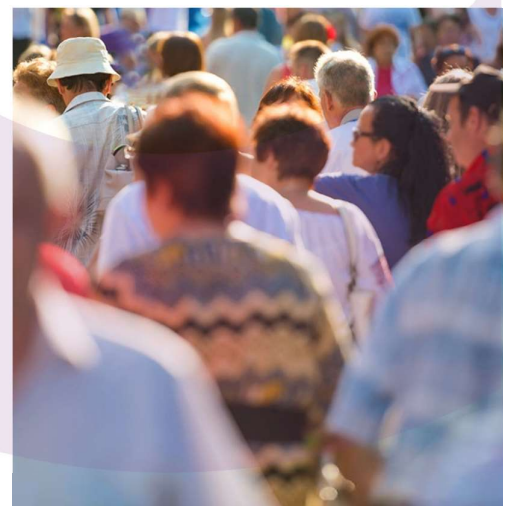
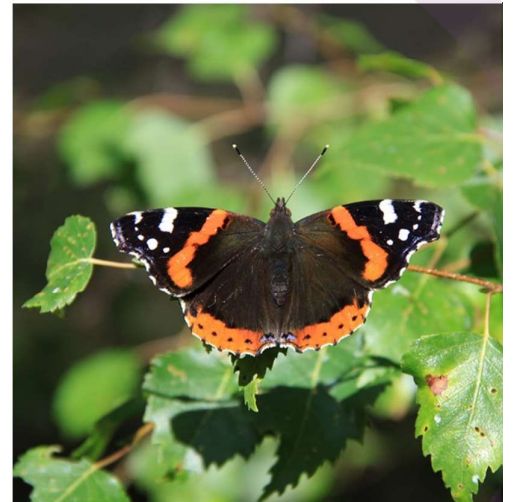




Wessex Water Services Ltd

**Avonmouth Food Waste Treatment Plant (AFWTP)
Combined Heat and Power (CH&P)
Biomethane Upgrade Plant (BUP)**

2021 Annual Groundwater Monitoring
(Environmental Permit PP3734LK)



Report for

Rachel Creed
Regulations and Systems Manager
Wessex Water Services Ltd
Kings Weston Lane
Bristol Sewage Treatment Works
Avonmouth
Bristol
BS11 0YS

Main contributors

Lynne Gemmell

Issued by

.....
Lynne Gemmell

Approved by


.....
Laurence Munden

Wood Group UK Limited

Redcliff Quay
120 Redcliff Street
Bristol BS1 6HU
United Kingdom
Tel +44 (0)117 317 8950

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Executive summary

Purpose of this report

This report presents the findings of groundwater monitoring carried out at the Avonmouth Food Waste Treatment Plant (AFWTP), Combined Heat and Power (CHP) Plant and Biomethane Upgrade Plant (BUP) located at Kingsweston Lane, Avonmouth ("the installation"). The installation is operated by Wessex Water Services Limited (WWSL) and is regulated under the Environmental Permitting (England and Wales) Regulations 2016, as amended, under permit reference PP3734LK.

The permit requires WWSL to carry out regular groundwater monitoring, and in accordance with the Site Protection and Monitoring Programme (SPMP) monitoring takes place on an annual basis and the results are reported to the Environment Agency. This annual report is representative of the 12-month period up to the annual groundwater sampling round completed in February 2021. Chemical analysis results for groundwater have been compared against trigger values (control levels and compliance levels) agreed with the Environment Agency in 2016.

The annual groundwater monitoring round for 2021 has found all targeted organic Potentially Polluting Substances (PPS) at concentrations below the trigger values, and inorganic PPS below the trigger values with only minor exceptions at WS001 for nitrate and at WS003 for sodium. The nitrate exceedance of Trigger 1 in the sample from WS001 and the sodium exceedance of Trigger 2 in WS003 are both at similar concentrations to those recorded from previous sampling. No other PPS concentrations have increased in these wells. Based on the 2021 monitoring results, there is no indication that concentrations of PPS in groundwater have increased due to site activities.

WWSL have confirmed that they are not aware of any incidents that may have impacted ground or groundwater within the last 12 months. The nitrate concentration in WS001 is likely to be indicative of natural variation in the aquifer however WWSL should continue to review this location to check if any spills or leaks occur. The same recommendation is made for WS003 on a precautionary basis.

For all locations it is recommended that WWSL continues the annual monitoring programme, with the monitoring suite continuing to include the following analytes:

- Inorganics: pH, EC, nitrite (as NO₂), nitrate (as NO₃), sulphate, sulphite, chloride, chemical oxygen demand (COD), ammoniacal nitrogen (as NH₄), phosphate (as PO₄), hardness (alkalinity as CaCO₃).
- Metals and metalloids: Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Lead (Pb), Mercury (Hg), Nickel (Ni), Potassium (K), Selenium (Se), Sodium (Na) and Zinc (Zn).
- Organics: TPH (CWG speciated with aliphatic/aromatic split), MTBE and BTEX.

The recommended analytical suite (above) should be amended and agreed between WWSL and the Environment Agency if new processes or operations on site have the potential to release different contaminants (PPS) to the ground or groundwater.

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1. Introduction

This report presents the findings of groundwater monitoring carried out at the Avonmouth Food Waste Treatment Plant (AFWTP), Combined Heat and Power (CHP) Plant and Biomethane Upgrade Plant (BUP) located at Kingsweston Lane, Avonmouth ("the installation"). The installation is operated by Wessex Water Services Limited (WWSL) and is regulated under the Environmental Permitting (England and Wales) Regulations 2016, as amended, under permit reference PP3734LK. The permit requires WWSL to carry out regular groundwater monitoring, and in accordance with the Site Protection and Monitoring Programme (SPMP)¹ monitoring takes place on an annual basis and the results are reported to the Environment Agency. This annual report is representative of the 12-month period up to the annual groundwater sampling round completed in February 2021.

Chemical analysis results have been compared against trigger values (Control Levels and Compliance Levels) agreed with the Environment Agency in 2016². This report is supported by, and should be read in conjunction with, previous environmental monitoring reports, as follows:

- Design of a Site Protection and Monitoring Programme for the Collection of Reference Data (Amec Foster Wheeler ref. 20172/C00/RR001i2) (Amec Foster Wheeler, 2007)¹.
- Wessex Water Services Ltd, Avonmouth Food Waste Treatment Plant (AFWTP)/ Combined Heat and Power (CHP) Plant/ Biomethane Upgrade Plant (BUP), Site Condition Report – Operational (Amec Foster Wheeler Report ref. 32546RR016i3), September 2017, Amec Foster Wheeler.
- Wessex Water Services Ltd, Avonmouth Food Waste Treatment Plant (AFWTP) Combined Heat and Power (CH&P) Biomethane Upgrade Plant (BUP), Annual Groundwater Monitoring (Environmental Permit PP3734LK):
 - January 2018 Annual Groundwater Monitoring Report, Wood Report Ref. 40478RR009i3, dated 27 June 2018.
 - March 2019 Annual Groundwater Monitoring Report, Wood Report Ref. 40478RR012i1, dated 02 May 2019.
 - March 2020 Annual Groundwater Monitoring Report, Wood Report Ref. 40478-WOOD-XX-XX-RP-OC-0001_A_C01.

The annual groundwater monitoring results are to be provided to the Environment Agency by WWSL to demonstrate that the site soil and groundwater is being protected and that the site is being maintained in a 'satisfactory state' throughout the permitted operations. Regular monitoring also provides WWSL with a record of the site condition throughout the lifespan of the Environmental Permit. The results of monitoring should be maintained by WWSL as they can support an application to vary or surrender the Environmental Permit.

Legislative context

The Industrial Emissions Directive (IED) is enacted in England by the Environmental Permitting (England and Wales) Regulations 2016 (EPR). Regular groundwater monitoring (minimum frequency of every 5 years) is a requirement for all Part A installations where there is a possibility of historical or future land or groundwater contamination. The IED also states that periodic soil monitoring is required at a minimum frequency of every

¹ Amec Foster Wheeler (2007). Design of a Site Protection and Monitoring Programme for the Collection of Reference Data, Report Ref. 20172/C00/RR001i2.

² Amec Foster Wheeler (July 2016). Revised Proposed Control Levels / Compliance Levels and Proposed Environmental Monitoring programme, Ref. 32546P201i1). Accepted by the Environment Agency on 4 August 2016 (Amec Foster Wheeler ref. 32546P202).

10 years. These requirements are set out in the Environment Agency's H5 Site Condition Report – template and guidance (Environment Agency, ref. LIT 8001 Version 3.0 April 2013). WWSL is carrying out annual groundwater monitoring in accordance with the Environmental Permit for the installation and therefore, complies with the groundwater monitoring requirements of the IED. WWSL has agreed with the Environment Agency that following the reporting of the baseline soil condition in the Site Condition Report (SCR)³, regular soil monitoring is not required.

In the context of Site Condition Reports, pollutants are interpreted to refer to only the substances handled at the installation under an Environmental Permit, meeting the definition of 'substance' or 'hazardous substance', as given in paragraph 4 of Schedule 22 of EPR 2016. In this report the term potentially polluting substances (PPS) is used to refer to both hazardous substances and other substances with potential to cause pollution.

Use of trigger values for groundwater assessment

Trigger values (control and compliance limits) have been developed for groundwater at each of the monitoring wells at the site. These are used for comparison with monitoring results to provide a means of assessing whether deterioration in groundwater quality has occurred in the vicinity of each well. In addition, use of trigger values is designed to alert WWSL if further investigation is needed to determine whether releases of PPS are occurring to the land from the installation.

The analytical suite for the groundwater monitoring has been agreed between WWSL and the Environment Agency but may be subject to amendment by agreement with the Environment Agency. The suite of analysis used in this monitoring round is detailed in Section 2.3.

³ Amec Foster Wheeler (September 2017). Wessex Water Services Ltd, Avonmouth Food Waste Treatment Plant (AFWTP)/ Combined Heat and Power (CHP) Plant/ Biomethane Upgrade Plant (BUP), Site Condition Report – Operational, Report Ref. 32546RR016i3.

2. Methodology

2.1 Setting control levels and compliance levels

The methodology used for setting the control levels and compliance levels was set out in correspondence to the Environment Agency in 2016².

A control level (trigger 1) and a compliance level (trigger 2) were set for each potentially polluting substance (PPS) at each monitoring well.

Where minimum reporting values (MRVs) are available they have been used as both the control level and the compliance level. Where applicable (WS006 and WS007), the laboratory chemical test method limit of detection (LOD) has been used for hydrocarbons. Where baseline data indicates an exceedance of the respective MRV (or LOD for hydrocarbons) in background groundwater from historical contamination, the control level and the compliance level have been set at the maximum baseline value and it has been assumed that groundwater conditions will improve.

Where MRVs are not available, compliance levels have been set with respect to published water quality targets.

Calculation of control levels (trigger 1) and compliance levels (trigger 2)

Control Level (trigger 1) = mean result + (1.2 x variance) where variance is the maximum value minus the mean.

N.B. where the baseline data is less than the laboratory detection limit, trigger 1 has been set as double the detection limit. In any cases where the value exceeds the compliance level, the control level has been set as the same as the compliance level.

Compliance Level (trigger 2) = MRV, or WQT where MRVs are not available and the LOD for hydrocarbons (where applicable).

In any other cases, trigger 2 has been set at ten times the detection limit where the baseline data is less than the LOD, or double the maximum 'baseline' result.

Trigger values are used as follows:

- If annual monitoring data indicates that trigger 1 has been exceeded, it will be established by WWSL / Wessex Water whether the exceedance is due to an on-site activity (spills, leakages etc). If the exceedance is confirmed or suspected as being due to an on-site activity a repeat sample will be taken immediately, and if this is still above trigger 1, additional quarterly monitoring will be conducted.
- If annual monitoring data indicates that trigger 2 has been exceeded, similar measures as those for trigger 1 will initially be taken by WWSL / Wessex Water to establish whether the exceedance is due to an on-site activity and if the exceedance is confirmed or suspected as being due to an on-site activity a repeat sample will be taken immediately. If this is still above trigger 2, it is proposed that monthly monitoring will be conducted, and further action taken to identify and address the source of the pollution.

If there is an exceedance of trigger value(s), WWSL / Wessex Water will communicate this to the Environment Agency as soon as is reasonably possible, particularly if:

- The exceedance of trigger values may be, or is confirmed to be, due to an on-site activity and a release of PPS is ongoing (established by monthly / quarterly monitoring); or
- It poses an immediate risk to the environment or other receptors.

If this is the case, then the source of the pollution will be identified, and measures taken to prevent further release. The environmental impact of any pollution caused by the permitted process will be investigated and assessed and, depending on the impact, remediation and mitigation measures may be implemented in consultation with, and the agreement of, the Environment Agency.

2.2 Environmental monitoring of groundwater

Six groundwater monitoring wells (WS001 to WS003 and WS005 to WS007), were used for the collection of groundwater samples and were designed to target the areas of the site outlined in Table 2.1. The site location is shown on Figure 1 and the locations of the wells are shown on Figure 2 in Appendix A. Groundwater sample collection took place on the 11 February 2021.

Table 2.1 Monitoring Well Locations

Location ID	Position/ Target
WS001	Biomethane Upgrade Plant (General) and Chemical Storage
WS002	Former Condensate Soakaway and Anaerobic Digester Tanks
WS003	Former Condensate Soakaway and Anaerobic Digester Tanks
WS005	Anaerobic Digester Tanks, Sludge Drying and Proposed Pumping Station
WS006	Former Condensate Soakaway and Standby Boiler
WS007	Fuel Storage, Workshop and Engines

Environmental monitoring infrastructure

The condition of the well installations was inspected, and all targeted wells were found to be in good condition.

Sampling techniques and protocols

Groundwater sampling was carried out by a Wood consultant. Sampling was undertaken in accordance with an agreed protocol, which comprised:

- Initial groundwater measurement (depth to water, depth to installation base) using an oil/water interface meter or clean dip meter. The interface meter was used to detect the presence/absence and thickness (if present) of light non-aqueous phase liquid (LNAPL) within the monitoring well.
- A peristaltic pump was used to carry out low flow groundwater sampling, following purging of standing water in each well sufficient to ensure the sample was representative of groundwater in the surrounding area. A sample was collected following stabilisation of field monitoring parameters including pH, electrical conductivity, dissolved oxygen and temperature.

- Samples were collected into laboratory-provided, chilled containers. Samples were then submitted by courier to ALS Life Sciences Ltd (ALS) for analysis.
- Filtration and preservation of water samples for metals analysis was undertaken onsite. This is in accordance with best practice guidance as specified in ISO5667-3:2012 Water Quality – Sampling – Part 3: Preservation and handling of water.

All measurements and observations were recorded on Groundwater Monitoring Record Sheets, which are summarised in Appendix B.

Purge water from the monitoring wells was released to site drains flowing to the head of the sewage treatment works by prior agreement with WWSL.

2.3 Field observations of groundwater quality

Visual and olfactory observations of groundwater quality during purging and sampling of the monitoring installations found that:

- No free hydrocarbon product was detected by the oil water interface probe and no hydrocarbon sheens were observed.
- Water in WS001 was slightly brown, in WS002 slightly orange, and in WS006 slightly yellow in colour. In WS001 and WS006 the water was slightly turbid.
- No odours were noted from the water during sampling.

Chemical analysis

Analytical Suite

The analytical suite used for the annual site wide monitoring event is presented in Table 2.2.

Table 2.2 Suite of laboratory analysis (annual monitoring, February 2021)

Sample type	Determinands
Groundwater	pH, EC, nitrite (as NO ₂), nitrate (as NO ₃), sulphate, sulphite, chloride, chemical oxygen demand (COD), ammoniacal nitrogen (as NH ₄), phosphate (as PO ₄), hardness (alkalinity as CaCO ₃).
	Metals and metalloids: Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Lead (Pb), Mercury (Hg), Nickel (Ni), Potassium (K), Selenium (Se), Sodium (Na) and Zinc (Zn)
	TPHCWG (speciated with aliphatic/aromatic split), MTBE and BTEX

EC – electrical conductivity

BTEX – benzene, toluene, ethylbenzene and xylenes

MTBE – methyl tertiary butyl ether

TPH – total petroleum hydrocarbons

TPH CWG (TPH Criteria Working Group)

Analytical techniques and detection limits

Analytical techniques were selected to target specific PPS and on the basis of the analysis techniques having low limits of detection (LOD) and ISO 17025 accreditation, where possible. All LODs were below the trigger values.

Total petroleum hydrocarbons (TPH)

All samples were subject to TPH analysis using the TPHCWG approach, which divides the petroleum mixtures into fractions using the Equivalent Carbon (EC) number convention. EC numbers are used to normalise petroleum constituents by reference to their boiling point and the boiling point of equivalent n-alkanes where the number of carbon atoms is known. This allows EC numbers to be determined for constituents where only the boiling point is known. This convention is described fully in TPHCWG (1997).

In addition to dividing the petroleum mixtures by EC number, the TPHCWG method also considers aliphatic and aromatic hydrocarbon fractions separately due to their differing behaviour in the environment and variation in toxicity. Thus, for the purposes of laboratory analysis (and risk assessment), the TPHCWG recommend that petroleum mixtures are considered in fractions which includes aliphatic and aromatic compounds with equivalent carbon numbers of up to 35.

Analytical quality assurance and quality control (QA/QC)

The selected laboratory, ALS (Hawarden), has UKAS (ISO 17025) accreditation for metals, inorganics (not including nitrate or hardness), gasoline range organics (GRO) and benzene, ethylbenzene, toluene and xylenes (BTEX). The laboratory accreditation for each analysis technique is detailed on the certificates presented in Appendix C.

ALS has a number of quality control systems in place including:

- Use of analytical quality control Samples (AQC): These can be a certified reference material (CRM), internal reference material (IRM) or Matrix spiked material. These are matrix matched to and within the calibration range of the relevant test method. An AQC sample is prepared and analysed within each batch of samples. Results are charted and assessed statistically monthly to ensure continued method performance. Rules are set to indicate whether an analytical method is out of control and relevant action is taken and recorded when any one of the control rules is breached e.g. a) When any single result exceeds an action limit i.e. $\pm 3SD$, b) When two or more consecutive results fall outside the warning limits ($\pm 2SD$) and c) Cases of significant bias (9 successive QC results on the same side of the mean);
- Use of process blanks with each batch of samples and use of instrument blanks to check for contamination within the instrument; and
- Ongoing competence of analysts is monitored using proficiency testing (PT) samples and comparing analysts' results to those expected by the PT provider. Proficiency testing is undertaken where available for every accredited component. All PT scheme results are audited, and investigations and root cause analysis is carried out and recorded where unsatisfactory z scores are reported.

Project quality assurance

During this monitoring round the following sampling process was used to provide additional quality assurance of the sampling and analysis:

- One duplicate groundwater sample was collected from WS005 and submitted for an identical suite of analysis. The duplicate sample was obtained by taking two discrete water samples at this location.

The use of duplicate samples is designed to check that the sampling and analytical procedures provide consistent results and, therefore, provides an indication that the analysis for the remaining monitoring wells is reliable.

A comparison of the duplicate sample results (referenced as WS005 and WS005 DUP) indicates very good correlation between the samples, with results all below LOD for organics and relative percentage differences (RPD) typically below 25% for inorganics, exceptions were sulphide and lead, and in both instances this is due to one of the results being below the LOD and the other close to the LOD. Laboratory certificates are presented in Appendix C.

3. Groundwater monitoring results

Six water samples were collected from groundwater monitoring wells WS001, WS002, WS003, WS005, WS006 and WS007. The laboratory certificates are presented in Appendix C.

3.1 Summary of chemical analysis results (February 2021)

Inorganics

All samples were tested for a range of water quality parameters and inorganics. The results are presented in Table 3.1.

Table 3.1 Summary of laboratory inorganic chemical analysis results

Inorganic	Locations where Substance Recorded above the LOD	Unit	LOD	Minimum	Maximum
pH	N/A	N/A	N/A	7.26	7.79
Electrical conductivity	All locations (WS001 to WS003, WS005 to WS007 and duplicate of WS005)	mS/cm	<0.005	0.615	1.65
Hardness (as CaCO₃)	All locations (WS001 to WS003, WS005 to WS007 and duplicate of WS005)	mg/l	<0.35	307	559
Ammoniacal nitrogen	All locations (WS001 to WS003, WS005 to WS007 and duplicate of WS005)	mg/l	<0.3	0.973	3.46
Nitrate	All locations (WS001 to WS003, WS005 to WS007 and duplicate of WS005)	mg/l	<0.3	1.14	2.14
Nitrite	None	mg/l	<0.05	<0.05	<0.05
Sulphate	All locations (WS001 to WS003, WS005 to WS007 and duplicate of WS005)	mg/l	<2	7.9	139
Phosphate	All locations (WS001 to WS003, WS005 to WS007 and duplicate of WS005)	mg/l	<0.05	0.057	2.29

Metals

A range of metals and metalloids were analysed in the annual groundwater monitoring round. The sample locations with concentrations above the LOD are identified in Table 3.2.

Table 3.2 Summary of metals analysis results

Inorganic	Locations where Substance Recorded above the LOD	Unit	LOD	Minimum	Maximum
Arsenic (diss.filt)	All locations (WS001 to WS003, WS005 to WS007 and duplicate of WS005)	mg/l	<0.0005	0.000986	0.123
Cadmium (diss.filt)	WS006	mg/l	<0.00008	<0.00008	0.000216

Inorganic	Locations where Substance Recorded above the LOD	Unit	LOD	Minimum	Maximum
Chromium (diss.filt)	None	mg/l	<0.001	<0.001	<0.001
Copper (diss.filt)	WS006	mg/l	<0.0003	<0.0003	0.00306
Lead (diss.filt)	WS002, WS003, WS005	mg/l	<0.0002	<0.0002	0.000425
Mercury (diss.filt)	None	mg/l	<0.00001	<0.00001	<0.00001
Nickel (diss.filt)	All locations (WS001 to WS003, WS005 to WS007 and duplicate of WS005)	mg/l	<0.0004	0.00111	0.00699
Potassium (Dis.Filt)	All locations (WS001 to WS003, WS005 to WS007 and duplicate of WS005)	mg/l	<0.2	5.78	30.6
Selenium (diss.filt)	None	mg/l	<0.001	<0.001	<0.001
Sodium (Dis.Filt)	All locations (WS001 to WS003, WS005 to WS007 and duplicate of WS005)	mg/l	<0.076	27.1	253
Zinc (diss.filt)	All locations (WS001 to WS003, WS005 to WS007 and duplicate of WS001)	mg/l	<0.001	0.00154	0.0136

Organics

Total petroleum hydrocarbons (TPH)

Concentrations of aliphatic and aromatic TPH in the C5 to C35 carbon range, BTEX compounds and MTBE were all below the LOD.

4. Annual site monitoring results compared with trigger values

Section 2.1 of this report sets out the way trigger values are to be used to provide a comparison with the results obtained from the groundwater monitoring rounds.

The Environment Agency should be informed in the event of an exceedance of a trigger value. If the reason for the exceedance of trigger value is due to an on-site activity and the source is ongoing (established by monthly / quarterly monitoring) or critical, remediation may be necessary by agreement with the Environment Agency.

4.1 Comparison of trigger values with chemical analysis results

Concentrations of PPS in comparison to trigger values are tabulated in Appendix D, the results for the previous annual monitoring round in 2020 are also presented for comparison. Values in excess of trigger 1 are highlighted in yellow and values in excess of trigger 2 are highlighted in orange.

All organic PPS were at concentrations below the trigger values and below the laboratory LOD.

The majority of inorganic PPS including metals and metalloids, were at concentrations below trigger 1 and 2, with the exception of nitrate in WS001 which exceeded trigger 1 and sodium in WS003 which exceeded trigger 2.

Inorganics

All results for inorganics were below the trigger values, with the exception of the nitrate concentration in WS001 which was 1.14 mg/l and exceeds the Trigger 1 value of 0.6 mg/l.

A summary of the inorganic results that exceed trigger values is presented in Table 4.1.

Table 4.1 Summary of Trigger Value Comparison for Inorganics (January 2021)

Substance	Locations where Substance was Above Trigger 1 only	Locations where Substance was Recorded Above Trigger 1 and Trigger 2	Comment
Nitrate	WS001	None	The concentration slightly exceeds Trigger 1 but is below the WQT. The 2021 concentration of 1.14mg/l is close to the maximum previous result of 1.04mg/l in 2020. This is not considered to indicate a significant increase in concentration and as no other PPS have increased in concentration the result is likely to be within the range of natural variation in the aquifer.

Metals and Metalloids

Chromium and mercury were below their LODs (<0.001 mg/l and <0.00001 mg/l, respectively) in all samples.

Arsenic, cadmium, copper, lead, nickel, potassium, sodium and zinc were present at concentrations above their respective LODs in some or all of the samples, however, all concentrations were below their respective trigger values.

There was a trigger value exceedances at one location, WS003, for sodium:

- The sodium concentration of 253 mg/l exceeds the Trigger 1 control level and the Trigger 2 compliance level of 232 mg/l (the same value for both triggers, based on a maximum concentration detected during baseline sampling). This is slightly lower than the previous maximum concentration in this well, which was 258 mg/l in 2020.

A summary of the metal and metalloid results that exceed trigger values is presented in Table 4.2.

Table 4.2 Summary of Trigger Value Comparison for Metals and Metalloids (February 2021)

Substance	Locations where Substance was Above Trigger 1 only	Locations where Substance was Recorded Above Trigger 1 and Trigger 2	Comment
Sodium	WS003	WS003	Sodium is non-hazardous. The result is similar to the maximum concentration recorded in previous years, all of which marginally exceed the trigger values. There is no sustained upwards trend. The results may be indicative of natural variation in the aquifer.

Total Petroleum Hydrocarbons

At all monitored wells, concentrations of TPH, and BTEX and MTBE, measured as part of the TPHCWG suite, were below the trigger value and below the LOD.

4.2 Conclusions

The inorganic PPS are generally below both control and compliance trigger values. The only exceedances are limited to WS001 and WS003 and are relatively marginal when compared to the trigger values. Based on the monitoring rounds to date so far there are no sustained increasing trends in concentrations of inorganic PPS. Both the trigger values that have been exceeded for inorganic compounds are for non-hazardous PPS and comparable to concentrations detected during previous rounds of annual sampling.

Organic PPS were all below trigger values in this round.

5. Conclusions and recommendations

The annual groundwater monitoring round for 2021 has found all targeted organic PPS at concentrations below the trigger values, and inorganic PPS below the trigger values with only two minor exceptions – at WS001 for nitrate and WS003 for sodium.

The nitrate exceedance of trigger 1 in the sample from WS001 is a similar concentration to that recorded in the 2020 sampling in WS001, and no other PPS concentrations have increased in this well. Based on the 2021 monitoring results, there is no indication that concentrations of PPS in groundwater have increased due to site activities. The sodium exceedance in the sample from WS003 is comparable to previous results (within 2%) and slightly below concentrations reported in 2018 and 2020. Based on the 2021 monitoring results, there is no indication that concentrations of PPS in groundwater have increased due to site activities.

Correspondence from WWSL states that they are not aware of any incidents that may have impacted ground or groundwater in the last 12 months.

Table 5.1 presents a summary of the comments on the data as compared against the trigger values and provides recommendations.

Table 5.1 Summary of PPS Concentrations against Trigger Values and Trends

PPS	Relevant Wells	Comment	Recommendations
Nitrate	WS001	The nitrate concentration slightly exceeds Trigger 1 in the sample from WS001 but is below the WQT. It is the maximum concentration recorded in this well, however it is close to the maximum recorded previously in 2020. It is likely that the slight increase is within the range of natural variation in the aquifer however WWSL should review potential sources and pathways to groundwater in the vicinity of WS001.	Continued annual monitoring and check for increasing trend. WWSL should continue to review this location to check if any spills or leaks occur.
Sodium	WS003	The sodium concentration slightly exceeds the Trigger 1 & 2 value (same for both), and slightly exceeds the UK Drinking Water Standard of 200mg/l. The result is comparable to the maximum concentration recorded in 2018 and each subsequent year and there is no evidence of a sustained upwards trend.	Continued annual monitoring and check for increasing trend. As a precautionary measure, WWSL should continue to review this location to check if any spills or leaks occur.

For all locations it is recommended that WWSL continues the annual monitoring programme, with the monitoring suite continuing to include the following analytes:

- Inorganics: pH, EC, nitrite (as NO₂), nitrate (as NO₃), sulphate, sulphite, chloride, chemical oxygen demand (COD), ammoniacal nitrogen (as NH₄), phosphate (as PO₄), hardness (alkalinity as CaCO₃).
- Metals and metalloids: Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Lead (Pb), Mercury (Hg), Nickel (Ni), Potassium (K), Selenium (Se), Sodium (Na) and Zinc (Zn).
- Organics: TPH (CWG speciated with aliphatic/aromatic split), MTBE and BTEX.

The recommended analytical suite (above) should be amended and agreed between WWSL and the Environment Agency if new processes or operations on site have the potential to release different contaminants [PPS] to the ground or groundwater.

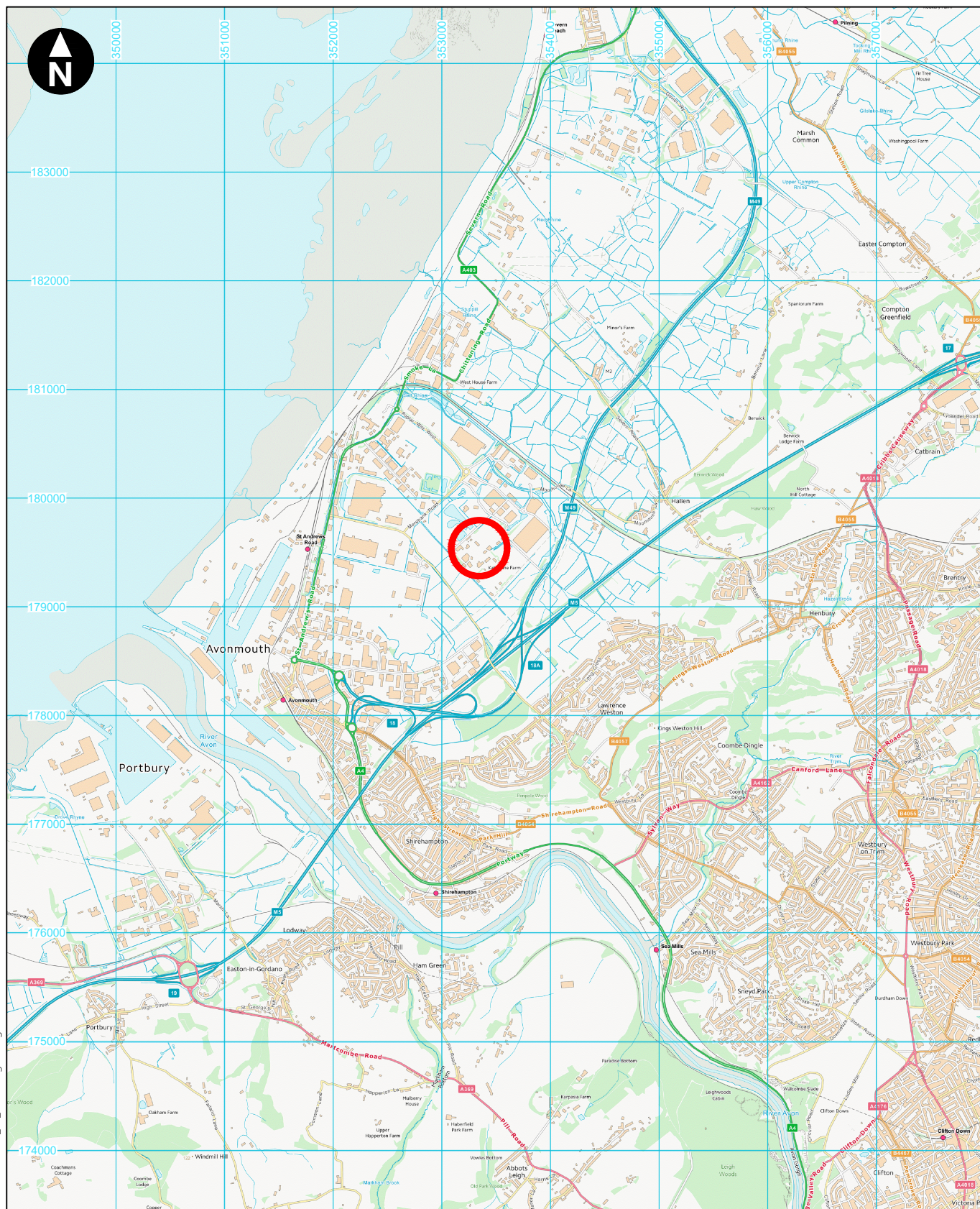
Appendix A

Figures

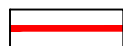
Figure 1 Site Location

Figure 2 Site Layout

R:\Projects\40478 GENeco EMP\Drawings\40478-WOOD-XX-FG-OC-0001_S0_P01.dwg Originator: VICKI SMITH



Key



Site location

0 km 3 km

Scale 1:50,000 @ A4

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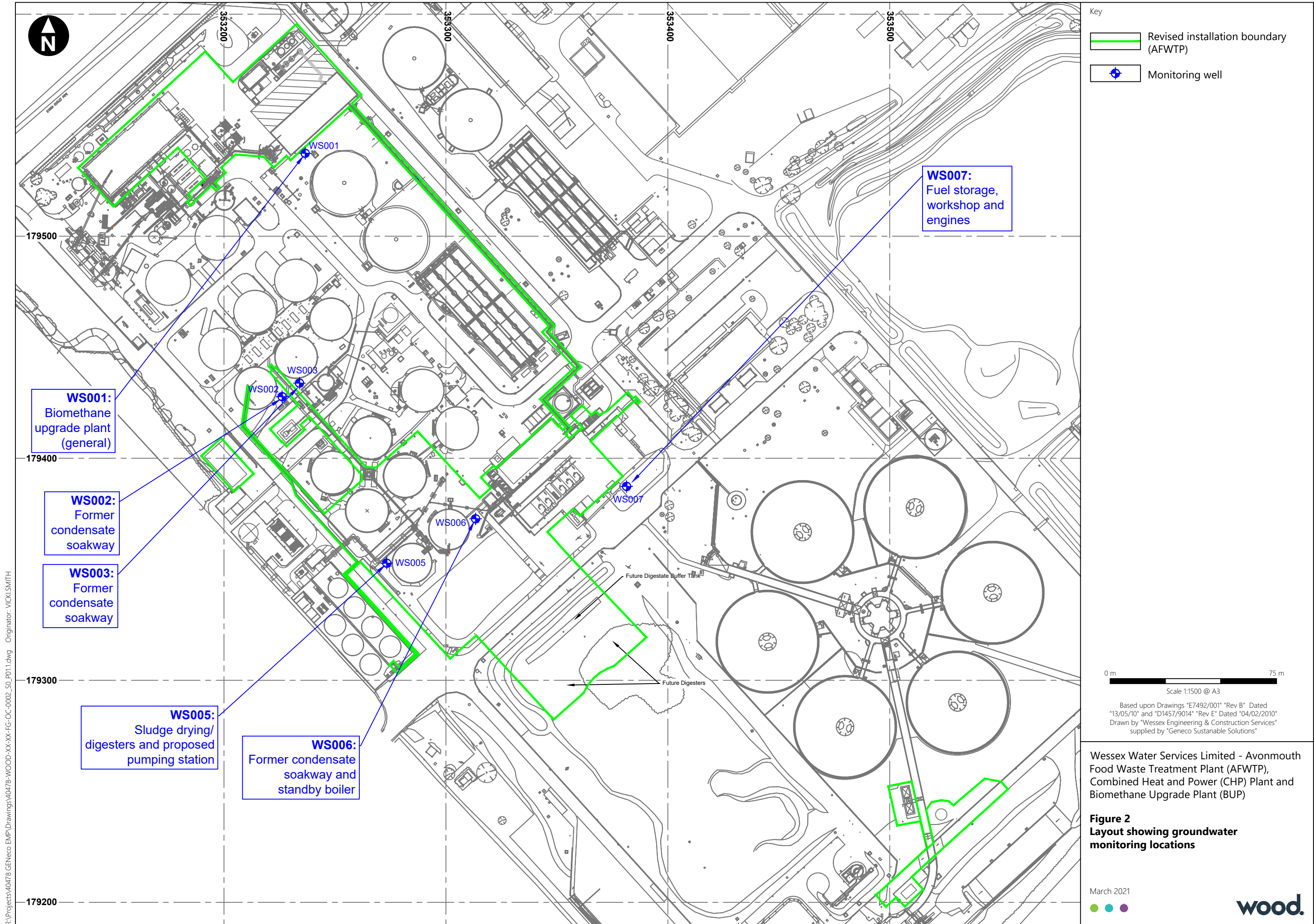
Wessex Water Services Limited - Avonmouth
Food Waste Treatment Plant (AFWTP),
Combined Heat and Power (CHP) Plant and
Biomethane Upgrade Plant (BUP)

Figure 1
Site location map

March 2021



wood.



Appendix B

Field monitoring results

Borehole Monitoring Records

Site:	Avonmouth WWTW
Data Description:	Monitoring Well Records
Date:	11/02/2021
Weather	Clear/ Cold
Monitoring values	pH, EC, DO stabilised values
Completed By:	Reece Temple
Checked By:	Lynne Gemmell

Key		
m AOD		Metres Above Ordnance Datum
m bcl		Metres below cover level
DO		Dissolved Oxygen
EC		Electrical Conductivity
µS/cm		Micro Siemens per Centimetre

Round 4

Groundwater Monitoring												
Exploratory Hole	Date	Ground Level	Depth to Water	Water Level	Well Depth	Water Column	Purge Volume	Stabilised conditions after purging				Comments
		m AOD	mbcl	m AOD	mbgl	m	Litres	pH	EC µS/cm	Temp °C	DO %	
WS001	11/02/2021	7.31	1.34	5.97	5.18	3.84	13.4	6.99	1045	9.30	20.7	Slight brownish tint, slightly turbid. No obvious odour or sheen.
WS002	11/02/2021	7.59	1.78	5.81	4.81	3.03	10.6	7.54	655	14.30	11.8	Slight orange tint, clear. No obvious odour or sheen.
WS003	11/02/2021	7.70	2.05	5.65	4.93	2.88	10.1	7.32	1588	16.60	8.8	Clear. No obvious odour or sheen.
WS005	11/02/2021	7.78	1.83	5.95	4.00	2.17	7.6	7.12	1765	9.40	19.6	Clear. No obvious odour or sheen. Duplicate taken.
WS006	11/02/2021	7.89	1.71	6.18	3.66	1.95	6.8	7.14	1049	9.60	13.1	Slight yellow tint, slightly turbid. No obvious odour or sheen.
WS007	11/02/2021	7.86	2.22	5.64	4.77	2.55	8.9	7.14	1408	10.20	16.3	Clear. No obvious odour or sheen.

Appendix C

Certificates of laboratory analysis



Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: hawardencustomerservices@alsglobal.com
Website: www.alsenvironmental.co.uk

Wood Environment & Infrastructure Solutions UK Limited
Ground Floor
Redcliff Quay
120 Redcliff Street
Almondsbury
Bristol
Avon
BS1 6HU

Attention: Laurence Munden

CERTIFICATE OF ANALYSIS

Date of report Generation:	19 February 2021
Customer:	Wood Environment & Infrastructure Solutions UK Limited
Sample Delivery Group (SDG):	210212-68
Your Reference:	40478
Location:	Avonmouth
Report No:	587534

We received 7 samples on Friday February 12, 2021 and 7 of these samples were scheduled for analysis which was completed on Friday February 19, 2021. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.

Incorrect sampling dates and/or sample information will affect the validity of results.

The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

Sonia McWhan

Operations Manager





CERTIFICATE OF ANALYSIS

Validated

SDG: 210212-68
Location: Avonmouth

Client Reference: 40478
Order Number:

Report Number: 587534
Superseded Report:

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
23714259	WS003	EWFeb 2021	0.00 - 3.90	11/02/2021
23714272	WS005	EWFeb 2021	0.00 - 3.00	11/02/2021
23714288	WS006	EWFeb 2021	0.00 - 2.60	11/02/2021
23714302	WS007	EWFeb 2021	0.00 - 3.90	11/02/2021
23714230	WS001a	EWFeb 2021	0.00 - 4.00	11/02/2021
23714241	WS002a	EWFeb 2021	0.00 - 4.00	11/02/2021
23714318	WS005 DUP	EWFeb 2021	0.00 - 3.00	11/02/2021

Only received samples which have had analysis scheduled will be shown on the following pages.

[illegible]



CERTIFICATE OF ANALYSIS

Validated

SDG: 210212-68 Client Reference: 40478 Report Number: 587534
Location: Avonmouth Order Number: Superseded Report:

TPH CWG (W)

Results Legend			Customer Sample Ref.		WS003	WS005	WS006	WS007	WS001a	WS002a
#	ISO17025 accredited.		Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	WS003	0.00 - 3.90	0.00 - 3.00	0.00 - 2.60	0.00 - 3.90	0.00 - 4.00	0.00 - 4.00
M	mCERTS accredited.				Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)	Ground Water (GW)
aq	Aqueous / settled sample.				11/02/2021	11/02/2021	11/02/2021	11/02/2021	11/02/2021	11/02/2021
diss.filt	Dissolved / filtered sample.				00:00	00:00	00:00	00:00	00:00	00:00
tot.unfilt	Total / unfiltered sample.				12/02/2021	12/02/2021	12/02/2021	12/02/2021	12/02/2021	12/02/2021
Subcontracted - refer to subcontractor report for accreditation status.					210212-68	210212-68	210212-68	210212-68	210212-68	210212-68
% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery					23714259	23714272	23714288	23714302	23714230	23714241
(F)	Trigger breach confirmed				EWFeb 2021	EWFeb 2021	EWFeb 2021	EWFeb 2021	EWFeb 2021	EWFeb 2021
1-4*5@	Sample deviation (see appendix)									
Component	LOD/Units	Method								
GRO Surrogate % recovery**	%	TM245			111	99	109	109	102	113
GRO >C5-C12	<0.05 mg/l	TM245			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
					#	#	#	#	#	#
Methyl tertiary butyl ether (MTBE)	<0.003 mg/l	TM245			<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
					#	#	#	#	#	#
Benzene	<0.007 mg/l	TM245			<0.007	<0.007	<0.007	<0.007	<0.007	<0.007
					#	#	#	#	#	#
Toluene	<0.004 mg/l	TM245			<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
					#	#	#	#	#	#
Ethylbenzene	<0.005 mg/l	TM245			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
					#	#	#	#	#	#
m,p-Xylene	<0.008 mg/l	TM245			<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
					#	#	#	#	#	#
o-Xylene	<0.003 mg/l	TM245			<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
					#	#	#	#	#	#
Sum of detected Xylenes	<0.011 mg/l	TM245			<0.011	<0.011	<0.011	<0.011	<0.011	<0.011
Sum of detected BTEX	<0.028 mg/l	TM245			<0.028	<0.028	<0.028	<0.028	<0.028	<0.028
Aliphatics >C5-C6	<0.01 mg/l	TM245			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aliphatics >C6-C8	<0.01 mg/l	TM245			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aliphatics >C8-C10	<0.01 mg/l	TM245			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aliphatics >C10-C12	<0.01 mg/l	TM245			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aliphatics >C12-C16 (aq)	<0.01 mg/l	TM174			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aliphatics >C16-C21 (aq)	<0.01 mg/l	TM174			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aliphatics >C21-C35 (aq)	<0.01 mg/l	TM174			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Aliphatics >C12-C35 (aq)	<0.01 mg/l	TM174			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aromatics >EC5-EC7	<0.01 mg/l	TM245			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aromatics >EC7-EC8	<0.01 mg/l	TM245			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aromatics >EC8-EC10	<0.01 mg/l	TM245			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aromatics >EC10-EC12	<0.01 mg/l	TM245			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aromatics >EC12-EC16 (aq)	<0.01 mg/l	TM174			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aromatics >EC16-EC21 (aq)	<0.01 mg/l	TM174			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aromatics >EC21-EC35 (aq)	<0.01 mg/l	TM174			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Aromatics >EC12-EC35 (aq)	<0.01 mg/l	TM174			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Aliphatics & Aromatics >C5-35 (aq)	<0.01 mg/l	TM174			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aliphatics >C16-C35 Aqueous	<0.01 mg/l	TM174			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01



CERTIFICATE OF ANALYSIS

Validated

SDG: 210212-68
Location: AvonmouthClient Reference: 40478
Order Number:Report Number: 587534
Superseded Report:

TPH CWG (W)

Results Legend		Customer Sample Ref.	WS005 DUP					
#	ISO17025 accredited.	Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference	0.00 - 3.00 Ground Water (GW) 11/02/2021 00:00 12/02/2021 210212-68 23714318 EWFeb 2021					
M	mCERTS accredited.							
aq	Aqueous / settled sample.							
diss.filt	Dissolved / filtered sample.							
tot.unfilt	Total / unfiltered sample.							
*	Subcontracted - refer to subcontractor report for accreditation status.							
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery							
(F)	Trigger breach confirmed							
1-4*5@	Sample deviation (see appendix)							
Component	LOD/Units	Method						
GRO Surrogate % recovery**	%	TM245	107					
GRO >C5-C12	<0.05 mg/l	TM245	<0.05	#				
Methyl tertiary butyl ether (MTBE)	<0.003 mg/l	TM245	<0.003	#				
Benzene	<0.007 mg/l	TM245	<0.007	#				
Toluene	<0.004 mg/l	TM245	<0.004	#				
Ethylbenzene	<0.005 mg/l	TM245	<0.005	#				
m,p-Xylene	<0.008 mg/l	TM245	<0.008	#				
o-Xylene	<0.003 mg/l	TM245	<0.003	#				
Sum of detected Xylenes	<0.011 mg/l	TM245	<0.011					
Sum of detected BTEX	<0.028 mg/l	TM245	<0.028					
Aliphatics >C5-C6	<0.01 mg/l	TM245	<0.01					
Aliphatics >C6-C8	<0.01 mg/l	TM245	<0.01					
Aliphatics >C8-C10	<0.01 mg/l	TM245	<0.01					
Aliphatics >C10-C12	<0.01 mg/l	TM245	<0.01					
Aliphatics >C12-C16 (aq)	<0.01 mg/l	TM174	<0.01					
Aliphatics >C16-C21 (aq)	<0.01 mg/l	TM174	<0.01					
Aliphatics >C21-C35 (aq)	<0.01 mg/l	TM174	<0.01					
Total Aliphatics >C12-C35 (aq)	<0.01 mg/l	TM174	<0.01					
Aromatics >EC5-EC7	<0.01 mg/l	TM245	<0.01					
Aromatics >EC7-EC8	<0.01 mg/l	TM245	<0.01					
Aromatics >EC8-EC10	<0.01 mg/l	TM245	<0.01					
Aromatics >EC10-EC12	<0.01 mg/l	TM245	<0.01					
Aromatics >EC12-EC16 (aq)	<0.01 mg/l	TM174	<0.01					
Aromatics >EC16-EC21 (aq)	<0.01 mg/l	TM174	<0.01					
Aromatics >EC21-EC35 (aq)	<0.01 mg/l	TM174	<0.01					
Total Aromatics >EC12-EC35 (aq)	<0.01 mg/l	TM174	<0.01					
Total Aliphatics & Aromatics >C5-35 (aq)	<0.01 mg/l	TM174	<0.01					
Aliphatics >C16-C35 Aqueous	<0.01 mg/l	TM174	<0.01					



CERTIFICATE OF ANALYSIS

Validated

SDG: 210212-68
Location: Avonmouth

Client Reference: 40478
Order Number:

Report Number: 587534
Superseded Report:

Table of Results - Appendix

Method No	Reference	Description
TM099	BS 2690: Part 7:1968 / BS 6068: Part2.11:1984	Determination of Ammonium in Water Samples using the Kone Analyser
TM101	Method 4500B & C, AWWA/APHA, 20th Ed., 1999	Determination of Sulphide in soil and water samples using the Kone Analyser
TM107	ISO 6060-1989	Determination of Chemical Oxygen Demand using COD Dr Lange Kit
TM120	Method 2510B, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part 9:1970	Determination of Electrical Conductivity using a Conductivity Meter
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS
TM174	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Waters by GC-FID
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers
TM245	By GC-FID	Determination of GRO by Headspace in waters
TM256	The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4.	Determination of pH in Water and Leachate using the GLpH pH Meter

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).



CERTIFICATE OF ANALYSIS

Validated

SDG: 210212-68
Location: Avonmouth

Client Reference: 40478
Order Number:

Report Number: 587534
Superseded Report:

Test Completion Dates

Lab Sample No(s)	23714259	23714272	23714288	23714302	23714318	23714230	23714241
Customer Sample Ref.	WS003	WS005	WS006	WS007	WS005 DUP	WS001a	WS002a
AGS Ref.	EWFeb 2021	EWFeb 2021	EWFeb 2021	EWFeb 2021	EWFeb 2021	EWFeb 2021	EWFeb 2021
Depth	0.00 - 3.90	0.00 - 3.00	0.00 - 2.60	0.00 - 3.90	0.00 - 3.00	0.00 - 4.00	0.00 - 4.00
Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
Ammoniacal Nitrogen	19-Feb-2021	19-Feb-2021	19-Feb-2021	19-Feb-2021	19-Feb-2021	19-Feb-2021	19-Feb-2021
Anions by Kone (w)	18-Feb-2021	18-Feb-2021	17-Feb-2021	18-Feb-2021	18-Feb-2021	18-Feb-2021	18-Feb-2021
COD Unfiltered	19-Feb-2021	19-Feb-2021	19-Feb-2021	19-Feb-2021	19-Feb-2021	19-Feb-2021	19-Feb-2021
Conductivity (at 20 deg.C)	17-Feb-2021	17-Feb-2021	17-Feb-2021	17-Feb-2021	17-Feb-2021	17-Feb-2021	17-Feb-2021
Dissolved Metals by ICP-MS	16-Feb-2021	16-Feb-2021	16-Feb-2021	16-Feb-2021	16-Feb-2021	16-Feb-2021	16-Feb-2021
EPH CWG (Aliphatic) Aqueous GC (W)	17-Feb-2021	17-Feb-2021	18-Feb-2021	17-Feb-2021	17-Feb-2021	17-Feb-2021	17-Feb-2021
EPH CWG (Aromatic) Aqueous GC (W)	17-Feb-2021	17-Feb-2021	18-Feb-2021	17-Feb-2021	17-Feb-2021	17-Feb-2021	17-Feb-2021
GRO by GC-FID (W)	18-Feb-2021	18-Feb-2021	18-Feb-2021	18-Feb-2021	18-Feb-2021	18-Feb-2021	18-Feb-2021
Mercury Dissolved	18-Feb-2021	18-Feb-2021	18-Feb-2021	18-Feb-2021	18-Feb-2021	18-Feb-2021	18-Feb-2021
Nitrite by Kone (w)	17-Feb-2021	17-Feb-2021	17-Feb-2021	17-Feb-2021	17-Feb-2021	17-Feb-2021	17-Feb-2021
pH Value	17-Feb-2021	16-Feb-2021	17-Feb-2021	17-Feb-2021	17-Feb-2021	17-Feb-2021	17-Feb-2021
Phosphate by Kone (w)	16-Feb-2021	16-Feb-2021	16-Feb-2021	16-Feb-2021	16-Feb-2021	16-Feb-2021	16-Feb-2021
Sulphide	16-Feb-2021	16-Feb-2021	16-Feb-2021	16-Feb-2021	16-Feb-2021	16-Feb-2021	16-Feb-2021
Total Metals by ICP-MS	16-Feb-2021	16-Feb-2021	16-Feb-2021	16-Feb-2021	16-Feb-2021	16-Feb-2021	16-Feb-2021
TPH CWG (W)	18-Feb-2021	18-Feb-2021	18-Feb-2021	18-Feb-2021	18-Feb-2021	18-Feb-2021	18-Feb-2021



CERTIFICATE OF ANALYSIS

Validated

SDG: 210212-68
Location: AvonmouthClient Reference: 40478
Order Number:Report Number: 587534
Superseded Report:

ASSOCIATED AQC DATA

Ammoniacal Nitrogen

Component	Method Code	QC 2321
Ammoniacal Nitrogen as N	TM099	98.8 91.28 : 106.64

Anions by Kone (w)

Component	Method Code	QC 2398	QC 2300
Chloride	TM184	97.0 91.40 : 109.10	96.3 91.40 : 109.10
Sulphate (soluble)	TM184	94.8 91.99 : 109.30	94.8 91.99 : 109.30
TON as NO3	TM184	96.5 92.98 : 109.90	99.0 92.98 : 109.90

COD Unfiltered

Component	Method Code	QC 2363	QC 2307
COD	TM107	99.05 97.45 : 103.77	98.67 97.45 : 103.77

Conductivity (at 20 deg.C)

Component	Method Code	QC 2373	QC 2352	QC 2301
Conductivity (at 20 deg.C)	TM120	103.01 100.75 : 105.26	103.01 100.75 : 105.26	102.26 100.75 : 105.26

Dissolved Metals by ICP-MS

Component	Method Code	QC 2314
Aluminium	TM152	107.0 90.98 : 111.82
Antimony	TM152	101.33 90.44 : 113.04
Arsenic	TM152	99.5 88.00 : 112.00
Barium	TM152	97.17 90.20 : 111.19
Beryllium	TM152	101.67 87.77 : 113.97
Bismuth	TM152	101.5 91.90 : 112.20
Borate	TM152	113.58 88.00 : 112.00



CERTIFICATE OF ANALYSIS

Validated

SDG: 210212-68
Location: AvonmouthClient Reference: 40478
Order Number:Report Number: 587534
Superseded Report:

Dissolved Metals by ICP-MS

		QC 2314
Boron	TM152	113.33 96.48 : 114.93
Cadmium	TM152	101.83 96.43 : 110.53
Calcium	TM152	102.67 81.38 : 119.09
Chromium	TM152	101.33 91.84 : 108.67
Cobalt	TM152	96.33 88.00 : 112.00
Copper	TM152	102.0 92.47 : 118.11
Iron	TM152	101.33 92.00 : 113.00
Lead	TM152	101.33 88.00 : 112.00
Lithium	TM152	105.5 91.62 : 113.12
Magnesium	TM152	100.67 93.14 : 107.91
Manganese	TM152	102.67 95.03 : 110.58
Molybdenum	TM152	99.17 88.00 : 112.00
Nickel	TM152	101.33 88.00 : 112.00
Phosphorus	TM152	99.33 88.00 : 112.00
Potassium	TM152	102.0 93.90 : 112.36
Selenium	TM152	97.5 91.58 : 115.98
Silver	TM152	101.33 88.80 : 122.30
Sodium	TM152	102.0 94.28 : 110.71
Strontium	TM152	102.67 88.00 : 112.00
Tellurium	TM152	97.5 93.32 : 114.66
Thallium	TM152	99.67 88.00 : 112.00
Tin	TM152	102.17 92.63 : 109.70
Titanium	TM152	107.17 95.58 : 111.68
Tungsten	TM152	100.5 81.32 : 124.72
Uranium	TM152	100.17 88.00 : 112.00
Vanadium	TM152	102.17 88.00 : 112.00
Zinc	TM152	100.33 92.98 : 118.95



CERTIFICATE OF ANALYSIS

Validated

SDG: 210212-68
Location: Avonmouth

Client Reference: 40478
Order Number:

Report Number: 587534
Superseded Report:

EPH CWG (Aliphatic) Aqueous GC (W)

Component	Method Code	QC 2380	QC 2394
Total Aliphatics >C10-C40	TM174	89.6 68.59 : 134.82	100.0 69.79 : 134.39

EPH CWG (Aromatic) Aqueous GC (W)

Component	Method Code	QC 2394	QC 2303
Total Aromatics >EC10-EC40	TM174	88.29 60.75 : 129.09	102.93 59.92 : 128.54

GRO by GC-FID (W)

Component	Method Code	QC 2363
Benzene by GC	TM245	104.0 81.54 : 119.70
Ethylbenzene by GC	TM245	103.0 80.99 : 121.09
m & p Xylene by GC	TM245	102.75 82.77 : 123.19
MTBE GC-FID	TM245	102.0 80.06 : 123.27
o Xylene by GC	TM245	104.5 84.26 : 121.50
QC	TM245	84.94 67.65 : 138.14
Toluene by GC	TM245	104.0 82.78 : 121.99

Mercury Dissolved

Component	Method Code	QC 2379	QC 2336
Mercury Dissolved (CVAf)	TM183	91.2 69.30 : 128.70	87.4 69.30 : 128.70

pH Value

Component	Method Code	QC 2354	QC 2331
pH	TM256	100.4 99.33 : 102.54	99.87 99.33 : 102.54

Phosphate by Kone (w)



CERTIFICATE OF ANALYSIS

Validated

SDG: 210212-68
Location: Avonmouth

Client Reference: 40478
Order Number:

Report Number: 587534
Superseded Report:

Phosphate by Kone (w)

Component	Method Code	QC 2348
Phosphate (Ortho as PO4)	TM184	104.8 96.40 : 109.60

Sulphide

Component	Method Code	QC 2318	QC 2340	QC 2368
Sulphide	TM101	104.0 88.90 : 112.50	102.67 88.90 : 112.50	103.33 88.90 : 112.50

Total Metals by ICP-MS

Component	Method Code	QC 2380
Aluminium	TM152	102.33 88.99 : 114.16
Antimony	TM152	100.0 80.45 : 122.65
Arsenic	TM152	96.83 85.20 : 116.13
Barium	TM152	97.83 88.50 : 113.15
Beryllium	TM152	101.33 83.77 : 113.97
Bismuth	TM152	99.83 91.18 : 107.28
Boron	TM152	106.67 86.68 : 117.67
Cadmium	TM152	99.83 87.95 : 113.45
Calcium	TM152	100.0 81.38 : 119.09
Chromium	TM152	99.5 90.87 : 108.50
Cobalt	TM152	97.5 84.39 : 114.26
Copper	TM152	98.5 84.61 : 114.08
Iron	TM152	99.33 90.00 : 111.84
Lead	TM152	99.67 85.65 : 113.58
Lithium	TM152	101.33 87.07 : 115.37
Magnesium	TM152	98.0 86.65 : 109.61
Manganese	TM152	99.33 91.67 : 111.62
Molybdenum	TM152	96.0 87.00 : 108.89



CERTIFICATE OF ANALYSIS

Validated

SDG: 210212-68
Location: AvonmouthClient Reference: 40478
Order Number:Report Number: 587534
Superseded Report:

Total Metals by ICP-MS

		QC 2380
Nickel	TM152	98.33 88.26 : 111.14
Phosphorus	TM152	98.0 84.56 : 112.20
Potassium	TM152	98.0 86.97 : 112.46
Selenium	TM152	96.17 88.44 : 113.86
Silver	TM152	96.67 82.13 : 120.33
Sodium	TM152	98.0 84.47 : 113.44
Strontium	TM152	99.0 90.72 : 114.82
Tellurium	TM152	92.33 86.97 : 108.87
Thallium	TM152	96.83 80.92 : 114.72
Tin	TM152	101.0 93.70 : 111.83
Titanium	TM152	105.17 90.30 : 110.00
Uranium	TM152	98.67 84.78 : 111.18
Vanadium	TM152	97.67 88.43 : 114.30
Zinc	TM152	99.67 86.52 : 115.27

The above information details the reference name of the analytical quality control sample (AQC) that has been run with the samples contained in this report for the different methods of analysis.

The figure detailed is the percentage recovery result for the AQC.

The subscript numbers below are the percentage recovery lower control limit (LCL) and the upper control limit (UCL). The percentage recovery result for the AQC should be between these limits to be statistically in control.



CERTIFICATE OF ANALYSIS

SDG:	210212-68	Client Reference:	40478	Report Number:	587534
Location:	Avonmouth	Order Number:		Superseded Report:	

Appendix

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH₄ by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

General

17. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

18. Sample Deviations

If a sample is classed as deviated then the associated results may be compromised.

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
4	Matrix interference
◆	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to late arrival of instructions or samples
§	Sampled on date not provided

19. Asbestos

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.
Standing Committee of Analysts, *The Quantification of Asbestos in Soil* (2017).

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Appendix D

Comparison of results against trigger values

WS001 Biomethane Upgrade Plant (General) and Chemical Storage
Baseline Groundwater Data and EMP Trigger Levels

Assessed by:	Lynne Gemmell
Reviewed by:	Laurence Munden

Below Control and Compliance Levels
Above Control Level
Above Compliance Level

										Above Control Level									
Customer Sample ID										WS001		WS001		WS001					
Depth										1.78		1.11		1.17					
Sampled Date										18/03/2016		30/03/2016		15/04/2016					
										Control Level			Compliance Level						
Test	Method	Units	LOD 2016	LOD 2021				Max	Min	Mean	Trigger 1	Trigger 2	Notes	Jan-18	Mar-19	Jan-20	Jan-20 (duplicate)	Feb-21	
Inorganics																			
Conductivity @ 20 deg.C	TM120	mS/cm	<0.005	<0.02	1.94	1.91	1.93	1.94	1.91	1.927	n/a	n/a	n/a	1.96	1.6	1.08	1.34	0.971	
Nitrite as NO2	TM184	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.10	0.50	WQT (Trigger 2)	<0.05	<0.05	<0.05	<0.05	<0.05	
pH	TM256	pH Units	<1	<1	7.65	7.52	7.59	7.65	7.52	7.587	n/a	n/a	n/a	7.58	7.77	7.57	7.29	7.26	
Sulphate	TM184	mg/l	<2	<2	245	265	268	268	245	259.333	268.00	268.00	Max used *** (Mean + 1.2 x Variance >WQT)	274.00	224.00	137.00	174.00	101.10	
Sulphide	TM101	mg/l	<0.01	<0.01	<0.01	0.089	<0.01	0.089	0.089	0.089	0.09	0.18	No standard	<0.01	<0.01	<0.01	<0.01	<0.01	
Chloride	TM184	mg/l	<2	<2	102	110	119	119	102	110.333	120.73	238.00	Trigger 2 < WQT	125.00	78.60	41.70	66.90	30.40	
COD, unfiltered	TM107	mg/l	<7	<7	96.4	218	71.8	218	71.8	128.733	n/a	n/a	n/a	144	26	25.7	27.9	31.7	
Ammoniacal Nitrogen as NH4	TM099	mg/l	<0.3	<0.3	7.52	5.39	5.08	7.52	5.08	5.997	7.52	7.52	Max used *** (Mean + 1.2 x Variance >WQT)	4.92	4.63	3.00	2.64	0.97	
Phosphate (ortho) as PO4	TM184	mg/l	<0.05	<0.05	0.371	0.202	0.288	0.371	0.202	0.287	0.39	0.70	WQT (Trigger 2)	0.24	0.25	0.13	0.21	0.06	
Nitrate as NO3	TM184	mg/l	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.60	3.00	Trigger 2 < WQT	<0.3	<0.3	1.04	0.49	1.14	
Filtered (Dissolved) Metals																			
Mercury (diss.filt)	TM183	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	n/a	n/a	No triggers set - Data for baseline	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	
Arsenic (diss.filt)	TM152	mg/l	<0.00012	<0.0005	0.00282	0.00395	0.00759	0.00759	0.00282	0.005	n/a	n/a	No triggers set - Data for baseline	0.00	0.00	0.00	0.00	0.00	
Sodium (diss.filt)	TM228	mg/l	<0.076	<0.076	181	189	197	197	181	189.000	198.60	200.00	WQT (Trigger 2)	219.00	182.00	101.00	105.00	80.40	
Potassium (diss.filt)	TM228	mg/l	<1	<0.2	38.9	37.9	34.8	38.9	34.8	37.200	39.24	77.80	No Standard	38.2	36.3	23.2	24.3	17.1	
Hardness, Total as CaCO3	TM228	mg/l	<1	<0.35	600	614	588	614	588	600.667	n/a	n/a	No triggers set - Data for baseline	852	655	512	518	457	
Cadmium (diss.filt)	TM152	mg/l	<0.0001	<0.00008	<0.0001	<0.0001	0.000129	0.000129	0.000129	0.0001290	n/a	n/a	No triggers set - Data for baseline	0.000267	<0.00008	<0.00008	<0.00008	<0.00008	
Chromium (diss.filt)	TM152	mg/l	<0.00022	<0.001	0.000417	0.0138	0.00851	0.0138	0.000417	0.0075757	n/a	n/a	No triggers set - Data for baseline	<0.001	<0.001	<0.001	<0.001	<0.001	
Copper (diss.filt)	TM152	mg/l	<0.00065	<0.0003	0.00136	0.0017	0.00209	0.00209	0.00136	0.0017167	n/a	n/a	No triggers set - Data for baseline	0.00	<0.0003	<0.0003	<0.0003	<0.0003	
Lead (diss.filt)	TM152	mg/l	<0.00002	<0.0002	0.000039	0.000227	0.000297	0.000297	0.000039	0.0001877	n/a	n/a	No triggers set - Data for baseline	<0.0002	0.0000	<0.0002	<0.0002	<0.0002	
Nickel (diss.filt)	TM152	mg/l	<0.00015	<0.0004	0.00513	0.00716	0.00563	0.00716	0.00513	0.0059733	n/a	n/a	No triggers set - Data for baseline	<0.0002	0.0039	0.0036	0.0028	0.0027	
Selenium (diss.filt)	TM152	mg/l	<0.00039	<0.001	0.00101	0.00251	0.00319	0.00319	0.00101	0.0022367	n/a	n/a	No triggers set - Data for baseline	<0.0005	<0.001	<0.001	<0.001	<0.001	
Zinc (diss.filt)	TM152	mg/l	<0.00041	<0.001	0.011	0.00693	0.0107	0.011	0.00693	0.0095433	n/a	n/a	No triggers set - Data for baseline	0.0082	0.0014	0.0220	0.0196	0.0026	
TPH Criteria Working Group (TPH CWG)																			
GRO >C5-C12	TM245	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	n/a	n/a	No triggers set - Data for baseline	<0.05	<0.05	<0.05	<0.05	<0.05	
Methyl tertiary butyl ether (MTBE)	TM245	mg/l	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	0.003	LOD **	<0.003	<0.003	<0.003	<0.003	<0.003	
Benzene	TM245	mg/l	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	0.007	0.007	LOD **	<0.007	<0.007	<0.007	<0.007	<0.007	
Toluene	TM245	mg/l	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.004	0.004	MRV ** / LOD **	<0.004	<0.004	<0.004	<0.004	<0.004	
Ethylbenzene	TM245	mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.005	LOD **	<0.005	<0.005	<0.005	<0.005	<0.005	
m,p-Xylene	TM245	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	0.008	0.008	LOD **	<0.008	<0.008	<0.008	<0.008	<0.008	
o-Xylene	TM245	mg/l	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	0.003	MRV ** / LOD **	<0.003	<0.003	<0.003	<0.003	<0.003	
Sum of detected Xylenes	TM245	mg/l	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	0.011	0.011	LOD **	<0.011	<0.011	<0.011	<0.011	<0.011	
Sum of detected BTEX	TM245	mg/l	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028	0.028	0.028	LOD **	<0.028	<0.028	<0.028	<0.028	<0.028	
Aliphatics >C5-C6	TM245	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	n/a	n/a	No triggers set - Data for baseline	<0.01	<0.01	<0.01	<0.01	<0.01	
Aliphatics >C6-C8	TM245	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	n/a	n/a	No triggers set - Data for baseline	<0.01	<0.01	<0.01	<0.01	<0.01	
Aliphatics >C8-C10	TM245	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	n/a	n/a	No triggers set - Data for baseline	<0.01	<0.01	<0.01	<0.01	<0.01	
Aliphatics >C10-C12	TM245	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	n/a	n/a	No triggers set - Data for baseline	<0.01	<0.01	<0.01	<0.01	<0.01	
Aliphatics >C12-C16 (aq)	TM174	mg/l	<0.01	<0.01	0.01	<0.01	<0.01	0.01	0.01	0.010	n/a	n/a	No triggers set - Data for baseline	0.023	<0.01	<0.01	<0.01	<0.01	
Aliphatics >C16-C21 (aq)	TM174	mg/l	<0.01	<0.01	0.232	0.132	0.138	0.232	0.132	0.167	n/a	n/a	No triggers set - Data for baseline	0.077	<0.01	<0.01	<0.01	<0.01	
Aliphatics >C21-C35 (aq)	TM174	mg/l	<0.01	<0.01	0.248	0.169	0.161	0.248	0.161	0.193	n/a	n/a	No triggers set - Data for baseline	0.128	<0.01	<0.01	<0.01	<0.01	
Total Aliphatics >C12-C35 (aq)	TM174	mg/l	<0.01	<0.01	0.49	0.301	0.299	0.49	0.299	0.363	n/a	n/a	No triggers set - Data for baseline	0.228	<0.01	<0.01	<0.01	<0.01	
Aromatics >EC5-EC7	TM245	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	n/a	n/a	No triggers set - Data for baseline	<0.01	<0.01	<0.01	<0.01	<0.01	
Aromatics >EC7-EC8	TM245	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	n/a	n/a	No triggers set - Data for baseline	<0.01	<0.01	<0.01	<0.01	<0.01	
Aromatics >EC8-EC10	TM245	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	n/a	n/a	No triggers set - Data for baseline	<0.01	<0.01	<0.01	<0.01	<0.01	
Aromatics >EC10-EC12	TM245	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	n/a	n/a	No triggers set - Data for baseline	<0.01	<0.01	<0.01	<0.01	<0.01	
Aromatics >EC12-EC16 (aq)	TM174	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	n/a	n/a	No triggers set - Data for baseline	<0.01	<0.01	<0.01	<0.01	<0.01	
Aromatics >EC16-EC21 (aq)	TM174	mg/l	<0.01	<0.01	0.044	0.028	0.023	0.044	0.023	0.032	n/a	n/a	No triggers set - Data for baseline	<0.01	<0.01	<0.01	<0.01	<0.01	
Aromatics >EC21-EC35 (aq)	TM174	mg/l	<0.01	<0.01	0.112	0.083	0.066	0.112	0.066	0.087	n/a	n/a	No triggers set - Data for baseline	0.027	<0.01	<0.01	<0.01	<0.01	
Total Aromatics >EC12-EC35 (aq)	TM174	mg/l	<0.01	<0.01	0.156	0.111	0.089	0.156	0.089	0.119	n/a	n/a	No triggers set - Data for baseline	0.027	<0.01	<0.01	<0.01	<0.01	
Total Aliphatics & Aromatics >C5-35 (aq)	TM174	mg/l	<0.01	<0.01	0.646	0.412	0.405	0.646	0.405	0.488	n/a	n/a	No triggers set - Data for baseline	0.255	<0.01	<0.01	0.010	<0.01	

Notes
Trigger values applied associated with monitoring location
Hazardous substances with Minimum Reporting Value (MRV)

* Environment Agency MRV for Hazardous Substances used as Control Level and Compliance Level

** LOD - Limit of Detection used as Control Level and Compliance Level where above the MRV used

*** Maximum concentration used as Control Level and Trigger Level where MRV exceeded from historical contamination, or where no MRV published for hydrocarbons.

Environment Agency MRV: <https://www.gov.uk/government/publications/values-for-groundwater-risk-assessments/hazardous-substances-to-groundwater-minimum-reporting-values> [last accessed 29/06/16]

WS002 Former Condensate Soakaways and Anaerobic Digester Tanks
Baseline Groundwater Data and EMP Trigger Levels

Assessed by:	Lynne Gemmell
Reviewed by:	Laurence Munden

												Below Control and Compliance Levels											
												Above Control Level											
												Above Compliance Level											

WS003 Former Condensate Soakaways and Anaerobic Digester Tanks Baseline Groundwater Data and EMP Trigger Levels

Assessed by:	Lynne Gemmell
Reviewed by:	Laurence Munden

Below Control and Compliance Levels
Above Control Level
Above Compliance Level

										Above Control Level			
										Above Compliance Level			

Notes
Trigger values applied associated with monitoring location
Hazardous substances with Minimum Reporting Value (MRV)

* Environment Agency MRV for Hazardous Substances used as Control Level and Compliance Level

** LOD - Limit of Detection used as Control Level and Compliance Level where above the MRV used

*** Maximum concentration used as Control Level and Trigger Level where MRV exceeded from historical contamination, or where no MRV published for hydrocarbons.

Environment Agency MRV: <https://www.gov.uk/government/publications/values-for-groundwater-risk-assessments/hazardous-substances-to-groundwater-minimum-reporting-values> [last accessed 29/05/16]

Assessed by:	Lynne Gemmell	
Reviewed by:	Laurence Munden	
		Below Control and Compliance Levels
		Above Control Level
		Above Compliance Level

Notes

Trigger values applied associated with monitoring location
Hazardous substances with Minimum Reporting Value (MRV)

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Assessed by:	Lynne Gemmell	
Reviewed by:	Laurence Morden	
		Below Control and Compliance Levels
		Above Control Level
		Above Compliance Level

Notes

Trigger values applied associated with monitoring location
Hazardous substances with Minimum Reporting Value (MRV)

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** LOD - Limit of Detection used as Control Level and Compliance Level where above the MRV used

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WS007 Fuel Storage, Workshop and Engines
Baseline Groundwater Data and EMP Trigger Levels

Assessed by:	Lynne Gemmell
Reviewed by:	Laurence Munden

										Round 1	Round 2	Round 3														
										Customer Sample ID	WS007	WS007	WS007													
										Depth	2.24-	2.00-	2.15-													
										Sampled Date	18/03/2016	30/03/2016	15/04/2016													
Avonmouth STW													Control Level		Compliance Level											
Test	Method	Units	LOD 2016	LOD 2021				Max	Min	Mean	Trigger 1	Trigger 2	Notes	Jan-18	Mar-19	Jan-20	Feb-21									
Inorganics																										
Conductivity @ 20 deg.C	TM120	mS/cm	<0.005	<0.02	1.81	1.7	1.58	1.81	1.58	1.697	n/a	n/a	No triggers set - Data for baseline	1.39	1.32	1.24	1.21									
Nitrite as NO2	TM184	mg/l	<0.05	<0.05	<0.05	<0.05	0.143	0.143	0.143	0.143	n/a	n/a	No triggers set - Data for baseline	<0.05	<0.05	<0.05	<0.05									
pH	TM256	pH Units	<1	<1	7.94	7.43	7.44	7.94	7.43	7.603	n/a	n/a	No triggers set - Data for baseline	7.59	7.72	7.42	7.35									
Sulphate	TM184	mg/l	<2	<2	412	345	326	412	326	361.000	n/a	n/a	No triggers set - Data for baseline	178.00	185.00	166.00	139.00									
Sulphide	TM101	mg/l	<0.01	<0.01	0.0895	0.149	<0.01	0.149	0.0895	0.119	n/a	n/a	No triggers set - Data for baseline	<0.01	<0.01	<0.01	<0.01									
Chloride	TM184	mg/l	<2	<2	193	168	139	193	139	166.667	n/a	n/a	No triggers set - Data for baseline	112.00	132.00	112.00	98.00									
COD, unfiltered	TM107	mg/l	<7	<7	203	49	72.6	203	49	108.200	n/a	n/a	No triggers set - Data for baseline	113	34.1	24.9	26.9									
Ammoniacal Nitrogen as NH4	TM099	mg/l	<0.3	<0.3	2.4	2.11	2.2	2.4	2.11	2.237	n/a	n/a	No triggers set - Data for baseline	2.94	1.38	1.50	1.22									
Phosphate (ortho) as PO4	TM184	mg/l	<0.05	<0.05	0.142	0.063	0.059	0.142	0.059	0.088	n/a	n/a	No triggers set - Data for baseline	0.16	0.31	0.35	0.23									
Nitrate as NO3	TM184	mg/l	<0.3	<0.3	0.385	5.47	2.77	5.47	0.385	2.875	n/a	n/a	No triggers set - Data for baseline	5.36	2.30	1.13	2.14									
Filtered (Dissolved) Metals																										
Mercury (diss.filt)	TM183	mg/l	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	n/a	n/a	No triggers set - Data for baseline	<0.00001	<0.00001	<0.00001	<0.00001									
Arsenic (diss.filt)	TM152	mg/l	<0.00012	<0.0005	0.00859	0.00373	0.00295	0.00859	0.00295	0.005	n/a	n/a	No triggers set - Data for baseline	0.01	0.00	0.00	0.01									
Sodium (diss.filt)	TM228	mg/l	<0.076	<0.076	112	103	96.1	112	96.1	103.700	n/a	n/a	No triggers set - Data for baseline	96.60	73.50	81.40	67.50									
Potassium (diss.filt)	TM228	mg/l	<1	<0.2	27	25.6	24.6	27	24.6	25.733	n/a	n/a	No triggers set - Data for baseline	23.9	20.8	23.4	20.2									
Hardness, Total as CaCO3	TM228	mg/l	<1	<0.35	708	675	649	708	649	677.333	n/a	n/a	No triggers set - Data for baseline	699	558	577	559									
Cadmium (diss.filt)	TM152	mg/l	<0.0001	<0.00008	<0.0001	0.000214	0.000825	0.000825	0.000214	0.000520	n/a	n/a	No triggers set - Data for baseline	0.000114	<0.00008	<0.00008	<0.00008									
Chromium (diss.filt)	TM152	mg/l	<0.00022	<0.001	0.00958	0.00823	0.000419	0.00958	0.000419	0.006076	n/a	n/a	No triggers set - Data for baseline	<0.001	<0.001	<0.001	<0.001									
Copper (diss.filt)	TM152	mg/l	<0.00085	<0.0003	0.003	0.00268	0.00257	0.003	0.00257	0.002750	n/a	n/a	No triggers set - Data for baseline	0.0012	0.0005	<0.0003	<0.0003									
Lead (diss.filt)	TM152	mg/l	<0.00002	<0.0002	0.00129	0.000502	0.000296	0.00129	0.000295	0.000696	n/a	n/a	No triggers set - Data for baseline	0.0004	0.0003	0.0003	<0.0002									
Nickel (diss.filt)	TM152	mg/l	<0.00015	<0.0004	0.0142	0.0133	0.0119	0.0142	0.0119	0.013133	n/a	n/a	No triggers set - Data for baseline	0.0044	0.0024	0.0023	0.0020									
Selenium (diss.filt)	TM152	mg/l	<0.00039	<0.001	0.00194	0.00352	0.00332	0.00352	0.00194	0.002927	n/a	n/a	No triggers set - Data for baseline	0.0010	0.0015	<0.001	<0.001									
Zinc (diss.filt)	TM152	mg/l	<0.00041	<0.001	0.0102	0.0507	0.0463	0.0507	0.0102	0.035733	n/a	n/a	No triggers set - Data for baseline	0.0337	0.0160	0.0096	0.0136									
TPH Criteria Working Group (TPH CW)																										
GRO >C5-C12	TM245	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.050	0.050	LOD **	<0.05	<0.05	<0.05	<0.05									
Methyl tertiary butyl ether (MTBE)	TM245	mg/l	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	0.003	LOD **	<0.003	<0.003	<0.003	<0.003									
Benzene	TM245	mg/l	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	0.007	0.007	LOD **	<0.007	<0.007	<0.007	<0.007									
Toluene	TM245	mg/l	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.004	0.004	MRV ** / LOD **	<0.004	<0.004	<0.004	<0.004									
Ethylbenzene	TM245	mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.005	LOD **	<0.005	<0.005	<0.005	<0.005									
m,p-Xylene	TM245	mg/l	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	0.008	0.008	LOD **	<0.008	<0.008	<0.008	<0.008									
o-Xylene	TM245	mg/l	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	0.003	MRV ** / LOD **	<0.003	<0.003	<0.003	<0.003									
Sum of detected Xylenes	TM245	mg/l	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	0.011	0.011	LOD **	<0.011	<0.011	<0.011	<0.011									
Sum of detected BTEX	TM245	mg/l	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028	0.028	0.028	LOD **	<0.028	<0.028	<0.028	<0.028									
Aliphatics >C5-C6	TM245	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.010	0.010	LOD **	<0.01	<0.01	<0.01	<0.01									
Aliphatics >C6-C8	TM245	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.020	0.020	LOD **	<0.01	<0.01	<0.01	<0.01									
Aliphatics >C8-C10	TM245	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.020	0.020	LOD **	<0.01	<0.01	<0.01	<0.01									
Aliphatics >C10-C12	TM245	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.020	0.020	LOD **	<0.01	<0.01	<0.01	<0.01									
Aliphatics >C12-C16 (aq)	TM174	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.020	0.020	LOD **	<0.01	<0.01	<0.01	<0.01									
Aliphatics >C16-C21 (aq)	TM174	mg/l	<0.01	<0.01	0.058	0.014	0.019	0.058	0.014	0.030	0.058	0.058	Max detected ***	0.024	<0.01	<0.01	<0.01									
Aliphatics >C21-C35 (aq)	TM174	mg/l	<0.01	<0.01	0.089	0.024	0.01	0.089	0.01	0.041	0.089	0.089	Max detected ***	<0.01	<0.01	<0.01	<0.01									
Total Aliphatics >C12-C35 (aq)	TM174	mg/l	<0.01	<0.01	0.147	0.038	0.029	0.147	0.029	0.071	0.147	0.147	Max detected ***	0.024	<0.01	<0.01	<0.01									
Aromatics >EC5-EC7	TM245	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.010	0.010	LOD **	<0.01	<0.01	<0.01	<0.01									
Aromatics >EC7-EC8	TM245	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.010	0.010	LOD **	<0.01	<0.01	<0.01	<0.01									
Aromatics >EC8-EC10	TM245	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.010	0.010	LOD **	<0.01	<0.01	<0.01	<0.01									
Aromatics >EC10-EC12	TM245	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.010	0.010	LOD **	<0.01	<0.01	<0.01	<0.01									
Aromatics >EC12-EC16 (aq)	TM174	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.010	0.010	LOD **	<0.01	<0.01	<0.01	<0.01									
Aromatics >EC16-EC21 (aq)	TM174	mg/l	<0.01	<0.01	0.017	<0.01	<0.01	0.017	0.017	0.017	0.017	0.017	Max detected ***	<0.01	<0.01	<0.01	<0.01									
Aromatics >EC21-EC35 (aq)	TM174	mg/l	<0.01	<0.01	0.06	0.02	<0.01	0.06	0.02	0.040	0.060	0.060	Max detected ***	<0.01	<0.01	<0.01	<0.01									
Total Aromatics >EC12-EC35 (aq)	TM174	mg/l	<0.01	<0.01	0.077	0.02	<0.01	0.077	0.02	0.049	0.077	0.077	Max detected ***	<0.01	<0.01	<0.01	<0.01									
Total Aliphatics & Aromatics >C5-35 (aq)	TM174	mg/l	<0.01	<0.01	0.249	0.058	0.029	0.249	0.029	0.112	0.249	0.249	Max detected ***	0.024	<0.01	<0.01	<0.01									

Notes
Trigger values applied associated with monitoring location
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