the bedrock along the quarry boundary for the

purposes of groundwater monitoring (refer to Chapter 6: Land, Soils and Geology for the borehole logs). In addition 3 no. boreholes were drilled into the sand and gravel subsoils deposits to the north of the site for the purposed of monitoring groundwater in the local sand and gravel aquifer. Groundwater monitoring borehole locations are presented in **Figure 7-2**.

Karst

7.41 There are no known or mapped karst features within the proposed development site or in the wider area (GSI online map viewer: www.gsi.ie). The nearest mapped karst feature is over 8km away.

Surface Water - Hydrology

Catchments

7.42 The proposed development site is located in the Boyne surface water catchment within Hydrometric Area 07 of the Eastern River Basin District. This catchment has a total area of 2,690 km^2 (EPA). This is the Water Framework Directive (WFD) Water Management Unit Catchment and is the highest-level catchment unit in Ireland. A regional hydrology map is included as **Figure 7-1**.

7.43 More locally the proposed development site is mapped in the Boyne Sub-Catchment (Boyne_SC_020; ID: 07_16) (EPA) and 2 no. WFD river sub-basins. The west of the proposed development site is mapped within the Boyne_040 river sub-basin. Meanwhile, the east is located in the Glash_020 river sub-basin.

Surface Water Bodies

7.44 Within the Boyne_040 river sub-basin, the closest surface water body is the adjacent Annagh Stream. This watercourse is located immediately to the west of the proposed development site. The Annagh Stream flows to the north and discharges into the Boyne River ~650m north-west of the proposed development site. Further downstream, the Boyne River continues to flow to the north-east towards the town of Trim. A regional hydrology map is presented in **Figure 7-3.**

7.45 Within the Glash_020 river sub-basin, the Ballinlig stream is mapped ~200m east of the proposed development site. This watercourse flows in a northerly direction before it discharges into the Glash River, ~2.2km to the northeast of the site. The Glash River flows to the northwest before it discharges into the River Boyne ~3km north of the proposed development site.

7.46 The Boyne River is located ~380m west of the proposed development site at its closest point. The level of the River Boyne to the northwest of the site at the confluence with the Annagh Stream was surveyed in December 2021 and lies at ~63mOD.

7.47 No additional surface water features were noted in the vicinity of the proposed development site during the walkover surveys. A local hydrology map is presented in **Figure 7-4**.

Surface Water Flows

7.48 There are no OPW gauging stations located in the immediate vicinity of the proposed development site. The closest OPW gauging station for which flow data is available is located at the Boyne Aqueduct. Here the 95%ile flow in the Boyne River is recorded as being 1.22m^3/s. This means that the flow in the Boyne equals or exceeds 1.22m^3/s 95% of the time.

7.55 Q-rating data from 2020 is available on the Glash River upstream of its confluence with the Boyne (EPA Station code: RS07G020600). Here the Glash River achieved a Q-rating of Q3-4 i.e. moderate status. The closest Q-rating data downstream of the proposed development site on the Boyne River is located at Ashfield Bridge (EPA Station Code: RS07B040600). At this monitoring station the Boyne River also achieved a Q-rating of Q3-4 in 2020. The locations of these EPA monitoring stations are shown in **Figure 7-4**.

Table 7-2
Latest EPA Water Quality Monitoring Q-Values (2020)

Watercourse	Station ID	Easting	Northing	Q-Rating
Glash	RS07G020600	266961	243485	Q3-4
Boyne	RS07B040600	268466	244868	Q3-4

7.56 Surface water grab samples were taken at 2 no. locations in the vicinity of the proposed development site by CLS on 30th March 2023. SW1 is located on the Annagh Stream immediately to the west of the proposed development site while SW2 is located on the Boyne River at Ballyboggan Bridge. The locations of these monitoring points are shown in **Figure 7-3**. The samples were sent to an accredited laboratory for analysis. The results of the analysis are summarised in **Table 7-3** below alongside the relevant water quality regulations. The original laboratory reports are attached as **Appendix 7-D**.

7.57 Suspended solids concentrations ranged from <2mg/l at SW2 on the Boyne River to 4mg/l at SW1 on the Annagh Stream. These concentrations are well below the EQS of 25mg/l. Meanwhile, electrical conductivity ranged from 617 to 619 and the pH was noted to be neutral to slightly alkaline.

7.58 Ammonia was found to be below the level of detection (0.005mg/l) of the laboratory in both samples. In comparison to S.I. No. 272, both samples were of high status with respect to ammonia. With respect to BOD both samples were below the high status threshold of 1.3mg/l.

7.59 Nitrate concentrations ranged from 12.2mg/l at SW2 to 14.4mg/l at SW1 while chloride concentrations ranged from 14.9 to 17.8mg/l. The concentration of TPH was below the level of detection (<10mg/l) in both samples.

7.60 The surface water quality at the monitoring locations is generally of good quality except for Coliforms. The surface water pH, suspended solids, ammonia and nitrates all indicate good water quality; however, the presence of Coliforms indicates potential human impacts within the catchments of these watercourses.

Table 7-3
Surface Water Quality Data (30/03/2023)

Parameter	EQS	Monitoring Location	
		SW1	SW2
pH (H^+ units)	≥6 ≤9[1]	7.7	7.9
Conductivity (µS/cm)	-	619	617
Suspended Solids (mg/l)	≤25(1)	4	<2
Ammonia N (mg/l)	≤0.065 to ≤0.04[2]	<0.005	<0.005
Nitrite NO_2 (mg/l)	≤0.05(1)	0.031	0.069
Total Phosphorus P (mg/l)	-	<0.05	<0.05
Nitrate NO_3 (mg/l)	-	14.4	12.2
Chloride (mg/l)	-	14.9	17.8
BOD	≤1.3 to ≤1.5(2)	<1	1
TPH	-	<10	<10
Total Coliforms	-	42	100 est.
Faecal Coliforms	-	35	100 est.

Water Framework Directive

7.61 Local Surface Water Body (SWB) Water Framework Directive (WFD) information is available for review at www.catchments.ie and further details are provided in the 3rd Cycle Boyne Catchment Report (EPA, 2021). Summary WFD information for the SWBs draining the proposed development site is presented in **Table 7-4** below.

7.62 Under the WFD 2016-2021, the watercourses draining the proposed development site (Boyne_040 and Glash_020) achieved moderate status based on their physio-chemical and biological quality. Further downstream the status of the River Boyne ranges from moderate to good.

7.63 The waterbodies in the immediate vicinity of the proposed development site (Glash_020 and Boyne_040) have been deemed to be at risk of not meeting their respective WFD objectives by 2027.

7.64 The Glash_020 waterbody has been identified as being under significant pressure from peat activities (peat drainage and peat extraction). Peat pressures are related to increased sediment loads which alters habitats, morphology and hydrology. Peat extraction activities also result in fluctuations in downstream ammonia concentrations.

[1] S.I. No. 293 of 1988: European Communities (Quality of Salmonid Waters) Regulations

[2] S.I. No. 272 of 2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended by S.I. No. 296/2009; S.I. No. 386/2015; S.I. No. 327/2012; and S.I. No. 77/2019 and giving effect to Directive 2008/105/EC on environmental quality standards in the field of water policy and Directive 2000/60/EC establishing a framework for Community action in the field of water policy).

7.65 The Boyne_040 SWB is under significant pressure from hydromorphology, peat, mines and quarries. In relation to mines and quarries, the EPA (2021) state that a number of old and backfilled quarries have caused morphological effects on this SWB.

7.66 No SWBs in the immediate vicinity of the proposed development site have been identified as a Drinking Water Protected Area (DWPA) under the Water Framework Directive (WFD). The closest DWPA is the Boyne_100 SWB which is located downstream of the town of Trim, Co. Meath.

7.67 The Boyne River downstream of the proposed development site is a salmonid protected river under the WFD. The tributaries of the Boyne which drain the proposed development site, i.e. the Annagh, Kilr and Ballinlig streams; are not salmonid protected waters.

7.68 A full WFD Compliance Assessment report for the Proposed Development is included as **Appendix 7-E.**

Table 7-4
Summary WFD Information for Surface Water Bodies

River Waterbody	Status 2010-2015	Status 2013-2018	Status 2016-2021	3rd Cycle Risk Status	Pressures
Glash_020	Moderate	Moderate	Moderate	At risk	Peat
Boyne_050	Moderate	Moderate	Moderate	At risk	Peat, Mines and Quarries and Hydromorphology

Flooding

7.69 A Stage 1 Flood Risk Assessment (FRA) was undertaken for the proposed development and the report is included in **Appendix 7-F** and is summarised below. The Stage 1 screening FRA examined possible sources of flooding at the proposed development site.

7.70 To identify those areas as being at risk of flooding, the OPW's Past Flood Events Maps, the National Indicative Fluvial Mapping, CFRAM River Flood Extents, historical mapping (i.e. 6" and 25" base maps) and the GSI Groundwater Flood Maps were consulted. These flood maps are available to view at www.floodinfo.ie.

7.71 The OPW Past Flood Events Maps have no records of recurring or historic flood instances within the proposed development site or in the surrounding lands. Similarly, identifiable text on local available historical 6" or 25" mapping does not identify any land which are liable to flood.

7.72 The closest recurring past flood event is located ~1km to the southwest and upstream of the proposed development site at Ballycowan (Flood ID: 1297) and is associated with the floodplain of the Boyne River. The closest mapped downstream flood event is located at Ashfield Bridge (Flood ID: 1953) on the Boyne. This flood event dates from November 2002 and is located ~4km northeast of the proposed development site.

7.73 The GSI Winter 2015/2016 Surface Water Flood Map shows surface water flood extents for this winter flood event. This flood event is recognised as being the largest flood event on record in many areas. This flood map does not show any historic flood zones within the proposed development site. A flood zone is mapped in close proximity to the east of the site in townland of Cornamucklagh. This flood zone corresponds to the location of a historic quarry and this flood zone does not encroach

upon the site. To the west, no flood zones are mapped on the Annagh Stream while flood zones are recorded along the Boyne River.

7.74 CFRAM flood mapping has been completed along the Boyne River to the west of the proposed development site. The mapped low probability (1 in 1,000-year flood event) flood zone along the Boyne River is located ~130m from the western boundary of the proposed development site. No CFRAM fluvial flood zones for the Present Day Scenario encroach upon the proposed development site. The Mid-Range and High-End scenarios model potential flood zones associated with climate change and an increase in rainfall of 20% and 30% respectively. These modelled flood zones do not differ significantly from the Present Day Scenario with the modelled flood zones not extending to within 120m of the proposed development site.

7.75 The National Indicative Fluvial Flood Map does not record any flood zones in the local area.

7.76 Furthermore, the proposed development site is not mapped within any historic or modelled groundwater flood zones.

7.77 The Stage 1 flood risk assessment concludes that the proposed development site is not at risk of flooding from all sources including tidal, fluvial, surface water, groundwater sources, and infrastructure failure.

7.78 The Flood Planning Guidelines state that if a flood risk is identified at this Stage 1, it is necessary to progress and undertake a Stage 2 Initial Flood Risk Assessment for the site. Each of the potential flooding sources have been assessed here based on the findings of a desktop study. The desktop survey has been verified by a site visit.

7.79 The findings from the screening study indicate that a Stage 2 FRA is not required for the proposed development.

Groundwater - Hydrogeology

Aquifer Characteristics

7.80 The GSI online map viewer (www.gsi.ie) shows that much of the proposed development site is underlain by a locally important gravel aquifer (Lg), known as the Clonard-Ballyboggan gravels. This gravel aquifer has a total area of 18km^2. The extent of this gravel aquifer in the local area is shown on **Figure 7-5**. The gravel aquifer is underlain by a locally important bedrock aquifer (Lm); bedrock which is generally moderately productive. The bedrock aquifer has a total area of 1,010km^2. A map of local bedrock aquifers is presented as **Figure 7-6**.

7.81 The GSI describe groundwater vulnerability as a term used to represent the natural ground characteristics that determine the ease with which groundwater may be contaminated by human activities. Groundwater vulnerability embodies the characteristics of the intrinsic geological and hydrogeological features at a site. Groundwater vulnerability is related to recharge acceptance, whereby in areas where recharge occurs more readily, a higher quantity of contaminants will have access to groundwater.

7.82 The mapped vulnerability at the proposed development site is classed by the GSI as “High”, see **Figure 7-7**. This vulnerability rating indicates that the highly permeable sand and gravels are at least 3m thick in this area. Meanwhile, groundwater vulnerability in the southeast of the site is mapped as “Extreme”. This rating is for areas which have “Rock at or near surface”, showing that the soils and

subsoils have been removed from the existing quarry footprint. Soils and subsoils have been removed from much of the southern section of the site and will have extreme groundwater vulnerability.

7.83 According to the GSI, the groundwater recharge at the proposed development site is 385mm/yr with a recharge coefficient of 85% where soils and subsoils remain. Where soils and subsoils have been removed, i.e. in the existing quarry void, groundwater recharge will be higher.

7.84 Groundwater flow in gravel aquifers is through the pore spaces between gravel grains (primary porosity), and the permeability is mainly determined by the 'sorting' of the material (the more uniform, the higher the permeability). Groundwater flow in limestone bedrock aquifers is through fractures (secondary porosity).

Groundwater Body Characteristics

7.85 The proposed lateral extension of the bedrock quarry is located within the Kilrathmurry Groundwater Body (GWB), referring to the gravel aquifer. Meanwhile, much of the existing bedrock quarry is within the Trim GWB. A description of both GWBs is published by the GSI and the details are summarised below. Groundwater bodies are shown in **Figure 7-8**.

Kilrathmurry GWB

7.86 The Kilrathmurry GWB is described by the GSI as a gravel aquifer contained between the low-lying valleys of the Boyne and Glash Rivers. Elevations range from 90mOD to around 70mOD along the riverbanks. Drilling evidence from Kildare suggests the thickness of this deposit varies from 10m - 30m.

7.87 Though permeability testing data are limited, productivity, borehole logging and quarry data (e.g., Kilrathmurry pit) tend to support the suggestion that coarse material predominates and that the permeability and storativity in the aquifer are high.

7.88 The water table within gravel aquifers is usually flat and therefore the depth to water will depend on the topography of the area. The flow paths within the aquifer are constrained by the extent of the deposit and therefore will not develop to a regional scale.

7.89 Groundwater will recharge through rainwater percolating through the topsoil and unsaturated sand and gravel deposits. The presence of less permeable layers in the deposits, even if thin, can create perched water tables and prevent recharge of the true water table. Where the water table lies below the local river network it is likely that some stream water may pass into the aquifer. This will be most likely in the higher elevations where a river flows onto the aquifer from where it has previously been flowing over impermeable subsoil or bedrock.

7.90 Groundwater will discharge from this aquifer where the water table is above the local river network. There is also likely to be groundwater seepage from the extremities of the gravel body at the lower elevations as springs and seeps.

7.91 Although the gravel aquifer is permeable, groundwater velocity is slow because storativity is high and water table elevations are generally subdued. Therefore, discharge to rivers will not be flashy and will be sustained through drier periods of the year.

7.92 The interaction between surface water and groundwater throughout this aquifer is complex and will depend on the position of the water table. The nature of this interaction will not be uniform over the area of the body.

Trim GWB

7.93 The Trim GWB includes the locally important (Lm) bedrock aquifer. The proposed development site lies in the southwestern corner of this GWB.

7.94 This GWB comprises a large area of limestone which is extremely heterogeneous. Overall, the aquifer is classified as a generally moderately productive aquifer based on drilling evidence.

7.95 Diffuse recharge in the GWB occurs over the majority of the area, being higher in areas where the subsoils are thinner/more permeable.

7.96 The main discharge mechanism for this aquifer is as baseflow to the River Boyne and its tributaries. The variety noted in the structural deformation of the rocks will influence the groundwater flow and hence the nature of the discharge from the aquifer.

7.97 EPA hydrographs also show the water level's annual fluctuation is only in the region of 2m, suggesting a high storativity in the bedrock aquifer.

7.98 Groundwater flow will be from local areas of high recharge, e.g., areas of thin subsoils in the uplands, to the main surface water bodies overlying the aquifer, such as the Boyne River.

Groundwater Supply Wells

GSI

7.99 The GSI (www.gsi.ie) do not map the presence of any National Federation registered Group Water Schemes (GWS) or Public Water Schemes or an associated Source Protection Area (SPA) within the proposed development site or in the surrounding lands.

7.100 The closest mapped GWS for which there is a delineated SPA is the Ballindoolin GWS located ~2.6km to the south and hosted in the Edenderry Oolite Member. The preliminary SPA associated with this GWS is ~2.4km from the southern boundary of the proposed development site.

7.101 A search of private well locations was undertaken using the online GSI well database (www.gsi.ie).

7.102 According to the GSI well database, there are a large number of wells within a 2km radius of the proposed development site, these are shown on **Figure 7-9**. The wells are located in either the gravel aquifer (Kilrathmurry Gravels Groundwater Body (GWB)), the locally important bedrock aquifer (Trim GWB), or the nearby locally important bedrock aquifer (Athboy GWB).

7.103 The closest well (GSI name 2623NWW285) is an agricultural and domestic well located ~700m to the south-east and hosted within the Trim GWB.

7.104 The closest well within the gravel aquifer and the Kilrathmurry GWB is an agricultural and domestic well located ~1km to the east (GSI name 2623NWW240).

7.105 There is an ESB well (GSI name 2623SWW247) located ~1.1km to the south-east and another (GSI name 2623NWW202) ~4.3km to the east. Both wells are hosted in the locally important bedrock aquifer and Trim GWB.

7.106 The Clogherinkoe Public Groundwater Supply well (GSI name 2623SWW262) for Kildare County Council is located ~1.9km south of the proposed development site in the Lm bedrock aquifer and Trim GWB. A volume of 23m^3 is abstracted daily. No SPA has been delineated for this PWS.

7.107 The other wells within 2km of the proposed development site are used for agricultural, domestic, 'other' or 'unknown' purposes.

7.108 The yield is not stated for the majority of wells within 2km of the proposed development site. However, the few that state yield are 'poor' yield in the bedrock aquifers (Trim and Athboy GWBs) and 'moderate' to 'good' yield in the sand and gravel aquifer (Kilrathmurry Gravels GWB).

Groundwater Abstraction

7.109 The groundwater supply abstraction for the site (Borehole W3) has been registered by Kilsaran with the EPA, as required European Union (Water Policy) (Abstractions Registration) Regulations 2018 (S.I. No. 261 of 2018). The EPA abstraction reference number for W3 is Reg No. R01582.

Well Survey

7.110 A well survey of local residences within 700m of the quarry void was undertaken on the 24th January 2022, see **Appendix 7-G** for record of wells surveyed and **Figure 7-10** for well locations. All local residences are served by individual supply wells, and there is no mains or Group Water Scheme supply to residences in the vicinity of the site.

7.111 A total of 19 residences were visited as part of the survey; however, access to only four wells was possible on the day of the survey and the results of these are shown in **Appendix 7-G**.

7.112 The groundwater levels in the wells surveyed are shown in **Table 7-5** below. The well supplies all served local residential dwellings and despite the wells being pumped the groundwater levels were all recorded as being relatively close to the ground level, groundwater levels were recorded within 4.5m of the ground level.

Table 7-5
Groundwater Levels from Local Well Survey

Well ID	Groundwater level 24/01/2022 (meters below ground level)
R1 and R2	4.46
R21	2.23
R23	2.9
R34	No groundwater level available. New well installed in 2017 to serve residence
R39	No groundwater level available. New well installed in 2021/22 to serve residence
R40	4.04

Kildare Groundwater Protection Scheme

7.113 The Kildare Groundwater Protection Scheme was issued by the GSI in December 2002. The Kildare Groundwater Protection Scheme report includes a classification of the Edenderry Oolite (limestone) aquifer, which is the bedrock aquifer that the quarry is located in. The Edenderry Oolite forms part of the Allenwood Limestone Formation but is classed separately under the Offaly Groundwater Protection Scheme (Daly et al, 1998). It is a pure, medium-coarse grained limestone occupying a small part of the north-western corner of County Kildare.

7.114 The report states that there is one small group scheme known to be drawing groundwater from this unit. The hydrogeological data are sparse for this rock unit, being restricted to two productivity values and seven well yield values. There is one Class IV and one Class V well, both in County Offaly. There are two wells with "Good" yields of 345m^3/d and 200m^3/d. Based primarily on productivity data and well yield data from County Offaly the Edenderry Oolite is classed as a Locally Important Aquifer that

is moderately productive (Lm), however a note on the classification suggests that the aquifer should be classified as LI instead.

Groundwater Monitoring

Boreholes

7.115 Initially there were 3 no. on-site boreholes: W1, W2, and W3. These boreholes were drilled in 1999. However, borehole W1 was damaged and borehole W2 was lost due to quarry extension and therefore only borehole W3 remains and now serves as the site supply borehole. Details are summarised in **Table 7-5**, for more details refer to borehole logs in **Chapter 6.**

7.116 Additionally, there is a private well located at a house to the south-east of the proposed development site (W4). There are no drilling or installation details. Location details are outlined in **Table 7-6**.

7.117 3 no. groundwater monitoring boreholes (21-CL-01 to 21-CL-03) were drilled in March 2021 by Ground Investigations Ireland (GII) and supervised by Kilsaran. Borehole 21-CL-01 is located directly south of the existing quarry footprint, borehole 21-CL-02 is located directly north of the quarry while borehole 21-CL-03 is located in the west of the site. These 3 no. boreholes extend to ~30mOD. Groundwater strikes were not recorded during drilling.

7.118 The overburden deposits ranged from 6.9m (21-Cl-03) in the west to 23.4m (21-CL-02) in the north. The overburden typically consisted of sandy gravelly clay which is underlain by sands and gravels at boreholes 21-CL-01 and 21-CL-02. The overburden deposits are underlain by the Edenderry Oolite Formation in boreholes 21-CL-01 and 21-CL-02 and is described as moderately strong, pale blue-grey, medium grained, massive oolitic limestones. Meanwhile, the Lucan Formation was recorded at borehole 21-Cl-03 and was also noted to be present beneath the oolitic limestones at borehole 21-CL-02. The Lucan Formation was described as moderately strong and medium grained limestones interbedded with shales. Detailed logs of these boreholes are provided in **Chapter 6**.

7.119 The borehole installation included a gravel pack installed in the annular space between the slotted casing and the borehole. In boreholes 21-CL-01 to 21-CL03 a bentonite seal was installed above the gravel pack to prevent the entry of surface water into the borehole. The borehole was fitted with a stand-up cover surrounded by concrete. Details are summarised in **Table 7-7**, for more details refer to borehole logs in **Chapter 6**.

7.120 In addition, 3 no. boreholes (21-CL-04 to 21-CL-06) were drilled in the agricultural land to the north of the site in 2021. The boreholes encountered sand and gravel deposits above the bedrock. No bentonite seal was installed in the gravels during the construction of these boreholes. Therefore the water level in these boreholes records water levels in the sand and gravel aquifer in the local area. We note that the sand and gravel aquifer has largely been removed from the site due to the previous activities and only small in-situ areas remain within the lateral quarry extension area.

7.121 Groundwater monitoring borehole locations are shown in **Figure 7-2.**

Table 7-6
Details of existing historic boreholes W3 and W4

	W3 - Site Supply Borehole	W4
Easting / Northing	665496 , 740559	665734 , 740105
Ground Level Elevation (m AOD)	73.41*	91.008

	W3 - Site Supply Borehole	W4
Depth (mbgl)	45.1	No log available
Elevation of base of borehole (m AOD)	c. 28	
Sand & gravel or bedrock	Bedrock	
Fractures (mbgl)	17.3-17.9, 21.8, 23.9, 28.1-28.4, 30.9-37.4, 42.5-44.5	
*Top of casing No standpipe or gravel pack installation details and no water strikes noted for borehole W3. Coordinates in ITM		

Table 7-7
Details of 2021 bedrock boreholes (21-CL-01 - 21-CL-03)

	21-CL-01	21-CL-02	21-CL-03
		Bedrock	
Easting / Northing (ITM)	665694 , 740180	665759 , 740638	665071 , 740881
Ground Level Elevation (m AOD)	90.639	83.454	67.688
Depth (mbgl)	60	53.4	40
Elevation of base of borehole (m AOD)	30.6399	30.0544	27.6887
Fractures (mbgl)	12-8 – 42.8	0-6.9	6.9-10.15
Standpipe installation (mbgl)	0-10 plain 10-60 slotted	0-25 plain 25-53.4 slotted	0-13 plain 13-40 slotted
Gravel pack installation (mbgl)	Backfilled with pea gravel, bentonite seal 9.6-10	Backfilled with pea gravel, bentonite seal 24.6-25 and at top	Backfilled with pea gravel, bentonite seal at 13
*** Standpipe pulled up to 15m while casing being pulled. Failed to get standpipe back to 19m after multiple attempts.** **Slotted standpipes covered with geotextile sock. Water strikes not recorded**			

Groundwater Levels

7.122 Groundwater levels have been monitored in 3 no. bedrock boreholes (21-CL-01, 21-CL-02 and 21-CL-03) since July 2021 and in the 3 no. boreholes (21-CL-04, 21-CL-05 and 21-CL0-6) on the sand and gravel aquifer since October 2021. The recorded groundwater levels are presented in **Chart 7-2** below and summarised in **Table 7-8**.

Chart 7-2
Clonard Quarry Groundwater Levels.
Note: dashed lines are boreholes located in the Sand & Gravel, non-dashed lines are boreholes located in bedrock

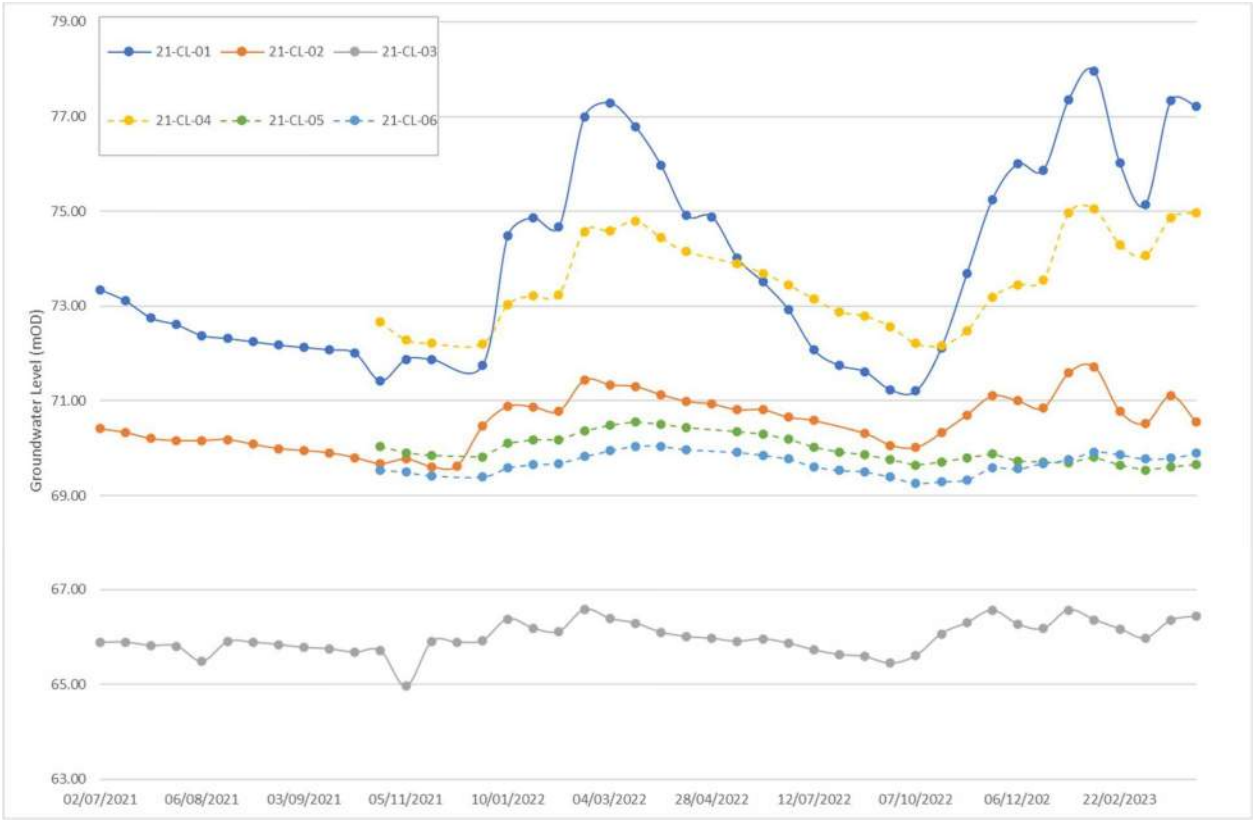


Table 7-8
Summary of Clonard Quarry Groundwater Levels

		21-CL-01	21-CL-02	21-CL-03	21-CL-04	21-CL-05	21-CL-06
		Bedrock			S&G		
m AOD	Max	77.96	71.72	66.58	75.05	70.56	70.04
	Ave	73.90	70.55	65.98	73.52	69.98	69.67
	Min	71.21	69.61	64.97	72.17	69.54	69.26
mbTOC	Max	19.66	14.08	3.02	4.84	11.90	8.53
	Ave	16.98	13.15	2.01	3.50	11.47	8.12
	Min	12.91	11.97	1.41	1.96	10.88	7.75
m	Range	6.75	2.11	1.61	2.88	1.02	0.78
Number of Manual Readings		43	43	44	32	31	31

7.123 In the bedrock boreholes (21-CL-01, 21-CL-02, 21-CL-03):

- the maximum recorded groundwater level is 77.96mOD in borehole 21-CL-01 and the minimum recorded groundwater level is 64.97mOD in borehole 21-CL-03;
- the maximum recorded range is 6.75m in borehole 21-CL-01 and the minimum recorded range is 1.61m in borehole 21-CL-03;
- the depth to groundwater ranged from a maximum of 19.66mbTOC (metres below top of casing) at 21-CL-01 to 1.41mbTOC at 21-CL-03;
- The greatest groundwater levels were recorded in 21-CL-01 in the south of the proposed development site. The groundwater levels are lower to the north and west and in the vicinity of the quarry void (this is confirmed by the lack of any groundwater inflows into the existing quarry which stands at (~75-76mOD);
- The elevated groundwater levels recorded at 21-CL-01 are likely due to the fractured and brecciated nature of the limestones encountered in this boreholes (i.e. conduit for groundwater flow). Meanwhile, the limestones encountered in 21-CL-2 and 21-CL-3 were less fractured and moderately strong, implying less groundwater flow within that area of bedrock.
- No significant faults or fracture zones are recorded in the existing faces of the quarry, or in the proposed extraction area that would indicate the presence of potential groundwater flowpaths. Furthermore, the existing quarry floor (~75-76mOD) is dry. Therefore, the local groundwater table is below ~75mOD and no groundwater inflows will occur in the lateral quarry extension area; and
- the groundwater flow direction in the bedrock aquifer is in a north-westerly direction.

7.124 In the sand and gravel boreholes (21-CL-04, 21-CL-05, 21-CL-06):

- the maximum recorded groundwater level is 75.05mOD in 21-CL-04 and the minimum recorded groundwater level is 70.04mOD in borehole 21-CL-06;

- the depth to groundwater varied from 11.90mbTOC in 21-CL-05 to 1.96mbTOC in 21-CL-04; and,
- the groundwater flow direction in the sand and gravel aquifer is in an easterly direction.

7.125 The groundwater level in the sand and gravel boreholes is at or below the existing bedrock quarry floor level which stands at 75-76mOD.

Groundwater Quality

7.126 In relation to groundwater hydrochemistry, the GSI Groundwater Characterisation Report for the Trim GWB states that this GWB has a calcium bicarbonate signature. Electrical conductivity concentrations range from 500 to 800µS/cm and these groundwaters are considered to be moderately hard to very hard and alkalinities range between 150 to 350mg/l. Meanwhile, the GSI's Characterisation Report for the Kilrathmurry Gravels GWB states that no information is available on the nature of the groundwater in this GWB.

7.127 Groundwater samples were collected from seven boreholes by CLS on 29th March 2023 and the baseline groundwater quality is discussed below. The samples were scheduled for an extensive list of parameters. The groundwater sample laboratory certificates and tabulated results are included in **Appendix 7-H**.

7.128 A Waterra pump and tubing were used to pump water from depth for 6 no. boreholes. This ensured that recent surface water inflow was not collected. Due to large volumes of water in the bedrock boreholes W3, 21-CL-01, 21-CL-02 and 21-CL-03, each borehole was pumped until pH, conductivity, and temperature readings stabilised (any two successive readings are within 10% of each other). Sand and Gravel boreholes 21-CL-05 and 21-CL-06 were pumped until they yielded three well volumes. Meanwhile, 21-CL-04 recorded some silty inflows and was purged dry (please refer to **Appendix 7-I** for the groundwater sampling field sheets).

7.129 The results were compared with the Groundwater Regulations (SI No 366 of 2016 or SI No 9 of 2010), Drinking Water Regulations (SI No 122 of 2014) and the EPA Interim Guideline Values (IGVs), where available and in that order. The following exceedances were noted:

- Total coliforms were elevated above the EPA IGV and the laboratory limit at 2 no. locations (21CL01 and 21-CL06). Faecal coliforms were elevated above the EPA guideline value at these locations. Meanwhile, total coliforms and faecal coliforms were below the level of detection of 100cfu at 21-CL-04.
- Total Petroleum Hydrocarbons were below the level of detection of the laboratory (10µg/l) in all 7 no. samples.
- Nitrate and nitrite concentrations were below the Drinking Water Regulations and the EPA IGV at all locations.
- Sulphate was found to be above the EPA IGV of 200mg/l at 21CL04 (412mg/l).
- Manganese exceeded the Drinking Water Regulation Value and the EPA IGV values of 50µg/l at 5 no locations with concentrations at these boreholes ranging from 59µg/l to 1363µg/l at 21CL04.
- Aluminium exceeded the EPA IGV of 200µg/l at 4 no. locations with concentrations at these boreholes ranging from 154µg/l to 14,714µg/l at 21CL04.
- Elevated barium concentrations were encountered in 3 no. samples (21CL01, 21CL02 and 2CL05).

Water Framework Directive

7.130 Local Groundwater Body WFD information is available for view from www.catchments.ie and is summarised in **Table 7-9** below.

7.131 The Kilrathmurry Gravels GWB and the Trim GWB underlying the proposed development site both achieved good status in all 3 no. WFD cycles.

7.132 The risk status for the Kilrathmurry Gravels GWB is currently under review while the Trim GWB has been deemed to be at risk of failing to meet its WFD objectives.

7.133 The EPA (2021) have identified several pressures on the Trim GWB which include domestic wastewater and an unknown anthropogenic pressure.

Table 7-9
Summary WFD Information for Groundwater Bodies

River Waterbody	Status 2010-2015	Status 2013-2018	Status 2016-2021	3rd Cycle Risk Status	Pressures
Kilrathmurry Gravels	Good	Good	Good	Not at risk	-
Trim	Good	Good	Good	At risk	Domestic wastewater and anthropogenic pressures

Protected Areas

7.134 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).

7.135 The proposed development site is not located within 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).

7.136 However, several designated sites are located in the surrounding lands and/or downstream of the proposed development site. A map of designated sites is included as **Figure 7-11** and designated sites in the vicinity or downstream of the proposed development site include:

- Ballina Bog pNHA (Site Code: 000390) located ~3.7km to the east – the Glash River acts as a hydrological barrier between the proposed development site and this pNHA;
- The Royal Canal pNHA (Site Code: 002103) is located ~5km to the northeast – No hydrological connections exist between the proposed development site and this pNHA;
- Carbury Bog NHA (Site Code: 001388) is located ~5km to the southeast - No hydrological connections exist between the proposed development site and this NHA;
- Mount Hevey SAC/pNHA (Site Code (SAC): 002342) is located ~6.3km to the northwest - No hydrological connections exist between the proposed development site and this SAC/pNHA;
- Molerick Bog NHA (Site Code: 001582) is located ~4.9km to the north - No hydrological connections exist between the proposed development site and this NHA;
- River Boyne and River Blackwater SAC (Site Code: 002299) is located ~5.6km to the northeast and is hydrologically linked with the proposed development site via the tributaries of the Boyne;

- River Boyne and River Blackwater SPA (Site Code: 004232) is located ~5.6km to the northeast and is hydrologically linked with the proposed development site via the tributaries of the Boyne;
- Trim pNHA (Site Code: 001357) is located ~23.5km to the northeast and along the river Boyne;
- Boyne Woods pNHA (Site Code: 001592) is located ~38.5km to the northeast and along the River Boyne;
- Crewbane March pNHA (Site Code: 000553) is located ~45.5km to the northeast and along the River Boyne;
- Dowth Wetland pNHA (Site Code: 001861) is located ~50.5km to the northeast and along the River Boyne;
- Boyne River Islands pNHA (Site Code: 001862) is located ~52.5km to the northeast and along the River Boyne; and,
- Boyne Coast and Estuary SAC and pNHA(Site Code: 001957) is located ~56.5km to the northeast and along the River Boyne.

7.137 The Boyne River is also designated as a salmonid protected river under the WFD, while its tributaries which drain the area of the proposed development site are not designated salmonid waters.

7.138 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). Sensitive areas under the UWWTD are water bodies affected by eutrophication associated with elevated nitrate concentrations and act as an indication that action is required to prevent further pollution caused by nutrients.

7.139 The Boyne River NSA (IERI_EA_1994_0001) and the Boyne Estuary NSA (IE_EA_010_0100) are mapped downstream of the proposed development site. The Boyne River NSA is mapped downstream of Navan, ~35.5km to the northeast of the proposed development site. According to the 3rd Cycle Draft Boyne Catchment Report (2021, EPA) the NSA objectives are being met for the River Boyne and Boyne Estuary within the catchment.

Water Environment – Sensitive Receptors

7.140 From the baseline study undertaken here, the following water environment sensitive receptors have been identified in the receiving environment:

- Downstream surface water quality in the adjacent streams (Annagh and Ballinlig streams) and in the Glash and Boyne rivers;
- The Boyne River and associated SAC and SPA;
- The Boyne River salmonid waters;
- Locally important gravel aquifer / Kilrathmurry GWB;
- Locally important bedrock aquifer / Trim GWB; and
- Groundwater supply wells in the surrounding lands.

7.141 Due to the local hydrogeological regime, with high rates of groundwater recharges (associated with exposed bedrock and the permeable subsoils, where they remain in situ), groundwater will be the main sensitive receptor.

7.142 In terms of surface water receptors, no direct hydrological links exist between the proposed development site and downstream receptors. Surface water runoff rates at the proposed

development site are low and the primary link between the site and downstream surface water course is via lateral groundwater flow.

7.143 For each identified receptor, the significance and sensitivity of the receptor is assessed in **Table 7-10** below and a rating (High/Medium/Low/Negligible) applied, based on the methodology outlined in existing guidance and reproduced in **Appendix 7-J**.

Table 7-10
Existing Environment - Significance and Sensitivity/Importance

No.	Existing Environment	Significance	Sensitivity	Existing Environment Significance/Sensitivity Rating (H/M/L/N)
1	Smaller rivers adjacent to the proposed development site (Annagh and Ballinlig, streams and the Glash River).	Located in close proximity to the proposed development site. Achieved moderate status (WFD 2016-2021).	Watercourses are expected to be in hydraulic continuity with the gravel aquifer at the proposed development site. SWBs are at risk of not meeting their WFD objectives by 2027.	**Medium** - Attribute has a medium quality or value on a local scale
2	Boyne River	Boyne River is ~380m west of the proposed development site. Associated SAC and SPA ~5.6km to the northeast. Boyne River is salmonid protected (WFD). Boyne River is moderate status (WFD 2016-2021)	Boyne River, salmonid waters and SAC and SPA are downstream of the proposed development site. Boyne River is at risk of not meeting its WFD objectives by 2027.	**High** - Attribute has a high quality or value on an international scale downstream of the proposed development site due to its designation as an SAC and SPA.
3	Locally important gravel aquifer / Kilrathmurry GWB.	Locally important aquifer. Achieved good status (WFD 2016-2021).	Kilrathmurry GWB is expected to be in hydraulic continuity with surface water courses through groundwater recharge and discharge. Local groundwater abstractions for drinking water supplies. Kilrathmurry GWB is *not* at risk of not meeting its objectives by 2027 (WFD).	**Medium** - Attribute has a medium quality or value on a local scale (locally important aquifer and provides baseflow to the adjacent smaller rivers).
4	Locally important bedrock Aquifer / Trim GWB.	Locally important aquifer Achieved good status (WFD 2016-2021).	Local groundwater abstractions for drinking water supplies. Trim GWB is at risk of not meeting its objectives by 2027 (WFD).	**Medium** - Attribute has a medium quality or value on a local scale (locally important aquifer and provides baseflow to the adjacent smaller rivers).

No.	Existing Environment	Significance	Sensitivity	Existing Environment Significance/Sensitivity Rating (H/M/L/N)
5	Groundwater supply wells in surrounding area.	Private and public water supplies. ESB wells.	Local groundwater abstractions for drinking water supplies.	**Medium** - Attribute has a medium quality or value on a local scale (potable water source supplying >50 homes). The Proposed Development Site is not located within a source protection area.

Baseline Summary

7.144 The area covered by the final quarry extraction footprint has been mostly stripped of topsoil and overburden deposits except for small areas of in-situ soils and stockpiled materials. The subsoils in the local area comprise of clays and sand and gravel deposits.

7.145 The proposed development site is underlain by oolitic limestones of the Edenderry Oolite Member with some massive Waulsortian Limestone in the southeast and dark limestones and shales of the Lucan Formation in the north.

7.146 The proposed development site is located within the Boyne Catchment and Hydrometric Area 07 of the Eastern River Basin District. More locally, the proposed development site is located within the Boyne Sub-Catchment (Boyne_SC_020). There are several surface water bodies in close proximity to the proposed development site. These include: the Annagh and Ballinlig streams. All watercourses eventually discharge into the Boyne River.

7.147 Under the WFD classification, all watercourses in the vicinity and immediately downstream of the proposed development site are of moderate status based on their physio-chemical and biological quality.

7.148 There are no recorded flood events at or near the site, nor is there any potential flooding.

7.149 The surface water quality in the Annagh Stream is generally of good quality except for Coliforms. The presence of Coliforms reflects human impacts in the stream catchment.

7.150 The subsoil sands and gravels in the local area form part of the Kilrathmurry Groundwater Body (GWB). This gravel aquifer is underlain by the Trim GWB. Both GWBs are classified as having a “Good” status under the WFD classification. These deposits have been largely removed from the proposed development site.

7.151 The groundwater vulnerability at the proposed development site ranges from High where permeable soils and subsoils remain to Extreme where rock is exposed at the surface in the existing quarry void.

7.152 There are seven boreholes on-site and in the surrounding lands. 5 no. boreholes are in bedrock (one is assumed) and 3 no. boreholes are in the sand and gravel aquifer. Bedrock groundwater levels range from 64.97mOD to 77.96mOD. Groundwater levels in the sand and gravel aquifer range from 69.26mOD to 75.05mOD.

7.153 Groundwater samples were undertaken by CLS Laboratories in March 2023. Total coliforms and faecal coliforms were above the level of detection of the laboratory in at 2 no. locations. Sulphate was elevated at 1 no. location within the sand and gravel aquifer. Manganese, aluminium and barium were also elevated in some of the bedrock and sand and gravel boreholes.

7.154 There are a large number of wells within the vicinity of the proposed development site, including private wells, ESB wells, Public Water Supply wells, County Council wells, and Group Water Supply Scheme wells.

IMPACT ASSESSMENT

Evaluation Methodology

7.155 The potential direct and indirect effects to surface water and groundwater associated with the proposed development are discussed below.

7.156 The methodology applied here is a qualitative risk assessment methodology in which the nature of the potential effects are described in terms of the character, magnitude, duration, probability and consequence of the impact, see **Appendix 7-K** and **Appendix 7-L**.

7.157 The potential effect is then screened against the sensitivity of the receiving environment to establish the overall significance of the potential effect (without mitigation). Appropriate mitigation measures for the potential effects identified are discussed, and the identified potential effects reassessed assuming the identified mitigation measures in place.

Construction Phase Potential Effects (No Mitigation)

7.158 The potential direct and indirect effects to surface waters and groundwater are discussed below.

7.159 In the context of the proposed development, the construction phase is taken to be any site preparation works which will involve the construction of the new site entrance and associated internal road realignments, the installation of a new wheelwash, the removal of any remaining soil/subsoil material in the lateral quarry extension area and the construction of a new perimeter screening berm along the western boundary of the site. The construction phase will also include the proposed road widening along 3 no. sections of the haul route between the site entrance and the R148 regional road.

7.160 The soil and subsoil, where present, will be stripped from the lateral quarry extension area using earth moving machinery. The topsoil and any overburden material will be stored in temporary overburden storage berms, ready to be used in the restoration of the site.

7.161 The construction phase will be approximately six-months in duration and will be carried out in tandem with ongoing operational phase works. Rock extraction and the importation of fine aggregate will be ongoing with the above mentioned works.

Direct Effects

7.162 The removal of any remaining soil/subsoil from the proposed lateral extension to the bedrock quarry, will increase the groundwater vulnerability rating of the underlying bedrock aquifer, which is currently mapped as high to extreme, based on on-site hydrogeological conditions. Following the removal of any remaining overburden, the groundwater vulnerability will increase to extreme. However, it is worth noting that many of the soils/subsoils have already been removed and in-situ overburden is only present in small areas.

Indirect Effects

7.163 There is the potential for the generation of suspended sediment in surface water runoff during the construction phase. Earthworks and the stripping of soil/subsoil, where present, and the stockpiling of such material (creation of the proposed perimeter berm) will be a potential source of sediment

laden water. Such activities can result in the release of suspended solids to nearby surface waters. Therefore, there is the potential for an indirect effect on the downstream local surface water quality.

7.164 Earthworks will also be required at 3 no. locations along the haul route and have the potential to generate suspended solids in surface water runoff. The works are located in the Boyne_040 river sub-basin, however no watercourses or roadside drains are located in close proximity to these proposed work areas. Earthworks will also be required for the construction of the new site entrance. Any potential surface water quality effects associated with the proposed haul route works (*i.e.* road widening) and the new site entrance will be limited due to the small scale and short duration of the proposed works. Furthermore, due to the shallow nature of the works, there will be no effects on groundwater levels or groundwater quality.

7.165 The proposed works during the construction phase will be completed using machinery which will be powered by diesel engines and operated using hydraulics. Unless carefully managed, such plant and machinery have the potential to leak hydraulics or cause fuel leaks during refuelling operations. Such activities have the potential to have an effect local surface water quality and groundwater quality in the underlying aquifers.

7.166 The key sensitive receptors during the construction phase will be the local groundwater receptors, due to the lack of surface water connections between the proposed development site and the adjacent surface water courses. Surface water runoff rates at the proposed development site are low and surface water may only be affected due to the hydraulic continuity of surface waters with the local gravel aquifer. The only potential for surface water to be impacted is via hydraulic continuity with the local sand and gravel aquifer. However, the overburden deposits have previously largely been removed from the site and only small areas of in-situ soils/subsoils remain. Therefore, water falling within the proposed development site will infiltrate into the bedrock, with groundwater in the bedrock aquifers being the primary receptor.

7.167 The Boyne River designated salmonid waters and the River Boyne SAC and SPA are in hydraulic continuity with the smaller watercourses adjacent the proposed development site. Therefore, any potential adverse effect on local surface water quality has the potential to indirectly effect downstream designated sites.

7.168 Furthermore, any potential effect on the hydrological and hydrogeological environment has the potential to indirectly effect the WFD status of the underlying GWBs and downstream SWBs.

Operation Phase Potential Effects (No Mitigation)

7.169 During the operation phase, the direct and indirect effects described above during the construction phase will also apply.

7.170 The operation phase includes the extraction of rock from the quarry and subsequent processing, the importation of fine aggregate and concrete manufacturing.

7.171 The operation phase does not include any extraction below the groundwater table. The existing quarry floor stands at ~75.1mOD *i.e.* the previously permitted level, is dry and above the local groundwater table. No vertical deepening is proposed as part of the proposed development. Therefore, maintaining the quarry at this level will ensure that there will be no inflows of groundwater. Consequently there will be no requirement for dewatering and no requirement to treat or discharge large volumes of groundwater.

7.172 The proposed development does not include any discharge to surface waters. As such there will be no change in local surface water flow volumes.

7.173 The operation phase will be approximately 10-years in duration.

Direct Effects

7.174 During the operation phase, water will be sourced from the on-site borehole in order to top-up the wheel wash when required. This can have a direct effect on local groundwater levels. However, water is already being sourced from the onsite borehole for the existing wheel wash. For this reason and due to the very small volumes of water being abstracted, no effects on local groundwater levels and/or local groundwater well supplies will occur.

Indirect Effects

7.175 The indirect effects include potential effects on groundwater and surface quality due to suspended sediment and the accidental spillage of hydrocarbons. These potential effects are the same as those outlined above for the construction phase.

7.176 During the operation phase there will be no direct discharge to surface waters. All water within the proposed development site will be discharged to ground. However, in the absence of mitigation measures runoff from the proposed new site entrance and access road could enter the local surface water drainage network.

7.177 The processing and washing of material at the aggregate processing plant can generate suspended sediment entrainment in surface water within the site. This water could infiltrate into ground and enter the underlying bedrock aquifer. However, we note that there no visible open fractures or voids within the exposed bedrock face, and it is not proposed to quarry deeper within the bedrock. There is nothing exposed on the quarry faces that suggests there are open groundwater flowpaths below the quarry. Therefore, there is limited evidence to indicate that groundwater flowpaths for sediment exist.

7.178 During the operation phase there is a risk of the release of cement-based products from the existing on-site concrete batching. Concrete and other cement-based products are highly alkaline and corrosive and can have negative effects on water quality. The batching of wet concrete and the washing out of transport and placement machinery are the activities which are most likely to generate a risk of cement-based pollution.

7.179 The potential release of untreated wastewater during the operational phase has the potential to effect local groundwater quality. However, it is proposed to continue to utilise the existing wastewater treatment systems at the proposed development site.

7.180 There is the potential for an indirect effect on the Boyne River SAC and SPA and the River Boyne designated salmonid waters which are downstream of the proposed development site.

7.181 Any potential effect on the hydrological and hydrogeological environment has the potential to affect the status of the underlying GWBs and downstream SWBs.

Restoration Phase Effects (No Mitigation)

7.182 The post-operation phase will be 2 years in duration.

7.183 During the restoration phase, the existing pit floor areas and the majority of the processing area will be restored to agricultural land. The areas will be cleared, levelled and covered with topsoil. Meanwhile, the quarry void will be restored to a natural habitat areas.

7.184 All works completed during the restoration phase will be in accordance with EPA Guidelines.

Direct Effects

7.185 During the restoration phase, the pit floor areas and the majority of the processing area will be restored to agricultural land. The areas will be cleared, levelled and covered with topsoil. Meanwhile, the quarry void will be restored to a natural habitat areas. Within the rock extraction area, surface water runoff may accumulate on the quarry floor during times of heavy rainfall. Here, the water will either evaporate or infiltrate naturally into the bedrock.

Indirect Effects

7.186 No indirect effects will occur.

Significance of Potential Effects (Unmitigated)

7.187 The significance of the identified potential impacts are assessed here and is shown in **Table 7-11** below. The significance of the impact is based on the Significance/Sensitivity of the receiving environment (**Table 7-10**) and the Impact Rating with no mitigation. The significance of the impact is determined according to the table in **Appendix 7-L**.

Table 7-11
Pre-Mitigation Potential Effects

No.	Identified Potential Effects	Description of Effects (No Mitigation)	Magnitude of Effect (Pre Mitigation)
Construction Phase - Direct			
1	Increase in groundwater vulnerability rating in proposed extraction areas.	The removal of soil and subsoil from the lateral extension of the bedrock quarry will increase the vulnerability rating of the underlying aquifers. This will result in a likely and permanent effect on the groundwater vulnerability rating. However, much of the soil/subsoil has already been removed and there are only small area where in-situ soils remain. The resulting change in groundwater vulnerability associated with the removal of any remaining overburden material would be in line with emerging trends (i.e. the vulnerability ratings in the existing quarry void) and therefore its effect is not considered to be significant.	Negative, slight, direct, long-term, likely effect
Construction Phase – Indirect			
2	Reduction in surface water quality from an increase in suspended solids and accidental fuel leakage/spillage.	Construction phase activities including construction of the new site entrance, wheelwash and boundary berm and the internal site access road realignment will require earthworks. In addition, soils/subsoils will require removal, where present, from the proposed lateral quarry extension area. These activities can result in the release of suspended sediments to surface water and could result in an increase in the suspended sediment load which could affect downstream water quality. Furthermore, accidental spillage of hydrocarbons during the construction phase poses a risk to surface water quality. The primary potential pathway to affect surface water quality is through hydraulic continuity with groundwater in gravel aquifer. Groundwater quality could be impacted from vertical migration through unsaturated zone in gravel aquifer, followed by lateral migration. Impact to groundwater is unlikely due to the nature of works, and also as a result of the filtration and attenuation capacity of the residual subsoils. Furthermore,	Negative, not significant, indirect, temporary, likely effect

No.	Identified Potential Effects	Description of Effects (No Mitigation)	Magnitude of Effect (Pre Mitigation)
		much of the sands and gravels have already been removed from the site, so there will be limited interaction with the gravel aquifer.	
3	Reduction of groundwater quality in gravel and bedrock aquifer from increase in suspended solids.	Construction phase activities including construction of the new site entrance, wheelwash and boundary berm and the internal site access road realignment will require earthworks and the removal of soils/subsoils, where present, from the proposed lateral quarry extension area, will result in the entrainment of suspended sediment in water. Potential to affect groundwater quality in underlying aquifer is through vertical migration through the unsaturated zone until it reaches the water table.	Negative, slight, indirect, temporary, likely effect
4	Reduction in groundwater quality in the gravel and bedrock aquifer from accidental fuel leakage/spillage.	Potential to affect groundwater quality in underlying aquifer from vertical migration through unsaturated zone in gravel aquifer. Impact to groundwater is unlikely due to the nature of works. Any leakage / spillage would be accidental only and of limited volume.	Negative, moderate, indirect, medium-term, unlikely effect
5	Reduction in groundwater quality in the domestic water supplies from increase in suspended solids and accidental fuel leakage/spillage.	Potential to affect groundwater quality in underlying aquifer through vertical migration followed by lateral migration. Impact on groundwater is unlikely due to the nature of works. Any leakage / spillage would be accidental only and of limited volume.	Negative, moderate, indirect, medium-term, unlikely effect
6	Indirect effects on the Boyne River SAC and SPA from increase in suspended solids and accidental fuel leakage/spillage.	Potential for any impacted surface water to reach the downstream Boyne River. Impact to Boyne River is highly unlikely due to the nature of works and the location of the Boyne River SAC and SPA at a significant distance downstream, and the absence of a surface water discharge from the proposed development. Furthermore, the large flow volumes within the Boyne River and the associated dilution limit the potential for effect. Any leakage / spillage would be accidental only and of limited volume. There is no proposed surface water discharge from the development site.	Negative, not significant, indirect, medium-term, unlikely effect
7	Indirect Effect on the status of SWBs and GWBs	Effects on the overall status of a SWB are unlikely due to the nature of works and the absence of any direct hydrological connection between the Proposed Development Site	Negative, not significant, indirect, medium-term, unlikely effect.

No.	Identified Potential Effects	Description of Effects (No Mitigation)	Magnitude of Effect (Pre Mitigation)
		and any existing SWB. Similarly, any potential effect on groundwater is unlikely due to the nature of works.	
Operation Phase – Direct			
8	Effects on groundwater levels due to abstraction from on-site borehole	The groundwater abstraction rate from the on-site well will be very small and comparable to the existing abstraction rate. The existing abstraction rate is not having any effect on local groundwater levels and the proposed continued abstraction will not have any potential to effect local groundwater levels and groundwater well supplies. The abstraction rate is too small to have a wider dewatering effect.	Negative, imperceptible, direct, long-term, likely effect.
Operation Phase – Indirect			
9	Reduction in surface water quality from increase in suspended solids and accidental fuel leakage/spillage	Potential to affect surface water quality is through hydraulic continuity with groundwater in gravel aquifer and via runoff from the new proposed site access roads and site entrance.	Negative, not significant, indirect, temporary, likely effect.
10	Reduction in groundwater quality from increase in suspended solids	Quarrying activities including the processing of material has the potential to generate suspended sediment which could infiltrate into ground and enter local groundwater. However, based on site observations, the potential for this effect is reduced due to the lack of any groundwater flowpaths within the quarry..	Negative, slight, indirect, temporary, likely effect.
11	Reduction in groundwater quality in gravel and bedrock aquifer from accidental fuel leakage/spillage.	Potential to affect groundwater quality in underlying aquifer through direct contact in quarry floor. Any leakage / spillage would be accidental only and of limited volume.	Negative, moderate, indirect, medium-term, likely effect.
12	Reduction in groundwater quality from the release of cement-based products.	Potential to affect groundwater quality in underlying aquifer through direct contact in quarry floor. Any leakage / spillage would be accidental only and of limited volume.	Negative, moderate, indirect, medium-term, likely effect.
13	Reduction in groundwater quality from the release of wastewater.	Potential to affect groundwater quality in underlying aquifer through direct contact in quarry floor. Any leakage / spillage would be accidental only and of limited volume.	Negative, moderate, indirect, medium-term, likely effect.

No.	Identified Potential Effects	Description of Effects (No Mitigation)	Magnitude of Effect (Pre Mitigation)
14	Reduction in groundwater quality in the domestic water supplies from increase in suspended solids, accidental fuel leakage/spillage, release of cement-based compounds or wastewater	Potential to affect groundwater quality in underlying aquifer through direct contact in quarry floor followed by horizonal migration of impacted groundwater to water supplies. Any leakage / spillage would be accidental only and of limited volume.	Negative, moderate, indirect, medium-term, likely effect.
15	Indirect effect on the Boyne River SAC and SPA from increase in suspended solids and accidental fuel leakage/spillage, release of cement-based compounds or wastewater	Potential for any impacted surface water to reach the downstream Boyne River. Impact to Boyne River is highly unlikely due to nature of works and the location of the Boyne River SAC and SPA at a significant distance downstream, and the absence of a required discharge from the site. Any leakage / spillage would be accidental only and of limited volume. There is no proposed surface water discharge from the development site.	Negative, not significant, indirect, medium-term, unlikely effect.
16	Indirect Effect on the status of SWBs and GWBs	Effects on the overall status of a SWB are unlikely due to the nature of works and the absence of any direct hydrological connection between the proposed development and any existing SWB. There is no proposed surface water discharge from the development site. Similarly, any potential effect on groundwater is unlikely due to the nature of works, and the lack of any dewatering requirements.	Negative, not significant, indirect, medium-term, unlikely effect.

Cumulative Effects

7.188 The proposed Kilsaran Concrete Brackagh sand and gravel pit along with three other disused pit/quarry sites are located within ~1km of the proposed development site, with other pits located ~2-3km to the southeast at Kilglass.

7.189 A review of the local Authority Planning Register shows that there are several planning applications within the cumulative study areas *i.e.,* the Boyne_040 and Glash_020 river sub-basins and the Trim and Kilrathmurry Gravels GWBs.

7.190 Due to the nature of the proposed development, *i.e.,* a lateral extension to an existing bedrock quarry, construction of a new site entrance and site access roads and road widening along 3 no. sections of the haul route between the new site entrance and the R148 regional road, the potential for cumulative effects is low. There will be no effect on local groundwater levels as no dewatering is proposed and all extraction works will be completed above the local groundwater table. Therefore, there is no potential for cumulative groundwater quantity effects with other developments. In addition, there will be no discharge to surface waters, significantly reducing the potential for cumulative hydrological effects with other developments.

7.191 Detailed mitigation measures are outlined below to ensure the protection of surface water and groundwater quality during all phases of the proposed development. This will ensure that there is no potential for any significant cumulative effects to arise during all phases of the proposed development.

Unplanned Events

7.192 It is highly unlikely that any unplanned events within the proposed development site would result in a noticeable impact on the hydrology and hydrogeology. Accidents could result in the spillage of fuel, which has been considered in the assessment above.

'Do-nothing Scenario'

7.193 If the proposed lateral extension of the bedrock quarry is not permitted, the proposed development site will be restored to a mainly ecological after-use.

MITIGATION MEASURES

7.194 Mitigation measures required to reduce the significance of potential effects associated with the proposed lateral quarry extension are detailed below.

Construction Phase

7.195 Impacts on Groundwater Vulnerability Rating Due to Soil/Subsoil Removal:

- There will be an increase in groundwater vulnerability rating due to the removal of overburden, however this will only be slight as most soils/subsoils have already been removed.
- The main mitigation with respect to groundwater quality will be employed during the operational phase with the employment of best practice mitigation measures with respect to oil usage and refuelling of plant and machinery.

7.196 Surface and Groundwater Contamination from Oil/Fuel Spills and Leaks

- All plant and machinery will be serviced before being mobilised to site;
- Refuelling will be completed in a controlled manner using drip trays (bunded container trays) at all times;
- Bunded fuel storage is provided for, under cover in the existing workshop at the site and there is a hydrocarbon interceptor at the diesel filling point;
- Only designated trained operators will be authorised to refuel plant on site; and
- Procedures and contingency plans will be set up to deal with emergency accidents or spills.

7.197 Earthworks Resulting in Suspended Solids Entrainment in Surface Waters

- Due to the hydrogeological characteristics, no specific mitigation measures are required during the construction phase. Due to the permeable nature of the local subsoils, where present, and the lack of surface watercourses in the vicinity of the proposed extraction area, any surface water runoff from the site will quicky infiltrate to ground.
- Similarly, the hydrogeological regime at the proposed haul route work locations is characterised by high rates of groundwater recharge and a lack of surface water features. Therefore any runoff from these areas will quickly infiltrate into the local sand and gravel subsoils which will filter out any suspended sediment.

Operation Phase

7.198 In order to mitigate against the risk of pollution to groundwater and surface water arising during the proposed lateral quarry extension, the following water / environmental control measures will be implemented:

- The proposed site entrance and new site roads will be hard paved to prevent the generation of suspended solids and will slope into the site to prevent surface water from flowing onto the adjacent road and entering the local surface water network. Water from the site entrance will be directed back into the site, draining towards a new proposed French drain to be located immediately to the south of the new site access road. The French drain will direct water towards a new suitably sized soakaway which will discharge to ground;
- Measures will continue to be taken to ensure that all diesel fuel/oil storage will be in bunded fuel tanks in the existing workshop building to prevent contamination of groundwater and refuelling takes place on the hardstand area with any run-off directed to the hydrocarbon interceptor;
- A spill kit including high absorbency mats and pig tails will be available on site to be used in the event of a hydrocarbon spill;
- Periodic spill kit training will be undertaken by staff members;
- Suspended solids generated from the processing of material on-site will be mitigated against through the use of a closed circuit cycle where silt is allowed to settle in constructed settlement lagoons before the water is recycled back to the processing plant. The settlement ponds will be regularly cleaned and once dry the material will be used in the restoration of the site.

- A programme of groundwater quality monitoring will be implemented; if there is a deterioration in levels and quality as a result of construction related activities then measures to manage and reduce fines in any runoff will be implemented;
- The existing measures with respect of wastewater (septic tank and Bord na Mona Puraflow treatment system) and water at the concrete batching plant will be continued to be implemented at the proposed development site; and,
- The Environmental Management System will continue to be implemented at the site and will include, where possible, the monitoring of local domestic groundwater wells.

Residual Impact Assessment

7.199 With the above mitigation measures in place at the proposed development site, it is projected that the following reduction in the assessed magnitude of effects will occur.

Table 7-12
Post-Mitigation Potential Effects

No.	Identified Potential Effects	Post Mitigation Potential Residual Effect	Significance of Effects
Construction Phase – Direct			
1	Increase in groundwater vulnerability rating in proposed extraction areas	The application of best practice methods with regard oils and fuels and the proposed restoration plan means effect on groundwater vulnerability will be negative, irreversible, slight, direct, likely, permanent effect on groundwater vulnerability.	No significant effects on groundwater vulnerability will occur.
Construction Phase – Indirect			
2	Reduction in surface water quality from increase in suspended solids and accidental fuel leakage/spillage.	All application site construction drainage/runoff water will be managed, contained, and released to ground within the site thereby breaking the surface water pathway to local watercourses. Drainage from the new site entrance and access roads will be routed back into the site and will infiltrate to ground. Drainage from the 3 no. road widening sections will also be via infiltration to ground. The potential for the release of hydrocarbons to groundwater and watercourse receptors is a risk to surface water and groundwater quality, and also the aquatic quality of the surface water receptors. Proven and effective measures to mitigate the risk of releases of hydrocarbons have been proposed above and will break the pathway between the potential source and each receptor. Negative, indirect, imperceptible, temporary, unlikely effect on surface water quality. Please note that these same measures have proven effective within the existing operation at the site.	No significant effects on surface water quality will occur.
3	Reduction in groundwater quality from increase in suspended solids.	Removal of soils and subsoils could result in elevated suspended solids from disturbed ground entering groundwater. However, the nature of the sand and gravel subsoils provide filtration and will remove suspended solids from groundwater. The post-mitigation residual effect will be negative, indirect, imperceptible, temporary, unlikely effect on groundwater quality.	No significant effects on groundwater quality will occur.

No.	Identified Potential Effects	Post Mitigation Potential Residual Effect	Significance of Effects
4	Reduction in groundwater quality from accidental fuel leakage/spillage.	The potential for the release of hydrocarbons to groundwater and watercourse receptors is a risk to surface water and groundwater quality, and also the aquatic quality of the surface water receptors. Proven and effective measures to mitigate the risk of releases of hydrocarbons have been proposed above and will break the pathway between the potential source and each receptor. The post mitigation residual effect will be negative, indirect, imperceptible, short term, unlikely effect on local groundwater quality and surface water quality.	No significant effects on groundwater quality will occur.
5	Reduction in groundwater quality in the domestic water supplies from increase in suspended solids and accidental fuel leakage/spillage.	No effects on local groundwater wells will occur with the implementation of the recommended mitigation measures in relation to the protection of groundwater quality. The post-mitigation residual effect will be negative, imperceptible, indirect, medium-term, unlikely effect.	No significant effects on local groundwater supplies will occur.
6	Indirect effects on the Boyne River SAC and SPA from increase in suspended solids and accidental fuel leakage/spillage.	No effects on the River Boyne and River Blackwater SAC and SPA will occur with the implementation of the recommended mitigation measures in relation to the protection of groundwater and surface water quality.	No significant effects on the River Boyne and the River Blackwater SAC and SPA will occur.
7	Indirect Effect on the status of SWBs and GWBs	No effects on local groundwater wells will occur with the implementation of the recommended mitigation measures in relation to the protection of groundwater quality. The post mitigation residual effect will be negative, not significant, indirect, medium-term, unlikely effect.	No significant effects on the WFD status of SWBs and GWBs will occur.
Operation Phase – Direct			
8	Effects on groundwater levels due to abstraction from on-site borehole	The groundwater abstraction rate from the on-site well will be very small and comparable to the existing abstraction rate. The existing abstraction rate is not having any effect on local groundwater levels and the proposed continued abstraction will not have any potential to effect local groundwater levels and groundwater well supplies. No dewatering is required for extraction operations at the site. The post mitigation residual effect will be a negative, imperceptible, direct, long-term, likely effect.	No significant effects on groundwater levels will occur.

No.	Identified Potential Effects	Post Mitigation Potential Residual Effect	Significance of Effects
Operation Phase – Indirect			
9	Reduction in surface water quality from increase in suspended solids and accidental fuel leakage/spillage	During the operation phase there will be no discharge to surface waters. The new proposed site entrance and access road will drain to a new proposed French drain and associated soakaway. All water within the wider quarry area will also infiltrate to ground. Potential to affect surface water quality is through hydraulic continuity with groundwater in gravel aquifer. Groundwater quality could be impacted from vertical migration through unsaturated zone in gravel aquifer followed by lateral migration. The residual sand and gravel will filter any suspended solids in surface water as it recharges or flows laterally within the ground. Sand is one of the best natural filters and it is used widely in the water treatment processes. The post mitigation residual effect is considered to be a negative, imperceptible, indirect, medium-term, unlikely effect.	No significant effects on surface water quality will occur.
10	Reduction in groundwater quality from increase in suspended solids	Potential to affect groundwater quality in underlying aquifer through vertical migration through unsaturated zone in gravel aquifer and direct contact in quarry floor. As outlined above, sand is one of the best natural filters and it is used widely in the water treatment processes and as such solids will not travel far within the sand and gravel deposits. There are no visible open fractures or voids within the exposed bedrock face, and it is not proposed to quarry deeper within the bedrock. While the quarry faces do expose a complex geology with notable deformation and structure, there is nothing significant noted that suggests there are open groundwater flowpaths below the quarry, therefore there is limited evidence to indicate that groundwater flowpaths for sediment exist. The post-mitigation residual effect will be a negative, imperceptible, indirect, medium-term, unlikely effect.	No significant effects on groundwater quality will occur.
11	Reduction in groundwater quality in from accidental fuel leakage/spillage.	Potential affects to groundwater quality in underlying aquifer through vertical migration through unsaturated zone in gravel aquifer and direct contact in quarry floor. The existing groundwater quality monitoring demonstrates that there is no issues associated with hydrocarbons at Clonard. The existing mitigation measures will continue to be implemented. The post mitigation residual effect will be a negative, slight, indirect, medium-term, unlikely effect.	No significant effects on groundwater quality will occur.

No.	Identified Potential Effects	Post Mitigation Potential Residual Effect	Significance of Effects
12	Reduction in groundwater quality from the release of cement-based products.	The potential release of cement-based products associated with the readymix batching plant at the site can affect local groundwater quality. However, the existing mitigation measures at the batching plant will continue throughout the operational phase of the proposed development. These mitigation measures have proven effective throughout the existing operations. The post mitigation residual effect will be a negative, imperceptible, indirect, medium-term, unlikely effect.	No significant effects on groundwater quality will occur.
13	Reduction in groundwater quality from the release of wastewater.	It is proposed to use the existing established wastewater system within the site. The existing groundwater monitoring demonstrates that this existing treatment system is not having an impact on local groundwater quality. There will be no untreated discharge to ground. There is no proposed increase in staffing rates at the site, and there is no requirement to upgrade the existing wastewater treatment system. The post mitigation residual effect will be a negative, imperceptible, indirect, medium-term, unlikely effect.	No significant effects on groundwater quality will occur.
14	Reduction in groundwater quality in the domestic water supplies from increase in suspended solids, accidental fuel leakage/spillage, release of cement-based compounds or wastewater	Activities during the operational phase have the potential to effect local groundwater quality and in turn the groundwater quality in nearby well supplies. However, detailed mitigation measures have been proposed for the protection of groundwater quality. These mitigation measures are being implemented for the existing operations and no effects on groundwater well supplies have been reported. The post mitigation residual effect is considered to be a negative, imperceptible, indirect, medium-term, unlikely effect.	No significant effects on groundwater supplies will occur.
15	Indirect effect on the Boyne River SAC and SPA from increase in suspended solids and accidental fuel leakage/spillage, release of cement-based compounds or wastewater	Impact to Boyne River is highly unlikely due to the lack of surface water pathways from the site to this designated site. Mitigation measures have been proposed for the protection of groundwater quality. There is an existing permitted and operational wastewater treatment plant within the site. There is no proposed surface water discharge from the site. Therefore, the post mitigation residual effects will be a negative, imperceptible, indirect, medium-term, unlikely effect.	No significant effects on the River Boyne and the River Blackwater SAC and SPA will occur.

No.	Identified Potential Effects	Post Mitigation Potential Residual Effect	Significance of Effects
16	Indirect Effect on the status of SWBs and GWBs	The proposed development cannot change or impact on the overall status of downstream SWBs as there is no proposed discharge from the development. Proven controls for protection of groundwater quality are proposed and these will break the pathway between potential sources and the underlying groundwater Aquifers and GWBs. Therefore, the post mitigation residual effect will be a Negative, not significant (imperceptible), indirect, medium-term, unlikely effect.	No significant effects on the downstream SWBs or the underlying aquifers/GWBs will occur.

Findings

7.200 It is therefore considered that with the implementation of the mitigation measures outlined above, the proposed development will not cause any significant, or likely significant, impact on groundwater and/or surface water.

MONITORING

7.201 As a baseline the groundwater levels, surface water quality, and groundwater quality have all been monitored prior to any work associated with this proposed development commencing.

7.202 The following monitoring activities will be carried out to demonstrate that the development is not having an adverse impact on the surrounding environment:

- Groundwater levels in boreholes (21-CL-01 to 21-CL-06, W3 and W4) will be monitored on a monthly basis for the duration of the proposed development;
- Regular groundwater quality monitoring (quarterly) of nearby private wells (provided consent is given) to demonstrate the development is not having any adverse impacts on private water supplies;
- The water quality in the adjacent stream will be monitored on a quarterly basis for the duration of the proposed development. Suggested parameters are outlined below; and
- The groundwater quality in all on-site boreholes and one off-site borehole (if permission is granted by owner) will be monitored on a quarterly basis for the duration of the proposed development. Suggested parameters are outlined below.

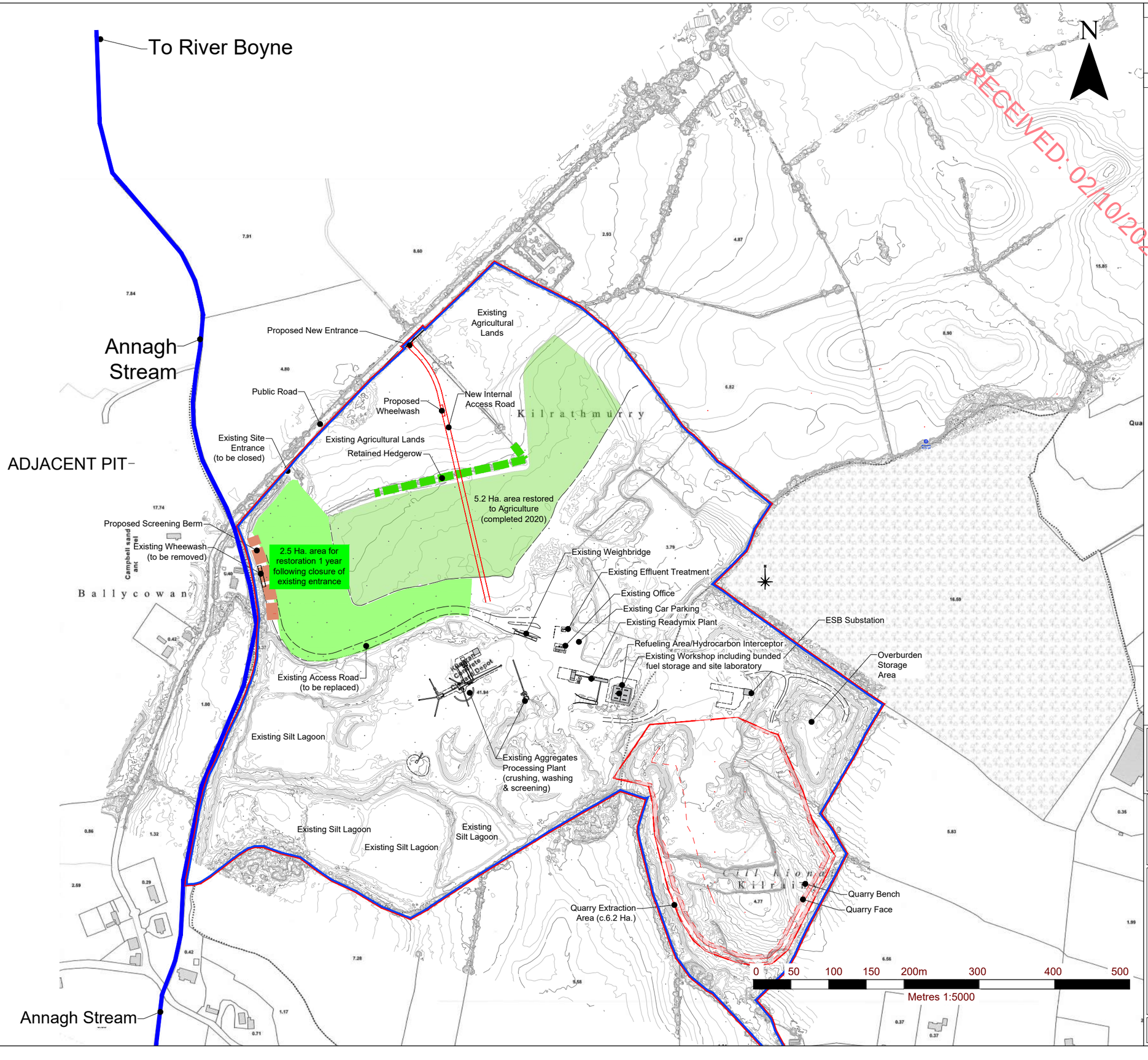
Surface water and Groundwater quality parameters:

- Cadmium (dissolved);
- Chromium (dissolved);
- Copper (dissolved);
- Lead (dissolved);
- Mercury (dissolved);
- Nickel (dissolved);
- Selenium (dissolved);
- Zinc (dissolved);
- Aluminium;
- Antimony (dissolved);
- Barium (dissolved);
- Boron (dissolved);
- Calcium (dissolved);
- Iron (dissolved);
- Magnesium;
- Manganese;
- Phosphorus (dissolved);
- Potassium (dissolved);
- Sodium (dissolved);
- Vanadium (dissolved);
- Ammoniacal Nitrogen (low level);
- Ammonia as NH_4 (low level);
- Ammoniacal Nitrogen as NH_3 (low level);
- Chloride;
- Cyanide, free (low level);
- Cyanide, total (low level);
- Fluoride;
- Nitrate as NO_3;
- Nitrite as NO_2;
- TON;
- Phosphate (Ortho as P);
- Molybdate Reactive P;
- Sulphate;
- Sulphide;
- Conductivity @ 20°C;
- pH;
- TPH CWG;
- Total Coliforms; and
- Faecal Coliforms.

Surface water quality parameters only:

- Suspended Solids
- COD;
- Oxygen.
- BOD; and
- Dissolved

FIGURES



RECEIVED: 02/10/2023

NOTES

Extract from Ordnance Survey 1:5000 Sheets 3119 & 3051

Ordnance Survey Ireland Licence No. CYAL5016488
(c) Ordnance Survey Ireland and Government of Ireland

LEGEND

- APPLICANTS LAND INTEREST BOUNDARY (c. 51.6 ha)
- SITE APPLICATION AREA c.51.6 ha
  TOTAL APPLICATION AREA c.51.7 ha
  (Site & Road Works)
- AREA RESTORED TO AGRICULTURAL LANDS IN 2020 (c.5.2 HECTARES)
- BUILDINGS / STRUCTURES

Kilsaran
ideas taking shape

SLR CONSULTING IRELAND
7 DUNDRUM BUSINESS PARK
WINDY ARBOUR
DUBLIN 14
T: +353-1-2964667
F: +353-1-2964676
www.slrconsulting.com

KILSARAN CONCRETE UNLIMITED COMPANY
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

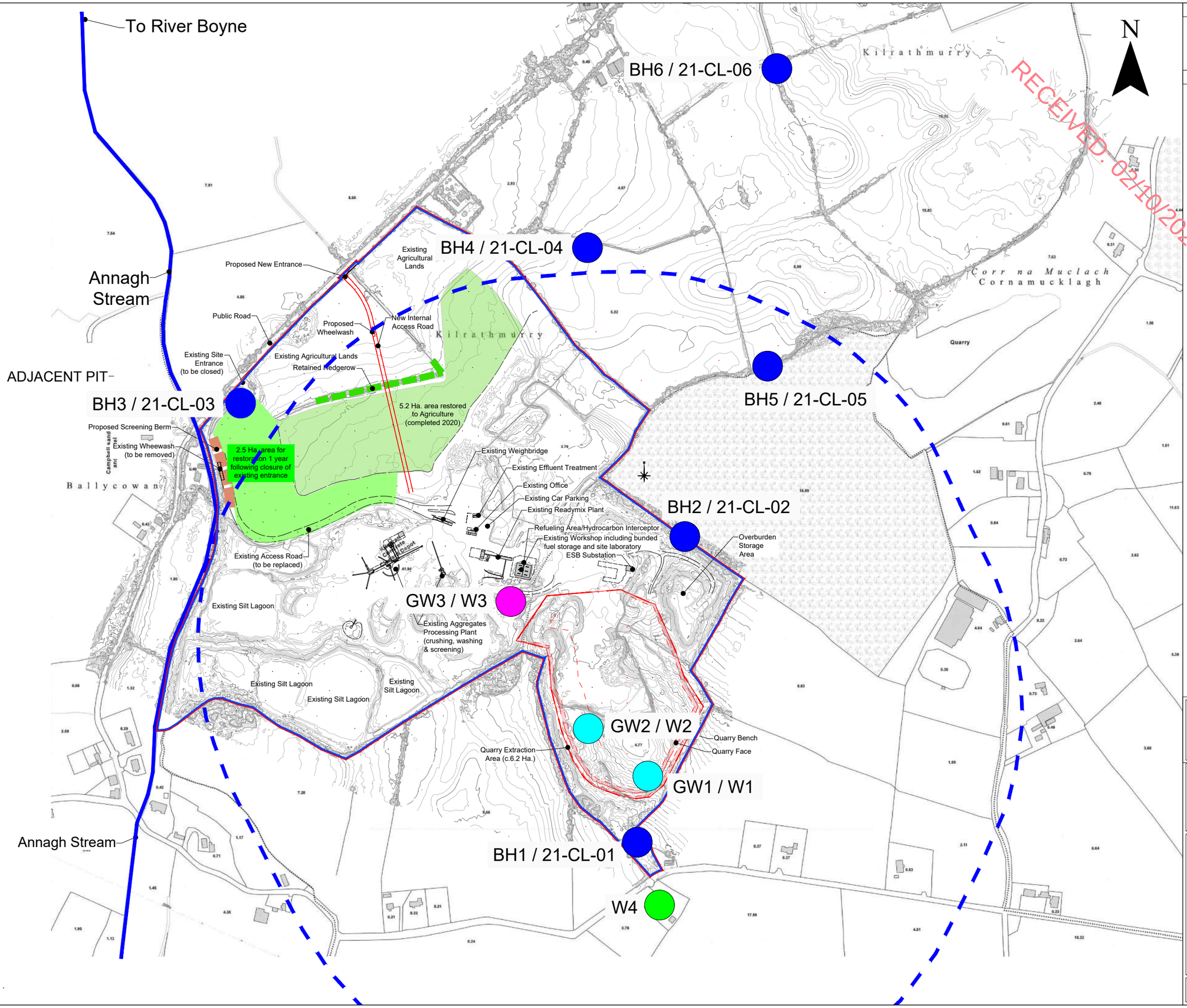
QUARRY DEVELOPMENT AT
KILRATHMURRY & KILRAINY
TOWNLANDS, CO. KILDARE

SITE LAYOUT & WATER MANAGEMENT

FIGURE 7-1

Scale	Date
1:5,000 @ A3	SEPTEMBER 2023

00036.065251 Clonard EIAR Fig 7-1 Site Water.dwg



NOTES

Extract from Ordnance Survey 1:5000 Sheets 3119 & 3051

Ordnance Survey Ireland Licence No. CYAL5016488
(c) Ordnance Survey Ireland and Government of Ireland

LEGEND

- APPLICANTS LAND INTEREST BOUNDARY (c. 51.6 ha)
- SITE APPLICATION AREA c.51.6 ha TOTAL APPLICATION AREA c.51.7 ha (Site & Road Works)
- AREA RESTORED TO AGRICULTURAL LANDS IN 2020 (c.5.2 HECTARES)
- BUILDINGS / STRUCTURES
- 500M OFF-SET FROM QUARRY EXTRACTION VOID
- HISTORICAL GROUNDWATER WELLS.
- GW3 / W3 SITE SUPPLY WELL
- W4 THIRD PARTY MONITORING WELL
- GROUNDWATER MONITORING BOREHOLES (2021)
- BH1 — 21-CL-01
- BH2 — 21-CL-02
- BH3 — 21-CL-03
- BH4 — 21-CL-04
- BH5 — 21-CL-05
- BH6 — 21-CL-06

Kilsaran
ideas taking shape

SLR CONSULTING IRELAND
7 DUNDRUM BUSINESS PARK
WINDY ARBOUR
DUBLIN 14
T: +353-1-2964667
F: +353-1-2964676
www.slrconsulting.com

KILSARAN CONCRETE UNLIMITED COMPANY
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

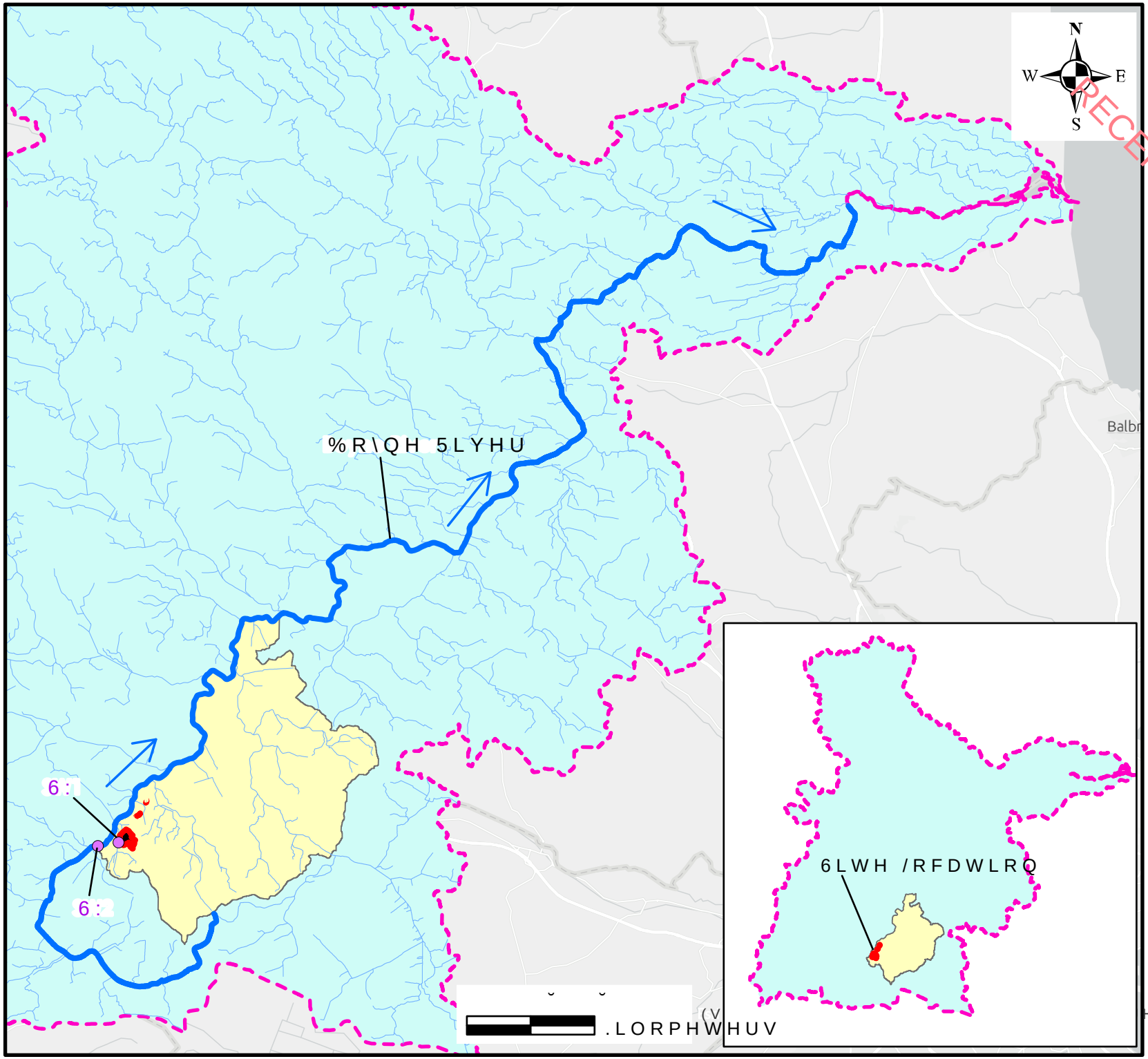
QUARRY DEVELOPMENT AT
KILRATHMURRY & KILRAINY
TOWNLANDS, CO. KILDARE

BOREHOLE LOCATIONS

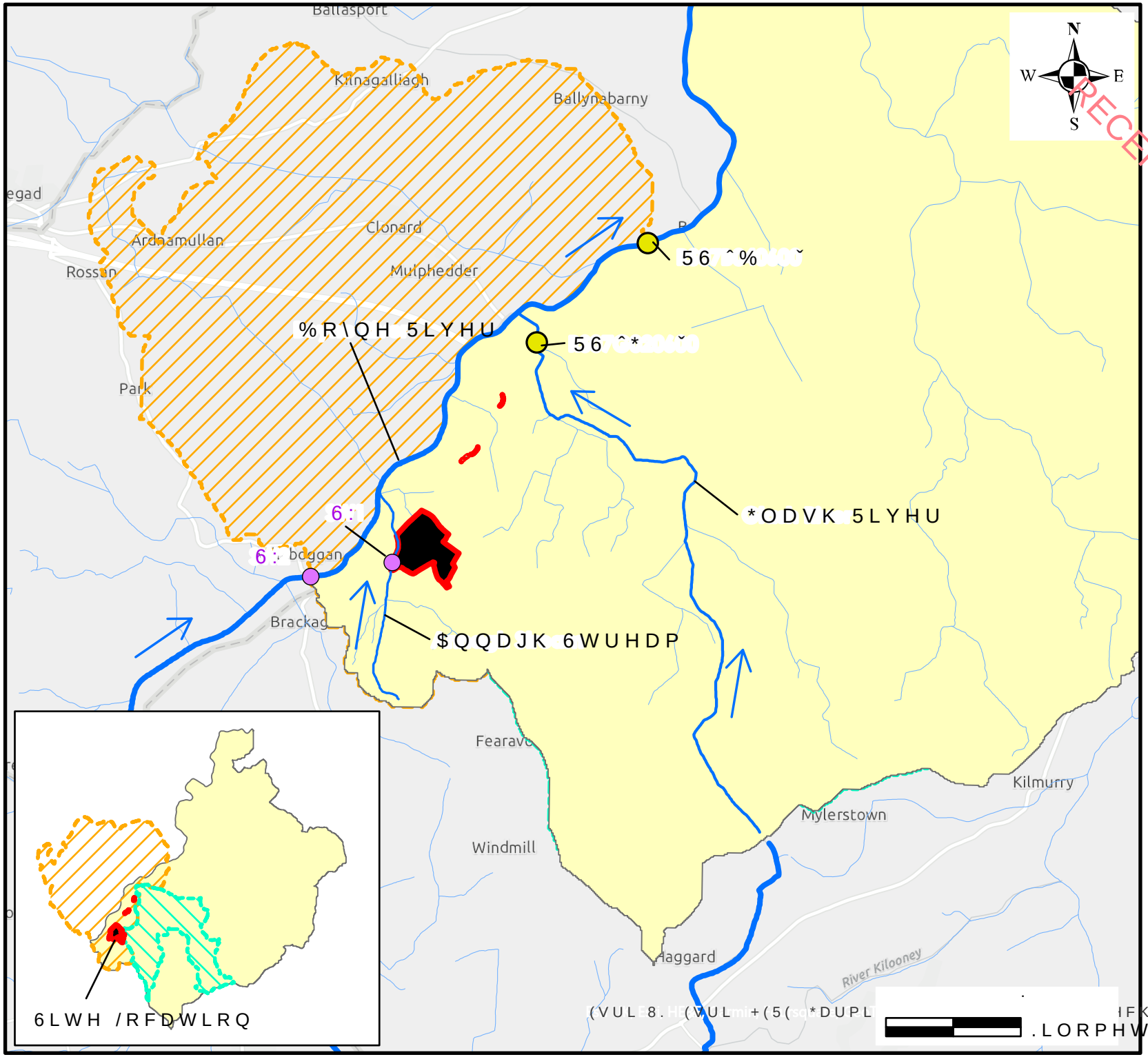
FIGURE 7-2

Scale	Date
NTS @ A3	SEPTEMBER 2023

00036.065251 Clonard EIAR Fig 7-2 BH Locations.dwg



HYDRO ENVIRONMENTAL SERVICES
22 Lower Main St
Dungarvan
Co.Waterford
Ireland
tel: +353 (0)58 44122
fax: +353 (0)58 44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie



/HJHQG

$SSOLFDWLRQ 6LWH %RXQGDU

:DWHUFRXUVHV

:)' 6XEFDWFKPHQWV

%R\QHB6&B

:) 5LYHU 6XE %DVLQV

%2<1(B

*-$6+B

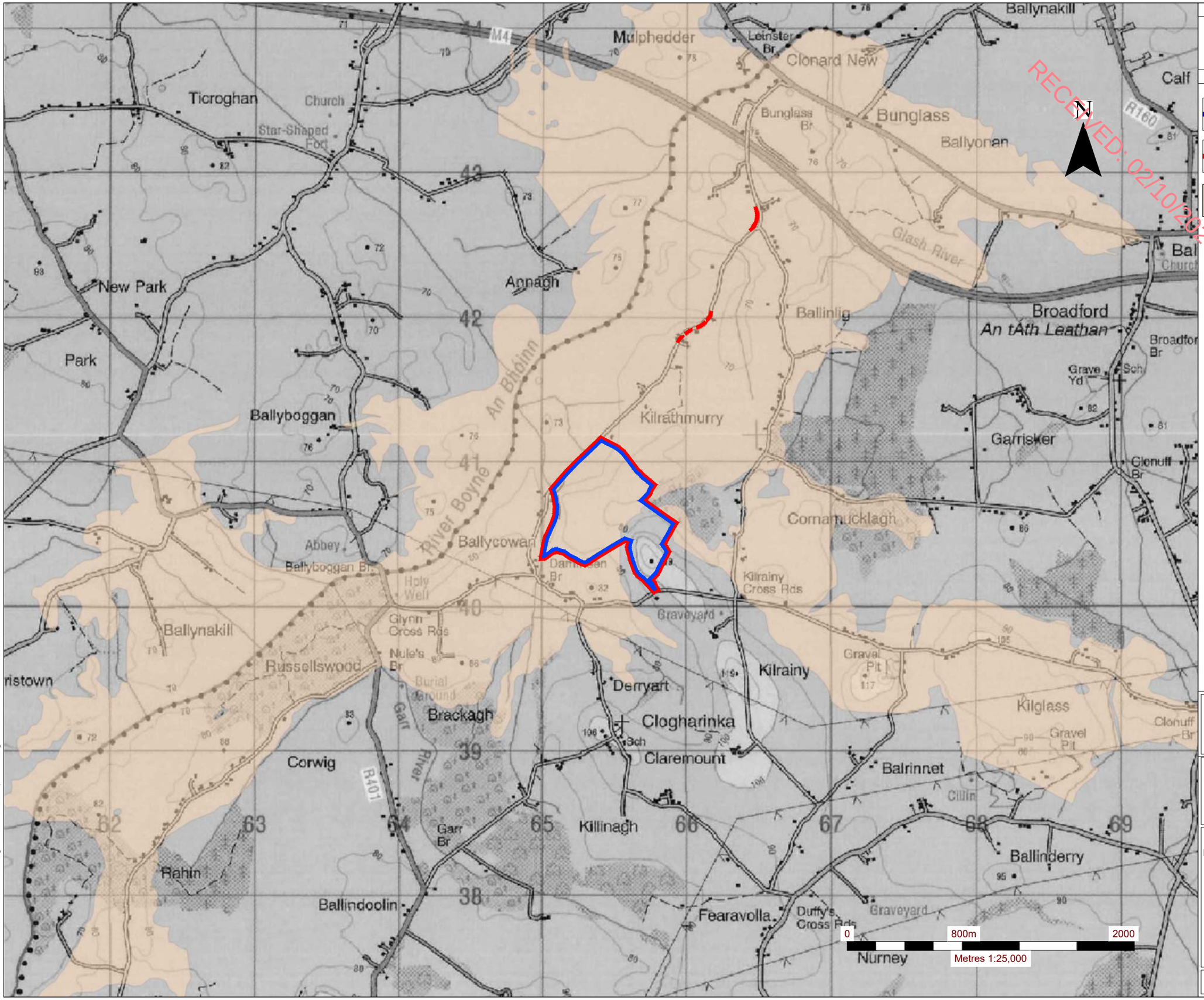
6XUIDFH :DWHU 6DPSOH /RF

(3$ 0RQLWRULQJ 6WDWLRQV

4 9DOXH, 4

RECEIVED: 02/10/2023

HYDRO ENVIRONMENTAL SERVICES
22 Lower Main St
Dungarvan
Co.Waterford
Ireland
tel: +353 (0)58 44122
fax: +353 (0)58 44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie



RECEIVED: 02/10/2023

NOTES

Ordnance Survey Ireland Licence No. CYAL5016488
(c) Ordnance Survey Ireland and Government of Ireland

Extract from Ordnance Survey Discovery Series Map No. 49

Extract from Groundwater Data Mapping © GSI

LEGEND

APPLICANTS LAND INTEREST BOUNDARY (c. 51.6 ha)

SITE APPLICATION AREA c.51.6 ha
TOTAL APPLICATION AREA c.51.7 ha
(Site & Road Works)

LOCALLY IMPORTANT GRAVEL AQUIFER

Kilsaran
ideas taking shape

SLR CONSULTING IRELAND
7 DUNDRUM BUSINESS PARK
WINDY ARBOUR
DUBLIN 14
T: +353-1-2964667
F: +353-1-2964676
www.slrconsulting.com

KILSARAN CONCRETE UNLIMITED COMPANY
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

QUARRY DEVELOPMENT AT KILRATHMURRY & KILRAINY TOWNLANDS, CO. KILDARE

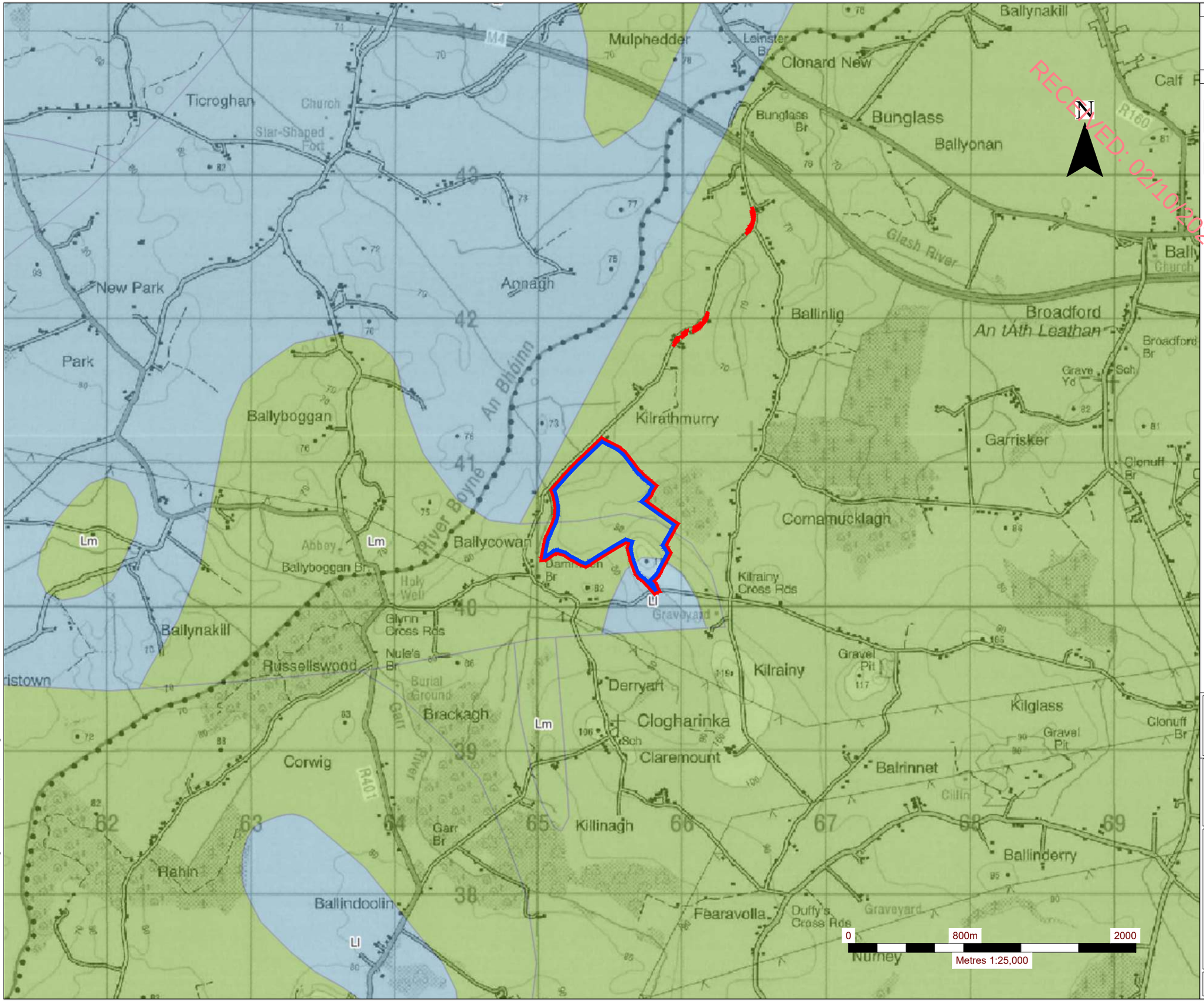
GRAVEL AQUIFER MAP

FIGURE 7-5

Scale 1:25,000 @ A3

Date SEPTEMBER 2023

00036.065251 Clonard EIAR Fig 7-5 Gravel Aquifer.dwg



NOTES

LEGEND

APPLICANTS LAND INTEREST BOUNDARY (c. 51.6 ha)

SITE APPLICATION AREA c.51.6 ha
TOTAL APPLICATION AREA c.51.7 ha
(Site & Road Works)

BEDROCK AQUIFER (Source: GSI)

Lm- LOCALLY IMPORTANT AQUIFER (GENERALLY MODERATELY PRODUCTIVE)

LI- LOCALLY IMPORTANT AQUIFER (MODERATELY PRODUCTIVE ONLY IN LOCAL ZONES

Kilsaran
ideas taking shape

SLR CONSULTING IRELAND
7 DUNDRUM BUSINESS PARK
WINDY ARBOUR
DUBLIN 14
T: +353-1-2964667
F: +353-1-2964676
www.slrconsulting.com

KILSARAN CONCRETE UNLIMITED COMPANY
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

QUARRY DEVELOPMENT AT KILRATHMURRY & KILRAINY TOWNLANDS, CO. KILDARE

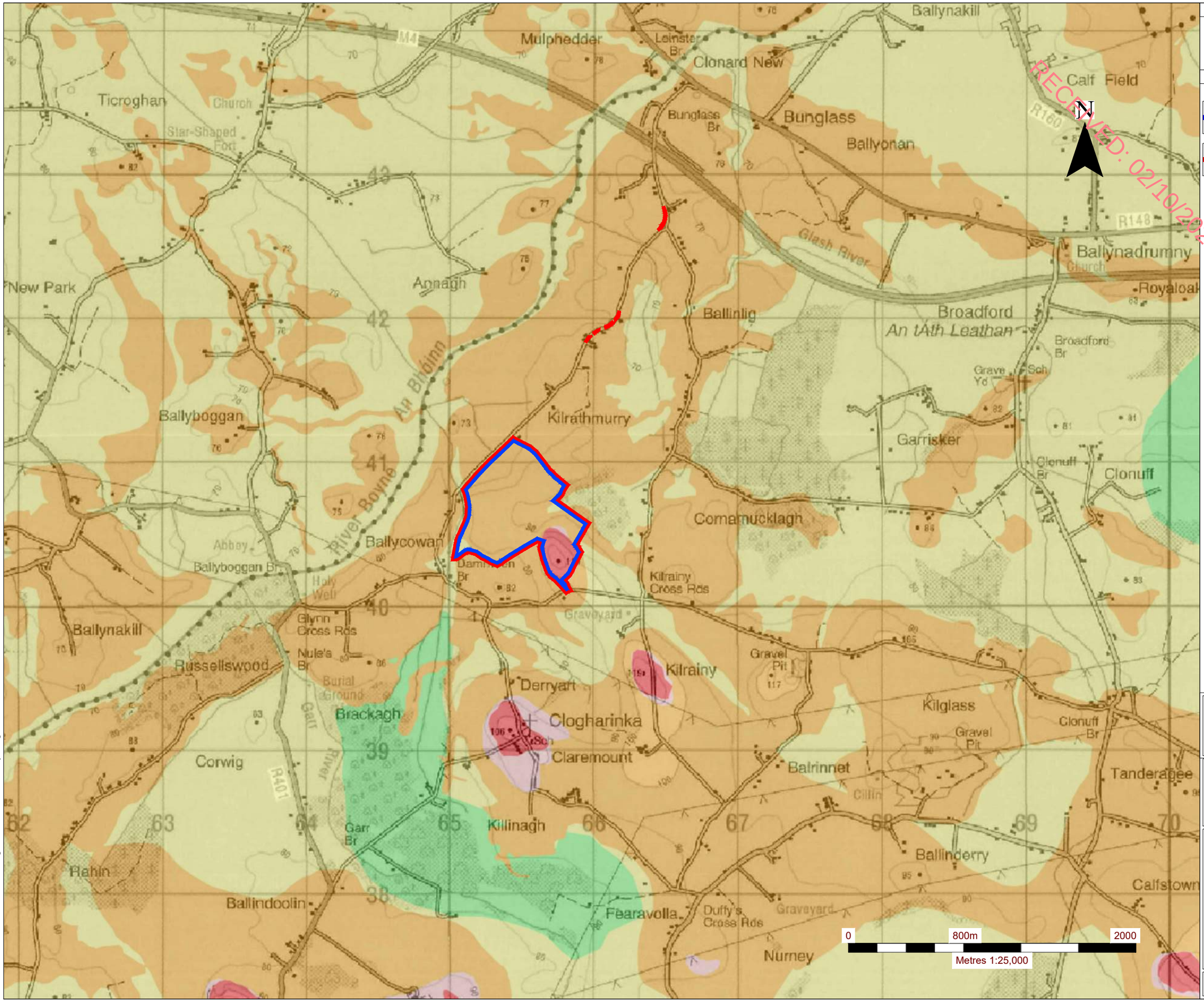
BEDROCK AQUIFER MAP

FIGURE 7-6

Scale: 1:25,000 @ A3

Date: SEPTEMBER 2023

00036.065251 Clonard EIAR Fig 7-6 Bedrock Aquifer.dwg



RECEIVED: 02/10/2023

NOTES

Ordnance Survey Ireland Licence No. CYAL5016488
(c) Ordnance Survey Ireland and Government of Ireland

Extract from Ordnance Survey Discovery Series Map No. 49

Extract from Groundwater Data Mapping © GSI

LEGEND

APPLICANTS LAND INTEREST BOUNDARY (c. 51.6 ha.)

SITE APPLICATION AREA c.51.6 ha
TOTAL APPLICATION AREA c.51.7 ha
(Site & Road Works)

GROUNDWATER VULNERABILITY

ROCK AT OR NEAR SURFACE

EXTREME VULNERABILITY

HIGH VULNERABILITY

MODERATE VULNERABILITY

LOW VULNERABILITY

SLR CONSULTING IRELAND
7 DUNDRUM BUSINESS PARK
WINDY ARBOUR
DUBLIN 14
T: +353-1-2964667
F: +353-1-2964676
www.slrconsulting.com

KILSARAN CONCRETE UNLIMITED COMPANY
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

QUARRY DEVELOPMENT AT
KILRATHMURRY & KILRAINY
TOWNLANDS, CO. KILDARE

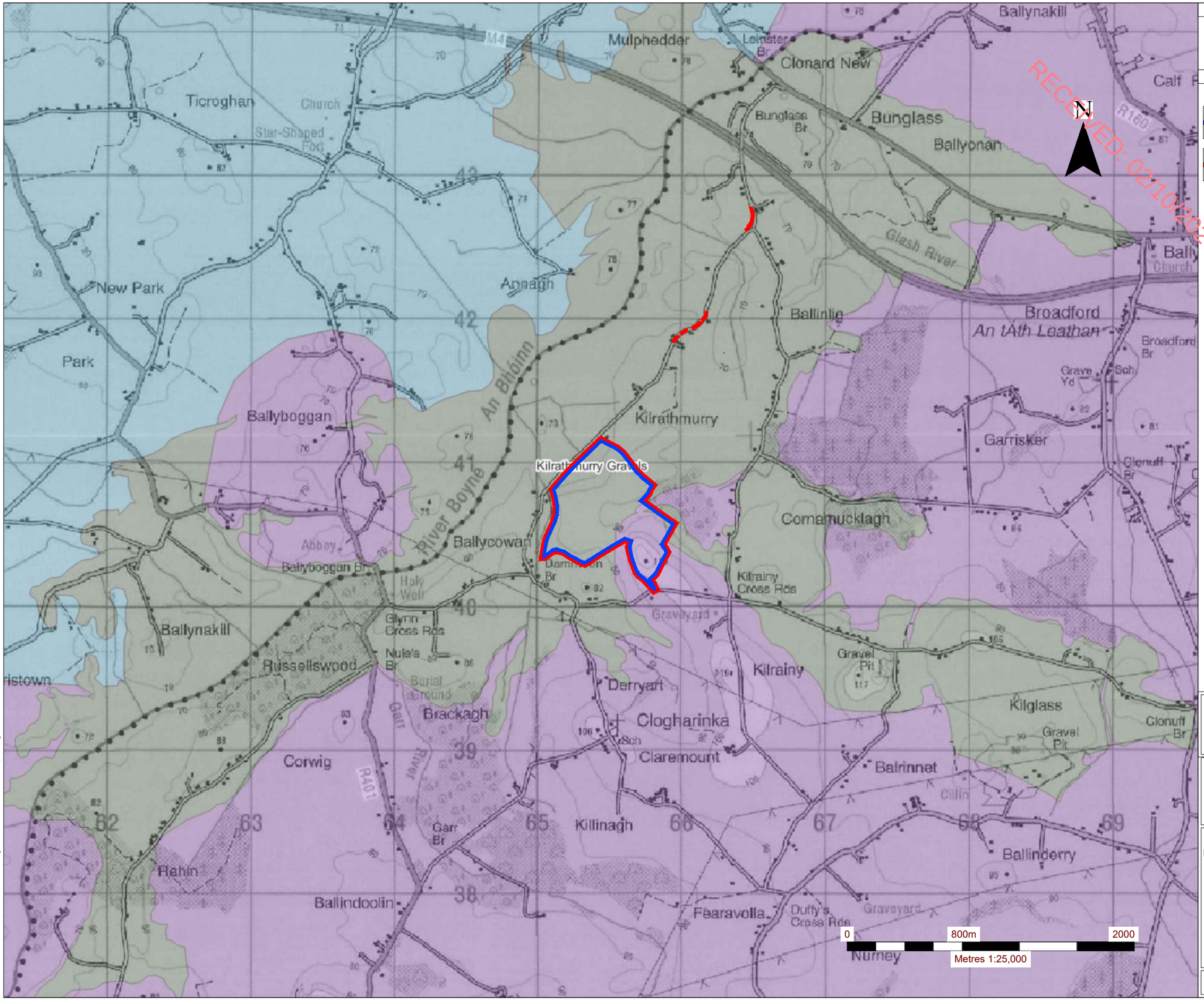
GROUNDWATER VULNERABILITY MAP

FIGURE 7-7

Scale
1:25,000 @ A3

Date
SEPTEMBER 2023

00036.065251 Clonard EIAR Fig 7-7 GW Vulnerability.dwg



NOTES

Ordnance Survey Ireland Licence No. CYAL5016488
(c) Ordnance Survey Ireland and Government of Ireland

Extract from Ordnance Survey Discovery Series Map No. 49

Extract from Groundwater Data Mapping © GSI

LEGEND

APPLICANTS LAND INTEREST BOUNDARY (c. 51.6 ha.)

SITE APPLICATION AREA c.51.6 ha
TOTAL APPLICATION AREA c.51.7 ha
(Site & Road Works)

GROUNDWATER BODY (Source: GSI)

ATHBOY

KILRATHMURRY GRAVELS

TRIM

Kilsaran
ideas taking shape

SLR CONSULTING IRELAND
7 DUNDRUM BUSINESS PARK
WINDY ARBOUR
DUBLIN 14
T: +353-1-2964667
F: +353-1-2964676
www.slrconsulting.com

KILSARAN CONCRETE UNLIMITED COMPANY
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

QUARRY DEVELOPMENT AT
KILRATHMURRY & KILRAINY
TOWNLANDS, CO. KILDARE

GROUNDWATER BODIES MAP

FIGURE 7-8

Scale: 1:25,000 @ A3

Date: SEPTEMBER 2023

00036.065251 Clonard EIAR Fig 7-8 GW Bodies Map.dwg

NOTES

Ordnance Survey Ireland Licence No. CYAL5016488
(c) Ordnance Survey Ireland and Government of Ireland

Extract from Ordnance Survey Discovery Series Map No. 49

Extract from Groundwater Data Mapping © GSI

LEGEND

APPLICANTS LAND INTEREST BOUNDARY (c. 51.6 ha.)

SITE APPLICATION AREA c.51.6 ha
TOTAL APPLICATION AREA c.51.7 ha
(Site & Road Works)

WELLS 1KM_500B

WELLS 10 TO 50

WELLS 100_50B

WELLS 500_250B

Kilsaran
ideas taking shape

SLR CONSULTING IRELAND
7 DUNDRUM BUSINESS PARK
WINDY ARBOUR
DUBLIN 14
T: +353-1-2964667
F: +353-1-2964676
www.slrconsulting.com

KILSARAN CONCRETE UNLIMITED COMPANY
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

QUARRY DEVELOPMENT AT
KILRATHMURRY & KILRAINY
TOWNLANDS, CO. KILDARE

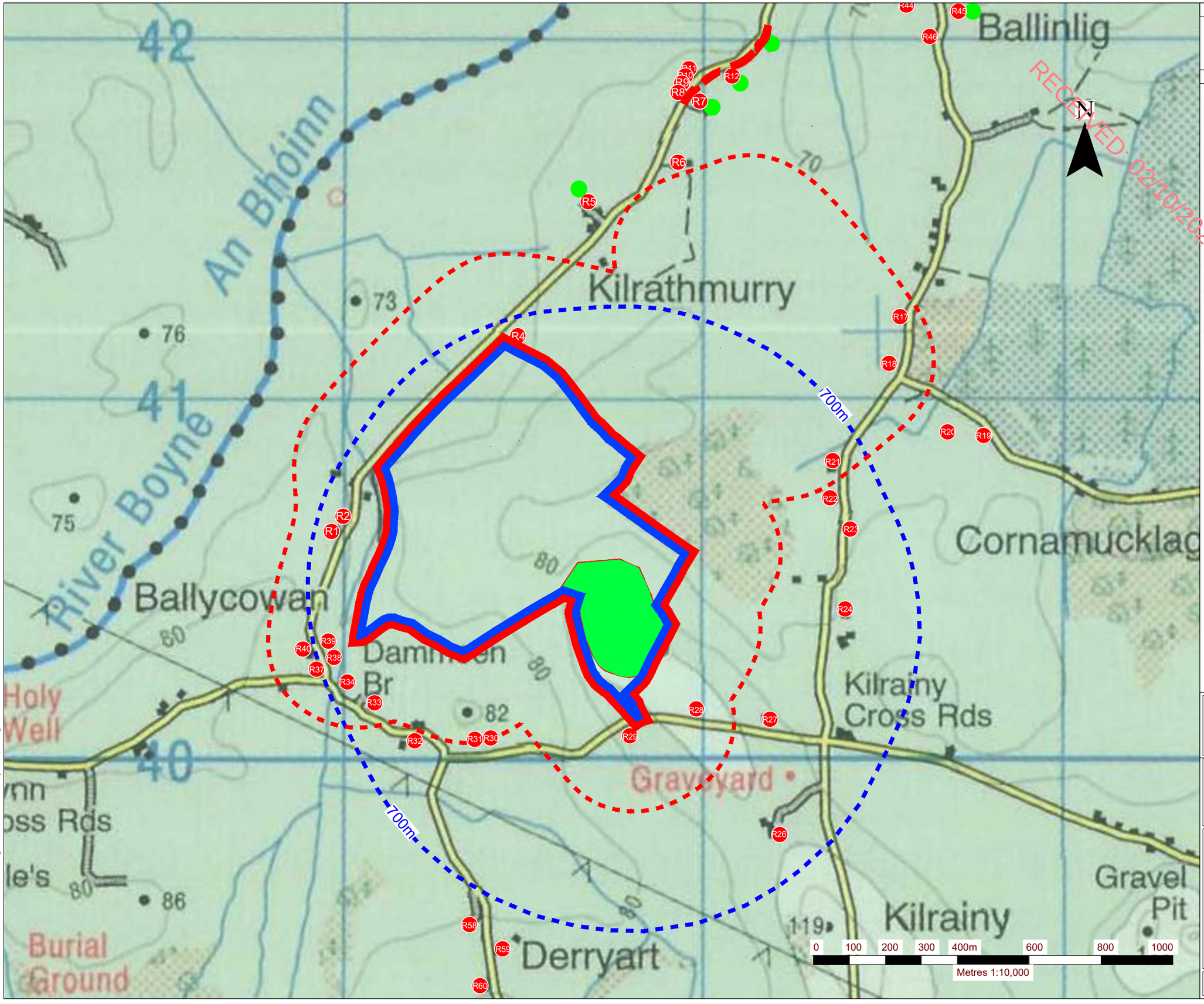
GROUNDWATER WELLS MAP (GSI)

FIGURE 7-9

Scale
1:25,000 @ A3

Date
SEPTEMBER 2023

00036.065251 Clonard EIAR Fig 7-9 GW Wells Map (GSI).dwg



RECEIVED: 02/10/2023

NOTES

Ordnance Survey Ireland Licence No. CYAL5016488
(c) Ordnance Survey Ireland and Government of Ireland

Extract from Ordnance Survey Discovery Series Map No. 49

LEGEND

- APPLICANTS LAND INTEREST BOUNDARY (c. 51.6 ha.)
- SITE APPLICATION AREA c.51.6 ha
  TOTAL APPLICATION AREA c.51.7 ha
  (Site & Road Works)
- R18 — RESIDENCE LOCATIONS & REFERENCE NUMBERS FOR WELL SURVEY
- QUARRY EXTRACTION VOID
- 700M OFF-SET FROM **QUARRY VOID**
- WELL SURVEY CARRIED OUT FOR ALL RESIDENCES WITHIN RED DASHED LINE **AND** ANY ADDITIONAL RESIDENCES WITHIN 700M OF QUARRY VOID (BLUE DASH) AND

Kilsaran
ideas taking shape

SLR CONSULTING IRELAND
7 DUNDRUM BUSINESS PARK
WINDY ARBOUR
DUBLIN 14
T: +353-1-2964667
F: +353-1-2964676
www.slrconsulting.com

KILSARAN CONCRETE UNLIMITED COMPANY
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

QUARRY DEVELOPMENT AT
KILRATHMURRY & KILRAINY
TOWNLANDS, CO. KILDARE

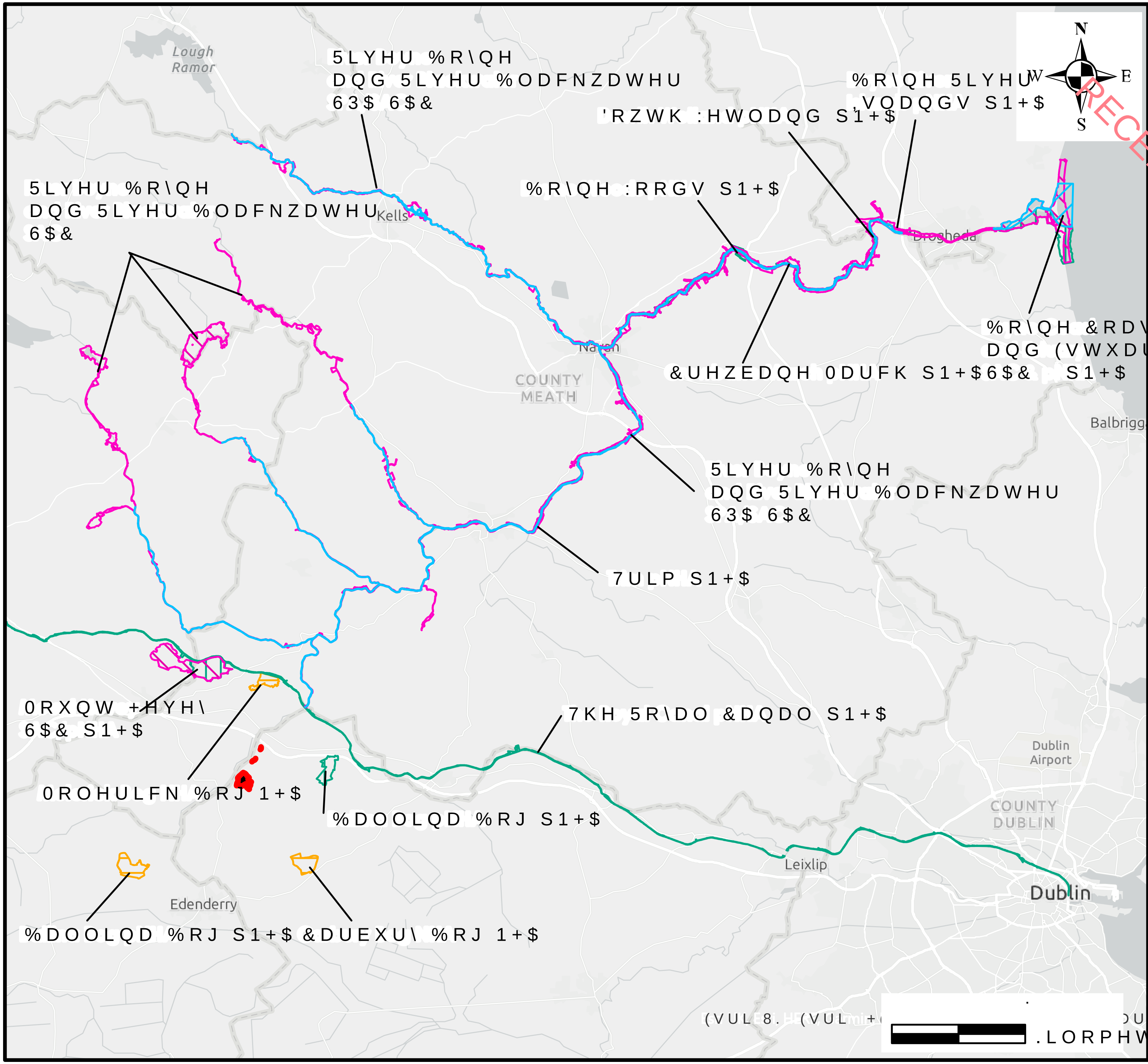
LOCAL DOMESTIC WELL SURVEY

FIGURE 7-10

Scale: 1:10,000 @ A3

Date: SEPTEMBER 2023

00036.065251 Clonard EIAR Fig 7-10 Well Survey Map.dwg



/HJHQG

- $SSOLFDWLRQ 6LWH %RXQGD
- 63$
- 6$&
- S1+$
- 1+$

HYDRO ENVIRONMENTAL SERVICES

22 Lower Main St
Dungarvan
Co.Waterford
Ireland

tel: +353 (0)58 44122
fax: +353 (0)58 44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

.LORPHWHUV