Unit 15
Melbourne Business Park
Model Farm Road
Cork

O'Callaghan Moran & Associates
ENVIRONMENTAL MANAGEMENT FOR BUSINESS

E:info@ocallaghanmoran.com
www.ocallaghanmoran.com
T: 021 434 5366

GROUNDWATER

QUARTERLY MONITORING REPORT

RILTA ENVIRONMENTAL LTD

GREENOGUE BUSINESS PARK FACILITY

LICENCE NO. W0185-01

2nd Quarter 2017

(April, May & June 2017)

Prepared For: -

Rilta Environmental Ltd
Block 402,
Grants Drive,
Greenogue Business Park,
Rathcoole,
County Dublin

Prepared By: -

O' Callaghan Moran & Associates,
Unit 15 Melbourne Business Park,
Model Farm Road,
Cork.

12 July 2017

Project	Quarterly Monitoring Programme Report GROUND WATER			
Client	RILTA Environmental Ltd W0185-01			
Report No	Date	Status	Prepared By	Reviewed By
1950203	15/06/2017	Draft	Neil Sandes PGeo	Jim O'Callaghan MSc.
	12/07/2017	Final		

TABLE OF CONTENTS

PAGE

1. INTRODUCTION

RILTA Environmental Ltd (RILTA) appointed O'Callaghan Moran & Associates (OCM) to conduct the annual environmental monitoring programme at its Industrial Emissions Licenced (Reg.No.W0185-01) facility at Greenogue Business Park, Rathcoole, County Dublin.

1.1 Reporting Period

This is the report on the groundwater monitoring completed in the second calendar quarter (April, May & June) of 2017.

1.2 Contributors to the Report

- **OCM** was responsible for the collection of samples and the preparation of this report.
- **Exova Jones Environmental Ltd** analysed the groundwater samples at their laboratory in Deeside, UK.

The field work and report preparation was carried out by Mr. Neil Sandes PGeo and reviewed by Mr. Jim O'Callaghan MSc. The report is accurate and representative of the monitoring completed in the 2nd calendar Quarter 2017 (groundwater).

Neil Sandes

Jim O' Callaghan

1.3 Monitoring and Reporting Requirements

The Licence requires monitoring of two on-site groundwater wells on a quarterly basis for the parameters listed in Table 1.1.

Table 1.1 Monitoring Requirements

Parameter	Sampling Frequency
pH	Quarterly
Electrical Conductivity	Quarterly
Dissolved Oxygen	Quarterly
Chloride	Quarterly
Sulphate	Quarterly
Total Organic Carbon	Quarterly
List I/II Organic Substances	Annually
Metals	Annually

2. GROUNDWATER MONITORING

2.1 Well Locations

There are two on site groundwater wells. GW-1 is located in the southern upgradient section of the site. The other well, GW-2, is located in the northern downgradient section of the site. The well locations are shown on Figure 2.1.

2.2 Methods

2.2.1 Sampling

The samples were collected on the 29th May 2017. Groundwater levels were recorded in each well using a water level probe following which the well was purged to remove the stagnant water in the well pipe and surrounding gravel pack. Purging is necessary to ensure that the samples are representative of the groundwater beneath the site.

The pH, electrical conductivity and temperature were measured in-situ using a Hanna Instruments combo pH, electrical conductivity and temperature probe. All field equipment was calibrated and tested prior to the sampling programme and the monitoring results are in Table 2.1. The samples were stored in cooler boxes to maintain sample temperature below 9°C. All the samples were delivered to the Exova Jones Environmental laboratory within 24 hours of sampling.

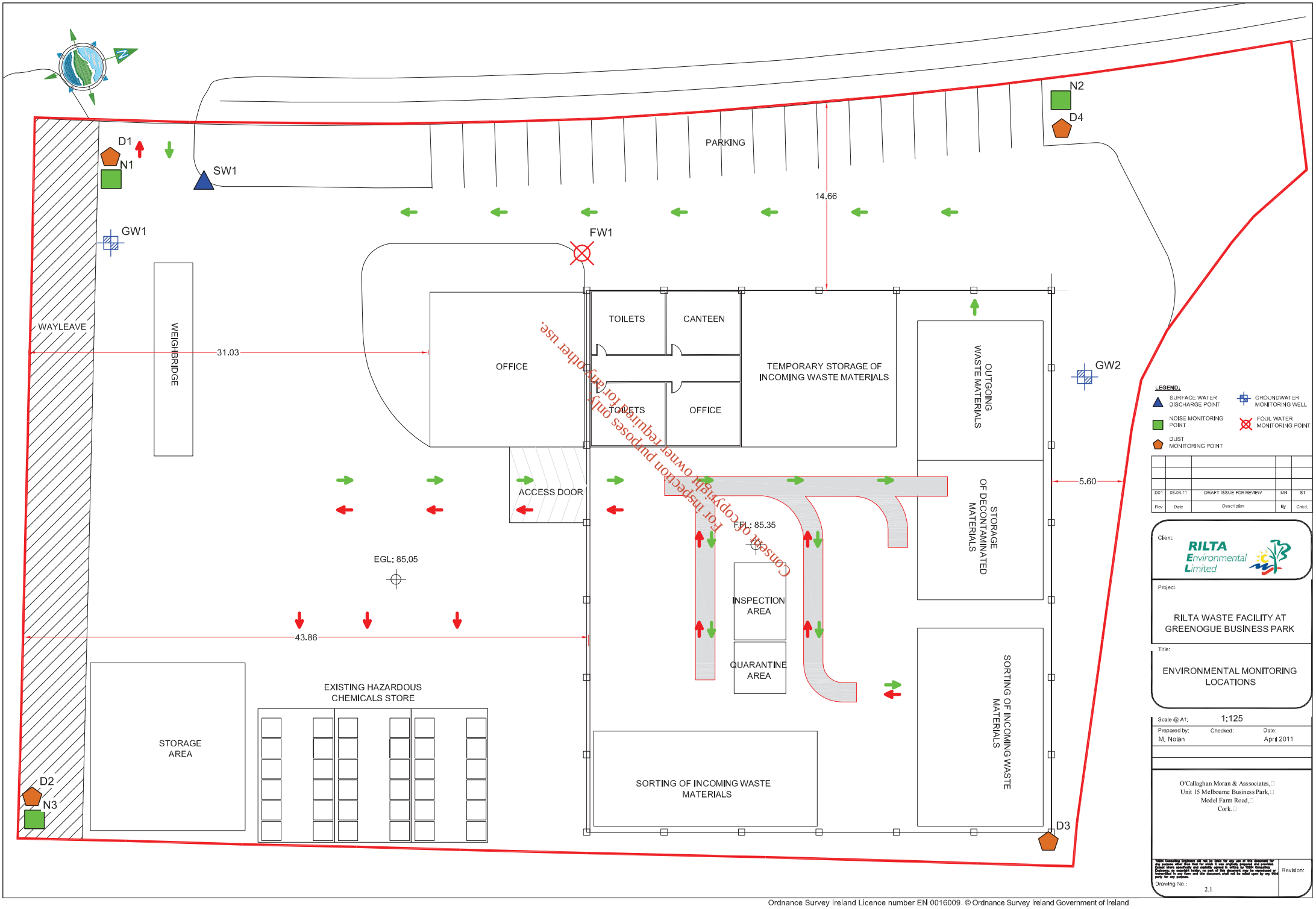
Table 2.1 In-Situ Monitoring Data Q2 2017

Parameter	Unit	GW-1	GW-2	IGV	GTV
Water Level (mBTOC)*	metres	1.72	2.03	-	-
pH	pH Units	6.6	6.78	6.5-9.5	
EC	µS/cm	630	644	1,000	800 – 1,875
Temperature	°C	12.2	10.5	25	-

* - metres below top of casing

2.2.2 Analysis

The samples were analysed for the quarterly range of parameters listed in Schedule D of the Licence, which includes pH, electrical conductivity, dissolved oxygen, Total Organic Carbon, chloride and sulphate. The methodologies were all ISO/CEN approved or equivalent and the method detection limits for all of the analyses were lower than the relevant environmental standards.



2.3 Results

The analytical results are presented in Tables 2.2 and 2.3 and the full laboratory report is in Appendix 1. The tables include groundwater trigger levels for indicator parameters for each well.

Groundwater quality data between Q-1 2009 and Q-3 2015 was used to derive the trigger levels. The calculation was based on guidance in the 'Methodology for the Determination of Natural Background Quality of Groundwaters, 2004' prepared for the Agency as part of the ERTDI[1] programme 2000-2006. These are intended to provide guidance in determining the maximum naturally occurring background conditions for groundwater as part of the implementation of the Water Framework Directive in Ireland.

The methodology used to establish trigger levels required the determination of the mean plus or minus two standard deviations (approximately the 95th percentile[2]) of the log concentration. As any impacts from the facility are most likely to result in an increase in the selected parameters, the trigger levels are based on plus two standard deviations. Where the data is reported as less than the level of detection (e.g. ammonia) a figure of 50% of the level of detection was applied, as recommended in the Methodology.

As the trigger levels have not yet been approved, the tables include the EPA Interim Guideline Values (IGVs) on groundwater quality and the Groundwater Regulation Threshold Values (TV) for comparative purposes.

The IGVs are not statutory guidelines but have been prepared by the EPA to assist in the assessment of impacts on groundwater quality in the context of the implementation of the Water Framework Directive. The TVs were introduced in 2010 (S.I. 9 of 2010) on foot of requirements from the Water Framework Directive and have evolved from the IGVs.

The IGV represent typical background or unpolluted conditions; however levels higher than the IGV may occur naturally depending on the local geological and hydrogeological conditions. While the TVs are more appropriate for large scale abstraction wells used for potable supply, they can be used to assess the significance of contamination where present in non-potable groundwater supplies. Because not all parameters monitored have been assigned a TV, the relevant IGV continues to be used for comparative purposes.

[1] ERTDI - Environmental Research Technological Development Innovation: Funded by the National Development Plan.
[2] 95% probability that the normal values will be below the trigger value.

Table 2.2 **GW-1** Q2 2017 Monitoring Data

Parameter	Unit	GW-1 Up Gradient	Trigger Level Lower Limit	Trigger Level Upper Limit	IGV	TV
pH	pH Units	7.54	6.8	8.4	**6.5-9.5**	-
EC	µS/cm	638	379	954	**1,000**	**875 – 1,875**
DO	mg/l	4	1.69	13.66	**NAC**	-
Chloride	mg/l	17.2	7.6	39.75	**30**	**187.5**
Sulphate	mg/l	82.3	38.14	170.44	**200**	**187.5**
TOC	mg/l	<2	0.68	8.58	**NAC**	-

Table 2.2 **GW-2** Q2 2017 Monitoring Data

Parameter	Unit	GW-2 Down Gradient	Trigger Level Lower Limit	Trigger Level Upper Limit	IGV	TV
pH	pH Units	7.43	6.57	8.35	**6.5-9.5**	-
EC	µS/cm	598	576	1,126	**1,000**	**875 – 1,875**
DO	mg/l	5	1.74	13.44	**NAC**	-
Chloride	mg/l	14.6	15.50	45.71	**30**	**187.5**
Sulphate	mg/l	61.4	74.55	207.64	**200**	**187.5**
TOC	mg/l	<2	1.11	12.46	**NAC**	-

2.5 Discussion

All parameters were within the trigger levels and below the IGV and TVs.

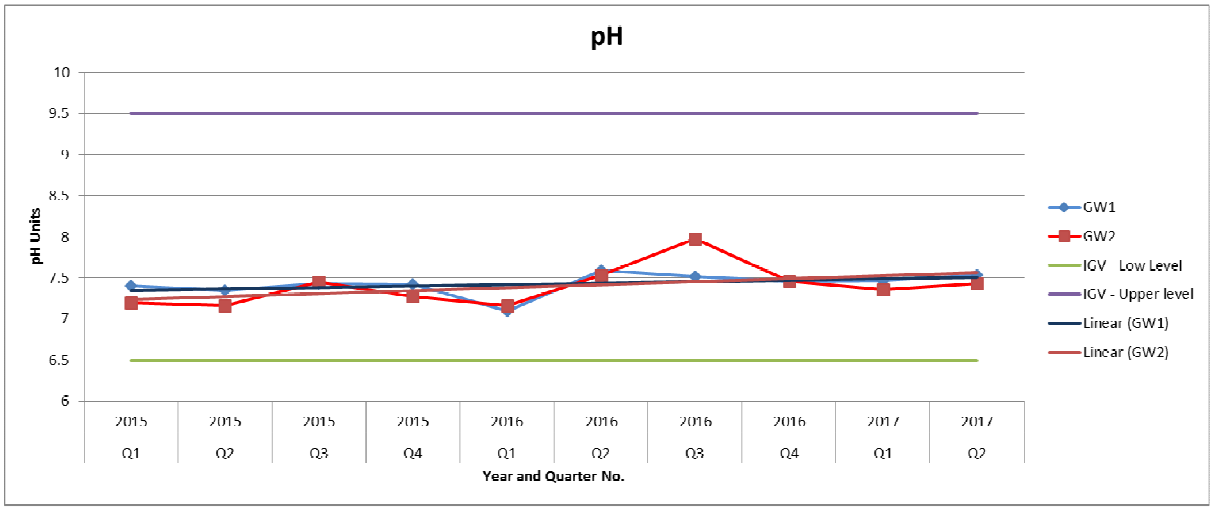
2.6 Trend Analysis

An assessment of the parameter trends was carried out using the results from Q1 2015 to the most recent monitoring round.

2.6.1 pH

Figure 2.2 plots the pH in GW1 and GW2 over the analysis period. The average value for GW1 is 7.43 pH Units and for GW2 is 7.40. All the results are within the upper and lower IGV.

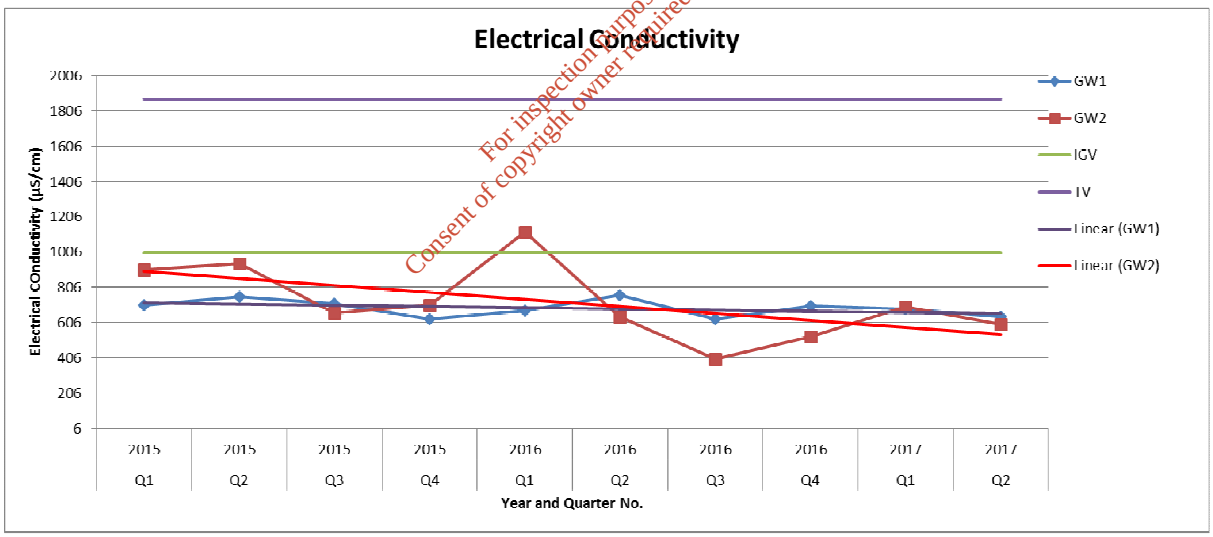
Figure 2.2 pH Trend Data



2.6.2 Electrical Conductivity

Figure 2.3 plots the electrical conductivity (EC) in GW1 and GW2 over the analysis period. There was one exceedance of the IGV (GW2 – Q1 2016) but no exceedances of the TV.

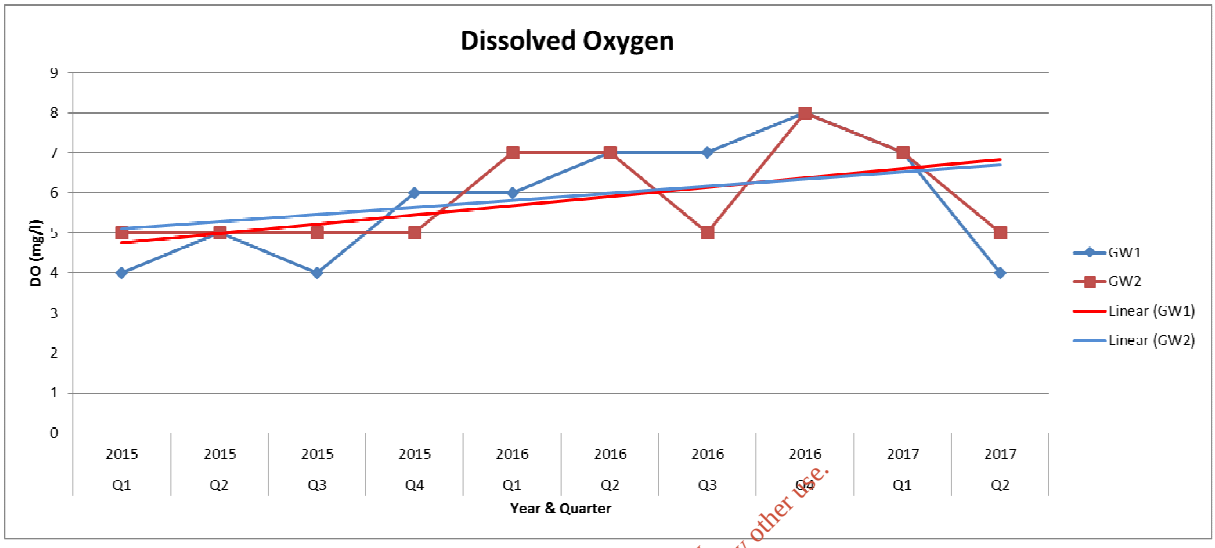
Figure 2.3 EC Trend Data



2.6.3 Dissolved Oxygen

Figure 2.4 plots the dissolved oxygen (DO) in GW1 and GW2 over the analysis period. There has been an increasing trend over the analysis period but recent results are showing a decline in DO concentration in the groundwater in both wells.

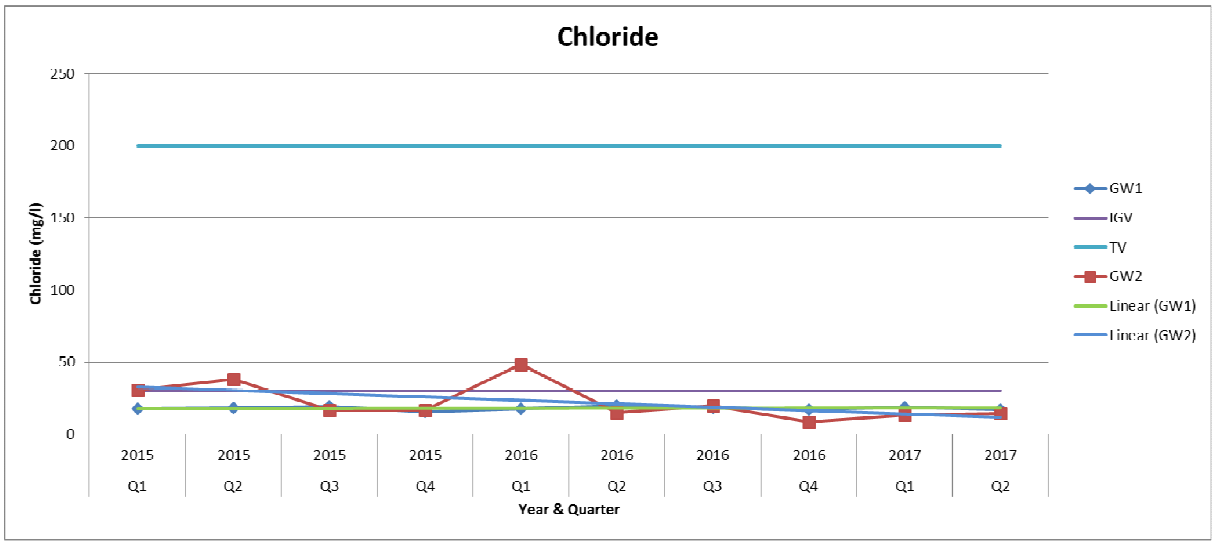
Figure 2.4 DO Trend Data



2.6.4 Chloride

Figure 2.5 plots the chloride concentrations in GW1 and GW2 over the analysis period. The chloride concentrations in GW1 were very consistent over the monitoring period and the trend is stable. In GW2 there were exceedances of the IGV but not the TV in Q1 and Q2 2015 along with Q1 2016, but there have been no exceedances since then and there is a decreasing trend in GW-2 over the monitoring period.

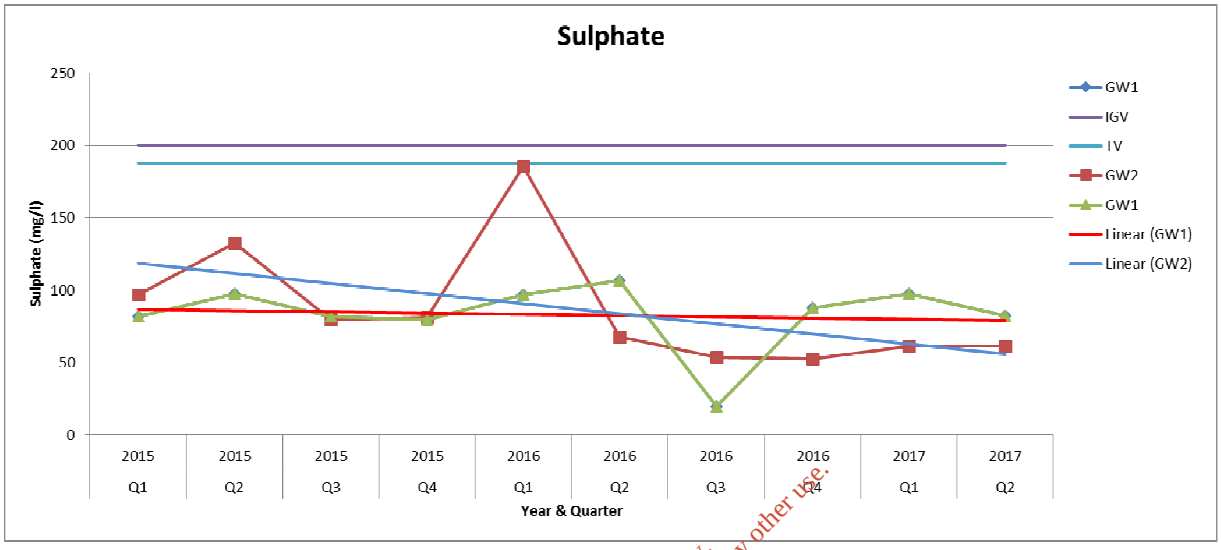
Figure 2.5 Chloride Trend Data



2.6.5 Sulphate

Figure 2.6 plots the sulphate concentrations in GW1 and GW2 over the analysis period. The sulphate concentrations in GW1 and GW2 were below the IGV and TVs. Both plots show a decreasing trend over the monitoring period.

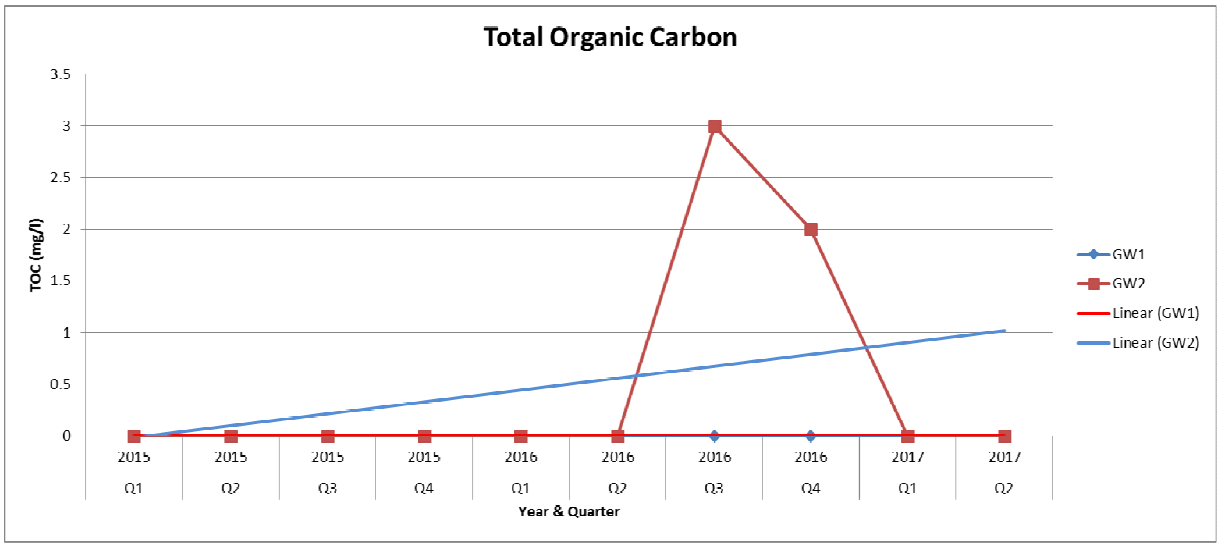
Figure 2.6 Sulphate Trend Data



2.6.6 TOC

Figure 2.7 plots the TOC concentrations in GW1 and GW2 over the analysis period. The TOC concentrations in GW1 are always less than the laboratory's Limit of detection (LoD). In GW2 TOC concentrations were below the LoD except for Q3 and Q4 2016 and this suggests an increasing trend over the analysis period however the Q1 and Q2 results have in fact been less than the laboratory detection limit of <2mg/l.

Figure 2.7 TOC Trend Data.



APPENDIX 1

Monitoring Results

Exova Jones Environmental

Registered Address : Exova (UK) Ltd, Lochend Industrial Estate, Newbridge, Midlothian, EH28 8PL

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781

4225

O'Callaghan Moran & Associates
Unit 15
Melbourne Business Park
Model Farm
Cork
Ireland

Attention :	Neil Sandes
Date :	12th June, 2017
Your reference :	17-195-02
Our reference :	Test Report 17/9449 Batch 1
Location :	Rilta W0185-01
Date samples received :	30th May, 2017
Status :	Final report
Issue :	1

Two samples were received for analysis on 30th May, 2017 of which two were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Bruce Leslie
Project Co-ordinator

Client Name: O'Callaghan Moran & Associates
Reference: 17-195-02
Location: Rilta W0185-01
Contact: Neil Sandes
JE Job No.: 17/9449

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	1-2	3-4									LOD/LOR	Units	Method No.
Sample ID	GW-1	GW-2											
Depth													
COC No / misc													
Containers	V P	V P											
Sample Date	29/05/2017 13:30	29/05/2017 13:00											
Sample Type	Ground Water	Ground Water											
Batch Number	1	1											
Date of Receipt	30/05/2017	30/05/2017											
Sulphate as SO4 #	82.3	61.4									<0.5	mg/l	TM38/PM0
Chloride #	17.2	14.6									<0.3	mg/l	TM38/PM0
Dissolved Oxygen	4	5									<1	mg/l	TM59/PM0
Electrical Conductivity @25C #	638	598									<2	uS/cm	TM76/PM0
pH #	7.54	7.43									<0.01	pH units	TM73/PM0
Total Organic Carbon #	<2	<2									<2	mg/l	TM60/PM0

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: O'Callaghan Moran & Associates
Reference: 17-195-02
Location: Rilta W0185-01
Contact: Neil Sandes

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
No deviating sample report results for job 17/9449						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 17/9449

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory.

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters, the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS) accredited - UK.
SA	ISO17025 (SANAS) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

JE Job No: 17/9449

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM59	Determination of Dissolved Oxygen using the Hach HQ30D Oxygen Meter	PM0	No preparation is required.				
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.	Yes			
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			