

Silent Valley Waste Services
Limited

Silent Valley Landfill

2021 Annual and Fourth Quarter
Monitoring Report

Issue | 31 January 2022

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

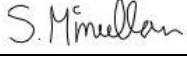
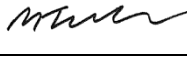
Job number 115825-00

Ove Arup & Partners Ltd
1 West Regent Street
Glasgow G2 1RW
United Kingdom
www.arup.com

ARUP

Document Verification

ARUP

Project		Silent Valley Landfill		Job Number 115825-00	
Document title		2021 Annual and Fourth Quarter Monitoring Report		File reference	
Document ref					
Revision	Date	Filename	2021 Annual and Fourth Quarter Monitoring Report		
Draft	19 Jan 2022	Filename	2021 Annual and Fourth Quarter Monitoring Report_Draft.docx		
		Description	Draft		
			Prepared by	Checked by	Approved by
		Name	Shannon McMullan	Melanie Thrush	Charlie Martin
		Signature			
Issue	31 Jan 2022	Filename	2021 Annual and Fourth Quarter Monitoring Report_Issue.docx		
		Description	For Issue		
			Prepared by	Checked by	Approved by
		Name	Shannon McMullan	Melanie Thrush	Charlie Martin
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
Issue Document Verification with Document ☒					

Contents

	Page
1 Introduction	2
1.1 Monitoring Regime	2
2 Discussion of Monitoring Results	3
2.1 Rainfall	3
2.2 Leachate	3
2.3 Surface Water Quality	5
2.4 Groundwater	5
2.5 Landfill Gas	8
3 Conclusion	11

References

Appendices

Appendix A

Monitoring Results - Graphs

Appendix B

Monitoring Results - Tables

Appendix C

GMW14/14A Technical Note

Appendix D

LC2A Technical Note

Appendix E

Flux Box Survey Report

1 Introduction

This 2021 Annual Monitoring Report presents the surface water, groundwater, landfill gas and leachate results for the monitoring undertaken in the period January to December 2021 in accordance with the Silent Valley Environmental Permit (Permit no. MP3835SV, Ref. [1]) and the Aftercare Phase Environmental and Infrastructure Monitoring Program (Ref. [6]).

This report also includes the Fourth Quarter Monitoring results for the period October to December 2021.

The data has been collected as referenced in Schedule 3 of the Consolidated Permit [1]. This report makes reference to the 2020 Annual Monitoring Report [2] and the 2021 Third Quarter Monitoring Report [3].

1.1 Monitoring Regime

The monitoring regime is undertaken in accordance with the Aftercare Phase Environmental and Infrastructure Monitoring Program [6] and in line with the Consolidated Permit [1], which is fully detailed within the 2019 Annual Report [4].

1.2 Appended Documents

Based on the conclusions within the 2020 Annual Monitoring Report [2] and the 2021 Third Quarter Monitoring Report [3], the following reports have been appended to this report;

- Appendix C - GMW14/14A Technical Note
 - Note discussing the ongoing carbon dioxide gas exceedances in GMW14/14A.
- Appendix D - LC2A Technical Note
 - Note discussing the continuing high levels of zinc, nickel and ammoniacal nitrogen recorded in the leachate within LC2A.
- Appendix E – Flux Box Monitoring Survey

2 Discussion of Monitoring Results

2.1 Rainfall

Measured rainfall data is illustrated in **Appendix A, Figures A1 to A3**.

Based on the available data, October recorded the highest monthly rainfall of the quarter with a total of 239mm and December held the highest daily rainfall total of 22.4mm. These values are significantly lower than the same quarter of 2020. November has recorded the driest month since recording began in 2008 with a total of 34.9mm. This is the driest fourth quarter on the site since 2018.

Annual summary

The combined rainfall total for the year 2021 is 1,550.7mm, which is above the long-term average for the region of 1,260mm (Ref [10]).

May recorded the highest month of rainfall during 2021 with a level of 300mm, data also shows June as a relatively drier month. March, April, June, August, and September recorded rainfall levels below 100mm. Notably August, October and December were drier than the previous year. The lowest rainfall was recorded in April with a level of 18.9mm.

2.2 Leachate

2.2.1 Leachate Quality Monitoring

Leachate quality monitoring results from within the waste body and from leachate standpipes are presented in **Appendix B, Table B1**.

The Acceptable Maximum Concentration (AMC) have been compared with the overall average (mean) concentrations from the wells. Exceedance of an AMC will trigger contingency actions.

No quarterly average leachate levels were above the Acceptable Maximum Concentration (AMC). Individual well trends are discussed below.

No samples were retrieved from L1A, LC1A and LC5A.

Installation LC5A has been damaged since October 2020 and will undergo reinstallation in 2022. LC2A continues to exceed the AMC for Ammoniacal Nitrogen, however, the concentration of this well historically has been shown to fluctuate. The concentration recorded for LC2A is higher than the previous quarter. LC2A also exceeded the AMC for Nickel, a concentration which has been fluctuating above the AMC over the past year but decreased from the third quarter. LC2A has been investigated with regards to these elevated concentrations and a technical note is included in Appendix D.

Wells LC2A and LC4A also exceeded the AMC for zinc. These exceedances have been present in LC2A since the fourth quarter of 2020 but have continued to fluctuate for LC4A, increasing from the last quarter.

Annual summary

The overall average well concentrations for the monitored contaminants have been recorded below their respective AMCs throughout 2021 with the exception of zinc in the first and second quarter. In accordance with the Aftercare Phase Environmental and Infrastructure Monitoring Program report (Ref. [6]), a contingency plan is to be implemented when the mean concentration from wells in waste mass exceeds assessment limit on two consecutive surveys. Therefore, a technical note has been completed for LC2A which is included in Appendix D.

Zinc was recorded in LC2A above the AMC in each quarter of 2021. Zinc was recorded above the AMC in LC4A for three quarters of 2021. However, the average well concentrations for zinc only exceeded the AMC in the first two quarters of 2021.

The concentration of ammoniacal nitrogen and nickel have also been fluctuating in well LC2A since 2017, however, these determinants are below the level of detection in the downstream compliance wells.

2.2.2 Leachate Head Monitoring

Leachate head monitoring results are presented in **Appendix A, Figure A2** and **Appendix B, Table B2**.

The monthly average level for all the wells remains below the required 3.0m, as per the Permit (Ref [1]).

Annual Average Leachate Head

The average leachate head per year has decreased again, as detailed in Table 2.1 below. This excludes LC5A which was damaged at the end of 2020 and been inactive throughout 2021.

Table 2.1: Annual Average Leachate Head

Year	Maximum Leachate Head	Average leachate Head	Average Leachate Head <3m
2013	2.45m	1.01m	Yes
2014	3.95m	1.14m	Yes
2015	4.96m	1.81m	Yes
2016	4.83m	2.54m	Yes
2017	5.09m	2.70m	Yes
2018	5.36m	2.58m	Yes
2019	5.05m	2.74m	Yes
2020	4.89m	2.47m	Yes
2021	3.09m	1.94m	Yes

When the average annual leachate head started decreasing in 2018 it was assumed to be due to a reduced volume of rainfall, 2018 was significantly drier than other

years. However, the average leachate head continued to decrease even in 2020 which was the wettest year on record.

The driver for the higher average leachate head is LC5A as leachate levels in the other wells have remained relatively stable over the years. As LC5A has been inactive all through 2021 this trend may change when it is reinstalled and monitored again.

2.3 Surface Water Quality

The surface water quality monitoring results are presented in **Appendix B, Table B3**, and graphically in **Appendix A, Figure A4**.

Commentaries are provided for upstream and downstream monitoring points in the Nant Merddog, including locations SW1 to SW10 located downstream of the landfill, as discussed below.

2.3.1 Upstream Surface Water

Surface water monitoring locations, SWU, SW2A1, SWW4, SWW1 and SWW2 are located downstream of the landfill and monitored on a six-monthly basis in accordance with the Permit requirements. These wells were monitored this quarter and show all locations are compliant.

Annual summary

Results show all upstream surface water locations have been compliant with the freshwater EQS concentrations during both monitoring rounds this year.

Note, SW2A1 which was not sampled in April was sampled in October and is compliant.

2.3.2 Downstream Surface Water

SWD and SWD1

Results show SWD and SWD1 remain complaint this quarter.

Annual summary

On review of results obtained this year, all downstream surface water locations have been compliant with the freshwater EQS concentrations provided.

2.4 Groundwater

2.4.1 Groundwater Quality Monitoring

Groundwater quality monitoring results are presented graphically in **Appendix A, Figures A5 and A6** and in **Appendix B, Table B4**.

Any non-compliances for both upstream and downstream wells are discussed in the following sections.

2.4.1.1 Upstream Groundwater wells

Well GW3A and GW4

GW3A and GW4 monitor the sandstone strata classified as S3-East, and GW11B had been installed in the sandstone strata classified as S2-West. GW11B has not been sampled since the third quarter of 2019 as there has been not enough volume to take a sample.

In GW3A the mercury concentration continues to remain higher than the trigger level (concentration ranging from 0.26 – 0.62ug/l over 2020 and 2021). Mercury concentrations in GW3A have been continually recorded above the trigger level since April 2018, although the trigger level is applied to the downstream groundwater. Based on previous results these are temporary fluctuations associated with the environment outside of the influence of the landfill.

Manganese has continually been recorded above the assessment level in GW4 with continued fluctuations throughout the years showing a gradual increasing trend throughout 2021 (1.56 – 1.79mg/l). The elevated concentrations recorded upstream are likely to be from steel works waste deposited to the north of the landfill and old mine workings in the area. Manganese is a typical contaminant of mine drainage, which is considered to be impacting the groundwater in the locale of the landfill.

Annual Summary

As discussed above, concentrations of mercury and manganese have remained elevated this year in GW3 and GW4, respectively. These wells will continue to be monitored in the future. Zinc exceeded the trigger level in April for GW3A and control levels in GW4 in April and July, however these levels have remained beneath the assessment level since.

2.4.1.2 Downstream Groundwater wells

The results from the compliance wells indicate that generally the pumping system at the toe of the landfill is continuing to successfully control the potential egress of leachate from the landfill. No issues associated with pump failure within the cut-off system have been recorded during 2021.

Well GW10

GW10 has been installed in the sandstone strata classified as S3-East. GW10 is compliant except for ongoing manganese exceedances (1.48mg/l). This is the third consecutive exceedance of 2021 and will be discussed further in the below summary.

Well GW9

GW9 has been installed in the sandstone strata classified as S2-East.

GW9 continues to be non-compliant for ammoniacal nitrogen in relation to the Trigger Level of 1mg/l with concentrations ranging from 1.05 – 24.9mg/l and an average value of 7.43mg/l for the past two years. Concentrations of ammoniacal

nitrogen have marginally decreased from last quarter but are showing an overall increasing trend. GW9 has previously been reviewed with regards to breakout monitoring and a technical note was prepared [15].

Well GW12

GW12 has been installed in the sandstone strata classified as S2-West.

GW12 has exceeded control levels this quarter for mercury which has been fluctuating throughout 2020 and 2021. Additionally control levels have been exceeded for sulphate, this is the first exceedance since April 2020.

Wells GW6 and GW7

GW6 and GW7 have been installed in the centre of the valley in the sandstone strata classified as S1. GW6 is compliant.

The manganese concentration in GW7 has been recorded above the assessment level, it has increased from last quarter. Manganese levels have historically been known to fluctuate within this well, and it is considered that the concentrations are also impacted by the upstream groundwater considering GW4 has also exhibited similar concentrations. Over the past two years manganese concentrations have ranged from 0.007 – 2.05mg/l. This is the second consecutive exceedance of 2021 and will be discussed further in the below summary.

Annual Summary

Zinc has exceeded the trigger levels in GW6, GW10 and GW12 and control levels in GW9. All of these elevations are in April 2021 and levels have remained compliant since.

GW7 has shown an increase to above assessment level in July and October for Manganese. These levels were also noted in the 2020 Annual Monitoring Report [4]. GW10 also has assessment level exceedances for manganese in three consecutive quarters. Upstream GW4 is also recording manganese concentrations of similar magnitudes. It is likely that the upstream well is influencing GW7 and GW10. These wells should be monitored closely for the next six months, if there are any significant changes a review should be undertaken of the well with recommendations set out within a technical note.

GW12 has had fluctuating mercury levels exceeding control levels this year with no clear trends along with the first control level exceedance of sulphate since April 2020. However, no action is required at this stage due to the limited number of exceedances.

As discussed above, GW9 has ongoing exceedances in ammoniacal nitrogen with an increasing trend throughout 2021. GW9 has previously been reviewed with regards to breakout monitoring and a technical note was issued [15].

2.4.2 Groundwater Levels Monitoring

Groundwater levels are monitored on a quarterly basis in the compliance and upstream wells. The monitoring results are illustrated graphically in **Appendix A, Figure A7**. All water levels have remained consistent this quarter.

Annual summary

Overall, the ground water levels have remained constant over 2021. Small variations have been identified in the well levels over the year of less than 1.0mOD. The largest variation was identified in GW7 with a decrease in 6.7mOD from the fourth quarter of 2020 to the first quarter of 2021. However, this was discussed in the previous annual report and it was assumed there was a recording error in the fourth quarter. Values have since returned to stable levels.

2.5 Landfill Gas

2.5.1 Landfill Gas Quality Monitoring

The landfill gas monitoring results are presented in **Appendix B, Table B5**. Gas monitoring levels were recorded October, November, and January this quarter as readings were unable to be recorded during the month of December. However, for the below discussion and to close out 2021 it will be assumed the final round of results were undertaken in December.

Methane

Methane concentrations continue to be recorded below the respective Control and Trigger Levels (where available) in all monitoring locations.

Carbon Dioxide

Carbon dioxide concentrations were recorded below the respective Control and Trigger Levels, where available, in the majority of monitoring locations with the exception of GMW2, GMW6, GMW12 and GMW14/14A.

Carbon dioxide levels have been recorded above the Control and/or Trigger Levels in the following wells (valves):

Control Level

- GMW2 (red) in October and November.
- GMW12 (yellow) in November only.
- GMW14/14A (white) October and (red) November.

Trigger Level

- GMW6 (red) October and November.
- GMW12 (yellow) October only.

- GMW14/14A (red) October and December, (yellow) November only and (white) December only.

GMW2 concentrations were recorded above the Control levels in October and November but have returned to compliance levels for the first time 7 months.

GMW6 recorded elevated concentrations in the first two months of the quarter, however concentrations are below Control and Trigger values for December. The concentration in December is notably low compared to previous months so any trends should be further reviewed following receipt of next quarter's readings.

GMW12 has been decreasing in concentration since October and was compliant in December.

In GMW14/14A consecutive exceedances have been recorded in 2021. The gas concentrations have been fluctuating above Trigger and Control levels this quarter. All valves in GMW14/14A are recording at least one Trigger and Control Level each month.

Annual summary

Throughout 2021 methane levels have remained below the respective Control and Trigger Levels (where available) in all monitoring locations with the rare exception in GMW3 (yellow) in September exceeding the control level by 0.1%.

Carbon dioxide concentrations were recorded above the respective Control and Trigger Levels in numerous wells.

In GMW2 the control level was exceeded from May to September in the red valve (maximum value of 1.5%). The last recorded Trigger Level exceedance for GMW2 was in July 2019 with 1.6%. The control level exceedances are similar to 2020, 2019 and 2018 with higher recordings during the summer months.

The yellow valve in GMW3 was compliant for most of the year but exceeded trigger and control levels on three occasions in May, August & September.

The Control Level of 1% in GMW4 red valve was exceeded by a maximum of 1.1% in August 2021 and this well was compliant the rest of the year.

The red valve Trigger Level of 4.3% was exceeded in GMW6 from June to November with a maximum recorded concentration of 5.8%. These exceedances have occurred within similar months during 2020, 2019 and 2018, however by the fourth quarter the levels begin to reduce and December is compliant with a low reading of 0.1%. This should be further reviewed following receipt of next quarter's readings.

In GMW12 the Control Level of 2.4% was exceeded January, February, March, August, September, and November in the yellow valve with the highest recorded concentration of 2.8%. The Trigger Level of 2.9% was also exceeded from August to November with a maximum concentration of 3.1%. However, the concentrations in this well have reduced below the control level again and were compliant in December. This should be further reviewed following receipt of next quarter's readings.

The yellow valve Control Level of 5.5% for GMW13 was exceeded once in July with a value of 5.6% and this well was compliant the rest of the year.

GMW14A was installed in August 2019, since installation the well has recorded concentrations above the Trigger and Control Levels in the red valve (deep install 26.3m bgl) with a maximum concentration of 5.4% in December 2021. The exceedances are higher during winter months. The yellow (15m bgl) valve also shows exceedance in both trigger and control levels with higher levels also in winter months and a maximum exceedance of 6.9% in September. The white valve (shallow install 5m bgl) has also shown exceedances above the Trigger level of 5.4% with concentrations of up to 6.9% during the winter months. On review of the installation work, repairs occurred in this well at the end of 2019. However, a full year of readings demonstrate the gassing regime of this well is still recording concentrations that exceed control/trigger levels. As stated by Golder Associates (Ref. [11]), single exceedances do not require to be actioned. However, if ongoing exceedances are recorded then the relevant people require to be informed and appropriate measures of identification and solutions identified. Considering the ongoing exceedances in GMW14/14A, a technical note has prepared and is included in Appendix C.

Levels of carbon dioxide continue to be recorded in GMW1, GMW8, GMW9, GMW10, GMW17 and GMW18. However, no control or Trigger Levels have been derived for these monitoring locations as they are not required by the permit [1].

Gas monitoring will continue in accordance with the agreed programme and the relevant Permit conditions.

3 Conclusion

The monitoring data and interpretation produced in this report has not identified any significant issues relating to contaminant levels recorded above the screening criteria within the leachate, surface water and groundwater. Where limited minor exceedances have been identified there is no evidence to suggest they are having a discernible impact on the surrounding environment and the landfill continues to comply with the requirements of the permit.

The annual report has noted the following;

- The average leachate well concentrations for zinc exceeded the AMC in the first two quarters of 2021. LC2A has been investigated with regards to these elevated concentrations and a technical note is included in Appendix D. Separately LC4A recorded zinc exceedances in three quarters of 2021, these values continue to fluctuate, this well will be reviewed again following receipt of next quarter's readings.
- GW7 has shown repetitive signs of increase above assessment levels for Manganese in the past two quarters. GW10 has continued assessment level exceedances for manganese in three consecutive quarters. It is likely these wells are being influenced by upstream GW4. These wells should be monitored closely for the next six months, if there are any significant changes a review should be undertaken of the well with recommendations set out within a technical note.
- GMW6 carbon dioxide concentration in December is notably lower than previous months so any trends should be further reviewed following receipt of next quarter's readings.
- In GMW12 the carbon dioxide concentration was finally compliant in December. This should be further reviewed following receipt of next quarter's readings.
- In GMW14/14A exceedances of carbon dioxide have been recorded above the Trigger and Controls levels throughout 2021. GMW14/14A has been further investigated and a technical note is included in Appendix C.

Based on the conclusions within the 2021 Third Quarter Monitoring Report [3], the following work is still ongoing;

- LC5A was damaged during 2020 and efforts to install LC5B have been delayed due to returning tenders not meeting the tender criteria. The Installation of LC5B tender will be reissued in 2022. Any leachate data will be reviewed following the installation of a new well.
- Work is also ongoing to an updated Hydrogeological Risk Assessment.

References

- [1] Environment Agency, Silent Valley Landfill Site, Pollution Prevention and Control (England and Wales) Regulations 2000, Landfill (England and Wales) Regulations 2002, Permit number MP3835SV, November 2005, Permit amended as of 04/03/16.
- [2] Arup, Silent Valley Landfill, 2020 Annual Monitoring Report, 29th January 2021.
- [3] Arup, Silent Valley Landfill, 2021 Third Quarter Monitoring Report, 29th October 2021.
- [4] Arup, Silent Valley Landfill, 2019 Annual Monitoring Report, 31st January 2020.
- [5] Arup, Silent Valley Landfill, Interim GW9 and Nant Merddog W, Issue May 2015.
- [6] Arup, Silent Valley Landfill, Aftercare Phase Environmental and Infrastructure Monitoring Program, Issue June 2013.
- [7] Arup, Silent Valley Landfill, Hydrogeological Risk Assessment, document reference 04/6363, November 2004.
- [8] Arup, Silent Valley Landfill, Investigation into the Western Flank of the Cut-off System. Compliance Well GW9 and GW10, document reference 115825, August 2011.
- [9] Environment Agency, Guidance on Monitoring of Landfill Leachate, Groundwater and Surface Water, report reference LFTGN02, June 2014.
- [10] Arup, Silent Valley Landfill, Hydrogeological Risk Assessment (Supplementary Revision May 2009), document reference 09/7543, June 2009.
- [11] Golder Associates, Establishment of Trigger Levels at Silent Valley landfill site, letter report dated 21 December 2006.
- [12] Environment Agency, Guidance on the management of landfill gas, document reference LFTGN03, June 2014.
- [13] The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.
- [14] Water Framework Directive - United Kingdom Technical Advisory Group (WFD-UKTAG), "Metal Bioavailability Assessment Tool (M-BAT)," 2014.
- [15] Arup, Silent Valley Landfill, Updated review of non-Compliance at GW9, Issue May 2020.

Appendix A

Monitoring Results - Graphs

Figure A1
Daily rainfall totals and sampling events (December 2014 - December 2021)

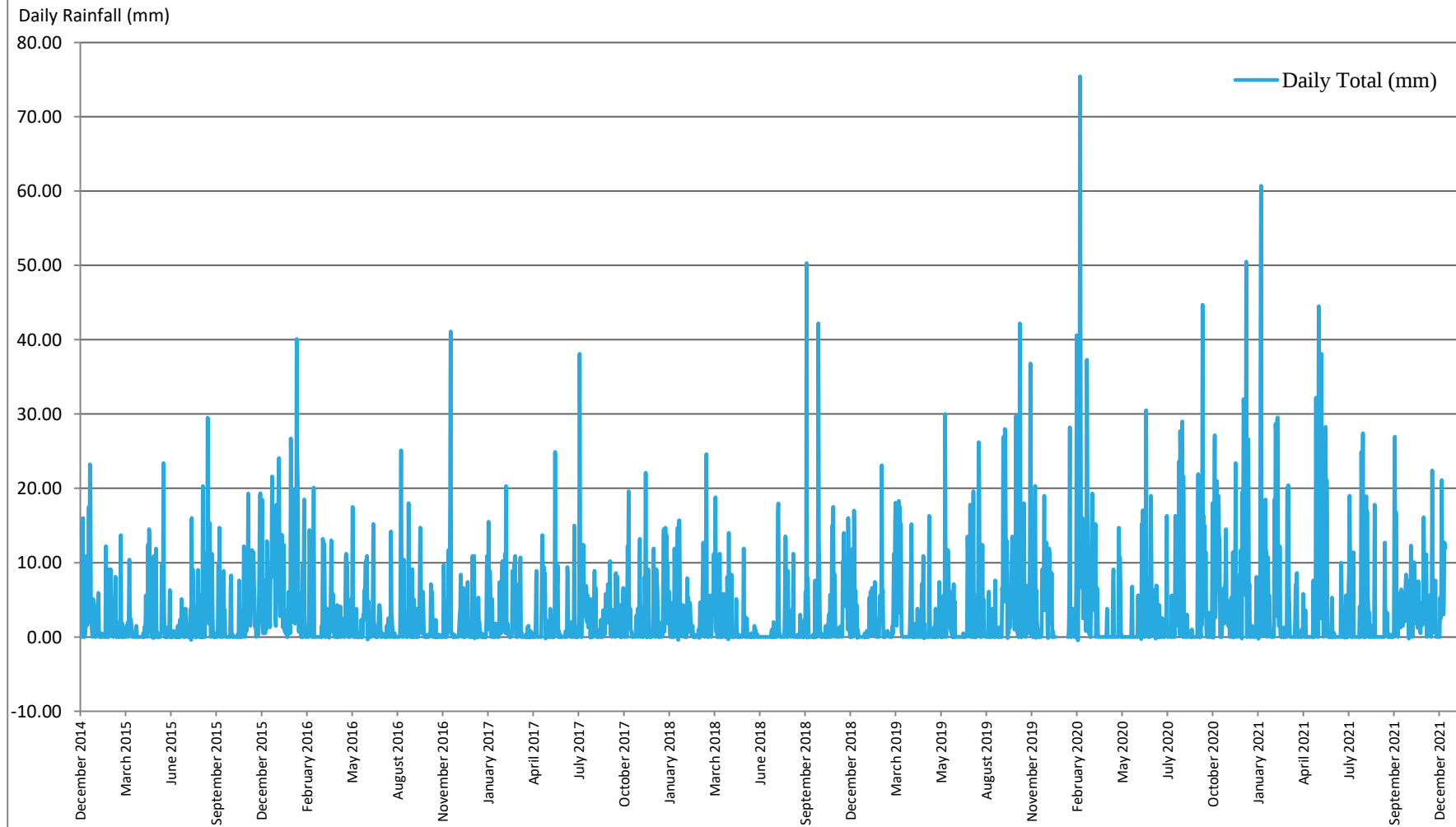
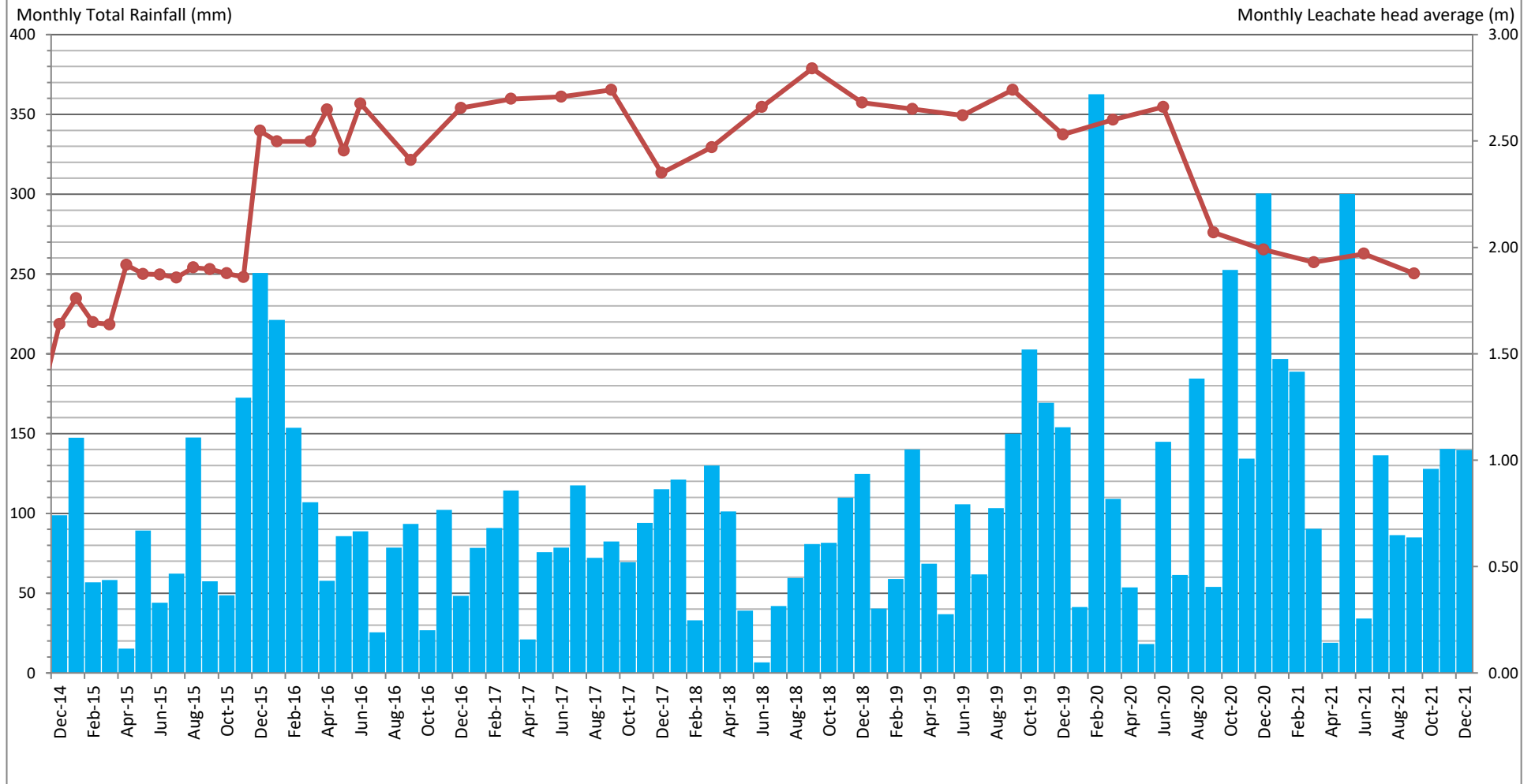


Figure A2
Monthly rainfall totals (December 2014 - December 2021)



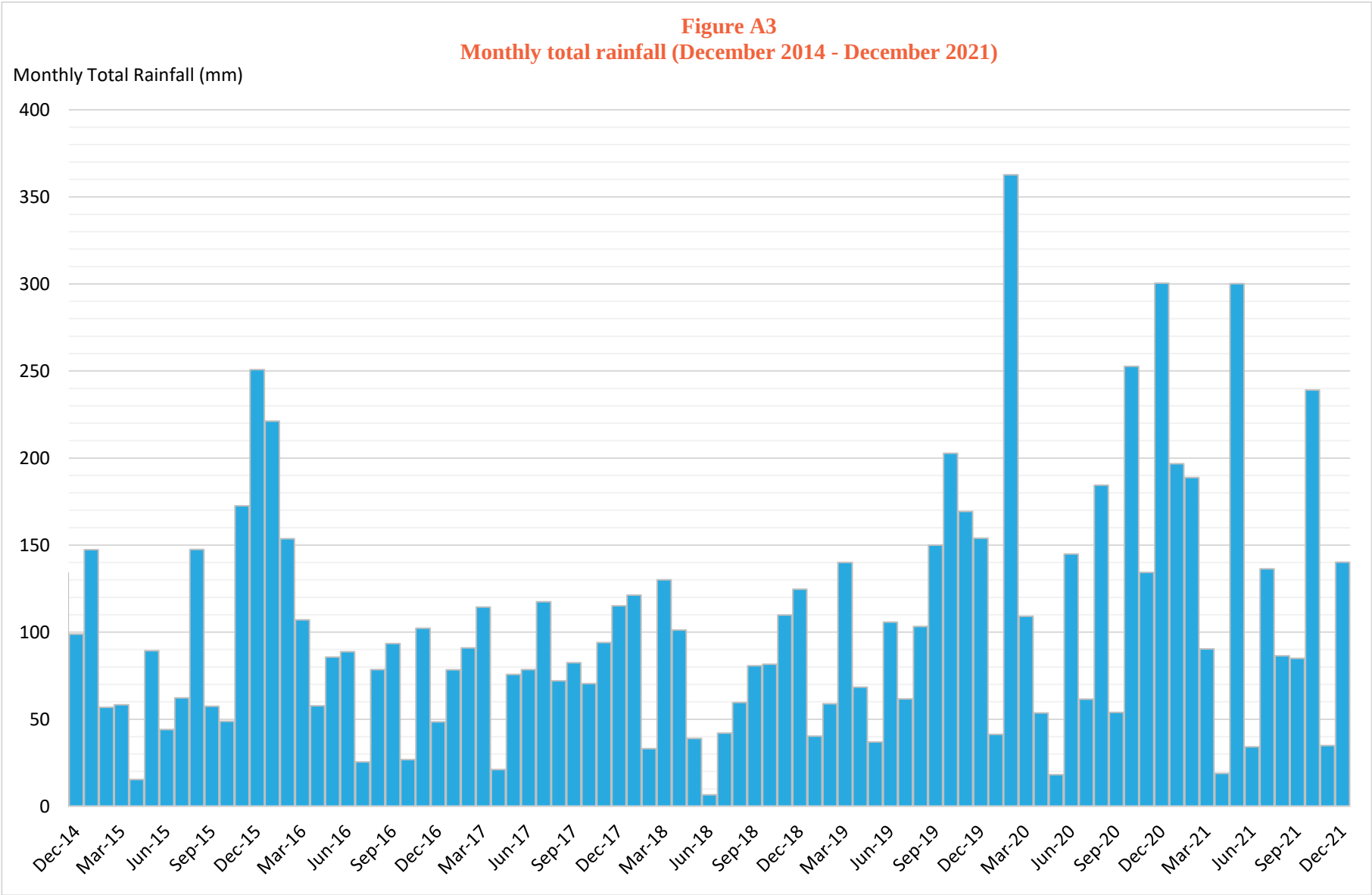


Figure A4
Surface water monitoring graphs

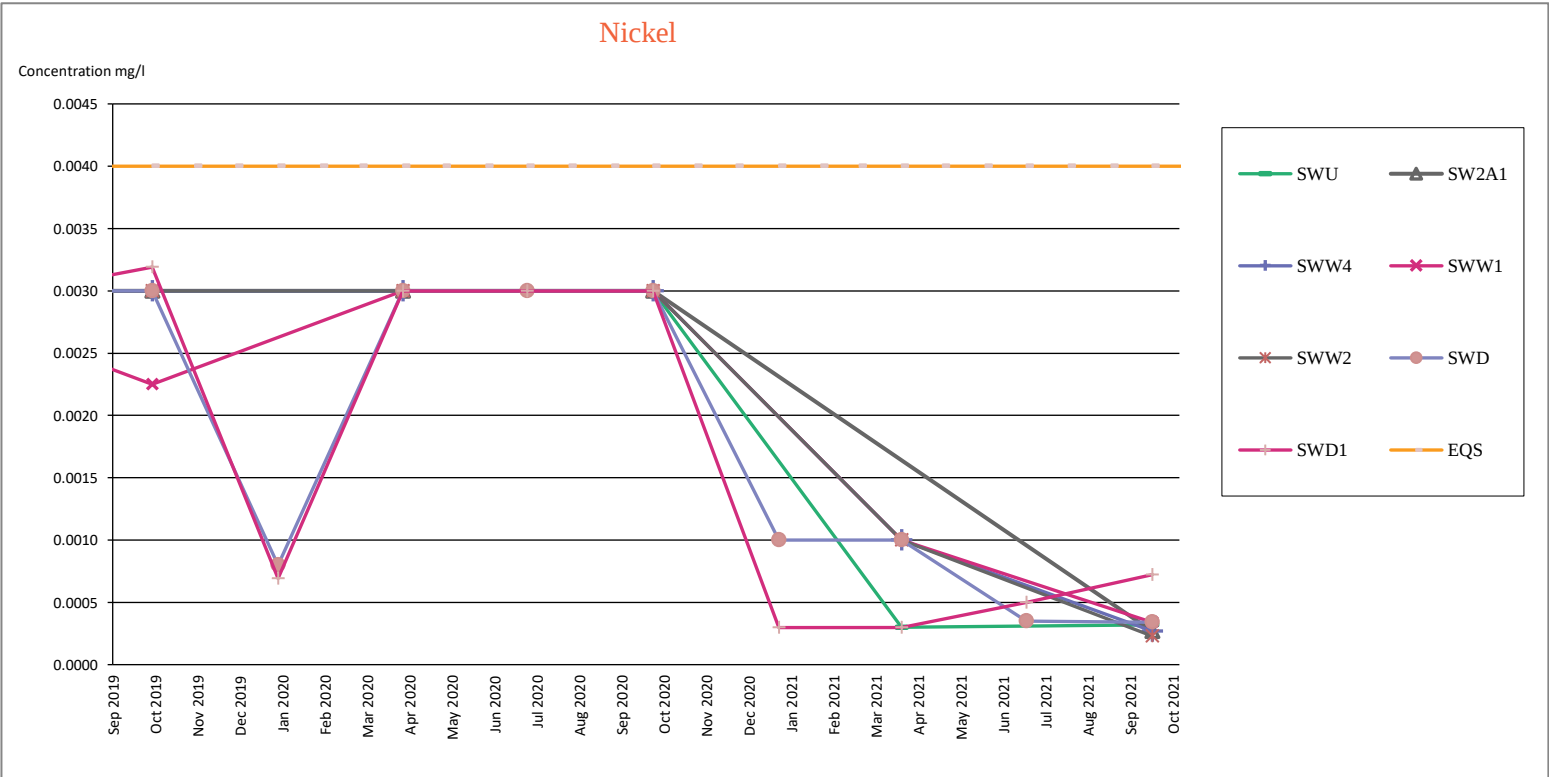
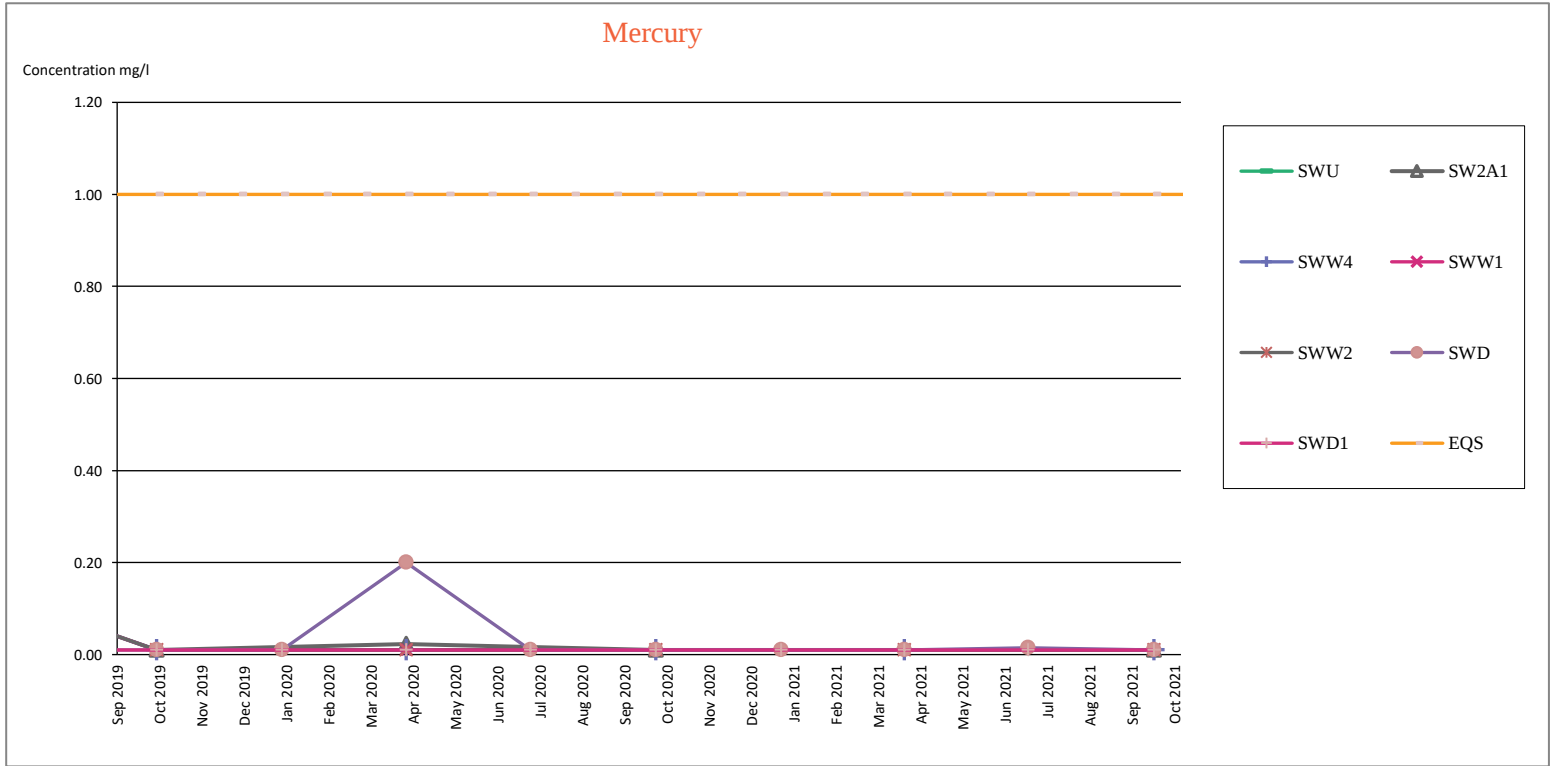
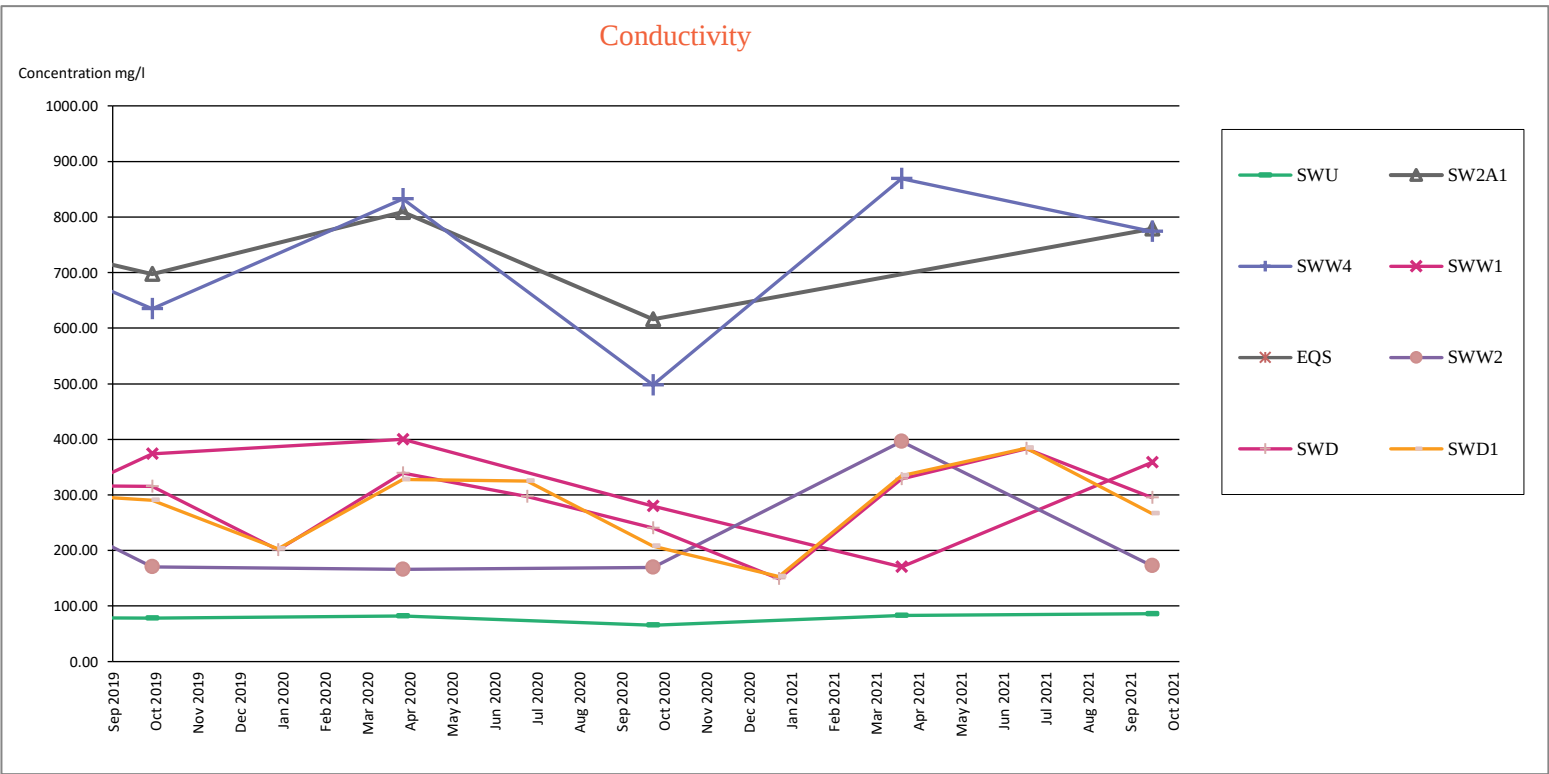
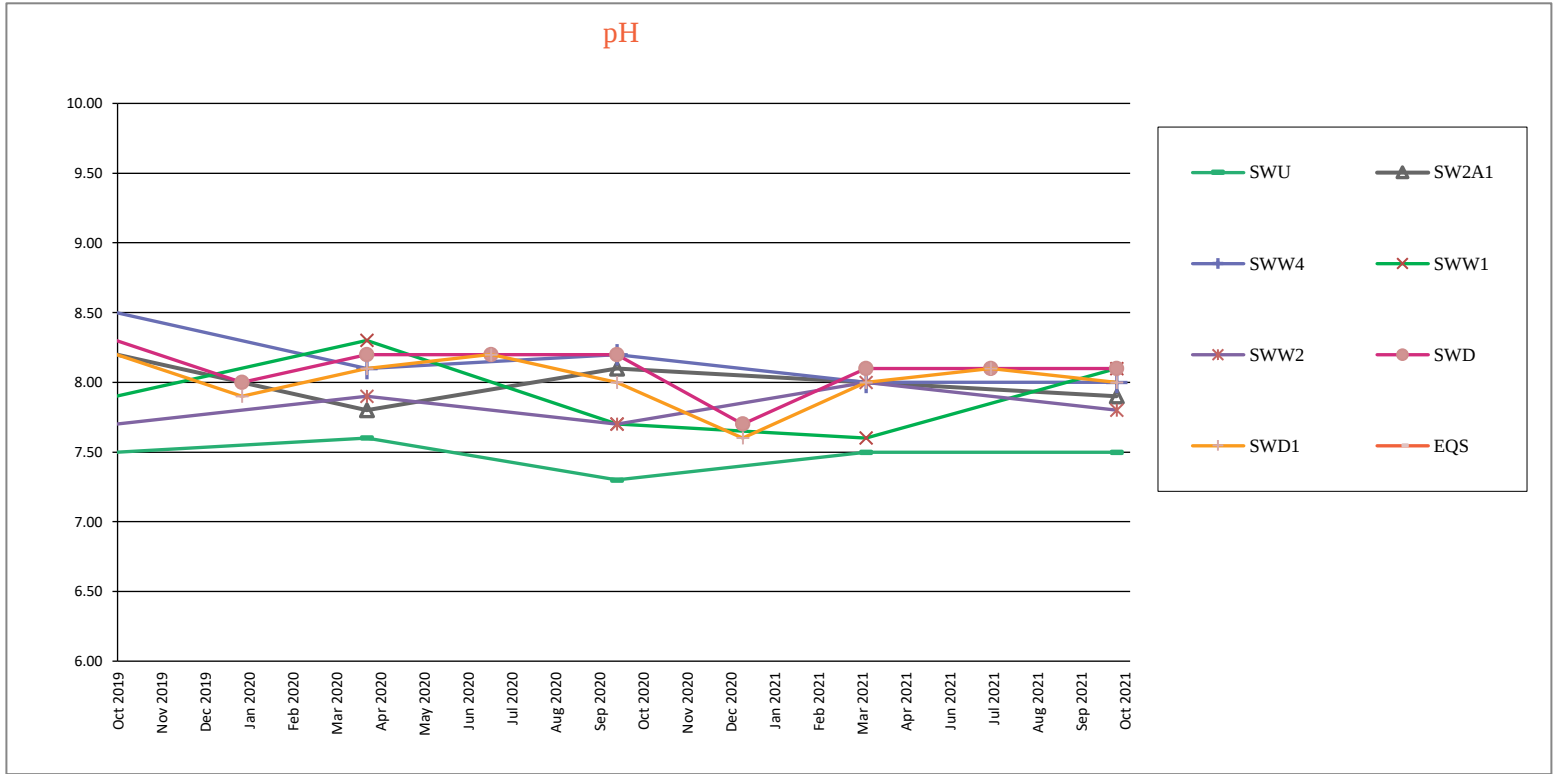


Figure A4
Surface water monitoring graphs

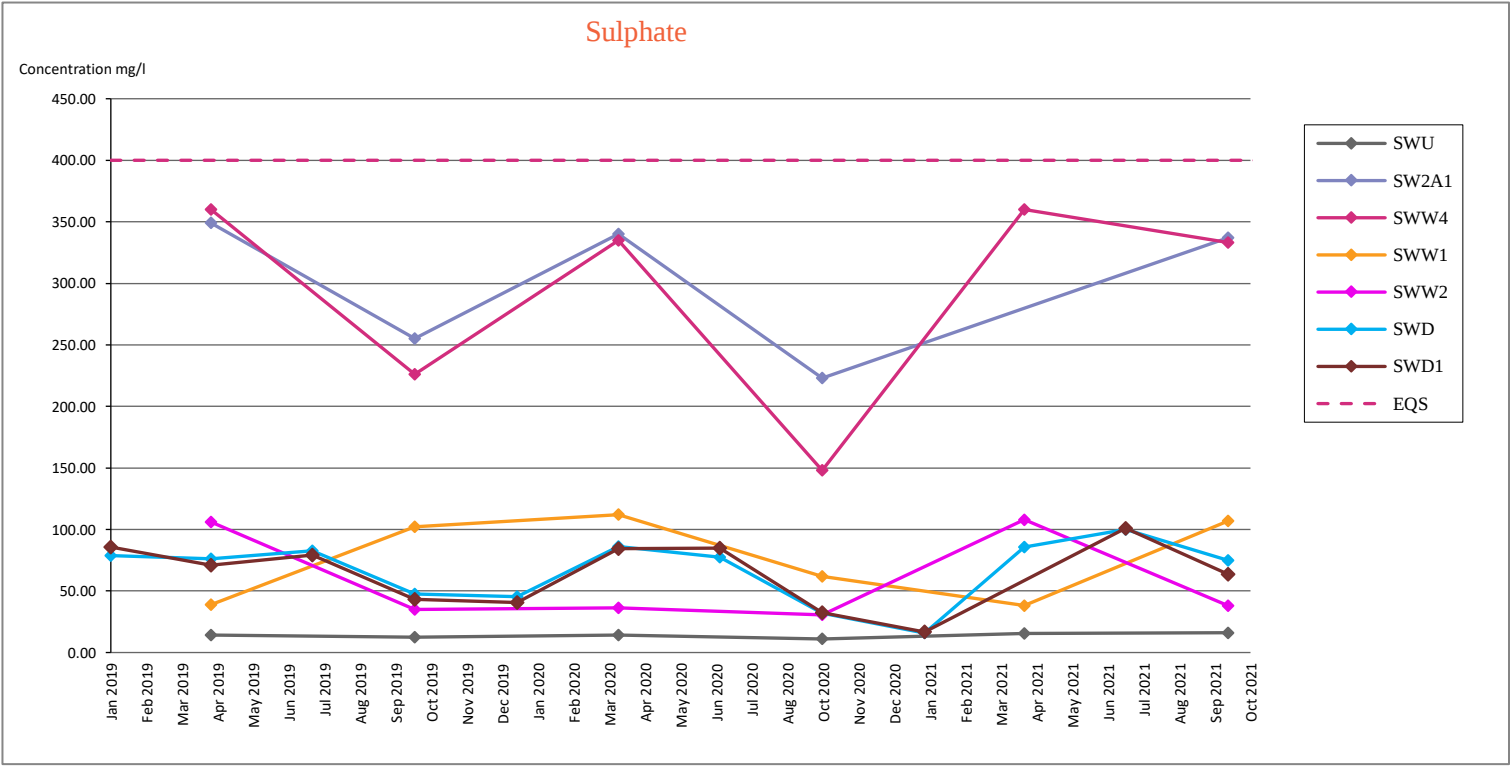
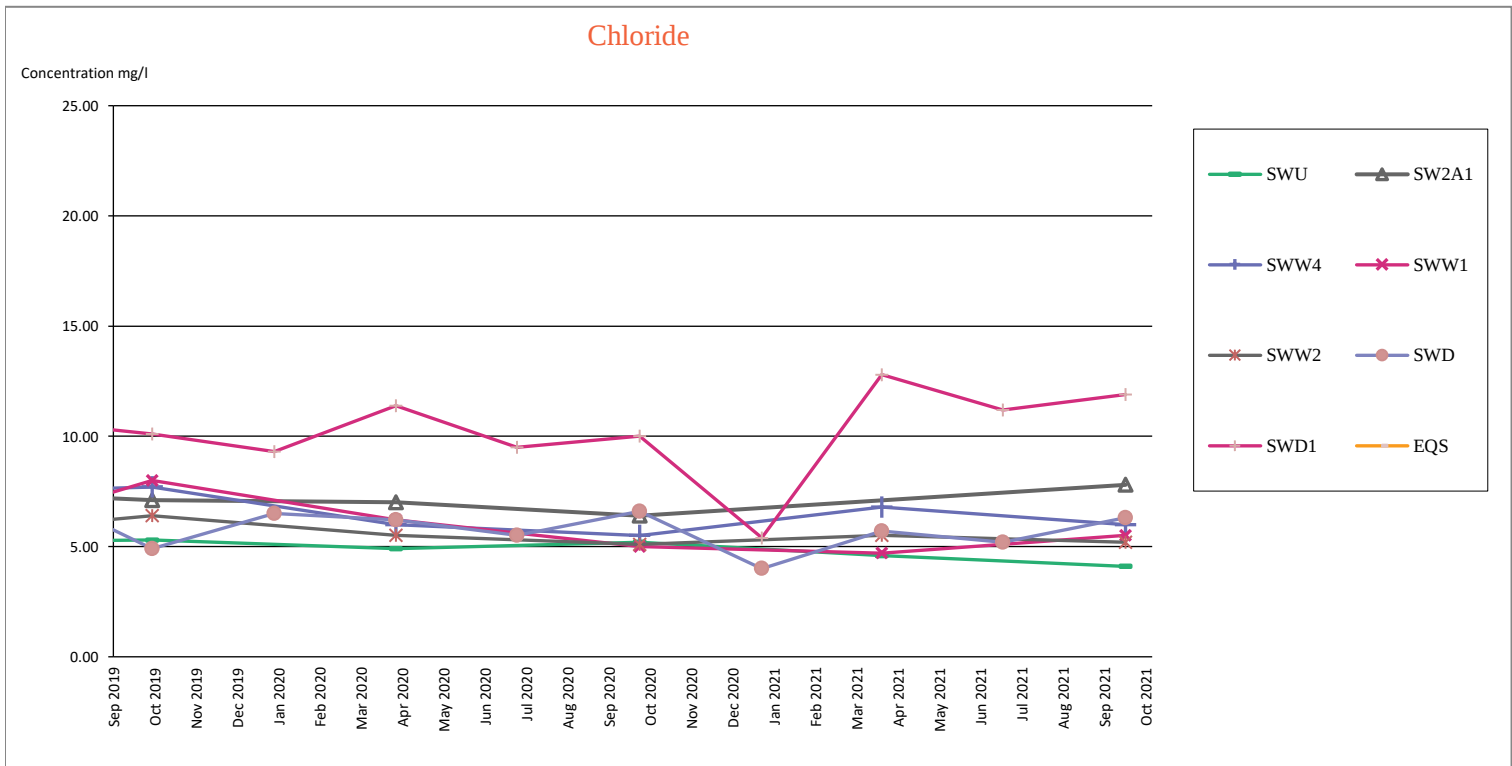
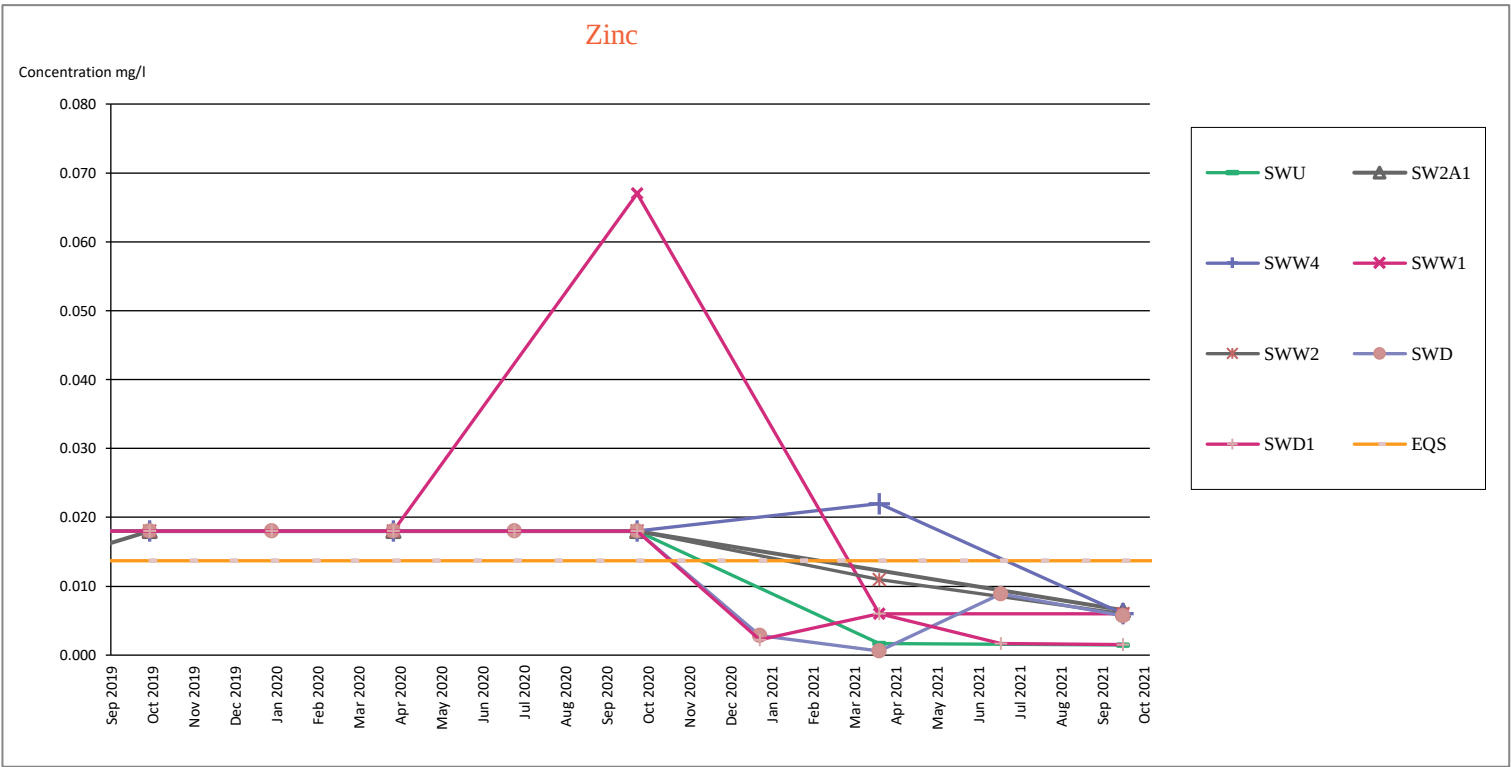
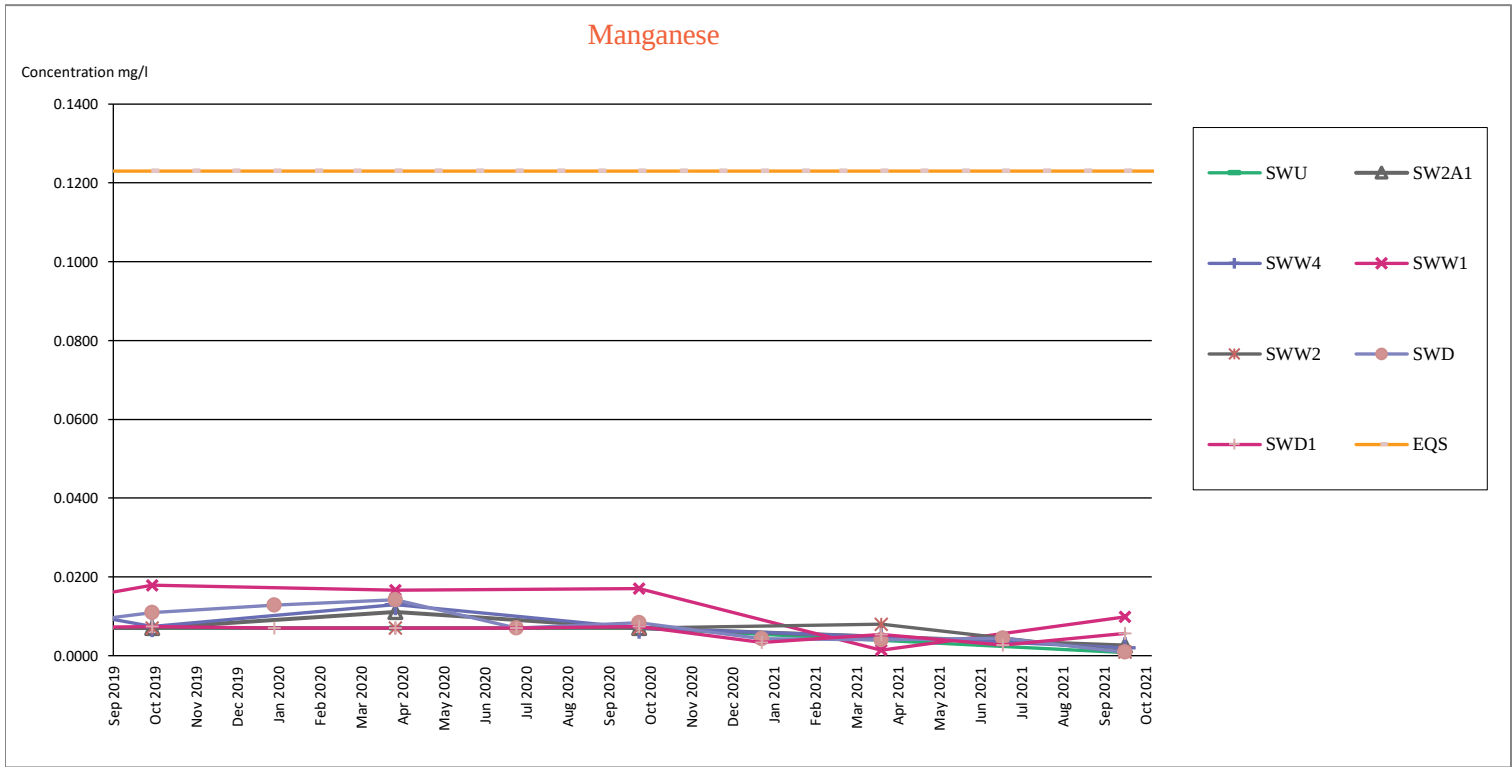


Figure A4
Surface water monitoring graphs

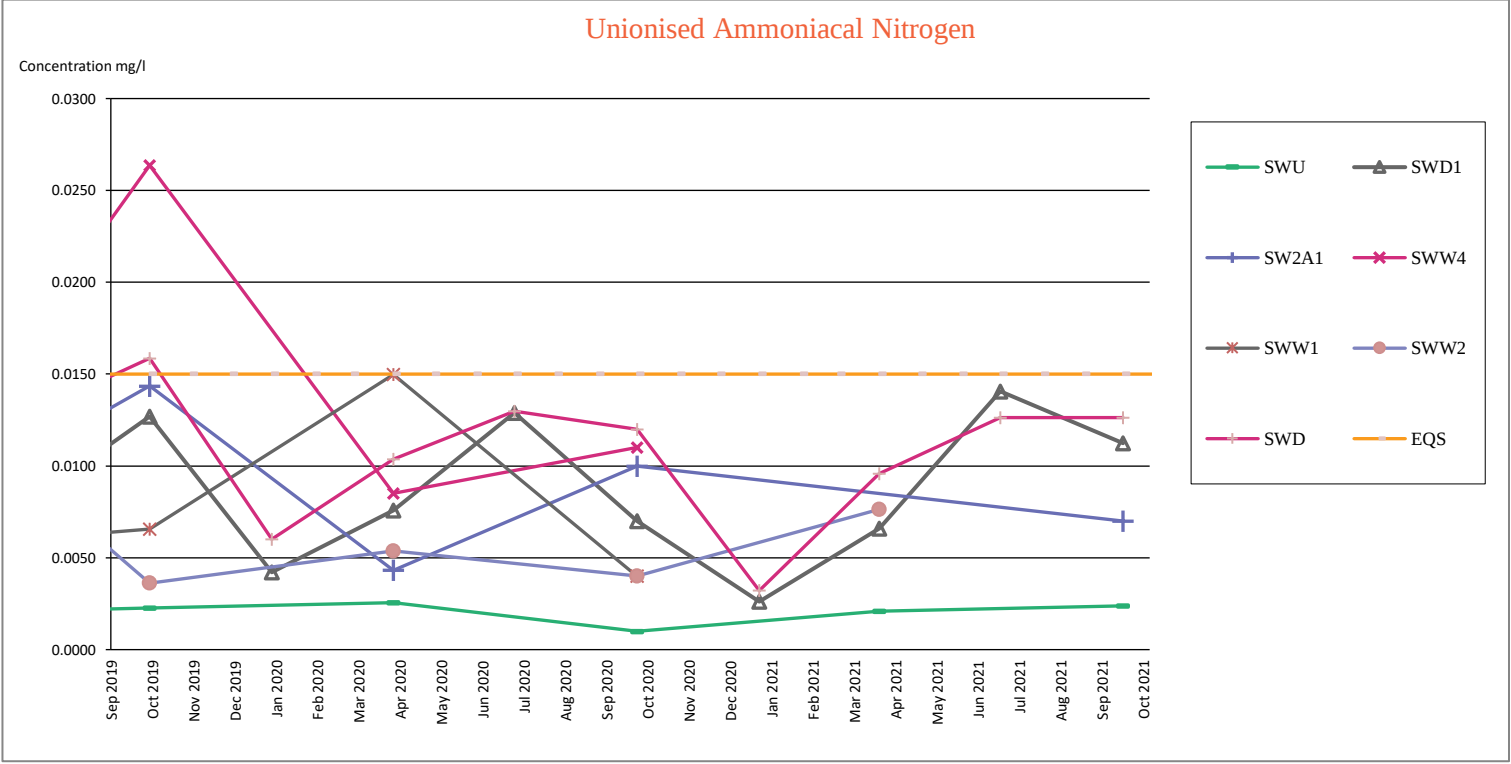
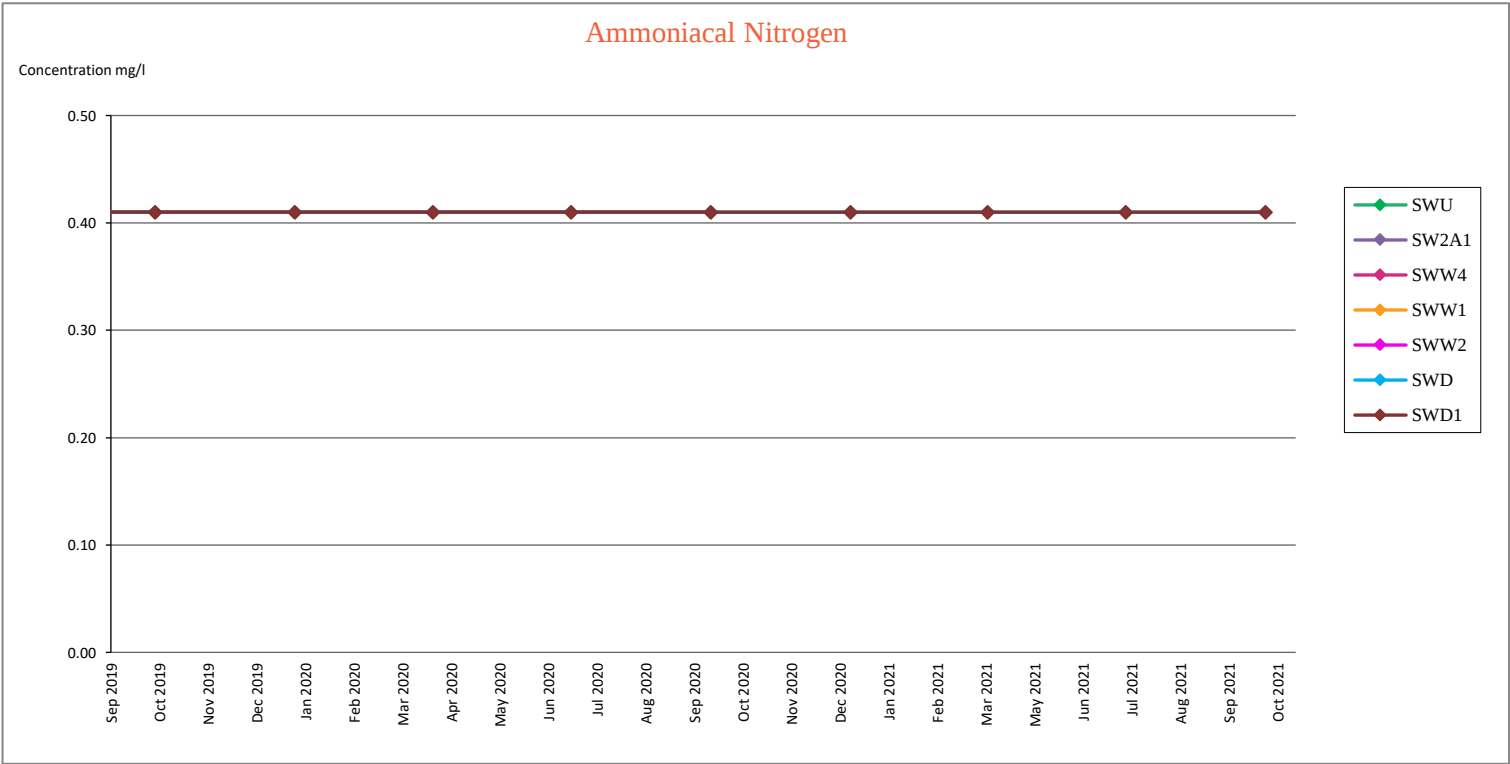


Figure A5
Groundwater quality monitoring results - Compliance wells graphs

Compliance wells graphs

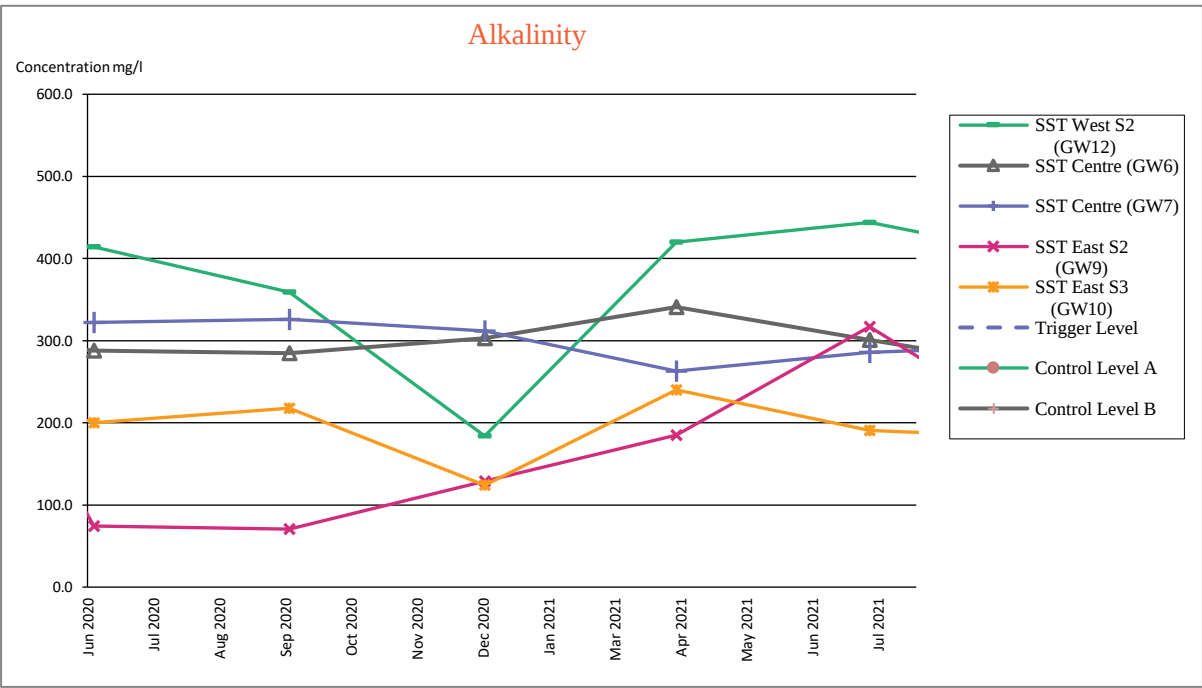
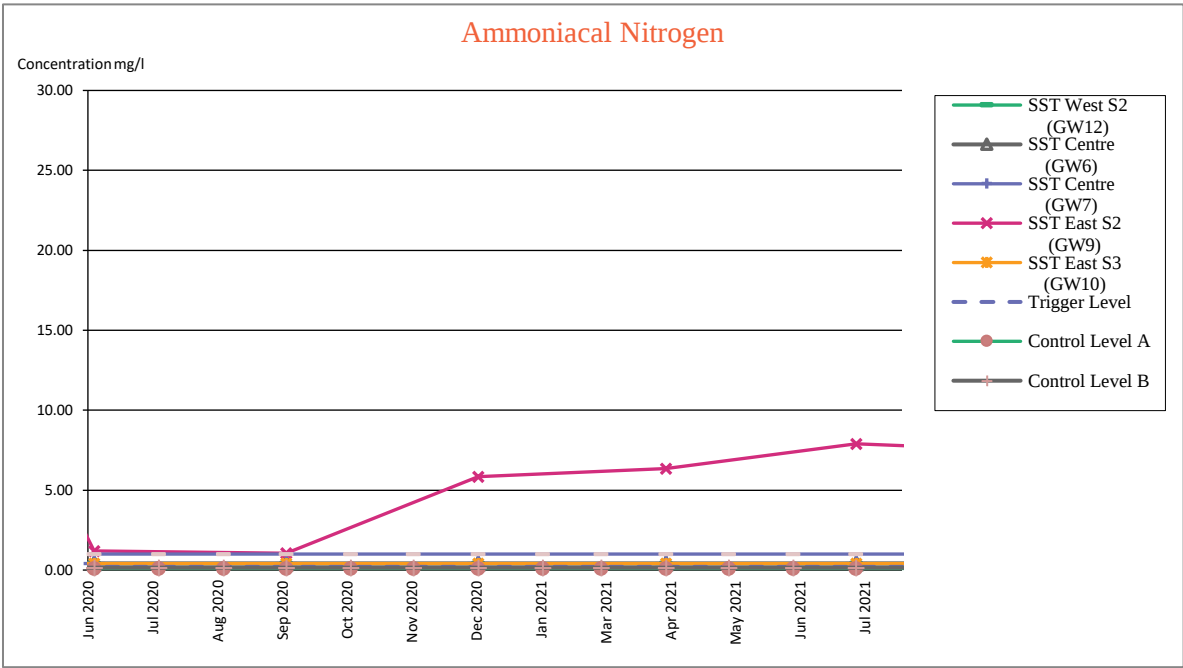
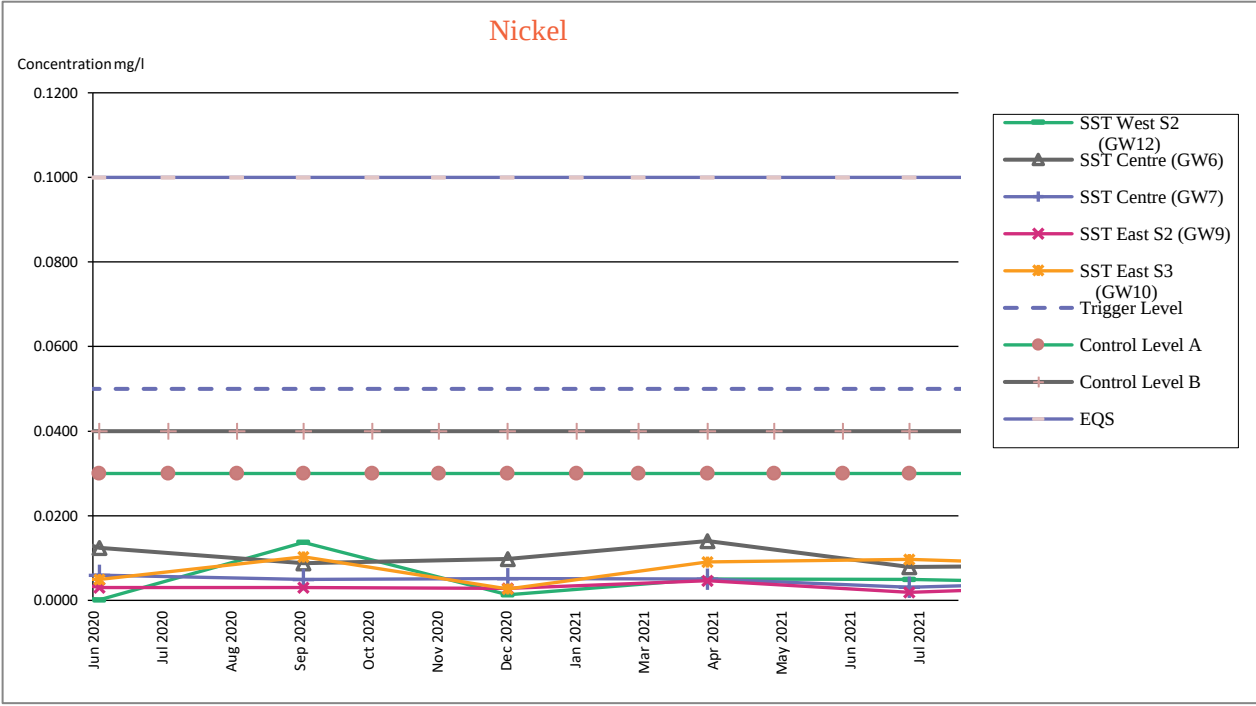
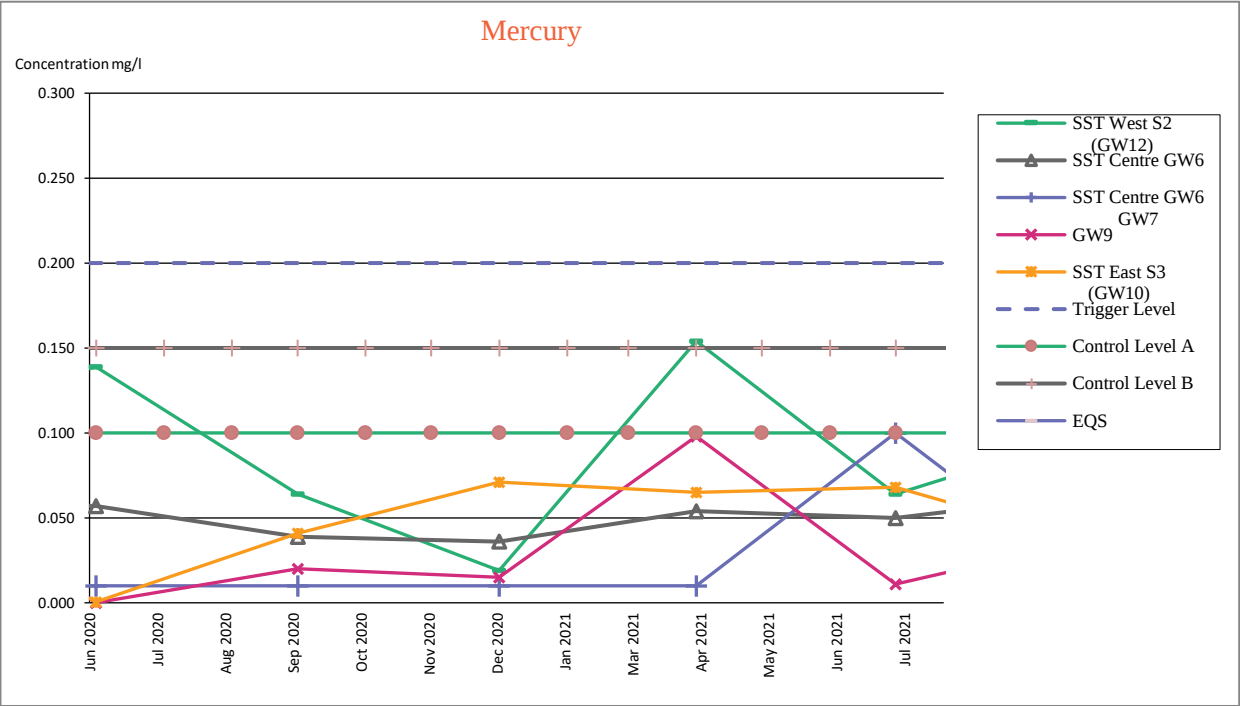


Figure A5
Groundwater quality monitoring results - Compliance wells graphs

Compliance wells graphs

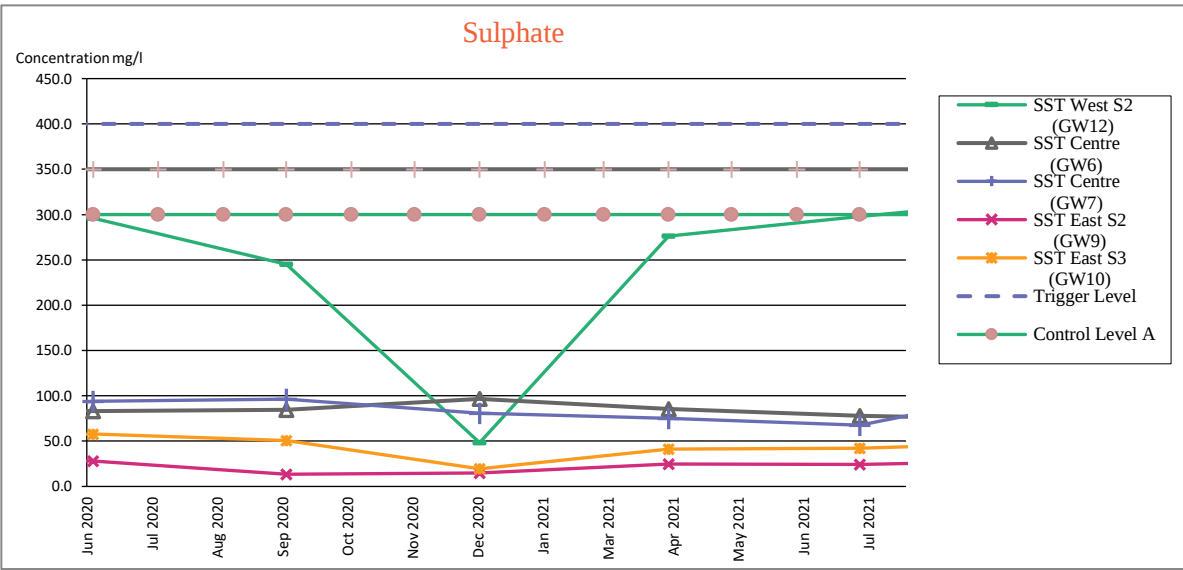
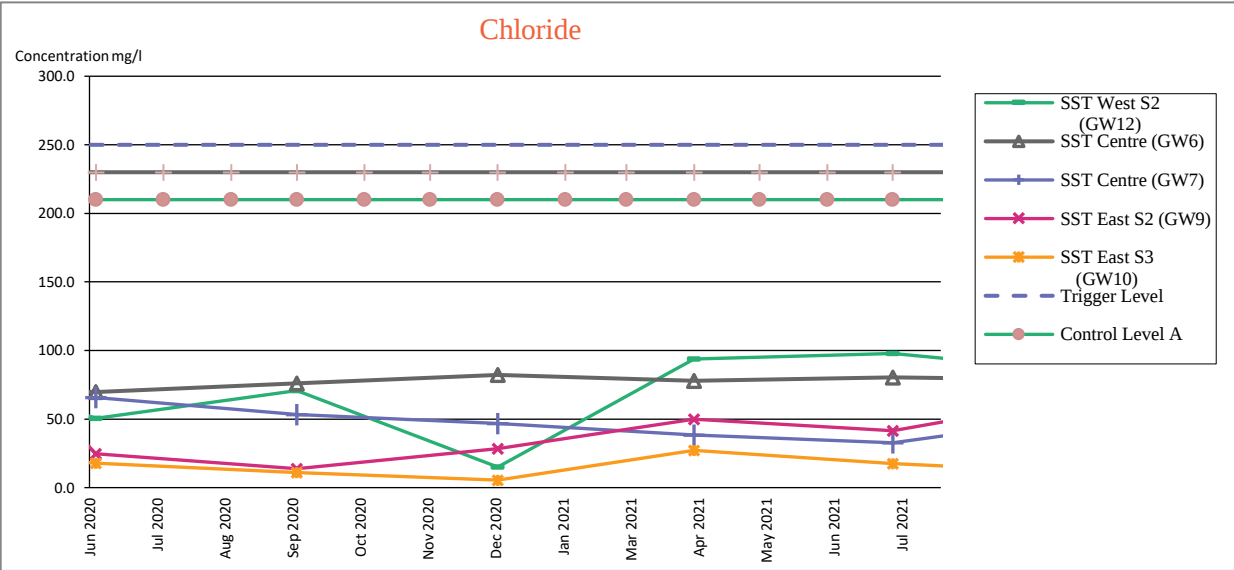
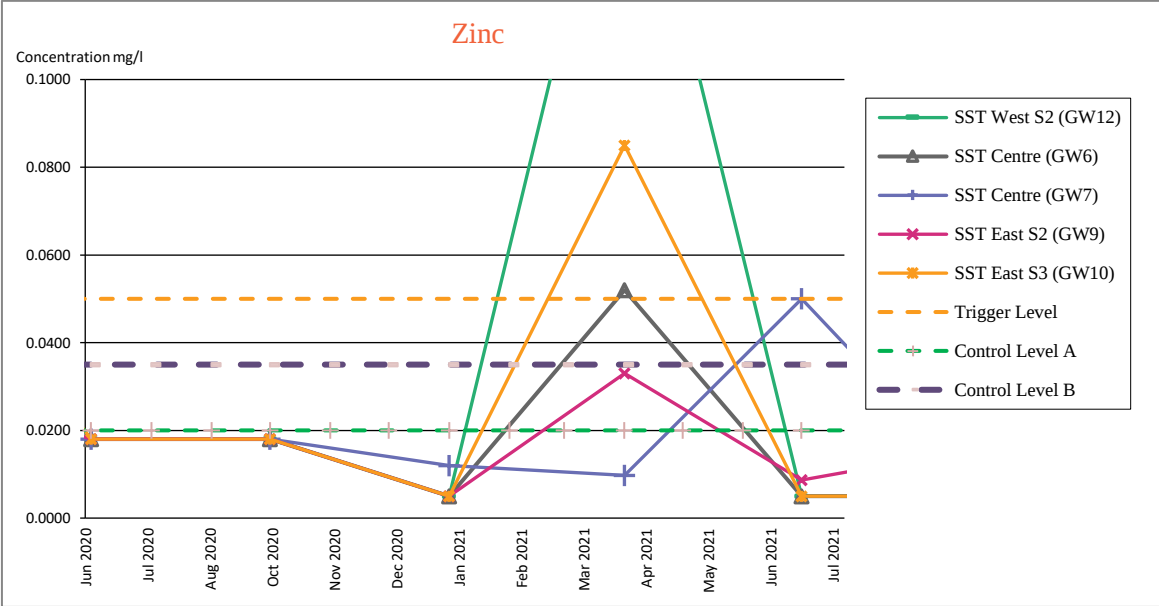
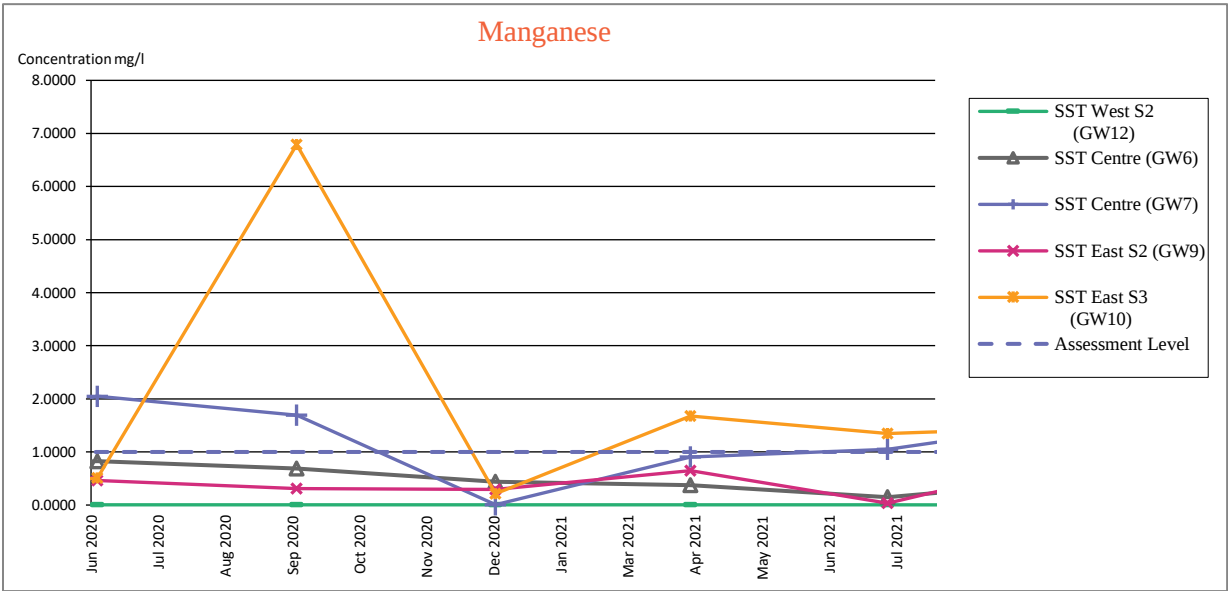


Figure A5
Groundwater quality monitoring results - Compliance wells graphs

Compliance wells graphs

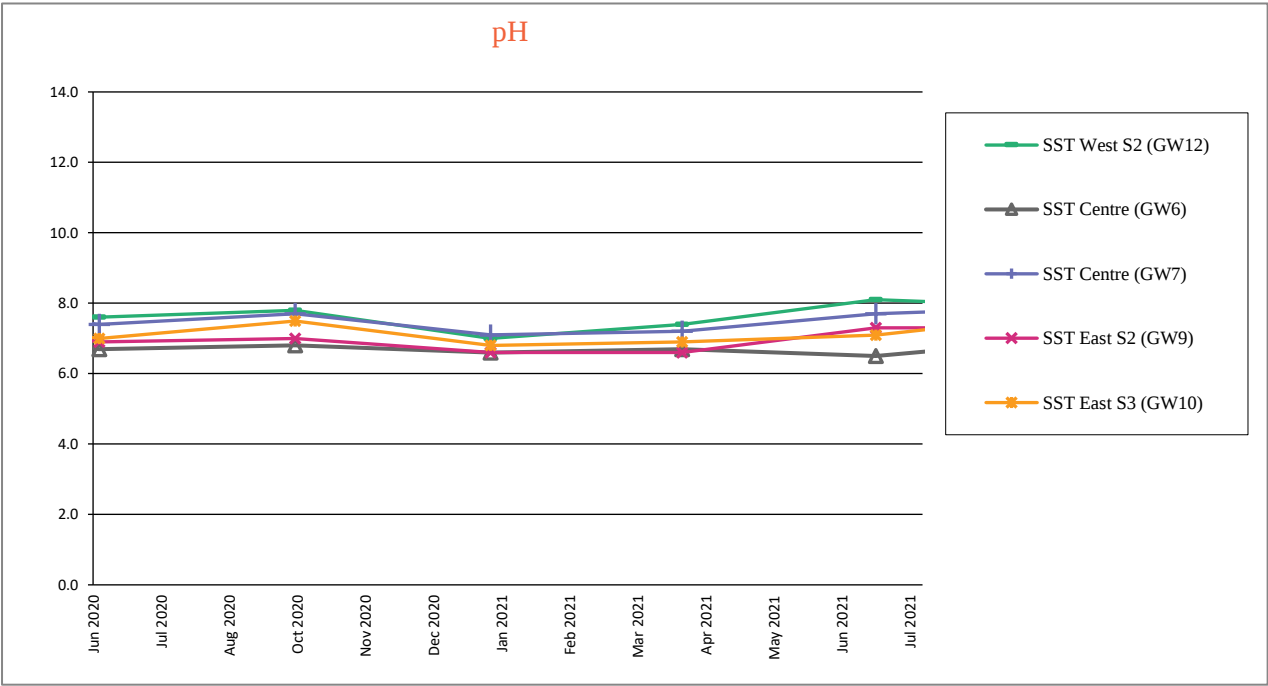


Figure A6
Groundwater quality monitoring results - Upstream wells graphs

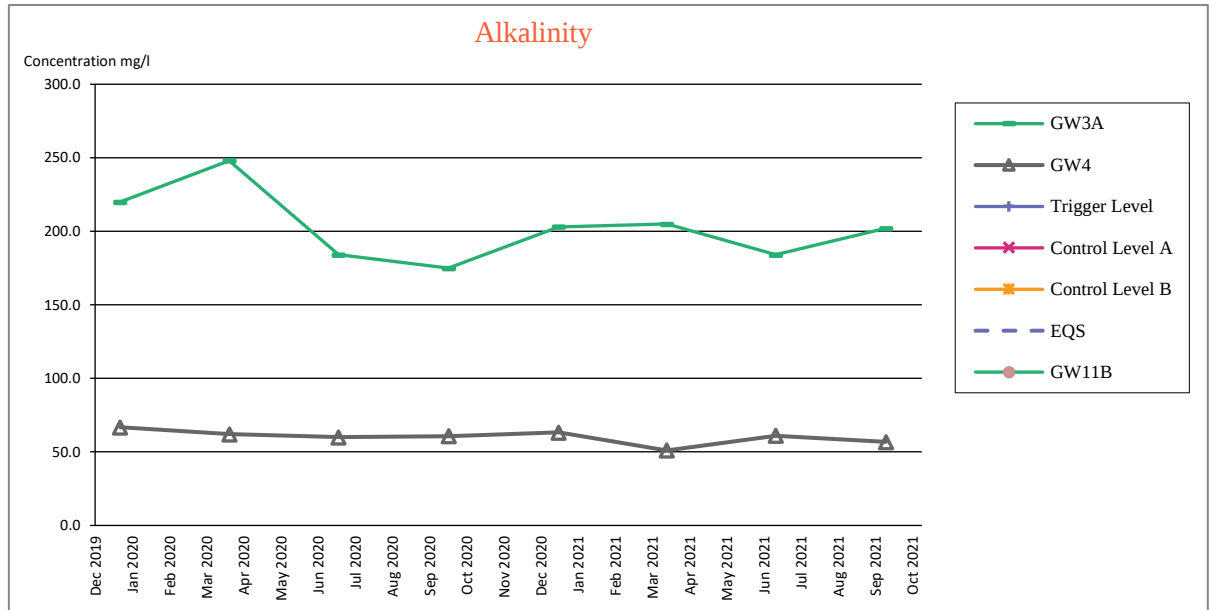
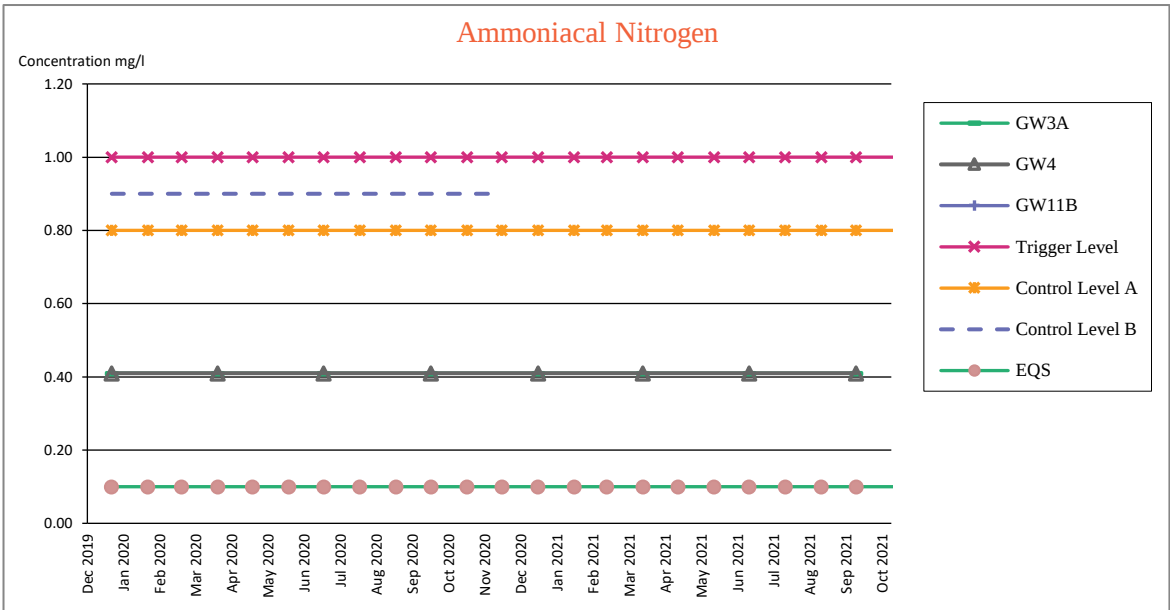
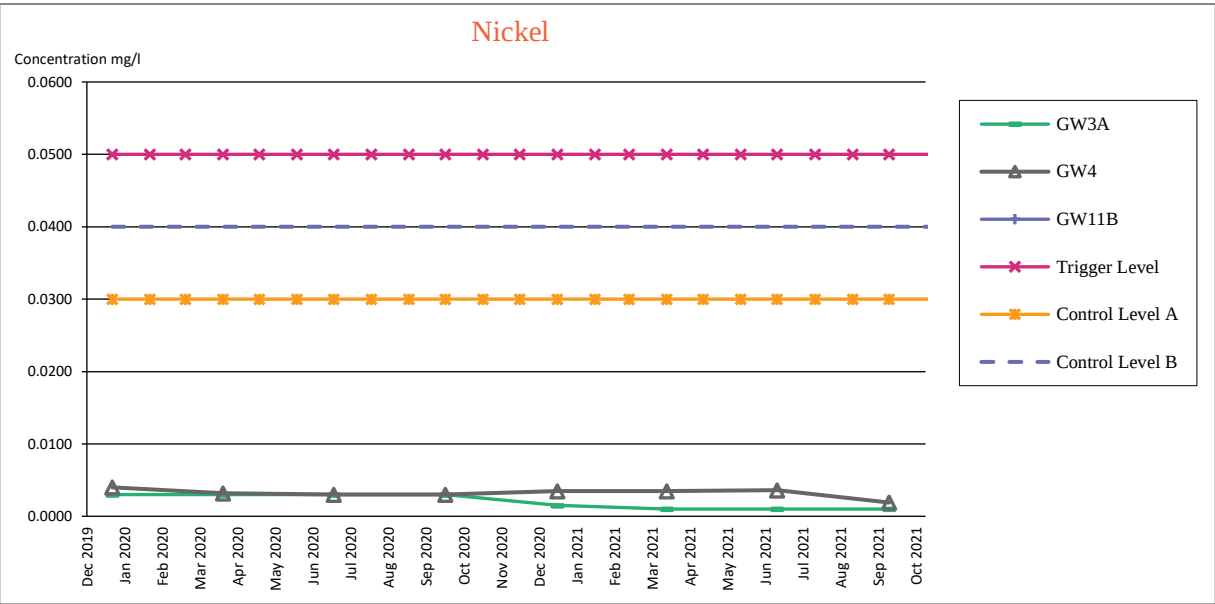
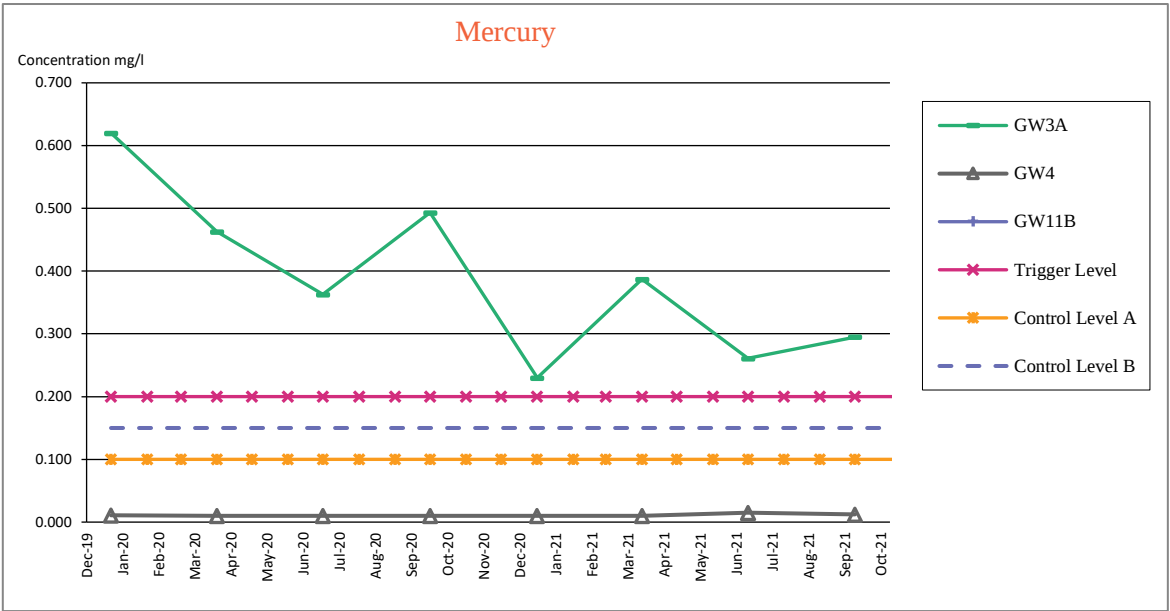


Figure A6
Groundwater quality monitoring results - Upstream wells graphs

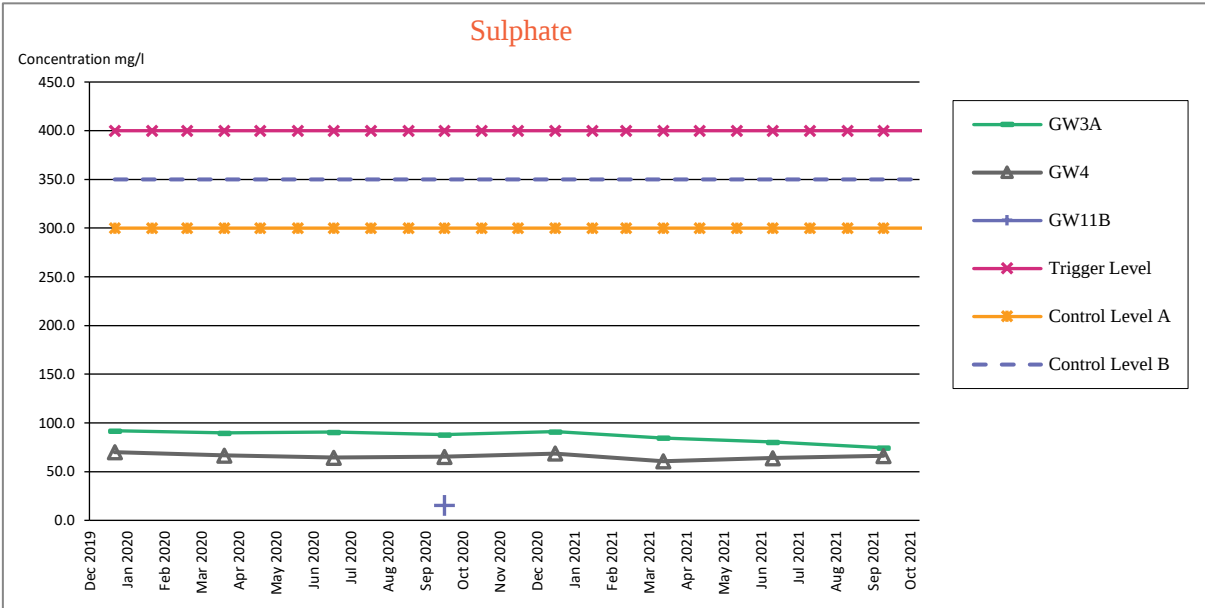
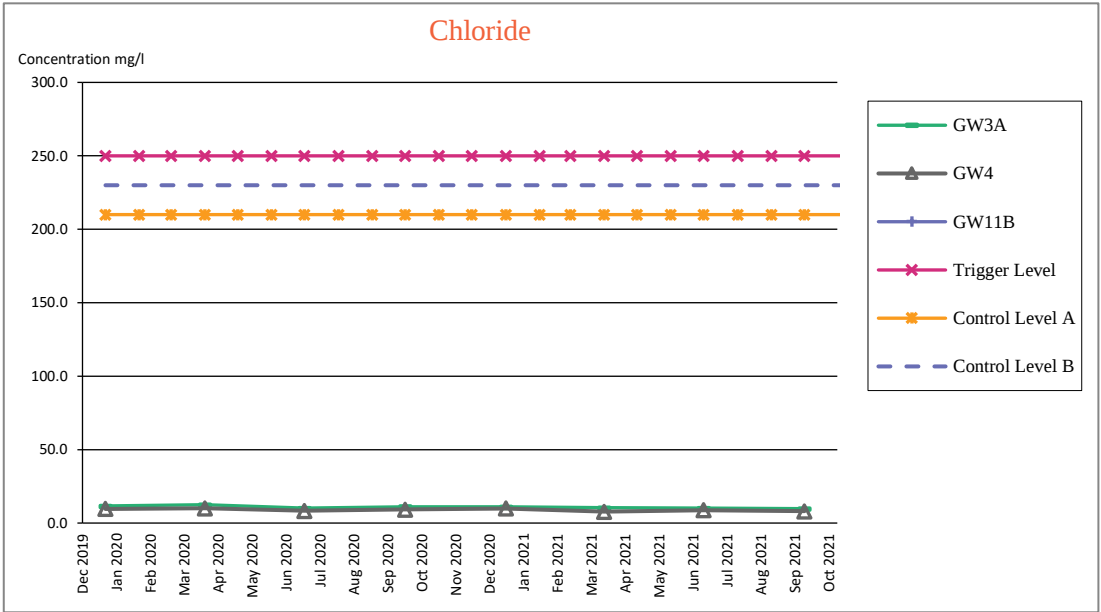
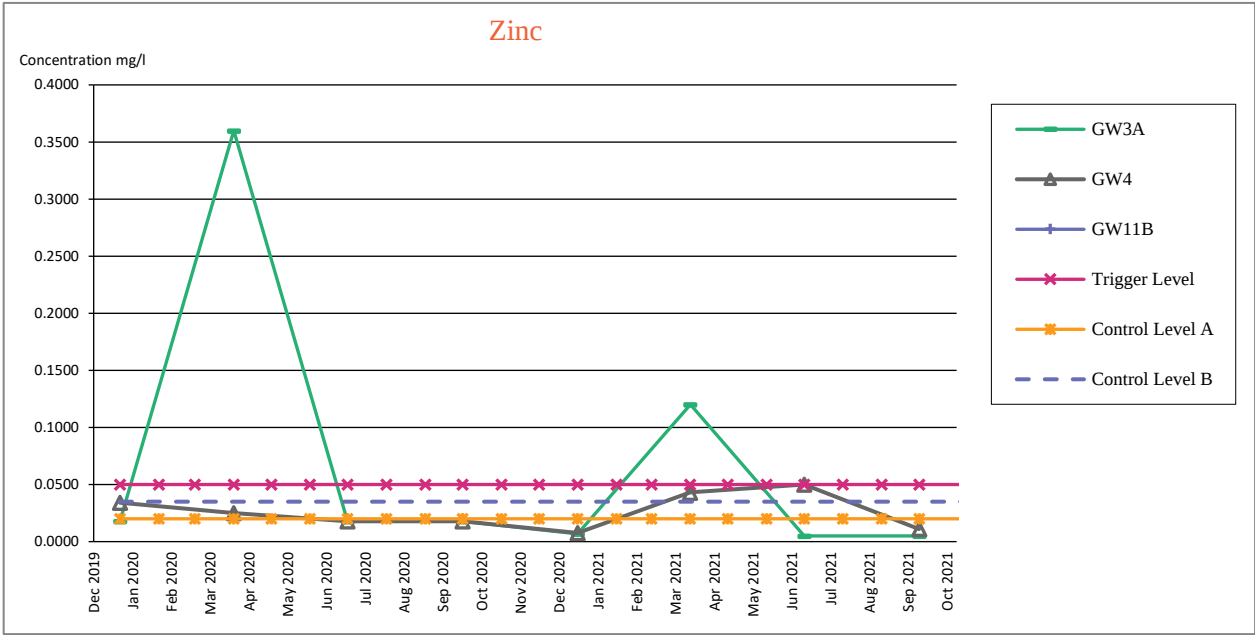
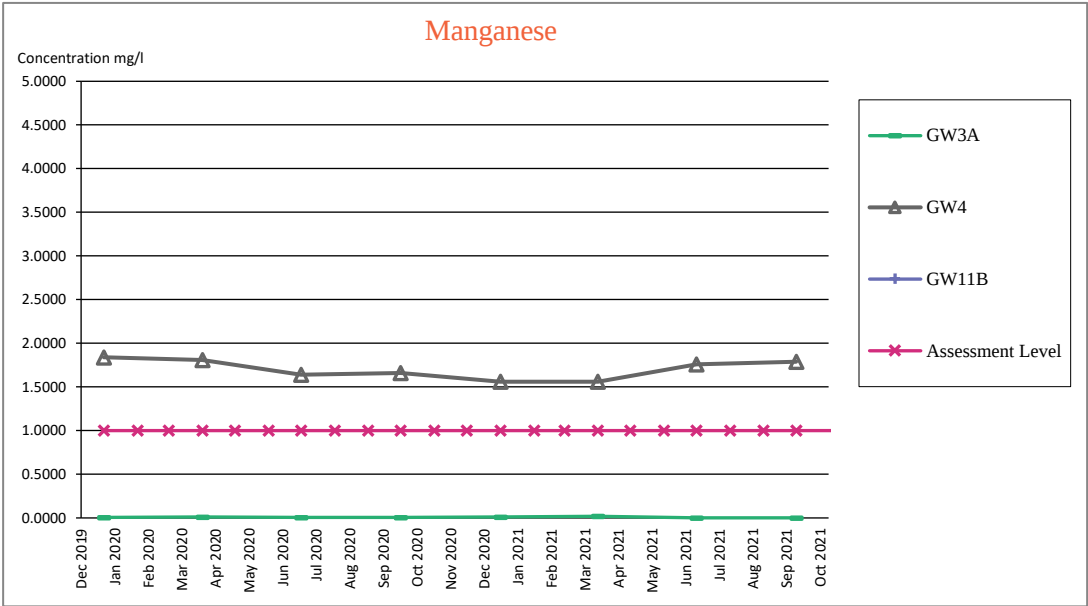


Figure A6
Groundwater quality monitoring results - Upstream wells graphs

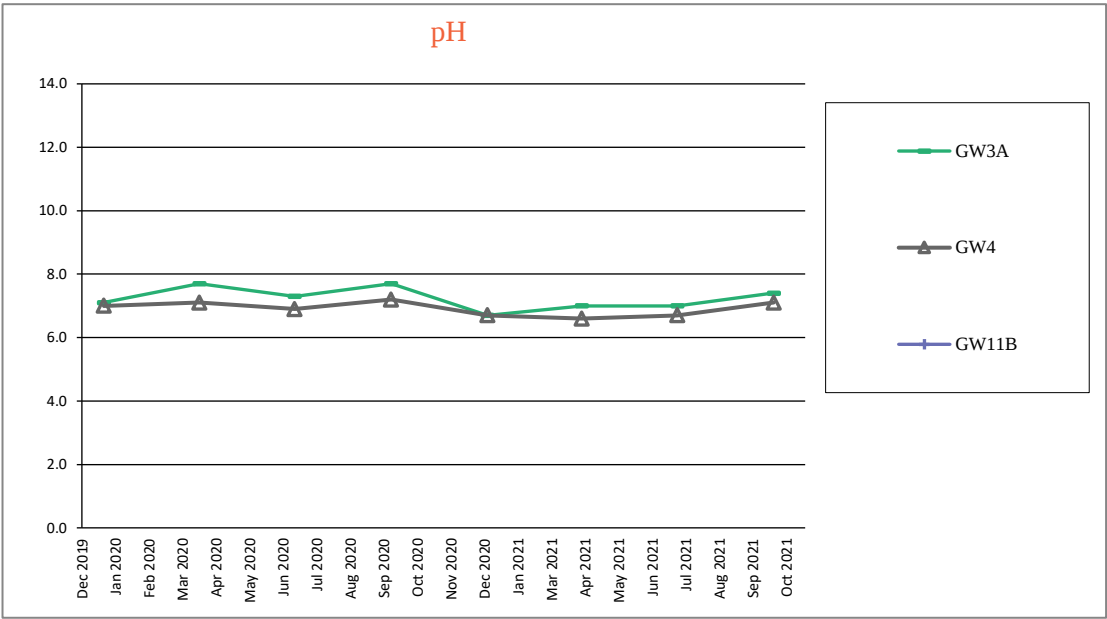
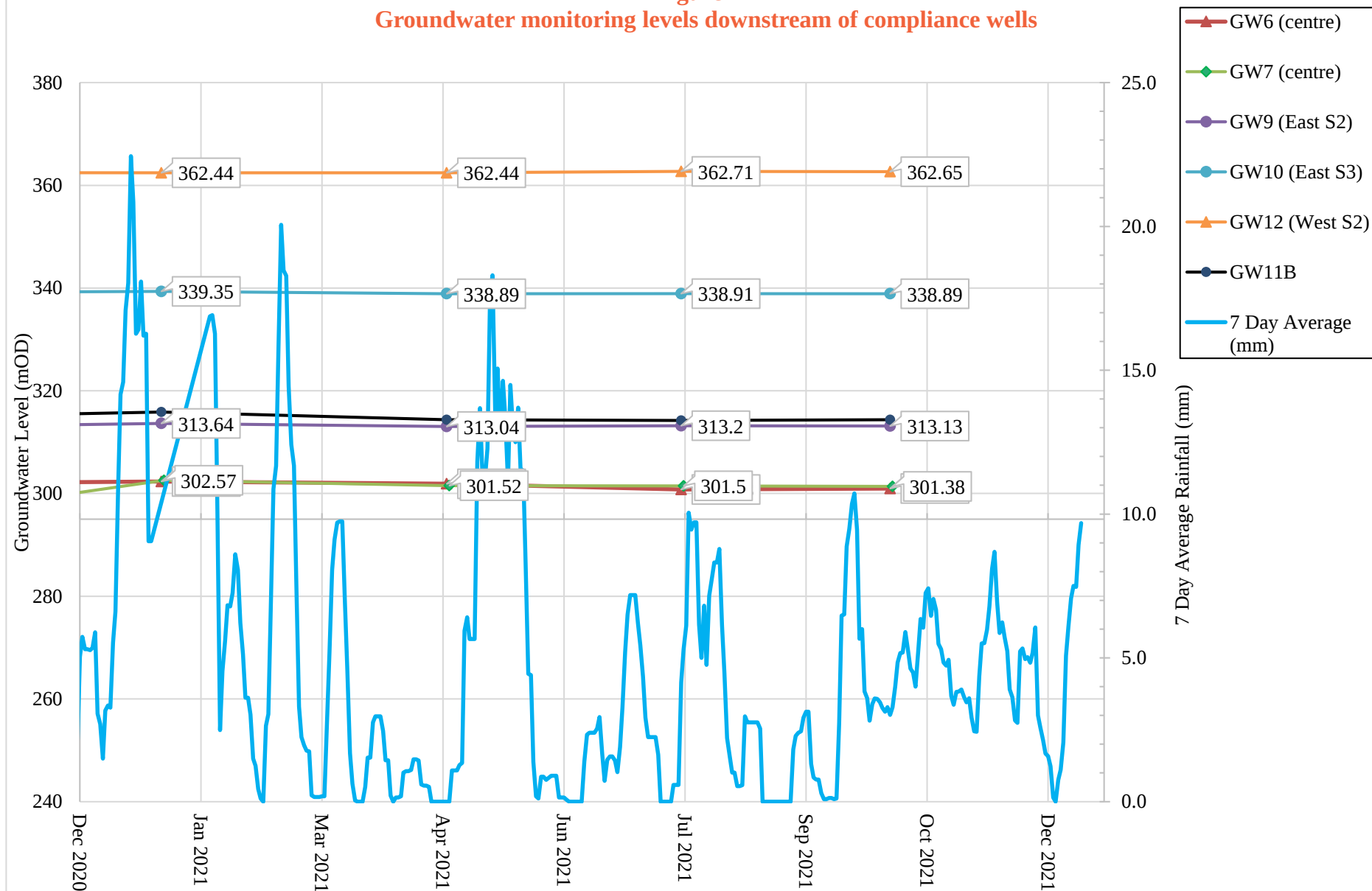


Figure A7
Groundwater monitoring levels downstream of compliance wells



Appendix B

Monitoring Results - Tables

Appendix B
Table B1
Leachate Monitoring Results

October 2021												
LOCATION	Units	L1A	L1B	LC1A	LC2A	LC4A	LC5	Maximum concentration (mg/l)	Average concentration (mg/l)	Acceptable Maximum Concentration (AMC) (mg/l)	LP3A	LP4
Date Sampled	-											
Manganese in filtrate as Mn	mg/l	N/S	0.485	N/S	0.123	0.765	N/S	0.765	0.458	--	0.0014	0.089
Mercury, filt trace as Hg	mg/l	N/S	< 0.00001	N/S	*A/C	*A/C	N/S	0.00001	0.00001	0.00056	0.000032	< 0.00001
Nickel in filtrate as Ni	mg/l	N/S	0.011	N/S	0.086	0.0113	N/S	0.086	0.0361	0.0681	0.0058	0.005
Zinc, ultra-low filtered as Zn	mg/l	N/S	0.023	N/S	1.89	1.86	N/S	1.890	1.258	1.38	0.027	0.022
pH	pH Units	N/S	8.2	N/S	8.3	7.4	N/S	8.300	7.967	--	8.4	8.2
Conductivity- Electrical 20C	uS/cm	N/S	2140	N/S	10600	3680	N/S	10600	5473.3	--	1490	1750
Alkalinity as CaCO3	mg/l	N/S	521	N/S	412	2120	N/S	2120	1017.7	--	415	609
Ammoniacal Nitrogen as N	mg/l	N/S	< 0.41	N/S	824	233	N/S	824	352.5	526	< 0.41	17.5
Chloride as Cl	mg/l	N/S	199	N/S	858	173	N/S	858	410	1408	136	119
Sulphate as SO4	mg/l	N/S	379	N/S	651	23.9	N/S	651	351.3	999	229	227
Redox Potential (see note 4)	mV	N/S	-236	N/S	-208	-214	N/S	-236	-219	--	-215	-198
Total Suspended Solids	mg/l	N/S	23	N/S	2190	2950	N/S	2950	1721	--	11	4
Solids, Total Dissolved 180 deg C	mg/l	N/S	1660	N/S	5230	1610	N/S	5230	2833	--	1110	1240
Dissolved Oxygen, Fixed	mg/l	N/S	2.2	N/S	< 0.5	< 0.5	N/S	2.2	1.067	--	7.5	6
TOC (filtered)	mg/l	N/S	21.3	N/S	267	39.9	N/S	39.9	109.4	--	13.9	13.1

*A/C= Unable to analyse Mecury due to sample matrix interference (Stated by laboratory)

Notes

- 1. < denotes 'less than'.
 - 2. L1A,L1B, LC1A, LC2A,LC4A, LC5A: Wells in Waste.
 - 3. -- denotes 'no acceptable maximum concentration available'.
 - 4. The redox potential was not measured on site and there is a possibility that it has changed between sampling and analysis.
 - 5. LC5 currently under repair
 - 6. NS denotes 'not sampled'.
- No monthly average leachate levels above Maximum Acceptable Concentration (MAC)

Exceedance of AMC for well concentration
Exceedance of AMC for Average Concentration

Table B2
Leachate Head Levels

		Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21
LC1A	Elevation of base of landfill mAOD	357.62			357.62			357.62			357.62		
	Elevation at top of casing mAOD	398.85			398.85			398.85			398.85		
	Depth to leachate from top of casing (m)	40.39			40.39			40.36			40.39		
	Leachate elevation (mAOD)	358.46			358.46			358.49			358.46		
	Calculated leachate head (m)	0.84			0.84			0.87			0.84		
LC2A	Elevation of base of landfill mAOD	362.49			362.49			362.49			362.49		
	Elevation at top of casing mAOD	401.12			401.12			401.12			401.12		
	Depth to leachate from top of casing (m)	35.54			35.73			35.63			35.90		
	Leachate elevation (mAOD)	365.58			365.39			365.49			365.22		
	Calculated leachate head (m)	3.09			2.90			3.00			2.73		
LC4A	Elevation of base of landfill mAOD	372.27			372.27			372.27			372.27		
	Elevation at top of casing mAOD	401.14			401.14			401.14			401.14		
	Depth to leachate from top of casing (m)	26.84			26.82			26.83			26.81		
	Leachate elevation (mAOD)	374.30			374.32			374.31			374.33		
	Calculated leachate head (m)	2.03			2.05			2.04			2.06		
LC5A	Elevation of base of landfill mAOD	350.14			350.14			350.14			350.14		
	Elevation at top of casing mAOD	380.75			380.75			380.75			380.75		
	Depth to leachate from top of casing (m)	DAMAGED			DAMAGED			DAMAGED			DAMAGED		
	Leachate elevation (mAOD)												
	Calculated leachate head (m)												
L1	Casing height (mAOD)	357.00			357.00			357.00			357.00		
	Leachate (mbgl)				21.06						Dry		
	Leachate (m AOD)	-			335.94						-		
	Base of landfill (m AOD)	336.80			336.80			336.80			336.80		
	Depth of well from top of casing (m)	21.03			21.06			21.07			20.89		
	Base of well (m AOD)	335.97			335.94			335.93			336.11		
L1A*	Calculated leachate head (m)				-0.86								
	Casing height (mAOD)	355.79			355.79			355.79			355.79		
	Leachate (mbgl)				20.90						20.89		
	Leachate (m AOD)				334.89						334.90		
	Base of landfill (m AOD)	316.64			316.64			316.64			316.64		
	Depth of well from top of casing (m)	20.91			20.91			20.91			20.91		
L1B*	Base of well (m AOD)	334.88			334.88			334.88			334.88		
	Calculated leachate head (m)				18.25						18.26		
	Casing height (mAOD)	354.80			354.80			354.80			354.80		
	Leachate (mbgl)	26.75			25.28			29.49			26.07		
	Leachate (m AOD)	328.05			329.52			325.31			328.73		
	Base of landfill (m AOD)	319.60			319.60			319.60			319.60		
L1B*	Depth of well from top of casing (m)	34.86			34.86			34.86			34.86		
	Base of well (m AOD)	319.94			319.94			319.94			319.94		
	Calculated leachate head (m)	8.45			9.92			5.71			9.13		

2021	Quarterly Leachate Head Averages (m)
January	1.99
February	
March	
April	1.93
May	
June	
July	1.97
August	
September	
October	1.88
November	
December	

Minimum monthly leachate head average

Maximum monthly leachate head average

- Notes:
- Top of casings were re-surveyed in August 2019
- LC1A top of casing is 1710mm above ground level.
 - LC2A top of casing is 820mm above GL.
 - LC4A top of casing is 1040mm above GL.
 - LC5A top of casing is 1050mm above GL.

* Well not included in monthly average.

Note: L1 is generally dry or with very little water in it.

Table B3
Surface Water Monitoring Results

Month	Location	Date	Mercury, ultra-low total as Hg	Manganese in filtrate as Mn	Nickel in filtrate as Ni	Bioavailable Ni	Zinc, ultra-low total as Zn	Bioavailable Zn	pH	Conductivity-Electrical 20C	Ammoniacal Nitrogen as N	*Unionised Ammoniacal Nitrogen based on measured Temperature	Measured surface water temperature	Chloride as Cl	Sulphate as SO4	Total Suspended Solids	Dissolved Oxygen, fixed	TOC, filtered	Redox Potential	Alkalinity as CaCO3	Calcium
			ug/l	mg/l	mg/l	mg/l	mg/l	mg/l		uS/cm	mg/l	mg/l	°C	mg/l	mg/l	mg/l	mg/l	mg/l	mV	mg/l	mg/l
		Freshwater EQS**	1	0.123	0.004	0.004	0.0137	0.0137				0.015**		250	400						
J a n u a r y	Upstream of Landfill	SWU	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SW2A1	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SWW4	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
	NW Ditch System	SWW1	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SWW2	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
	Downstream of Landfill	SWD	<	0.0100	0.0043	0.0010	0.0002	0.0130	7.70	149.00	<	0.41	7.80	4.00	15.80	7.00	11.00	2.10	119.00	65.60	27.00
		SWD1	<	0.0100	0.0033	0.0014	0.0003	0.0100	7.60	153.00	<	0.41	8.10	5.40	16.70	24.00	10.90	3.30	121.00	57.80	23.00
F e b r u a r y	Upstream of Landfill	SWU	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SW2A1	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SWW4	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
	NW Ditch System	SWW1	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SWW2	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
	Downstream of Landfill	SWD	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SWD1	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
M a r c h	Upstream of Landfill	SWU	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SW2A1	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SWW4	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
	NW Ditch System	SWW1	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SWW2	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
	Downstream of Landfill	SWD	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SWD1	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
A p r i l	Upstream of Landfill	SWU	<	0.010	0.004	0.001	0.000	0.018	7.50	82.60	<	0.41	8.20	4.60	15.50	37.00	9.90	<0.7	-145.00	16.00	7.40
		SW2A1	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SWW4	<	0.010	0.005	<	0.001	<	8.00	869.00	<	0.41	9.60	6.80	360.00	8.00	9.60	9.20	137.00	93.80	134.00
	NW Ditch System	SWW1	<	0.010	0.001	<	0.001	<	7.60	170.00	<	0.41	8.70	4.70	38.20	1.00	8.90	<0.7	-133.00	37.80	19.00
		SWW2	<	0.010	0.008	<	0.001	<	8.00	396.00	<	0.41	10.30	5.50	108.00	4.00	8.00	1.50	-135.00	89.40	40.00
	Downstream of Landfill	SWD	<	0.0100	0.0040	<	0.0010	<	8.10	329.00	<	0.41	10.30	5.70	85.50	5.00	8.80	1.20	-132.00	81.40	44.00
		SWD1	<	0.0100	0.0054	0.0026	0.0003	<	8.00	334.00	<	0.41	8.30	12.80	89.00	3.00	9.60	1.30	-130.00	67.60	59.00
M a y	Upstream of Landfill	SWU	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SW2A1	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SWW4	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
	NW Ditch System	SWW1	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SWW2	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
	Downstream of Landfill	SWD	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SWD1	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S

Table B3
Surface Water Monitoring Results

Month	Location	Date	Mercury, ultra-low total as Hg	Manganese in filtrate as Mn	Nickel in filtrate as Ni	Bioavailable Ni	Zinc, ultra-low total as Zn	Bioavailable Zn	pH	Conductivity-Electrical 20C	Ammoniacal Nitrogen as N	*Unionised Ammoniacal Nitrogen based on measured Temperature	Measured surface water temperature	Chloride as Cl	Sulphate as SO4	Total Suspended Solids	Dissolved Oxygen, fixed	TOC, filtered	Redox Potential	Alkalinity as CaCO3	Calcium
J u n e	Upstream of Landfill	SWU	ug/l	mg/l	mg/l	mg/l	mg/l	mg/l	N/S	uS/cm	mg/l	mg/l	°C	mg/l	mg/l	mg/l	mg/l	mg/l	mV	mg/l	mg/l
		SW2A1	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SWW4	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
	NW Ditch System	SWW1	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SWW2	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
	Downstream of Landfill	SWD	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SWD1	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
J u l y	Upstream of Landfill	SWU	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SW2A1	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SWW4	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
	NW Ditch System	SWW1	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SWW2	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
	Downstream of Landfill	SWD	< 0.0150	0.0005	< 0.0010	0.0004	0.0370	0.0089	8.1000	383.0000	< 0.4100	0.01	14.10	11.00	100.00	5.00	9.20	2.60	-343.00	113.00	46.00
		SWD1	0.0100	0.0027	0.0014	0.0010	0.0070	0.0017	8.1000	384.0000	< 0.4100	0.01	15.60	5.00	101.00	3.00	8.70	2.60	-353.00	94.20	47.00
A u g u s t	Upstream of Landfill	SWU	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SW2A1	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SWW4	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
	NW Ditch System	SWW1	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SWW2	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
	Downstream of Landfill	SWD	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SWD1	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
S e p t e m b e r	Upstream of Landfill	SWU	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SW2A1	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SWW4	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
	NW Ditch System	SWW1	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SWW2	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
	Downstream of Landfill	SWD	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
		SWD1	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S

Table B3
Surface Water Monitoring Results

Month	Location	Date		Mercury, ultra-low total as Hg	Manganese in filtrate as Mn	Nickel in filtrate as Ni	Bioavailable Ni	Zinc, ultra-low total as Zn	Bioavailable Zn	pH	Conductivity-Electrical 20C	Ammoniacal Nitrogen as N	*Unionised Ammoniacal Nitrogen based on measured Temperature	Measured surface water temperature	Chloride as Cl	Sulphate as SO4	Total Suspended Solids	Dissolved Oxygen, fixed	TOC, filtered	Redox Potential	Alkalinity as CaCO3	Calcium							
October	Upstream of Landfill	SWU	Six Monthly 18/10/2021	<	ug/l	mg/l	mg/l	mg/l	<	mg/l	mg/l	7.50	86.20	<	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mV	mg/l	mg/l						
		SW2A1		<	0.01	0.00	0.00	0.00	<	0.00	0.01	7.90	779.00	<	0.41	0.01	1.00	9.70	0.80	-282.00	17.00	7.50							
		SWW4		<	0.01	0.00	<	0.00	0.00	<	0.01	0.00	8.00	774.00	<	0.41	0.01	12.20	7.80	6.90	-286.00	81.00	120.00						
	NW Ditch System	SWW1	Six-monthly 18/10/2021	<	0.01	0.01	0.00	0.00	<	0.01	0.00	8.10	358.00	<	0.41	0.01	1.00	9.90	1.40	-291.00	80.60	38.00							
		SWW2		<	0.01	0.00	<	0.00	0.00	<	0.01	0.00	7.80	172.00	<	0.41	0.00	9.50	5.20	38.20	1.00	10.40	0.70	-278.00	40.60	19.00			
	Downstream of Landfill	SWD	18/10/2021	<	0.010	0.001	<	0.001	0.000		0.006	8.100	295.00	<	0.41	0.01	19.00	9.80	1.40	-274.00	80.60	39.00							
SWD1	<	0.010		0.006	0.002	0.001	0.007	0.002	8.000	266.00	<	0.41	0.01	12.20	11.90	63.80	8.00	9.70	3.10	-301.00	60.60	34.00							
November	Upstream of Landfill	SWU	Six-monthly	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S							
		SW2A1		N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S							
		SWW4		N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S							
	NW Ditch System	SWW1	Six-monthly	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S							
		SWW2		N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S							
	Downstream of Landfill	SWD	Quarterly	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S							
SWD1	N/S	N/S		N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S								
December	Upstream of Landfill	SWU	Six-monthly	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S							
		SW2A1		N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S							
		SWW4		N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S							
	NW Ditch System	SWW1	Six-monthly	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S							
		SWW2		N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S							
	Downstream of Landfill	SWD	Quarterly	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S							
SWD1	N/S	N/S		N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S								
Minimum				<	0.0100	<	0.0008	<	0.0010	<	0.0002	<	0.0006	<	0.0013	7.5000	86.2000	<	<	0.0024	9.5000	4.1000	16.1000	1.0000	7.4000	0.7000	-301.0000	17.0000	7.5000
Maximum				<	0.0100	<	0.0098	<	0.0023	<	0.0007	<	0.0250	<	0.0065	8.1000	779.0000	<	<	0.0107	12.2000	11.9000	337.0000	170.0000	10.4000	7.4000	-192.0000	81.0000	120.0000
Count					7.00	#	#	#	#	#	7.00	7.00	#	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	0.00							

- Exceedance of EQS
- Upstream of Nant Merddog
- Downstream of Nant Merddog
- Notes
- 1.The redox potential was not measured on site and there is a possibility that it has changed between sampling and analysis
- 2.N/S - Not analysed
- 3.Unionised ammoniacal nitrogen based on measured
- 4.Environmental Quality Standard EQS 1 for freshwater is derived to protect the most sensitive aquatic life.
- 5.NW Ditch - North Western (ditch system)

Table B4
Groundwater monitoring results

Location	Month	Date	Test reference number	Redox Potential	Mercury, filtrate as Hg	Manganese in filtrate as Mn	Nickel in filtrate as Ni	Zinc, ultra-low filtered as Zn	pH	Electrical Conductivity 20C	Alkalinity as CaCO3	Ammonical Nitrogen as N	Ammonical Nitrogen ***	Measure water temperature	Chloride as Cl	Sulphate as SO4	Calcium	D.O. concentration	TOC (Filtered)					
				mV	ug/l	mg/l	mg/l	mg/l	pH units	uS/cm	mg/l	mg/l	mg/l	°C	mg/l	mg/l	mg/l	mg/l	mg/l					
Trigger Level					(0.2°)		0.05	(0.05°)	--	--	--	1	--	--	250	400	--	--	--					
Control Level A					(0.1°)	--	0.03	(0.02°)	--	--	--	0.8	--	--	210	300	--	--	--					
Control Level B					(0.15°)	--	0.04	(0.035°)	--	--	--	0.9	--	--	230	350	--	--	--					
Assessment Level					--	(1.0°)	--	--	--	--	--	--	--	--	--	--	--	--	--					
UPSTREAM WELLS																								
SST East S3																								
GW3A	Jan-20	21/01/20	18977407	15	0.620	<	0.0070	<	0.0030	<	0.0180	7.1	496.0	220.0	<	0.41	11.6	92.0	72.5	9.1	1.4			
	Feb-20		Quarterly																					
	Mar-20																							
	Apr-20	21/04/20	1860909	157	0.463		0.0089	<	0.0030	<	0.3600	7.7	560.0	248.0	<	0.41	0.0048	13.2	12.5	89.6	8.0	1.6		
	May-20		Quarterly																					
	Jun-20																							
	Jul-20	21/07/20	19513248	119	0.36	<	0.0070	<	0.0030	<	0.0180	7.3	473.0	184.0	<	0.41	0.0020	13.5	10.2	90.6	68.6	11.2	1.8	
	Aug-20		Quarterly																					
	Sep-20																							
	Oct-20	29/10/20	19827617	-39	0.493	<	0.0070	<	0.003	<	0.0180	7.7	467.0	175	<	0.41	0.0050	13.2	11.2	87.9	62.0	10.2	0.9	
	Nov-20		Quarterly																					
	Dec-20																							
GW4	Jan-21	21/01/21	20069616	108	0.230		0.0089		0.0015		0.0067	6.7	519.0	203.0	<	0.41	0.0005	13.1	11.1	91.2	79.0	8.7	2.1	
	Feb-21		Quarterly																					
	Mar-21																							
	Apr-21	27/04/21	20384851	-26	0.387		0.019	<	0.0010		0.1200	7.0	514.0	205.0	<	0.41	0.0010	13.4	10.4	84.6	N/S	7.1	1.5	
	May-21		Quarterly																					
	Jun-21																							
	Jul-21	20/07/21	20670057	-318	0.26		0.0014	<	0.0010	<	0.0050	7.0	481.0	184.0	<	0.41	0.0010	13.8	10.2	80.5	60.0	8.0	1.7	
	Aug-21		Quarterly																					
	Sep-21																							
	Oct-21	18/10/21	20977670	-248	0.295		0.0016	<	0.001	<	0.0050	7.4	487.0	202	<	0.41	0.0025	13.2	9.8	74.5	68.0	8.5	1.4	
	Nov-21		Quarterly																					
	Dec-21																							
GW11B	Jan-20	21/01/20	18977408	9	0.011	1.8400		0.0040		0.0340	7.0	258.0	66.8	<	0.41		9.7	70.0	16.6	2.3		0.7		
	Feb-20		Quarterly																					
	Mar-20																							
	Apr-20	21/04/20	1860909	152	<	0.010	1.8100		0.0032		0.0251	7.1	261.0	62.0	<	0.41	0.0010	10.0	10.1	66.8		2.0	0.8	
	May-20		Quarterly																					
	Jun-20																							
	Jul-20	21/07/20	19513249	102	<	0.010	1.6400	<	0.0030	<	0.0180	6.9	255.0	60.0	<	0.41	0.0006	9.8	8.4	64.4	68.6	1.9	15.5	
	Aug-20		Quarterly																					
	Sep-20																							
	Oct-20	29/10/20	19827618	-36	<	0.010	1.6600	<	0.0030	<	0.0180	7.2	254.0	60.8	<	0.41	0.0010	9.5	9.2	65.2	16.3	2.0	<	0.7
	Nov-20		Quarterly																					
	Dec-20																							
GW11B	Jan-21	20/01/21	20069616	103	<	0.010	1.5600		0.0035		0.0076	6.7	268.0	63.2	<	0.41	0.0004	9.1	10.0	68.7	19.0	10.2	8.7	
	Feb-21		Quarterly																					
	Mar-21																							
	Apr-21	27/04/21	20384852	-92	<	0.010	1.5600		0.0035		0.0430	6.6	243.0	51.0	<	0.41	0.0003	10.0	7.8	60.7	N/S	1.7	<	0.7
	May-21		Quarterly																					
	Jun-21																							
	Jul-21	27/07/21	20670058	-361		0.015	1.7600		0.0036	<	0.0500	6.7	257.0	61.0	<	0.41	0.0005	12.3	8.8	64.0	18.0	1.3	<	0.7
	Aug-21		Quarterly																					
	Sep-21																							
	Oct-21	18/10/21	20977671	-261		0.012	1.7900		0.0019		0.0110	7.1	251.0	56.8	<	0.41	0.0011	9.8	8.0	66.2	18.0	2.9	<	0.7
	Nov-21		Quarterly																					
	Dec-21																							
GW11B	Jan-20		Not sampled	Quarterly																				
	Feb-20																							
	Mar-20		Not sampled	Quarterly																				
	Apr-20																							
	May-20																							
	Jun-20																							
	Jul-20		Not sampled	Quarterly																				
	Aug-20																							
	Sep-20																							
	Oct-20		Not sampled	Quarterly																				
	Nov-20																							
	Dec-20																							
GW11B	Jan-21		Not sampled	Quarterly																				
	Feb-21																							
	Mar-21																							
	Apr-21		Not sampled	Quarterly																				
	May-21																							
	Jun-21																							
	Jul-21																							
	Aug-21		Not sampled	Quarterly																				
	Sep-21																							
	Oct-21																							
	Nov-21		Not sampled	Quarterly																				
	Dec-21																							

Table B4
Groundwater monitoring result

Location	Month	Date	Test reference number	Redox Potential	Mercury, filtrate as Hg	Manganese in filtrate as Mn	Nickel in filtrate as Ni	Zinc, ultra-low filtered as Zn	pH	Electrical Conductivity 20C	Alkalinity as CaCO3	Ammoniacal Nitrogen as N	Ammoniacal Nitrogen ***	Measure water temperature	Chloride as Cl	Sulphate as SO4	Calcium	D.O. concentration	TOC (Filtered)	
				mV	ug/l	mg/l	mg/l	mg/l	pH units	uS/cm	mg/l	mg/l	mg/l	°C	mg/l	mg/l	mg/l	mg/l	mg/l	
Trigger Level				--	(0.2")	--	0.05	(0.05")	--	--	--	1	--	--	250	400	--	--	--	
Control Level A				--	(0.1")	--	0.03	(0.02")	--	--	--	0.8	--	--	210	300	--	--	--	
Control Level B				--	(0.15")	--	0.04	(0.035")	--	--	--	0.9	--	--	230	350	--	--	--	
Assessment Level				--	(1.0")	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
DOWNSTREAM WELLS / COMPLIANCE WELLS																				
SST West S2	GW12	Jan-20	18977414	40	0.098	0.0102	0.0076	< 0.0180	7.8	1660.0	431.0	< 0.41	--	--	95.0	321.0	151.0	4.0	11.8	
		Feb-20	Quarterly																	
		Mar-20																		
		Apr-20	21/04/20	1860909	183	0.11	0.0130	0.0062	0.0659	8.2	1660.0	433.0	< 0.41	0.0254	20.8	101.0	312.0		4.8	9.3
		May-20	Quarterly																	
		Jun-20																		
		Jul-20	21/07/20		133	0.14	< 0.0070	0.0001	< 0.0180	7.6	1360.0	414.0	< 0.41	0.0059	19.1	50.6	296.0	129.0	6.2	6.0
		Aug-20	Quarterly																	
		Sep-20																		
		Oct-20	29/10/20	19827623	-20	0.06	< 0.0070	0.0137	< 0.0180	7.8	1340.0	359.0	< 0.41	0.0100	19.8	70.9	245	122	6.6	7.7
		Nov-20	Quarterly																	
		Dec-20																		
	GW12	Jan-21	20/01/21	20069623	137	0.019	0.0081	0.0013	< 0.0050	7.0	454.0	184.0	< 0.41	0.0016	20.1	15.0	48.3	55.0	8.8	2.4
		Feb-21	Quarterly																	
		Mar-21																		
		Apr-21	27/04/21	20384858	-173	0.15	0.0015	0.0051	0.1700	7.4	1530.0	420.0	< 0.41	0.0038	19.3	93.8	276.0	N/S	6.0	10.9
May-21		Quarterly																		
Jun-21																				
Jul-21		27/07/21	20670064	-271	0.06	0.0009	0.0050	< 0.0050	8.1	1620.0	444.0	< 0.41	0.0190	19.8	97.8	298.0	146.0	5.7	9.2	
Aug-21		Quarterly																		
Sep-21																				
Oct-21	18/10/21	20977677	-296	0.10	0.0005	0.0040	< 0.0050	7.9	1520.0	397.0	< 0.41	0.0122	18.5	83.8	318.0	161.0	6.6	8.5		
Nov-21	Quarterly																			
Dec-21																				
SST Centre	GW6	Jan-20	18977409	30	0.064	0.4630	0.0150	< 0.0180	7.0	854.0	354.0	< 0.41	--	--	71.3	91.2	61.0	3.5	7.1	
		Feb-20	Quarterly																	
		Mar-20																		
		Apr-20	21/04/20	1860909	170	0.06	0.7120	0.0254	< 0.0180	7.3	869.0	311.0	< 0.41	0.0018	12.0	73.7	86.6		3.5	4.2
		May-20	Quarterly																	
		Jun-20																		
		Jul-20	21/07/20	19513250	116	0.06	0.8270	0.0124	< 0.0180	6.7	786.0	288.0	< 0.41	0.0005	12.4	69.7	83.3	54.9	3.1	3.9
		Aug-20	Quarterly																	
		Sep-20																		
		Oct-20	29/10/20	19827619	-26	0.04	0.6860	0.0088	< 0.0180	6.8	838.0	285.0	< 0.41	0.0010	12.2	76	84.8	48.3	2.4	4.1
		Nov-20	Quarterly																	
		Dec-20																		
	GW6	Jan-21	20/01/21	20069618	137	0.036	0.4410	0.0098	< 0.0050	6.6	901.0	303.0	< 0.41	0.0004	12.0	82.2	96.6	54.0	4.1	4.8
		Feb-21	Quarterly																	
		Mar-21																		
		Apr-21	27/04/21	20384853	-94	0.05	0.3740	0.0140	0.0520	6.7	935.0	341.0	< 0.41	0.0004	11.8	77.9	85.5	N/S	3.2	4.7
May-21		Quarterly																		
Jun-21																				
Jul-21		27/07/21	20670059	-318	0.05	0.1480	0.0079	< 0.0050	6.5	879.0	301.0	< 0.41	0.0003	12.8	80.4	77.9	57.0	2.5	5.1	
Aug-21		Quarterly																		
Sep-21																				
Oct-21	18/10/21	20977672	-252	0.06	0.4820	0.0083	< 0.0050	7.0	799.0	262.0	< 0.42	0.0009	12.4	78.6	73.7	54.0	2.6	3.6		
Nov-21	Quarterly																			
Dec-21																				
	GW7	Jan-20	18977410	44	< 0.01	1.2800	0.0065	< 0.0180	7.6	900.0	323.0	< 0.41	--	--	59.2	62.6	84.7	4.3	6.4	
		Feb-20	Quarterly																	
		Mar-20																		
		Apr-20	21/04/20	1860909	175	< 0.01	1.2700	0.0056	< 0.0180	8.1	888.0	318.0	< 0.41	0.0104	11.4	56.7	72.6		4.9	6.2
		May-20	Quarterly																	
		Jun-20																		
		Jul-20	21/07/20	19513251	124	< 0.01	2.0500	0.0060	< 0.0180	7.4	968.0	322.0	< 0.41	0.0021	11.6	65.7	94.2	88.3	3.7	6.5
		Aug-20	Quarterly																	
		Sep-20																		
		Oct-20	29/10/20	19827620	-26	< 0.01	1.6900	0.0050	< 0.0180	7.7	927.0	326.0	< 0.41	0.0040	12.0	53.4	96.2	83.8	3.5	5.0
		Nov-20	Quarterly																	
		Dec-20																		
	GW7	Jan-21	20/01/21	20069619	111	< 0.010	0.0071	0.0052	0.0120	7.1	837.0	312.0	< 0.41	0.0011	11.8	46.9	80.6	85.0	4.1	5.3
		Feb-21	Quarterly																	
		Mar-21																		
		Apr-21	27/04/21	20384854	-168	< 0.010	0.9050	0.0051	0.0097	7.2	736.0	263.0	< 0.41	0.0014	11.7	38.3	75.1	N/S	4.5	4.7
May-21		Quarterly																		
Jun-21																				
Jul-21		27/07/21	20670060	-321	< 0.10	1.0500	0.0031	< 0.0500	7.7	679.0	286.0	< 0.41	0.0048	13.2	32.7	67.5	84.0	3.5	5.2	
Aug-21		Quarterly																		
Sep-21																				
Oct-21	18/10/21	20977673	-254	< 0.01	1.5900		0.0044	0.0068	7.9	853.0	294.0	< 0.41	0.0075	12.0	52.7	110.0	85.0	3.6	5.9	
Nov-21	Quarterly																			
Dec-21																				

Table B4
Groundwater monitoring results

Location	Month	Date	Test reference number	Redox Potential	Mercury, filtrate as Hg	Manganese in filtrate as Mn	Nickel in filtrate as Ni	Zinc, ultra-low filtered as Zn	pH	Electrical Conductivity 20C	Alkalinity as CaCO ₃	Ammoniacal Nitrogen as N	Unionised Ammoniacal Nitrogen ***	Measure water temperature	Chloride as Cl	Sulphate as SO ₄	Calcium	D.O. concentration	TOC (Filtered)
				mV	ug/l	mg/l	mg/l	mg/l	pH units	uS/cm	mg/l	mg/l	mg/l	°C	mg/l	mg/l	mg/l	mg/l	mg/l
Trigger Level				(0.2°)			0.05	(0.05°)	--	--	--	1	--	--	250	400	--	--	--
Control Level A				(0.1°)		--	0.03	(0.02°)	--	--	--	0.8	--	--	210	300	--	--	--
Control Level B				(0.15°)		--	0.04	(0.035°)	--	--	--	0.9	--	--	230	350	--	--	--
Assessment Level				--		(1.0°)	--	--	--	--	--	--	--	--	--	--	--	--	--
SST East S2	GW9	Jan-20	21/01/20 18977411 Quarterly	33	0.01	0.8880	0.0051	< 0.0180	6.9	555.0	218.0	4.75	--	--	40.7	67.2	35.5	1.8	4.9
		Feb-20																	
		Mar-20																	
		Apr-20	21/04/20 1860909 Quarterly	186	0.08	1.6800	0.0114	0.0304	7.7	1570.0	495.0	24.90	0.2604	11.7	179.0	33.7		4.4	14.0
		May-20																	
		Jun-20																	
		Jul-20	21/07/20 19513252 Quarterly	115	0.00	0.4630	< 0.0030	< 0.0180	6.9	368.0	74.6	1.20	0.0021	12.3	24.8	28.2	21.3	2.3	2.3
		Aug-20																	
		Sep-20																	
		Oct-20	29/10/20 19827621 Quarterly	-29	0.02	0.3120	< 0.0030	< 0.0180	7.0	249.0	70.6	1.05	0.0020	12.0	13.8	13.5	15.3	2.0	2.4
		Nov-20																	
		Dec-20																	
	GW10	Jan-21	20/01/21 20069620 Quarterly	110	0.015	0.2920	0.0028	0.0050	6.6	376.0	129.0	5.85	0.0049	11.7	28.5	15.1	21.0	2.9	3.7
		Feb-21																	
		Mar-21																	
		Apr-21	27/04/21 20384855 Quarterly	-170	0.10	0.6490	0.0046	0.0330	6.6	664.0	185.0	6.35	0.0054	11.8	49.9	24.9	N/S	2.5	5.6
		May-21																	
		Jun-21																	
		Jul-21	27/07/21 20670061 Quarterly	-285	0.01	0.0347	0.0019	0.0087	7.3	926.0	317.0	7.90	0.0402	14.3	41.4	24.1	71.0	3.4	8.0
		Aug-21																	
		Sep-21																	
		Oct-21	18/10/21 20977674 Quarterly	-307	0.04	0.9200	0.0035	0.0160	7.3	772.0	169.0	7.43	0.0378	12.7	67.4	28.6	45.0	1.8	4.7
		Nov-21																	
		Dec-21																	
SST East S3	GW9	Jan-20	21/01/20 18977412 Quarterly	30	0.09	6.4600	0.0139	< 0.0180	7.2	584.0	245.0	< 0.41	--	--	22.6	56.5	66.1	< 0.5	10.4
		Feb-20																	
		Mar-20																	
		Apr-20	21/04/20 1860909 Quarterly	164	0.06	0.0900	0.0058	0.0705	7.8	688.0	276.0	< 0.41	0.0047	9.9	29.2	51.1		6.7	6.9
		May-20																	
		Jun-20																	
		Jul-20	21/07/20 19513253 Quarterly	114	0.00	0.5150	0.0050	< 0.0180	7.0	520.0	200.0	< 0.41	0.0008	10.0	17.9	57.9	63.5	5.1	4.7
		Aug-20																	
		Sep-20																	
		Oct-20	29/10/20 19827622 Quarterly	-27	0.04	6.7900	0.0103	< 0.0180	7.5	500.0	218.0	< 0.41	0.0030	11.4	10.9	50.6	68.1	1.6	5.7
		Nov-20																	
		Dec-20																	
	GW10	Jan-21	20/01/21 20069621 Quarterly	104	0.07	0.2140	0.0027	< 0.0050	6.8	254.0	124.0	< 0.41	0.0006	13.1	5.5	19.5	45.0	9.2	2.3
		Feb-21																	
		Mar-21																	
		Apr-21	27/04/21 20384856 Quarterly	-251	0.07	1.6800	0.0091	0.085	6.9	639.0	240.0	< 0.41	0.0006	10.1	27.1	41.1	N/S	2.9	7.0
		May-21																	
		Jun-21																	
		Jul-21	27/07/21 20670062 Quarterly	-310	0.07	1.3500	0.0097	< 0.0050	7.1	480.0	191.0	< 0.41	0.0012	13.4	17.5	42.3	61.0	5.4	5.3
		Aug-21																	
		Sep-21																	
		Oct-21	18/10/21 20977675 Quarterly	-281	0.03	1.4800	0.0082	< 0.0050	7.7	439.0	181.0	< 0.41	0.0049	11.1	10.8	48.7	61	5.3	4.1
		Nov-21																	
		Dec-21																	

Notes

* The redox potential was not measured on site and there is a possibility that it has changed between sampling and analysis(*°)

** Unionised ammoniacal nitrogen based on measured Temperature and pH; unionised ammoniacal nitrogen = total ammonia/(1+10^{(10.055-(0.0124°T°)-pH)}), where T° is measured water temperature.

^ Ammonia result confirmed on duplicate analysis.

	Exceedance of Control Level
	Exceedance of Trigger Level
	Exceedance of Assessment Level

Silent Valley Landfill

Silent Valley Landfill

Table B5
Landfill Gas Monitoring Results

METHANE (% by Volume)													CARBON DIOXIDE (% by Volume)														
Location	Valve	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Jan-22*	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Jan-22*	Comments	
GMW7	Yellow Valve	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0.2	0.2	0.6	0.8	0.6	0.6	0.6	0.9	0.6	0.8	0.6	0.2	Yellow Valve,12 depth	
	White Valve	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0.2	0.2	0.6	0.8	0.6	0.6	0.6	0.9	0	0	0.6	0.2	White Valve, 5m depth	
	Trigger Levels	1	1	1	1	1	1	1	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	Trigger Levels	
	Control Levels	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	-	-	-	-	-	-	-	-	-	-	-	Control Levels	
	Trigger Level Yellow	-	-	-	-	-	-	-	-	-	-	-	-	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	Trigger Level Yellow	
	Trigger Level White	-	-	-	-	-	-	-	-	-	-	-	-	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	1.82	Trigger Level White	
	Control Level Yellow	-	-	-	-	-	-	-	-	-	-	-	-	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	Control Level Yellow	
Control Level White	-	-	-	-	-	-	-	-	-	-	-	-	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.32	Control Level White		
GMW12	Red Valve	0	0	0	0	0	0	0	0.1	0.1	0.1	0	0	0.4	0.4	2.3	0.7	0.9	0	0	0	0.1	0.1	0.3	0	Red Valve, 26.3m depth	
	Yellow Valve	0	0	0	0	0	0	0	0.1	0.1	0.1	0	0	2.8	2.7	2.8	1.2	2.1	2.4	2.4	2.6	2.9	3.1	2.5	0.3	Yellow Valve,15m depth	
	White Valve	0	0	0	0	0	0	0.1	0.1	0.1	0.1	0	0	0.4	0.9	1	0.8	1.1	0.8	0.8	0.9	1	1.1	0.9	1.2	White Valve, 5m depth	
	Trigger Level Red	1.89	1.89	1.89	1.89	1.89	1.89	1.89	1.89	1.89	1.89	1.89	1.89	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	Trigger Level Red
	Trigger Level Yellow	1	1	1	1	1	1	1	1	1	1	1	1	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	Trigger Level Yellow	
	Trigger Level White	1	1	1	1	1	1	1	1	1	1	1	1	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	Trigger Level White
	Control Level Red	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39	4	4	4	4	4	4	4	4	4	4	4	4	Control Level Red	
	Control Level Yellow	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	Control Level Yellow	
Control Level White	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	5	5	5	5	5	5	5	5	5	5	5	5	Control Level White		
GMW13	Red Valve	0	0	0	0	0	0.1	nt	0.1	0.1	0.1	0	0	1.4	1.5	1.1	1.3	0.9	5.6	nt	1.3	1.5	1.4	1.2	1.5	Red Valve, 26.3m depth	
	Yellow Valve	0.1	0.1	0.1	0	0.1	0	0.1	0.2	0.2	0.2	0.1	0.1	4.2	4.9	4.8	5.1	5	2.5	5.6	5.3	5	4.9	5.1	4.6	Yellow Valve,15m depth	
	White Valve	0	0	0	0	0	0	0	0.1	0.1	0.1	0	0	2.1	2.4	0	2.4	2.5	1.4	2.5	2.1	3.4	3.8	2.2	3.4	White Valve, 5m depth	
	Trigger Level Red	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	Trigger Level Red	
	Trigger Level Yellow	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	6	6	6	6	6	6	6	6	6	6	6	6	Trigger Level Yellow	
	Trigger Level White	1	1	1	1	1	1	1	1	1	1	1	1	5.82	5.82	5.82	5.82	5.82	5.82	5.82	5.82	5.82	5.82	5.82	5.82	5.82	Trigger Level White
	Control Level Red	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	Control Level Red	
	Control Level Yellow	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	Control Level Yellow	
Control Level White	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	5.32	5.32	5.32	5.32	5.32	5.32	5.32	5.32	5.32	5.32	5.32	5.32	Control Level White		
GMW14/14A	Red Valve	0	0	0	0	0	0	0	0	0.1	0.1	0	0	1.7	3.4	3.7	0.6	0.3	0.5	1.4	0.8	1.1	3.9	1.3	5.4	Red Valve, 26.3m depth	
	Yellow Valve	0	0	0	0	0	0.1	0.1	0	0.1	0.1	0	0	6	6.5	6.3	4.5	3.7	3.6	3.6	7	6.9	5	6	4.7	Yellow Valve,15m depth	
	White Valve	0	0	0	0	0	0	0	0	0.1	0.1	0	0	5.1	5.5	5.3	1.9	3.9	2.2	2.2	3.4	4.3	5.3	4	6.9	White Valve, 5m depth	
	Trigger Level Red	1	1	1	1	1	1	1	1	1	1	1	1	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	Trigger Level Red	
	Trigger Level Yellow	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	Trigger Level Yellow	
	Trigger Level White	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	Trigger Level White
	Control Level Red	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	1	1	1	1	1	1	1	1	1	1	1	Control Level Red	
	Control Level Yellow	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	Control Level Yellow	
Control Level White	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	Control Level White		
GMW1**	Red Valve	0	0.3	0.4	0.7	0	3	3	2.1	4.3	6.7	1.1	2.5	2.1	6	2.8	1.8	0	4.1	4.1	4.2	6.3	7.5	3.6	2.3	Red Valve, 23.5m depth	
	Yellow Valve	2.6	0	0	23.3	6.8	16.1	16.1	16.5	15.2	26.6	10	nt	1.2	0.1	0	1.6	7.3	8.8	8.8	10.1	10.7	10.5	6.9	nt	Yellow Valve,14.7m depth	
	White Valve	0	1.2	0.8	0	0	0.1	0.1	0.1	nt	nt	tap damaged tap damaged		0	0.9	0.6	0	0	0	0	0	nt	nt	tap damaged tap damaged		White Valve, 6.5m depth	
GMW8*	Yellow Valve	8.6	9.4	8.9	7.3	4.1	4.7	4.7	4	4	4.1	5.3	6.5	8.3	7.6	7.7	7.8	4.7	5.1	5.1	5.1	4.6	5.3	5.6	7.7	Yellow Valve,17.5m depth	
	White Valve	0	0	0	0	0	0.1	0.1	0	0.1	0.1	0	0	4	3.7	3.9	3.8	3.8	3.4	3.4	3.4	4.2	4.8	3.5	4.9	White Valve, 5.7m depth	
GMW9*	Red Valve	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0	0	1.9	1.8	1.9	1.9	1.6	1.7	1.7	1.7	1.9	1.9	1.7	2	Red Valve, 27m depth	
	Yellow Valve	25.3	27.7	27.6	23.7	22.7	20.4	20.4	18.5	19	18.1	21.8	19.4	8.6	8.7	9.1	9.3	8.3	9.7	9.7	10.5	11.5	11.8	9.5	9.1	Yellow Valve,15m depth	
	White Valve	0.1	0.1	0	0	0	0.1	0.1	0.1	0.1	0.1	0	0	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.2	0.2	0.2	0.1	0.1	White Valve, 8.5m depth	
GMW10*	Red Valve	14.8	15	0.1	25.3	18.6	19.2	19.2	19.8	20.9	32.3	18.3	0	4.3	3.7	7.8	6.9	6.7	8.1	8.1	8.8	7.6	8.2	7	4.1	Red Valve, 19.5m depth	
	Yellow Valve	15.6	18	0	41.4	19.7	13.2	13.2	34.2	18.8	32.3	26.5	13.5	2.6	2.3	0.1	6.7	3.2	2.7	2.7	7.3	4	6.6	5	2.3	Yellow Valve,15m depth	
	White Valve	16.5	14.5	12.1	5.5	3.2	3	3	3.9	5.7	7.3	6.3	0	6.5	7.2	8.3	8.4	8.3	8.4	8.4	8.4	8.4	8.8	8	4.3	White Valve, 8m depth	
GMW17**	Red Valve	0	0	0	0	0	0	0	0	0.1	0.1	0	0	1.4	1.5	1.3	1.3	1.1	1.2	1.2	1.3	1.3	1.4	1.3	1.6	Red Valve, 26.3m depth	
	Yellow Valve	0	0	0	0	0	0	0	0	0.1	0.1	0	0	5.1	5.1	4.8	4.9	4.3	4.1	4.1	4	4.6	5.6	4.3	6.1	Yellow Valve,15m depth	
	White Valve	0	0	0	0	0	0	0	0	0.1																	

- Notes:
1. Water denotes 'water in well - reading abandoned'.
 2. NT denotes 'reading not taken'.
 3. NT in GMW14 is due to cattle quarantine paddock around well location.
 4. Where the asterisc (*) is present, no trigger levels have been set, as high levels of methane and carbon dioxide gas are recorded. This is likely to be associated with the presence of bog/marshland.
 5. Where two asteriscs (**) are present, no trigger levels have been set, as not require by the Permit (Reference [2]).

	Exceedance of Trigger
	Exceedance of Control

Appendix C

GMW14/14A Technical Note

Appendix D

LC2A Technical Note

Appendix E

Flux Box Survey Report

Flux Box Survey Report
Silent Valley Landfill Site
September 2021

Approval Sheet

Customer Arup

Site Silent Valley Landfill Site

Project title Flux Box Survey

Project Manager D Stodgell

Project Staff A Meaden, L Goodchild, M Credali, C Keightley

Address enitial
Enterprise Drive
Four Ashes
Wolverhampton
WV10 7DE

Tel: 01902 798798
www.enitial.co.uk

Version	Date	Prepared by	Signature	Date
1	18/10/2021	C Keightley	C Keightley	13/10/2021
		Approved by	Signature	Date
		D Stodgell	D Stodgell	18/10/2021

Foreword

Enitial has used its best endeavours, experience, and expertise to provide a meaningful, accurate and relevant representation of any works carried out and information procured. Any works detailed are based on a defined programme and scope of works and any data acquisition and management is in accordance with contract conditions agreed with the Client.

The findings discussed in this document relating to information acquired on behalf of the Client relates only to data and information to which we have had access. It is acknowledged that certain aspects may be superseded or rendered irrelevant by information in documentation to which we have no access.

Enitial cannot accept responsibility to any parties whatsoever, following the issue of this report, for any matters arising which may be considered outside the agreed scope of works.

This report is issued solely to the Client, Enitial does not accept any responsibility to any third parties to whom this report may be circulated, in part or in full, and any such parties rely on the contents at their own risk.

Contents

<i>Approval Sheet, Foreword and Contents</i>	2-4
1. Introduction	
1.1 Brief	5
1.2 Desk Study	5
2. Survey Summary	
2.1 Flux Box Survey	6
3. Results Summary	
3.1 Flux Box Survey Results	7
3.2 Notes on Calculation of Flux and Average Q Values	8
4. Field Log	
4.1 Weather Conditions and Meteorological Data	9
4.2 Site Personnel and Equipment	10
 Appendix	
A. Flux Box Survey Results	
B. Flux Box Survey Plan	

1.0 Introduction

1.1 Brief

enitial were commissioned by Arup to undertake a Surface Emissions Phase 2 (Flux Box) Survey at their Silent Valley Landfill Site in September 2021. Silent Valley Landfill Site is situated in the Ebbw Vale area of Blaenau Gwent at NGR SO185070. The site is no longer accepting waste inputs and the site has been permanently capped.

1.2 Desk Study

A desktop study was undertaken prior to the Flux Box Survey by collecting information supplied by Arup in the form of drawings of capping areas and up to date topography. One zone was identified as requiring Flux Box Surveying which comprised of permanent grass covered clay capping.

2.0 Survey Summary

2.1 Flux Box Survey

The Flux Box Survey was undertaken on 14, 16, 23, 24, 27, 29 and 30 September 2021 and included the capped and restored areas of the landfill site as indicated on the plan contained in Appendix B.

The required number of test locations was calculated to be 64 during the desktop study. Co-ordinates were generated for each test and each location was set out by the use of a handheld GPS with a typical accuracy of up to 3m. Where a test location was not accessible or unsuitable, the nearest practical location was used and the revised co-ordinates recorded. The flux box used was constructed using a white plasterer's bath with a quick release monitoring point. Where required, each location was cleared of vegetation and / or levelled using hand tools prior to the test being undertaken. The flux box was then placed onto the surface and adequately sealed in addition to placing a weight on top of the flux box. Each location was tested for a duration of 30 minutes by connecting the Gas-Tec FID to the flux box monitoring point, with any concentration increases recorded at 1 minute intervals for the first 10 minutes and at 2 minute intervals for the remainder of the test.

3.0 Results Summary

3.1 Flux Box Survey Results

A full set of Flux Box Survey results are presented in Appendix A along with a plan showing the location of each test in Appendix B.

The EA Guidance sets standards for gas emissions from a landfill surface which is expressed as the average flux of methane from the surface of the cap in each zone. The emission standard for a permanently capped zone is 0.001mg/m²/second.

As can be seen from the table below, the average flux of methane from the surface of the cap in Zone 1 is within the EA standards detailed above.

Zone	Capping Type	EA Standard for Capping Type (mg/m ² /sec)	Average Q Value for Zone (mg/m ² /sec)	Within EA Standards (Y/N)
1	Permanent	0.001	0.00041	Y

3.2 Notes on Calculation of Flux and Average Q Values

Data points used in the calculation of the Q values are shown as highlighted yellow in the tables presented in Appendix A. The concentration change is converted into mg/m^3 by multiplying the ppm value by 0.714 (source - EA Guidance). The volume of the flux box used is 0.16m^3 with a basal area of 0.65m^2 .

In order to obtain data with a high correlation coefficient (preferably $r^2 \geq 0.8$) some data points may be removed at the calculation stage (as detailed in Section 7.2 of the EA Guidance). In addition, an assessment is made to determine what data is considered most representative for that test location and which data will be used in the Q value calculation.

Where data used does not achieve an r^2 value of ≥ 0.8 , the location is reported as being 'at the limit of detection' and as detailed above the data that is considered the most representative for that test location is used, subject to the possibility of retesting the location depending on the overall / average Q value for that zone, i.e. if the emission rate for that location is not likely to significantly affect the overall average Q value of the zone then retesting is not deemed necessary.

Where no elevated readings are detected (or the change in concentration is zero, or a negative change in concentration is recorded at locations when an initial zero reading cannot be attained due to elevated background readings), the location is reported as being less than the lower detection limit value of $5 \times 10^{-5} \text{ mg}/\text{m}^2/\text{second}$ for the flux box used.

4.0 Field Log

4.1 Weather Conditions and Meteorological Data

Meteorological data was recorded from on-site observations and local weather station data. The table below details conditions and observations made during the survey.

Date / Time Period	Weather Conditions	Ground Conditions	Temperature (°C)	Atmospheric Pressure (mbar)	Wind Direction / Speed (mph)
14/09/2021 13:04	Overcast	Moist	15	1013	NNE / 6
14/09/2021 15:10	Overcast	Moist	16	1013	N / 6
16/09/2021 09:45	Sunny	Dry	16	1018	W / 5
16/09/2021 15:15	Overcast	Dry	17	1017	WSW / 8
23/09/2021 09:05	Light rain	Moist	16	1021	W / 11
23/09/2021 16:50	Sunny	Dry	18	1019	W / 8
24/09/2021 08:10	Sunny	Moist	12	1017	W / 8
24/09/2021 13:00	Sunny	Dry	18	1017	NW / 12
27/09/2021 09:15	Sunny intervals	Wet	9	1006	W / 13
27/09/2021 15:55	Sunny	Moist	13	1011	WSW / 14
29/09/2021 09:05	Sunny	Wet	8	1020	WNW / 14
29/09/2021 16:15	Sunny	Wet	12	1024	WNW / 14
30/09/2021 08:50	Rain	Wet	11	1018	SSW / 14
30/09/2021 15:10	Rain	Wet	14	1014	SW / 20

4.2 Site Personnel and Equipment

The table below details the personnel on site during the survey and the equipment type used including serial number and calibration expiry details.

Date	Personnel	Instrument Type	Instrument Serial Number	Calibration Due	Flux Box Reference
14/09/2021	A Meaden L Goodchild M Credali	Gas-Tec FID	60670 3393	28/12/2021	UNK
16/09/2021	L Goodchild	Gas-Tec FID	201112 0001	14/11/2021	UNK
23/09/2021	A Meaden	Gas-Tec FID	60670 3393	28/12/2021	UNK
24/09/2021	A Meaden	Gas-Tec FID	60670 3393	28/12/2021	UNK
27/09/2021	A Meaden	Gas-Tec FID	60670 3393	28/12/2021	UNK
29/09/2021	A Meaden	Gas-Tec FID	60670 3393	28/12/2021	UNK
30/09/2021	A Meaden	Gas-Tec FID	60670 3393	28/12/2021	UNK

APPENDIX A

Flux Box Survey Results

Silent Valley Landfill Site

Flux Box Survey Calculations - Zone 1

September 2021



ID	Date	Location		Concentration in mg/m³ over time in seconds																		Linear Regression		V/A (V = 0.16m³, A = 0.65m²)	Flux (Q) in mg/m²/secon d (Q = V/A x (dc/dt))	Comments			
		E	N	0	60	120	180	240	300	360	420	480	540	600	720	840	960	1080	1200	1320	1440	1560	1680				1800	r² value	dc/dt
Z1/01	14/09/2021	318626	207270	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection
Z1/02	14/09/2021	318674	207270	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.500	0.002	0.246	0.00059	At limit of detection *
Z1/03	16/09/2021	318434	207222	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection
Z1/04	16/09/2021	318482	207222	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection
Z1/05	16/09/2021	318530	207222	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection
Z1/06	16/09/2021	318578	207222	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection
Z1/07	16/09/2021	318626	207222	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.500	0.007	0.246	0.00176	At limit of detection *
Z1/08	14/09/2021	318674	207222	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection
Z1/09	23/09/2021	318386	207174	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection
Z1/10	23/09/2021	318434	207174	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection
Z1/11	23/09/2021	318482	207174	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.7	0.7	0.7	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	0.854	0.001	0.246	0.00026	r2 > 0.8
Z1/12	23/09/2021	318530	207174	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection
Z1/13	23/09/2021	318578	207174	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.7	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.750	0.004	0.246	0.00088	At limit of detection *
Z1/14	16/09/2021	318626	207174	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection
Z1/15	16/09/2021	318674	207174	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection
Z1/16	23/09/2021	318338	207126	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection
Z1/17	23/09/2021	318386	207126	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	1.4	1.4	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.627	0.002	0.246	0.00061	At limit of detection *
Z1/18	23/09/2021	318434	207126	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection
Z1/19	23/09/2021	318482	207126	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection
Z1/20	23/09/2021	318530	207126	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection
Z1/21	23/09/2021	318578	207126	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection
Z1/22	23/09/2021	318626	207126	0.0	0.0	0.7	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.125	0.001	0.246	0.00029	At limit of detection *
Z1/23	23/09/2021	318674	207126	0.0	0.0	0.0	0.0	0.0	0.7	0.7	0.7	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.771	0.003	0.246	0.00075	At limit of detection *
Z1/24	24/09/2021	318722	207126	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection
Z1/25	27/09/2021	318338	207078	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection
Z1/26	27/09/2021	318386	207078	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.750	0.004	0.246	0.00088	At limit of detection *
Z1/27	27/09/2021	318434	207078	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection
Z1/28	24/09/2021	318482	207078	0.0	0.0	0.7	0.7	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.750	0.004	0.246	0.00088	At limit of detection *
Z1/29	24/09/2021	318530	207078	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection
Z1/30	24/09/2021	318578	207078	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection
Z1/31	24/09/2021	318626	207078	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection
Z1/32	24/09/2021	318674	207078	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection
Z1/33	24/09/2021	318722	207078	0.0	0.7	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.125	0.001	0.246	0.00029	At limit of detection *
Z1/34	24/09/2021	318770	207078	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection
Z1/35	27/09/2021	318345	207030	0.0	0.0	0.0	0.0	0.0	2.9	7.1	5.7	1.4	1.4	0.0	3.6	1.4	0.7	1.4	2.1	0.0	0.0	2.9	0.0	0.0	0.813	0.031	0.246	0.00762	r2 > 0.8
Z1/36	27/09/2021	318393	207030	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection
Z1/37	27/09/2021	318441	207030	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.					

Silent Valley Landfill Site

Flux Box Survey Calculations - Zone 1

September 2021



ID	Date	Location		Concentration in mg/m³ over time in seconds																		Linear Regression		V/A (V = 0.16m³, A = 0.65m²)	Flux (Q) in mg/m²/second d (Q = V/A x (dc/dt))	Comments			
				r² value	dc/dt																								
		E	N	O	60	120	180	240	300	360	420	480	540	600	720	840	960	1080	1200	1320	1440	1560	1680	1800					
Z1/45	29/09/2021	318386	206982	0.0	0.0	0.7	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.662	0.002	0.246	0.00055	At limit of detection *
Z1/46	29/09/2021	318434	206982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection	
Z1/47	29/09/2021	318482	206982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.7	0.0	0.0	0.0	0.7	0.7	0.750	0.002	0.246	0.00044	At limit of detection *
Z1/48	29/09/2021	318530	206982	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.500	0.002	0.246	0.00059	At limit of detection *	
Z1/49	29/09/2021	318578	206982	0.0	0.7	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.623	0.002	0.246	0.00043	At limit of detection *	
Z1/50	29/09/2021	318626	206982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection	
Z1/51	29/09/2021	318674	206982	0.0	0.0	0.0	0.0	0.0	0.7	0.7	0.0	0.0	0.7	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.750	0.004	0.246	0.00088	At limit of detection *	
Z1/52	29/09/2021	318722	206982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection	
Z1/53	29/09/2021	318770	206982	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.500	0.002	0.246	0.00059	At limit of detection *	
Z1/54	29/09/2021	318386	206934	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.797	0.002	0.246	0.00050	At limit of detection *	
Z1/55	30/09/2021	318434	206934	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.662	0.002	0.246	0.00055	At limit of detection *	
Z1/56	30/09/2021	318482	206934	0.0	0.7	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.083	0.001	0.246	0.00029	At limit of detection *	
Z1/57	30/09/2021	318530	206934	0.0	0.0	0.7	0.0	0.0	0.0	0.7	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.750	0.004	0.246	0.00088	At limit of detection *	
Z1/58	30/09/2021	318578	206934	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection	
Z1/59	30/09/2021	318722	206934	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.7	0.500	0.002	0.246	0.00059	At limit of detection *	
Z1/60	30/09/2021	318770	206934	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.662	0.002	0.246	0.00055	At limit of detection *	
Z1/61	30/09/2021	318386	206886	0.0	0.0	0.7	0.7	1.4	0.0	0.0	0.0	1.4	2.9	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.893	0.006	0.246	0.00146	r2 > 0.8	
Z1/62	30/09/2021	318434	206886	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.500	0.002	0.246	0.00059	At limit of detection *	
Z1/63	30/09/2021	318482	206886	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N/A	0.000	0.246	0.00000	Below limit of detection	
Z1/64	30/09/2021	318784	206886	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.7	0.7	0.0	0.0	0.0	0.771	0.002	0.246	0.00038	At limit of detection *	

Co-ordinates shown in blue denote monitoring point moved from original design GPS co-ordinates to nearest suitable location

*Refer to notes on Linear Regression Calculations and Final Q Values and:

Where data is 'at the limit of detection' of the flux box used, i.e. the r2 value of >0.8 could not be attained following data point removal, the data with the highest r2 value or data that is considered most representative of the overall test is used following assessment of such data

Zone 1 (Permanent Cap) Average Q Value **0.00041** mg / m² / second

APPENDIX B

Flux Box Survey Plan



LEGEND

Fluxbox Survey Zone Boundary

Fluxbox Test Location & Reference
(locations shown in blue denote monitoring point moved from original design GPS co-ordinates to nearest suitable location)

Z1/01

ZONE 1 - PERMANENT CAP (CLAY)	
AREA:	153,688m2
TESTS REQUIRED:	64
TEST SPACING:	48m

SILENT VALLEY LANDFILL SITE

FLUX BOX SURVEY
TEST LOCATION PLAN
SEPTEMBER 2021

DRAWN BY	CK	DATE	18/10/2021
APPROVED BY		SCALE @ A3	1:2500
DRAWING No	2021/SIV/FB1	STATUS	FINAL

enitl
Enterprise Drive
Four Ashes
Wolverhampton
WV10 7DE
tel +44 (0) 1902 798798
fax +44 (0) 1902 798711
www.enitl.co.uk