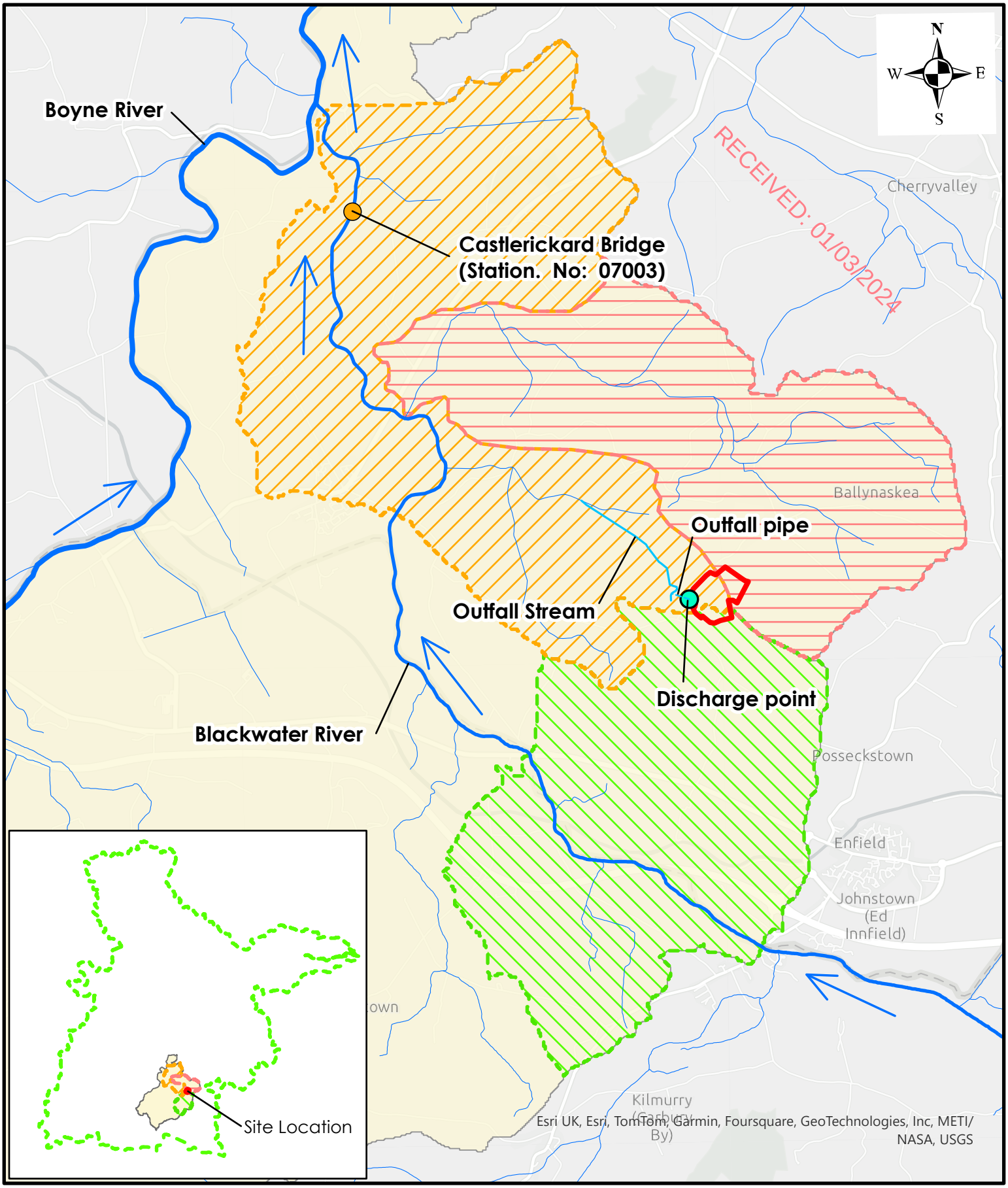

Legend

- Site Boundary
- Watercourses

WFD Catchments

- Boyne

WFD Subcatchments

- Boyne_SC_020

WFD River Sub-Basins

- BLACKWATER (LONGWOOD)_030
- BLACKWATER (LONGWOOD)_050
- RATHCORE STREAM_010
- OPW hydrometric gauge
- Outfall Stream
- Oufall pipe
- Discharge point

Client: Kilsaran Concrete

Job: Rathcore Quarry, Co. Meath

Title: Local Hydrology Map

Figure No: 7-4

Drawing No: P1642-0-0124-A4-704-00A

Scale: 1:60,000

Drawn By: GA

Sheet Size: A4

Project No: P1642-0

Date: 10/01/2024

Checked By: MG

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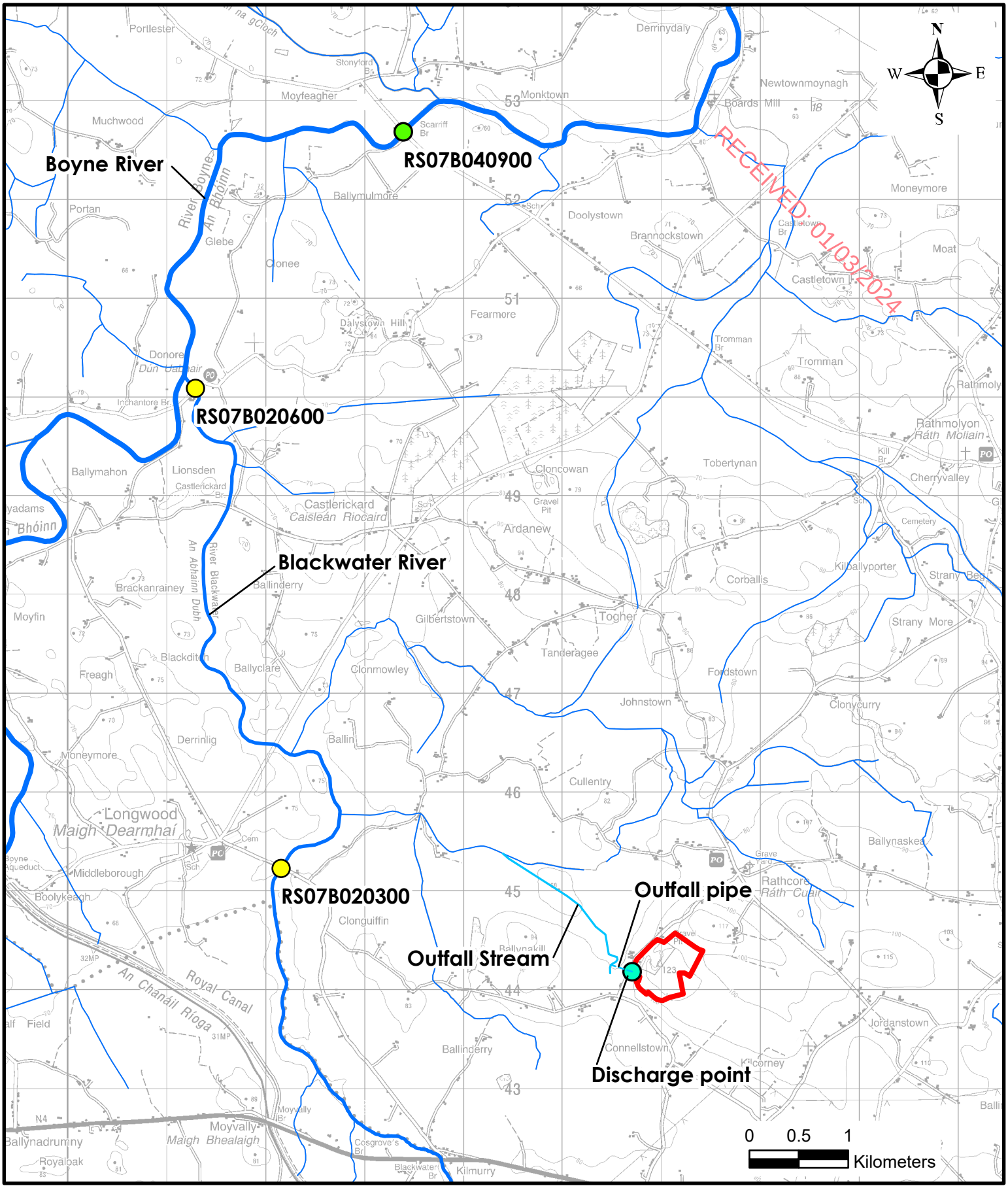

Legend

- Site Boundary
- Watercourses
- Outfall Stream
- Oufall pipe
- Discharge point

EPA Monitoring Stations

- (Q4) Good
- (Q3-4) Moderate

Client: Kilsaran Concrete		
Job: Rathcore Quarry, Co. Meath		
Title: EPA Monitoring Stations Map		
Figure No: 7-5		
Drawing No: P1642-0-0124-A4-705-00A	Scale: 1:70,000	Drawn By: GA
Sheet Size: A4 / Project No: P1642-0	Date: 10/01/2024	Checked By: MG

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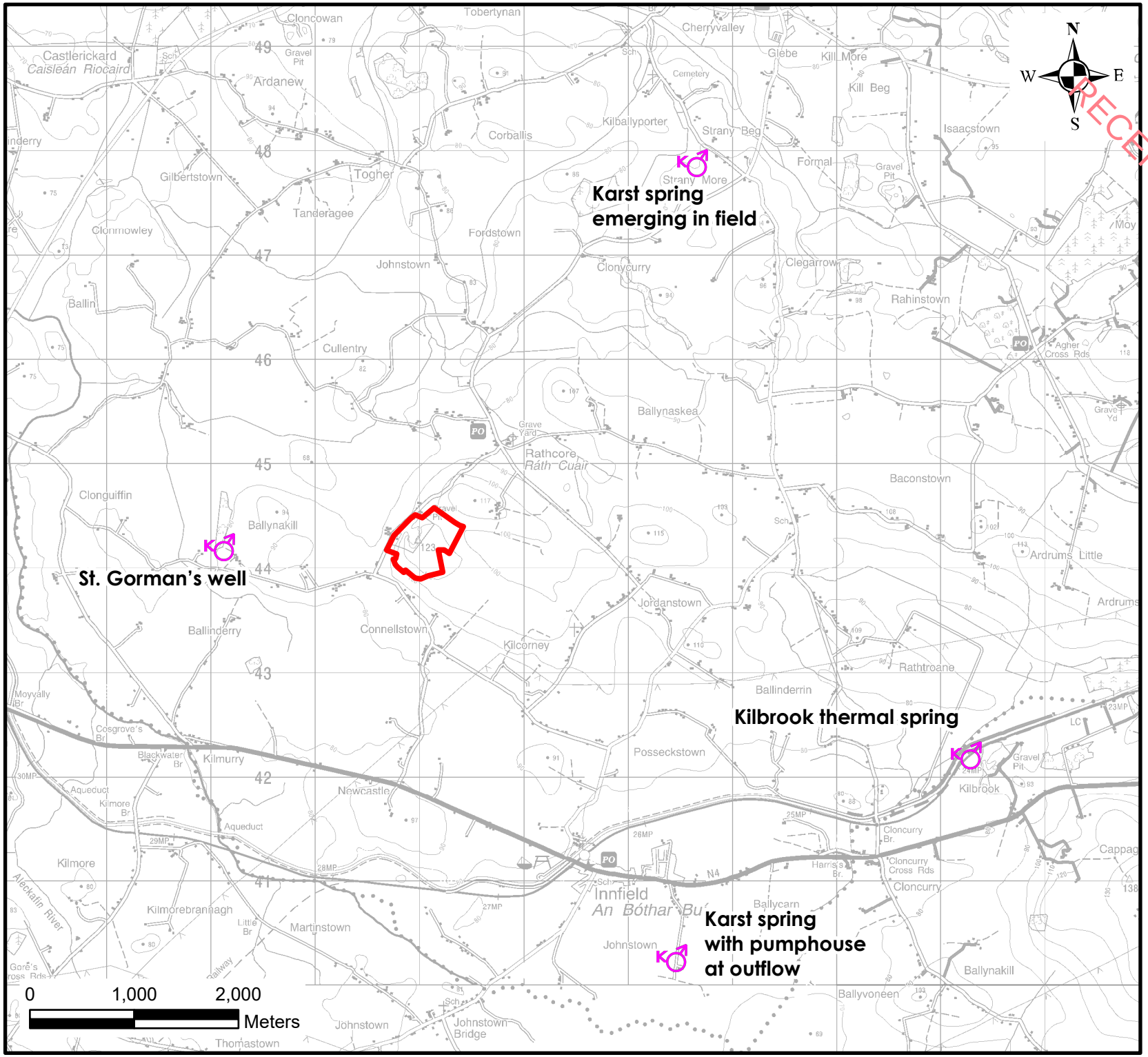

Legend

Site Boundary

Karst Features

Spring

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Client: Kilsaran Concrete	
Job: Rathcore Quarry, Co. Meath	
Title: Karst Features Map	
Figure No: 7-6	
Drawing No: P1642-0-0124-A4-706-00A	
Sheet Size: A4	Project No: P1642-0
Scale: 1:50,000	Drawn By: GA
Date: 10/01/2024	Checked By: MG

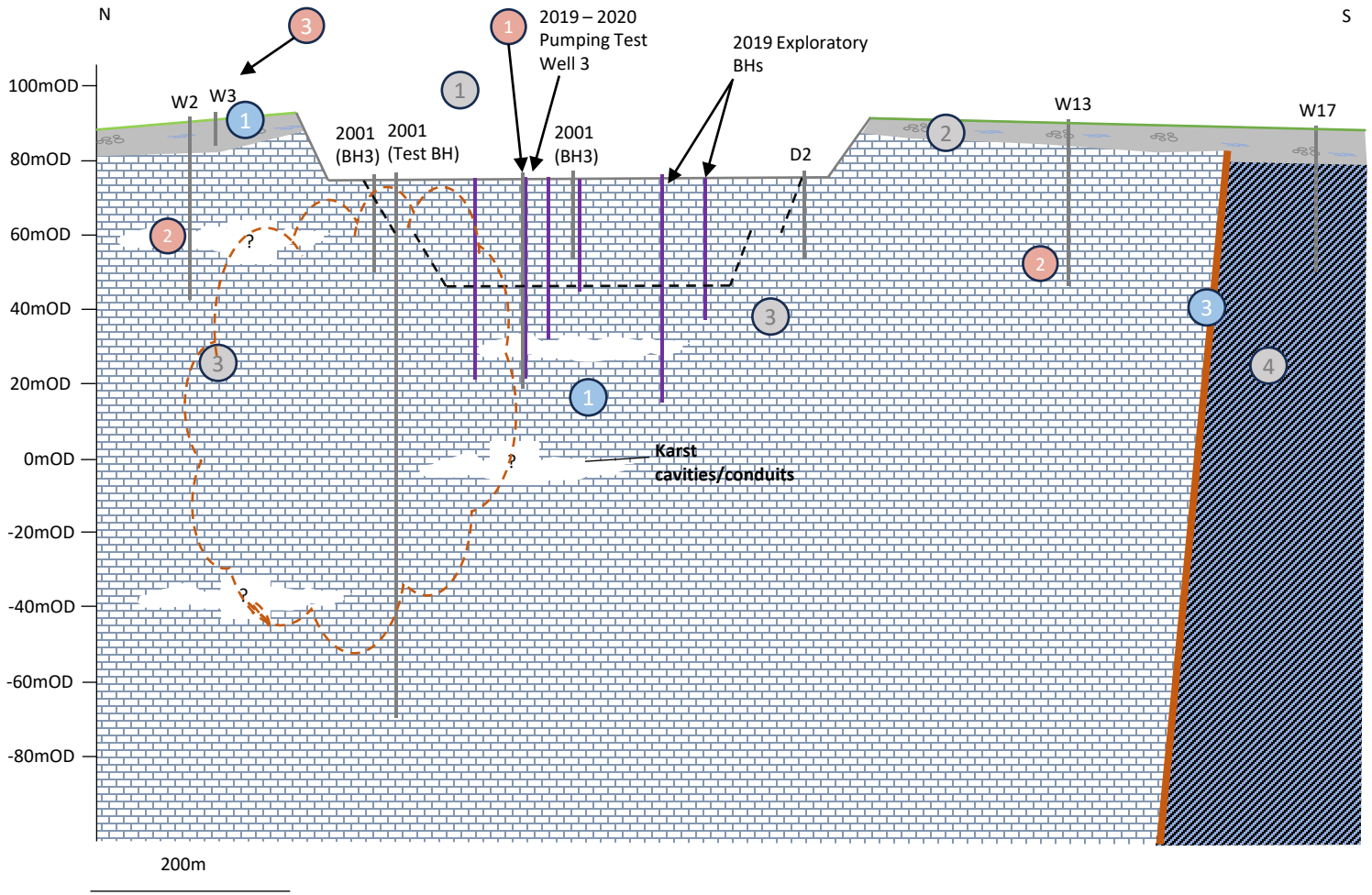


Figure 7.7: Rathcore Quarry Conceptual Site Model

Geological Legend

- Overburden – Sandy till and Gravels
- Lucan Formation – dark limestones and shales (Calp)
- At the quarry the bedrock geology is weathered Waulsortian Limestones*
- Dolomitised Waulsortian Limestone
- Fault Zone
- Outline of approx. quarry deepening

Drawing notes:

1. A Conceptual Site Model (CSM) is a graphical representation of the known elements of site geology and hydrogeology, and it can include groundwater flowpaths and sensitive receptors.
2. The drawing depicted here is a simplification of a complex geological and hydrogeological system.
3. The CSM is based on all available data.
4. Please refer to the notes below on geology, hydrogeology, and St. Gorman's well.

CSM Geological Notes:

*This cross-section is a simplification of a very complex geological area.

1. Detailed and comprehensive site investigations have been completed at Rathcore Quarry including 67 no. boreholes. The first boreholes were drilled in 2001. Recent investigations have included the drilling of 52 no. exploratory boreholes and 3 no. boreholes which were used in the 2019-2020 long, high-rate pumping test.
2. In the land around the quarry, the bedrock is overlain by overburden comprising sandy till and gravels.
3. Waulsortian Limestones underlie Rathcore Quarry and are highly karstified with an open underground cavity system. The limestone is also dolomitised. The rock in the south of the quarry contains less conduits.
4. Contrary to GSI mapping, the Calp Limestones of the Lucan Formation were not encountered at Rathcore. Based on site investigations, the faulted contact lies to the south of the quarry.

CSM Hydrogeological Notes:

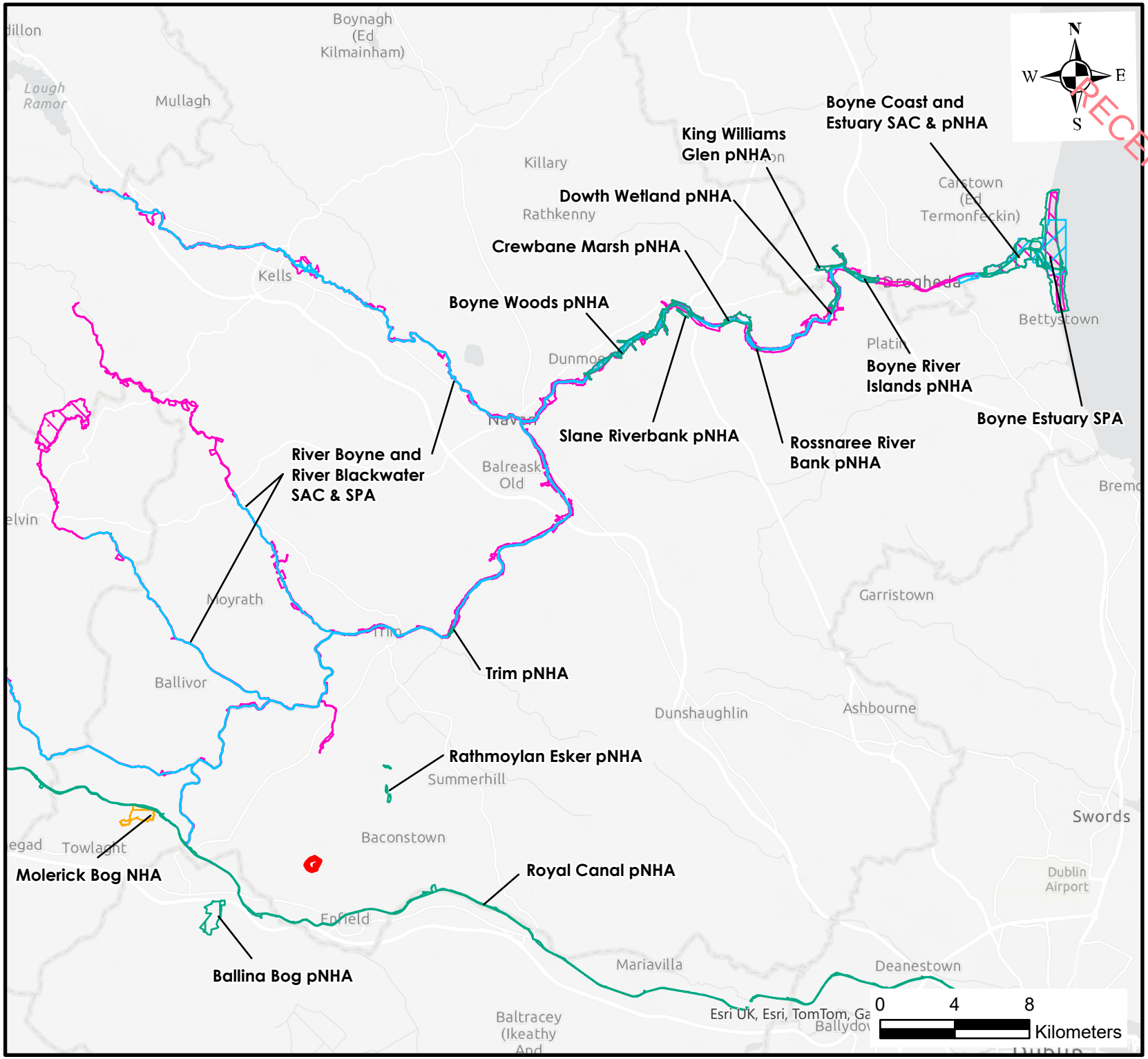
*This cross-section is a simplification of a very complex hydrogeological area.

1. Perched shallow aquifer in the sand till and gravel deposits.
2. Karst aquifer with interconnected cavities and fractures. Karst weathering is ubiquitous, but also heterogeneous (i.e. likely associated with structural alignments such as faults and fissures).
3. Fault acts as a hydrological barrier between the Lucan Formation and the Waulsortian Limestones.

* surrounding the quarry the bedrock geology is complicated and comprises of fault bounded blocks of weathered Waulsortian Limestones and the Lucan Formation.

CSM Notes Regarding Pumping Tests and Local Wells

1. Long, high-rate pumping tests were completed at 3 no. wells during 2020 and 2021. the pumping test were designed to simulate the effect of the proposed quarry deepening on local groundwater levels.
2. Groundwater levels in some on-site BHs were lowered by ~4m, with a reduction in local private wells of ~2m. A groundwater level decline of 2-4m will not impact the yield of any local well sourced from the karst bedrock aquifer as these wells tap into several deep karst conduits located well below the groundwater level.
3. Pumping did not affect the water level in local shallow wells sourced from the overburden aquifer as this is perched above and isolated from the underlying bedrock groundwater aquifer.



Legend

- Site Boundary
- SPA
- SAC
- pNHA
- NHA

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Client: Kilsaran Concrete	
Job: Rathcore Quarry, Co. Meath	
Title: Designated Sites Map	
Figure No: 7-8	
Drawing No: P1642-0-0124-A4-708-00A	
Sheet Size: A4	Project No: P1642-0
Scale: 1:280,000	Drawn By: GA
Date: 10/01/2024	Checked By: MG

Legend

1 Historic St. Gorman's Well depression (it fills when water levels are high enough)

2 Lined pond created in April 2021 (it is shallow and was filled with water pumped from SG3)

\+ Coordinate: ITM 673997, 744216

old drain

3 Track (farm road)

Drain flow direction

SG2 1980's EX Murphy BHs

BH Notes:
SG4 and SG7 overflows occasionally,
SG8 does not.
SG3 is ~180m deep
SG4 and SG7 are ~100m deep
SG8 is 510m deep

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Client: Kilsaran Concrete	
Job: Rathcore Quarry, Co. Meath	
Title: St. Gorman's Well, Existing BH Locations and Surface Hydrological Features	
Figure No: 7-9	
Drawing No: P1642-0-0124-A4-709-00A	
Sheet Size: A4	Project No: P1642-0
Scale: as shown	Drawn By: GA
Date: 10/01/2024	Checked By: MG

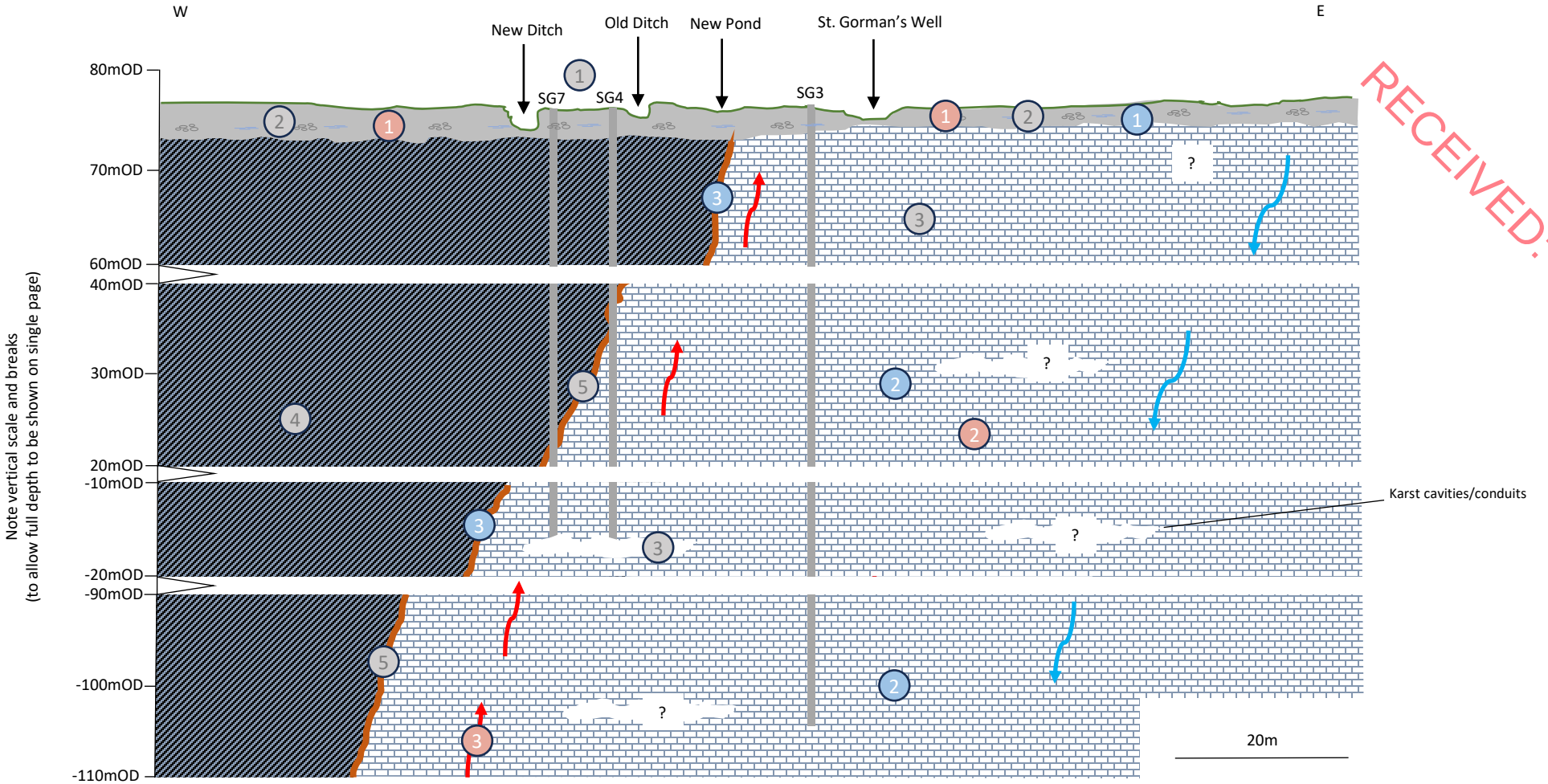


Figure 7.10: St. Gorman's Well Conceptual Site Model

Geological Legend

- Overburden – Sandy Tills and Gravels
- Lucan Formation – dark limestones and shales (Calp)
- Complicated geology comprising of fault bounded blocks of weathered Waulsortian Limestones and Lucan Formation
- Fault Zone
- Groundwater recharge and groundwater flow via connected cavities, fissures, and fractures

Drawing notes:

1. A Conceptual Site Model (CSM) is a graphical representation of the known elements of site geology and hydrogeology, and it can include groundwater flowpaths and sensitive receptors.
2. The drawing depicted here is a simplification of a complex geological and hydrogeological system.
3. The CSM is based on all available data.
4. Please refer to the notes below on geology, hydrogeology, and St. Gorman's well.

CSM Geological Notes:

*This cross-section is a simplification of a very complex geological area.

1. Detailed and comprehensive site investigations have been completed at St. Gorman's Well and in the surrounding lands. A total of 8 no. boreholes (SG1 – SG8) were drilled in the immediate vicinity of St. Gorman's Well by Hydro Research in the 1980s. These boreholes included 1 no. deep geothermal borehole which extended to a depth of ~510mbgl (metres below ground level). For ease of presentation only 3 no. boreholes are depicted on this CSM.
2. The underlying bedrock geology is overlain by ~3m of grey overburden comprising of sandy till and gravels.
3. Waulsortian Limestones underlie St. Gorman's Well. Site investigations have revealed the existence of several large cavities at depths of 90 – 95mbgl. SG4 and SG7 could not extend beyond these cavities.
4. Calp Limestones were encountered at SG4 and SG7 (~25m) west of St. Gorman's Well.
5. The contact between the Calp Limestone and the Waulsortian Limestones (observed in SG7 and SG4) is a steeply dipping fault zone, with a roughly north – south alignment. Well-developed fracturing was noted in the Calp Limestones along the fault zone.

CSM Hydrogeological Notes:

*This cross-section is a simplification of a very complex hydrogeological area.

1. Perched shallow aquifer in the sand and gravel deposits.
2. Karst aquifer with interconnected cavities and fractures. Karst weathering is ubiquitous, but also heterogeneous (i.e. likely associated with structural alignments such as faults and fissures).
3. Fault acts as a hydrological barrier between the Lucan Formation and the Waulsortian Limestones.

CSM Notes Regarding St. Gorman's Well

*This is a simplification of the hydrogeological regime feeding St. Gorman's Well.

Groundwater flow at St. Gorman's well comprises:

1. A shallow, overburden-upper epikarst system that responds rapidly to rainfall recharge
2. A deeper, confined/pressurised, more regional, major conduit karst system at depths of 30 - 100m in the Waulsortian Limestones. This system is confined by clays and decomposed limestones which separate the deep karst groundwater system from the shallow perched water table in the overburden.
3. The source of the warm water St. Gorman's Well is along a deep u-shaped conduit (50-1000m deep). The warm water only flows at the spring when there is sufficient pressure at the other end of the conduit. The exact location of the conduit is unknown, but the assessment has revealed that is it not at Rathcore Hill. The conduit has been portrayed in this orientation for visualisation purposes but is not necessarily in an east-west orientation.

APPENDICES

APPENDIX 7-A
Rathcore Quarry - Hydrogeological Investigation Report (2022)

Appendix 7-A1

Executive Summary of Rathcore Quarry

- Hydrogeological Investigation Report (2022)

Is provided here within Chapter Text

Appendix 7-A2

Full Hydrogeological Investigation Report (2022) of Rathcore Quarry

Is provided Separately in 8 Parts due to large file size
(and 20MB limitation of file size uploading to online planning portal)

Executive Summary

David Balls Hydrogeological Investigation Report (2019-2022) is a comprehensive document that spans 6 chapters, and comprises 4 volumes with 155 figures and diagrams, and an Appendix with 55 drilling logs.

The following is an attempt to provide a brief synopsis of each chapter:

Chapter 1: Introduction

Chapter 1 briefly presents the overall aim of this significant body of work, outlines how the key hydrogeological questions were assessed and addressed, and it summarises several important findings of the study.

Kilsaran previously applied for planning permission to deepen the existing Rathcore quarry in 2017. An Bord Pleanála refused permission in 2018. One of the main reasons for refusal was the Board's view that the applicant's planning application contained a limited investigation and understanding of the complex hydrogeological conditions on site and in the area. As a result, the Board was not satisfied that the proposed development would not give rise to an adverse impact on water supplies in the vicinity of the site, or have an adverse effect on St Gorman's Well and its ecology.

David Ball's Hydrogeological Investigations and assessment were specifically tailored to address the concerns raised by the Board in their refusal of file PL17.249132.

A summary of the findings of the study are outlined below in the discussion on Chapter 6.

Chapter 2: Geology

Chapter 2 presents a detailed study of the geology of both Rathcore Quarry and the surrounding area. This chapter reveals that the bedrock geology is far more complex than previously understood and that the published GSI's bedrock geology map (1:100,000) is a simplification of the geology of the local area.

The geological data is presented chronologically, detailing how the understanding of the local bedrock geology has evolved over the past 160 years. During this time more than 30 geoscientists have investigated and mapped subsurface in this area. These previous site investigations provided important details on the geology of the local area, particularly the geology at St. Gorman's Well, and informed the scope of the more recent site investigations which were undertaken specifically for this assessment.

The historic data presented in this chapter comprises the following:

- Geological mapping of the area in the 1850s and observations at St Gorman's Well in 1855 and 1859;
- Field monitoring measurements of the flow and water temperature of St Gorman's Well between 1981 and 1983 by Stephen Peel of Minerex;
- 2 no. boreholes (BHs) drilled by the GSI and Minerex adjacent to St. Gorman's Well in 1983;
- 7 no. BHs drilled by Hydro-Research adjacent St. Gorman's Well in the mid-1980s;
- An exploration borehole drilling programme in the area by K.T.Cullen for a new water supply for Longwood village for Meath County Council
- A PhD study completed by Frank Murphy which included deep drilling of Borehole SG 8adjacent to St. Gorman's Well. This thesis was published in 1989;

- Bedrock Geology mapping by Chevron and published by the GSI in 1992;
- 4 no. deep mineral exploration boreholes and airborne geophysical surveys and mapping completed in the local area by BHP in the 1990s;
- Tracey Enterprises drilled 6 no. rotary coreholes at Rathcore quarry in 2001;
- Borehole logs and pumping test water level and temperature data for two production boreholes for the Longwood water supply in 2001 and 2011.
- Site investigation borehole logs, pumping test data, water level data from a detailed geology/hydrogeology investigation by Eugene Daly & Associates (EDA) in 2001-2002 and 2006 for a planning application (later withdrawn) by Roadstone for a new quarry on Ballinakill hill adjacent to the spring and boreholes at the St Gorman's Well site;
- Site visits and measurements by Ecoserve at St Gorman's Well in 2003;
- A Site visit and measurements by Tobins and Robbie Meehan to St Gorman's Well and the adjacent borehole SG4 in 2009;
- A Site visit and measurements by Richard Langford for GSI to St Gorman's Well and the adjacent boreholes and drains in 2011;
- A PhD Study of the water levels, electrical conductivity and temperature in Borehole SG4 adjacent to St Gorman's Well by Sarah Blake between 2013 and 2015, and supplementary water level and temperature monitoring by Sarah Blake in 2018/19. Sarah's study also included a magneto-telluric ground geophysical survey to investigate deep structures;
- Numerous papers published in scientific journals by Sarah Blake and other authors on the temperature and water levels in Borehole SG4 and geophysics;
- More recently (2019-2022) David Ball completed inspections of the bedrock exposed in the quarry walls and floor at Rathcore with John Paul Moore, a structural geologist carrying out research in UCD under iCRAG;
- 52 no. exploratory BHs were drilled at Rathcore under the direction of David Ball and J.P.Moore to explore structural geology targets identified from a structural analysis of the features identified in the quarry by MK Drilling Ltd (2019);
- 3 no. wide diameter BHs were drilled on targets identified during the exploration drilling in Rathcore Quarry under the direction of David Ball by Patrick Briody and Sons (2019);
- Several long and shorter high rate pumping tests were carried out in 2020-2021 using these 3 no. wide diameter BHs to investigate the quantity of water that could be withdrawn from the karst conduit system under the quarry, and the potential effect that abstraction of water from the quarry may have on the local groundwater levels;
- Concurrent water level monitoring (before during and after the pumping tests) to determine the effects that abstraction of water from the quarry may have on local groundwater levels and resources;
- Tellus Airborne conductivity survey data from 48 flight lines flown 200 metres apart across the area, with measurements taken every six metres along the flight path, was specially re-processed by the GSI as a research project. The re-processed data were used to create 48 graphically consistent, cross sections down to roughly 30 metres below sea level. The data also was compiled from the sections into five depth slice maps down to 75metres below ground level. The sections and maps were correlated with the geology recorded in the logs of boreholes. There was a good correlation. The sections and maps were then used for a geology/structural geology/karst weathering interpretation of the subsurface that is currently hidden below the overburden;
- A down-the-hole video survey of boreholes SG4 and SG7 carried out by the GSI in 2021

The data obtained from these historic and recent site investigations form part of a detailed and extensive geological dataset for the local area.

Based on the site-specific geological data, it has been concluded that the bedrock geology of the local area is divided into upward, downward, and sideways, juxtaposed blocks of different limestones separated by Carboniferous and Cenozoic age faults.

More specifically, site investigations have shown that Rathcore Quarry is underlain entirely by Waulsortian Limestones. In contrast to the GSI's map, the Lucan Formation is not present at Rathcore Quarry. The recent airborne geophysical data from the GSI's Tellus project also shows that the Lucan formation lies to the east of the quarry site outside the area of the proposed excavation.

The Waulsortian Limestones at Rathcore are highly karstified, with drilling at the quarry encountering an open underground cavity system. The cavities were found to contain clay with variable water flows. In between the cavities, the limestone rock is solid and dolomitised in places. The rock in the south of the quarry contains less solutionally enlarged faults. Structural features have played a key role in the development of karst conduits with the younger Cenozoic faults more likely to be karstified than the Carboniferous structures which have largely been closed by subsequent tectonic stresses. Correlation of drilling logs with (Tellus) geophysical surveys have revealed that the Waulsortian Limestones are highly karstified not just at Rathcore but also throughout the local area.

The drilling and pumping tests during the Hydrogeology Investigation in 2019-2022 discovered that a hidden network of open and connected karst conduits exists below Rathcore Quarry. However, drilling and water level monitoring in the east and south of the quarry found fewer and smaller, poorly connected fractures and conduits in the more massive, less broken limestones.

This chapter ends by stating that it is likely that based on the new borehole logs, the geophysical information, combined with the hydrogeological data presented in Chapter 3 and Chapter 4 that the aquifer classification of the Waulsortian Limestones in this area will be re-classified to a Locally Important Karstified bedrock aquifer, if not a Regionally Important Karstified bedrock aquifer.

Chapter 3: Groundwater Investigations at Rathcore Quarry

Chapter 3 details the groundwater investigations that were completed at Rathcore Quarry as part of David Ball's assessment.

The hydrogeological investigations are summarised as follows:

- Groundwater pumping tests were designed to stress the groundwater system and see how the system responded to this stress and how this water level stress response extended beyond the quarry boundaries.
- 3 no. wide diameter boreholes were drilled in November and December 2019 to obtain access to the groundwater system;
- These boreholes were sited on structures identified during the preceding exploratory drilling phase which identified the presence of large groundwater conduits (passageways) beneath the quarry floor which can transmit large volumes of groundwater;
- Due to the karstic nature of the bedrock, with identified clay filled cavities, the drilling and construction of these 3 no. boreholes was complicated and difficult, but successful groundwater wells were constructed to facilitate the planned long pumping tests;
- Prior to the completion of the long pumping tests it was necessary to clear clay from the karst conduits with the 3 no boreholes so that water could be discharged from the quarry site and meet the discharge licence limit with regard to suspended solids. This was achieved

by completing a series of short pumping tests to develop the boreholes by cleaning clay from the cavities. This pumped water was released onto the floor of the quarry until it ran clear;
- Due to the significant volumes of water which would require discharge during the pumping tests, permission was sought from Meath County Council to amend the discharge licence for the duration of the test to an increased rate of 250m^3/hr (6 million litres per day);
- The first long pumping test commenced in mid-July 2020 and was one of the longest pumping tests ever completed in the country;
- During this test which lasted almost 5 months (140 days), the karst conduits beneath Rathcore Quarry sustained a flow of over 2 million litres per day;
- A second long pumping test was completed in February and March 2021 to simulate winter conditions when groundwater levels were higher;
- The significant groundwater flow volumes encountered during the pumping tests indicate that the conduits beneath the existing quarry floor are connected to a large scale karstic groundwater flow system;
- The hydrogeological data obtained during these pumping tests indicates that there is a complex but extensive and interconnected system of karst conduits in the underlying Waulsortian Limestones; and,
- Despite this, the pumping tests showed that water levels could be held down (to the proposed quarry deepening level) by sustained pumping.

Chapter 4: Water Level Monitoring and correlation with rainfall and pumping at Rathcore Quarry

Chapter 4 describes the monitoring of groundwater levels, before, during and after the pumping tests undertaken at Rathcore Quarry.

Long-term groundwater monitoring has been carried out by Kilsaran in both on-site boreholes and local private wells[1]. This monitoring has been undertaken to discover whether the quarry dewatering operations are impacting local groundwater levels and local well supplies. This long-term monitoring has comprised the following:

- Manual weekly monitoring of groundwater levels in 4 no. onsite boreholes since 2008; and,
- Manual monthly monitoring of groundwater levels in 14 no. local wells since 2006.

These wells and boreholes comprise a mixture of deep boreholes in the limestone bedrock and shallow wells in the gravel and till overburden deposits. Since this long-term monitoring began, a gradual decline in water levels has been recorded. The greatest decline has been observed in the bedrock boreholes (4-6m fall) with less of a decline recorded in shallow wells (1m fall). This decline in groundwater levels predates the onset of groundwater pumping at Rathcore Quarry which began in 2013. Therefore, this trend in declining groundwater levels cannot be attributed to dewatering at the quarry.

It is suggested that the long-term decline in local groundwater levels is a result of decreased rainfall. A reduction in rainfall would account for the difference in water level decline observed in the overburden and bedrock due to the high permeability of the overburden deposits which contains a lot of space to accommodate rainfall. In contrast, the available space in the bedrock is limited to the conduits and cavities. Therefore, any reduction in groundwater will cause a larger fall in water levels in the limestone bedrock aquifer in comparison to the overlying overburden aquifer.

[1] *Please note this groundwater monitoring is ongoing.*

During the 2020 and 2021 long pumping tests, the ongoing manual monitoring of local groundwater levels was supplemented by continuous water level monitoring in 9 no. boreholes through the use of in-situ water level dataloggers. This monitoring was completed to determine the effect that the sustained pumping was having on local groundwater levels. The results of the monitoring are summarised as follows:

- During the pumping tests there was a decline in local groundwater levels associated with the increased quarry pumping rates;
- Groundwater levels in some of the onsite boreholes were reduced by ~4m, with a reduction of ~2m in some nearby private wells;
- Pumping did not have an effect on water levels in the shallow wells as these are sourced from the overburden aquifer which overlies the limestone bedrock; and,
- Pumping only affects water levels in the boreholes adjacent to St. Gorman's Well in summer conditions when the spring is not flowing. In winter conditions, when the spring is flowing, pumping does not have an effect on water levels at St. Gorman's Well.

Chapter 5: St. Gorman's Well and Boreholes

Chapter 5 initially provides a detailed description of St. Gorman's Well and outlines the key historic observations made at the well, beginning in July 1859. St. Gorman's Well is a County Geological Heritage Site and is one of the highest temperature warm springs in Ireland. The flow at St. Gorman's Well is seasonal, with the feature appearing in the landscape as a micro-sized enclosed depression which contains water when the local water table is high and contains no water in summer when the water table falls sufficiently. The designation as a County Geological Heritage Site has been based upon historic temperature data recorded at the spring and the associated depression. Recent data indicates that some of these historic high temperature readings are misleading and may have been influenced by ambient air temperature. A review of all available data (historic and recent) suggests that the spring may not be as ecologically significant as previously understood.

The St Gorman's Well site consists of two important features; the Well or spring, and the deep boreholes drilled in the mid-1980s by Hydro-Research. The spring depression flows or contains water infrequently. Therefore, as there is no water to be seen in it most of the time, it is not possible to use it monitor groundwater conditions at, or under, the site. However, two of the 1980s boreholes provide an invaluable piece of infrastructure to monitor and assess the changes in the groundwater levels/pressures and changes in water temperature throughout the year. Therefore, the scientific value of the site lies mostly in the information that has, and can be, obtained from the boreholes. Borehole SG4 has been continuously monitored for water pressure/levels and temperature since 2013 with the exception of a gap from September 2015 to August 2018.

Also, there has been confusion in the past in reports and papers where data appears to be ascribed to 'St Gorman's Well', whereas it is actually data from a borehole on the site close to St Gorman's Well. In Chapter 5, the small natural depression that sometimes contains water is referred to as St Gorman's Well. The boreholes are referred to by their individual names (e.g. SG4 and so on).

In recent years, the well has only flowed in winter. Based on historical observations and records from previous site visits, combined with recent detailed monitoring it appears that the well previously flowed for longer. This correlates with the slow decline of water levels in the boreholes monitored by Kilsaran since 2006. This chapter attempts to discover the reasoning behind this decline of local water levels and presents detailed analysis and discussion with respect to changing rainfall patterns associated with climate change as well as considering the impact of groundwater abstractions in the

local area which may have resulted in lower groundwater levels and have depleted the local groundwater resource. The groundwater abstractions considered include but are not limited to the increase in one-off houses in the local area, pumping of the Longwood boreholes and removal of groundwater from Rathcore Quarry.

This chapter also presents a very detailed assessment of water levels and water temperature data at St. Gorman's Well. The St. Gorman's Well site contains a cluster of boreholes, the details of which are provided in Chapter 2. Many of these were drilled to investigate the geothermal potential of the spring. These boreholes have facilitated the monitoring of water levels and temperature at St. Gorman's Well prior to and during the pumping tests completed at Rathcore Quarry. The water levels and temperatures are analysed with regard to rainfall patterns and "earth tides" (the local distortion of the earth's shape by the gravitational pull of the moon and the sun). The data has been used to attempt to understand the provenance of the warm water at St. Gorman's Well and to determine whether the proposed pumping at Rathcore Quarry would affect the spring.

Based on the detailed analysis, this chapter concludes that 3 no. groundwater flow system are present at St. Gorman's Well:

- A shallow, overburden-upper epikarst system that responds principally to local rainfall recharge;
- A deeper, confined/pressurised, more regional, major conduit karst system at depths of 30 - 100m in the Waulsortian Limestones. This system is confined over much of the general area by clays and clayey decomposed limestones which separate the deep karst groundwater system from the shallow perched water table in the overburden; and,
- A very deep, probably 'U-shaped' conduit system (50-1000m) which brings water from the greater depths towards the surface.

Based on the results of the pumping tests, designed to simulate the effects of the long term quarry dewatering, the following conditions arise:

- In winter conditions when there is enough recharge, St. Gorman's Well will continue to flow even if future groundwater dewatering at the quarry is implemented.
- In summer conditions, when there is limited recharge, water levels are low and St. Gorman's Well is naturally dry, there is potential for future quarry dewatering to slightly lower groundwater levels, as measured in the boreholes at the St. Gorman's Well site. The St. Gorman's Well spring depression can still fill and overflow when there is sufficient local rainfall recharge.

Chapter 6: Conclusions and Recommendations

Chapter 6 answers 22 no. questions in respect of the proposed development and likely significant hydrogeological effects that the development may have on local groundwater, local wells, and St Goman's Well. This chapter also recommends several mitigation measures with regard to the Longwood production boreholes, local private wells and St. Gorman's Well.

The detailed Hydrogeological Investigation Report concludes the following:

- The aim of this hydrogeological investigation was to determine whether there is, or could be, a link between the quarry and the spring at St. Gorman's Well and whether the proposed dewatering at Rathcore could impact the local hydrogeological regime;

- Significant scope and latitude has been provided for the completion of a comprehensive set of site investigations and to collect an unparalleled hydrogeological dataset in order to address these questions;
- The potential hydrogeological linkage between the quarry and the spring was determined through several phases of hydrogeological investigation works, with the findings of one phase, adjusting the scope of the next;
- The site investigations completed at the site were iterative and multi-phased;
- From the outset, it was known that it would be necessary to establish high yielding boreholes at the quarry site, the aim being to pumping those boreholes, in order to simulate the proposed future dewatering at Rathcore quarry and the monitoring of local groundwater levels, throughout several meteorological seasons;
- The siting of 3 no. high-yielding boreholes was preceded by an extensive exploration drilling programme, comprising 52 no. exploration boreholes, and an assessment of bedrock exposures within the existing Rathcore quarry;
- Unprecedented long, high rate pumping tests have been completed to simulate the proposed dewatering at Rathcore Quarry and groundwater levels were recorded in nearby wells and at St. Gorman's Well;
- The conclusions based on the results of the long pumping tests and the wider hydrogeological investigation include the following:
    - Groundwater at Rathcore is located in a karst conduit system, however, the conduits are not everywhere and the intervening rock is competent and does not facilitate groundwater flow;
    - The south and east of the quarry contain few and less well developed karst conduits than the north and west;
    - Pumping at an appropriate rate can hold down the groundwater level at Rathcore Quarry;
    - Therefore, the quarry can be dewatered to facilitate the proposed deepening;
    - The proposed dewatering will lower local groundwater levels (~2-4m) with the greatest reduction being within the quarry void;
    - Groundwater levels outside of the quarry will only be lowered by ~2m;
    - This reduction in groundwater is unlikely to impact the yield of local private wells, as many local domestic wells are sourced from the overburden aquifer which is perched above and hydrogeologically isolated from the underlying limestone aquifer. These shallow wells will not be impacted by future quarry dewatering;
    - The yield in local deep boreholes sourced from the limestone aquifer will not be impacted by a 2m drawdown as these wells receive flow from several deep conduits which will remain open and continue to provide groundwater to the wells;
    - The drawdown will have no effect on the functionality of St. Gorman's Well. During winter, when the spring flows, there will be no effect on groundwater levels or flow at St. Gorman's Well due to the large volumes of groundwater and recharge within the local groundwater system which will offset any lowering of groundwater levels at the quarry. In summer conditions, when there is limited recharge and St. Gorman's Well is not flowing, there is the potential for future quarry dewatering to lower groundwater levels slightly at St. Gorman's Well. However, this seasonal impact does not affect the ability of the spring to overflow in winter conditions;
    - The proposed increase in discharge from the quarry to the local stream will not result in any increase in downstream flood risk;

    - The downstream receiving waters coped with similar flow volumes during the long, high rate pumping tests and studies have shown that the proposed maximum discharge is only a fraction of the capacity of the receiving drain which is maintained by the OPW; and,
    - The proposed dewatering will not result in any downstream surface water quality effects as the existing water treatment system, which comprises settlement ponds, a hydrocarbon interceptor, and a reed bed, will be upgraded to cater for the proposed increased discharge volumes.
- The above conclusions and impact assessments are unambiguous and are supported by site-specific geological and hydrogeological datasets. The drawdown and impact assessment analyses are not theoretical, they are based on factual and proven data from the long pumping tests. The comprehensive scientific datasets and the factual nature of analyses provides a high degree of confidence in the hydrogeological assessment.

APPENDIX 7-B
Proposed Wastewater Treatment

SITE CHARACTERISATION FORM
COMPLETING THE FORM

Step 1:

Goto Menu Item **File, Save As** and save the file under a reference relating to the client or the planning application reference if available.

Clear Form

Use the **Clear Form** button to clear all information fields.

Notes:

All calculations in this form are automatic.

Where possible information is presented in the form of drop down selection lists to eliminate potential errors.

Variable elements are recorded by tick boxes. In all cases only one tick box should be activated.

All time record fields must be entered in twenty hour format as follows: HH:MM

All date formats are DD/MM/YYYY.

All other data fields are in text entry format.

This form can be printed out fully populated for submission with related documents and for your files. It can also be submitted by email.

Section 3.2

In this section use an underline _____ across all six columns to indicate the depth at which changes in classification / characteristics occur.

Section 3.4

Lists supporting documentation required.

Section 4

Select the treatment systems suitable for this site and the discharge route.

Section 5

Indicate the system type that it is proposed to install.

Section 6

Provide details, as required, on the proposed treatment system.

SITE CHARACTERISATION FORM

File Reference:

1.0 GENERAL DETAILS (From planning application)

Prefix: First Name: Kilsaran Concrete Surname:

Address: Piercetown, Dnboyne Co. Meath

Site Location and Townland: Rathcore, Trim, Co. Meath

Telephone No: Fax No:

E-Mail:

Maximum no. of Residents: No. of Double Bedrooms: No. of Single Bedrooms:

Proposed Water Supply: Mains ☐ Private Well/Borehole ☑ Group Well/Borehole ☐

2.0 GENERAL DETAILS (From planning application)

Soil Type, (Specify Type): Grey Brown Podzolic Soil of Patrickswell Series

Aquifer Category: Regionally Important ☐ Locally Important LI Poor ☐

Vulnerability: Extreme ☑ High ☐ Moderate ☐ Low ☐ High to Low ☐ Unknown ☐

Bedrock Type: Dinantian Pure Unedded Limestone

Name of Public/Group Scheme Water Supply within 1 km: None

Groundwater Protection Scheme (Y/N): Yes Source Protection Area: SI ☐ SO ☐

Groundwater Protection Response: R2[1]

Presence of Significant Sites (Archaeological, Natural & Historical): None

Past experience in the area: Not in immediate area

Comments:

(Integrate the information above in order to comment on: the potential suitability of the site, potential targets at risk, and/or any potential site restrictions).

The bedrock aquifer is classed as locally important. Vulnerability is extreme Response is therefore taken as R2(1)
Groundwater will be a target at risk. There are 8 Quarry worker and 10 drivers. Allow 30L/person for workers and 10L/driver equating to 340 litres or a PE of 3. Allow 20grams of BOD/worker and 10g BOD /driver equates to 260 grams BOD or a PE of 5

Note: Only information available at the desk study stage should be used in this section.

3.0 ON-SITE ASSESSMENT

3.1 Visual Assessment

Landscape Position: Undulating countryside surrounds Quarry

Slope: Steep (>1:5) ☐ Shallow (1:5-1:20) ☐ Relatively Flat (<1:20) ☑

Surface Features within a minimum of 250m (Distance To Features Should Be Noted In Metres)

Houses: house borders site to Northeast, House to Southwest at about 200m

Existing Land Use: Quarry

Vegetation Indicators: No rushes on site or in adjoining lands

Groundwater Flow Direction: North

Ground Condition: Firm

Site Boundaries: Hedgerow and post & wire Roads: Road to West

Outcrops (Bedrock And/Or Subsoil): Quarry

Surface Water Ponding: None Lakes: None

Beaches/Shellfish: None Areas/Wetlands: None

Karst Features: None Watercourse/Stream*: Tributary of Blackwater to North 1km

Drainage Ditches*: None Springs / Wells*: Site and neighboring houses served by wells

Comments:
(Integrate the information above in order to comment on: the potential suitability of the site, potential targets at risk, the suitability of the site to treat the wastewater and the location of the proposed system within the site).

There is an existing septic tank on site with no evidence of a percolation area. This should be decommissioned and removed.#
The site for the percolation area is is located near the office and weigh-bridge beside quarry entrance.
Subsoils are likely to be high in sand & gravel - good soakage and groundwater will be a target at risk.
There will be very low usage of facilities and therefore volumes will be small meaning the risk from the source will be limited.
There are a series of monitoring wells on the site - not used for abstraction of water. The production well is to the Northeast well in excess of 50m away. The closest well is in the house to the Northwest which is alongside the percolation area and is well in excess of 25m away.

***Note and record** water level

3.2 **Trial Hole** (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas, which are at or adjacent to significant sites (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 3.00

Depth from ground surface to bedrock (m) (if present):

Depth from ground surface to water table (m) (if present):

Depth of water ingress:

Rock type (if present): 1.9

Date and time of excavation: 26/09/2016

Date and time of examination: 28/09/2016

	Depth of P/T Test*	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m	P	Fill containing mix of silty aggregates and Gravel	No Trds or ribs	Structureless	Stiff to Hard depending on material	Grey/Brown	The presence of aggregates will mean this material will have preferential flow-paths
0.2 m	P						
0.3 m	P						
0.4 m	P,						
0.5 m	T1-3	sandy Clay	Poorly Dilatent Trds = 7,8, 8 Ribs 100, 110, 100	Blocky	Firm	Light Brown	None
0.6 m	T1-3						
0.7 m	T1-3						
0.8 m	T3						
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m		Sandy Gravely CLAY	Poorly Dilatent Trds =9, 8, 8 Ribs= 120, 110,110	Blocky	Firm	Dark brown	
1.4 m							
1.5 m							
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m		Clayey Gravely SAND Few Cobbles	No trds or Ribs	Structureless	Firm	Light Brown	
2.4 m							
2.5 m							
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							

Evaluation:

No watertable encountered. Under the fill the subsoil is high in clay but is not compacted and is likely to have good soakage.

Likely T value: 10.00

Note: *Depth of percolation test holes should be indicated on log above. (Enter P or T at depts as appropriate).
** See Appendix E for BS 5930 classification.
*** 3 samples to be tested for each horizon and results should be entered above for each horizon.
**** All signs of mottling should be recorded.

3.3(a) Percolation ("T") Test for Deep Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm) (A)	1,000	1,000	1,000
Depth from ground surface to base of hole (mm) (B)	1,400	1,400	1,400
Depth of hole (mm) [B - A]	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

Date and Time pre-soaking started	28/09/2016		28/09/2016		28/09/2016	

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

Step 3: Measuring T_{100}

Percolation Test Hole No.	1	2	3
Date of test	29/09/2016	29/09/2016	29/09/2016
Time filled to 400 mm	09:16	09:18	09:19
Time water level at 300 mm	09:32	09:55	09:38
Time to drop 100 mm (T_{100})	16.00	37.00	19.00
Average T_{100}			24.00

If T_{100} > 300 minutes then T-value >90 – site unsuitable for discharge to ground
If $T_{100} \leq 210$ minutes then go to Step 4;
If T_{100} > 210 minutes then go to Step 5;

Step 4: Standard Method (where $T_{100} \leq 210$ minutes)

Percolation Test Hole	1			2			3		
Fill no.	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)
1	09:32	09:57	25.00	09:55	10:44	49.00	09:38	10:01	23.00
2	09:57	10:28	31.00	10:44	11:49	65.00	10:01	10:36	35.00
3	10:28	11:03	35.00	11:49	13:02	73.00	10:36	11:19	43.00
Average Δt Value			30.33			62.33			33.67
	Average Δt/4 = [Hole No.1]		7.58 (t_1)	Average Δt/4 = [Hole No.2]		15.58 (t_2)	Average Δt/4 = [Hole No.3]		8.42 (t_3)

Result of Test: T = 10.53 (min/25 mm)

Comments:

Overall Result is in the acceptable range

Step 5: Modified Method (where $T_{100} > 210$ minutes)

Percolation Test Hole No.	1				2				3			
Fall of water in hole (mm)	Time Factor = T_f	Time of fall (mins) = T_m	$K_{fs} = T_f / T_m$	T – Value = 4.45 / K_{fs}	Time Factor = T_f	Time of fall (mins) = T_m	$K_{fs} = T_f / T_m$	T – Value = 4.45 / K_{fs}	Time Factor = T_f	Time of fall (mins) = T_m	$K_{fs} = T_f / T_m$	T – Value = 4.45 / K_{fs}
300 - 250	8.1				8.1				8.1			
250 - 200	9.7				9.7				9.7			
200 - 150	11.9				11.9				11.9			
150 - 100	14.1				14.1				14.1			
Average T- Value	T- Value Hole 1= (t_1)			0.00	T- Value Hole 1= (t_2)			0.00	T- Value Hole 1= (t_3)			0.00

Result of Test: T = 0.00 (min/25 mm)

Comments:

3.3(b) Percolation ("P") Test for Shallow Soil / Subsoils and/or Water Table

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)			
Depth from ground surface to base of hole (mm)			
Depth of hole (mm)	0	0	0
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

Date and Time pre-soaking started					

Each hole should be pre-soaked twice before the test is carried out. Each hole should be empty before refilling.

Step 3: Measuring P_{100}

Percolation Test Hole No.	1	2	3
Date of test			
Time filled to 400 mm			
Time water level at 300 mm			
Time to drop 100 mm (P_{100})	0.00	0.00	0.00
Average P_{100}			0.00

If P_{100} > 300 minutes then T-value >90 – site unsuitable for discharge to ground
If $P_{100} \leq 210$ minutes then go to Step 4;
If P_{100} > 210 minutes then go to Step 5;

Step 4: Standard Method (where $P_{100} \leq 210$ minutes)

Percolation Test Hole	1			2			3		
Fill no.	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δp (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δp (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δp (min)
1			0.00			0.00			0.00
2			0.00			0.00			0.00
3			0.00			0.00			0.00
Average Δp Value			0.00			0.00			0.00
	Average Δp/4 = [Hole No.1]		0.00 (p_1)	Average Δp/4 = [Hole No.2]		0.00 (p_2)	Average Δp/4 = [Hole No.3]		0.00 (p_3)

Result of Test: P = 0.00 (min/25 mm)

Comments:

P - Value not tested as area is built-up and therefore no topsoil

Step 5: Modified Method (where $P_{100} > 210$ minutes)

Percolation Test Hole No.	1				2				3			
Fall of water in hole (mm)	Time Factor = T_f	Time of fall (mins) = T_m	$K_{fs} = T_f / T_m$	P – Value = 4.45 / K_{fs}	Time Factor = T_f	Time of fall (mins) = T_m	$K_{fs} = T_f / T_m$	P – Value = 4.45 / K_{fs}	Time Factor = T_f	Time of fall (mins) = T_m	$K_{fs} = T_f / T_m$	P – Value = 4.45 / K_{fs}
300 - 250	8.1				8.1				8.1			
250 - 200	9.7				9.7				9.7			
200 - 150	11.9				11.9				11.9			
150 - 100	14.1				14.1				14.1			
Average P- Value	P- Value Hole 1= (p_1)			0.00	P- Value Hole 1= (p_2)			0.00	P- Value Hole 1= (p_3)			0.00

Result of Test: P = 0.00 (min/25 mm)

Comments:

3.4 The following associated Maps, Drawings and Photographs should be appended to this site characterisation form.

1. Discovery Series 1:50,000 Map indicating overall drainage, groundwater flow direction and housing density in the area.
2. Supporting maps for vulnerability, aquifer classification, soil, bedrock.
3. North point should always be included.
4. (a) Sketch of site showing measurements to Trial Hole location and
   (b) Percolation Test Hole locations,
   (c) wells and
   (d) direction of groundwater flow (if known),
   (e) proposed house (incl. distances from boundaries)
   (f) adjacent houses,
   (g) watercourses,
   (h) significant sites
   (i) and other relevant features.
5. Cross sectional drawing of the site and the proposed layout[1] should be submitted.
6. Photographs of the trial hole, text holes and site (date and time referenced).

[1] The calculated percolation area or polishing filter area should be set out accurately on the site layout drawing in accordance with the code of practice's requirements.

4.0 CONCLUSION of SITE CHARACTERISATION

Integrate the information from the desk study and on-site assessment (i.e. visual assessment, trial hole and percolation tests) above and conclude the type of system(s) that is (are) appropriate. This information is also used to choose the optimum final disposal route of the treated wastewater.

Not Suitable for Development ☐

Suitable for [1]		**Discharge Route**
1. Septic tank system (septic tank and percolation area)	No	Discharge to Ground Water
2. Secondary Treatment System		
a. septic tank and filter system constructed on-site and polishing filter; or	Yes	
b. packaged wastewater treatment system and polishing filter	Yes	

5.0 RECOMMENDATION

Propose to install: Septic tank and filter system constructed on-site and polishing filter

and discharge to: Ground Water

Trench Invert level (m): 0.80

Site Specific Conditions (e.g. special works, site improvement works testing etc.

Although the average T-value is acceptable for a standard septic tank it will be necessary to pump the effluent to the percolation area and as there is limited space it is recommended to install a package treatment unit and a sand filter.This will meet requirements of an R2(1) response
It is proposed to follow the amendment to the EPA code of Practice as published Feb. 2012 (Clarification on the Disposal of Effluent from Polishing Filters - +Tertiary Treatment Systems) This allows the area for disposal of treated wastewater to be calculated from the formula Area = 0.125 x T x PE.
The proposed approach is to achieve secondary treatment in an Oakstown BAF unit and Tertiary treatment in a Sand Filter. The disposal of the treated wastewater is then achieved by distributing the effluent from the sand filter over a gravel distribution layer. As the watertable is in excess of 3m bgl it is recommended that the base of the distribution gravel is at about 1m bgl. The fill is removed and the soil down to about1m and the area leveled. A 300mm layer of washed gravel (8-32mm diameter) is placed over the prepared area. The Sand Filter is placed on this gravel. Effluent flows from the sand filter and percolates into the gravel by gravity.
On this site the T-value is 11 and the PE is 3. Area for disposal = 0.125 x 11 x 3m2 = 4.12m2
It is recommended that the disposal area is increased to 15m2.
The sand filter can be loaded at up to 60 litres/m2 - thus requiring a minimum of 7.5m2 filter. It must be constructed in accordance with the EPA code of practice using Sand certified to be of the required particle size and with a Cu <4
The BAF will be located at location of existing septic tank and be at leas 3m from all boundaries. The Sand Filter and disposal pad should be located at least 10m from the facility served and 3m from all other boundaries. I

[1] note: more than one option may be suitable for a site and this should be recorded

[2] A discharge of sewage effluent to "waters" (definition includes any or any part of any river, stream, lake, canal, reservoir, aquifer, pond, watercourse or other inland waters, whether natural or artificial) will require a licence under the Water Pollution Acts 1977-90. Refer to Section 2.6.2.

6.0 TREATMENT SYSTEM DETAILS

SYSTEM TYPE: Septic Tank System

Tank Capacity (m^3)	4.00	Percolation Area		Mounded Percolation Area	
		No. of Trenches		No. of Trenches	
		Length of Trenches (m)		Length of Trenches (m)	
		Invert Level (m)		Invert Level (m)	

SYSTEM TYPE: Secondary Treatment System

Filter Systems

Media Type	Area (m^2)*	Depth of Filter	Invert Level
Sand/Soil			
Soil			
Constructed Wetland			
Other			

Package Treatment Systems

Type	BAF P6
Capacity PE	6.00
Sizing of Primary Compartment	3.00 m^3

SYSTEM TYPE: Tertiary Treatment System

Polishing Filter: Surface Area (m^2)*	7.50
or **Gravity Fed:**	
No. of Trenches	
Length of Trenches (m)	
Invert Level (m)	

Package Treatment System: Capacity (pe)	
Constructed Wetland: Surface Area (m^2)*	

DISCHARGE ROUTE:

Groundwater	✓	Hydraulic Loading Rate * ($l/m^2.d$)	60.00
Surface Water **		Discharge Rate (m^3/hr)	

TREATMENT STANDARDS:

Treatment System Performance Standard (mg/l)	BOD	SS	NH_3	Total N	Total P
	20.00	30.00	20.00		

QUALITY ASSURANCE:

Installation & Commissioning	On-going Maintenance
Certified by qualified assessor	Annual maintenance contract - including desludging

* Hydrolic loading rate is determined by the percolation rate of subsoil

** Water Pollution Act discharge licence required

7.0 SITE ASSESSOR DETAILS

Company: Trinity Green

Prefix: Dr. First Name: Eugene Surname: Bolton

Address: Clonfert, Maynooth, Co. Kildare

Qualifications/Experience: PhD Microbiology, Site Suitability Assessment Course (FETAC)

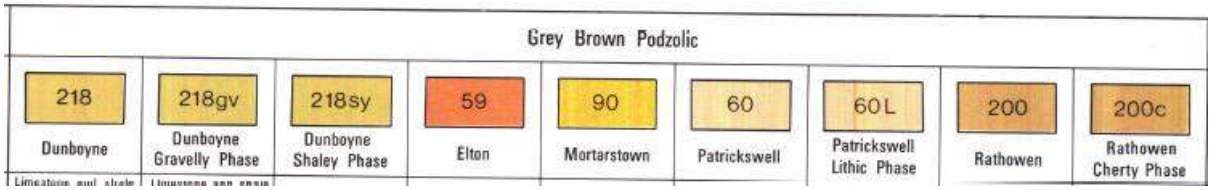
Date of Report: 10/10/2016

Phone: 086 2434828 Fax: e-mail eugenembolton@gmail.com

Indemnity Insurance Number: ICY134A3N939

Signature: 

Soil

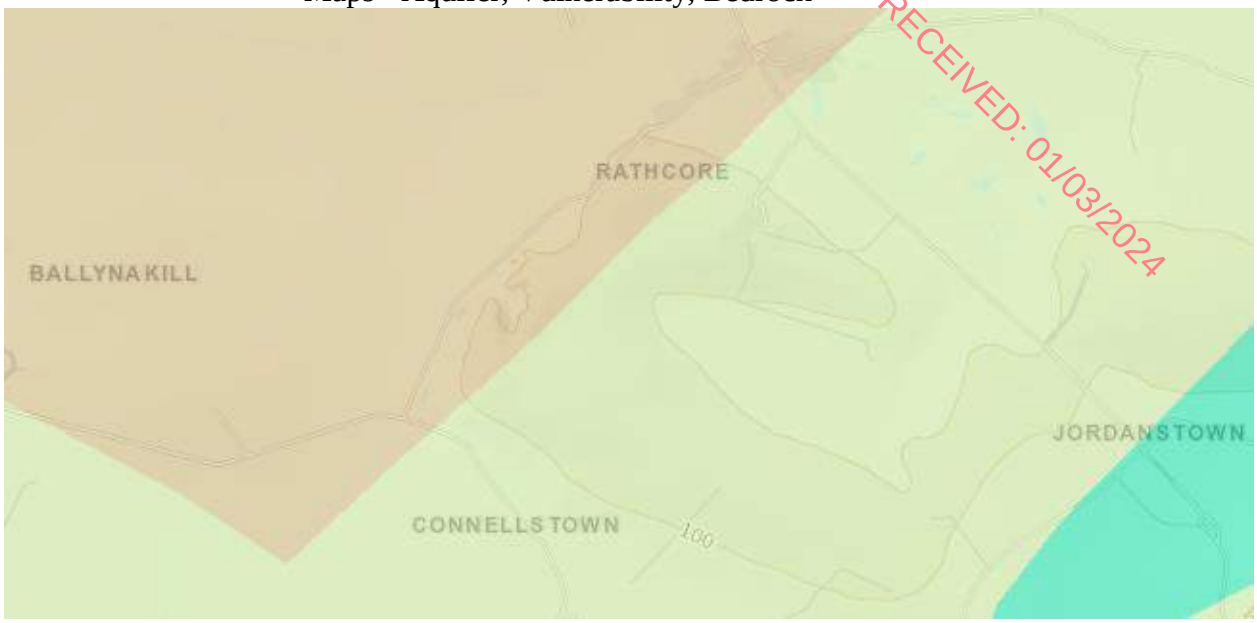


Soil is a Grey Brown Podzolic soil of Patrickswell Series#

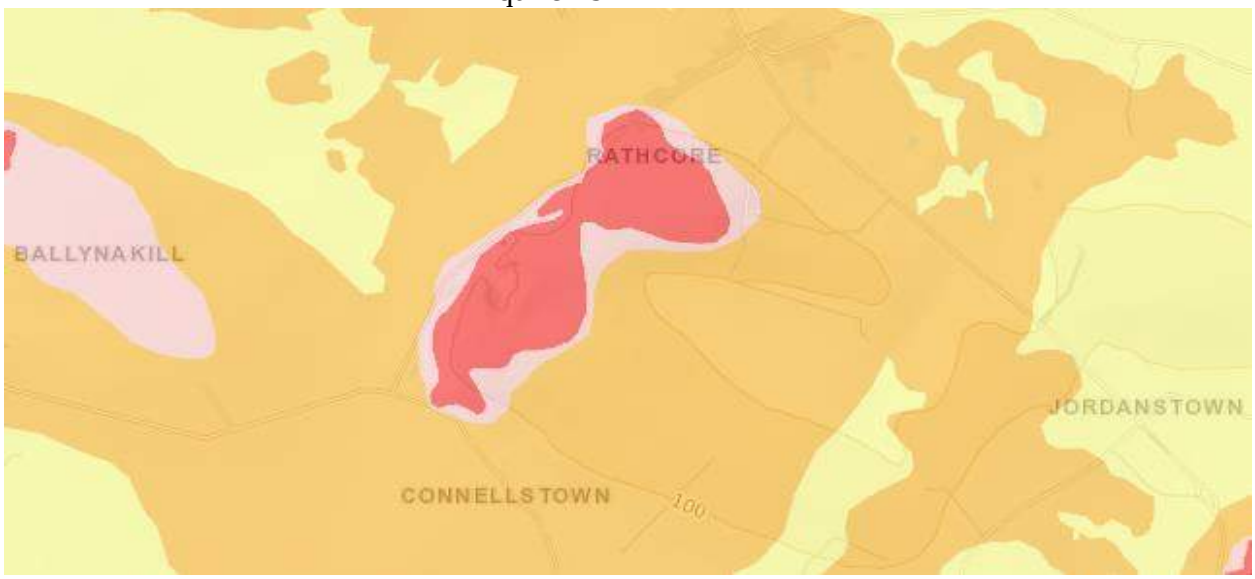
Site Location

Site

Maps - Aquifer, Vulnerability, Bedrock

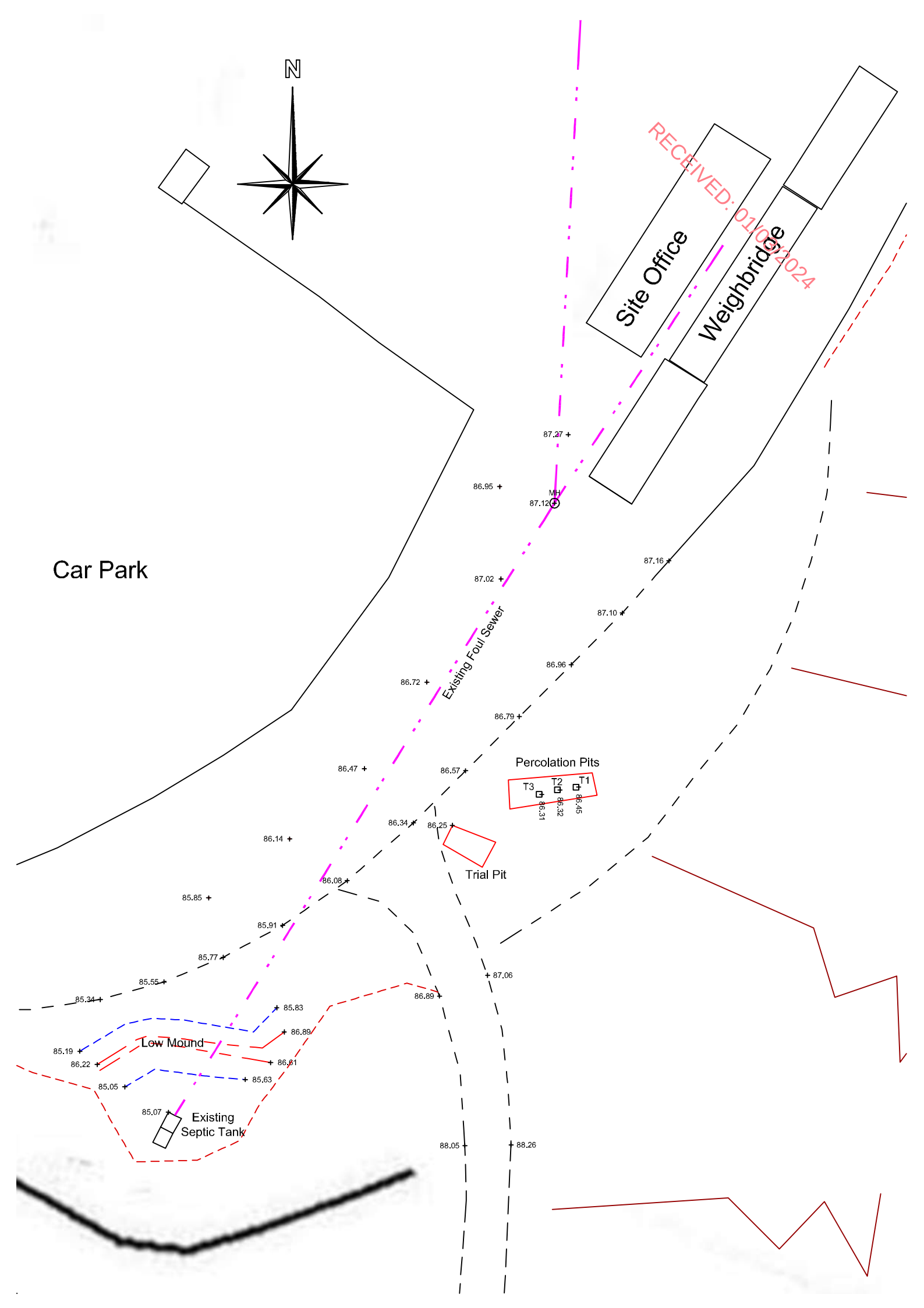


Aquifer is LI



Vulnerability is Extreme

Bedrock is Dinantian Pure Unbedded Limestone


N
RECEIVED: 01/08/2024
Site Office
Weighbridge
Car Park
87.27
86.95
MH
87.12
87.16
87.02
87.10
86.96
86.72
Existing Foul Sewer
86.79
Percolation Pits
T3
T2
T1
86.31
86.32
86.45
86.47
86.57
86.34
86.25
86.14
Trial Pit
86.08
85.85
85.91
85.77
85.55
85.34
87.06
86.89
85.83
86.89
Low Mound
85.19
86.22
86.61
85.05
85.63
85.07
Existing
Septic Tank
88.05
88.26

Photos

T1

T2

T3

Trial Pit

Site Overview

APPENDIX 7-C
Discharge Licence Surface Water Monitoring Laboratory Results
(Jan 2020 – Aug 2023)

Fitz scientific
Monitoring and Testing Services

Unit 35,
Boyne Business Park,
Drogheda,
Co. Louth
Ireland
Tel: +353 41 9845440
Fax: +353 41 9846171
Web: www.fitzsci.ie
email info@fitzsci.ie

A copy of this certificate is available on www.fitzsci.ie

Customer	**James Kelliher** **Kilsaran Concrete** **Piercetown** **Dunboyne** **Co Meath**	***Lab Report Ref. No.***	**1900/312/01**
		Date of Receipt	**29/01/2020**
		Sampled On	**29/01/2020**
		Date Testing Commenced	**30/01/2020**
		Received or Collected	**Delivered by Customer**
		Condition on Receipt	**Acceptable**
Customer PO	**HO4598**	***Date of Report***	**11/02/2020**
Customer Ref	**Rathcore**	***Sample Type***	**Surface Water**
Ref 2	**29/01/20**		
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Ammonia (Surface Water)	114	Colorimetry	0.02	mg/L as N	UKAS
Benzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
BOD (Surface Water)	113	Electrometry	<2	mg/L	UKAS
BTEX Total (Surface Water)	154	GCMS	<1	ug/L	UKAS
COD (Surface Water)	107	Colorimetry	5	mg/L	UKAS
Ethylbenzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
m- & p-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
Nitrate (Surface Water)	103	Colorimetry	7.90	mg/L as N	UKAS
o-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
pH (Surface Water)	110	Electrometry	7.72	pH Units	UKAS
Phosphate (Ortho) Surface Water	117	Colorimetry	<0.014	mg/L as P	UKAS
Solids (Total Suspended)	106	Gravimetry	<2	mg/L	
Toluene (Surface Water)	154	GCMS	<1	ug/L	UKAS
TPH (>C10-40)	188	GC-FID	<1	ug/L	
Xylene Total (Surface Water)	154	GCMS	<1	ug/L	UKAS

Signed : A Harmon ***Date : 11/02/2020***

Aoife Harmon - Laboratory Supervisor

Acc. : Accredited Parameters by ISO/IEC 17025:2017
PVL - Parametric Value Limit as per EU (Drinking water) Regulations (SI 122 2014)
For bacterial analysis a result of 0 means none detected in volume examined
All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of Fitz Scientific
Results contained in this report relate only to the samples tested (P) : Presumptive Results

2802

** : The test result for this parameter may be invalid as it has exceeded the recommended holding time (BS EN ISO 5667-3:2018)

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Customer	**James Kelliher** **Kilsaran Concrete** **Piercetown** **Dunboyne** **Co Meath**	***Lab Report Ref. No.***	**1900/317/01**
		Date of Receipt	**24/02/2020**
		Sampled On	**24/02/2020**
		Date Testing Commenced	**24/02/2020**
		Received or Collected	**Delivered by Customer**
		Condition on Receipt	**Acceptable**
Customer PO	**HO4598**	***Date of Report***	**11/03/2020**
Customer Ref	**Rathcore**	***Sample Type***	**Surface Water**
Ref 2	**24/02/20 11:50am**		
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Ammonia (Surface Water)	114	Colorimetry	<0.01	mg/L as N	UKAS
Benzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
BOD (Surface Water)	113	Electrometry	<2	mg/L	UKAS
BTEX Total (Surface Water)	154	GCMS	<1	ug/L	UKAS
COD (Surface Water)	107	Colorimetry	<5	mg/L	UKAS
Ethylbenzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
m- & p-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
Nitrate (Surface Water)	103	Colorimetry	7.22	mg/L as N	UKAS
o-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
pH (Surface Water)	110	Electrometry	7.61	pH Units	UKAS
Phosphate (Ortho) Surface Water	117	Colorimetry	<0.014	mg/L as P	UKAS
Solids (Total Suspended)	106	Gravimetry	<2	mg/L	
Toluene (Surface Water)	154	GCMS	<1	ug/L	UKAS
TPH (>C10-40)	188	GC-FID	<1	ug/L	
Xylene Total (Surface Water)	154	GCMS	<1	ug/L	UKAS

Signed : Katherine McQuillan ***Date : 11/03/2020***

Katherine McQuillan - Technical Manager

Acc. : Accredited Parameters by ISO/IEC 17025:2017
PVL - Parametric Value Limit as per EU (Drinking water) Regulations (SI 122 2014)
For bacterial analysis a result of 0 means none detected in volume examined
All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of Fitz Scientific
Results contained in this report relate only to the samples tested (P) : Presumptive Results

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Customer	**James Kelliher** **Kilsaran Concrete** **Piercetown** **Dunboyne** **Co Meath**	***Lab Report Ref. No.***	**1900/320/01**
		Date of Receipt	**02/03/2020**
		Sampled On	**02/03/2020**
		Date Testing Commenced	**02/03/2020**
		Received or Collected	**Delivered by Customer**
		Condition on Receipt	**Acceptable**
Customer PO	**HO4598**	***Date of Report***	**16/03/2020**
Customer Ref	**Rathcore**	***Sample Type***	**Surface Water**
Ref 2	**02/03/20 10:15am**		
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Ammonia (Surface Water)	114	Colorimetry	0.02	mg/L as N	UKAS
Benzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
BOD (Surface Water)	113	Electrometry	<2	mg/L	UKAS
BTEX Total (Surface Water)	154	GCMS	<1	ug/L	UKAS
COD (Surface Water)	107	Colorimetry	<5	mg/L	UKAS
Ethylbenzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
m- & p-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
Nitrate (Surface Water)	103	Colorimetry	9.04	mg/L as N	UKAS
o-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
pH (Surface Water)	110	Electrometry	7.90	pH Units	UKAS
Phosphate (Ortho) Surface Water	117	Colorimetry	<0.014	mg/L as P	UKAS
Solids (Total Suspended)	106	Gravimetry	<2	mg/L	
Toluene (Surface Water)	154	GCMS	<1	ug/L	UKAS
TPH (>C10-40)	188	GC-FID	<1	ug/L	
Xylene Total (Surface Water)	154	GCMS	<1	ug/L	UKAS

Signed : A Harmon ***Date : 16/03/2020***

Aoife Harmon - Laboratory Supervisor

Acc. : Accredited Parameters by ISO/IEC 17025:2017
PVL - Parametric Value Limit as per EU (Drinking water) Regulations (SI 122 2014)
For bacterial analysis a result of 0 means none detected in volume examined
All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of Fitz Scientific
Results contained in this report relate only to the samples tested (P) : Presumptive Results

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Customer	**James Kelliher** **Kilsaran Concrete** **Piercetown** **Dunboyne** **Co Meath**	***Lab Report Ref. No.***	**1900/327/01**
		Date of Receipt	**14/05/2020**
		Sampled On	**14/05/2020**
		Date Testing Commenced	**14/05/2020**
		Received or Collected	**Delivered by Customer**
		Condition on Receipt	**Acceptable**
Customer PO	**HO4598**	***Date of Report***	**03/06/2020**
Customer Ref	**Rathcore Discharge**	***Sample Type***	**Surface Water**
Ref 2	**14/05/20 12:00**		
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Ammonia (Surface Water)	114	Colorimetry	0.02	mg/L as N	UKAS
Benzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
BOD (Surface Water)	113	Electrometry	<2	mg/L	UKAS
BTEX Total (Surface Water)	154	GCMS	<1	ug/L	UKAS
COD (Surface Water)	107	Colorimetry	<5	mg/L	UKAS
Ethylbenzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
m- & p-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
Nitrate (Surface Water)	103	Colorimetry	7.32	mg/L as N	UKAS
o-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
pH (Surface Water)	110	Electrometry	7.57	pH Units	UKAS
Phosphate (Ortho) Surface Water	117	Colorimetry	<0.014	mg/L as P	UKAS
Solids (Total Suspended)	106	Gravimetry	<2	mg/L	
Toluene (Surface Water)	154	GCMS	<1	ug/L	UKAS
TPH (>C10-40)	188	GC-FID	<1	ug/L	
Xylene Total (Surface Water)	154	GCMS	<1	ug/L	UKAS

Signed : A Harmon ***Date : 03/06/2020***

Aoife Harmon - Laboratory Supervisor

Acc. : Accredited Parameters by ISO/IEC 17025:2017
PVL - Parametric Value Limit as per EU (Drinking water) Regulations (SI 122 2014)
For bacterial analysis a result of 0 means none detected in volume examined
All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of Fitz Scientific
Results contained in this report relate only to the samples tested (P) : Presumptive Results

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Customer	**James Kelliher** **Kilsaran Concrete** **Piercetown** **Dunboyne** **Co Meath**	***Lab Report Ref. No.***	**1900/335/01**
		Date of Receipt	**09/06/2020**
		Sampled On	**09/06/2020**
		Date Testing Commenced	**09/06/2020**
		Received or Collected	**Delivered by Customer**
		Condition on Receipt	**Acceptable**
Customer PO	**HO4598**	***Date of Report***	**29/06/2020**
Customer Ref	**Rathcore**	***Sample Type***	**Surface Water**
Ref 2	**09/06/20 10:15am**		
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Ammonia (Surface Water)	114	Colorimetry	0.03	mg/L as N	UKAS
Benzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
BOD (Surface Water)	113	Electrometry	<2	mg/L	UKAS
BTEX Total (Surface Water)	154	GCMS	<1	ug/L	UKAS
COD (Surface Water)	107	Colorimetry	5	mg/L	UKAS
Ethylbenzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
m- & p-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
Nitrate (Surface Water)	103	Colorimetry	8.31	mg/L as N	UKAS
o-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
pH (Surface Water)	110	Electrometry	7.69	pH Units	UKAS
Phosphate (Ortho) Surface Water	117	Colorimetry	<0.014	mg/L as P	UKAS
Solids (Total Suspended)	106	Gravimetry	<2	mg/L	
Toluene (Surface Water)	154	GCMS	<1	ug/L	UKAS
TPH (>C10-40)	188	GC-FID	<1	ug/L	
Xylene Total (Surface Water)	154	GCMS	<1	ug/L	UKAS

Signed : A Harmon ***Date : 29/06/2020***

Aoife Harmon - Laboratory Supervisor

Acc. : Accredited Parameters by ISO/IEC 17025:2017
PVL - Parametric Value Limit as per EU (Drinking water) Regulations (SI 122 2014)
For bacterial analysis a result of 0 means none detected in volume examined
All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of Fitz Scientific
Results contained in this report relate only to the samples tested (P) : Presumptive Results

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Customer	**James Kelliher** **Kilsaran Concrete** **Piercetown** **Dunboyne** **Co Meath**	***Lab Report Ref. No.***	**1900/344/01**
		Date of Receipt	**17/07/2020**
		Sampled On	**17/07/2020**
		Date Testing Commenced	**17/07/2020**
		Received or Collected	**Delivered by Customer**
		Condition on Receipt	**Acceptable**
Customer PO	**HO4598**	***Date of Report***	**31/07/2020**
Customer Ref	**Rathcore**	***Sample Type***	**Surface Water**
Ref 2	**17/07/20 10:05am**		
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Ammonia (Surface Water)	114	Colorimetry	0.01	mg/L as N	UKAS
Benzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
BOD (Surface Water)	113	Electrometry	<2	mg/L	UKAS
BTEX Total (Surface Water)	154	GCMS	<1	ug/L	UKAS
COD (Surface Water)	107	Colorimetry	<5	mg/L	UKAS
Ethylbenzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
m- & p-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
Nitrate (Surface Water)	103	Colorimetry	7.76	mg/L as N	UKAS
o-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
pH (Surface Water)	110	Electrometry	7.61	pH Units	UKAS
Phosphate (Ortho) Surface Water	117	Colorimetry	<0.014	mg/L as P	UKAS
Solids (Total Suspended)	106	Gravimetry	4	mg/L	
Toluene (Surface Water)	154	GCMS	<1	ug/L	UKAS
TPH (>C10-40)	188	GC-FID	<1	ug/L	
Xylene Total (Surface Water)	154	GCMS	<1	ug/L	UKAS

Signed : A Harmon ***Date : 31/07/2020***

Aoife Harmon - Laboratory Supervisor

Acc. : Accredited Parameters by ISO/IEC 17025:2017
PVL - Parametric Value Limit as per EU (Drinking water) Regulations (SI 122 2014)
For bacterial analysis a result of 0 means none detected in volume examined
All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of Fitz Scientific
Results contained in this report relate only to the samples tested (P) : Presumptive Results

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** : The test result for this parameter may be invalid as it has exceeded the recommended holding time (BS EN ISO 5667-3:2018)

Final results will be issued without any estimated uncertainty of measurement being applied.
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Customer	**James Kelliher** **Kilsaran Concrete** **Piercetown** **Dunboyne** **Co Meath**	***Lab Report Ref. No.***	**1900/347/01**
		Date of Receipt	**17/08/2020**
		Sampled On	**14/08/2020**
		Date Testing Commenced	**17/08/2020**
		Received or Collected	**Delivered by Customer**
		Condition on Receipt	**Acceptable**
Customer PO	**HO4598**	***Date of Report***	**04/09/2020**
Customer Ref	**Rathcore**	***Sample Type***	**Surface Water**
Ref 2	**14/08/20 11am**		
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Ammonia (Surface Water)	114	Colorimetry	0.01	mg/L as N	UKAS
**Benzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
**BOD (Surface Water)	113	Electrometry	<2	mg/L	UKAS
**BTEX Total (Surface Water)	154	GCMS	<1	ug/L	UKAS
COD (Surface Water)	107	Colorimetry	<5	mg/L	UKAS
**Ethylbenzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
**m- & p-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
Nitrate (Surface Water)	103	Colorimetry	6.68	mg/L as N	UKAS
**o-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
**pH (Surface Water)	110	Electrometry	7.49	pH Units	UKAS
Phosphate (Ortho) Surface Water	117	Colorimetry	0.01	mg/L as P	UKAS
Solids (Total Suspended)	106	Gravimetry	4	mg/L	
**Toluene (Surface Water)	154	GCMS	<1	ug/L	UKAS
TPH (>C10-40)	188	GC-FID	<1	ug/L	
**Xylene Total (Surface Water)	154	GCMS	<1	ug/L	UKAS

Signed : A Harmon

Aoife Harmon - Laboratory Supervisor

Date : 04/09/2020

Acc. : Accredited Parameters by ISO/IEC 17025:2017
PVL - Parametric Value Limit as per EU (Drinking water) Regulations (SI 122 2014)
For bacterial analysis a result of 0 means none detected in volume examined
All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of Fitz Scientific
Results contained in this report relate only to the samples tested (P) : Presumptive Results

2802

** : The test result for this parameter may be invalid as it has exceeded the recommended holding time (BS EN ISO 5667-3:2018)
This sample was identified as deviant (BS EN ISO 5667-3:2018) due to [HoldingTime] and the test results may be invalid.

Final results will be issued without any estimated uncertainty of measurement being applied. This can be supplied on request.
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Customer	**James Kelliher** **Kilsaran Concrete** **Piercetown** **Dunboyne** **Co Meath**	***Lab Report Ref. No.***	**1900/351/01**
		Date of Receipt	**11/09/2020**
		Sampled On	**11/09/2020**
		Date Testing Commenced	**11/09/2020**
		Received or Collected	**Delivered by Customer**
		Condition on Receipt	**Acceptable**
Customer PO	**HO4598**	***Date of Report***	**02/10/2020**
Customer Ref	**Rathcore**	***Sample Type***	**Surface Water**
Ref 2	**11/09/20 08:45am**		
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Ammonia (Surface Water)	114	Colorimetry	0.01	mg/L as N	UKAS
Benzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
BOD (Surface Water)	113	Electrometry	<2	mg/L	UKAS
BTEX Total (Surface Water)	154	GCMS	<1	ug/L	UKAS
COD (Surface Water)	107	Colorimetry	<5	mg/L	UKAS
Ethylbenzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
m- & p-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
Nitrate (Surface Water)	103	Colorimetry	6.46	mg/L as N	UKAS
o-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
pH (Surface Water)	110	Electrometry	7.54	pH Units	UKAS
Phosphate (Ortho) Surface Water	117	Colorimetry	0.02	mg/L as P	UKAS
Solids (Total Suspended)	106	Gravimetry	3	mg/L	
Toluene (Surface Water)	154	GCMS	<1	ug/L	UKAS
TPH (>C10-40)	188	GC-FID	<1	ug/L	
Xylene Total (Surface Water)	154	GCMS	<1	ug/L	UKAS

Signed : A Harmon

Aoife Harmon - Laboratory Supervisor

Date : 02/10/2020

Acc. : Accredited Parameters by ISO/IEC 17025:2017
PVL - Parametric Value Limit as per EU (Drinking water) Regulations (SI 122 2014)
For bacterial analysis a result of 0 means none detected in volume examined
All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of Fitz Scientific
Results contained in this report relate only to the samples tested (P) : Presumptive Results

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Customer supplied information appear in italics.

Customer	*James Kelliher* *Kilsaran Concrete* *Piercetown* *Dunboyne* *Co Meath*	*Lab Report Ref. No.*	**1900/357/01**
		Date of Receipt	**29/10/2020**
		Sampled On	***29/10/2020***
		Date Testing Commenced	**29/10/2020**
		Received or Collected	**Delivered by Customer**
		Condition on Receipt	**Acceptable**
Customer PO	***HO4598***	*Date of Report*	**23/11/2020**
Customer Ref	***Rathcore***	*Sample Type*	***Surface Water***
Ref 2	***29/10/20 10:20am***		
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Ammonia (Surface Water)	114	Colorimetry	<0.01	mg/L as N	UKAS
Benzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
BOD (Surface Water)	113	Electrometry	<2	mg/L	UKAS
BTEX Total (Surface Water)	154	GCMS	<1	ug/L	UKAS
COD (Surface Water)	107	Colorimetry	<5	mg/L	UKAS
Ethylbenzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
m- & p-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
Nitrate (Surface Water)	103	Colorimetry	7.05	mg/L as N	UKAS
o-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
pH (Surface Water)	110	Electrometry	7.44	pH Units	UKAS
Phosphate (Ortho) Surface Water	117	Colorimetry	0.06	mg/L as P	UKAS
Solids (Total Suspended)	106	Gravimetry	3	mg/L	
Toluene (Surface Water)	154	GCMS	<1	ug/L	UKAS
TPH (>C10-40)	188	GC-FID	<1	ug/L	
Xylene Total (Surface Water)	154	GCMS	<1	ug/L	UKAS

Signed : A Harmon

Aoife Harmon - Laboratory Supervisor

Date : 23/11/2020

Acc. : Accredited Parameters by ISO/IEC 17025:2017
PVL - Parametric Value Limit as per EU (Drinking water) Regulations (SI 122 2014)
For bacterial analysis a result of 0 means none detected in volume examined
All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of Fitz Scientific
Results contained in this report relate only to the samples tested (P) : Presumptive Results

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Customer supplied information appear in italics.

Customer	***James Kelliher***	***Lab Report Ref. No.***	**1900/360/01**
	Kilsaran Concrete	***Date of Receipt***	**18/11/2020**
	Piercetown	***Sampled On***	***18/11/2020***
	Dunboyne	***Date Testing Commenced***	**18/11/2020**
	Co Meath	***Received or Collected***	**Delivered by Customer**
		Condition on Receipt	**Acceptable**
Customer PO	***HO4598***	***Date of Report***	**03/12/2020**
Customer Ref	***Rathcore***	***Sample Type***	***Surface Water***
Ref 2	***18/11/20 13:05***		
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Ammonia (Surface Water)	114	Colorimetry	0.02	mg/L as N	UKAS
Benzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
BOD (Surface Water)	113	Electrometry	3	mg/L	UKAS
BTEX Total (Surface Water)	154	GCMS	<1	ug/L	UKAS
COD (Surface Water)	107	Colorimetry	<5	mg/L	UKAS
Ethylbenzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
m- & p-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
Nitrate (Surface Water)	103	Colorimetry	6.53	mg/L as N	UKAS
o-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
pH (Surface Water)	110	Electrometry	7.51	pH Units	UKAS
Phosphate (Ortho) Surface Water	117	Colorimetry	0.04	mg/L as P	UKAS
Solids (Total Suspended)	106	Gravimetry	<2	mg/L	
Toluene (Surface Water)	154	GCMS	<1	ug/L	UKAS
TPH (>C10-40)	188	GC-FID	<1	ug/L	
Xylene Total (Surface Water)	154	GCMS	<1	ug/L	UKAS

Signed : A Harmon

Aoife Harmon - Laboratory Supervisor

Date : 03/12/2020

Acc. : Accredited Parameters by ISO/IEC 17025:2017
PVL - Parametric Value Limit as per EU (Drinking water) Regulations (SI 122 2014)
For bacterial analysis a result of 0 means none detected in volume examined
All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of Fitz Scientific
Results contained in this report relate only to the samples tested (P) : Presumptive Results

ilac-MRA UKAS TESTING 2802

** : The test result for this parameter may be invalid as it has exceeded the recommended holding time (BS EN ISO 5667-3:2018)

Final results will be issued without any estimated uncertainty of measurement being applied. This can be supplied on request.
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Customer supplied information appear in italics.

Customer	***James Kelliher***	***Lab Report Ref. No.***	**1900/369/01**
	Kilsaran Concrete	***Date of Receipt***	**02/12/2020**
	Piercetown	***Sampled On***	***02/12/2020***
	Dunboyne	***Date Testing Commenced***	**02/12/2020**
	Co Meath	***Received or Collected***	**Delivered by Customer**
		Condition on Receipt	**Acceptable**
Customer PO	***HO4598***	***Date of Report***	**18/12/2020**
Customer Ref	***Rathcore***	***Sample Type***	***Surface Water***
Ref 2	***02/12/20 12:05pm***		
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Ammonia (Surface Water)	114	Colorimetry	0.01	mg/L as N	UKAS
Benzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
BOD (Surface Water)	113	Electrometry	<2	mg/L	UKAS
BTEX Total (Surface Water)	154	GCMS	<1	ug/L	UKAS
COD (Surface Water)	107	Colorimetry	<5	mg/L	UKAS
Ethylbenzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
m- & p-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
Nitrate (Surface Water)	103	Colorimetry	7.73	mg/L as N	UKAS
o-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
pH (Surface Water)	110	Electrometry	7.72	pH Units	UKAS
Phosphate (Ortho) Surface Water	117	Colorimetry	0.02	mg/L as P	UKAS
Solids (Total Suspended)	106	Gravimetry	6	mg/L	
Toluene (Surface Water)	154	GCMS	<1	ug/L	UKAS
TPH (>C10-40)	188	GC-FID	<1	ug/L	
Xylene Total (Surface Water)	154	GCMS	<1	ug/L	UKAS

Signed : A Harmon

Aoife Harmon - Laboratory Supervisor

Date : 18/12/2020

Acc. : Accredited Parameters by ISO/IEC 17025:2017
PVL - Parametric Value Limit as per EU (Drinking water) Regulations (SI 122 2014)
For bacterial analysis a result of 0 means none detected in volume examined
All organic results are analysed as received and all results are corrected for dry weight at 104 C
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ilac-MRA UKAS TESTING 2802

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Customer supplied information appear in italics.

Customer	***James Kelliher***	***Lab Report Ref. No.***	**1900/377/01**
	Kilsaran Concrete	***Date of Receipt***	**21/01/2021**
	Piercetown	***Sampled On***	***21/01/2021***
	Dunboyne	***Date Testing Commenced***	**21/01/2021**
	Co Meath	***Received or Collected***	**Delivered by Customer**
		Condition on Receipt	**Acceptable**
Customer PO	***HO4598***	***Date of Report***	**05/02/2021**
Customer Ref	***Rathcore***	***Sample Type***	***Surface Water***
Ref 2	***21/01/21 11:41am***		
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Ammonia (Surface Water)	114	Colorimetry	0.02	mg/L as N	UKAS
Benzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
BOD (Surface Water)	113	Electrometry	<2	mg/L	UKAS
BTEX Total (Surface Water)	154	GCMS	<1	ug/L	UKAS
COD (Surface Water)	107	Colorimetry	<5	mg/L	UKAS
Ethylbenzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
m- & p-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
Nitrate (Surface Water)	103	Colorimetry	7.12	mg/L as N	UKAS
o-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
pH (Surface Water)	110	Electrometry	7.85	pH Units	UKAS
Phosphate (Ortho) Surface Water	117	Colorimetry	0.01	mg/L as P	UKAS
Solids (Total Suspended)	106	Gravimetry	<2	mg/L	
Toluene (Surface Water)	154	GCMS	<1	ug/L	UKAS
TPH (>C10-40)	188	GC-FID	<1	ug/L	
Xylene Total (Surface Water)	154	GCMS	<1	ug/L	UKAS

Signed : A Harmon

Aoife Harmon - Laboratory Supervisor

Date : 05/02/2021

Acc. : Accredited Parameters by ISO/IEC 17025:2017
PVL - Parametric Value Limit as per EU (Drinking water) Regulations (SI 122 2014)
For bacterial analysis a result of 0 means none detected in volume examined
All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of Fitz Scientific
Results contained in this report relate only to the samples tested (P) : Presumptive Results

ilac-MRA UKAS TESTING 2802

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Customer	***James Kelliher***	***Lab Report Ref. No.***	**1900/380/01**
	Kilsaran Concrete	***Date of Receipt***	**22/02/2021**
	Piercetown	***Sampled On***	***22/02/2021***
	Dunboyne	***Date Testing Commenced***	**22/02/2021**
	Co Meath	***Received or Collected***	**Delivered by Customer**
		Condition on Receipt	**Acceptable**
Customer PO	***HO 4598***	***Date of Report***	**10/03/2021**
Customer Ref	***Rathcore***	***Sample Type***	***Surface Water***
Ref 2	***22/02/21 10:38am***		
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Ammonia (Surface Water)	114	Colorimetry	0.10	mg/L as N	UKAS
Benzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
BOD (Surface Water)	113	Electrometry	<2	mg/L	UKAS
BTEX Total (Surface Water)	154	GCMS	<1	ug/L	UKAS
COD (Surface Water)	107	Colorimetry	<5	mg/L	UKAS
Ethylbenzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
m- & p-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
Nitrate (Surface Water)	103	Colorimetry	7.48	mg/L as N	UKAS
o-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
pH (Surface Water)	110	Electrometry	7.63	pH Units	UKAS
Phosphate (Ortho) Surface Water	117	Colorimetry	0.01	mg/L as P	UKAS
Solids (Total Suspended)	106	Gravimetry	9	mg/L	
Toluene (Surface Water)	154	GCMS	<1	ug/L	UKAS
TPH (>C10-40)	188	GC-FID	<1	ug/L	
Xylene Total (Surface Water)	154	GCMS	<1	ug/L	UKAS

Signed : A Harmon

Aoife Harmon - Laboratory Supervisor

Date : 10/03/2021

Acc. : Accredited Parameters by ISO/IEC 17025:2017
PVL - Parametric Value Limit as per EU (Drinking water) Regulations (SI 122 2014)
For bacterial analysis a result of 0 means none detected in volume examined
All organic results are analysed as received and all results are corrected for dry weight at 104 C
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Results contained in this report relate only to the samples tested (P) : Presumptive Results

ilac-MRA UKAS TESTING 2802

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Customer	**James Kelliher** **Kilsaran Concrete** **Piercetown** **Dunboyne** **Co Meath**	***Lab Report Ref. No.***	**1900/389/01**
		Date of Receipt	**29/03/2021**
		Sampled On	**29/03/2021**
		Date Testing Commenced	**29/03/2021**
		Received or Collected	**Delivered by Customer**
		Condition on Receipt	**Acceptable**
Customer PO	**4598**	***Date of Report***	**19/04/2021**
Customer Ref	**Rathcore**	***Sample Type***	**Surface Water**
Ref 2	**29/03/21 10:04am**		
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Ammonia (Surface Water)	114	Colorimetry	0.03	mg/L as N	UKAS
Benzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
BOD (Surface Water)	113	Electrometry	<2	mg/L	UKAS
BTEX Total (Surface Water)	154	GCMS	0	ug/L	UKAS
COD (Surface Water)	107	Colorimetry	<5	mg/L	UKAS
Ethylbenzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
m- & p-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
Nitrate (Surface Water)	103	Colorimetry	7.58	mg/L as N	UKAS
Nitrate as NO3	103	Calculation	33.57	mg/L as NO3	
o-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
pH (Surface Water)	110	Electrometry	7.69	pH Units	UKAS
Phosphate (Ortho as PO4)	117	Calculation	0.06	mg/L as PO4	
Phosphate (Ortho) Surface Water	117	Colorimetry	0.02	mg/L as P	UKAS
Solids (Total Suspended)	106	Gravimetry	23	mg/L	
Toluene (Surface Water)	154	GCMS	<1	ug/L	UKAS
TPH (>C10-40)	188	GC-FID	<1	ug/L	
Xylene Total (Surface Water)	154	GCMS	0	ug/L	UKAS

Signed : A Harmon

Date : 19/04/2021

Aoife Harmon - Laboratory Supervisor

Acc. : Accredited Parameters by ISO/IEC 17025:2017
PVL - Parametric Value Limit as per EU (Drinking water) Regulations (SI 122 2014)
For bacterial analysis a result of 0 means none detected in volume examined
All organic results are analysed as received and all results are corrected for dry weight at 104 C
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Results contained in this report relate only to the samples tested (P) : Presumptive Results

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Customer supplied information appear in italics.

Customer	***James Kelliher***	***Lab Report Ref. No.***	**1900/393/01**
	Kilsaran Concrete	***Date of Receipt***	**21/04/2021**
	Piercetown	***Sampled On***	***21/04/2021***
	Dunboyne	***Date Testing Commenced***	**21/04/2021**
	Co Meath	***Received or Collected***	**Delivered by Customer**
		Condition on Receipt	**Acceptable**
Customer PO	***HO4598***	***Date of Report***	**06/05/2021**
Customer Ref	***Rathcore***	***Sample Type***	***Surface Water***
Ref 2	***21/04/21 10:45am***		
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Ammonia (Surface Water)	114	Colorimetry	0.01	mg/L as N	UKAS
Benzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
BOD (Surface Water)	113	Electrometry	3	mg/L	UKAS
BTEX Total (Surface Water)	154	GCMS	0	ug/L	UKAS
COD (Surface Water)	107	Colorimetry	<5	mg/L	UKAS
Ethylbenzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
m- & p-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
Nitrate (Surface Water)	103	Colorimetry	9.40	mg/L as N	UKAS
Nitrate as NO3	103	Calculation	41.65	mg/L as NO3	
o-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
pH (Surface Water)	110	Electrometry	7.37	pH Units	UKAS
Phosphate (Ortho as PO4)	117	Calculation	<0.01	mg/L as PO4	
Phosphate (Ortho) Surface Water	117	Colorimetry	<0.01	mg/L as P	UKAS
Solids (Total Suspended)	106	Gravimetry	<2	mg/L	
Toluene (Surface Water)	154	GCMS	<1	ug/L	UKAS
TPH (>C10-40)	188	GC-FID	<1	ug/L	
Xylene Total (Surface Water)	154	GCMS	0	ug/L	UKAS

Signed : A Harmon

Date : 06/05/2021

Aoife Harmon - Laboratory Supervisor

Acc. : Accredited Parameters by ISO/IEC 17025:2017
PVL - Parametric Value Limit as per EU (Drinking water) Regulations (SI 122 2014)
For bacterial analysis a result of 0 means none detected in volume examined
All organic results are analysed as received and all results are corrected for dry weight at 104 C
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Results contained in this report relate only to the samples tested (P) : Presumptive Results

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Customer supplied information appear in italics.

Customer	***James Kelliher***	***Lab Report Ref. No.***	**1900/398/01**
	Kilsaran Concrete	***Date of Receipt***	**28/05/2021**
	Piercetown	***Sampled On***	***28/05/2021***
	Dunboyne	***Date Testing Commenced***	**28/05/2021**
	Co Meath	***Received or Collected***	**Delivered by Customer**
		Condition on Receipt	**Acceptable**
Customer PO	***HO4598***	***Date of Report***	**15/06/2021**
Customer Ref	***Rathcore***	***Sample Type***	***Surface Water***
Ref 2	***28/05/21 11:11am***		
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Ammonia (Surface Water)	114	Colorimetry	0.01	mg/L as N	UKAS
Benzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
BOD (Surface Water)	113	Electrometry	<2	mg/L	UKAS
BTEX Total (Surface Water)	154	GCMS	0	ug/L	UKAS
COD (Surface Water)	107	Colorimetry	7	mg/L	UKAS
Ethylbenzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
m- & p-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
Nitrate (Surface Water)	103	Colorimetry	9.83	mg/L as N	UKAS
Nitrate as NO3	103	Calculation	43.54	mg/L as NO3	
o-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
pH (Surface Water)	110	Electrometry	7.53	pH Units	UKAS
Phosphate (Ortho as PO4)	117	Calculation	0.02	mg/L as PO4	
Phosphate (Ortho) Surface Water	117	Colorimetry	0.01	mg/L as P	UKAS
Solids (Total Suspended)	106	Gravimetry	<2	mg/L	
Toluene (Surface Water)	154	GCMS	<1	ug/L	UKAS
TPH (>C10-40)	188	GC-FID	<1	ug/L	
Xylene Total (Surface Water)	154	GCMS	0	ug/L	UKAS

Signed : A Harmon **Date : 15/06/2021**

Aoife Harmon - Laboratory Supervisor

Acc. : Accredited Parameters by ISO/IEC 17025:2017
PVL - Parametric Value Limit as per EU (Drinking water) Regulations (SI 122 2014)
For bacterial analysis a result of 0 means none detected in volume examined
All organic results are analysed as received and all results are corrected for dry weight at 104 C
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Results contained in this report relate only to the samples tested (P) : Presumptive Results

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Customer supplied information appear in italics.

Customer	***James Kelliher***	***Lab Report Ref. No.***	**1900/404/01**
	Kilsaran Concrete	***Date of Receipt***	**16/06/2021**
	Piercetown	***Sampled On***	***16/06/2021***
	Dunboyne	***Date Testing Commenced***	**16/06/2021**
	Co Meath	***Received or Collected***	**Delivered by Customer**
		Condition on Receipt	**Acceptable**
Customer PO	***4298***	***Date of Report***	**30/06/2021**
Customer Ref	***Rathcore***	***Sample Type***	***Surface Water***
Ref 2	***16/06/21 12:02pm***		
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Ammonia (Surface Water)	114	Colorimetry	0.08	mg/L as N	UKAS
Benzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
BOD (Surface Water)	113	Electrometry	<2	mg/L	UKAS
BTEX Total (Surface Water)	154	GCMS	0	ug/L	UKAS
COD (Surface Water)	107	Colorimetry	<5	mg/L	UKAS
Ethylbenzene (Surface Water)	154	GCMS	<1	ug/L	UKAS
m- & p-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
Nitrate (Surface Water)	103	Colorimetry	7.27	mg/L as N	UKAS
Nitrate as NO3	103	Calculation	32.20	mg/L as NO3	
o-Xylene (Surface Water)	154	GCMS	<1	ug/L	UKAS
pH (Surface Water)	110	Electrometry	7.88	pH Units	UKAS
Phosphate (Ortho as PO4)	117	Calculation	0.04	mg/L as PO4	
Phosphate (Ortho) Surface Water	117	Colorimetry	0.01	mg/L as P	UKAS
Solids (Total Suspended)	106	Gravimetry	3	mg/L	
Toluene (Surface Water)	154	GCMS	<1	ug/L	UKAS
TPH (>C10-40)	188	GC-FID	<1	ug/L	
Xylene Total (Surface Water)	154	GCMS	0	ug/L	UKAS

Signed : A Harmon

Date : 30/06/2021

Aoife Harmon - Laboratory Supervisor

Acc. : Accredited Parameters by ISO/IEC 17025:2017
PVL - Parametric Value Limit as per EU (Drinking water) Regulations (SI 122 2014)
For bacterial analysis a result of 0 means none detected in volume examined
All organic results are analysed as received and all results are corrected for dry weight at 104 C
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Customer supplied information appear in italics.

Customer	***James Kelliher***	***Lab Report Ref. No.***	**1900/414/01**
	Kilsaran Concrete	***Date of Receipt***	**20/07/2021**
	Piercetown	***Sampled On***	***20/07/2021***
	Dunboyne	***Date Testing Commenced***	**20/07/2021**
	Co Meath	***Received or Collected***	**Delivered by Customer**
		Condition on Receipt	**Acceptable**
Customer PO	***HO4598***	***Date of Report***	**06/08/2021**
Customer Ref	***Rathcore***	***Sample Type***	***Surface Water***
Ref 2	***20/07/21 11:43***		
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Ammonia (Surface Water)	114	Colorimetry	0.68	mg/L as N	INAB
Benzene (Surface Water)	154	GCMS	<1	ug/L	INAB
BOD (Surface Water)	113	Electrometry	2.8	mg/L	INAB
BTEX Total (Surface Water)	154	GCMS	0	ug/L	INAB
COD (Surface Water)	107	Colorimetry	<5	mg/L	INAB
Ethylbenzene (Surface Water)	154	GCMS	<1	ug/L	INAB
m- & p-Xylene (Surface Water)	154	GCMS	<1	ug/L	INAB
Nitrate (Surface Water)	103	Colorimetry	6.65	mg/L as N	INAB
Nitrate as NO3	103	Calculation	29.45	mg/L as NO3	
o-Xylene (Surface Water)	154	GCMS	<1	ug/L	INAB
pH (Surface Water)	110	Electrometry	7.81	pH Units	INAB
Phosphate (Ortho as PO4)	117	Calculation	0.02	mg/L as PO4	
Phosphate (Ortho) Surface Water	117	Colorimetry	0.01	mg/L as P	INAB
Solids (Total Suspended)	106	Gravimetry	<2	mg/L	
Toluene (Surface Water)	154	GCMS	<1	ug/L	INAB
TPH (>C10-40)	188	GC-FID	<1	ug/L	
Xylene Total (Surface Water)	154	GCMS	0	ug/L	INAB

Signed : A Harmon

Aoife Harmon - Laboratory Supervisor

Date : 06/08/2021

Acc. : Accredited Parameters by ISO/IEC 17025:2017
PVL - Parametric Value Limit as per EU (Drinking water) Regulations (SI 122 2014)
For bacterial analysis a result of 0 means none detected in volume examined
All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of Fitz Scientific
Results contained in this report relate only to the samples tested (P) : Presumptive Results

** : The test result for this parameter may be invalid as it has exceeded the recommended holding time (BS EN ISO 5667-3:2018)

Final results will be issued without any estimated uncertainty of measurement being applied. This can be supplied on request.
Fitz Scientific maintain all customer information in the strictest confidence which is legally enforceable.

FITZ SCIENTIFIC
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A copy of this certificate is available on www.fitzsci.ie

Customer supplied information appear in italics.

Customer	***James Kelliher***	***Lab Report Ref. No.***	**1900/419/01**
	Kilsaran Concrete	***Date of Receipt***	**27/08/2021**
	Piercetown	***Sampled On***	***27/08/2021***
	Dunboyne	***Date Testing Commenced***	**27/08/2021**
	Co Meath	***Received or Collected***	**Delivered by Customer**
		Condition on Receipt	**Acceptable**
Customer PO	***HO4598***	***Date of Report***	**09/09/2021**
Customer Ref	***Rathcore***	***Sample Type***	***Surface Water***
Ref 2	***27/08/21 09:48***		
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Ammonia (Surface Water)	114	Colorimetry	<0.01	mg/L as N	INAB
Benzene (Surface Water)	154	GCMS	<1	ug/L	INAB
BOD (Surface Water)	113	Electrometry	<2	mg/L	INAB
BTEX Total (Surface Water)	154	GCMS	0	ug/L	INAB
COD (Surface Water)	107	Colorimetry	<5	mg/L	INAB
Ethylbenzene (Surface Water) m-	154	GCMS	<1	ug/L	INAB
& p-Xylene (Surface Water)	154	GCMS	<1	ug/L	INAB
Nitrate (Surface Water)	103	Colorimetry	6.05	mg/L as N	INAB
Nitrate as NO3	103	Calculation	26.79	mg/L as NO3	
o-Xylene (Surface Water)	154	GCMS	<1	ug/L	INAB
pH (Surface Water)	110	Electrometry	7.81	pH Units	INAB
Phosphate (Ortho as PO4)	117	Calculation	0.02	mg/L as PO4	
Phosphate (Ortho) Surface Water	117	Colorimetry	0.01	mg/L as P	INAB
Solids (Total Suspended)	106	Gravimetry	<2	mg/L	
Toluene (Surface Water)	154	GCMS	<1	ug/L	INAB
TPH (>C10-40)	188	GC-FID	<1	ug/L	
Xylene Total (Surface Water)	154	GCMS	0	ug/L	INAB

Signed : Katherine McQuillan

Katherine McQuillan - Technical Manager

Date : 09/09/2021

Acc. : Accredited Parameters by ISO/IEC 17025:2017
PVL - Parametric Value Limit as per EU (Drinking water) Regulations (SI 122 2014)
For bacterial analysis a result of 0 means none detected in volume examined
All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of Fitz Scientific
Results contained in this report relate only to the samples tested (P) : Presumptive Results

** : The test result for this parameter may be invalid as it has exceeded the recommended holding time (BS EN ISO 5667-3:2018)

Final results will be issued without any estimated uncertainty of measurement being applied. This can be supplied on request.
Fitz Scientific maintain all customer information in the strictest confidence which is legally enforceable.

BHP/AC/F115v2

TEST REPORT NO: 208678 Issue 2

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 21/10/1142
Quote Ref: QC005806
Order No: N/A
Sales Order: 119218
Date Received: 07/10/2021
Date Sampled: 07/10/2021
Date Completed: 19/10/2021
Sample Type: Surface Water

Testing
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Consulting

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Thomondgate
Limerick
Tel: +353 61 455399
EMail:dervlapurcell@bhp.ie

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly_Surface Water
Client Ref: Quarry Outlet

Test		Units	Results	Customer Limits	Date Analysed	Method
B.O.D.	Acc.	mg/L	0.7		14/10/2021	BHP AC 005
C.O.D.	Acc.	mg/L	<15		14/10/2021	BHP AC 006
Total Suspended Solids	Acc.	mg/L	<5		12/10/2021	BHP AC 012
pH		pH Units	7.98		07/10/2021	BHP AC 067
Total Petroleum Hydrocarbons (>C_6-C_{40})	*	mg/L	<0.01		13/10/2021	1670
Nitrate (as NO_3)	Acc.	mg/L	30		07/10/2021	BHP AC 019
OrthoPhosphate (as P)	Acc.	mg/L	<0.065		07/10/2021	BHP AC 019
OrthoPhosphate (as PO_4)	Acc.	mg/L	<0.2		07/10/2021	BHP AC 019
Benzene	*	mg/L	<0.001		15/10/2021	1760
Toluene	*	mg/L	<0.001		15/10/2021	1760
Ethyl Benzene	*	mg/L	<0.001		15/10/2021	1760
m & p-Xylene	*	mg/L	<0.001		15/10/2021	1760
o-Xylene	*	mg/L	<0.001		15/10/2021	1760
Total Ammonia (as N)	Acc.	mg/L	<0.1	0.1 -500	09/10/2021	BHP AC 095
Nitrate (as NO_3-N)	Acc.	mg/L	6.8		07/10/2021	BHP AC 019

Authorised by: Dervla Purcell, Laboratory Manager
Date Authorised: 03/11/2021
[Supplement to previous issue]

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
***** Subcontracted to an approved accredited laboratory
****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

Reason for Re-issue: Added Nitrate as N

BHP/AC/F115v2

TEST REPORT NO: 210421

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 21/11/1194
Quote Ref: QC005806
Order No: N/A
Sales Order: 121676
Date Received: 08/11/2021
Date Sampled: 08/11/2021
Date Completed: 16/11/2021
Sample Type: Surface Water

Testing
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Consulting

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FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly_Surface Water
Client Ref: Quarry Discharge

Test		Units	Results	Customer Limits	Date Analysed	Method
B.O.D.	Acc.	mg/L	<0.1		11/11/2021	BHP AC 005
C.O.D.	Acc.	mg/L	<15		11/11/2021	BHP AC 006
Total Suspended Solids	Acc.	mg/L	<10		09/11/2021	BHP AC 012
pH		pH Units	7.93		08/11/2021	BHP AC 067
Total Petroleum Hydrocarbons (>C_6-C_{40})	*	mg/L	<0.01		15/11/2021	1670
Nitrate (as NO_3)	Acc.	mg/L	33		08/11/2021	BHP AC 019
OrthoPhosphate (as P)	Acc.	mg/L	<0.065		08/11/2021	BHP AC 019
OrthoPhosphate (as PO_4)	Acc.	mg/L	<0.2		08/11/2021	BHP AC 019
Benzene	*	mg/L	<0.0001		12/11/2021	1760
Toluene	*	mg/L	<0.0001		12/11/2021	1760
Ethyl Benzene	*	mg/L	<0.0001		12/11/2021	1760
m & p-Xylene	*	mg/L	<0.0001		12/11/2021	1760
o-Xylene	*	mg/L	<0.0001		12/11/2021	1760
Total Ammonia (as N)	Acc.	mg/L	<0.1	0.1 -500	13/11/2021	BHP AC 095
Nitrate (as NO_3-N)	Acc.	mg/L	7.4		08/11/2021	BHP AC 019

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 22/11/2021

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
***** Subcontracted to an approved accredited laboratory
****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

BHP/AC/F115v2

TEST REPORT NO: 211936

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 21/12/0428
Quote Ref: QC005806
Order No: N/A
Sales Order: 123809
Date Received: 02/12/2021
Date Sampled: 02/12/2021
Date Completed: 14/12/2021
Sample Type: Surface Water

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FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly_Surface Water
Client Ref: Quarry Discharge

Test		Units	Results	Customer Limits	Date Analysed	Method
B.O.D.	Acc.	mg/L	<0.1		09/12/2021	BHP AC 005
C.O.D.	Acc.	mg/L	<15		09/12/2021	BHP AC 006
Total Suspended Solids	Acc.	mg/L	<5		03/12/2021	BHP AC 012
pH		pH Units	7.79		02/12/2021	BHP AC 067
Total Petroleum Hydrocarbons (>C_6-C_{40})	*	mg/L	<0.01		13/12/2021	1670
Nitrate (as NO_3)	Acc.	mg/L	35		02/12/2021	BHP AC 019
OrthoPhosphate (as P)	Acc.	mg/L	<0.065		02/12/2021	BHP AC 019
OrthoPhosphate (as PO_4)	Acc.	mg/L	<0.2		02/12/2021	BHP AC 019
Benzene	*	mg/L	<0.001		10/12/2021	1760
Toluene	*	mg/L	<0.001		10/12/2021	1760
Ethyl Benzene	*	mg/L	<0.001		10/12/2021	1760
m & p-Xylene	*	mg/L	<0.001		10/12/2021	1760
o-Xylene	*	mg/L	<0.001		10/12/2021	1760
Total Ammonia (as N)	Acc.	mg/L	<0.1	0.1 -500	11/12/2021	BHP AC 095
Nitrate (as NO_3-N)	Acc.	mg/L	7.9		02/12/2021	BHP AC 019

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 15/12/2021

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
***** Subcontracted to an approved accredited laboratory
****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

BHP/AC/F115v2

TEST REPORT NO: 213397

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 22/01/0420
Quote Ref: QC005806
Order No: N/A
Sales Order: 125896
Date Received: 10/01/2022
Date Sampled: 10/01/2022
Date Completed: 18/01/2022
Sample Type: Surface Water

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly Surface Water
Client Ref: Quarry Discharge

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Test		Units	Results	Customer Limits	Date Analysed	Method
B.O.D.	Acc.	mg/L	<0.1		13/01/2022	BHP AC 005
C.O.D.	Acc.	mg/L	<15		13/01/2022	BHP AC 006
Total Suspended Solids	Acc.	mg/L	<5		12/01/2022	BHP AC 012
pH		pH Units	7.75		10/01/2022	BHP AC 067
Total Petroleum Hydrocarbons (>C_6-C_{40})	*	mg/L	<0.01		17/01/2022	1670
Nitrate (as NO_3)	Acc.	mg/L	31		11/01/2022	BHP AC 019
OrthoPhosphate (as P)	Acc.	mg/L	<0.065		11/01/2022	BHP AC 019
OrthoPhosphate (as PO_4)	Acc.	mg/L	<0.2		11/01/2022	BHP AC 019
Benzene	*	mg/L	<0.001		14/01/2022	1760
Toluene	*	mg/L	<0.001		14/01/2022	1760
Ethyl Benzene	*	mg/L	<0.001		14/01/2022	1760
m & p-Xylene	*	mg/L	<0.001		14/01/2022	1760
o-Xylene	*	mg/L	<0.001		14/01/2022	1760
Total Ammonia (as N)	Acc.	mg/L	<0.1	0.1 -500	15/01/2022	BHP AC 095
Nitrate (as NO_3-N)	Acc.	mg/L	7.0		11/01/2022	BHP AC 019

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 24/01/2022

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
***** Subcontracted to an approved accredited laboratory
****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

BHP/AC/F115v2

TEST REPORT NO: 214854

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 22/02/0888
Quote Ref: QC005806
Order No: N/A
Sales Order: 127982
Date Received: 03/02/2022
Date Sampled: 03/02/2022
Date Completed: 15/02/2022
Sample Type: Surface Water

Testing
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Consulting

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FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly_Surface Water
Client Ref: Quarry Discharge

Test		Units	Results	Customer Limits	Date Analysed	Method
B.O.D.	Acc.	mg/L	<0.1		10/02/2022	BHP AC 005
C.O.D.	Acc.	mg/L	19		10/02/2022	BHP AC 006
Total Suspended Solids	Acc.	mg/L	<5		08/02/2022	BHP AC 012
pH		pH Units	7.58		03/02/2022	BHP AC 067
Total Petroleum Hydrocarbons (>C_6-C_{40})	*	mg/L	<0.01		11/02/2022	1670
Nitrate (as NO_3)	Acc.	mg/L	41		03/02/2022	BHP AC 019
OrthoPhosphate (as P)	Acc.	mg/L	<0.065		03/02/2022	BHP AC 019
OrthoPhosphate (as PO_4)	Acc.	mg/L	<0.2		03/02/2022	BHP AC 019
Benzene	*	mg/L	<0.001		15/02/2022	1760
Toluene	*	mg/L	<0.001		15/02/2022	1760
Ethyl Benzene	*	mg/L	<0.001		15/02/2022	1760
m & p-Xylene	*	mg/L	<0.001		15/02/2022	1760
o-Xylene	*	mg/L	<0.001		15/02/2022	1760
Total Ammonia (as N)	Acc.	mg/L	<0.1		08/02/2022	BHP AC 095
Nitrate (as NO_3-N)	Acc.	mg/L	9.3		03/02/2022	BHP AC 019

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 16/02/2022

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
***** Subcontracted to an approved accredited laboratory
****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

BHP/AC/F115v2

TEST REPORT NO: 216678

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 22/03/1333
Quote Ref: QC005806
Order No: N/A
Sales Order: 130479
Date Received: 07/03/2022
Date Sampled: 07/03/2022
Date Completed: 15/03/2022
Sample Type: Surface Water

Testing
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FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly_Surface Water
Client Ref: Quarry Discharge

Test		Units	Results	Customer Limits	Date Analysed	Method
B.O.D.	Acc.	mg/L	0.2		10/03/2022	BHP AC 005
C.O.D.	Acc.	mg/L	<15		10/03/2022	BHP AC 006
Total Suspended Solids	Acc.	mg/L	<5		09/03/2022	BHP AC 012
pH		pH Units	7.41		07/03/2022	BHP AC 067
Total Petroleum Hydrocarbons (>C_6-C_{40})	*	mg/L	<0.01		11/03/2022	1670
Nitrate (as NO_3)	Acc.	mg/L	32		07/03/2022	BHP AC 019
OrthoPhosphate (as P)	Acc.	mg/L	<0.065		07/03/2022	BHP AC 019
OrthoPhosphate (as PO_4)	Acc.	mg/L	<0.2		07/03/2022	BHP AC 019
Benzene	*	mg/L	<0.001		11/03/2022	1760
Toluene	*	mg/L	<0.001		11/03/2022	1760
Ethyl Benzene	*	mg/L	<0.001		11/03/2022	1760
m & p-Xylene	*	mg/L	<0.001		11/03/2022	1760
o-Xylene	*	mg/L	<0.001		11/03/2022	1760
Total Ammonia (as N)	Acc.	mg/L	<0.1		09/03/2022	BHP AC 095
Nitrate (as NO_3-N)	Acc.	mg/L	7.2		07/03/2022	BHP AC 019

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 20/03/2022

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
***** Subcontracted to an approved accredited laboratory
****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

BHP/AC/F115v2

TEST REPORT NO: 219423

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 22/04/0898
Quote Ref: QC005806
Order No: N/A
Sales Order: 133802
Date Received: 06/04/2022
Date Sampled: 06/04/2022
Date Completed: 14/04/2022
Sample Type: Surface Water

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly_Surface Water
Client Ref: Quarry Discharge

Testing
Analysing
Consulting

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Tel: +353 61 455399
EMail:dervlapurcell@bhp.ie

Test		Units	Results	Customer Limits	Date Analysed	Method
B.O.D.	Acc.	mg/L	<0.1		07/04/2022	BHP AC 005
C.O.D.	Acc.	mg/L	<15		14/04/2022	BHP AC 006
Total Suspended Solids	Acc.	mg/L	<5		09/04/2022	BHP AC 012
pH		pH Units	7.68		06/04/2022	BHP AC 067
Total Petroleum Hydrocarbons (>C_6-C_{40})	*	mg/L	<0.01		11/04/2022	1670
Nitrate (as NO_3)	Acc.	mg/L	35		08/04/2022	BHP AC 019
OrthoPhosphate (as P)		mg/L	<0.065		07/04/2022	BHP AC 019
OrthoPhosphate (as PO_4)		mg/L	<0.2		07/04/2022	BHP AC 019
Benzene	*	mg/L	<0.001		11/04/2022	1760
Toluene	*	mg/L	<0.001		11/04/2022	1760
Ethyl Benzene	*	mg/L	<0.001		11/04/2022	1760
m & p-Xylene	*	mg/L	<0.001		11/04/2022	1760
o-Xylene	*	mg/L	<0.001		11/04/2022	1760
Total Ammonia (as N)	Acc.	mg/L	<0.1		12/04/2022	BHP AC 095
Nitrate (as NO_3-N)		mg/L	8.0		08/04/2022	BHP AC 019

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 22/04/2022

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
***** Subcontracted to an approved accredited laboratory
****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

BHP/AC/F115v2

TEST REPORT NO: 221195

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 22/05/0933
Quote Ref: QC005806
Order No: N/A
Sales Order: 136172
Date Received: 05/05/2022
Date Sampled: 05/05/2022
Date Completed: 17/05/2022
Sample Type: Surface Water

Testing
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Tel: +353 61 455399
EMail:dervlapurcell@bhp.ie

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly_Surface Water
Client Ref: Quarry Discharge

Test		Units	Results	Customer Limits	Date Analysed	Method
B.O.D.	Acc.	mg/L	<0.1		12/05/2022	BHP AC 005
C.O.D.	Acc.	mg/L	<15		11/05/2022	BHP AC 006
Total Suspended Solids	Acc.	mg/L	<5		10/05/2022	BHP AC 012
pH		pH Units	7.82		05/05/2022	BHP AC 067
Total Petroleum Hydrocarbons (>C_6-C_{40})	*	mg/L	<0.01		11/05/2022	1670
Nitrate (as NO_3)	Acc.	mg/L	43		06/05/2022	BHP AC 019
OrthoPhosphate (as P)		mg/L	<0.065		06/05/2022	BHP AC 019
OrthoPhosphate (as PO_4)		mg/L	<0.2		06/05/2022	BHP AC 019
Benzene	*	mg/L	<0.001		11/05/2022	1760
Toluene	*	mg/L	<0.001		11/05/2022	1760
Ethyl Benzene	*	mg/L	<0.001		11/05/2022	1760
m & p-Xylene	*	mg/L	<0.001		11/05/2022	1760
o-Xylene	*	mg/L	<0.001		11/05/2022	1760
Total Ammonia (as N)	Acc.	mg/L	<0.1		09/05/2022	BHP AC 095
Nitrate (as NO_3-N)		mg/L	9.6		06/05/2022	BHP AC 019

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 22/05/2022

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
***** Subcontracted to an approved accredited laboratory
****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

BHP/AC/F115v2

TEST REPORT NO: 224356

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 22/06/1595
Quote Ref: QC005806
Order No: N/A
Sales Order: 139942
Date Received: 08/06/2022
Date Sampled: 08/06/2022
Date Completed: 21/06/2022
Sample Type: Surface Water

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly_Surface Water
Client Ref: Quarry Discharge

Testing
Analysing
Consulting

BHP Laboratories
New Road
Thomondgate
Limerick
Tel: +353 61 455399
EMail:dervlapurcell@bhp.ie

Test		Units	Results	Customer Limits	Date Analysed	Method
B.O.D.	Acc.	mg/L	0.1		16/06/2022	BHP AC 005
C.O.D.	Acc.	mg/L	<15		16/06/2022	BHP AC 006
Total Suspended Solids	Acc.	mg/L	<5		09/06/2022	BHP AC 012
pH		pH Units	7.70		08/06/2022	BHP AC 067
Total Petroleum Hydrocarbons (>C_6-C_{40})	*	mg/L	<0.01		16/06/2022	1670
Nitrate (as NO_3)	Acc.	mg/L	37		09/06/2022	BHP AC 019
OrthoPhosphate (as P)		mg/L	<0.065		09/06/2022	BHP AC 019
OrthoPhosphate (as PO_4)		mg/L	<0.2		09/06/2022	BHP AC 019
Benzene	*	mg/L	<0.0001		14/06/2022	1760
Toluene	*	mg/L	<0.0001		14/06/2022	1760
Ethyl Benzene	*	mg/L	<0.0001		14/06/2022	1760
m & p-Xylene	*	mg/L	<0.0001		14/06/2022	1760
o-Xylene	*	mg/L	<0.0001		14/06/2022	1760
Total Ammonia (as N)	Acc.	mg/L	<0.1		13/06/2022	BHP AC 095
Nitrate (as NO_3-N)		mg/L	8.3		09/06/2022	BHP AC 019

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 29/06/2022

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
***** Subcontracted to an approved accredited laboratory
****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

BHP/AC/F115v2

TEST REPORT NO: 226677

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 22/07/2530
Quote Ref: QC005806
Order No: N/A
Sales Order: 142967
Date Received: 13/07/2022
Date Sampled: 13/07/2022
Date Completed: 21/07/2022
Sample Type: Surface Water

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly_Surface Water
Client Ref: Quarry Discharge

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Test		Units	Results	Customer Limits	Date Analysed	Method
B.O.D.	Acc.	mg/L	0.7		14/07/2022	BHP AC 005
C.O.D.	Acc.	mg/L	<15		14/07/2022	BHP AC 006
Total Suspended Solids	Acc.	mg/L	<5		19/07/2022	BHP AC 012
pH		pH Units	7.51		13/07/2022	BHP AC 067
Total Petroleum Hydrocarbons (>C_6-C_{40})	*	mg/L	<0.01		21/07/2022	1670
Nitrate (as NO_3)	Acc.	mg/L	35		14/07/2022	BHP AC 019
OrthoPhosphate (as P)		mg/L	<0.065		15/07/2022	BHP AC 019
OrthoPhosphate (as PO_4)		mg/L	<0.2		14/07/2022	BHP AC 019
Benzene	*	mg/L	<0.001		21/07/2022	1760
Toluene	*	mg/L	<0.001		21/07/2022	1760
Ethyl Benzene	*	mg/L	<0.001		21/07/2022	1760
m & p-Xylene	*	mg/L	<0.001		21/07/2022	1760
o-Xylene	*	mg/L	<0.001		21/07/2022	1760
Total Ammonia (as N)	Acc.	mg/L	<0.1		18/07/2022	BHP AC 095
Nitrate (as NO_3-N)		mg/L	7.9		14/07/2022	BHP AC 019

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 24/07/2022

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
***** Subcontracted to an approved accredited laboratory
****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

BHP/AC/F115v2

TEST REPORT NO: 229189

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 22/08/1350
Quote Ref: QC005806
Order No: N/A
Sales Order: 145937
Date Received: 08/08/2022
Date Sampled: 08/08/2022
Date Completed: 16/08/2022
Sample Type: Surface Water

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Consulting

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EMail:dervlapurcell@bhp.ie

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly_Surface Water
Client Ref: Quarry Discharge

Test		Units	Results	Customer Limits	Date Analysed	Method
B.O.D.	Acc.	mg/L	<0.1		11/08/2022	BHP AC 005
C.O.D.	Acc.	mg/L	<15		11/08/2022	BHP AC 006
Total Suspended Solids	Acc.	mg/L	<5		10/08/2022	BHP AC 012
pH		pH Units	7.84		08/08/2022	BHP AC 067
Total Petroleum Hydrocarbons (>C_6-C_{40})	*	mg/L	<0.01		16/08/2022	1670
Nitrate (as NO_3)	Acc.	mg/L	40		12/08/2022	BHP AC 019
OrthoPhosphate (as P)		mg/L	<0.065		12/08/2022	BHP AC 019
OrthoPhosphate (as PO_4)		mg/L	<0.2		12/08/2022	BHP AC 019
Benzene	*	mg/L	<0.001		15/08/2022	1760
Toluene	*	mg/L	<0.001		15/08/2022	1760
Ethyl Benzene	*	mg/L	<0.001		15/08/2022	1760
m & p-Xylene	*	mg/L	<0.001		15/08/2022	1760
o-Xylene	*	mg/L	<0.001		15/08/2022	1760
Total Ammonia (as N)	Acc.	mg/L	<0.1		15/08/2022	BHP AC 095
Nitrate (as NO_3-N)		mg/L	8.9		12/08/2022	BHP AC 019

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 30/08/2022

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
***** Subcontracted to an approved accredited laboratory
****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

TEST REPORT NO: 233103

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 22/09/1425
Quote Ref: QC005806
Order No: N/A
Sales Order: 150482
Date Received: 07/09/2022
Date Sampled: 07/09/2022
Date Completed: 16/09/2022
Sample Type: Surface Water

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly_Surface Water
Client Ref: Quarry Discharge

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EMail:dervlapurcell@bhp.ie

Test		Units	Results	Customer Limits	Date Analysed	Method
B.O.D.	Acc.	mg/L	0.3		08/09/2022	BHP AC 005
C.O.D.	Acc.	mg/L	<15		08/09/2022	BHP AC 006
Total Suspended Solids	Acc.	mg/L	<10		13/09/2022	BHP AC 012
pH		pH Units	7.77		07/09/2022	BHP AC 067
Total Petroleum Hydrocarbons (>C_6-C_{40})	*	mg/L	<0.01		16/09/2022	1670
Nitrate (as NO_3)	Acc.	mg/L	40		08/09/2022	BHP AC 019
OrthoPhosphate (as P)		mg/L	<0.065		13/09/2022	BHP AC 019
OrthoPhosphate (as PO_4)		mg/L	<0.2		13/09/2022	BHP AC 019
Benzene	*	mg/L	<0.001		15/09/2022	1760
Toluene	*	mg/L	<0.001		15/09/2022	1760
Ethyl Benzene	*	mg/L	<0.001		15/09/2022	1760
m & p-Xylene	*	mg/L	<0.001		15/09/2022	1760
o-Xylene	*	mg/L	<0.001		15/09/2022	1760
Total Ammonia (as N)	Acc.	mg/L	<0.1		12/09/2022	BHP AC 095
Nitrate (as NO_3-N)		mg/L	9.1		08/09/2022	BHP AC 019

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 28/09/2022

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
***** Subcontracted to an approved accredited laboratory
****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

BHP/AC/F115v2

TEST REPORT NO: 236021

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 22/10/1061
Quote Ref: QC005806
Order No: N/A
Sales Order: 154049
Date Received: 06/10/2022
Date Sampled: 06/10/2022
Date Completed: 18/10/2022
Sample Type: Surface Water

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FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly_Surface Water
Client Ref: Quarry discharge

Test		Units	Results	Customer Limits	Date Analysed	Method
B.O.D.	Acc.	mg/L	<0.1		13/10/2022	BHP AC 005
C.O.D.	Acc.	mg/L	<15		13/10/2022	BHP AC 006
Total Suspended Solids	Acc.	mg/L	<5		12/10/2022	BHP AC 012
pH		pH Units	7.53		06/10/2022	BHP AC 067
Total Petroleum Hydrocarbons (>C_6-C_{40})	*	mg/L	<0.01		18/10/2022	1670
Nitrate (as NO_3)	Acc.	mg/L	39		07/10/2022	BHP AC 019
OrthoPhosphate (as P)		mg/L	0.29		07/10/2022	BHP AC 019
OrthoPhosphate (as PO_4)		mg/L	0.89		07/10/2022	BHP AC 019
Benzene	*	mg/L	<0.01		18/10/2022	1760
Toluene	*	mg/L	<0.001		18/10/2022	1760
Ethyl Benzene	*	mg/L	<0.001		18/10/2022	1760
m & p-Xylene	*	mg/L	<0.001		18/10/2022	1760
o-Xylene	*	mg/L	<0.001		18/10/2022	1760
Total Ammonia (as N)	Acc.	mg/L	<0.1		17/10/2022	BHP AC 095
Nitrate (as NO_3-N)		mg/L	8.8		07/10/2022	BHP AC 019

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 24/10/2022

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
***** Subcontracted to an approved accredited laboratory
****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

BHP/AC/F115v2

TEST REPORT NO: 237877

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 22/11/1166
Quote Ref: QC005806
Order No: N/A
Sales Order: 156513
Date Received: 07/11/2022
Date Sampled: 07/11/2022
Date Completed: 16/11/2022
Sample Type: Surface Water

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BHP Laboratories
New Road
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Limerick
Tel: +353 61 455399
EMail:dervlapurcell@bhp.ie

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly_Surface Water
Client Ref: Quarry Discharge

Test		Units	Results	Customer Limits	Date Analysed	Method
B.O.D.	Acc.	mg/L	0.5		10/11/2022	BHP AC 005
C.O.D.	Acc.	mg/L	<15		09/11/2022	BHP AC 006
Total Suspended Solids	Acc.	mg/L	<10		09/11/2022	BHP AC 012
pH		pH Units	7.76		07/11/2022	BHP AC 067
Total Petroleum Hydrocarbons (>C_6-C_{40})	*	mg/L	<0.01		14/11/2022	1670
Nitrate (as NO_3)	Acc.	mg/L	39		07/11/2022	BHP AC 019
OrthoPhosphate (as P)		mg/L	<0.065		07/11/2022	BHP AC 019
OrthoPhosphate (as PO_4)		mg/L	<0.2		07/11/2022	BHP AC 019
Benzene	*	mg/L	<0.0001		16/11/2022	1760
Toluene	*	mg/L	<0.0001		16/11/2022	1760
Ethyl Benzene	*	mg/L	<0.0001		16/11/2022	1760
m & p-Xylene	*	mg/L	<0.0001		16/11/2022	1760
o-Xylene	*	mg/L	<0.0001		16/11/2022	1760
Total Ammonia (as N)	Acc.	mg/L	<0.1		08/11/2022	BHP AC 095
Nitrate (as NO_3-N)		mg/L	8.9		07/11/2022	BHP AC 019

Authorised by: Dervla Purcell
Laboratory Manager
Date Authorised: 22/11/2022

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
***** Subcontracted to an approved accredited laboratory
****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

TEST REPORT NO: 242821

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 22/12/1563
Quote Ref: QC005806
Order No: N/A
Sales Order: 162100
Date Received: 07/12/2022
Date Sampled: 07/12/2022
Date Completed: 16/12/2022
Sample Type: Surface Water

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly_Surface Water
Client Ref: Quarry Discharge

Testing
Analysing
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BHP Laboratories
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Thomondgate
Limerick
Tel: +353 61 455399
EMail:dervlapurcell@bhp.ie

Test		Units	Results	Customer Limits	Date Analysed	Method
B.O.D.	Acc.	mg/L	0.2		08/12/2022	BHP AC 005
C.O.D.	Acc.	mg/L	<15		08/12/2022	BHP AC 006
Total Suspended Solids	Acc.	mg/L	<5		09/12/2022	BHP AC 012
pH		pH Units	7.52		07/12/2022	BHP AC 067
Total Petroleum Hydrocarbons ($>C_6$-C_{40})	*	mg/L	<0.01		16/12/2022	1670
Nitrate (as NO_3)	Acc.	mg/L	48		08/12/2022	BHP AC 019
OrthoPhosphate (as P)		mg/L	<0.065		08/12/2022	BHP AC 019
OrthoPhosphate (as PO_4)		mg/L	<0.2		08/12/2022	BHP AC 019
Benzene	*	mg/L	<0.001		14/12/2022	1760
Toluene	*	mg/L	<0.001		14/12/2022	1760
Ethyl Benzene	*	mg/L	<0.001		14/12/2022	1760
m & p-Xylene	*	mg/L	<0.001		14/12/2022	1760
o-Xylene	*	mg/L	<0.001		14/12/2022	1760
Total Ammonia (as N)	Acc.	mg/L	<0.1		16/12/2022	BHP AC 095
Nitrate (as NO_3-N)		mg/L	11		08/12/2022	BHP AC 019

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 21/12/2022

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
***** Subcontracted to an approved accredited laboratory
****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

BHP/AC/F115v2

TEST REPORT NO: 246178

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 23/01/1361
Quote Ref: QC005806
Order No: N/A
Sales Order: 165875
Date Received: 12/01/2023
Date Sampled: 12/01/2023
Date Completed: 24/01/2023
Sample Type: Surface Water

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Tel: +353 61 455399
EMail:dervlapurcell@bhp.ie

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly_Surface Water
Client Ref: Quarry Discharge

Test		Units	Results	Customer Limits	Date Analysed	Method
B.O.D.	Acc.	mg/L	0.2		19/01/2023	BHP AC 005
C.O.D.	Acc.	mg/L	<15		18/01/2023	BHP AC 006
Total Suspended Solids	Acc.	mg/L	<5		17/01/2023	BHP AC 012
pH		pH Units	7.53		12/01/2023	BHP AC 067
Total Petroleum Hydrocarbons (>C_6-C_{40})	*	mg/L	<0.01		23/01/2023	1670
Nitrate (as NO_3)		mg/L	5.5		13/01/2023	BHP AC 095
OrthoPhosphate (as P)	Acc.	mg/L	<0.01		13/01/2023	BHP AC 095
OrthoPhosphate (as PO_4)		mg/L	<0.031		13/01/2023	BHP AC 095
Benzene	*	mg/L	<0.001		20/01/2023	1760
Toluene	*	mg/L	<0.001		20/01/2023	1760
Ethyl Benzene	*	mg/L	<0.001		20/01/2023	1760
m & p-Xylene	*	mg/L	<0.001		20/01/2023	1760
o-Xylene	*	mg/L	<0.001		20/01/2023	1760
Total Ammonia (as N)	Acc.	mg/L	<0.1		17/01/2023	BHP AC 095
Nitrate (as NO_3-N)		mg/L	1.2		13/01/2023	BHP AC 095

Authorised by: Dervla Purcell, Laboratory Manager **Date Authorised:** 06/02/2023

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
***** Subcontracted to an approved accredited laboratory
****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

BHP/AC/F115v2

TEST REPORT NO: 248002

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 23/02/1972
Quote Ref: QC005806
Order No: N/A
Sales Order: 168193
Date Received: 09/02/2023
Date Sampled: 09/02/2023
Date Completed: 21/02/2023
Sample Type: Surface Water

Testing
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Limerick
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EMail:dervlapurcell@bhp.ie

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly_Surface Water
Client Ref: Quarry Discharge

Test		Units	Results	Customer Limits	Date Analysed	Method
B.O.D.	Acc.	mg/L	0.1		16/02/2023	BHP AC 005
C.O.D.	Acc.	mg/L	<15		16/02/2023	BHP AC 006
Total Suspended Solids	Acc.	mg/L	<10		11/02/2023	BHP AC 012
pH		pH Units	7.53		09/02/2023	BHP AC 067
Total Petroleum Hydrocarbons (>C_6-C_{40})	*	mg/L	<0.01		20/02/2023	1670
Nitrate (as NO_3)	Acc.	mg/L	43		10/02/2023	BHP AC 019
OrthoPhosphate (as P)		mg/L	<0.065		10/02/2023	BHP AC 019
OrthoPhosphate (as PO_4)		mg/L	<0.2		10/02/2023	BHP AC 019
Benzene	*	mg/L	<0.001		17/02/2023	1760
Toluene	*	mg/L	<0.001		17/02/2023	1760
Ethyl Benzene	*	mg/L	<0.001		17/02/2023	1760
m & p-Xylene	*	mg/L	<0.001		17/02/2023	1760
o-Xylene	*	mg/L	<0.001		17/02/2023	1760
Total Ammonia (as N)	Acc.	mg/L	<0.1		14/02/2023	BHP AC 095
Nitrate (as NO_3-N)		mg/L	9.8		10/02/2023	BHP AC 019

Authorised by: Dervla Purcell
Laboratory Manager
Date Authorised: 22/02/2023

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
***** Subcontracted to an approved accredited laboratory
****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

BHP/AC/F115v2

TEST REPORT NO: 250996

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 23/03/2489
Quote Ref: QC005806
Order No: N/A
Sales Order: 171867
Date Received: 09/03/2023
Date Sampled: 09/03/2023
Date Completed: 22/03/2023
Sample Type: Surface Water

Testing
Analysing
Consulting

BHP Laboratories
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Thomondgate
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EMail:dervlapurcell@bhp.ie

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly_Surface Water
Client Ref: Quarry Discharge

Test		Units	Results	Customer Limits	Date Analysed	Method
B.O.D.	Acc.	mg/L	<0.1		16/03/2023	BHP AC 005
C.O.D.	Acc.	mg/L	<15		15/03/2023	BHP AC 006
Total Suspended Solids	Acc.	mg/L	<10		14/03/2023	BHP AC 012
pH		pH Units	7.70		09/03/2023	BHP AC 067
Total Petroleum Hydrocarbons ($>C_6$-C_{40})	*	mg/L	<0.01		22/03/2023	1670
Nitrate (as NO_3)	Acc.	mg/L	48		09/03/2023	BHP AC 019
OrthoPhosphate (as P)		mg/L	<0.065		09/03/2023	BHP AC 019
OrthoPhosphate (as PO_4)		mg/L	<0.2		09/03/2023	BHP AC 019
Benzene	*	mg/L	<0.001		20/03/2023	1760
Toluene	*	mg/L	<0.001		20/03/2023	1760
Ethyl Benzene	*	mg/L	<0.001		20/03/2023	1760
m & p-Xylene	*	mg/L	<0.001		20/03/2023	1760
o-Xylene	*	mg/L	<0.001		20/03/2023	1760
Total Ammonia (as N)	Acc.	mg/L	<0.1		14/03/2023	BHP AC 095
Nitrate (as NO_3-N)		mg/L	11		09/03/2023	BHP AC 019

Authorised by: Dervla Purcell — Laboratory Manager **Date Authorised:** 23/03/2023

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
***** Subcontracted to an approved accredited laboratory
****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

TEST REPORT NO: 252808

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 23/04/1242
Quote Ref: QC007587
Order No: N/A
Sales Order: 174269
Date Received: 06/04/2023
Date Sampled: 06/04/2023
Date Completed: 24/04/2023
Sample Type: Surface Water

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly_Surface Water
Client Ref: Quarry Discharge

Testing
Analysing
Consulting
BHP Laboratories
New Road
Thomondgate
Limerick
Tel: +353 61 455399
EMail:dervlapurcell@bhp.ie

Test		Units	Results	Customer Limits	Date Analysed	Method
B.O.D.	Acc.	mg/L	0.2		14/04/2023	BHP AC 005
C.O.D.	Acc.	mg/L	<15		12/04/2023	BHP AC 006
Total Suspended Solids	Acc.	mg/L	<5		12/04/2023	BHP AC 012
pH		pH Units	7.35		06/04/2023	BHP AC 067
Total Petroleum Hydrocarbons (>C_6-C_{40})	*	mg/L	<0.01		17/04/2023	1670
Nitrate (as NO_3)	Acc.	mg/L	41		06/04/2023	BHP AC 019
OrthoPhosphate (as P)		mg/L	<0.065		24/04/2023	BHP AC 019
OrthoPhosphate (as PO_4)		mg/L	<0.2		24/04/2023	BHP AC 019
Benzene	*	mg/L	<0.001		17/04/2023	1760
Toluene	*	mg/L	<0.001		17/04/2023	1760
Ethyl Benzene	*	mg/L	<0.001		17/04/2023	1760
m & p-Xylene	*	mg/L	<0.001		17/04/2023	1760
o-Xylene	*	mg/L	<0.001		17/04/2023	1760
Total Ammonia (as N)	Acc.	mg/L	<0.1		12/04/2023	BHP AC 095
Nitrate (as NO_3-N)		mg/L	9.3		06/04/2023	BHP AC 019

Authorised by: Dervla Purcell
Laboratory Manager
Date Authorised: 25/04/2023

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
***** Subcontracted to an approved accredited laboratory
****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

TEST REPORT NO: 254798

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 23/05/1491
Quote Ref: QC007587
Order No: N/A
Sales Order: 176921
Date Received: 08/05/2023
Date Sampled: 08/05/2023
Date Completed: 22/05/2023
Sample Type: Surface Water

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly_Surface Water
Client Ref: Quarry Discharge

Testing
Analysing
Consulting

BHP Laboratories
New Road
Thomondgate
Limerick
Tel: +353 61 455399
EMail:dervlapurcell@bhp.ie

Test		Units	Results	Customer Limits	Date Analysed	Method
B.O.D.	Acc.	mg/L	0.1		11/05/2023	BHP AC 005
C.O.D.	Acc.	mg/L	<15		10/05/2023	BHP AC 006
Total Suspended Solids	Acc.	mg/L	<10		10/05/2023	BHP AC 012
pH		pH Units	7.98		08/05/2023	BHP AC 067
Total Petroleum Hydrocarbons (>C_6-C_{40})	*	mg/L	<0.01		16/05/2023	1670
Nitrate (as NO_3)	Acc.	mg/L	35		09/05/2023	BHP AC 019
OrthoPhosphate (as P)		mg/L	<0.065		09/05/2023	BHP AC 019
OrthoPhosphate (as PO_4)		mg/L	<0.2		09/05/2023	BHP AC 019
Benzene	*	mg/L	<0.001		22/05/2023	1760
Toluene	*	mg/L	<0.001		22/05/2023	1760
Ethyl Benzene	*	mg/L	<0.001		22/05/2023	1760
m & p-Xylene	*	mg/L	<0.001		22/05/2023	1760
o-Xylene	*	mg/L	<0.001		22/05/2023	1760
Total Ammonia (as N)	Acc.	mg/L	<0.1		16/05/2023	BHP AC 095

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 01/06/2023

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
***** Subcontracted to an approved accredited laboratory
****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

TEST REPORT NO: 254798

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 23/05/1491
Quote Ref: QC007587
Order No: N/A
Sales Order: 176921
Date Received: 08/05/2023
Date Sampled: 08/05/2023
Date Completed: 22/05/2023
Sample Type: Surface Water

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly_Surface Water
Client Ref: Quarry Discharge

Testing
Analysing
Consulting

BHP Laboratories
New Road
Thomondgate
Limerick
Tel: +353 61 455399
EMail:dervlapurcell@bhp.ie

Test	Units	Results	Customer Limits	Date Analysed	Method
Nitrate (as NO_3-N)	mg/L	7.9		09/05/2023	BHP AC 019

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 01/06/2023

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
* Subcontracted to an approved accredited laboratory
** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

TEST REPORT NO: 258813

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 23/06/1126
Quote Ref: QC007587
Order No: N/A
Sales Order: 181470
Date Received: 06/06/2023
Date Sampled: 06/06/2023
Date Completed: 20/06/2023
Sample Type: Surface Water

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly_Surface Water
Client Ref: Quarry Discharge

Testing
Analysing
Consulting

BHP Laboratories
New Road
Thomondgate
Limerick
Tel: +353 61 455399
EMail:dervlapurcell@bhp.ie

Test		Units	Results	Customer Limits	Date Analysed	Method
B.O.D.	Acc.	mg/L	0.9		15/06/2023	BHP AC 005
C.O.D.	Acc.	mg/L	<15		14/06/2023	BHP AC 006
Total Suspended Solids	Acc.	mg/L	<5		07/06/2023	BHP AC 012
pH - Field		pH Units	7.83		06/06/2023	BHP AC 067
Total Petroleum Hydrocarbons (>C_6-C_{40})	*	mg/L	<0.01		16/06/2023	1670
Nitrate (as NO_3)	Acc.	mg/L	45		08/06/2023	BHP AC 019
OrthoPhosphate (as P)		mg/L	<0.065		08/06/2023	BHP AC 019
OrthoPhosphate (as PO_4)		mg/L	<0.2		08/06/2023	BHP AC 019
Benzene	*	mg/L	<0.001		14/06/2023	1760
Toluene	*	mg/L	<0.001		14/06/2023	1760
Ethyl Benzene	*	mg/L	<0.001		14/06/2023	1760
m & p-Xylene	*	mg/L	<0.001		14/06/2023	1760
o-Xylene	*	mg/L	<0.001		14/06/2023	1760
Total Ammonia (as N)	Acc.	mg/L	0.16		20/06/2023	BHP AC 095

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 22/06/2023

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
***** Subcontracted to an approved accredited laboratory
****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

TEST REPORT NO: 258813

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 23/06/1126
Quote Ref: QC007587
Order No: N/A
Sales Order: 181470
Date Received: 06/06/2023
Date Sampled: 06/06/2023
Date Completed: 20/06/2023
Sample Type: Surface Water

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly_Surface Water
Client Ref: Quarry Discharge

Testing
Analysing
Consulting

BHP Laboratories
New Road
Thomondgate
Limerick
Tel: +353 61 455399
EMail:dervlapurcell@bhp.ie

Test	Units	Results	Customer Limits	Date Analysed	Method
Nitrate (as NO_3-N)	mg/L	10		08/06/2023	BHP AC 019

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 22/06/2023

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
* Subcontracted to an approved accredited laboratory
** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

TEST REPORT NO: 261238

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 23/07/1678
Quote Ref: QC007587
Order No: N/A
Sales Order: 184581
Date Received: 06/07/2023
Date Sampled: 06/07/2023
Date Completed: 18/07/2023
Sample Type: Surface Water

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly_Surface Water
Client Ref: Quarry Discharge

Testing
Analysing
Consulting

BHP Laboratories
New Road
Thomondgate
Limerick
Tel: +353 61 455399
EMail:dervlapurcell@bhp.ie

Test		Units	Results	Customer Limits	Date Analysed	Method
B.O.D.	Acc.	mg/L	<0.1		13/07/2023	BHP AC 005
C.O.D.	Acc.	mg/L	<15		12/07/2023	BHP AC 006
Total Suspended Solids	Acc.	mg/L	<10		10/07/2023	BHP AC 012
pH - Field		pH Units	7.76		06/07/2023	BHP AC 067
Total Petroleum Hydrocarbons (>C_6-C_{40})	*	mg/L	<0.01		18/07/2023	1670
Nitrate (as NO_3)	Acc.	mg/L	42		06/07/2023	BHP AC 019
OrthoPhosphate (as P)		mg/L	<0.065		06/07/2023	BHP AC 019
OrthoPhosphate (as PO_4)		mg/L	<0.2		06/07/2023	BHP AC 019
Benzene	*	mg/L	<0.001		14/07/2023	1760
Toluene	*	mg/L	<0.001		14/07/2023	1760
Ethyl Benzene	*	mg/L	<0.001		14/07/2023	1760
m & p-Xylene	*	mg/L	<0.001		14/07/2023	1760
o-Xylene	*	mg/L	<0.001		14/07/2023	1760
Total Ammonia (as N)	Acc.	mg/L	0.12		11/07/2023	BHP AC 095

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 30/07/2023

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
***** Subcontracted to an approved accredited laboratory
****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

TEST REPORT NO: 261238

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 23/07/1678
Quote Ref: QC007587
Order No: N/A
Sales Order: 184581
Date Received: 06/07/2023
Date Sampled: 06/07/2023
Date Completed: 18/07/2023
Sample Type: Surface Water

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly_Surface Water
Client Ref: Quarry Discharge

Testing
Analysing
Consulting

BHP Laboratories
New Road
Thomondgate
Limerick
Tel: +353 61 455399
EMail:dervlapurcell@bhp.ie

Test	Units	Results	Customer Limits	Date Analysed	Method
Nitrate (as NO_3-N)	mg/L	9.5		06/07/2023	BHP AC 019

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 30/07/2023

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
* Subcontracted to an approved accredited laboratory
** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

TEST REPORT NO: 263678

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 23/08/2145
Quote Ref: QC007587
Order No: N/A
Sales Order: 187570
Date Received: 09/08/2023
Date Sampled: 09/08/2023
Date Completed: 18/08/2023
Sample Type: Surface Water

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly Surface Water
Client Ref: Quarry Discharge

Testing
Analysing
Consulting

BHP Laboratories
New Road
Thomondgate
Limerick
Tel: +353 61 455339
EMail:dervlapurcell@bhp.ie

Test		Units	Results	Customer Limits	Date Analysed	Method
B.O.D.	Acc.	mg/L	0.6		10/08/2023	BHP AC 005
C.O.D.	Acc.	mg/L	<50		10/08/2023	BHP AC 006
Total Suspended Solids	Acc.	mg/L	<10		11/08/2023	BHP AC 012
pH - Field		pH Units	7.54		09/08/2023	BHP AC 067
Total Petroleum Hydrocarbons (>C_6-C_{40})	*	mg/L	<0.01		17/08/2023	1670
Nitrate (as NO_3)	Acc.	mg/L	26		10/08/2023	BHP AC 019
OrthoPhosphate (as P)		mg/L	<0.065		10/08/2023	BHP AC 019
OrthoPhosphate (as PO_4)		mg/L	<0.2		10/08/2023	BHP AC 019
Benzene	*	mg/L	<0.001		18/08/2023	1760
Toluene	*	mg/L	<0.001		18/08/2023	1760
Ethyl Benzene	*	mg/L	<0.001		18/08/2023	1760
m & p-Xylene	*	mg/L	<0.001		18/08/2023	1760
o-Xylene	*	mg/L	<0.001		18/08/2023	1760
Total Ammonia (as N)	Acc.	mg/L	<0.1		15/08/2023	BHP AC 095

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 20/08/2023

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
***** Subcontracted to an approved accredited laboratory
****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

TEST REPORT NO: 263678

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No:	23/08/2145
Quote Ref:	QC007587
Order No:	N/A
Sales Order:	187570
Date Received:	09/08/2023
Date Sampled:	09/08/2023
Date Completed:	18/08/2023
Sample Type:	Surface Water

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: Monthly Surface Water
Client Ref: Quarry Discharge

Testing
Analysing
Consulting

BHP Laboratories
New Road
Thomondgate
Limerick
Tel: +353 61 455339
EMail:dervlapurcell@bhp.ie

Test	Units	Results	Customer Limits	Date Analysed	Method
Nitrate (as NO_3-N)	mg/L	5.9		10/08/2023	BHP AC 019

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 20/08/2023

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
* Subcontracted to an approved accredited laboratory
** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

APPENDIX 7-D
Surface Water Quality Laboratory Results (Nov 2023)

FITZ SCIENTIFIC
MONITORING & TESTING

Unit 35,
Boyne Business Park,
Drogheda,
Co. Louth,
Ireland
Tel: +353 41 9845440
Fax: +353 41 9846171
Web: www.fitzsci.ie
Email: info@fitzsci.ie

A copy of this certificate is available on www.fitzsci.ie.

Customer supplied information appear in italics.

Customer	*Fergus Gallagher* *Kilsaran Concrete* *Piercetown* *Dunboyne* *Co Meath*	Lab Report Ref. No.	1900/662/01
		Date of Receipt	20/11/2023
		Sampled On	*20/11/2023*
		Date Testing Commenced	20/11/2023
		Received or Collected	Delivered by Customer
		Condition on Receipt	Acceptable
Customer PO	*HO 9114*	Date of Report	29/11/2023
Customer Ref	*SW02 Blackwater Kilsaran*	*Sample Type*	*Surface Water*
Ref 2			
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Ammonia (Surface Water)	114	Colorimetry	0.03	mg/L as N	INAB
BOD (Surface Water)	113	Electrometry	1.4	mg/L	INAB
COD (Surface Water)	107	Colorimetry	48	mg/L	INAB
Conductivity (Surface Water at 20C)	112	Electrometry	643.0	µscm -1@20C	INAB
Nitrate (Surface Water)	103	Colorimetry	3.27	mg/L as N	INAB
Nitrite (Surface Water)	118	Colorimetry	0.015	mg/L as N	INAB
pH (Surface Water)	110	Electrometry	7.53	pH Units	INAB
Phosphorus (Total) Surface Water	166	Colorimetry	0.12	mg/L as P	INAB
Solids (Total Suspended)	106	Gravimetry	9	mg/L	

Signed: Katherine McQuillan **Date: 29/11/2023**

Katherine McQuillan - Technical Manager

Acc. : Accredited Parameters by ISO/IEC 17025:2017

For bacterial analysis a result of 0 means none detected in volume examined
All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of Fitz Scientific
Results contained in this report relate only to the samples tested (P) : Presumptive Results

** : The test result for this parameter may be invalid as it has exceeded the recommended holding time (BS EN ISO 5667-3:2018)

Final results will be issued without any estimated uncertainty of measurement being applied. This can be supplied on request.
Fitz Scientific maintain all customer information in the strictest confidence which is legally enforceable.

FITZ SCIENTIFIC
MONITORING & TESTING

Unit 35,
Boyne Business Park,
Drogheda,
Co. Louth,
Ireland
Tel: +353 41 9845440
Fax: +353 41 9846171
Web: www.fitzsci.ie
Email: info@fitzsci.ie

A copy of this certificate is available on www.fitzsci.ie.

Customer supplied information appear in italics.

Customer	*James Kelliher* *Kilsaran Concrete* *Piercetown* *Dunboyne* *Co Meath*	Lab Report Ref. No.	1900/663/01
		Date of Receipt	21/11/2023
		Sampled On	*21/11/2023*
		Date Testing Commenced	21/11/2023
		Received or Collected	Delivered by Customer
		Condition on Receipt	Acceptable
Customer PO	*9114*	Date of Report	29/11/2023
Customer Ref	*SW02 Blackwater*	*Sample Type*	*Surface Water*
Ref 2	*Kilsaran*		
Ref 3			

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Ammonia (Surface Water)	114	Colorimetry	0.04	mg/L as N	INAB
BOD (Surface Water)	113	Electrometry	1.5	mg/L	INAB
COD (Surface Water)	107	Colorimetry	46	mg/L	INAB
Conductivity (Surface Water at 20C)	112	Electrometry	616.0	µscm -1@20C	INAB
Nitrate (Surface Water)	103	Colorimetry	2.47	mg/L as N	INAB
Nitrite (Surface Water)	118	Colorimetry	0.017	mg/L as N	INAB
pH (Surface Water)	110	Electrometry	7.67	pH Units	INAB
Phosphorus (Total) Surface Water	166	Colorimetry	0.20	mg/L as P	INAB
Solids (Total Suspended)	106	Gravimetry	<2	mg/L	

Signed: Katherine McQuillan

Date: 29/11/2023

Katherine McQuillan - Technical Manager

Acc. : Accredited Parameters by ISO/IEC 17025:2017

For bacterial analysis a result of 0 means none detected in volume examined
All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of Fitz Scientific
Results contained in this report relate only to the samples tested (P) : Presumptive Results

** : The test result for this parameter may be invalid as it has exceeded the recommended holding time (BS EN ISO 5667-3:2018)

Final results will be issued without any estimated uncertainty of measurement being applied. This can be supplied on request.
Fitz Scientific maintain all customer information in the strictest confidence which is legally enforceable.

APPENDIX 7-E
WFD Compliance Assessment Report

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

WATER FRAMEWORK DIRECTIVE ASSESSMENT
RATHCORE QUARRY EXTENSION, CO. MEATH

FINAL REPORT

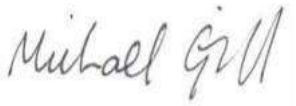
Prepared for:

KILSARAN CONCRETE

Prepared by:

HYDRO-ENVIRONMENTAL SERVICES

DOCUMENT INFORMATION

Document Title:	WATER FRAMEWORK DIRECTIVE ASSESSMENT RATHCORE QUARRY EXTENSION, CO. MEATH
Issue Date:	9th January 2024
Project Number:	P1642-0
Project Reporting History:	P1642-0_WFD Assessment_Draft D0
Current Revision No:	P1642-0_WFD Assessment_Final F0
Author:	MICHAEL GILL CONOR MCGETTIGAN JOHN TWOMEY
Signed:	 _____ Michael Gill B.A., B.A.I., M.Sc., MIEI Managing Director – Hydro-Environmental Services

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FIGURES (IN TEXT)

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1. INTRODUCTION

1.1 BACKGROUND

Hydro-Environmental Services (HES) were requested by SLR Consulting, on behalf of Kilsaran Concrete, to complete a Water Framework Directive (WFD) Compliance Assessment in relation to the proposed Rathcore Quarry Extension (the 'Proposed Development Site'). The existing quarry at Rathcore is located ~1km southwest of Rathcore village, Co. Meath.

The purpose of this WFD assessment is to determine if any specific components or activities associated with the Proposed Development will compromise WFD objectives or cause a deterioration in the status of any surface water or groundwater body and/or jeopardise the attainment of good surface water or groundwater status. This assessment will determine the water bodies with the potential to be impacted, describe the proposed mitigation measures, and determine if the project is in compliance with the objectives of the WFD.

This WFD Assessment is intended to supplement the EIAR submitted as part of the planning application for the Proposed Development.

1.2 STATEMENT OF AUTHORITY

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

This WFD assessment was prepared by Michael Gill, Conor McGettigan and John Twomey.

Michael Gill (P. Geo., B.A.I., MSc, Dip. Geol., MIEI) is an Environmental Engineer with over 22 years' environmental consultancy experience in Ireland. 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.

Conor McGettigan (MSc, BSc) is an Environmental Scientist with 3 years' experience in the environmental sector in Ireland. Conor holds an MSc in Applied Environment Science and a BSc in Geology. Conor routinely completed hydrological and hydrogeological impact assessment, flood risk assessments and WFD compliance assessments for a range of proposed developments including wind farms, residential developments, industrial developments, quarries and sand and gravel pits.

John Twomey (BSc) is a recent graduate of Earth and Ocean Science from UG and is in the process of training to become an Environmental Scientist. He has recently helped in the completion of hydrogeological and hydrological impact assessments on quarries, windfarms and industrial developments.

1.3 WATER FRAMEWORK DIRECTIVE

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

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

The WFD is implemented through the River Basin Management Plans (RBMP) which comprises a six-yearly cycle of planning, action and review. RBMPs include identifying river basin districts, water bodies, protected areas and any pressures or risks, monitoring and setting environmental objectives. In Ireland the first RBMP covered the period from 2010 to 2015 with the second cycle plan covering the period from 2018 to 2021.

The River Basin Management Plan (2018 - 2021) objectives, which have been integrated into the design of the proposed development, include:

- Ensure full compliance with relevant EU legislation;
- Prevent deterioration and maintain a 'high' status where it already exists;
- Protect, enhance and restore all waters with aim to achieve at least good status by 2027;
- Ensure waters in protected areas meet requirements; and,
- Implement targeted actions and pilot schemes in focused sub-catchments aimed at (1) targeting water bodies close to meeting their objectives and (2) addressing more complex issues that will build knowledge for the third cycle.

Furthermore, the Department of Housing, Local Government and Heritage are currently reviewing the submissions made on the Draft River Basin Management Plan (2022 - 2027) which was out for public consultation in Q4 of 2021 and Q1 of 2022. As of January 2023, the plan has not been published while the draft plan is available to view at https://www.gov.ie/en/consultation/2bda0-public-consultation-on-the-draft-river-basin-management-plan-for-ireland-2022-2027/.

Our understanding of these objectives is that water bodies, regardless of whether they have 'Poor' or 'High' status, should be treated the same in terms of the level of protection and mitigation measures employed.

2. WATERBODY IDENTIFICATION CLASSIFICATION

2.1 INTRODUCTION

This section identifies those surface water and groundwater bodies with potential to be affected by the proposed development and reviews any available WFD information.

2.2 SURFACE WATERBODY IDENTIFICATION

Regionally, the site is located within the Boyne surface water catchment within Hydrometric Area 7 of the Eastern River Basin District.

On a more local scale, the site is located within the Boyne_SC_020 river sub-catchment and 3 no. WFD river sub-basins:

- The south of the site is located in the Blackwater (Longwood)_030 WFD river sub-basin. Within this area, the Blackwater River flows to the northwest ~2.5km southwest of the site.
- The centre and west of the site are located in the Blackwater (Longwood)_050 WFD river sub-basin. The closest mapped watercourses to the site is a small 1st order stream (referred to as the Clonguiffin stream by the EPA), located ~950m to the northwest. This stream flows to the northwest before discharging a 2nd order stream (referred to as the Connellstown stream by the EPA). This stream flows to the west and discharges into the Blackwater River ~3.4km northwest of the site. Rathcore Quarry currently discharges into an open drain which flows to the northwest and discharged into the Clonguiffin stream to the northwest of the site. These watercourses in the vicinity of the site all form part of the Blackwater (Longwood)_050 river waterbody.
- The east of the site is located in the Rathcore Stream_010 WFD river sub-basin. The closest watercourse to the site is a 2nd order stream, mapped ~1.25km northeast of the site. This stream flows to the northeast and discharges into the Rathcore Stream ~750m northwest of Rathcore village. The Rathcore Stream flows to the northwest and discharges into the Blackwater (Longwood)_050 river waterbody ~4.2km northwest of the site.

The Blackwater (Longwood)_050 waterbody discharges into the Boyne_060 waterbody ~7.5km to the northwest of the site. The River Boyne then continues flowing to the northeast until the Boyne_180 waterbody discharges into the Boyne Estuary near Drogheda.

Figure A below presents a local hydrology map and identifies the surface waterbodies downstream of the site.

Table A presents the catchment area of each waterbody downstream of the site. The catchment area for the waterbodies increases progressively downstream as more tributaries discharge into the River Blackwater and the River Boyne. Therefore, those waterbodies which are in close proximity to the site are more susceptible to water quality impacts as a result of activities associated with the proposed development. The potential for the proposed development to impact a waterbody decreases further downstream due to the increasing catchment area to the surface waterbody and resulting increase in flow volumes.

Table A: Catchment Area of Surface Waterbodies Downstream of the Site

WFD River Sub-Basin	Total Catchment Area (km²)
Blackwater (Longwood)_030	119.6

Blackwater (Longwood)_050	159
Rathcore (Stream)_010	15.4
Boyne_060	>1000
Boyne_070	1,147.95
Boyne_080	1,343.76
Boyne_090	1,354.41
Boyne_100	1,471.87
Boyne_110	1,563.22
Boyne_120	1,666.65
Boyne_130	1,680.85
Boyne_140	2,397.15
Boyne_150	2,411.06
Boyne_160	2,468.03
Boyne_170	2,477.50
Boyne_180	2,524.54

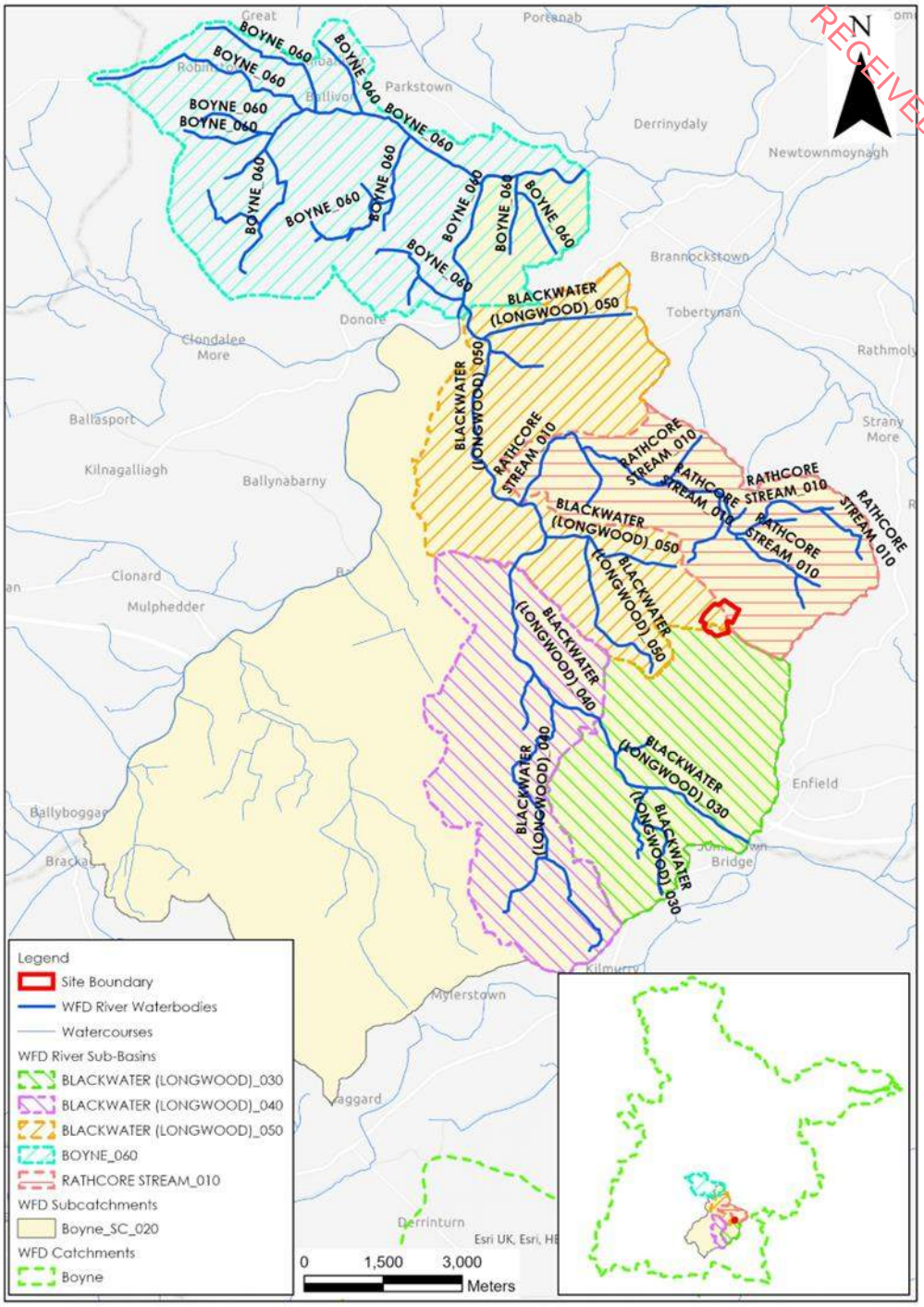

Figure A: Local Hydrology Map

2.3 SURFACE WATER BODY CLASSIFICATION

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

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

All sections of the Blackwater River in the vicinity and downstream of the site (Blackwater (Longwood)_030, Blackwater (Longwood)_040 and Blackwater (Longwood)_050) achieved "Moderate" status in the latest WFD cycle (2016-2021). To the northeast of the site, the Rathcore Stream_010 SWB achieved "Good" status in all 3 no. WFD cycles. Meanwhile, the Boyne_060 SWB is of "Good" status. Further downstream the status of the River Boyne is generally of "Moderate" status.

In terms of risk status, the Blackwater River in the vicinity and downstream of the site and the Rathcore Stream_010 SWB have been deemed to be "at risk" of failing to meet their respective WFD objectives. Further downstream several sections of the River Boyne are also "at risk" however the Boyne_060 SWB immediately downstream of the Blackwater River is "not at risk".

According to the 3rd Cycle Draft Boyne Catchment Report (EPA, 2021),agriculture is identified as a significant pressure on the Blackwater (Longwood)_030 and Blackwater (Longwood)_050 SWBs. In relation to agriculture the draft catchment report states that the main issues on waterbodies in this catchment relates to phosphorus loss to surface waters, organic pollution and elevated concentrations of suspended sediment. Meanwhile, peat related activities and an unknown anthropogenic pressure are impacting the Blackwater (Longwood)_040 SWB. The Rathcore Stream_010 does not have any pressures according to the catchment report.

Further downstream several sections of the River Boyne are listed as being under significant pressure due to agricultural activities and hydromorphological issues.

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

Table B: Summary WFD Information for Surface Waterbodies

SWB	Overall Status (2010-2015)	Overall Status (2013-2018)	Overall Status (2016-2021)	Risk Status 3rd Cycle	3rd Cycle WFD Pressures
Blackwater (Longwood)_030	Moderate	Moderate	Moderate	At risk	Agriculture
Blackwater (Longwood)_040	Moderate	Moderate	Moderate	At risk	Peat & Other
Blackwater (Longwood)_050	Moderate	Moderate	Moderate	At risk	Agriculture
Rathcore Stream_010	Good	Good	Good	At risk	None
Boyne_060	Moderate	Good	Good	Not at risk	Agriculture & Hydromorphology
Boyne_070	Good	Moderate	Moderate	At risk	Agriculture
Boyne_080	Moderate	Moderate	Moderate	At risk	Hydromorphology
Boyne_090	Moderate	Moderate	Moderate	At risk	Hydromorphology & urban run-off
Boyne_100	Moderate	Moderate	Moderate	At risk	Agriculture & Hydromorphology
Boyne_110	Unassigned	Good	Moderate	Under review	None
Boyne_120	Moderate	Good	Moderate	Under review	None
Boyne_130	Unassigned	Good	Moderate	Not at risk	None
Boyne_140	Unassigned	Moderate	Moderate	Under review	None
Boyne_150	Moderate	Moderate	Moderate	At risk	Anthropogenic & domestic wastewater
Boyne_160	Moderate	Moderate	Moderate	Under review	None
Boyne_170	Good	Good	Good	Under review	None
Boyne_180	Good	Good	Good	Not at risk	None
Boyne Estuary	Moderate	Moderate	Moderate	At risk	Agriculture & urban wastewater
Boyne Estuary Plume	Good	Moderate	Moderate	At risk	Anthropogenic & urban runoff

2.4 GROUNDWATER BODY IDENTIFICATION

According to GSI (www.gsi.ie), the site is underlain by 2 no. of GWBs; the Longwood GWB in the west and the Trim GWB in the east.

Within the Longwood GWB, the site is underlain by Waulsortian Limestones (Dinantian Pure Unbedded Limestones), which are described as massive, unbedded lime-mudstones. The bedrock here is known as a Locally Important aquifer (LI) – bedrock which is moderately productive only in local zones.

Within the Trim GWB, the eastern section of the site is underlain by the Lucan Formation (Dinantian Upper Impure Limestones), denoted by its dark limestone and shale (calp). The Lucan Formation is classified as a Locally Important Aquifer (Lm) – bedrock which is generally moderately productive.

However, a described in paragraph 7.121 to 7.129 of the EIAR, the bedrock geology at the site is more complex that is indicated in the available GSI mapping. Based on site-specific hydrogeological data, the Hydrogeological Investigation Report (Ball, 2022) recommended that the bedrock aquifer underlying the site is reclassified as a Regionally Important Karst Aquifer (conduit). Detailed site investigations have revealed that the site is underlain entirely by Waulsortian Limestones, and the Lican Formation is not present at Rathcore Quarry despite being mapped by the GSI.

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

2.5 GROUNDWATER BODY CLASSIFICATION

GWBs are assigned a status based on the assessment of groundwater chemical and quantitative figures.

Both the Trim and Longwood GWBs achieved "Good" status in all 3 no. WFD cycles. The Longwood GWB has been deemed to be "not at risk" of failing to meet its WFD objectives, while the Trim GWB is "at risk". According to the draft catchment report (EPA, 2021), the Trim GWB is under significant pressure from agricultural activities, domestic wastewater and an unknown anthropogenic activity.

Table C: Summary WFD Information for Groundwater Bodies

GWB	Overall Status 2010-2015	Overall Status 2013-2018	Overall Status 2016-2021	3rd Cycle Risk Status	Pressures
Longwood	Good	Good	Good	Not at risk	None
Trim	Good	Good	Good	At risk	Agriculture, domestic wastewater & an unknown anthropogenic pressure

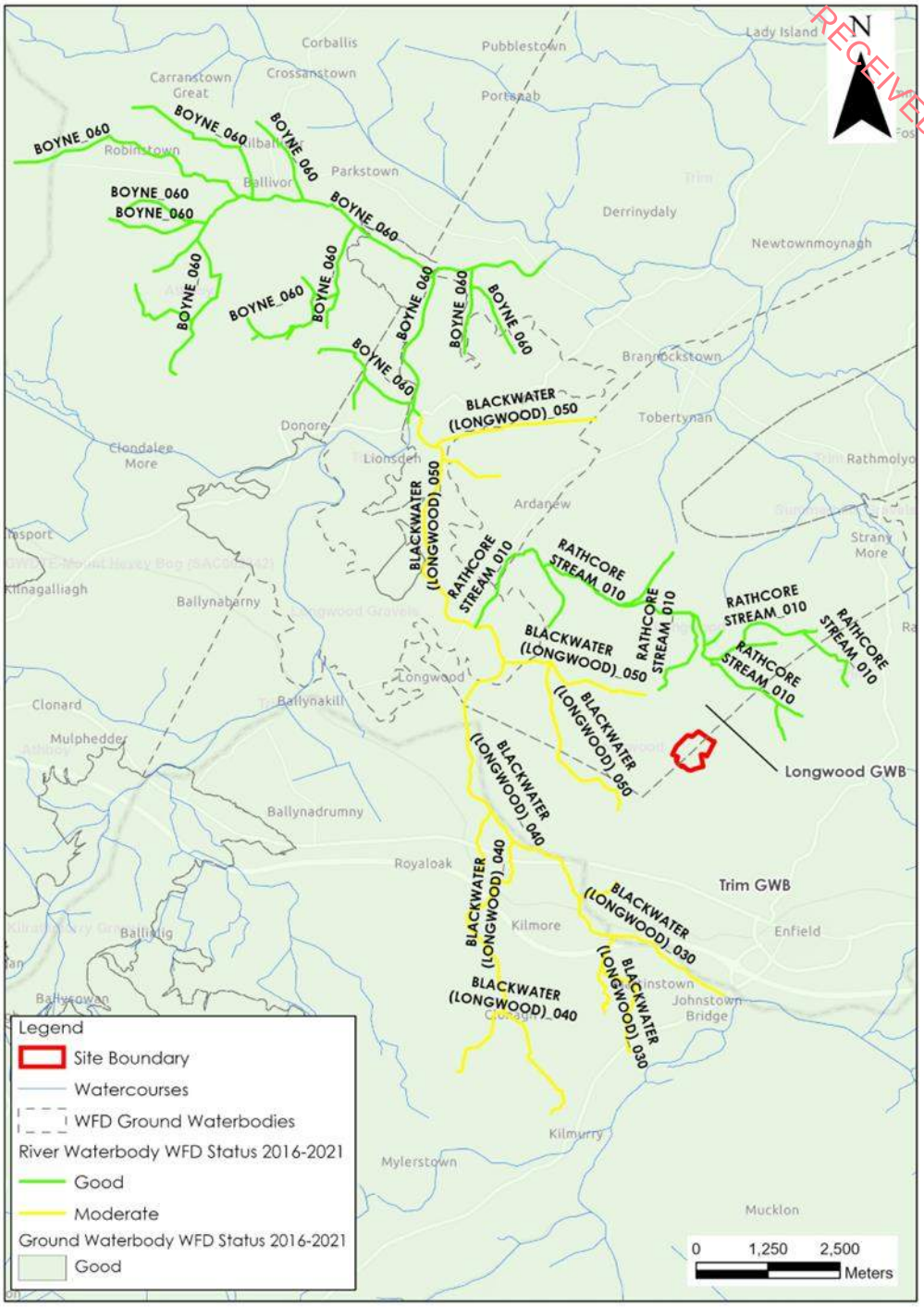

Figure B: WFD Groundwater and Surface Waterbody Status (2016-2021)

2.6 PROTECTED AREA IDENTIFICATION

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

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

2.6.1 Nature Conservation Designations

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

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

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

However, several designated sites are located in the surrounding lands and/or downstream of the site:

- St. Gorman's Well pNHA – 1.6km to the west.
- Royal Canal pNHA (002103) - 2.8km to the southwest.
- Ballina Bog pNHA (000390) – 5km to the southwest.
- River Boyne and River Blackwater SAC (002299) – 6.5km to the northwest.
- River Boyne and River Blackwater SPA (004232) – 6.5km to the northwest.
- Rathmoylan Esker pNHA (000557) – 5km to the northeast.
- Molerick Bog NHA (001583) – 8.5km to the northwest.
- Trim pNHA (001357) – 13.5km to the northeast.
- Boyne Woods pNHA (001529) – 30km to the northeast.
- Rossnaree River Bank pNHA (001589) – 31km to the northeast
- King Williams Glen (001804) – 41.8km to the northeast.
- Slane Riverbank (001591) – 35.4km to the northeast.
- Crewbane March pNHA (000553) – 36.1km to the northeast.
- Dowth Wetland pNHA (001861) – 40.5km to the northeast.
- Boyne River Islands pNHA (001862) – 42.6km to the northeast.
- Boyne Coast and Estuary SAC and pNHA (001957) – 45km to the northeast.
- Boyne Estuary SPA (004080) – 45km to the northeast.

2.6.2 Bathing Waters

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

There are no designated bathing water sites located in the vicinity or immediately downstream of the site.

2.6.3 Nutrient Sensitive Areas

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

The Boyne River NSA (IERI_EA_1994_0001) and the Boyne Estuary NSA (IE_EA_010_0100) are mapped downstream of the site. The Boyne River NSA is mapped downstream of Navan, ~27km to the northeast of the 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.

2.6.4 Shellfish Area

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

There are no Shellfish areas located in the vicinity or immediately downstream of the site.

2.6.5 Drinking Water

According to the 3rd Cycle Draft Boyne Catchment Report (EPA, 2021) there are 12 no. surface waterbodies in the catchment identified as Drinking Water Protected Areas (DWPAs). The closest DWPA downstream of the site is the Boyne River downstream of Trim (Boyne_100 SWB). This SWB is located ~13.6km northeast of the site (as the crow flies).

The GSI do not map the presence of any National Federation registered Group Water Schemes (GWS) or Public Water Schemes (PWS) or an associated Source Protection Area (SPA) within the site or in the surrounding lands. The closest mapped PWS is the Longwood PWS. The SPA associated with this PWS is located ~2.5km northwest of the site. The Enfield PWS is located ~3.8km south of the site with the outer SPA located ~2km from the site boundaries.

3. WFD SCREENING

As discussed in **Section 2**, there are a total of 19 no. surface waterbodies which are located in the vicinity and downstream of the site. These include a total of 17 no. river waterbodies, 1 no. transitional waterbody and 1 no. coastal waterbody. In addition, according to EPA/GSI mapping a total of 2 no. groundwater bodies underlie the site. Several protected areas are also located in the vicinity and downstream of the site.

3.1 SURFACE WATER BODIES

The Blackwater (Longwood)_030 and Blackwater (Longwood)_040 SWBs have been screened out of the WFD impact assessment. Despite the south of the site being mapped in the Blackwater (Longwood)_030 river sub-basin, there is no hydrological connection between the site and this waterbody. Due to the bowl-shaped nature of the site, any water in the area will enter the quarry void and will be directed to the sump in the quarry floor prior to treatment and discharge as surface water. The Blackwater (Longwood)_030 and Blackwater (Longwood)_040 SWBs are both located upstream of the discharge location. There is no potential for the proposed development to impact the status of these SWBs.

Furthermore, the Rathcore Stream_010 SWB has been screened out. There is no hydrological connection between the site and this waterbody and all water within the site will be discharged to the Blackwater (Longwood)_050 SWB. Therefore, there is no potential for the proposed development to impact the status of the SWB.

The Blackwater (Longwood)_050 to the northwest of the site will be included in the WFD Assessment. Rathcore Quarry discharges treated effluent to an open drainage ditch which is connected to this waterbody. Therefore, an assessment is required to consider the potential effects of the proposed development on this SWB.

The Boyne_060 SWB will also be included in the assessment as this SWB is located directly downstream of the Blackwater (Longwood)_050 SWB. Therefore, an assessment is required to consider the potential effects of the proposed development on this SWB.

Further downstream the River Boyne (Boyne_070 to Boyne_180) has been screened out due to the increasingly large volumes of water within the River Boyne. The increasing volumes of water will dilute any potential water quality/quantity effects arising from the proposed development. Therefore, there is no potential for the proposed development to impact the status of these SWBs.

Similarly the Boyne Estuary and Boyne Estuary Plume have been screened out due to their distant location from the site, the large volumes of water within these SWBs and the saline nature of the waters. Therefore, there is no potential for the proposed development to impact the status of these SWBs.

3.2 GROUNDWATER BODIES

The Longwood GWB and the Trim GWB are carried through to the WFD Impact Assessment due to their location directly underlying the site and the nature of the proposed development (*i.e.* a lateral extension and deepening of an existing bedrock quarry). An assessment is required to consider the potential effects of the proposed development on these GWBs.

3.3 PROTECTED AREAS

Several designated sites and protected areas are located downstream of the proposed development on the River Boyne.

The closest downstream designated site is the **River Boyne and River Blackwater SAC/SPA.** The qualifying interests of the SAC, as listed below are associated directly with the river system:

- [7230] Alkaline Fens
- [91E0] Alluvial Forests
- [1099] River Lamprey (*Lampetra fluviatilis*)
- [1106] Atlantic Salmon (*Salmo salar*)
- [1355] Otter (*Lutra lutra*)

Regarding the SPA, it is noted that the actual Special Conservation Interests of the SPA, as listed below, are not associated with watercourses:

- A229 Kingfisher

The River Boyne and River Blackwater SAC/SPA will be included in the WFD impact assessment due to its proximity to the proposed development and the hydrological connection between the site and the River Boyne via the Blackwater River.

Several additional designated sites are located further downstream along the River Boyne. However, due increasing downstream flow volumes in the River Boyne and the associated dilution effect, there other designated site will not be included in the impact assessment. The proposed development has no potential to impact the status of these designated sites. These designates sites include **Trim pNHA, Boyne Woods pNHA**, **Rossnaree River Bank pNHA**, **King William Glen pNHA**, **Slane Riverbank pNHA**, **Crewbane Marsh pNHA**, **Dowth Wetlands pNHA** and the **Boyne River Islands pNHA**.

In addition, there are several designated sites in the lands surrounding the proposed development site. These sites will not be included in the assessment due to their distant location from the site and the lack of hydrological connections. These sites include:

- The **Royal Canal pNHA**, located ~2.8km to the south. No hydrological connection exist. The Blackwater River acts as a hydrological barrier between the site and this pNHA.

- The **Ballina Bog pNHA,** located ~5km to the southwest. No hydrological connection. The Blackwater River acts as a hydrological barrier between the site and this pNHA.

- The **Rathmoylan Esker pNHA**, located ~5km to the northeast. No hydrological connections. Rathcore stream acts as a hydrological barrier between the site and this pNHA.

- The **Molerick Bog NHA** is located ~8.5km northwest of the site. No hydrological/hydrogeological connections. The Blackwater Rivers acts as a hydrological barrier between the site and this NHA.

However, **St. Gorman's Well pNHA** is located ~1.6km west of the site and will be included in the assessment due to the nature of this pNHA which comprises of a warm spring. This designated site relies on the underlying karstic flow regime in the local bedrock aquifers. Furthermore, there are no hydrological barriers between the site and this pNHA. Therefore, an assessment is required to consider the effects of the proposed development on the pNHA.

The **Boyne River NSA** downstream of the town of Trim has been screened out due to its distant location from the site and the increasing volumes of water within the Boyne River. Similarly the

River Boyne DWPA has been screened out due to its distant location from the proposed development.

3.4 WFD SCREENING SUMMARY

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

Table D: Screening of WFD Waterbodies and Protected Areas Downstream of Proposed Development Site

Type	WFD Classification	Waterbody Name/ID	Inclusion in Assessment	Justification
Surface Waterbodies	River	Blackwater (Longwood)_030	No	The Blackwater (Longwood)_030 will not be screened in as the unnamed stream that is located 2.5km to the south of the site will not be affected by the works taking place at the proposed development site. Therefore, the proposed development has no potential to impact the status of this SWB.
	River	Blackwater (Longwood)_040	No	The Blackwater (Longwood)_040 will not be screened in as the unnamed stream that is located upstream of the surface water discharge location. Furthermore, there are no hydrological connections between the site and this SWB. Therefore, the proposed development has no potential to impact the status of this SWB.
	River	Blackwater (Longwood)_050	**Yes**	Rathcore Quarry currently discharges into a local field drain to the northwest of the site which in turn discharges into the Blackwater (Longwood)_050. Therefore, an assessment is required to consider the potential effects of the proposed development on this SWB.
	River	Rathcore Stream_010	No	Despite the northeast of the site being mapped in the Rathcore Stream_010 river sub-basin, there is no hydrological connection between the site and this SWB. Due to the bowl shaped nature of the site all runoff will enter the quarry void. Therefore, the proposed development has no potential to impact the status of this SWB.
	River	Boyne_060	**Yes**	The Boyne_060 is located immediately downstream of the Blackwater (Longwood)_50 SWB and in close proximity to the site. Therefore, an assessment is required to consider the potential effects of the proposed development on this SWB.
	River	Boyne_070	No	The Boyne_070 SWB has been screened out due to its distant location from the site and the increasing volumes of water within the River Boyne. This SWB has an upstream catchment area of ~1,148km^2 and experiences significant flow volumes (large dilution effect), typical of a regional river waterbody. Therefore, the proposed development has no potential to impact the status of this SWB.
	River	Boyne_080	No	The Boyne_080 SWB has been screened out due to its distant location from the site and the increasing volumes of water within the River Boyne. This SWB has an upstream catchment area of ~1,344km^2. Therefore, the proposed development has no potential to impact the status of this SWB.
	River	Boyne_090	No	The Boyne_090 SWB has been screened out due to its distant location from the site and the increasing volumes of water within the River Boyne. This SWB has an upstream catchment area of ~1,354km^2. Therefore, the proposed development has no potential to impact the status of this SWB.
	River	Boyne_100	No	The Boyne_100 SWB has been screened out due to its distant location from the site and the increasing volumes of water within the River Boyne. This SWB has an upstream catchment area of ~1,472km^2. Therefore, the proposed development has no potential to impact the status of this SWB.
	River	Boyne_110	No	The Boyne_110 SWB has been screened out due to its distant location from the site and the

				increasing volumes of water within the River Boyne. This SWB has an upstream catchment area of ~1,563km^2. Therefore, the proposed development has no potential to impact the status of this SWB.
	River	Boyne_120	No	The Boyne_120 SWB has been screened out due to its distant location from the site and the increasing volumes of water within the River Boyne. This SWB has an upstream catchment area of ~1,667km^2. Therefore, the proposed development has no potential to impact the status of this SWB.
	River	Boyne_130	No	The Boyne_130 SWB has been screened out due to its distant location from the site and the increasing volumes of water within the River Boyne. This SWB has an upstream catchment area of ~1,681km^2. Therefore, the proposed development has no potential to impact the status of this SWB.
	River	Boyne_140	No	The Boyne_140 SWB has been screened out due to its distant location from the site and the increasing volumes of water within the River Boyne. This SWB has an upstream catchment area of ~2,397km^2. Therefore, the proposed development has no potential to impact the status of this SWB.
	River	Boyne_150	No	The Boyne_150 SWB has been screened out due to its distant location from the site and the increasing volumes of water within the River Boyne. This SWB has an upstream catchment area of ~2,411km^2. Therefore, the proposed development has no potential to impact the status of this SWB.
	River	Boyne_160	No	The Boyne_160 SWB has been screened out due to its distant location from the site and the increasing volumes of water within the River Boyne. This SWB has an upstream catchment area of ~2,468km^2. Therefore, the proposed development has no potential to impact the status of this SWB.
	River	Boyne_170	No	The Boyne_170 SWB has been screened out due to its distant location from the site and the increasing volumes of water within the River Boyne. This SWB has an upstream catchment area of ~2,478km^2. Therefore, the proposed development has no potential to impact the status of this SWB.
	River	Boyne_180	No	The Boyne_180 SWB has been screened out due to its distant location from the site and the increasing volumes of water within the River Boyne. This SWB has an upstream catchment area of ~2,523km^2. Therefore, the proposed development has no potential to impact the status of this SWB.
	Transitional	Boyne Estuary	No	The Boyne Estuary transitional waterbody has been screened out due to its distant location from the site, the large volume of water within the estuary and the saline nature of its water. Therefore, the proposed development has no potential to impact the status of this SWB.
	Coastal	Boyne Estuary Plume	No	The Boyne Estuary Plume coastal waterbody has been screened out due to its distant location from the site, the large volumes of water within the surface waterbody and the saline nature of its water. Therefore, the proposed development has no potential to impact the status of this SWB.
Groundwater Bodies	Groundwater	Longwood	**Yes**	The site is mapped to overlie the Longwood GWB. Therefore, an assessment is required to consider the impacts of the proposed development on this GWB.

	Groundwater	Trim	**Yes**	The site is mapped to overlie the Tim GWB. Therefore, an assessment is required to consider the impacts of the proposed development on this GWB.
Protected Areas	Nature Conservation Designations	Ballina Bog pNHA	No	The Ballina Bog pNHA has been screened out of further assessment as there are no hydrological/hydrogeological connections between the site and this pNHA. Therefore, the proposed development has no potential to impact this pNHA.
		Royal Canal pNHA	No	The Royal Canal pNHA has been screened out of further assessment as there are no hydrological/hydrogeological connections between the site and this pNHA. Therefore, the proposed development has no potential to impact this pNHA.
		Rathmoylan Esker pNHA	No	The Rathmoylan Esker pNHA has been screened out of further assessment as there are no hydrological/hydrogeological connections between the site and this pNHA. Therefore, the proposed development has no potential to impact this pNHA.
		St. Gorman's Well pNHA	**Yes**	St. Gorman's Well pNHA is located in close proximity to the site and is a warm spring. Any potential groundwater effects have the potential to impact St. Gorman's Well. Therefore, an assessment is required to consider the impacts of the proposed development on this pNHA.
		River Boyne and River Blackwater SAC & SPA	**Yes**	The River Boyne and River Blackwater SAC and SPA is located downstream of the site, with the Blackwater River discharging into this designated site. Therefore, an assessment is required to consider the impacts of the proposed development on the River Boyne and River Blackwater SAC & SPA.
		Molerick Bog NHA	No	The Rathmoylan Esker pNHA has been screened out of further assessment as there are no hydrological/hydrogeological connections between the site and this pNHA. Therefore, the proposed development has no potential to impact this pNHA.
		Trim pNHA	No	Trim pNHA is located on the River Boyne downstream of the site. However this designated site has been screened out due to the large volumes of water within the Boyne at this location and the distant location of this pNHA from the site. Therefore, the proposed development has no potential to impact this pNHA.
		Boyne Woods pNHA	No	Boyne Woods pNHA is located on the River Boyne downstream of the site. However this designated site has been screened out due to the large volumes of water within the Boyne at this location and the distant location of this pNHA from the site. Therefore, the proposed development has no potential to impact this pNHA.
		Rossnaree River Bank pNHA	No	Rossnaree River Bank pNHA is located on the River Boyne downstream of the site. However this designated site has been screened out due to the large volumes of water within the Boyne at this location and the distant location of this pNHA from the site. Therefore, the proposed development has no potential to impact this pNHA.
		King Williams Glen pNHA	No	King Williams Glen pNHA is located on the River Boyne downstream of the site. However this designated site has been screened out due to the large volumes of water within the Boyne at this location and the distant location of this pNHA from the site. Therefore, the proposed development has no potential to impact this pNHA.
		Slane Riverbank pNHA	No	Slane Riverbank pNHA is located on the River Boyne downstream of the site. However this designated site has been screened out due to the large volumes of water within the Boyne at this location and the distant location of this pNHA from the site. Therefore, the proposed

				development has no potential to impact this pNHA.
		Crewbane Marsh pNHA	No	Crewbane Marsh pNHA is located on the River Boyne downstream of the site. However this designated site has been screened out due to the large volumes of water within the Boyne at this location and the distant location of this pNHA from the site. Therefore, the proposed development has no potential to impact this pNHA.
		Dowth Wetland pNHA	No	Dowth Wetland pNHA is located on the River Boyne downstream of the site. However this designated site has been screened out due to the large volumes of water within the Boyne at this location and the distant location of this pNHA from the site. Therefore, the proposed development has no potential to impact this pNHA.
		Boyne River Islands pNHA	No	Boyne River Islands pNHA is located on the River Boyne downstream of the site. However this designated site has been screened out due to the large volumes of water within the Boyne at this location and the distant location of this pNHA from the site. Therefore, the proposed development has no potential to impact this pNHA.
		Boyne Coast and Estuary SAC and SPA	No	Boyne Coast and Estuary SAC and SPA are located on the River Boyne downstream of the site. However these designated sites have been screened out due to the large volumes of water within the Boyne at this location and the distant location of these designated sites from the site. Therefore, the proposed development has no potential to impact the Boyne Coast and Estuary SAC and SPA.
	Nutrient Sensitive Areas	Boyne River NSA	No	The Boyne River NSA has been screened out due to its distant location from the site (~27km) and the increasing volumes of water within the River Boyne. Therefore, the proposed development has no potential to impact the status of this NSA.
	DWPA	Boyne_100 DWPA	No	The Boyne_100 SWB DWPA has been screened out due to its distant location from the site and the large volumes of water within the River Boyne. Therefore, the proposed development has no potential to impact the status of this DWPA.

4. WFD COMPLIANCE ASSESSMENT

4.1 PROPOSALS

The proposed development comprises the lateral and vertical expansion of the existing Rathcore quarry.

The lateral expansion is relatively small, with the bedrock quarry's footprint increasing from an area of 9.7 hectares to 10.6 hectares (an expansion of 0.9 hectares). The vertical expansion of the current bedrock quarry is for the 10.6 hectare footprint, deepening the extraction area by 2 no. of 15m benches increasing the depth by 30m so that the quarry floor will sit at 45mAOD instead of the current 75mAOD.

The proposed development also includes the provision of a new rock milling plant and the replacement of an existing septic tank with a new wastewater treatment system. The proposed wastewater treatment system will comprise of a septic tank and filter system with treated effluent being discharged to ground via a percolation area. The treatment system will be required to treat a daily wastewater volume of 660l/day.

The bedrock quarry will continue to operate below the groundwater table and discharge the water to the drainage channel west of the quarry. The quarry currently operates in accordance with a discharge licence.

The existing processing methods at Clonard Quarry and water treatment processes will be used as part of the proposed development. In terms of the existing water treatment, a combination of surface water runoff and groundwater inflows are directed to a sump in the quarry floor. From here water is pumped to a settlement pond for attenuation and treatment (i.e. the settlement of fines). Water is then passed through a hydrocarbon interceptor and a constructed reed bed prior to discharge into a local open drainage channel. This channel discharges into the Blackwater (Longwood)_050 SWB.

A full description of the proposed development is provided in Chapter 2 of this EIAR.

4.2 POTENTIAL EFFECTS

4.2.1 Construction Phase (Unmitigated)

In the context of the proposed development, the construction phase is taken to be the preparation of the small lateral quarry extension area of 0.9ha. The construction phase will be approximately six-months in duration and will be carried out in tandem with ongoing operational phase works.

4.2.1.1 Potential Surface Water Quality Effects

Construction phase activities including removal of soil and overburden from the proposed lateral extraction area (0.9ha) will require earthworks resulting in removal of vegetation cover and excavation of soil and subsoils. The main risk will be from surface water runoff from bare soil and stockpiles during construction works.

Hydrocarbons will also be used during the construction phase. Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a significant pollution risk to surface waters at all construction sites. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk. Hydrocarbon has a high toxicity to humans, and all flora and fauna, including fish, and is persistent in the environment. It is also a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in the death of aquatic organisms.

Construction phase activities can result in the release of suspended solids and pollutants in runoff water and could result in an increase in the suspended sediment load, resulting in increased turbidity and contamination which in turn could affect the water quality and fish stocks of downstream watercourses.

Due to the bowl-shaped nature of the site, all water will enter the quarry void and will be treated with the existing water treatment processes which include a settlement pond and a hydrocarbon interceptor. This water will be discharged into an open drainage channel which I turn discharges into the Blackwater (Longwood)_050 SWB as per the existing discharge licence (DL 13/02).

Any potential deterioration in discharge quality has the potential to effect the status of downstream SWBs.

However, due to the existing water treatment processes and the short-term nature of the works during the construction phase there will be no potential to effect the status of downstream SWBs.

A summary of potential status change to SWBs arising from surface water quality impacts from earthworks during the construction phase of the proposed development in the unmitigated scenario are outlined in **Table E.**

Table E: Surface Water Quality Effects During Construction Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Blackwater (Longwood)_050	IE_EA_07B020600	Moderate	Moderate
Boyne_060	IE_EA_07B040900	Good	Good

4.2.1.2 Potential Groundwater Quality Effects

During the construction phase, overburden will be removed from the lateral quarry extension area which will increase the groundwater vulnerability rating in this small area (0.9ha).

Furthermore, accidental spillage of petroleum hydrocarbons and the entrainment of suspended solids have the potential to effect local groundwater quality during the construction phase.

However, during the construction phase, dewatering will continue to keep the current floor of the quarry dry. The dewatering creates a cone of drawdown, with local groundwater flow being directed towards the quarry. This groundwater will enter the sump and will be treated prior to discharge as surface water. Therefore, there is limited potential for groundwater quality to be impacted.

Furthermore, given the large areas of the underlying GWBs there is limited potential for any groundwater effects at the site to effect the overall status of the entire GWB. The Trim and Longwood GWBs have total areas of 669km^2 and 50km^2 respectively.

A summary of potential status change to the underlying GWBs, arising from potential groundwater quality impacts during the construction phase of the proposed development in the unmitigated scenario are outlined in **Table F**.

Table F: Groundwater Quality Impacts During Construction Phase (Unmitigated)

GWB	WFD Code	Current Status	Assessed Potential Status Change

Longwood	IE_EA_G_018	Good	Good
Trim	IE_EA_G_002	Good	Good

4.2.1.3 Potential Effects on Protected Areas

River Boyne and River Blackwater SAC/SPA: Given the small scale of the activities being undertaken during this phase of the proposed development, combined with the large volumes of water within the River Boyne, there is no potential to effects on this SAC/SPA.

St. Gorman's Well pNHA: Due to the nature of the activities being undertaken during the construction phase, there will be no increase in risk to this pNHA in comparison to the existing ongoing dewatering at Rathcore Quarry which will continue throughout this phase.

4.2.2 Operational Phase (Unmitigated)

4.2.2.1 Potential Surface Water Quality Effects

During the operation phase, runoff from the extraction area and pumped groundwater will be directed to temporary sumps in the quarry floor. En route to the sump, water may be contaminated by sediment particles or leaked hydrocarbons. Any release of untreated water has the potential to impact the status of downstream SWBS.

Monitoring of the discharge water quality in accordance with the discharge licence has shown that the site is compliant with the existing discharge emission limits.

However, based on recent site investigations at Rathcore, the initial flows from the karst conduits beneath the quarry will contain a large amount of suspended sediment. This water will require adequate treatment and attenuation in order to provide settling time for suspended sediment. Any release of inadequately treated water can impact the status of downstream SWBs.

A summary of potential status change to SWBs during the operation phase of the Proposed Development in the unmitigated scenario are outlined in **Table G**.

Table G: Potential Surface Water Quality Effects During Operational Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Blackwater (Longwood)_050	IE_EA_07B020600	Moderate	Poor
Boyne_060	IE_EA_07B040900	Good	Good

4.2.2.2 Potential Surface Water Quantity Effects

The proposed deepening and extension of the existing extraction area has the potential to increase volumes of surface water being discharged. This will be a consequence of the increased volumes of surface and groundwater being generated within the extended quarry void (Note that this will offset any reduction in surface water quantity associated with groundwater drawdown and a reduction in baseflow to local watercourses).

Surface water discharges from Rathcore Quarry currently operate under discharge licence conditions. A discharge licence review application will need to be completed for the increases in discharge volume associated with the proposed development. Any unmitigated and uncontrolled increases in discharge has the potential to adversely impact local hydromorphology, water quality and increase the flood risk downstream of the site.

Channel capacity assessments have shown that the lowest capacity of the drainage ditch is significantly greater than the proposed discharge volumes (5,000-6,000 m^3/day). This drainage channel and all downstream watercourses coped with similar flow volumes during a long, high rate pumping test, designed to simulate the proposed dewatering.

A summary of potential status change to SWBs during the operation phase of the proposed development in the unmitigated scenario are outlined in **Table H**.

Table H: Potential Surface Water Quantity Effects During Operational Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Blackwater (Longwood)_050	IE_EA_07B020600	Moderate	Poor
Boyne_060	IE_EA_07B040900	Good	Good

4.2.2.3 Potential Groundwater Quality Effects

Hydrocarbons, untreated wastewater and elevated concentrations of suspended sediment pose a risks to groundwater quality.

Dewatering and pumping will ensure that there is no discharge to ground associated within the quarry void. All potentially contaminated groundwater will enter to sump in the quarry floor and will be discharged as surface waters. However, it is proposed that wastewater will percolate to ground at the location of the new wastewater treatment system.

However, given the scale of the GWBs in comparison to the proposed development, there is unlikely to be any change in the status of the overall GWB as a result of activities at Rathcore.

A summary of potential status change to the underlying GWBs, arising from groundwater quality impacts during the operation stage of the Proposed Development in the unmitigated scenario are outlined in **Table I**.

Table I: Groundwater Quality Impacts During Operational Phase (Unmitigated)

GWB	WFD Code	Current Status	Assessed Potential Status Change
Longwood	IE_EA_G_018	Good	Good
Trim	IE_EA_G_002	Good	Good

4.2.2.4 Potential Groundwater Quantity Effects

The pumping rates will be increased to ensure that the floor of the quarry remains dry and workable. The increased pumping rate will result in a lowering of groundwater levels at the quarry. This reduction of groundwater levels will increase the extent of the cone of drawdown and has the potential to effect groundwater levels in nearby wells.

The potential effect of the drawdown on groundwater levels was assessed in the Hydrogeological Investigation Report (Ball, 2022). During a long, high rate pumping test, designed to simulate the potential effects associated with dewatering, groundwater levels were found to fall by ~4m in the onsite boreholes and ~2m in nearby local wells. This represents a loss of water from the underlying GWBs with the water redistributed into the overlying surface water catchment.

However, given the scale of the GWBs in comparison to the proposed development, there is unlikely to be any change in the status of the overall GWB as a result of activities at Rathcore.

A summary of potential status change to the underlying GWBs, arising from groundwater quality impacts during the operation stage of the proposed development in the unmitigated scenario are outlined in **Table J**.

Table J: Groundwater Quality Impacts During Operational Phase (Unmitigated)

GWB	WFD Code	Current Status	Assessed Potential Status Change
Longwood	IE_EA_G_018	Good	Good
Trim	IE_EA_G_002	Good	Good

4.2.2.5 Potential Effects on Protected Areas

River Boyne and River Blackwater SAC/SPA: Any potential change in surface water quality or discharge flow volumes have the potential to alter the status of this designated site. However, the potential for effects is limited given the large flow volumes in the River Boyne downstream of the site.

St. Gorman's Well pNHA: Further dewatering at the quarry, associated with the quarry deepening, has the potential to impact local groundwater levels which could influence the flow at the spring. However, the Hydrogeological Investigation Report (Ball, 2022) found that the lowering of water levels at the quarry is not linked to the groundwater system which drives warm water to the surface at the spring. Groundwater level monitoring during a long, high-rate pumping test found that pumping did not impact water levels or spring flow at St. Gorman's Well during winter conditions when there is adequate recharge. In summer conditions when recharge is limited and the spring is not flowing, there is the potential for dewatering to slightly lower groundwater levels at St. Gorman's Well. However, this slight seasonal reduction in groundwater levels would not affect the functionality of the spring which only flows during winter. The full details of the site investigations are summarised in Chapter 7 of the EIAR and provided in full in Appendix 7-B of the EIAR.

4.3 MITIGATION MEASURES

In order to mitigate against the potential negative effects on surface and groundwater quality, quantity and flow patterns, mitigation measures will be implemented during the construction and operational phases of the proposed development. These are outlined below.

Many of the mitigation measures proposed below are currently being utilised and effectively implemented as part of the existing operations at Rathcore.

4.3.1 Construction Phase

4.3.1.1 Mitigation Measures to Protect Surface Water Quality

The existing water management system will continue to treat surface water discharge. Surface water runoff and any groundwater inflows will gather in a sump on the floor of the quarry. From here water is pumped to a settlement pond which provides for attenuation and the settlement of fines. Water then passes through a hydrocarbon interceptor and a constructed reed bed prior to discharge. There will be no untreated discharge to surface waters.

Additional mitigation with respect to Hydrocarbons includes:

- 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;
- All fuels will be stored in the existing bunded fuel storage areas at the site workshop;
- Only designated trained operators will be authorised to refuel plant on site; and,
- Procedures and contingency plans will be in place to deal with emergency accidents or spills (spill kits including high absorbency mats will be available on-site).

4.3.1.2 Mitigation Measures to Protect Groundwater Quality

Due to the local hydrogeological regime and the ongoing dewatering and pumping at the site, all groundwater will flow into the sump in the quarry flow and will be treated prior to release as surface water.

No additional mitigation measures are required.

4.3.2 Operational Phase

4.3.2.1 Mitigation Measures to Protect Surface Water Quality

During the operational phase the existing water treatment system may be upgraded to deal with the increasing volumes of water requiring treatment (5,000-6,000m^3/day).

During the initial period of pumping, the pumped groundwater will contain a higher concentration of suspended solids as the clay in the karst conduits is disturbed. Initial "dirty" water was also encountered during the initial period of the pumping tests (Ball, 2022). During the initial phases of pumping, this "dirty" water will be released onto the floor of the quarry, where suspended solids will settle out naturally. A sump will be located at a low point on the quarry floor and water will be directed to this sump. The sump will promote additional settling of solids. Water from the sump will then be pumped to a settlement pond and will undergo the same treatment as for the standard operational phase (discussed below) which will require less treatment as the groundwater will contain significantly lower concentrations of suspended solids.

The following mitigation measures will be in place for the operational phase once the initial dirty water has been treated:

- The water will be pumped directly to the quarry sump and will then be treated through the settlement lagoon(s), hydrocarbon interceptor and a constructed reed bed prior to discharge as surface water;
- An additional settlement pond will be installed if sampling results for suspended solids indicates that additional treatment is required;
- Additional treatment capacity for hydrocarbons, in the form of hydrocarbon separator(s), will be added as required with the increase in discharge from the site;
- Kilsaran will apply to Meath County Council for a review of the existing discharge licence at the site. Kilsaran will comply with the conditions in any revised discharge licence and will put in place the necessary measures to achieve this;
- Fuel will be stored in the designated bunded tanks at the site with 110% of the tank capacity, and in a double skinned tank for the pump generator;
- Surface water from bunds will be pumped out through a suitable oil interceptor or will be taken off site by a licenced contractor for disposal;
- All chemicals and lubricating/hydraulic oils will be stored on spill trays under cover in the existing workshop;
- Waste oils will be stored under cover in the workshop on spill pallets and will be collected and disposed of by a licenced contractor;
- All plant will be regularly maintained and inspected daily for leaks of fuels, lubricating oil or other contaminating liquids/liquors;

- Maintenance of plant and machinery will be undertaken within existing site maintenance sheds / workshop or on the hard stand area in front of the workshop, as appropriate, in order to minimise the risk of uncontrolled release of polluting liquids;
- The refuelling of vehicles will be undertaken on the surfaced area adjacent from the fuel tank beside the workshop, in order to minimise the risk of uncontrolled release of polluting liquids / liquors reaching the receiving environment;
- The refuelling of plant and machinery on the quarry floor will only be undertaken using a mobile double skinned fuel bowser, in order to minimise the risk of uncontrolled release of polluting liquids/liquors which may arise from an accident; and,
- A spill kit is kept on site to stop the migration of any accidental spillages, should they occur.

Wastewater at the site will be treated in a new proprietary treatment system which will comprise of a septic tank and filter system. The treated effluent will be released through a percolation area. There will be no discharge of wastewater to surface watercourses.

4.3.2.2 Mitigation Measures for Surface Water Quantity

A water management system is already in place at Rathcore Quarry whereby a combination of groundwater and surface water is treated and attenuated within the site prior to discharge in accordance with the existing discharge licence.

The existing water management system will be upgraded as required to deal with the increasing volumes of water. The following mitigation measures will be implemented with respect to surface water discharge volumes:

- Temporary sumps on the quarry floor will provide attenuation of water;
- Water will be pumped to the existing settlement pond which will provide additional attenuation;
- An additional settlement pond will be installed if sampling results for suspended solids indicates that additional treatment is required;
- Kilsaran will apply to Meath County Council for a review of the existing discharge licence at the site. This licence will set out a new discharge volume limit and Kilsaran will comply with the conditions in any revised discharge licence and will put in place the necessary measures to achieve this.

4.3.2.3 Mitigation Measures to Protect Groundwater Quality

No additional mitigation measures beyond what is outlined above in **Section 4.3.2.1** are required.

4.3.2.4 Mitigation Measures for Groundwater Quantity

The proposed deepening of the quarry will extend to 45mOD, therefore limiting the extent of local groundwater drawdown.

A detailed Hydrogeological Investigation Report has been complete at Rathcore Quarry and that study included a long, high rate pumping test designed to simulate the effects of the proposed dewatering on groundwater levels. This assessment found that there is not likely to be any significant effects on nearby private wells due to the limited drawdown (2-4m). This limited drawdown effect is proven, and is not an estimate.

Kilsaran will continue to monitor groundwater levels in both on-site boreholes and local private wells throughout the operation phase to identify any further potential effects. In the event that a significant effect is identified, Kilsaran will either deepen the well or provide an alternative water supply to the property.

No additional mitigation measures are required.

4.3.2.5 Mitigation Measures for Protected Areas

No additional mitigation measures will be required to ensure the protection of downstream/downgradient designated sites.

The updated surface water treatment system with the additional capacity to cater for additional volumes of water will ensure the protection of downstream surface water quality. Kilsaran will apply to Meath County Council for a review of the existing discharge licence at the site. This licence will set out a new discharge volume and water quality parameter limits and Kilsaran will comply with the conditions in any revised discharge licence and will put in place the necessary measures to achieve this.

With respect to groundwater levels and potential effects on the detailed Hydrogeological Investigation (Ball, 2022) has been completed for Rathcore Quarry and this included an assessment of the potential effects of the dewatering on groundwater levels at St. Gorman's Well and flows from the spring. The assessment concluded that there is no link between lowering of the water levels at the quarry and the groundwater system which drives warm water to the surface at St. Gorman's Well. Therefore, no specific mitigation measures are required. Furthermore, no monitoring will be required at St. Gorman's Well. Intermediate groundwater level monitoring will be completed in the private wells adjacent to the quarry and this monitoring will detect any increased drawdown signal

4.3.3 Decommissioning Phase

The potential impacts associated with decommissioning of the proposed development will be similar to those associated with construction but of a reduced magnitude, due to the reduced scale of the proposed decommissioning works in comparison to construction phase works.

During decommissioning, the site will be restored to a combination of natural habitat and agricultural grassland.

No significant effects on the hydrological and hydrogeological environment will occur during the decommissioning phase of the proposed development.

4.3.4 Potential Effects with the Implementation of Mitigation

In all instances, the mitigation measures described in **Section 4.3** are sufficient to meet the WFD Objectives. The assessment of WFD elements for the WFD waterbodies is summarised in **Table K** below.

Table K: Summary of WFD Status for Unmitigated and Mitigated Scenarios

WFD Water Bodies	WFD Code	Current Status	Assessed Status - Unmitigated	Assessed Status with Mitigation Measures
Surface Water Bodies				
Blackwater (Longwood)_050	IE_EA_07B020600	Moderate	Poor	Moderate
Boyne_060	IE_EA_07B040900	Good	Good	Good
Groundwater Bodies				
Longwood	IE_EA_G_018	Good	Good	Good
Trim	IE_EA_G_002	Good	Good	Good

5. SUMMARY AND CONCLUSION

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

The proposed development includes the deepening of the existing quarry void below the groundwater table and will require additional dewatering which has the potential to impact local groundwater levels. A detailed Hydrogeological Investigation Report has been completed at Rathcore Quarry and that study concluded that the site is underlain by a karstified aquifer. A long, high-rate pumping test designed to simulate the effects of the proposed dewatering on groundwater levels, was completed as part of the study This assessment found that there is not likely to be any significant effects on groundwater levels with only a limited drawdown of 2-4m recorded in local private wells. Given the small scale of the proposed development in comparison to the larger GWBs there is no potential for the proposed development to impact the status of the underlying GWBs,

In addition, Kilsaran will continue to monitor groundwater levels in both on-site boreholes and local private wells throughout the operation phase to identify any further potential effects.

There is a direct discharge from the site to downstream receiving surface waters. The site currently operates under an existing discharge licence (DL13/02) and there is an existing water management system in place to attenuate and treat water prior to discharge. The existing water treatment system will be upgraded as required to cater for the increasing volumes of water being generated by the deepening of the quarry. There will be no discharge of untreated waters.

There will be no change in GWB or SWB status in the underlying GWBs or downstream SWBs resulting from the proposed development. There will be no change in quantitative (volume) or qualitative (chemical) status, and the underlying GWBs are protected from any potential deterioration from chemical pollution.

As such, the proposed development will not impact upon any surface water or groundwater body as it will not cause a deterioration of the status of the body and/or it will not jeopardise the attainment of good status.

As such, the proposed development:

- will not cause a deterioration in the status of all surface and groundwater bodies assessed;
- will not jeopardise the objectives to achieve 'Good' surface water/groundwater status;
- does not jeopardise the attainment of 'Good' surface water/groundwater chemical status;
- does not jeopardise the attainment of 'Good' surface water/groundwater quantity status;
- does not permanently exclude or compromise the achievement of the objectives of the WFD in other waterbodies within the same river basin district;
- is compliant with the requirements of the Water Framework Directive (2000/60/EC); and,
- is consistent with other Community Environmental Legislation including the EIA Directive (2014/52/EU), the Habitats Directive (92/43/EEC) and the Birds Directive (2009/147/EC) (Note that a full list of legislation complied with in relation to hydrology and hydrogeology is included in Section 7.22 to 7.25 of the EIAR).

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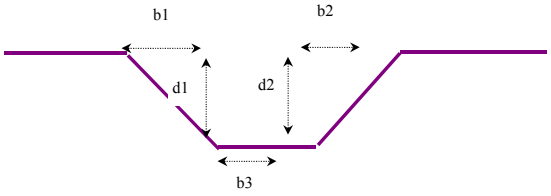
APPENDIX 7-F
Channel Capacity Assessment

Determination of Channel Flow - Using Manning's Equation

Mannings Equation is: $V = \frac{R^{0.67} x S^{0.5}}{n}$

Given a typical channel section:



Mannings n	
0.013	Smooth concrete channel
0.02	Spoil, earth of masonry channel
0.03	Short grass
0.03	Clean, straight natural stream
0.04	Clean winding natural stream
0.1	Overgrown stream or channel

Cross Section 1

When channel dimensions are:

b1 = **2.000** (m)
d1 = **0.930** (m)

b2 = **2.150** (m)
d2 = **1.380** (m)

b3 = **1.550** (m)

Height Change (m)	Length (m)
2.85	152

S = **0.019** (dim)

n = **0.03** (dim)

where:

V	Velocity (m/s)
R	(Cross Sectional Area of ditch) / (Wetted Perimeter)
S	Slope
n	Mannings Coefficient of Roughness

Gives:

R = **0.666**

V = **3.477** (m/s)

Q = **14.615** (m^3/s bankfull)

A = ***3.999***

Cross Section 2

When channel dimensions are:

b1 = **1.700** (m)
d1 = **1.300** (m)

b2 = **2.550** (m)
d2 = **1.000** (m)

b3 = **0.235** (m)

Height Change (m)	Length (m)
2.85	152

S = **0.019** (dim)

n = **0.03** (dim)

where:

V	Velocity (m/s)
R	(Cross Sectional Area of ditch) / (Wetted Perimeter)
S	Slope
n	Mannings Coefficient of Roughness

Gives:

R = **0.518**

V = **2.938** (m/s)

Q = **7.787** (m^3/s bankfull)

A = ***2.445***

Cross Section 3

When channel dimensions are:

b1 = 0.920 (m)
d1 = 1.510 (m)

b2 = 2.800 (m)
d2 = 1.380 (m)

b3 = 0.460 (m)

Height Change (m)	Length (m)		
1.51	105	S = 0.014	(dim)

n = 0.03 (dim)

where:
V Velocity (m/s)
R (Cross Sectional Area of ditch) / (Wetted Perimeter)
S Slope
n Mannings Coefficient of Roughness

Gives:

R = **0.615**

V = **2.887** (m/s)

Q = **9.501** (m^3/s bankfull)

A = ***2.024***

Cross Section 4

When channel dimensions are:

b1 = 2.700 (m)
d1 = 1.630 (m)

b2 = 1.700 (m)
d2 = 1.600 (m)

b3 = 1.800 (m)

Height Change (m)	Length (m)		
0.86	129	S = 0.007	(dim)

n = 0.1 (dim)

where:
V Velocity (m/s)
R (Cross Sectional Area of ditch) / (Wetted Perimeter)
S Slope
n Mannings Coefficient of Roughness

Gives:

R = **0.887**

V = **0.754** (m/s)

Q = **4.874** (m^3/s bankfull)

A = ***7.281***

Cross Section 5

When channel dimensions are:

b1 = 1.260 (m)
d1 = 1.730 (m)

b2 = 2.430 (m)
d2 = 1.360 (m)

b3 = 2.800 (m)

Height Change (m)	Length (m)		
0.78	151	S = 0.005	(dim)

n = 0.1 (dim)

where:
V Velocity (m/s)
R (Cross Sectional Area of ditch) / (Wetted Perimeter)
S Slope
n Mannings Coefficient of Roughness

Gives:

R = **0.915**

V = **0.677** (m/s)

Q = **4.787** (m^3/s bankfull)

A = ***5.9878***

Cross Section 6

When channel dimensions are:

b1 =	1.500	(m)
d1 =	1.520	(m)
b2 =	1.930	(m)
d2 =	1.970	(m)
b3 =	1.950	(m)

Height Change (m)	Length (m)			
0.64	264	S =	0.002	(dim)
		n =	0.1	(dim)

where:

V	Velocity (m/s)
R	(Cross Sectional Area of ditch) / (Wetted Perimeter)
S	Slope
n	Mannings Coefficient of Roughness

Gives:

R = **0.942**

V = **0.473** (m/s)

Q = **3.047** (m^3/s bankfull)

A = ***6.1215***

Cross Section 7

When channel dimensions are:

b1 =	0.200	(m)
d1 =	1.970	(m)
b2 =	1.170	(m)
d2 =	1.970	(m)
b3 =	3.200	(m)

Height Change (m)	Length (m)			
0.27	290	S =	0.001	(dim)
		n =	0.1	(dim)

where:

V	Velocity (m/s)
R	(Cross Sectional Area of ditch) / (Wetted Perimeter)
S	Slope
n	Mannings Coefficient of Roughness

Gives:

R = **1.024**

V = **0.310** (m/s)

Q = **2.373** (m^3/s bankfull)

A = ***6.698***

Cross Section 8

When channel dimensions are:

b1 =	1.630	(m)
d1 =	2.040	(m)
b2 =	1.200	(m)
d2 =	1.760	(m)
b3 =	1.360	(m)

Height Change (m)	Length (m)			
0.19	334	S =	0.001	(dim)
		n =	0.1	(dim)

where:

V	Velocity (m/s)
R	(Cross Sectional Area of ditch) / (Wetted Perimeter)
S	Slope
n	Mannings Coefficient of Roughness

Gives:

R = **0.869**

V = **0.217** (m/s)

Q = **1.151** (m^3/s bankfull)

A = ***5.7188***

Cross Section 9

When channel dimensions are:

b1 =	1.640	(m)
d1 =	1.800	(m)
b2 =	1.640	(m)
d2 =	1.800	(m)
b3 =	2.500	(m)
S =	0.001	(dim)
n =	0.1	(dim)

Height Change (m)	Length (m)
0.2	167

where:

V	Velocity (m/s)
R	(Cross Sectional Area of ditch) / (Wetted Perimeter)
S	Slope
n	Mannings Coefficient of Roughness

Gives:

R = **1.011**

V = **0.349** (m/s)

Q = **2.598** (m^3/s bankfull)

A = ***7.452***

APPENDIX 7-G
Assimilative Capacity Assessment

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ASSIMILATIVE CAPACITY ASSESSMENT
RATHCORE QUARRY DISCHARGE, ENFIELD, CO. MEATH

FINAL REPORT

Prepared for:

KILSARAN LTD

Prepared by:

HYDRO-ENVIRONMENTAL SERVICES

DOCUMENT INFORMATION

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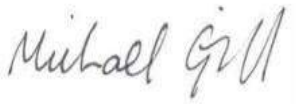
Author:	**MICHAEL GILL CONOR MCGETTIGAN**
Signed:	 **Michael Gill B.A., B.A.I., M.Sc., MIEI Managing Director – Hydro-Environmental Services**

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1. INTRODUCTION

1.1 BACKGROUND

Hydro-Environmental Services (HES) were requested by Kilsaran Limited, to complete an Assimilative Capacity Assessment for a planning application for the proposed lateral extension (0.8ha) and vertical deepening of Rathcore Quarry, Enfield, Co. Meath, with respect to the receiving River Blackwater.

The existing quarry at Rathcore is located approximately 1km southwest of Rathcore village, Co. Meath. There is an existing discharge from Rathcore Quarry and Kilsaran have a discharge licence for the existing permissions (Ref No: 13/02). The proposed deepening and extension of the existing quarry void will generate increased volumes of water which will require discharge.

The purpose of this Assimilative Capacity Assessment is to determine any potential effects on surface water quality or quantity within the River Blackwater downstream of the discharge location which may arise from the increased volumes of discharge.

During the operational phase the maximum volumes of water to be discharge will be up to 6,000m^3/day. This maximum discharge volume has been estimated based on volumes of water encountered during long, high rate pumping tests completed at Rathcore Quarry and combined volumes of rainfall and potential groundwater inflows.

This assessment will determine the capacity of the River Blackwater to accept the increased discharge volumes and determine the cumulative impact on water quality as a result of this discharge.

This Assimilative Capacity Assessment is intended to supplement the EIAR submitted as part of the proposed development planning application.

1.2 RELEVANT GUIDELINES & LEGISLATION

The assessment was carried out in accordance with the following guidance and tailored accordingly based on professional judgement:

- Local Authority Services National Training Group - Discharge to Surface Waters, Guidance to the Applicant (August 2011);
- CIRIA 2006: Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532. London, 2006; and,
- Department of the Environment, Heritage and Local Government; Quarries and Ancillary Activities – Guidance for Authorities (April, 2004).

The requirements of the following legislation have been considered during this assimilative capacity assessment and are complied with:

- S.I. No. 293/1988: European Communities (Quality of Salmonid Waters) Regulations, resulting from EU Directive 78/659/EEC on the Quality of Fresh Waters Needing Protection or Improvement in order to Support Fish Life;
- S.I. No. 272/2009: 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) and S.I. No. 722/2003 European Communities (Water Policy) Regulations which implement EU Water Framework Directive (2000/60/EC) establishing a framework for the Community action in the field of water policy and provide for implementation of 'daughter' Groundwater

Directive (2006/118/EC) on the protection of groundwater against pollution and deterioration. 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 of 2003);

- S.I. No. 684/2007: Waste Water Discharge (Authorisation) Regulations 2017, 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. 106/2007: European Communities (Drinking Water) Regulations 2007 and S.I. No. 122/2014: European Communities (Drinking Water) Regulations 2014, arising from EU Directive 98/83/EC on the quality of water intended for human consumption (the "Drinking Water Directive") and EU Directive 2000/60/EC;
- S.I. No. 9/2010: European Communities Environmental Objectives (Groundwater) Regulations 2010 (as amended by S.I. No. 389/2011; S.I. No. 149/2012; and,
- S.I. No. 296/2009: The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (as amended by S.I. No. 355/2018)

1.3 STATEMENT OF AUTHORITY

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

This Assimilative Capacity assessment was prepared by Michael Gill and Conor McGettigan.

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, Middleton Quarry in County Cork and Clonard Quarry in County Kildare.

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.

1.4 PROPOSED DEVELOPMENT DESCRIPTION

The proposed development includes the continued use of the permitted development within an overall application area of 31.0 hectares (ha), and all for a period of 22 years, and it will comprise the following:

- Permission for continued use of the previously permitted developments under P. Reg. Ref. No's. 01/1018 (PL17.127391), 95/1416 (PL17.099325) and 91/970 (PL17.089787) to include the existing quarry, drilling, blasting, crushing and screening of rock and related ancillary buildings and facilities;
- Permission for continued use of the previously permitted developments under P. Reg. Ref. No. TA/120923 consisting of a discharge water treatment facility comprising two lagoons (30m x 13m), an oil interceptor, a reed bed (27m x 10m) and a concrete canal with "V" notch weir;
- Permission for a small lateral extension of c.0.89 hectares from the existing quarry area of c.9.7 hectares as permitted under P. Ref. 01/1018 (PL17.127391) to give an overall extraction footprint of c.10.6 hectares;
- Permission for the deepening of the overall extraction area (c.10.6 hectares) by 2 no. 15m benches to a final depth of c.45m AOD from the current quarry floor level of c.75m AOD as permitted under P. Ref. P. Ref. 01/1018 (PL17.127391);
- Permission for a proposed new rock milling plant to be enclosed within a steel-clad building (c.575m² with roof height of 22.5m and exhaust stack height of 28.2m);
- Replacement of existing septic tank with a new wastewater treatment system and constructed percolation area;
- Restoration of the site to a beneficial ecological after-use; and,
- All associated site works within an overall application area of 31.0 hectares. The proposed operational period is for 20 years plus 2 years to complete restoration (total duration sought 22 years).

As detailed in the EIAR there will be three phases carried out as part of the proposed development, followed by an After-Care Phase. These phases are as follows:

- Construction Phase;
- Operational Phase; and,
- Post-Operational Phase.

1.4.1 Construction Phase

In advance of commencing the main operational activity, a program of construction works/site preparation works will be undertaken during a period of ca. 6 months. The main works will include the preparation (soil/subsoil stripping) of the small lateral quarry extension area and the construction of a new rock milling plant.

As noted in the EIAR, surface water discharges from Rathcore Quarry currently operate under DL 13/02 and associated licence conditions. During the construction phase, the quarry will continue to discharge water in order to keep the existing quarry floor dry.

1.4.2 Operational Phase

The operation phase is taken to comprise of the deepening of the quarry by 2 no. 15m benches to a final depth of 45mAOD from the current quarry floor level of 75mAOD. The reduction in floor level in the quarry will require continued and increased pumping from the sump in the quarry floor to maintain dry working conditions on the quarry floor.

During this phase, the quarry will continue to discharge treated effluent at the existing outfall location. The volume of effluent will likely increase, associated with the increased pumping

rate, and will be subject to a review of the discharge licence. The maximum discharge rate is estimated to be 6,000m^3/day.

The operation phase will be 20 years in duration.

1.4.3 Post-Operational Phase

On cessation of the quarrying activities, pumping of water from the quarry void will cease and the quarry will be allowed to flood and become a natural habitat. There will be no discharge to surface waters.

2. RECEIVING HYDROLOGICAL ENVIRONMENT

2.1 INTRODUCTION

This section identifies those surface water bodies with potential to be affected by the discharge from the proposed development.

2.2 SURFACE WATERBODY IDENTIFICATION

On a regional scale, the site is located is located in the Boyne regional surface water catchment and within Hydrometric Area 7 of the Eastern River Basin District.

More locally, the site is mapped in the Boyne_SC_020 WFD sub-catchment and drains to the Blackwater River which in turn discharges into the River Boyne ~7.5km to the northwest.

The site is located within 3 no. WFD river sub-basins:

- The south of the site is located in the Blackwater (Longwood)_030 WFD river sub-basin. Within this area, the Blackwater River flows to the northwest ~2.5km southwest of the site.
- The centre and west of the site are located in the Blackwater (Longwood)_050 WFD river sub-basin. The closest mapped watercourses to the site is a small 1st order stream, located ~950m to the northwest. This stream flows to the northwest before discharging a 2nd order stream. This stream flows to the west and discharges into the Blackwater River ~3.4km northwest of the site. These streams are locally unnamed but have been assigned names by the EPA. The small 1st order stream is referred to as the Clonguiffin stream while the 2nd order stream is referred to as Connellstown stream.
- The east of the site is located in the Rathcore Stream_010 WFD river sub-basin. The closest watercourse to the site is a 2nd order stream, referred to by the EPA as the Jordanstown Stream. This stream is mapped ~1.25km northeast of the site. This stream flows to the northeast and discharges into the Rathcore Stream ~750m northwest of Rathcore village. The Rathcore Stream flows to the northwest and discharges into the Blackwater River ~4.2km northwest of the site.

Error! Reference source not found. below is a local hydrology map of the area and indicates the existing discharge route.

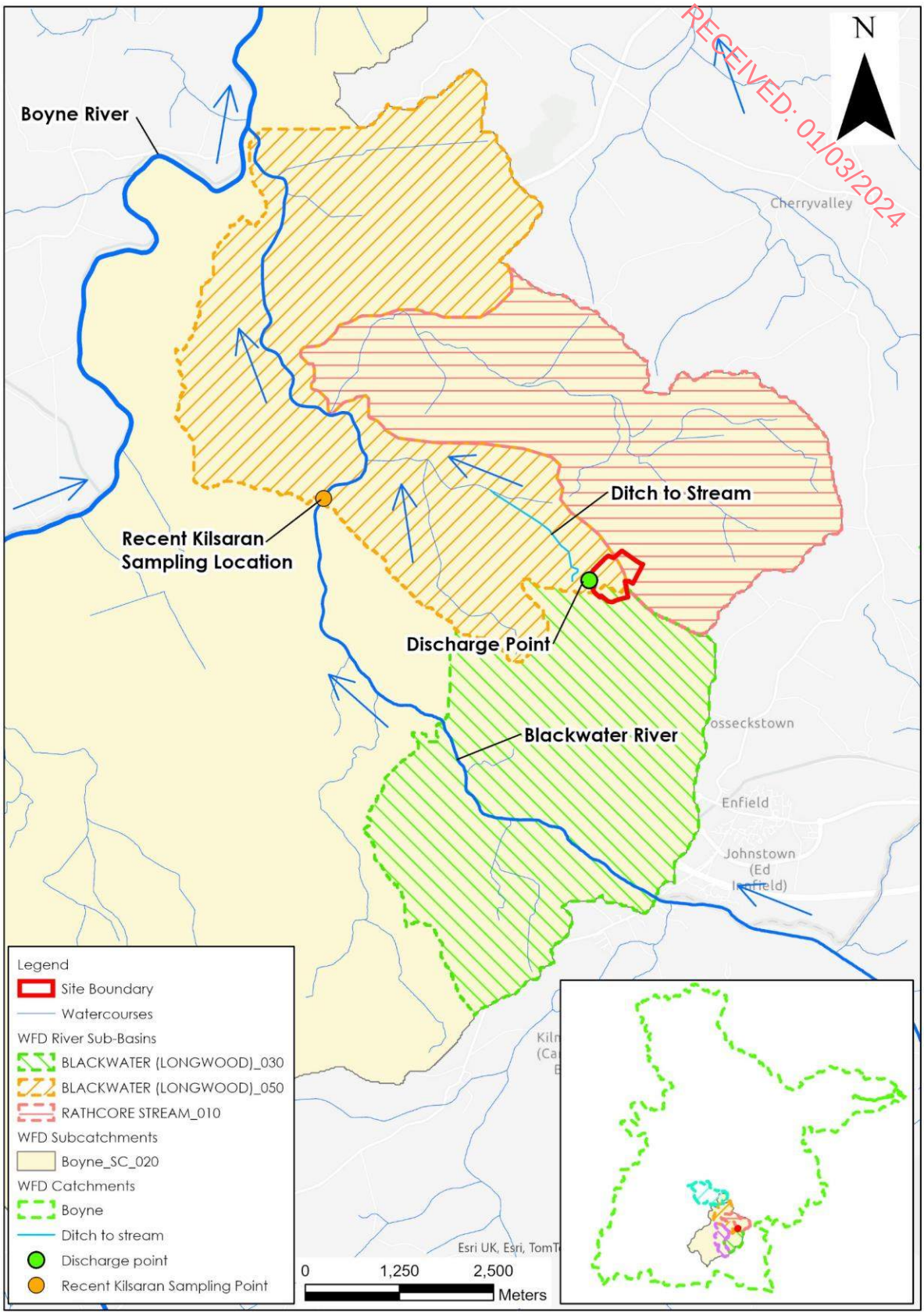

Figure A: Local Hydrology Map

2.3 EXISTING WATER TREATMENT AND DISCHARGE

The existing operations at Rathcore Quarry are below the local groundwater table and require a surface water discharge. Water is discharged to a nearby drain which flows to the northwest before discharging into a small tributary of the Blackwater River.

An existing Discharge Licence is in place for the ongoing operations. The Licence reference is 13/02, and it was issued by Meath County Council on 27th June 2013.

The discharge licence requires that all effluent generated by the dewatering operations is directed through a treatment system comprising of a settlement pond, hydrocarbon interceptor and a reed bed. This treatment system is being operated and maintained in accordance with the discharge licence.

Several maximum limit values are outlined in the Discharge Licence with respect to effluent water quality and discharge volumes.

Monitoring of surface water flow volumes and discharge water quality is currently being undertaken by Kilsaran in accordance with the existing discharge licence. The results of the recent monitoring and compliance are discussed below in relation to discharge quality and flow volumes.

Water Quality

A total of 43 no. grab samples have been taken and sent to an accredited laboratory for analysis between January 2020 and August 2023. The laboratory results and existing emission limits are summarised in

Table A below. 7 no. exceedances of the emission limits have been recorded during this time period with 4 no. exceedances being recorded for BOD. In addition, 1 no. exceedance has been recorded for suspended solids, ortho-phosphate and ammonia.

Table A: Water Quality Monitoring (Jan 2020 - Aug2023)

Parameter	Discharge Licence Limit	No. Samples	Average Conc.	Recorded Range	No. of Exceedances	% Compliant
BOD_5 (mg/l)	2.5	43	0.93	<0.1 – 3	4	91%
COD (mg/l)	50	43	13	<5 - <50	0	100%
Suspended Solids (mg/l)	20	43	7.29	<2 – 23	1	98%
pH (mg/l)	6.0 – 9.0	43	7.67	7.41 – 7.98	0	100%
Ortho-phosphate (mg/l)	0.065	43	0.04	<0.0014 - 0.29	1	98%
Nitrates (as N)	12	43	7.75	1.2 – 11	0	100%
Ammonium (as N)	0.1	43	0.073	<0.01 – 0.68	1	98%
TPH (µg/l)	50	43	Always below limit of detection	<0.01 - <10	0	100%
BTEX Compounds (µg/l)	10	43	Always below limit of detection	0 - <1	0	100%

Flow Volumes

Condition 2.2 (Ref. No. 13/02) of the existing discharge licence states that: "The total volume of effluent to be discharged shall not exceed 30m3/hr and a maximum volume of 724m^3/day."

Summary details of the discharge from January 2023 to present are shown in **Table B** below. The daily discharge volumes generally exceed the existing discharge licence limit. This A discharge licence applies to the site and is currently being reviewed, to increase the maximum daily discharge volume for the site.

Table B: Summary of Daily Discharge Results (Jan 2023 – Aug 2023)

Monitoring Period	Average Daily Discharge (m^3/day)
Jan-23	2005.4
Feb-23	1121.2
Mar-23	1224.9
Apr-23	1375.9
May-23	909.7
Jun-23	503.2
Jul-23	742.4
Aug-23	892.0

2.4 BASELINE OF RECEIVING ENVIRONMENT

Water Quality

Biological Q-rating data for EPA monitoring points are available along the River Blackwater downstream of the discharge locations. The most recent data available (2020) shows that the River Blackwater achieved "Moderate Status" (Q3-4) downstream of the discharge locations and upstream of its confluence with the River Boyne (Station Code: RS07B020600).

Furthermore the Blackwater River (Blackwater (Longwood)_050 surface waterbody) downstream of the site achieved "Moderate Status" under the latest WFD cycle (2016-2021). This river waterbody is listed as being at risk of failing to meet its WFD objectives and is under significant pressure from agriculture and hydromorphological issues.

The EPA complete chemical monitoring of the Blackwater River downstream of the site and the recent results are shown in **Table C**.

Table C: Summary Water Quality Results for the Blackwater river from the EPA (March 2020 to July 2023)

Parameter	Count	Mean
BOD_5 (mg/l)	11	1.5
pH (mg/l)	33	7.99
Ortho-phosphate (mg/l)	30	0.04
Nitrates (as N)	15	2.49
Nitrite	13	12.34
Ammonium (as N)	25	0.03
Chloride	18	25.97
Dissolved Oxygen (mg/l)	33	9.86
Total Nitrogen	12	3.19

Kilsraran have also completed sampling of the Blackwater River on 20th and 21st November 2023. The results of this sampling is presented in **Table D** and is used in the Assimilation Capacity Assessment (**Section 3**).

Table D: Kilsaran Sampling (2023)

Parameter	Units	20/11/2023	21/11/2023	Mean
Nitrite	mg/L as N	0.017	0.015	0.016
Nitrate	mg/L as N	2.47	3.27	2.87
Ammonia	mg/L as N	0.04	0.03	0.035
Solids (Total Suspended)	mg/L	9	<2	5.5
Conductivity	µscm -1@20C	616	643	630
COD	mg/L	46	48	47
BOD	mg/L	1.4	1.5	1.45
pH	pH Units	7.67	7.53	7.6
Phosphorus (Total)	mg/L as P	0.12	0.2	0.16

Flow Volumes

There is an OPW hydrometric gauging station located downstream of the site on the River Blackwater at Castlerickard Bridge. This gauging station has been operational since August 1953 and data is available for the period August 1953 to December 2010. The catchment at the gauging station is 190km^2. Based on the recorded flow data the Blackwater at Castlerickard station has a 50%ile flow of 1.64m^3/s and a 95%ile flow of 0.43m^3/s.

Flow volumes were also obtained from the EPA's hydrotool, available on www.catchments.ie. The Hydrotool dataset contains estimated of naturalise river flow duration percentiles. EPA Hydrotool Node 07_949 is the closest Node downstream of the discharge location on the River Blackwater. The 95%ile flow at this location is estimated to be 0.433m^3/s.

3. ASSIMILATIVE CAPACITY ASSESSMENT

3.1 BACKGROUND

The assimilative capacity is the measure of a receiving waters' ability to absorb pollutants, while maintaining an acceptable environmental quality standard (EQS) which in this case is the WFD status. The mass balance equation (as shown below) determines the anticipated cumulative concentrations of parameters in the water body due to the proposed discharge. The mass balance calculation will determine whether the discharge will cause an exceedance of the EQS.

The assimilative capacities of receiving waters have been assessed in accordance with the Environmental Objectives and water quality standards established in Part III of European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (S.I. No. 272/2009).

The assimilative capacity was carried out for parameters listed under S.I. 272/2009 Chemical Conditions Supporting Biological Elements for which EPA monitoring data is available:

- pH;
- COD;
- Suspended Solids;
- Biochemical Oxygen Demand (BOD);
- Ammonia as N;
- Nitrate (as NO_3); and
- Nitrite (as NO_2).

3.2 ASSIMILATION CAPACITY ASSESSMENT AND MASS BALANCE CALCULATIONS

The potential impact of these parameters in the discharge was assessed in two parts, firstly an Assimilative Capacity assessment for the receiving waters and then a Mass Balance of the parameters in the stream from the quarry discharge. The results were assessed and a percentage headroom calculation was undertaken for the receiving waters.

The calculations undertaken for this assessment are:

1. Assimilative capacity of the receiving waters;
2. The concentration of the chemical parameters in the quarry discharge;
3. The mass balance of the receiving waters; and
4. The percentage headroom calculations for the parameters in the receiving water.

1. The Assimilative Capacity of the Receiving Water is calculated as:

$$\text{Assimilative Capacity} = (C_{max} - C_{back}) \times F \qquad \textit{Eqn. 1}$$

Where:
C_{max}, is the maximum permissible concentration (EQS value);
C_{back}, is the background upstream concentration (from Kilsaran Monitoring); and
F, is the flow in the receiving waters.

Once the assimilative capacity of the receiving water has been established, the percentage of the assimilative capacity that will be used by the discharge may be calculated using the effluent load information.

2. The concentration of the chemical parameters in the discharge is calculated as (note that Concentration here is the maximum allowable discharge conc. as set out in the discharge licence):

Load = Discharge flow x Concentration *Eqn. 2*

3. The Mass Balance formula is used to calculate the concentration of a parameter in the receiving water downstream of the discharge. This downstream concentration may then be compared directly with the water quality standard (EQS), to determine whether the discharge will cause an exceedance of the EQS value in the receiving waters.

   The Mass Balance is calculated as:

$$T = \frac{FC + fc}{F + f} \qquad \textit{Eqn. 3}$$

Where:
T, is the concentration of pollutant downstream of the discharge;
F, is the river flow upstream of the discharge;
C, is the concentration of pollutant in the river upstream of the discharge;
f, is the flow of the discharge; and
c, is the maximum concentration of pollutant in the discharge.

4. The percentage available headroom in the receiving waters is calculated as:

Percentage headroom = (T - Cback) / (Cmax - Cback) *Eqn. 4*

Where:
T, is the concentration of pollutant downstream of the discharge (Mass Balance result);
C_{max}, is the maximum permissible concentration (EQS value); and
C_{back}, is the background upstream concentration.

3.3 ENVIRONMENTAL QUALITY STANDARDS

For the purpose of the AC Assessment Environmental Quality Standards (EQS) are required for the receiving waters to assess the discharge against. The primary source of EQS values is the Surface Water Regulations[1], where available. EQS sources are used from other regulations where applicable; however for a number of the parameters above there are no suitable EQS available. Where applicable, the EQS for 'Good Status' mean value in the surface water regulations was used in this assessment.

The water quality parameters and their EQS are shown in **Table E** below. Water quality standards from the Drinking Water Regulations (2014) and Salmonid Regulations (1988) have been used where no EQS under the Surface Water Regulations exist.

Table E: Water Quality Parameters and EQS Value

Parameter	EQS	EQS Type	EQS Source
pH	6 – 9 (pH Units)	-	S.I. No. 272 2009
BOD	1.5 (mg/l)	Good Status mean	S.I. No. 272 2009
COD	50	-	Discharge Licence ELV
Suspended Solids	25 (mg/l)	-	S.I. No. 293 1988[2]
Ammonia	0.065 (mg/l)	Good Status mean	S.I. No. 272 2009
Nitrate	50 (mg/l)	-	S.I. No. 122 of 2014
Nitrite	0.5 (mg/l)	-	S.I. No. 122 of 2014
BOD	1.5 (mg/l)	Good Status mean	S.I. No. 272 2009

[1] *S.I. No. 272 2009 - European Communities Environmental Objectives (Surface Waters) Regulations 2009*
[2] *S.I. No. 293 1988 European Communities (Quality of Salmonid Waters) Regulations 1988.*

3.4 ASSIMILATION CAPACITY ASSESSMENT RESULTS

The Assimilative Capacity assessment and Mass Balance calculations for the impact of the increased quarry discharge (6,000m^3/day) on the receiving waters of the Blackwater River is based on the discharge, low river flow and water quality input values outlined in the preceding sections.

The inputs were used to calculate the assimilative capacity (*Eqn. 1*), discharge concentration (*Eqn. 2*) and Mass Balance (*Eqn. 3*) under low flow conditions in the receiving waters (i.e. 95%ile flow).

Under the 95%'ile flow conditions in the Blackwater River the results of the Assimilative Capacity assessment calculations are shown in **Table F** below.

The results from the Assimilative Capacity assessment indicate that under the 95%'ile flow conditions in the receiving water there is no assimilative capacity for BOD as the background levels in the Blackwater River are relatively high at 1.45mg/l.

For the remainder of the parameters there is sufficient available Assimilative Capacity in the Blackwater River for the discharge from the quarry.

It must be noted that quarries are not like other industrial activities when undertaking Assimilative Capacity Assessments where a fixed discharge volume is generated, irrespective of the prevailing meteorological conditions. During periods of low flow in the Blackwater River it is unlikely that there will be any discharge from the quarry as groundwater inflows to the sump will be negligible; in this respect, the Assimilative Capacity assessment for the impact of the discharge on the receiving water quality during low flow conditions is a largely informative exercise only.

Table F: Assimilation Capacity Results under low flow conditions

Parameter	BOD_5 (mg/l)	Ammonia (as N)	Nitrate (as N)	pH (mg/l)	Suspended Solids (mg/l)	COD (mg/l)
95%ile flow in Blackwater River (m^3/s)	0.433	0.433	0.433	0.433	0.433	0.433
Sample Background Conc. In Blackwater River	1.45	0.035	2.87	7.6	5.5	47
Max Quarry Discharge (m^3/s)	0.06	0.06	0.06	0.06	0.06	0.06
Max Discharge Conc.	2.5	0.13	12	9	20	50
Assimilative Capacity of Blackwater River (Kg/day)	0	1.122	1,763	52.37	703	112.23
Load (Discharge) (Kg/day)	12.96	0.67	62.21	46.66	103.68	259.2
Mass Balance (mg/l)	1.57	0.046	3.98	7.77	7.26	47.36
% Available Headroom	Over EQS	28%	92%	14%	71%	5%
Good status/standard achieved	No	Yes	Yes	Yes	Yes	Yes

4. SUMMARY AND CONCLUSION

An Assimilative Capacity Assessment has been completed for the proposed development at Rathcore Quarry, Enfield, Co. Meath. The assessment has been completed in order to identify any potential water quality effects from any potential increase in quarry discharge associated with the proposed deepening and lateral extension of the existing limestone quarry.

During the operational phase of the proposed development it is estimated that the maximum discharge will increase to 6,000m^3/day.

The assessment has been based on water quality data gathered by the EPA from the River Blackwater and from monitoring of the existing discharge water quality in accordance with the existing discharge licence conditions. The flow volumes for the River Blackwater were obtained from the OPW and the EPA and are available to view at www.catchments.ie.

Based on the results of the assimilative capacity assessment there is sufficient available Assimilative Capacity in the Blackwater River for the discharge from the quarry for most parameters. There is no capacity with regards to BOD, but this relates to the elevated background concentrations in the Blackwater River.

Overall, based on the completed Assimilative Capacity Assessment there will be no significant effect on the River Blackwater as a result of the discharge, and there is available assimilative capacity to accept the proposed discharge.

* * * * * * * * * * * * * *

APPENDIX 7-H
Groundwater Quality Laboratory Results (March 2021)

TEST REPORT NO: 195353 .1

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 21/03/1036
Quote Ref: QC005144
Order No: N/A
Sales Order: 101532
Date Received: 10/03/2021
Date Sampled: 10/03/2021
Date Completed: 19/03/2021
Sample Type: Bore

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: On Demand_Bore
Client Ref: W1

Testing
Analysing
Consulting

BHP Laboratories
New Road
Thomondgate
Limerick
Tel: +353 61 455399
Fax: +353 61 455261
EMail:dervlapurcell@bhp.ie

Test		Units	Results	Customer Limits	Date Analysed	Method
Total Coliforms	Acc.	MPN/100mL	11		10/03/2021	BHP AC 020
E. coli	Acc.	MPN/100mL	ND		10/03/2021	BHP AC 020
Chloride (as Cl^-)	Acc.	mg/L	14		14/03/2021	BHP AC 095
Conductivity (25°C)		µS/cm	738		10/03/2021	BHP AC 067
Cyanide (Total as CN)	*	mg/L	<0.050		16/03/2021	1300
Molybdate Reactive Phosphorus (as P)	Acc. **	mg/L	<0.01		14/03/2021	BHP AC 095
OrthoPhosphate (as P)	Acc.	mg/L	<0.01		14/03/2021	BHP AC 095
Sulphate (as SO_4^{2-})	Acc.	mg/L	<10		14/03/2021	BHP AC 095
Total Ammoniacal Nitrogen (as N)	Acc.	mg/L	0.15		16/03/2021	BHP AC 095
Total Ammonia (as NH_3)	Acc.	mg/L	0.18		16/03/2021	BHP AC 095
Total Ammonia (as NH_4)	Acc.	mg/L	0.19		16/03/2021	BHP AC 095
Aluminium (Total as Al)		mg/L	23		19/03/2021	BHP AC 129
Arsenic (Total as As)		mg/L	0.011		12/03/2021	BHP AC 136
Iron (Total as Fe)		mg/L	39		19/03/2021	BHP AC 129
Mercury (Total as Hg)		mg/L	0.00031		12/03/2021	BHP AC 136
Manganese (Total as Mn)		mg/L	2.8		12/03/2021	BHP AC 136

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 23/03/2021

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
^ Potable water matrix
***** Subcontracted to an approved accredited laboratory
****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

TEST REPORT NO: 195353 .1

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 21/03/1036
Quote Ref: QC005144
Order No: N/A
Sales Order: 101532
Date Received: 10/03/2021
Date Sampled: 10/03/2021
Date Completed: 19/03/2021
Sample Type: Bore

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: On Demand_Bore
Client Ref: W1

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Consulting

BHP Laboratories
New Road
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Limerick
Tel: +353 61 455399
Fax: +353 61 455261
EMail:dervlapurcell@bhp.ie

Test		Units	Results	Customer Limits	Date Analysed	Method
Lead (Total as Pb)	Acc.	mg/L	0.20		19/03/2021	BHP AC 129
Boron (Total as B)	Acc.	mg/L	0.060		12/03/2021	BHP AC 129
Barium (Total as Ba)	Acc.	mg/L	0.22		12/03/2021	BHP AC 129
Calcium (Total as Ca)		mg/L	843		19/03/2021	BHP AC 129
Cadmium (Total as Cd)	Acc.	mg/L	0.020		12/03/2021	BHP AC 129
Chromium (Total as Cr)	Acc.	mg/L	0.060		12/03/2021	BHP AC 129
Copper (Total as Cu)	Acc.	mg/L	0.11		12/03/2021	BHP AC 129
Potassium (Total as K)	Acc.	mg/L	8.3		12/03/2021	BHP AC 129
Magnesium (Total as Mg)	Acc.	mg/L	31		12/03/2021	BHP AC 129
Sodium (Total as Na)	Acc.	mg/L	<10		12/03/2021	BHP AC 129
Nickel (Total as Ni)	Acc.	mg/L	0.23		12/03/2021	BHP AC 129
Zinc (Total as Zn)	Acc.	mg/L	0.35		12/03/2021	BHP AC 129
Antimony (Total as Sb)	*	mg/L	<0.0005		18/03/2021	1450
Selenium (Total as Se)	*	mg/L	0.0013		16/03/2021	1450
pH		pH Units	7.40		10/03/2021	BHP AC 067
Dissolved Oxygen		%	64.5		10/03/2021	BHP AC 067

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 23/03/2021

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ND: None detected in volume analysed
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Date Received: 10/03/2021
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Date Completed: 19/03/2021
Sample Type: Bore

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: On Demand_Bore
Client Ref: W1

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Limerick
Tel: +353 61 455399
Fax: +353 61 455261
EMail:dervlapurcell@bhp.ie

Test		Units	Results	Customer Limits	Date Analysed	Method
Temperature - Field		°C	10.0		10/03/2021	BHP AC 067
Nitrate (as NO_3-N)	Acc.	mg/L	4.7		11/03/2021	BHP AC 019
Nitrite (as NO_2-N)	Acc.	mg/L	<0.016		11/03/2021	BHP AC 019
Total Oxidised Nitrogen (as N)	Acc.	mg/L	4.7		11/03/2021	BHP AC 065
Aliphatic TPH >C_5-C_6	*	mg/L	<0.0001		18/03/2021	1675
Aliphatic TPH >C_6-C_8	*	mg/L	<0.0001		18/03/2021	1675
Aliphatic TPH >C_8-C_{10}	*	mg/L	<0.0001		18/03/2021	1675
Aliphatic TPH >C_{10}-C_{12}	*	mg/L	<0.0001		18/03/2021	1675
Aliphatic TPH >C_{12}-C_{16}	*	mg/L	<0.0001		18/03/2021	1675
Aliphatic TPH >C_{16}-C_{21}	*	mg/L	<0.0001		18/03/2021	1675
Aliphatic TPH >C_{21}-C_{35}	*	mg/L	<0.0001		18/03/2021	1675
Aliphatic TPH >C_{35}-C_{44}	*	mg/L	<0.0001		18/03/2021	1675
Total Aliphatic Hydrocarbons	*	mg/L	<0.005		18/03/2021	1675
Aromatic TPH >C_5-C_7	*	mg/L	<0.0001		18/03/2021	1675
Aromatic TPH >C_7-C_8	*	mg/L	<0.0001		18/03/2021	1675
Aromatic TPH >C_8-C_{10}	*	mg/L	<0.0001		18/03/2021	1675

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 23/03/2021

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
^ Potable water matrix
***** Subcontracted to an approved accredited laboratory
****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

TEST REPORT NO: 195353 .1

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 21/03/1036
Quote Ref: QC005144
Order No: N/A
Sales Order: 101532
Date Received: 10/03/2021
Date Sampled: 10/03/2021
Date Completed: 19/03/2021
Sample Type: Bore

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: On Demand_Bore
Client Ref: W1

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Consulting

BHP Laboratories
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Limerick
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Fax: +353 61 455261
EMail:dervlapurcell@bhp.ie

Test		Units	Results	Customer Limits	Date Analysed	Method
Aromatic TPH >C_{10}-C_{12}	*	mg/L	<0.0001		18/03/2021	1675
Aromatic TPH >C_{12}-C_{16}	*	mg/L	<0.0001		18/03/2021	1675
Aromatic TPH >C_{16}-C_{21}	*	mg/L	<0.0001		18/03/2021	1675
Aromatic TPH >C_{21}-C_{35}	*	mg/L	<0.0001		18/03/2021	1675
Aromatic TPH >C_{35}-C_{44}	*	mg/L	<0.0001		18/03/2021	1675
Total Aromatic Hydrocarbons	*	mg/L	<0.005		18/03/2021	1675
Total Petroleum Hydrocarbons (>C_5-C_{44})	*	mg/L	<0.01		18/03/2021	1675

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 23/03/2021

Additional Information:(Opinions, where stated, are not covered by accreditation)
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ND: None detected in volume analysed
^ Potable water matrix
* Subcontracted to an approved accredited laboratory
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~ : Sample Condition : ACCEPTABLE

TEST REPORT NO: 195353 .2

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 21/03/1037
Quote Ref: QC005144
Order No: N/A
Sales Order: 101532
Date Received: 10/03/2021
Date Sampled: 10/03/2021
Date Completed: 19/03/2021
Sample Type: Bore

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: On Demand_Bore
Client Ref: W4

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Fax: +353 61 455261
EMail:dervlapurcell@bhp.ie

Test		Units	Results	Customer Limits	Date Analysed	Method
Total Coliforms	Acc.	MPN/100mL	<10		10/03/2021	BHP AC 020
E. coli	Acc.	MPN/100mL	<10		10/03/2021	BHP AC 020
Chloride (as Cl^-)	Acc.	mg/L	23		14/03/2021	BHP AC 095
Conductivity (25°C)		µS/cm	691		10/03/2021	BHP AC 067
Cyanide (Total as CN)	*	mg/L	<0.050		16/03/2021	1300
Molybdate Reactive Phosphorus (as P)	Acc. **	mg/L	<0.01		14/03/2021	BHP AC 095
OrthoPhosphate (as P)	Acc.	mg/L	<0.01		14/03/2021	BHP AC 095
Sulphate (as SO_4^{2-})	Acc.	mg/L	71		14/03/2021	BHP AC 095
Total Ammoniacal Nitrogen (as N)	Acc.	mg/L	<0.1		16/03/2021	BHP AC 095
Total Ammonia (as NH_3)	Acc.	mg/L	<0.122		16/03/2021	BHP AC 095
Total Ammonia (as NH_4)	Acc.	mg/L	<0.129		16/03/2021	BHP AC 095
Aluminium (Total as Al)		mg/L	97		19/03/2021	BHP AC 129
Arsenic (Total as As)		mg/L	<0.0025		12/03/2021	BHP AC 136
Iron (Total as Fe)		mg/L	111		19/03/2021	BHP AC 129
Mercury (Total as Hg)		mg/L	<0.00025		12/03/2021	BHP AC 136
Manganese (Total as Mn)		mg/L	6.4		12/03/2021	BHP AC 136

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 23/03/2021

Additional Information:(Opinions, where stated, are not covered by accreditation)
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ND: None detected in volume analysed
^ Potable water matrix
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TEST REPORT NO: 195353 .2

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 21/03/1037
Quote Ref: QC005144
Order No: N/A
Sales Order: 101532
Date Received: 10/03/2021
Date Sampled: 10/03/2021
Date Completed: 19/03/2021
Sample Type: Bore

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: On Demand_Bore
Client Ref: W4

Testing
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BHP Laboratories
New Road
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Tel: +353 61 455399
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EMail:dervlapurcell@bhp.ie

Test		Units	Results	Customer Limits	Date Analysed	Method
Lead (Total as Pb)		mg/L	0.011		12/03/2021	BHP AC 129
Boron (Total as B)	Acc.	mg/L	0.23		12/03/2021	BHP AC 129
Barium (Total as Ba)	Acc.	mg/L	0.60		12/03/2021	BHP AC 129
Calcium (Total as Ca)		mg/L	1228		19/03/2021	BHP AC 129
Cadmium (Total as Cd)	Acc.	mg/L	0.030		12/03/2021	BHP AC 129
Chromium (Total as Cr)	Acc.	mg/L	0.19		12/03/2021	BHP AC 129
Copper (Total as Cu)	Acc.	mg/L	0.27		12/03/2021	BHP AC 129
Potassium (Total as K)	Acc.	mg/L	32		12/03/2021	BHP AC 129
Magnesium (Total as Mg)	Acc.	mg/L	59		12/03/2021	BHP AC 129
Sodium (Total as Na)	Acc.	mg/L	13		12/03/2021	BHP AC 129
Nickel (Total as Ni)	Acc.	mg/L	0.71		12/03/2021	BHP AC 129
Zinc (Total as Zn)	Acc.	mg/L	0.92		12/03/2021	BHP AC 129
Antimony (Total as Sb)	*	mg/L	<0.0005		18/03/2021	1450
Selenium (Total as Se)	*	mg/L	0.0017		16/03/2021	1450
pH		pH Units	7.29		10/03/2021	BHP AC 067
Dissolved Oxygen		%	27.3		10/03/2021	BHP AC 067

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 23/03/2021

Additional Information:(Opinions, where stated, are not covered by accreditation)
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ND: None detected in volume analysed
^ Potable water matrix
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Date Sampled: 10/03/2021
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Sample Type: Bore

FTAO: James Kelliher
Site: Rathcore Quarry
BHP Ref: On Demand_Bore
Client Ref: W4

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EMail:dervlapurcell@bhp.ie

Test		Units	Results	Customer Limits	Date Analysed	Method
Temperature - Field		°C	10.2		10/03/2021	BHP AC 067
Nitrate (as NO_3-N)	Acc.	mg/L	3.7		11/03/2021	BHP AC 019
Nitrite (as NO_2-N)	Acc.	mg/L	0.033		11/03/2021	BHP AC 019
Total Oxidised Nitrogen (as N)	Acc.	mg/L	3.7		11/03/2021	BHP AC 065
Aliphatic TPH >C_5-C_6	*	mg/L	<0.0001		18/03/2021	1675
Aliphatic TPH >C_6-C_8	*	mg/L	<0.0001		18/03/2021	1675
Aliphatic TPH >C_8-C_{10}	*	mg/L	<0.0001		18/03/2021	1675
Aliphatic TPH >C_{10}-C_{12}	*	mg/L	<0.0001		18/03/2021	1675
Aliphatic TPH >C_{12}-C_{16}	*	mg/L	<0.0001		18/03/2021	1675
Aliphatic TPH >C_{16}-C_{21}	*	mg/L	<0.0001		18/03/2021	1675
Aliphatic TPH >C_{21}-C_{35}	*	mg/L	<0.0001		18/03/2021	1675
Aliphatic TPH >C_{35}-C_{44}	*	mg/L	<0.0001		18/03/2021	1675
Total Aliphatic Hydrocarbons	*	mg/L	<0.005		18/03/2021	1675
Aromatic TPH >C_5-C_7	*	mg/L	<0.0001		18/03/2021	1675
Aromatic TPH >C_7-C_8	*	mg/L	<0.0001		18/03/2021	1675
Aromatic TPH >C_8-C_{10}	*	mg/L	<0.0001		18/03/2021	1675

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 23/03/2021

Additional Information:(Opinions, where stated, are not covered by accreditation)
Acc.: INAB Accredited
ND: None detected in volume analysed
^ Potable water matrix
***** Subcontracted to an approved accredited laboratory
****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

TEST REPORT NO: 195353 .2

Client: Kilsaran Concrete
Piercetown
Dunboyne
Co. Meath

BHP Ref. No: 21/03/1037
Quote Ref: QC005144
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Sales Order: 101532
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Date Sampled: 10/03/2021
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Sample Type: Bore

FTAO: James Kelliher
Site: Rathcore Quarry
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EMail:dervlapurcell@bhp.ie

Test		Units	Results	Customer Limits	Date Analysed	Method
Aromatic TPH >C_{10}-C_{12}	*	mg/L	<0.0001		18/03/2021	1675
Aromatic TPH >C_{12}-C_{16}	*	mg/L	0..036		18/03/2021	1675
Aromatic TPH >C_{16}-C_{21}	*	mg/L	<0.0001		18/03/2021	1675
Aromatic TPH >C_{21}-C_{35}	*	mg/L	<0.0001		18/03/2021	1675
Aromatic TPH >C_{35}-C_{44}	*	mg/L	<0.0001		18/03/2021	1675
Total Aromatic Hydrocarbons	*	mg/L	0.036		18/03/2021	1675
Total Petroleum Hydrocarbons (>C_5-C_{44})	*	mg/L	0.036		18/03/2021	1675

Authorised by: Dervla Purcell
Laboratory Manager

Date Authorised: 23/03/2021

Additional Information:(Opinions, where stated, are not covered by accreditation)
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ND: None detected in volume analysed
^ Potable water matrix
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APPENDIX 7-I
Rating of Existing Environment Significance / Sensitivity

Rating of Existing Environment Significance / Sensitivity (IGI, 2013 Guidelines)

Importance	Criteria	Typical Example
High	Attribute has a high quality or value on an international scale	Groundwater/ Surface Water supports river, wetland or surface water body ecosystem protected by EU legislation e.g. SAC or SPA status
	Attribute has a high quality or value on a regional or national scale	Regionally Important Aquifer with multiple wellfields. Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – e.g. NHA status. Regionally important potable water source supplying >2,500 homes Inner source protection area for regionally important water source. Drinking water supply from river. Amenity use of waterbody
	Attribute has a high quality or value on a local scale	Regionally Important Aquifer. Groundwater provides large proportion of baseflow to local rivers. Locally important potable water source supplying >1000 homes. Outer source protection area for regionally important water source. Inner source protection area for locally important water source.
Medium	Attribute has a medium quality or value on a local scale	Locally Important Aquifer Potable water source supplying >50 homes. Outer source protection area for locally important water source. No specific recreational use of waterbody
Low	Attribute has a low quality or value on a local scale	Poor Bedrock Aquifer. Potable water source supplying <50 homes. No water supply from surface water, no abstraction designation for watercourse No amenity value of waterbody
Negligible	Attribute has negligible quality or value on a local site scale	No groundwater supply from a bedrock aquifer inn vicinity of site. Surface water not used for any specific purpose.

APPENDIX 7-J
Descriptions of Effects (EPA, 2022)

Descriptions of Effects (EPA, 2022)

Impact Characteristic	Term	Description
Quality of Effects	Positive Effects	A change which improves the quality of the environment
	Neutral Effects	No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error
	Negative / Adverse Effects	A change which reduces the quality of the environment
Describing the Significance of Effects	Imperceptible	An effect capable of measurement but without significant consequences
	Not significant	An effect which causes noticeable2 changes in the character of the environment but without significant consequences.
	Slight Effects	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
	Moderate Effects	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
	Significant Effects	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
	Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
	Profound Effects	An effect which obliterates sensitive characteristics
Describing the Extent and Context of Effects	Extent	Describe the size of the area, the number of sites, and the proportion of a population affected by an effect
	Context	Describe whether the extent, duration, or frequency will conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?)
Describing the Probability of Effects	Likely Effects	Describe the size of the area, the number of sites, and the proportion of a population affected by an effect.
	Unlikely Effects	Describe whether the extent, duration, or frequency will conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?)
	Momentary Effects	Effects lasting from seconds to minutes

Impact Characteristic	Term	Description
Describing the Duration and Frequency of Effects	Brief Effects	Effects lasting less than a day
	Temporary Effects	Effects lasting less than a year
	Short-term Effects	Effects lasting one to seven years
	Medium-term Effects	Effects lasting seven to fifteen years
	Long-term Effects	Effects lasting fifteen to sixty years
	Permanent Effects	Effects lasting over sixty years
	Reversible Effects	Effects that can be undone, for example through remediation or restoration
	Frequency of Effects	Describe how often the effect will occur. (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually.
Describing the Types of Effects	Indirect / Secondary Effects	Likely, significant effects on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway.
	Cumulative Effects	The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects.
	Do-Nothing Effects	The environment as it would be in the future should the subject project not be carried out.
	Worst Case Effects	The effects arising from a project in the case where mitigation measures substantially fail.
	Indeterminable Effects	When the full consequences of a change in the environment cannot be described.
	Irreversible Effects	When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.
	Residual Effects	The degree of environmental change that will occur after the proposed mitigation measures have taken effect.
	Synergistic Effects	Where the resultant effect is of greater significance than the sum of its constituents, (e.g. combination of SOx and NOx to produce smog).