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Dennis Byrne
Irish Industrial Explosives
Clonagh
Enfield
Co. Kildare

Date: 25th August 2023
Verde Ref: 50990

RE: QUARTERLY GROUNDWATER AND SURFACE WATER SAMPLING RESULTS AT IIE – Q2 2023

Dear Dennis,

Verdé Environmental Consultants Ltd. (VEC) was commissioned by Irish Industrial Explosives Ltd (IIE) to undertake environmental monitoring and sampling of groundwater and surface water as part of the site's ongoing quarterly IPC compliance monitoring. The scope of monitoring each year includes three quarterly monitoring rounds and an annual monitoring round for a wider number of monitoring wells and parameters. An annual report is prepared each year in EPA report format. This summary report presents the results from Q2 monitoring conducted on the 29th of June 2023.

BACKGROUND INFORMATION

The IIE site covers a total of 50 hectares with the "working" site (red boundary Figure 2) as delineated by security fencing taking up c. 50 hectares. The site is bounded on all sides by agricultural land which is used for light grazing. The facility has been manufacturing explosive products since 1967 and was granted an IPC Licence by the EPA in 1996. ONT & DNT were used in dynamite manufacture until discontinued in 2003 supplied in 200L drums which were rinsed and stacked in current areas of concern, along the western drain. Licensable activities ceased c. 2007, the site remains active for non-licensable manufacturing activities. During 2013 the EPA informed IIE that they consider the site's licence to have lapsed and they will no longer be enforcing it with the exception of the Residuals Management Plan to include ongoing monitoring.

Detailed investigations completed 2012 – 2015 with on-going site monitoring and remediation works being carried out since 2014. A Detailed Quantitative Risk Assessment (DQRA) was completed in April 2015 which concluded a very low risk to groundwater and key risk was to surface water in the "Western Drain". Remediation works were carried out in Q3 and Q4 of 2015 whereby bulk contamination was excavated from two main areas on site referred to Area A (adjacent to western drain) and Area B (drum hotspot area). Monitored natural attenuation has been subsequently undertaken in Area A to reduce residual contamination levels in perched groundwater. A pumping system and containment trench with sumps were installed in 2018 to assist natural attenuation in localised areas adjacent to the western drain. Monitoring is ongoing and has included additional soil sampling (2018) and sediment sampling (2020) along the western drain in addition to quarterly groundwater and surface water monitoring.

In August 2021, Verde completed a further phase of investigation works the purpose of which was to further delineate the residual contamination across this part of the site under existing buildings, and to validate certain areas of the wider site which had not been investigated or sampled previously. Three distinct hotspots of 2,4-DNT, 2,6-DNT and of o-NT contamination were identified in shallow soils of 0 – 3m within the Garage and Store buildings. One distinct hotspot of NH4 contamination was identified in shallow soils within the Garage building.

The sampling in September 2021 of the new shallow monitoring wells in the buildings identified two distinct hotspots of 2,4-DNT and 2,6-DNT in shallow groundwater within the Store building and Garage building. Two distinct hotspots of o-NT contamination were identified in shallow groundwater in an area of the Store and Garage buildings. Two distinct hotspots of Ammonia contamination were identified in shallow groundwater within the Garage and Store buildings. Additional site investigation works were conducted in February and April 2022 in order to further delineate these identified hotspots of contamination. These findings are presented in a separate report. In summary with regards to the soil samples, three distinct hotspots of 2,4-DNT and 2,6-DNT were identified in shallow soils in both the Garage and Store buildings. Three distinct o-NT contamination hotspots were identified in shallow soils in both the Garage building and two hotspots in the Store building. Two distinct hotspots of Ammonia were identified in the shallow soils in the Garage building and in close proximity to the east of the Store building. In relation to the groundwater samples, two distinct hotspots of 2,4-DNT and 2,6-DNT were identified within both the Store and Garage building. Three hotspots of o-NT were identified in both the Garage and Store building. Two distinct hotspots of Ammonia were identified within the Garage building and to the east of the Store building.

Quarterly groundwater and surface water monitoring was carried out on 29th June 2023 (Q2). The following presents the monitoring results.

2023 QUARTER 2 MONITORING RESULTS

Groundwater Monitoring & Results

Groundwater monitoring focused on groundwater wells where residual contamination is being observed at the western side of the site. Monitoring on selected deeper groundwater wells was also proposed to confirm the findings of the DQRA that risks to the groundwater aquifer remain very low. Groundwater wells were purged prior to sample collection. Samples were taken from locations GW7, GW8a, GW9a, GW14 (bedrock), GW15 (bedrock) and pump outlet. The pump outlet sample represents water that is being pumped from sumps between the garage building and western drain to help reduce contamination level in the area. This pumped water is being combined with recycled rainwater and re-used to dissolve ammonium nitrate in emulsion manufacture on site.

Groundwater analytical results are presented in Tables 1 and 2 where they are compared against site specific remedial target concentrations (RTCs where available) and generic assessment criteria (GAC). For comparison purposes the relevant environmental standards and previous monitoring results are also presented in graphs. Groundwater logs are

presented in Appendix A and Laboratory Certificates are presented in Appendix B.

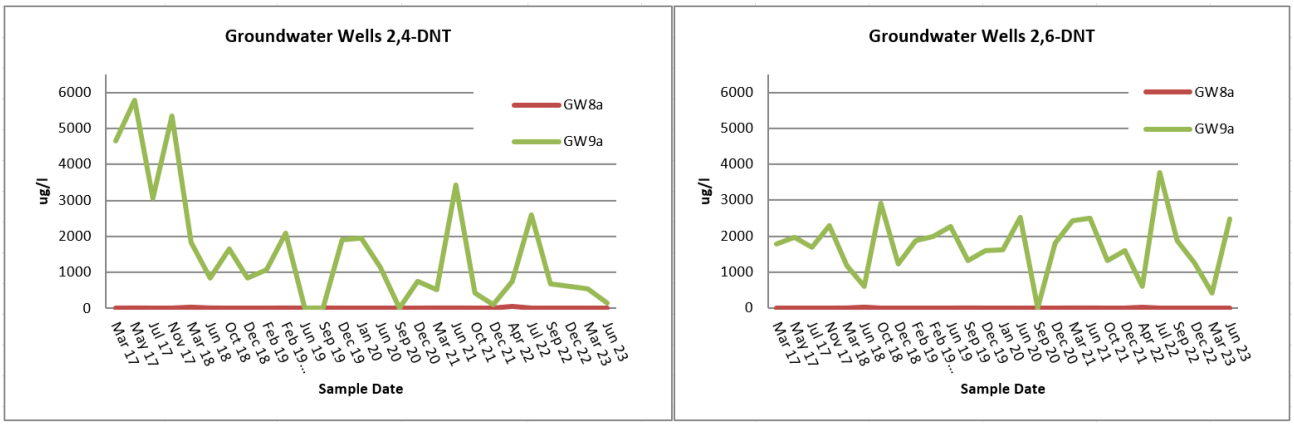
Perched Groundwater Analytical Results (Overburden Wells GW7, GW8a & GW9a)

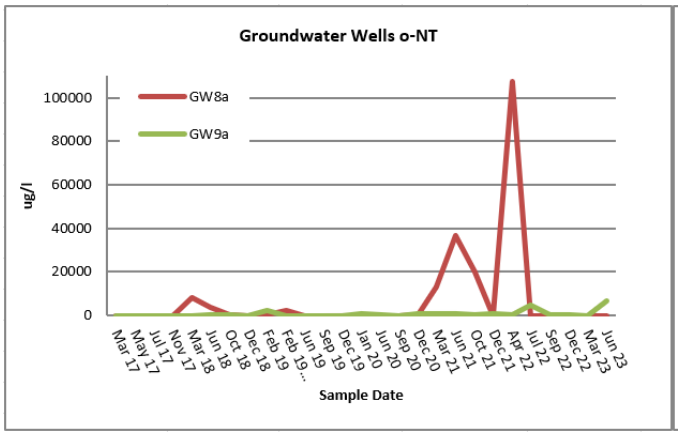
Explosives / SVOCs

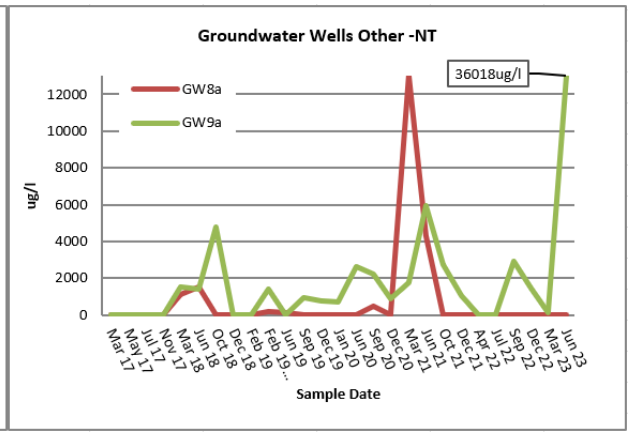
The Nitrotoluene compounds of potential concern (2,4 DNT, 2,6 DNT and o-NT) were analysed in the shallow overburden wells GW7, GW8a and GW9a. Wells located in the Garage/Store area beside the western drain had reasonably high concentrations of Nitrotoluene compounds historically. The following observations were made from the recent Q2 2023 groundwater sample results and graphs included below:

- GW7 and GW8a reported below laboratory detection limits for 2,4 DNT, 2,6 DNT and o-NT was not detected, similar to historical trends since July 2022 (Q2). In Q1 2022 GW8a concentrations of 2,4-DNT and 2,6-DNT were detected in low concentrations of 46.2ug/l and 28ug/l respectively. 2,4-DNT and 2,6-DNT were undetected in this well in Q3 and Q4 2021. In Q1 2022 a marked increase in o-NT concentrations (107,280ug/l) in this well (GW8a) was noted, however, concentrations have not been detected since. High levels of o-NT have been noted in historical sampling events.
- GW9a detected 2,4 DNT (161.9ug/l), representing a decrease from Q1 2023 (552.6ug/l) and Q4 2022 (613.5ug/l). This is the lowest concentration recorded over the last year.
- Concentrations of 2,6 DNT (2468ug/l) in GW9a show an increase from Q1 2023 (414ug/l) and Q4 2022 (1248ug/l), however, it is still lower that Q2 2022 (3,669ug/l).
- A significant increase in o-NT (6,579ug/l) was recorded in Q2 2023 in comparison to historical records, specifically Q1 2023 (Not Detected). Q3 2022 recorded a concentration of 4,620ug/l.
- Other nitrotoluenes in GW9a were detected at a concentration of 36,018ug/l, this concentration is a stark increase to that detected in Q1 (134ug/l).
- DNT concentrations remain above RTCs for the garage/store area specifically at GW9a.

Graph 1.1 – Nitrotoluenes (ug/l) in Groundwater Wells GW8a and GW9a.



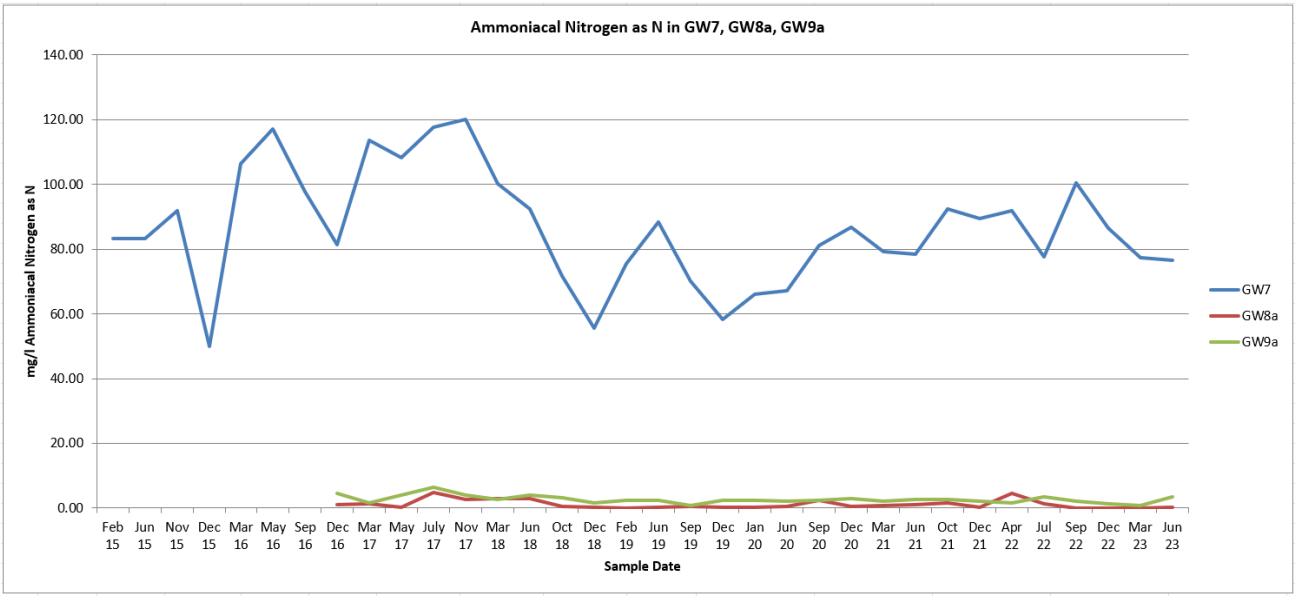




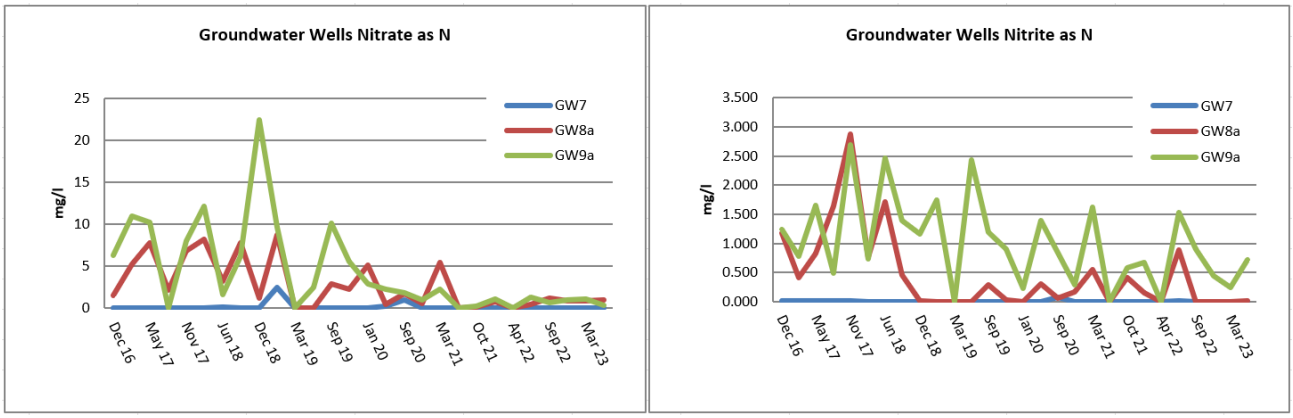
Ammoniacal Nitrogen, Nitrate and Nitrite

- A site specific RTC is available for Ammoniacal Nitrogen (0.179 mg/l). GW7 levels remains high, 76.61mg/l. This has slightly decreased to the level recorded in Q1 2023 (77.27mg/l) but is within similar concentration levels recorded for the 2022 and 2021 period. The concentration of Ammoniacal Nitrogen increased between Q2 and Q3 2021 as shown in Graph 1.2.
- Concentrations of Ammoniacal Nitrogen in other wells are significantly lower at 0.17mg/l (GW8a) which does not exceed the RTC limit. However, it is an increase on Q1 2023 (0.03mg/l). In general, concentrations in GW8a had been decreasing over the last two years, however, the recorded Q2 2023 concentration has altered this trend.
- GW9a (3.35mg/l) exceeded the RTC. This is an increase on Q1 2023 (0.90mg/l) which was the lowest recorded level over the last two years.
- There are no calculated RTCs for Nitrate and Nitrite but comparison of concentrations with generic groundwater GACs suggest that concentrations are generally low and within acceptable criteria with occasional variations. GW7 levels were below Laboratory Detection Limit (LOD) for both parameters.
- GW8a concentrations for Nitrate (1.00mg/l) and Nitrite (0.01mg/l) are below the compliance criteria of 37.5mg/l and 0.375mg/l for Nitrate and Nitrite respectively. These values are based on Groundwater Threshold Values European Communities Environmental Objectives Regulation 2010.
- GW9a recorded 0.34mg/l for Nitrate which is below the compliance criteria value; however, a concentration of 0.713mg/l was recorded for Nitrate. This value exceeds the compliance criteria value. This value is an increase on Q1 2023 (0.236mg/l) and Q4 2022 (0.447mg/l).
- Historical Nitrate and Nitrite results are presented in Graphs 1.3 with an overall downward trend over the years for these wells.

Graph 1.2 – Ammoniacal Nitrogen as N in GW7, GW8a and GW9a.



Graph 1.3 – Nitrate and Nitrate in GW7, GW8a and GW9a.



pH, Conductivity & Various Parameters

- The pH results were as follows 8.01 (GW7), 7.85 (GW8a) and 7.80 (GW9a), these are within acceptable ranges.
- Conductivity measurements ranged from 1224µS/cm in GW7, 497µS/cm in GW8a and 484µS/cm in GW9a. All readings are under the groundwater GAC of 1,875µS/cm and consistent with recent rounds of monitoring.
- PAHs, Phenols and Phthalates were all below detection limits in GW7 and GW8A; however, concentrations in GW9A where above the detection limits, with the sample requiring x20 dilution.

Groundwater Analytical Results (Bedrock Wells – GW14 and GW15)

Explosives / SVOCs

- No explosive compound or any other SVOCs (including o-NT) were detected in bedrock monitoring wells GW14 or GW15, which is consistent with previous monitoring rounds.

Ammoniacal Nitrogen, Nitrite and Nitrate

- Nitrate and Nitrite concentration for both GW14 and GW15 were below the detection limit of the laboratory (LOD). Nitrite in GW14 was lower than the concentration recorded in Q1 2023 (0.09mg/l).
- Ammoniacal Nitrogen was recorded below the groundwater limit value of 0.175mg/l for both wells with 0.05mg/l recorded for GW14 and 0.09mg/l recorded for GW15.
- Total Nitrogen was recorded as 1.1mg/l in GW14 and 1.3mg/l in GW15, both of which are greater than the LOD of <0.5mg/l. Both concentrations are higher than that recorded in each groundwater well in Q1 2023 (<0.5mg/l).

pH, Conductivity and Various Parameters

- pH was recorded as 7.43 and 7.50 for GW14 and GW15 respectively and is within acceptable ranges.
- Electrical conductivity was recorded as 471.4µS/cm and 744µS/cm for GW14 and GW15 respectively.
- Groundwater quality is generally good and no additional contamination trends are observed.

Surface Water Monitoring Results

Six monitoring locations, SW1, SW4 – 6 and WD1-2 were sampled in Q2 2023. No samples were obtained from SW2 and SW3 on the day as both streams had dried up after a period of little to no rainfall. WD1 and WD2 surface water sampling locations occur in the western drain opposite the garage building area were added in Q3 2021 to provide more information to this environmental receptor. Table 3 and 4 attached to this report shows all surface water results and Appendix A includes the SW logs. All pH and EC results were within the acceptable ranges.

Upstream Monitoring Points – SW1, SW2 & SW3

- Nitrate levels at SW1 have decreased to <0.5mg/l from 5.71mg/l in Q1 2023. This is a further decrease from the concentration recorded in Q4 2022 (11.18mg/l). Q2 2023 concentrations remain below the IGV of 50mg/l.
- The Ammoniacal Nitrogen concentration was 0.10mg/l for SW1, which when converted to Ammoniacal Nitrogen as NH_3 exceeded the Surface Water Regulations Standard (0.02mg/l).
- No samples were taken from SW2 as mentioned above.

Downstream Monitoring Points – SW4, SW5 and SW6

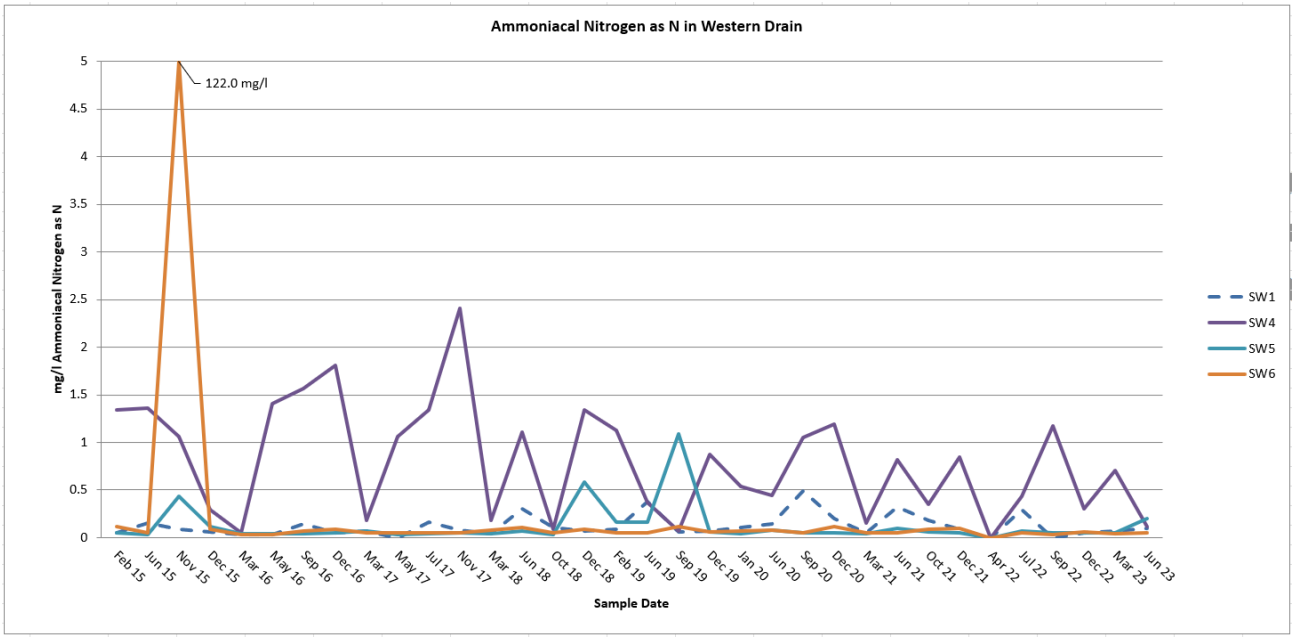
- Nitrotoluenes concentrations were undetected in surface water samples SW5 and SW6 in Q2 2023, showing a similar result from historic records. SW5 has detected low concentration levels of 2,6-DNT in Q4 2022 (8ug/l) similar to levels detected in Q3 2022, 2ug/l. Prior to this since 2018, consecutively for four years nitrotoluenes were undetected in SW5.
- SW4 recorded 2,4-DNT and 2,6-DNT concentrations of <0.5ug/l and 4ug/l respectively. This is a decrease from Q1 2023 (13.1ug/l and 35ug/l).

- Ammoniacal Nitrogen concentrations in SW4 was 0.12mg/l, SW5 was 0.20mg/l and SW6 0.05mg/l which are similar to 2021 and 2022 results. Ammoniacal Nitrogen as NH_3 exceeded the surface water regulations standard (0.02mg/l) at all three locations.

Surface Water Trends

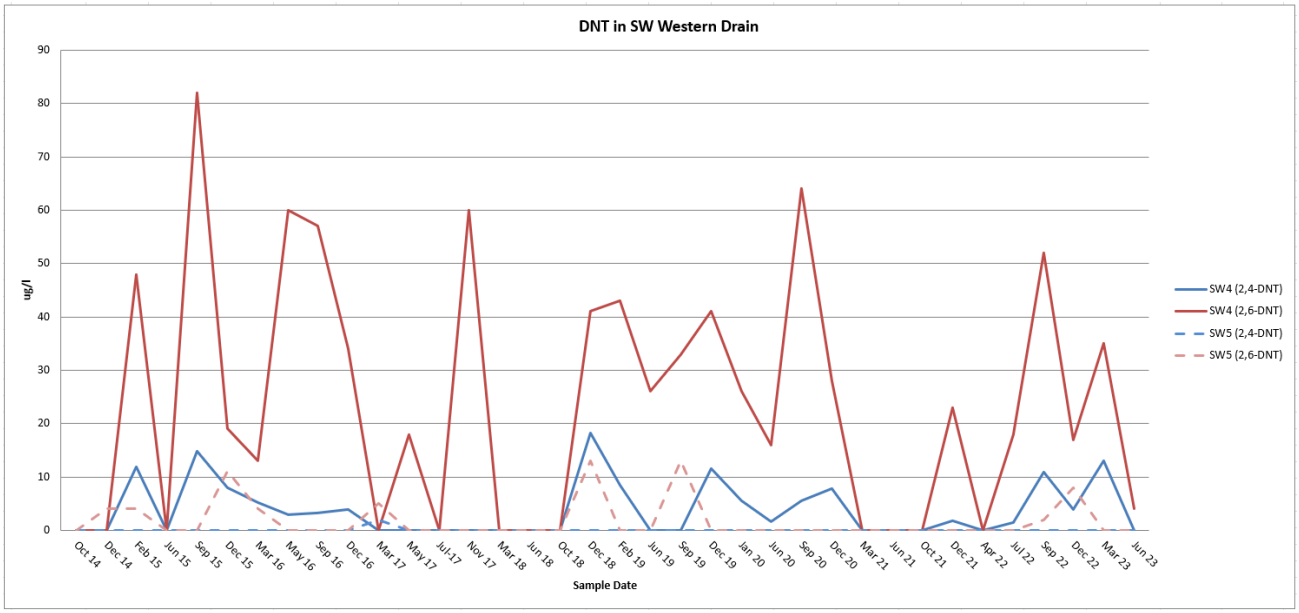
Concentrations of Ammoniacal Nitrogen have varied historically in SW2, SW3 and SW4. As SW2 and SW3 are up-gradient of site activities it indicates Ammoniacal Nitrogen influences from off-site agricultural or forestry sources. SW4 Ammoniacal Nitrogen results appear seasonally influenced and influenced by up-gradient off-site sources. Concentrations in most down gradient SW5 and SW6 are generally low and have remained steady over the sampling period. This is illustrated in Graph 1.4 below.

Graph 1.4 – Ammoniacal Nitrogen Trends in Surface Water.



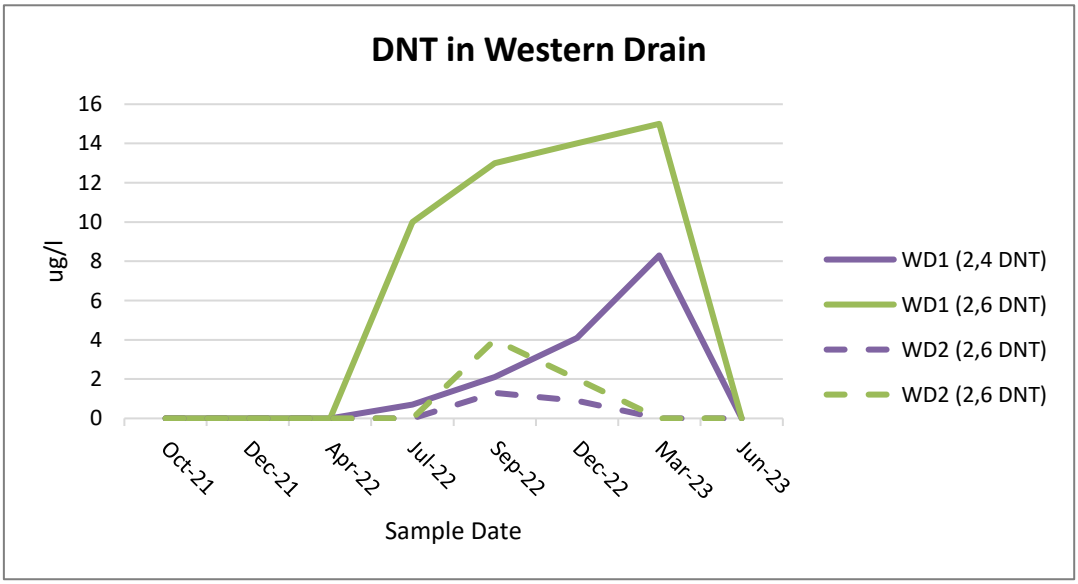
Nitrotoluenes were not detected in downstream surface water sample SW5 or SW6. Additionally, nitrotoluene concentrations in WD1 and WD2 were below the limit of detection. A concentration of 4ug/l was recorded in SW4 for 2,6-DNT; however, 2,4-DNT was reported below the LOD. The concentration levels in SW4 have fluctuated over the years as presented in Graph 1.5.

Graph 1.5 – Nitrotoluene Trends in the Western Drain.



Monitoring of the western drain commenced in 2021 at sampling points WD1 and WD2 located opposite the garage building. Q1 2023 detected nitrotoluenes in WD1 (<0.5ug/l 2,4-DNT and <1ug/l 2,6-DNT). Graph 1.6 indicates levels at this sampling point have decreased since Q1 2023. Initially there was no detection of the nitrotoluenes. WD2 did not detect any nitrotoluenes in Q2 2023, similar to Q1 2023. Levels were detected in the two previous sample rounds (Q3 and Q4 2022).

Graph 1.6 – Nitrotoluene Trends in the Western Drain (WD1 & WD2).



Additional Monitoring (Pump Outlet)

Since 2021 the pump outlet has been included as part of the quarterly monitoring. Results show a decrease in 2,4-DNT concentration to <0.5ug/l in comparison to Q1 2023 (100.5ug/l). The concentration of 2,6-DNT has increased however to 843ug/l. A concentration of 292ug/l was recorded in Q1 2023. Ammoniacal Nitrogen was recorded at 2.03mg/l which is an increase to the 0.37mg/l recorded in Q1 2023. The Q2 value exceeds the site specific RTC. This water poses no environmental risk as it is recycled in manufacturing operations on-site. The presence of contamination indicates that the sumps installed on-site are effectively removing Nitrotoluenes and other contaminants from the perched groundwater in the shallow subsoils which is seen to be present beneath the garage and store buildings from recent site investigation works.

SUMMARY CONCLUSIONS

Monitoring undertaken during Q2 2023, and historical rounds may be summarised as follows:

- Nitrotoluene compounds continue to be detected in the shallow groundwater well GW9a. Ammoniacal Nitrogen was detected in two overburden wells and concentrations remain elevated in GW7 and is consistent with historical trends.
- No Nitrotoluene compounds are being detected in bedrock monitoring wells, consistent with historical results.
- Nitrotoluene compounds were recorded in surface water samples SW4. No Nitrotoluene compounds were detected in SW1, SW5, SW6, WD1 and WD2. Is it noted that the previous surface water samples collected from SW5 and WD2 in 2022 detected Nitrotoluene compounds but prior to this they were undetected for consecutive years.

Ongoing monitoring at the site indicates that localised contamination exists in shallow perched groundwater near the western drain which is seen to be present beneath the garage and store buildings from recent site investigation works. Contaminant trends are stable or decreasing; however, nitrotoluene compounds remain elevated above remedial target concentrations in localised areas around GW8a and GW9a. While no nitrotoluene compounds were detected in the western drain samples, it is recommended to continue sampling to monitor the trend.

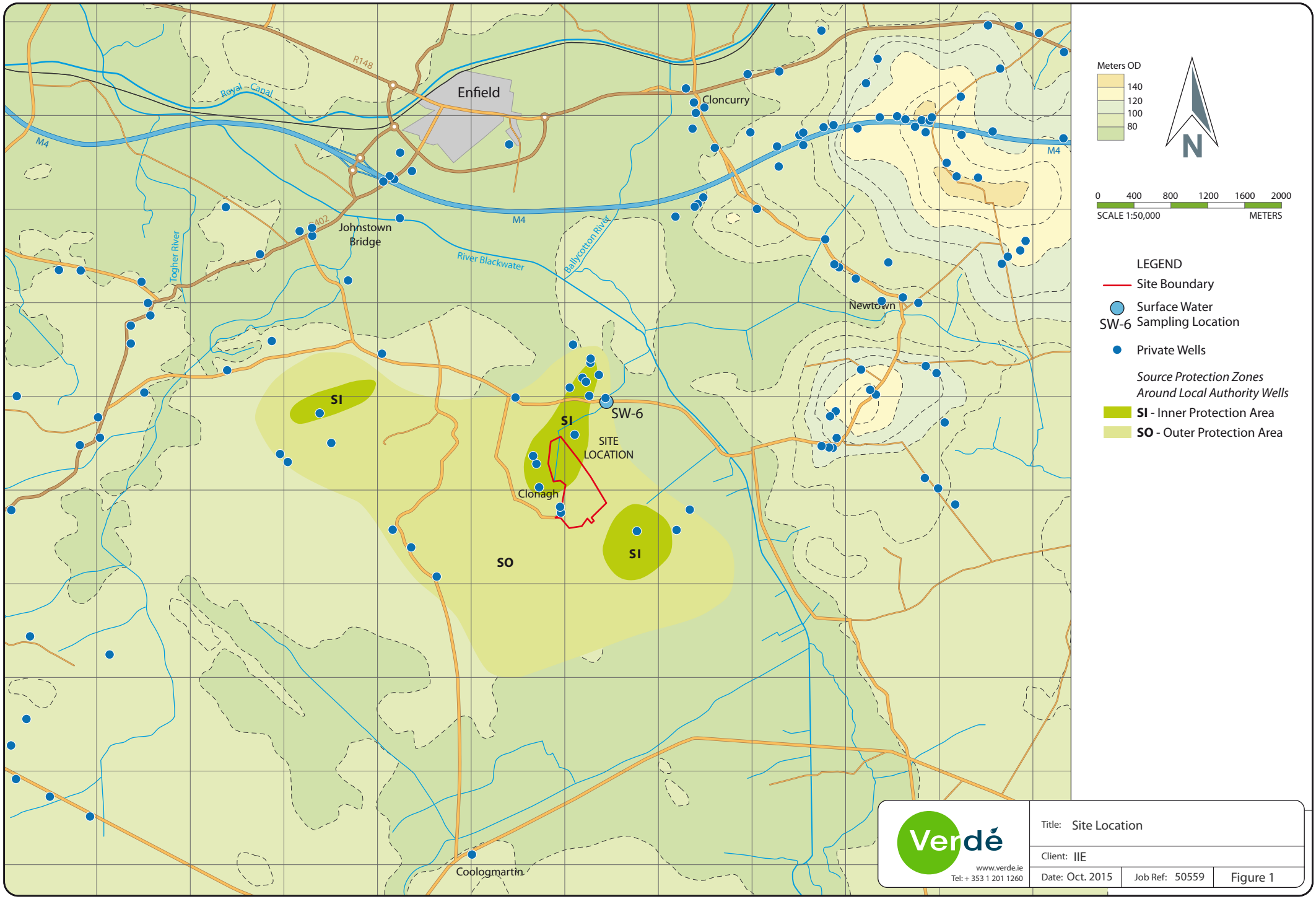
Yours sincerely,

Megan Tallon.

Megan Tallon
Environmental Consultant

Kevin Cleary
Project Director

FIGURES



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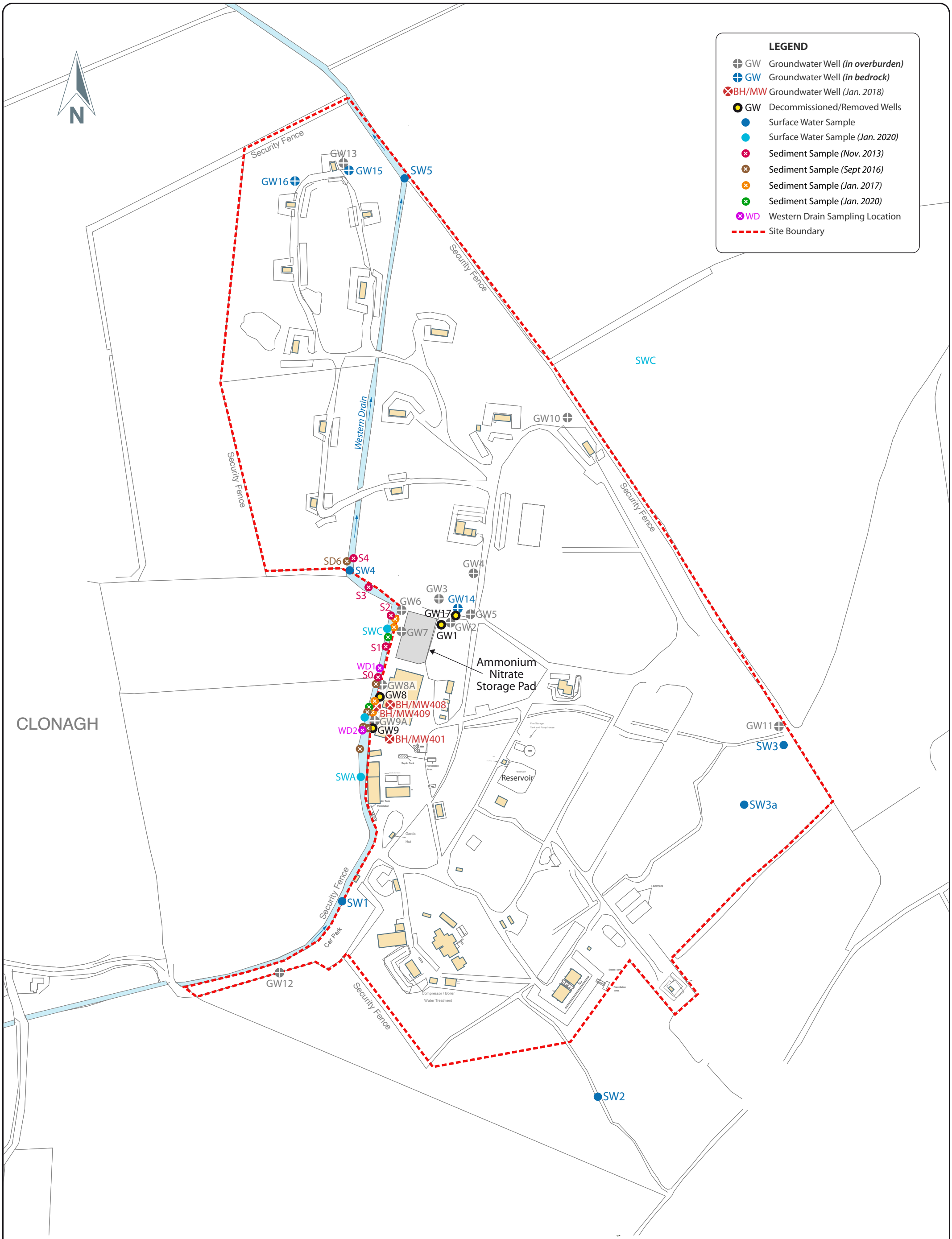
Title: Site Location
Client: IIE
Date: Oct. 2015 | Job Ref: 50559 | Figure 1


N
LEGEND
GW Groundwater Well (in overburden)
GW Groundwater Well (in bedrock)
BH/MW Groundwater Well (Jan. 2018)
GW Decommissioned/Removed Wells
Surface Water Sample
Surface Water Sample (Jan. 2020)
Sediment Sample (Nov. 2013)
Sediment Sample (Sept 2016)
Sediment Sample (Jan. 2017)
Sediment Sample (Jan. 2020)
WD Western Drain Sampling Location
Site Boundary
Security Fence
Western Drain
Car Park
CLONAGH
GW13
GW15
GW16
SW5
SWC
GW10
GW4
GW3
GW14
GW6
GW17
GW5
GW2
GW1
GW7
S1
WD1
S0
GW8A
GW8
BH/MW408
BH/MW409
GW9A
WD2
GW9
BH/MW401
SWA
SD6
S4
SW4
S3
S2
Ammonium Nitrate Storage Pad
Reservoir
GW11
SW3
SW3a
SW1
GW12
SW2
Compressor / Boiler
Water Treatment
Garda Hut
Septic Tank
Percolation Area
LAGOONS
0 50 100 150 200 250 300
Scale (at A3 size)
Metres
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Title: Sampling Locations
Client: IIE
Date: Nov. 2021
Job Ref: 50990
Figure No. 2

TABLES

Table 1A - Shallow Groundwater Analysis - COPCs

Analyte	ID:		Made Ground/Overburden			Pump Outlet
	Well:	Compliance Criteria	GW7	GW8A	GW9A	
	Units		29/06/2023			
Nitrogen - based compounds						
Nitrate as N	mg/l	37.5**	<0.05	1.00	0.34	NA
Nitrite as N	mg/l	0.375**	<0.006	0.01	0.713	NA
Ammonical Nitrogen as N	mg/l	0.179	**76.61**	0.17	**3.35**	**2.03**
Ammonical Nitrogen as NH4	mg/l	-	98.83	0.22	4.32	2.62
Total Nitrogen	mg/l	-	79.2	13.6	40.5	NA
Explosives						
2,4-DNT	ug/l	1.42	<0.5	<0.5	***161.9***	<0.5
2,6-DNT	ug/l	1.04	<1	<1	***>>2468***	**>>843**
o-NT	ug/l	2.52	ND	ND	**6579**	NA
Other nitrotoluenes	ug/l	-	ND	ND	36018	829

Notes:

NA - Not Anlysed

ND - Not Detected

* Compliance Criteria Level 3 RTCs quoted in DQRA - March 2015, For wells on site the most appropriate conservative RTC has been used.

** Compliance Criteria is based on Schedule 5 Groundwater Threshold Values European Communties Environmental Objectives (GROUNDWATER) Regulations, 2010

* Bedrock limit values are based on S.1. 366 of 2016 for groundwater

* Other nitrotoluenes includes: 3 Nitrotoluene, 4 Nitrotoluene, 3,4-Dinitrotoluene & 2,3-DNT

>> - Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.

Values in *italics* - x20 Dilution

Table 1B - Bedrock Groundwater Analysis - COPCs

Analyte	Well:	Compliance Criteria	BEDROCK	
			GW14	GW15
	Units		29/06/23	
Nitrogen - based compounds				
Nitrate as N	mg/l	8.5	<0.05	<0.05
Nitrite as N	mg/l	-	<0.006	<0.006
Ammonical Nitrogen as N	mg/l	0.175	0.05	0.09
Ammonical Nitrogen as NH4	mg/l	-	0.06	0.12
Total Nitrogen	mg/l	-	1.1	1.3
Explosives				
2,4-DNT	ug/l	1.3	<0.5	<0.5
2,6-DNT	ug/l	1	<1	<1
o-NT	ug/l	1.9	ND	ND
Other nitrotoluenes	ug/l	-	ND	ND

Notes

NA - Not Analysed

ND - Not Detected

* Bedrock limit values are based on S.1. 366 of 2016 for groundwater

Table 2 - Groundwater Analysis - General Parameters

Analyte	IGV	S.I. 122 of 2014 (DW)	S.I. 366 of 2016 (GW)	ID:	GW7	GW8A	GW9A	GW14	GW15	Pump Outlet
				Strata:	Made ground/Overburden			Bedrock		
				Units	29/06/23					
Dissolved Aluminium	200	200	150	ug/l	NA	NA	NA	NA	NA	NA
Dissolved Arsenic	10	10	7.5	ug/l	NA	NA	NA	NA	NA	NA
Dissolved Barium	-	-	-	ug/l	NA	NA	NA	NA	NA	NA
Dissolved Calcium	-	-	-	mg/l	NA	NA	NA	NA	NA	NA
Total Dissolved Iron	200	200	-	ug/l	NA	NA	NA	NA	NA	NA
Dissolved Manganese	50	50	-	ug/l	NA	NA	NA	NA	NA	NA
Dissolved Sodium	150	200	-	mg/l	NA	NA	NA	NA	NA	NA
Nitrate as N	50	50	37.5	mg/l	<0.05	1.00	0.34	<0.05	<0.05	NA
Nitrite as N	0.5	0.5	375	mg/l	<0.006	0.01	0.713	<0.006	<0.006	NA
Ammonical Nitrogen as N	-	-	-	mg/l	76.61	0.17	3.35	0.05	0.09	2.03
Ammonical Nitrogen as NH4	0.15	0.3	0.175	mg/l	**98.83**	**0.22**	**4.32**	0.06	0.12	**2.62**
Total Nitrogen	-	-	-	mg/l	79.2	13.6	40.5	1.10	1.30	NA
Sulphate as SO4	200	250	187.5	mg/l	NA	NA	NA	NA	NA	NA
Ortho Phosphate as PO4	0.03	0.03	-	mg/l	<0.06	<0.06	<0.06	0.07	<0.06	NA
Total Alkalinity as CaCO3	-	-	-	mg/l	NA	NA	NA	NA	NA	NA
pH #	6.5 - 9.5	6.5 - 9.5	-	pH units	8.01	7.85	7.80	7.43	7.50	8.25
Electrical Conductivity #	1000	2500	1875	uS/cm	**1224**	497	484	471.4	744	461
Phenols (various)	-	-	-	ug/l	<LOD	<LOD	>LOD	<LOD	<LOD	<LOD
PAHs (various)	-	-	-	ug/l	<LOD	<LOD	>LOD	<LOD	<LOD	<LOD
Phthalates (various)	-	-	-	ug/l	<LOD	<LOD	>LOD	<LOD	<LOD	<LOD

Notes

NA - Not Analysed

ND - Not Detected

<LOD - Lower than the limit of detection

>LOD - Greater than the limit of detection

"#" = field reading

S.I. 122 of 2014 (Drinking Water Regulations)

S.I. 366 of 2016 (Groundwater Regulations)

IGV taken from EPA Interim Guideline Values 2003

Table 3 - Surface Water Analysis - COPCs

Analyte	PVL	IGV	Units	SW1	SW2	SW3	SW4	SW5	SW6	WD1	WD2
				29/06/2023							
Field Parameters											
pH #	4.5-9.0	5.5-9.0	-	7.25	NA	NA	7.55	7.67	7.91	7.54	7.83
Electrical Conductivity #	1000	1000	uS/cm	762	NA	NA	704	714	647	665	682
Dissolved Oxygen #	>3	9 mg/l *	mg/l	**3.98**	NA	NA	**5.23**	**4.33**	**9.11**	1.83	**5.95**
Oxidation Reduction Potential #	-	-	mV	113.8	NA	NA	203.8	92.1	207.0	22.0	123.7
Nitrotoluenes											
2,4-DNT	-	-	ug/l	<0.5	NA	NA	<0.5	<0.5	<0.5	<0.5	<0.5
2,6-DNT	-	-	ug/l	<1	NA	NA	4	<1	<1	<1	<1
2-Nitrotoluene	-	-	ug/l	NA	NA	NA	NA	NA	NA	NA	NA
Other Nitrotoluenes	-	-	ug/l	ND	NA	NA	ND	ND	ND	ND	ND
SVOCs (various additional)											
Phenols (various)	-	-	ug/l	<LOD	NA	NA	<LOD	<LOD	<LOD	<LOD	29
PAHs (various)	-	-	ug/l	<LOD	NA	NA	<LOD	<LOD	<LOD	<LOD	<LOD
Phthalates (various)	-	-	ug/l	<LOD	NA	NA	<LOD	<LOD	<LOD	<LOD	<LOD

Notes

"#" = field reading

NA - Not Analysed

ND - Not Detected

PVL taken from EU Surface Water (Amendments) Regulations 2019; Annual Average - EQS for inland surface waters

IGV taken from- EPA Discussion Document “Environmental Quality Objectives and Environmental Quality Standards, The Aquatic Environment” 1997

*For copper and zinc, the standard quoted is for soft water ≤ 10 mg/l CaCO3, a higher standard applies for hard water

LOD = limit of detection ; various individual SVOCs are not listed here when below LOD. Full laboratory laboratory certificates are included in appendices

Table 4 - Surface Water Analysis - Various Parameters

Analyte	PVL	IGV	Units	SW1	SW2	SW3	SW4	SW5	SW6	WD1	WD2
				29/06/23							
pH #	4.5-9.0	5.5-9.0	-	7.25	NA	NA	7.55	7.67	7.91	7.54	7.83
E. Conductivity #	1000	1000	uS/cm	762	NA	NA	704	714	647	665	682
TDS #	-	-	mg/l	-	-	-	-	-	-	-	-
Dissolved O2 #	>3	9 mg/l *	mg/l	**3.98**	NA	NA	**5.23**	**4.33**	**9.11**	1.83	**5.95**
Nitrate as N	-	50	mg/l	<0.05	NA	NA	0.18	0.61	1.45	<0.05	<0.05
Nitrite as N	-	-	mg/l	<0.006	NA	NA	0.016	<0.006	<0.006	<0.006	<0.006
Ammonical Nitrogen as N	-	-	mg/l	0.10	NA	NA	0.12	0.20	0.05	0.41	0.23
Ammonia, NH3	≤ 0.04 or ≤ 0.065	0.02	mg/l	**0.13**	NA	NA	**0.15**	**0.26**	**0.06**	**0.53**	**0.30**
Total Nitrogen	-	-	mg/l	1.40	NA	NA	36.10	7.30	2.60	161.10	53.20
Sulphate as SO4	200	200	mg/l	NA	NA	NA	NA	NA	NA	NA	NA
Ortho Phosphate as PO4	-	0.03	mg/l	**0.06**	NA	NA	**0.10**	**0.07**	<0.06	**0.23**	<0.06

Notes

PVL taken from EU Surface Water Regulations (Amendment) 2019

IGV taken from- EPA Discussion Document “Environmental Quality Objectives and Environmental Quality Standards, The Aquatic Environment” 1997

* guideline value of 9 mg/l demonstrates high oxygen saturation

"#" = Field reading

APPENDIX A

GROUNDWATER AND SURFACE SAMPLE LOGS

GROUNDWATER SITE LOG SHEET

Client:	IIE	**Job Ref:**	50990
Date:	29-Jun-23	**Log by:**	DMC, MT and JJ
Site:	Clonagh Enfield	**Weather:**	Warm, bright and clear

Sample ID	pH	Temp (°C)	EC (µS/cm)	DO, mg/l	ORP, mV	Water Level, mBTOC	Well Depth, mBTOC	Purge Vol (L)	Recharge Notes	Odour	Visual Notes
GW-7	8.01	14.5	1224	-	-	1.16	3.05	11.4	Strong	None	Light brown yellowish tint. Sig. sediment.
GW-8A	7.85	18.8	497	-	-	2.41	2.87	1.2	Slow	None	Light brown. Sig. sediment.
GW-9A	7.80	20.7	484	-	-	2.50	3.02	2.0	Slow	Very mild almond	Light brown. Sig. sediment.
GW-14	7.43	12.5	471.4	7.02	96.0	0.83	26.96	60.0	Slow	None	Light brown tint.
GW-15	7.50	11.8	744	16.62	61.8	3.57	30.82	75.0	Slow	None	Light greytint.
Sump 8A	-	-	-	-	-	2.93	3.96	5.0	Moderate	Moderate almond	Light brown creamy tint. Some sediment.
Sump 8B	7.55	13.6	609	-	-	2.86	3.3	2.6	Moderate	Mild almond	Light brown tint. Some sediment.
Sump 9A	7.33	13.0	806	-	-	2.98	3.66	4.2	Strong	Mild organic	Yellow tint. Sonme sediment.
Sump 9B	7.59	14.1	591	-	-	2.77	3.87	5.0	Moderate	None	Light brown creamy tint. Some sediment.
MW 401	-	-	-	-	-	2.25	2.8	3.3	Slow	None	Light brown tint.
MW 408	-	-	-	-	-	2.59	2.9	1.9	Slow	MN	Light brown tint.
Pump outlet	8.25	17.8	461	-	-	-	-	-	-	None	Clear.

Notes:
Field readings not taken due to well running dry or physical evidence of contamination.

SURFACE WATER SITE LOG SHEET

Client:	IIE	**Job Ref:**	50990
Date:	29-Jun-23	**Log by:**	DMC, MT and JJ
Site:	Clonagh, Enfield	**Weather:**	Warm, bright and clear

Sample ID	pH	Temp (°C)	EC (µS/cm)	DO, mg/l	ORP, mV	Odour	Flow	Visual Notes
SW1	7.25	14.2	762	3.98	113.8	None	Slow	Very overgrown. Clear.
SW2	-	-	-	-	-	-	-	-
SW3	-	-	-	-	-	-	-	-
SW4	7.55	14.7	704	5.23	203.8	None	Stagnant	Very overgrown. Clear. Some sediment.
SW5	7.67	16.1	714	4.33	92.1	None	Stagnant	Very overgrown. Clear.
SW6	7.91	14.2	647	9.11	207.0	None	Moderate	Vegetation on banks. Clear. Stone and gravel in riverbed.
WD1	7.54	14.3	665	1.83	22.0	None	Stagnant	Overgrown. Very little water. Some sediment.
WD2	7.83	15.0	682	5.95	123.7	None	Stagnant	Overgrown. Very little water. Some sediment.

Notes:
Field readings not taken due to stream being dry.

APPENDIX B

LABORARTORY ANALYSIS CERTIFICATES

Element Materials Technology
Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

P: +44 (0) 1244 833780
F: +44 (0) 1244 833781
W: www.element.com

Verde Environmental Consultants
E7 Network Enterprise Park
Kilcoole
Co Wicklow
Ireland
A63 KV04

Attention :	Malcolm Dowling
Date :	11th July, 2023
Your reference :	50990
Our reference :	Test Report 23/10801 Batch 1
Location :	IIE
Date samples received :	4th July, 2023
Status :	Final report
Issue :	1

Twelve samples were received for analysis on 4th July, 2023 of which twelve 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.

Authorised By:

Phil Sommerton BSc
Senior Project Manager

Client Name: Verde Environmental Consultants
Reference: 50990
Location: IIE
Contact: Malcolm Dowling
EMT Job No: 23/10801

Report : Liquid

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

EMT Sample No.	1-3	4-6	7-9	10-12	13-15	16-18	19-22	23-26	27-30	31-34	LOD/LOR	Units	Method No.
Sample ID	GW7	GW8A	GW9A	GW14	GW15	SW1	SW4	SW5	SW6	WD1			
Depth	3.05	3.87	3.02	26.96	30.82								
COC No / misc													
Containers	H P G	H P G	H P G	H P G	H P G	H P G	H HN P G	H HN P G	H HN P G	H HN P G			
Sample Date	29/06/2023	29/06/2023	29/06/2023	29/06/2023	29/06/2023	29/06/2023	29/06/2023	29/06/2023	29/06/2023	29/06/2023			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	04/07/2023	04/07/2023	04/07/2023	04/07/2023	04/07/2023	04/07/2023	04/07/2023	04/07/2023	04/07/2023	04/07/2023			
Dissolved Aluminium #	-	-	-	-	-	-	<20	<20	<20	<20	<20	ug/l	TM30/PM14
Dissolved Antimony #	-	-	-	-	-	-	<2	<2	<2	<2	<2	ug/l	TM30/PM14
Dissolved Arsenic #	-	-	-	-	-	-	<2.5	<2.5	<2.5	<2.5	<2.5	ug/l	TM30/PM14
Dissolved Barium #	-	-	-	-	-	-	81	62	70	165	<3	ug/l	TM30/PM14
Dissolved Boron	-	-	-	-	-	-	19	16	13	16	<12	ug/l	TM30/PM14
Dissolved Cadmium #	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM30/PM14
Dissolved Calcium #	-	-	-	-	-	-	146.7	127.4	140.3	136.7	<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	-	-	-	-	-	-	<1.5	<1.5	<1.5	<1.5	<1.5	ug/l	TM30/PM14
Dissolved Copper #	-	-	-	-	-	-	<7	<7	<7	<7	<7	ug/l	TM30/PM14
Total Dissolved Iron #	-	-	-	-	-	-	180	83	82	163	<20	ug/l	TM30/PM14
Dissolved Lead #	-	-	-	-	-	-	<5	<5	<5	<5	<5	ug/l	TM30/PM14
Dissolved Manganese #	-	-	-	-	-	-	247	315	45	2679	<2	ug/l	TM30/PM14
Dissolved Nickel #	-	-	-	-	-	-	5	3	2	4	<2	ug/l	TM30/PM14
Dissolved Selenium #	-	-	-	-	-	-	<3	<3	<3	<3	<3	ug/l	TM30/PM14
Dissolved Sodium #	-	-	-	-	-	-	9.2	7.3	7.7	11.1	<0.1	mg/l	TM30/PM14
Dissolved Zinc #	-	-	-	-	-	-	10	5	<3	<3	<3	ug/l	TM30/PM14
SVOC TICs	ND	ND	See Attached	ND	ND	ND	ND	ND	ND	ND		None	TM16/PM30
o-Nitrotoluene (Benzene, 1-methyl-2-nitro-) (88-72-2)	ND	ND	6579	ND	ND	ND	ND	ND	ND	ND			
3-Nitrotoluene (Benzene, 1-methyl-3-nitro-(99-08-1)	ND	ND	<100	ND	ND	ND	ND	ND	ND	ND			
4-Nitrotoluene (Benzene, 1-methyl-4-nitro-) (99-99-0)	ND	ND	<100	ND	ND	ND	ND	ND	ND	ND			
Ortho Phosphate as PO4 #	<0.06	<0.06	<0.06	0.07	<0.06	0.06	0.10	0.07	<0.06	0.23	<0.06	mg/l	TM38/PM0
Nitrate as N #	<0.05	1.00	0.34	<0.05	<0.05	<0.05	0.18	0.61	1.45	<0.05	<0.05	mg/l	TM38/PM0
Nitrite as N #	<0.006	0.010	0.713	<0.006	<0.006	<0.006	0.016	<0.006	<0.006	<0.006	<0.006	mg/l	TM38/PM0
Ammoniacal Nitrogen as N #	76.61	0.17	3.35	0.05	0.09	0.10	0.12	0.20	0.05	0.41	<0.03	mg/l	TM38/PM0
Total Nitrogen	79.2	13.6	40.5	1.1	1.3	1.4	36.1	7.3	2.6	161.1	<0.5	mg/l	TM38/TM125/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Verde Environmental Consultants
Reference: 50990
Location: IIE
Contact: Malcolm Dowling
EMT Job No: 23/10801

Report : Liquid

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

EMT Sample No.	35-38	39,41									LOD/LOR	Units	Method No.
Sample ID	WD2	PUMP OUTLET											
Depth													
COC No / misc													
Containers	H HN P G	H G											
Sample Date	29/06/2023	29/06/2023											
Sample Type	Surface Water	Ground Water											
Batch Number	1	1											
Date of Receipt	04/07/2023	04/07/2023											
Dissolved Aluminium #	<20	-									<20	ug/l	TM30/PM14
Dissolved Antimony #	<2	-									<2	ug/l	TM30/PM14
Dissolved Arsenic #	<2.5	-									<2.5	ug/l	TM30/PM14
Dissolved Barium #	202	-									<3	ug/l	TM30/PM14
Dissolved Boron	16	-									<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	-									<0.5	ug/l	TM30/PM14
Dissolved Calcium #	136.4	-									<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<1.5	-									<1.5	ug/l	TM30/PM14
Dissolved Copper #	<7	-									<7	ug/l	TM30/PM14
Total Dissolved Iron #	153	-									<20	ug/l	TM30/PM14
Dissolved Lead #	<5	-									<5	ug/l	TM30/PM14
Dissolved Manganese #	3455	-									<2	ug/l	TM30/PM14
Dissolved Nickel #	5	-									<2	ug/l	TM30/PM14
Dissolved Selenium #	<3	-									<3	ug/l	TM30/PM14
Dissolved Sodium #	11.0	-									<0.1	mg/l	TM30/PM14
Dissolved Zinc #	3	-									<3	ug/l	TM30/PM14
SVOC TICs	ND	See Attached										None	TM16/PM30
Ortho Phosphate as PO4 #	0.06	-									<0.06	mg/l	TM38/PM0
Nitrate as N #	<0.05	-									<0.05	mg/l	TM38/PM0
Nitrite as N #	<0.006	-									<0.006	mg/l	TM38/PM0
Ammoniacal Nitrogen as N #	0.23	2.03									<0.03	mg/l	TM38/PM0
Total Nitrogen	53.2	-									<0.5	mg/l	TM38/TM125/PM0

Please see attached notes for all abbreviations and acronyms

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: Verde Environmental Consultants
Reference: 50990
Location: IIE
Contact: Malcolm Dowling
EMT Job No: 23/10801

SVOC Report : **Liquid**

EMT Sample No.	1-3	4-6	7-9	10-12	13-15	16-18	19-22	23-26	27-30	31-34	LOD/LOR	Units	Method No.
Sample ID	GW7	GW8A	GW9A	GW14	GW15	SW1	SW4	SW5	SW6	WD1			
Depth	3.05	3.87	3.02	26.96	30.82								
COC No / misc													
Containers	H P G	H P G	H P G	H P G	H P G	H P G	H HN P G	H HN P G	H HN P G	H HN P G			
Sample Date	29/06/2023	29/06/2023	29/06/2023	29/06/2023	29/06/2023	29/06/2023	29/06/2023	29/06/2023	29/06/2023	29/06/2023			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	04/07/2023	04/07/2023	04/07/2023	04/07/2023	04/07/2023	04/07/2023	04/07/2023	04/07/2023	04/07/2023	04/07/2023			
SVOC MS													
Phenols													
2-Chlorophenol #	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2-Methylphenol #	<0.5	<0.5	<10.0 AA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2-Nitrophenol	<0.5	<0.5	<10.0 AA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,4-Dichlorophenol #	<0.5	<0.5	<10.0 AA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,4-Dimethylphenol	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2,4,5-Trichlorophenol #	<0.5	<0.5	<10.0 AA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,4,6-Trichlorophenol	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Chloro-3-methylphenol #	<0.5	<0.5	<10.0 AA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
4-Methylphenol	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Nitrophenol	<10	<10	<200 AA	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM16/PM30
Pentachlorophenol	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Phenol	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
PAHs													
2-Chloronaphthalene #	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2-Methylnaphthalene #	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Naphthalene #	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Acenaphthylene #	<0.5	<0.5	<10.0 AA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Acenaphthene #	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Fluorene #	<0.5	<0.5	<10.0 AA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Phenanthrene #	<0.5	<0.5	<10.0 AA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Anthracene #	<0.5	<0.5	<10.0 AA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Fluoranthene #	<0.5	<0.5	<10.0 AA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Pyrene #	<0.5	<0.5	<10.0 AA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Benzo(a)anthracene #	<0.5	<0.5	<10.0 AA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Chrysene #	<0.5	<0.5	<10.0 AA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Benzo(bk)fluoranthene #	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Benzo(a)pyrene	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Indeno(123cd)pyrene	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Dibenzo(ah)anthracene #	<0.5	<0.5	<10.0 AA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Benzo(ghi)perylene #	<0.5	<0.5	<10.0 AA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Phthalates													
Bis(2-ethylhexyl) phthalate	<5	<5	<100 AA	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM16/PM30
Butylbenzyl phthalate	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Di-n-butyl phthalate #	<1.5	<1.5	<30.0 AA	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	ug/l	TM16/PM30
Di-n-Octyl phthalate	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Diethyl phthalate #	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Dimethyl phthalate	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30

Please see attached notes for all abbreviations and acronyms

Client Name: Verde Environmental Consultants
Reference: 50990
Location: IIE
Contact: Malcolm Dowling
EMT Job No: 23/10801

SVOC Report : **Liquid**

EMT Sample No.	1-3	4-6	7-9	10-12	13-15	16-18	19-22	23-26	27-30	31-34	LOD/LOR	Units	Method No.
Sample ID	GW7	GW8A	GW9A	GW14	GW15	SW1	SW4	SW5	SW6	WD1			
Depth	3.05	3.87	3.02	26.96	30.82								
COC No / misc													
Containers	H P G	H P G	H P G	H P G	H P G	H P G	H HN P G	H HN P G	H HN P G	H HN P G			
Sample Date	29/06/2023	29/06/2023	29/06/2023	29/06/2023	29/06/2023	29/06/2023	29/06/2023	29/06/2023	29/06/2023	29/06/2023			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	04/07/2023	04/07/2023	04/07/2023	04/07/2023	04/07/2023	04/07/2023	04/07/2023	04/07/2023	04/07/2023	04/07/2023			
SVOC MS													
Other SVOCs													
1,2-Dichlorobenzene #	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
1,2,4-Trichlorobenzene #	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
1,3-Dichlorobenzene #	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
1,4-Dichlorobenzene #	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2-Nitroaniline	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2,4-Dinitrotoluene #	<0.5	<0.5	161.9 AA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,6-Dinitrotoluene	<1	<1	>>2468 AA	<1	<1	<1	4	<1	<1	<1	<1	ug/l	TM16/PM30
3-Nitroaniline	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Bromophenylphenylether #	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Chloroaniline	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Chlorophenylphenylether #	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Nitroaniline	<0.5	<0.5	<10.0 AA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Azobenzene #	<0.5	<0.5	<10.0 AA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Bis(2-chloroethoxy)methane #	<0.5	<0.5	<10.0 AA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Bis(2-chloroethyl)ether #	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Carbazole #	<0.5	<0.5	<10.0 AA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Dibenzofuran #	<0.5	<0.5	<10.0 AA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Hexachlorobenzene #	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Hexachlorobutadiene #	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Hexachlorocyclopentadiene	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Hexachloroethane #	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Isophorone #	<0.5	<0.5	<10.0 AA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
N-nitrosodi-n-propylamine #	<0.5	<0.5	<10.0 AA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Nitrobenzene #	<1	<1	<20 AA	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Surrogate Recovery 2-Fluorobiphenyl	129	135 SV	143 SV AA	133 SV	143 SV	128	130	144 SV	119	131	<0	%	TM16/PM30
Surrogate Recovery p-Terphenyl-d14	130	141 SV	132 SV AA	153 SV	165 SV	147 SV	145 SV	165 SV	154 SV	149 SV	<0	%	TM16/PM30

Please see attached notes for all abbreviations and acronyms

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: Verde Environmental Consultants
Reference: 50990
Location: IIE
Contact: Malcolm Dowling
EMT Job No: 23/10801

SVOC Report : **Liquid**

EMT Sample No.	35-38	39,41									LOD/LOR	Units	Method No.
Sample ID	WD2	PUMP OUTLET											
Depth													
COC No / misc													
Containers	H HN P G	H G											
Sample Date	29/06/2023	29/06/2023											
Sample Type	Surface Water	Ground Water											
Batch Number	1	1											
Date of Receipt	04/07/2023	04/07/2023											
SVOC MS													
Phenols													
2-Chlorophenol #	<1	<1									<1	ug/l	TM16/PM30
2-Methylphenol #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
2-Nitrophenol	<0.5	<0.5									<0.5	ug/l	TM16/PM30
2,4-Dichlorophenol #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
2,4-Dimethylphenol	<1	<1									<1	ug/l	TM16/PM30
2,4,5-Trichlorophenol #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
2,4,6-Trichlorophenol	<1	<1									<1	ug/l	TM16/PM30
4-Chloro-3-methylphenol #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
4-Methylphenol	29	<1									<1	ug/l	TM16/PM30
4-Nitrophenol	<10	<10									<10	ug/l	TM16/PM30
Pentachlorophenol	<1	<1									<1	ug/l	TM16/PM30
Phenol	<1	<1									<1	ug/l	TM16/PM30
PAHs													
2-Chloronaphthalene #	<1	<1									<1	ug/l	TM16/PM30
2-Methylnaphthalene #	<1	<1									<1	ug/l	TM16/PM30
Naphthalene #	<1	<1									<1	ug/l	TM16/PM30
Acenaphthylene #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Acenaphthene #	<1	<1									<1	ug/l	TM16/PM30
Fluorene #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Phenanthrene #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Anthracene #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Fluoranthene #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Pyrene #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Benzo(a)anthracene #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Chrysene #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Benzo(bk)fluoranthene #	<1	<1									<1	ug/l	TM16/PM30
Benzo(a)pyrene	<1	<1									<1	ug/l	TM16/PM30
Indeno(123cd)pyrene	<1	<1									<1	ug/l	TM16/PM30
Dibenzo(ah)anthracene #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Benzo(ghi)perylene #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Phthalates													
Bis(2-ethylhexyl) phthalate	<5	<5									<5	ug/l	TM16/PM30
Butylbenzyl phthalate	<1	<1									<1	ug/l	TM16/PM30
Di-n-butyl phthalate #	<1.5	<1.5									<1.5	ug/l	TM16/PM30
Di-n-Octyl phthalate	<1	<1									<1	ug/l	TM16/PM30
Diethyl phthalate #	<1	<1									<1	ug/l	TM16/PM30
Dimethyl phthalate	<1	<1									<1	ug/l	TM16/PM30

Please see attached notes for all abbreviations and acronyms

All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Verde Environmental Consultants
Reference: 50990
Location: IIE
Contact: Malcolm Dowling
EMT Job No: 23/10801

SVOC Report : **Liquid**

EMT Sample No.	35-38	39,41											
Sample ID	WD2	PUMP OUTLET											
Depth											Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	H HN P G	H G											
Sample Date	29/06/2023	29/06/2023											
Sample Type	Surface Water	Ground Water											
Batch Number	1	1											
Date of Receipt	04/07/2023	04/07/2023											
SVOC MS											LOD/LOR	Units	Method No.
Other SVOCs													
1,2-Dichlorobenzene #	<1	<1									<1	ug/l	TM16/PM30
1,2,4-Trichlorobenzene #	<1	<1									<1	ug/l	TM16/PM30
1,3-Dichlorobenzene #	<1	<1									<1	ug/l	TM16/PM30
1,4-Dichlorobenzene #	<1	<1									<1	ug/l	TM16/PM30
2-Nitroaniline	<1	<1									<1	ug/l	TM16/PM30
2,4-Dinitrotoluene #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
2,6-Dinitrotoluene	<1	>>843									<1	ug/l	TM16/PM30
3-Nitroaniline	<1	<1									<1	ug/l	TM16/PM30
4-Bromophenylphenylether #	<1	<1									<1	ug/l	TM16/PM30
4-Chloroaniline	<1	<1									<1	ug/l	TM16/PM30
4-Chlorophenylphenylether #	<1	<1									<1	ug/l	TM16/PM30
4-Nitroaniline	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Azobenzene #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Bis(2-chloroethoxy)methane #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Bis(2-chloroethyl)ether #	<1	<1									<1	ug/l	TM16/PM30
Carbazole #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Dibenzofuran #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Hexachlorobenzene #	<1	<1									<1	ug/l	TM16/PM30
Hexachlorobutadiene #	<1	<1									<1	ug/l	TM16/PM30
Hexachlorocyclopentadiene	<1	<1									<1	ug/l	TM16/PM30
Hexachloroethane #	<1	<1									<1	ug/l	TM16/PM30
Isophorone #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
N-nitrosodi-n-propylamine #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Nitrobenzene #	<1	<1									<1	ug/l	TM16/PM30
Surrogate Recovery 2-Fluorobiphenyl	134 SV	128									<0	%	TM16/PM30
Surrogate Recovery p-Terphenyl-d14	154 SV	153 SV									<0	%	TM16/PM30

All solid results are expressed on a dry weight basis unless stated otherwise.

Job number: 23/10801
Sample number: 9
Sample identity: GW9A
Sample depth: 3.02
Sample Type: Ground Water
Units: ug/l

Method: SVOC
Matrix: Liquid

Note: Only samples with TICs (if requested) are reported. If TICs were requested but no compounds found they are not reported.

CAS No.	Tentative Compound Identification	Retention Time (minutes)	% Match	Concentration
95-53-4	o-Toluidine	5.197	95	3808
88-72-2	Benzene, 1-methyl-2-nitro-	6.016	90	6579
120-72-9	Indole	7.050	87	158
823-40-5	1,3-Benzenediamine, 2-methyl-	7.115	95	860
601-87-6	Benzenamine, 3-methyl-2-nitro-	7.889	99	10541
570-24-1	2-Methyl-6-nitroaniline	8.432	93	26551
602-01-7	Benzene, 1-methyl-2,3-dinitro-	8.447	91	17893
578-46-1	5-Methyl-2-nitroaniline	8.561	96	23184
610-39-9	Benzene, 4-methyl-1,2-dinitro-	8.777	96	14317
99-55-8	Benzenamine, 2-methyl-5-nitro-	8.869	96	2379
611-05-2	Benzenamine, 3-methyl-4-nitro-	9.160	96	1366
99-52-5	Benzenamine, 2-methyl-4-nitro-	9.346	98	6426

All solid results are expressed on a dry weight basis unless stated otherwise.

Job number: 23/10801
Sample number: 41
Sample identity: PUMP OUTLET
Sample depth:
Sample Type: Ground Water
Units: ug/l

Method: SVOC
Matrix: Liquid

Note: Only samples with TICs (if requested) are reported. If TICs were requested but no compounds found they are not reported.

CAS No.	Tentative Compound Identification	Retention Time (minutes)	% Match	Concentration
602-01-7	Benzene, 1-methyl-2,3-dinitro-	8.470	91	829
616-72-8	4,6-Dinitro-1,3-dimethyl-benzene	9.037	87	243

All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Verde Environmental Consultants
Reference: 50990
Location: IIE
Contact: Malcolm Dowling

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 23/10801						

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

EMT Job No.: 23/10801

SOILS and ASH

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. Asbestos samples are retained for 6 months.

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. Limits of detection for analyses carried out on as received samples are not moisture content corrected. 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. Ash samples are dried at 37°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.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

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.

STACK EMISSIONS

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 for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

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

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

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 requirement of our Accreditation Body 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.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) 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.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology 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
AA	x20 Dilution

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 23/10801

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
TM16	Modified USEPA 8270D v5:2014. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM16	Modified USEPA 8270D v5:2014. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified				
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified	Yes			
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM0	No preparation is required.	Yes			
TM38/TM125	Total Nitogen/Organic Nitrogen by calculation	PM0	No preparation is required.				