

# WATER QUALITY DATA – QUARTERLY SUMMARY

## WRESSLE-1 WELLSITE, NORTH LINCOLNSHIRE



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WATER

Ref: 3490485 Egdon Wressle 2023 \ RPT - Quarterly WQ Summary September 2023  
October 2023

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REV01	Client Issue	LMM	20/10/2023	PH	20/10/2023

# WATER QUALITY DATA – QUARTERLY SUMMARY

## WRESSLE-1 WELLSITE, NORTH LINCOLNSHIRE

### 1 INTRODUCTION

#### 1.1 Background

Egdon Resources U.K. Limited (Egdon) has developed the Wressle-1 wellsite (the “Site”) on farmland at Lodge Farm, Appleby, North Lincolnshire.

Egdon holds an environmental permit EPR/AB3609XX/V004 [Ref.1] for the Site, which requires groundwater and surface water monitoring to be carried out for a range of specific chemical and physico-chemical parameters. A Groundwater Monitoring Plan (GMP) [Ref. 2] was developed by Egdon and agreed with the Environment Agency. The GMP, in conjunction with the environmental permit, sets out the frequency of monitoring, the method of sampling and the monitoring parameters. Any changes to the GMP must be agreed with the Environment Agency.

Baseline monitoring was carried out by Envireau Water in April – July 2020 prior to the development of the Site [Ref. 3]. The Site was constructed in Autumn – Winter 2020 and operational monitoring began in January 2021.

The environmental permit requires Egdon to report on the operational monitoring data on a quarterly basis, and to submit a report to the Environment Agency within 28 days of the end of the reporting period.

#### 1.2 Purpose of This Report

This report presents a factual summary of all the monitoring data collected at the Site, with a focus on the data collected during July 2023 to September 2023 (Rounds 35 to 37).

Detailed information regarding the scheme of monitoring and sampling methods can be found in Ref. 3.

This report will be updated quarterly. Previous quarterly reports are listed below:

- *RPT - Quarterly WQ Summary March 2021*
- *RPT - Quarterly WQ Summary June 2021*
- *RPT - Quarterly WQ Summary September 2021*
- *RPT- Quarterly WQ Summary December 2021*
- *RPT- Quarterly WQ Summary March 2022*
- *RPT- Quarterly WQ Summary June 2022*
- *RPT- Quarterly WQ Summary September 2022*
- *RPT- Quarterly WQ Summary December 2022*
- *RPT- Quarterly WQ Summary March 2023*
- *RPT- Quarterly WQ Summary June 2023*

## **2 SCHEME OF MONITORING**

### **2.1 Overview**

The scheme of monitoring comprises groundwater monitoring in the Unconsolidated Sands aquifer (GWMBH1R, GWMBH2R, GWMBH3R, and GWMBH5) and the Lincolnshire Limestone aquifer (GWMBH4) at the Site, together with surface water monitoring in the Ella Beck (EB1, EB2 and EB3).

In August 2021, monitoring of the discharge of treated site surface water to the Ella Beck was added to the environmental permit (EPR/AB3609XX/V004). Monitoring occurs in the inspection chamber (IC1) before being discharged to the Ella Beck.

The locations of the monitoring points are shown on Figure 1.

### **2.2 Monitoring Frequency**

A summary of the monitoring undertaken to date is presented in Appendix A. The monitoring reflects the requirements of the environment permit.

### **2.3 Analytical Parameters**

The required analytical parameters are specified in the environmental permit for the Site [Ref. 1] and are included in full in Appendix B. A reduced suite of groundwater analytical parameters has been agreed between Egdon and the Environment Agency for Round 10 (and future sampling rounds, excluding sampling at the time of the proppant squeeze in July 2021, when a full suite of analyses was required).

Appendix B does not include analytical parameters for IC1. The IC1 analytical suite comprises the following parameters only: pH, chloride, total suspended solids (TSS), and observations on the presence of any oil or grease.

## **3 SUMMARY OF DATA COLLECTED BETWEEN – JULY 2023 – SEPTEMBER 2023**

Selected chemical indicators are plotted graphically (Figure 2 & 3) to illustrate the trends in water chemistry across the monitoring period.

The field and laboratory data from July 2023 – September 2023 was broadly consistent with the baseline data and previous operational monitoring rounds, with key observations including:

- NO visible oil or grease were observed during sampling.
- NO volatile or semi-volatile organic compounds (VOC or SVOC), extractable petroleum hydrocarbons, or alcohols/acetates were detected in any of the samples.
- Concentrations of dissolved methane were at very low levels and consistent with baseline data.
- The laboratory data displays good reproducibility. Ionic balances are  $< \pm 5\%$ , which is within acceptable criteria.

Key historic observations (carried over from previous reporting periods and reported here for completeness) include:

- Following the baseline period, dissolved methane was sampled in groundwater *only* during Round 11 (July 2021). Groundwater concentrations were all < 1 µg/l in shallow groundwaters. In the Lincolnshire Limestone well GWMBH4, it was found to be 32 µg/L, consistent with pre-operational baseline values.
- An increase in concentrations of some parameters (in particular potassium, chloride and nitrate) was observed in some of the groundwater monitoring points during June 2021, most notably in GWMBH1R, located up hydraulic gradient of the Site. Following summer 2021, concentrations of these parameters still remain somewhat elevated compared to the baseline conditions, albeit with some declining trend (e.g. nitrate). The cause of these elevated parameters remains unclear but may be related to agricultural practices up-gradient from the site.
- A chloride concentration of 352 mg/l was detected in the IC1 analytical results for the December 2021 sampling round, above the environmental permit maximum limit of 150 mg/l. The laboratory value corroborates the elevated field result for specific electrical conductivity (2056 µS/cm) and is attributed to the use of rock salt to prevent icy ground conditions at the well site during winter.
- Minor detects of naphthalene (0.2 µg/L) and acenaphthylene (0.005 µg/L) were detected in GWMBH2R during the March 2022 (Round 19) sampling round. Repeat sampling and analysis for PAHs was carried out at all groundwater monitoring points as part of the April 2022 sampling round (Round 20) with no PAHs recorded above detection limits. The abnormality in the PAH results was attributed to lab carryover or smear between sample batches and no further action was required.

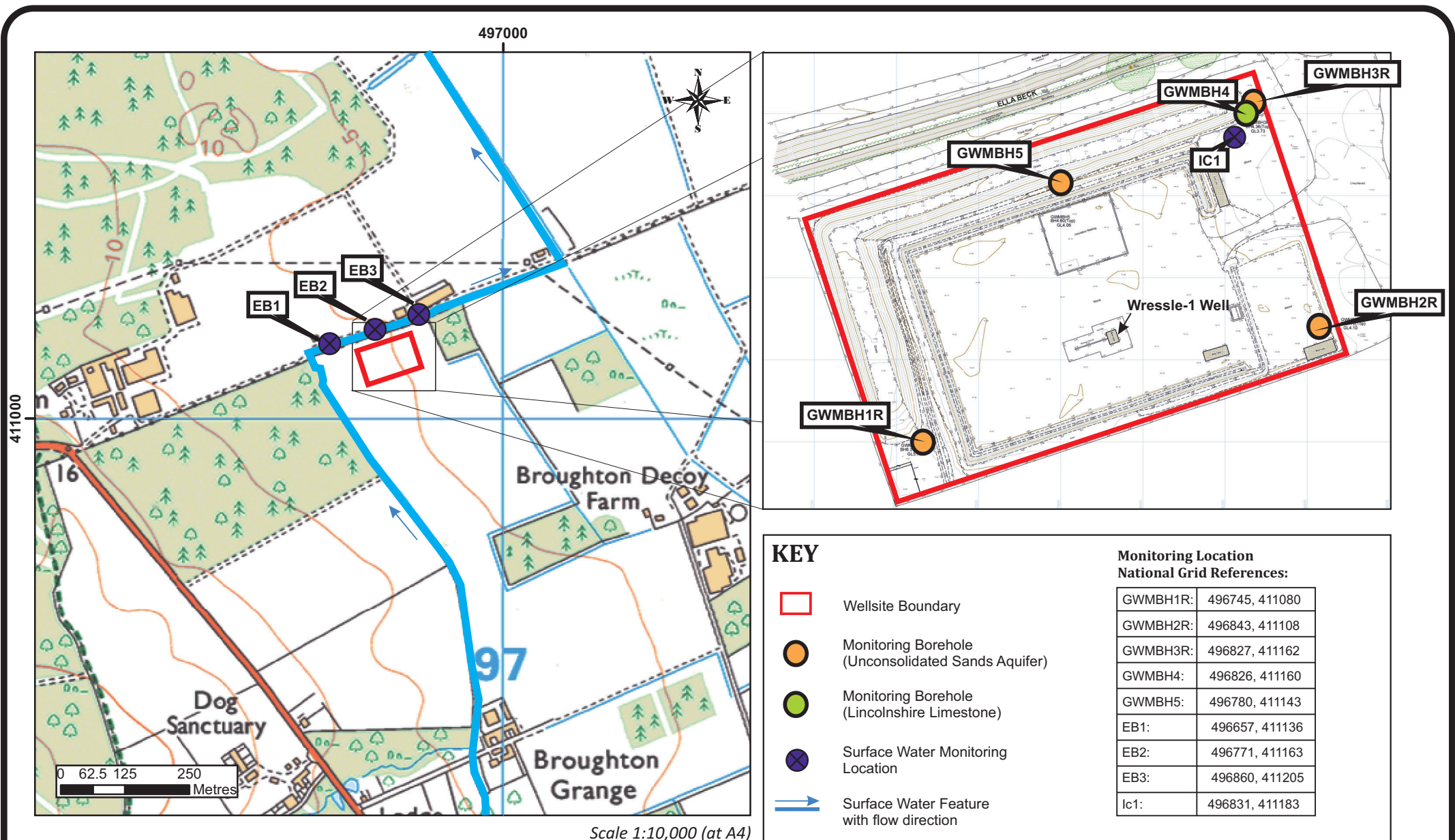
**Envireau Water**  
**20/10/23**

## **REFERENCES**

- Ref. 1 Permit Number: EPR/AB3609XX. Variation Number EPR/AB3609XX/V004. Egdon Resources UK Limited Wressle 1, Lodge Farm, Clapp Gate, Broughton and Appleby, Scunthorpe, DN15 0DB
- Ref. 2 Groundwater Monitoring Plan. Egdon Resources, 7/02/2017. Document Reference: ER-EPRA-W1-GWMP-001.
- Ref.3 Baseline Water Quality Data. Prepared by Envireau Water for Egdon Resources September 2020.

**FIGURES**





Scale 1:10,000 (at A4)

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**KEY**

- Wellsite Boundary
- Monitoring Borehole (Unconsolidated Sands Aquifer)
- Monitoring Borehole (Lincolnshire Limestone)
- Surface Water Monitoring Location
- Surface Water Feature with flow direction

**Monitoring Location National Grid References:**

GWMBH1R:	496745, 411080
GWMBH2R:	496843, 411108
GWMBH3R:	496827, 411162
GWMBH4:	496826, 411160
GWMBH5:	496780, 411143
EB1:	496657, 411136
EB2:	496771, 411163
EB3:	496860, 411205
Ic1:	496831, 411183

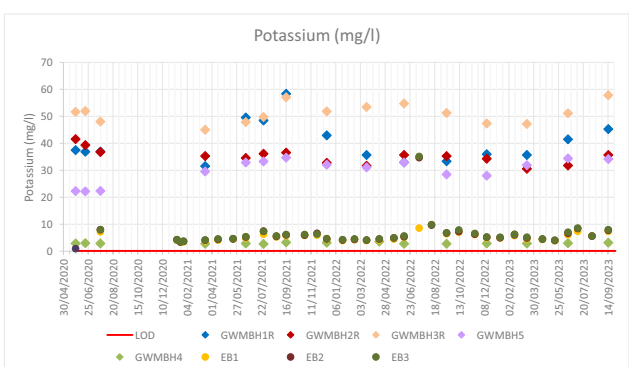
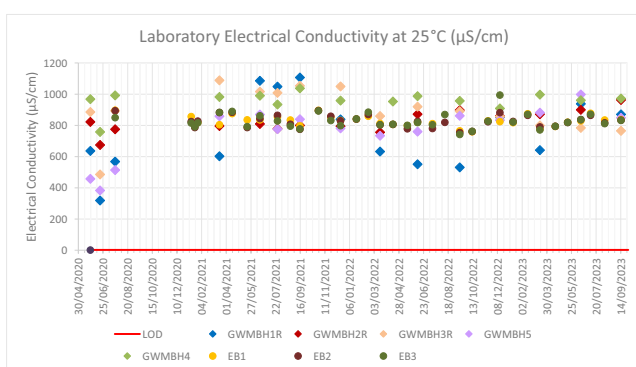
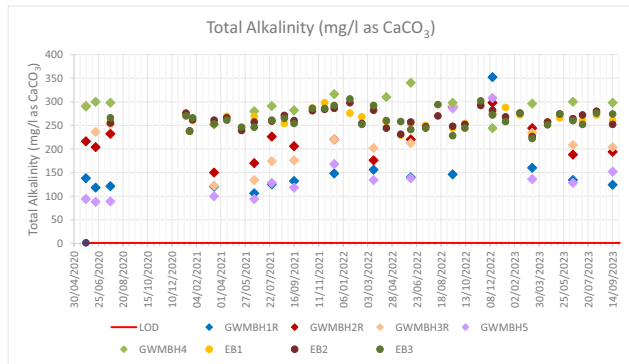
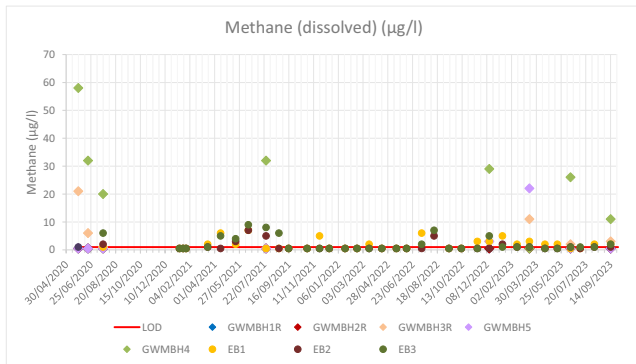
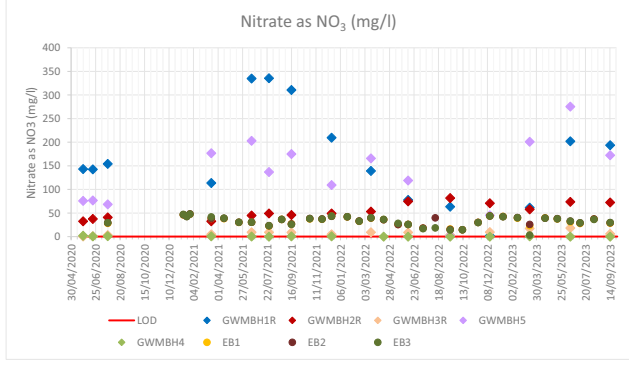
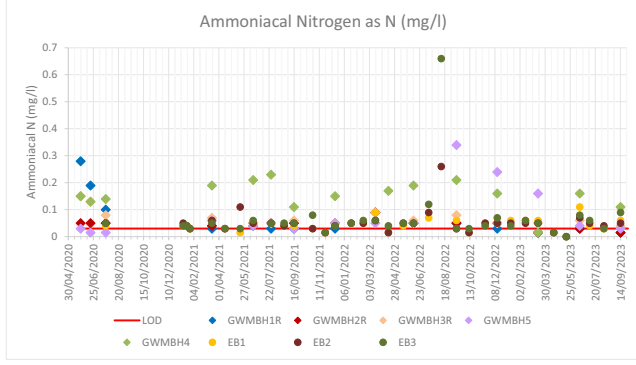
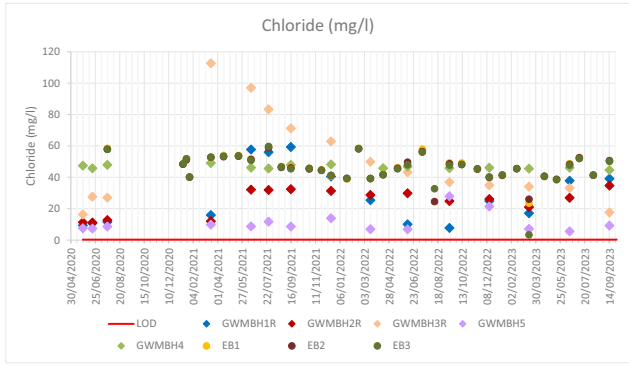
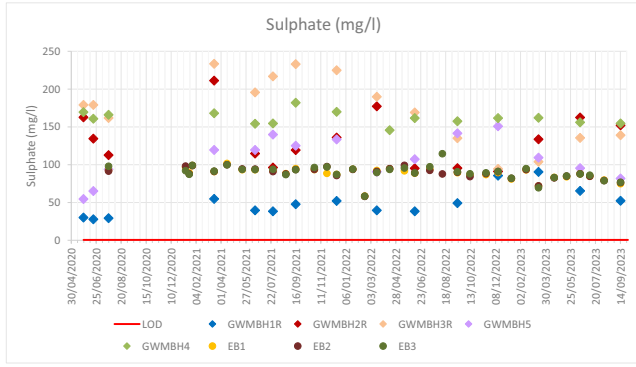
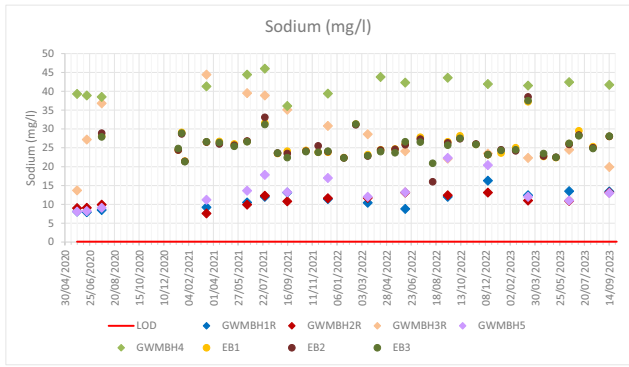
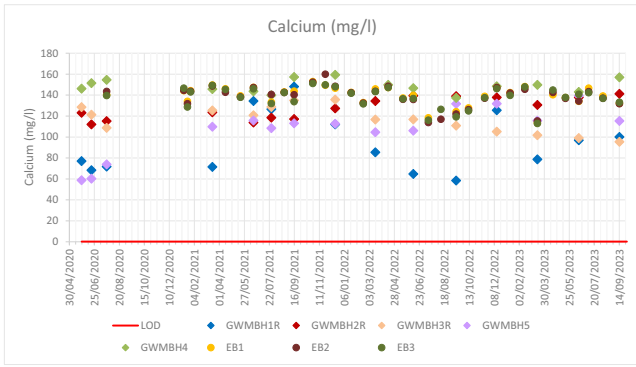


Ref: 3490485/Egdon Wressle 2023/ FIG 1 Site and Mon Locations  
Date: 20/10/2023

**Egdon Resources: Wressle**

Figure 1

Site and Monitoring Locations



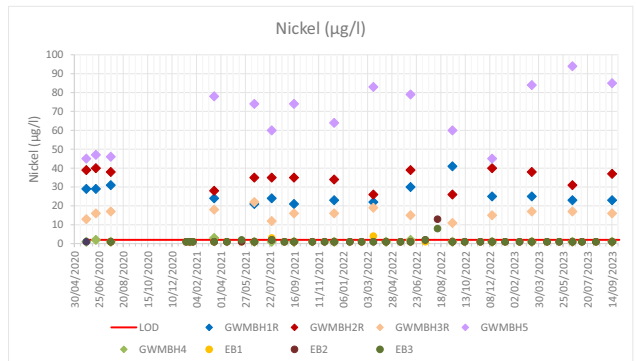
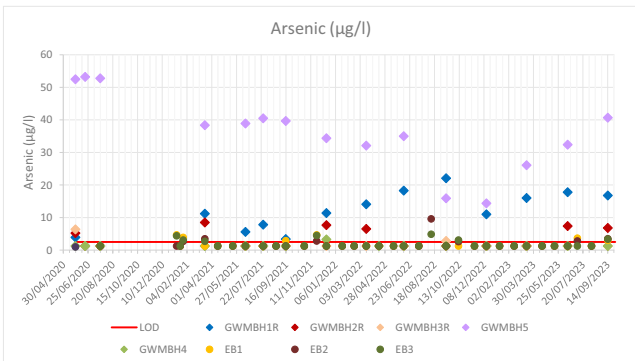
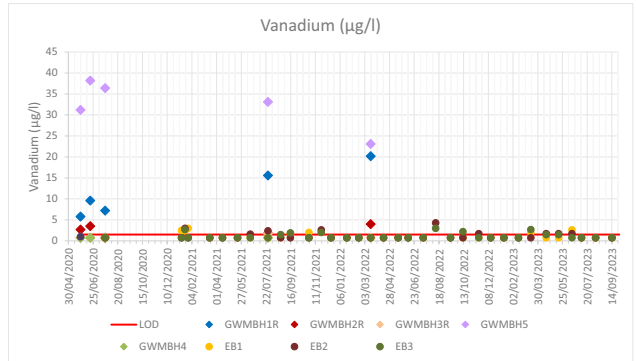
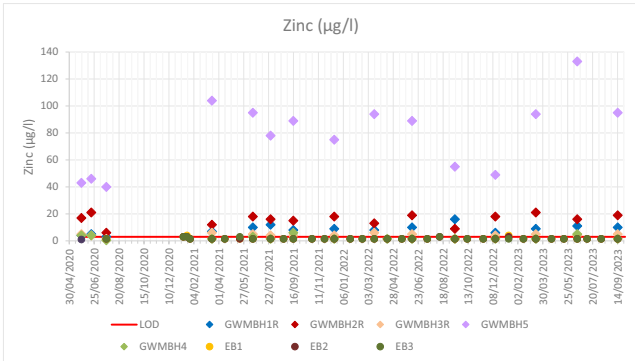
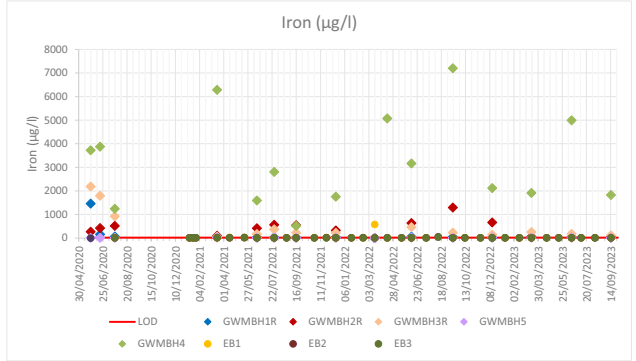
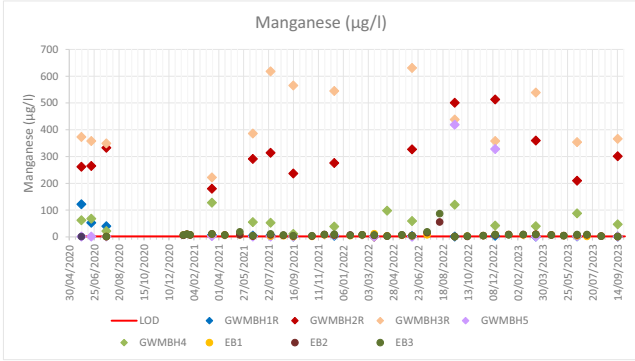
Ref: 3490485/Egdon Wressle 2023/ FIG 2  
 Selected Analytical Parameters RND37  
 Date: 20/10/2023

**Egdon Resources: Wressle**



Figure 2

Groundwater: Selected Analytical Parameters



**APPENDIX A  
MONITORING SUMMARY**

Sample Round	Phase	Date	Monitoring Location								
			GWM BH1R	GWMB H2R	GWMB H3R	GWMB H4	GWMB H5	EB1	EB2	EB3	IC1
1	Baseline/Pre-Operational	27/05/2020	X	X	X	X	X	-	-	-	-
2		18/06/2020	X	X	X	X	X	-	-	-	-
3		22/07/2020	X	X	X	X	X	X	X	X	-
4	Workover & Re-Perforation	11/01/2021	-	-	-	-	-	X	X	X	-
5		19/01/2021	-	-	-	-	-	X	X	X	-
6		26/01/2021	-	-	-	-	-	X	X	X	-
7	Operational	16/03/2021	X	X	X	X	X	X	X	X	-
8		14/04/2021	-	-	-	-	-	X	X	X	-
9		18/05/2021	-	-	-	-	-	X	X	X	-
10		16/06/2021	X	X	X	X	X	X	X	X	-
11	Proppant Squeeze	26/07/2021	X	X	X	X	X	X	X	X	-
12	Operational	24/08/2021	-	-	-	-	-	X	X	X	-
13		15/09/2021	X	X	X	X	X	X	X	X	X
14		27/10/2021	-	-	-	-	-	X	X	X	X
15		24/11/2021	-	-	-	-	-	X	X	X	-
16		16/12/2021	X	X	X	X	X	X	X	X	X
17		21/01/2022	-	-	-	-	-	X	X	X	-
18		17/02/2022	-	-	-	-	-	X	X	X	-
19		16/03/2022	X	X	X	-	X	X	X	X	-
20		14/04/2022	X	X	X	X	X	X	X	X	X
21		17/05/2022	-	-	-	-	-	X	X	X	X
22		09/06/2022	X	X	X	X	X	X	X	X	X
23		13/07/2022	-	-	-	-	-	X	X	X	-
24		10/08/2022	-	-	-	-	-	-	X	X	X
25		13/09/2022	X	X	X	X	X	X	X	X	X
26		11/10/2022	-	-	-	-	-	X	X	X	X
27		16/11/2022	-	-	-	-	-	X	X	X	X
28		13/12/2022	X	X	X	X	X	X	X	X	X
29		12/01/2023	-	-	-	-	-	X	X	X	X
30		07/02/2023	-	-	-	-	-	X	X	X	-
31		14/03/2023	X	X	X	X	X	X	X	X	X
32		18/04/2023	-	-	-	-	-	X	X	X	X
33		16/05/2023	-	-	-	-	-	X	X	X	X
34		15/06/2023	X	X	X	X	X	X	X	X	-
35		07/07/2023	-	-	-	-	-	X	X	X	X
36		08/08/2023	-	-	-	-	-	X	X	X	X
37		14/09/2023	X	X	X	X	X	X	X	X	X

**APPENDIX B**  
**LABORATORY ANALYSIS PARAMETERS**

Category	Analysis Parameters	Analytical Method	Method Detection Limit (units)
Alkali and alkaline earth metals	Ca(0.2), Mg(0.1), K(0.1), Na(0.1)	ICP-OES	various (mg/l), as indicated in parentheses after element symbol
Metals	Cd(0.5), Cr(1.5), Cu(7), Pb(5), Hg(1), Ni(2), Zn(3), Al(20), Ba(3), Co(2), Fe(20), Mo(2), Mn(2), V(1.5), Be(0.5), Ti(5)	ICP-OES	various (µg/l), as indicated in parentheses after element symbol
Minor Trace Elements	As(2.5), B(12), Sb(2), Se(3)	ICP-OES	various (µg/l)
Cl <sup>-</sup>	Chloride	Kone analyser	0.3 (mg/l)
Diss Meth	Dissolved methane	GCFID	1 (µg/l)
Alk	Bicarbonate and Total Alkalinity	Metrohm	1 (mg/l) as CaCO <sub>3</sub>
SO <sub>4</sub> <sup>=</sup>	Sulphate as SO <sub>4</sub> <sup>=</sup>	Kone analyser	0.5 (mg/l)
NO <sub>3</sub> <sup>-</sup>	Nitrate as NO <sub>3</sub> <sup>-</sup>	Kone analyser	0.2 (mg/l)
Amm N - N	Ammoniacal Nitrogen as N	Kone analyser	0.03 (mg/l)
Salinity	Salinity	Meter	0.1 (%)
pH	pH	Determination of pH (Metrohm)	0.01 pH units
EC	Electrical Conductivity	Metrohm	2 (µS/cm)
TPHCWG C44	TPH CWG (Aliphatics C5-6,>6-8,>8-10,>10-12,>12-16,>16-21,>21-35) (aromatics >C5-7,>7-8,>8-10,>10-12,>12-16,>16-21,>21-35) inc BTEX/MTBE to C44	C5-10 fractions by Headspace GCFID(036W). C10-44 fraction extracted with hexane, aliphatic/aromatic splits run by GCFID (005W).	10 (µg/l) (BTEX/MTBE 5 (µg/l))
SVOC	SVOC target list including PAHs, phenol and chlorinated phenols by GCMS	SVOC target list by GCMS - modified USEPA 8270 on DCM extract.	0.5-10 (µg/l), reducing to 0.1 – 0.005 (µg/l) from start 2022
VOC	VOC target list including BTEX/MTBE by GCMS	VOC target list by headspace GCMS - modified USEPA 8260	1-5 (µg/l)
TSS	Total Suspended Solids	Gravimetric - BSEN15216	10 (mg/l)
NO <sub>2</sub> <sup>-</sup>	Nitrite as NO <sub>2</sub> <sup>-</sup>	Kone analyser	0.02 (mg/l)
Alc/acet	Ethyl acetate, i-propyl acetate, methyl acetate, n-butyl acetate, n-propyl acetate, ethyl alcohol(ethanol), i-propyl alcohol(IPA), methyl alcohol(methanol), n-butyl alcohol, n-heptyl alcohol, n-hexyl alcohol, n-propyl alcohol, n-pentyl alcohol	GCMS headspace	100 (µg/l) except Methanol & Ethanol (500 (µg/l))

**Abbreviations:**

ICP-OES = inductively coupled plasma optical emission spectroscopy

GCFID = gas chromatography with flame ionisation detector

TPHCWG = total petroleum hydrocarbons (criteria working group)

SVOC / VOC = Semi-volatile / Volatile organic compounds

BTEX/MTBE = benzene, toluene, ethylbenzene and xylene / methyl tert-butyl ether

GCMS = Gas chromatography with mass spectrometry

DCM = dichloromethane

**Field filtration:**

Samples for metals and minor trace elements by ICP-OES were (or were not) field filtered at 0.45 µm prior to preservation by concentrated nitric acid. The analyses thus effectively represent the dissolved (<0.45 µm) fraction.