

Docksway Disposal Site

Annual Environmental Review for Area 2 - 2017

On behalf of **Newport City Council**



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Contents

1	Introduction	1
1.1	Background	1
1.2	Scope	1
1.3	Related Work.....	1
2	Surface Water Quality Monitoring	2
2.1	Current Monitoring Programme.....	2
2.2	Surface Water Hydrochemistry over the Preceding 12 Months	2
2.3	Review of Potential Risks and Future Monitoring	5
3	Groundwater Quality Monitoring.....	6
3.1	Monitoring Programme	6
4	Leachate Monitoring	11
4.1	Leachate Control Measures and Management System	11
4.2	Leachate Measurements.....	11
4.3	Leachate Chemistry.....	12
4.4	Review of Potential Risks and Future Monitoring	13
5	External Landfill Gas Monitoring.....	14
5.1	Gas Monitoring Locations.....	14
5.3	External Landfill Gas Monitoring	15
5.4	Review of Risks and Future Monitoring.....	16
6	Landfill Gas Generation and Usage	17
6.1	Landfill Gas Utilisation Plant.....	17
6.2	Landfill Gas Extraction	17
6.3	Monitoring of Extracted Gas.....	17
7	Annual Production / Treatment and Performance Parameters	18
7.1	Annual Production/Treatment.....	18
7.1	Performance Parameters	18
7.2	Topographic Surveys.....	18
8	Conclusions.....	20
8.1	Assessment of Environmental Performance Trends.....	20
8.2	Future Monitoring Requirements.....	20
9	References	21
10	Guidance for Readers of the Report	22

Tables

Table 2.1 – Details of Surface Water Locations Monitored During 2017	2
Table 3.2 – Accepted Area 2 Groundwater PPC Permit Compliance Limits for Emissions to Groundwater	7
Table 4.1 – Leachate Measurements at Cell 1 and Cell 2	11
Table 5.1 – Area 2 Landfill Gas Monitoring Boreholes.....	14
Table 7.1 – Annual production/treatment reported by NCC and Infinis (Landfill gas).....	18

Table 7.2 – Performance parameters reported by NCC (Whole site) 18

Figures

Figure 1: Site Location Plan

Figure 2: Monitoring Point Location Plan

Appendices

Appendix 1: Surface Water Chemistry Graphs

Appendix 2: Groundwater Chemistry Graphs

Appendix 3: Leachate Chemistry Graphs

Appendix 4: Gas Concentration Graphs

Appendix 5: Infinis Annual Report

Appendix 6: Drawing No 1476/Ph2/AEPR 17-18 (Ph 2 Waste Levels Jan 2017 -Dec 2017)

1 Introduction

1.1 Background

Docksway Disposal Site is located approximately 3km south of Newport City Centre, Gwent, and is centred on National Grid Reference ST 305 853. The site is operated by Newport City Council, referred to hereafter as NCC. The location of the site is shown on **Figure 1**.

The site is approximately split into a northern part (Area 1) and a southern part (Area 2):

- Area 1 is an unlined ('dilute and disperse') landfill that was operated under Waste Management Licence (WML) number EAWML30058 and is now closed, and in the aftercare phase; and
- Area 2 is an engineered containment landfill that is active and operated under Pollution Prevention Control (PPC) Permit No. DP3733BK, Variation Number V004 (July 2016).

It is a requirement of the PPC Permit for Area 2 (Conditions 4.2.1 and 4.2.2) that an Annual Environmental Review report is provided to Natural Resources Wales (NRW) on an annual basis in order to provide a review of data collected in relation to the environmental performance of the site.

1.2 Scope

This document reviews the data produced by various environmental monitoring programmes and management systems and provides an analysis of any trends in the data over the preceding 12-month period of January 2017 to December 2017. The data review and analysis is used to provide an appraisal of the potential environmental risks associated with Area 2 of the site. This document includes the following:

- Review and analysis of the Area 2 environmental monitoring results collated over the past 12 months.
- Comments on temporal trends observed in the longer term monitoring data collected.
- A review of the potential risks to sensitive environmental receptors.
- Energy consumption at the site and annual production/treatment.
- Comparison of the current topographical survey and the previous topographical survey and assessment of the settlement behaviour together with volumetric difference.
- Calculation of the remaining capacity.

Guidance for readers of this report is given in **Section 10** of this report.

1.3 Related Work

The environmental data commented on in this report has been issued to NRW previously in the form of monthly or quarterly interim environmental monitoring reports, but is provided within this report as a series of Appendices for ease of reference.

2 Surface Water Quality Monitoring

2.1 Current Monitoring Programme

A surface water monitoring programme commenced at Docksway Disposal Site in September 2003, in accordance with the requirements of Condition 62 of the Area 1 WML. Since this time, NCC has undertaken monthly surface water monitoring and has reported these results to NRW on a monthly basis. Details of the monitoring methodology and protocols for the site (including the frequency of testing and the range of chemical testing suites used) were presented in the Monitoring Plan for Area 1, dated 2011^[1], which was accepted by the NRW, and also the Monitoring Plan for Area 2: Landfill Extension, dated 2005^[2], which was accepted by the Environment Agency (now NRW) at that time.

Sampling locations SW25 and SW26 are the subject of individual discharge consents and will continue to be monitored in accordance with those consents, whilst all other locations will continue to be monitored in accordance with the Environmental Permit. It is noted that a new sampling point C3_Asb has been established since the start of 2017.

A total of seven monitoring locations have been used for assessing the surface water quality over the past 12 months, the locations of which are shown on **Figure 2**, and details are tabulated below:

Table 2.1 – Details of Surface Water Locations Monitored During 2017

Position Monitored	Location
SW1A	Ebbw Upstream
SW11	North Pond
SW23	Discharge to Maes Glas Pill from Docks Drain Outfall (Disused Culvert)
SW24	Oxbow Lake Position 1
SW25	Surface Water Management System Discharge Point. Subject to a discharge consent.
SW26	Area 2 Surface Water. Subject to a discharge consent.
C3_Asb	Cell 3 Settling Lagoon

2.2 Surface Water Hydrochemistry over the Preceding 12 Months

2.2.1 Compliance Limits

It was not a requirement of the Area 1 WML to set surface water compliance limits for the site, and consequently none have been set by NRW. Therefore, comments on the surface water hydrochemistry with respect to compliance limits are not presented in this report. Instead, only the data and any temporal trends in the data are presented and commented upon.

The exceptions to this are surface water sampling points SW25 and SW26 which are subject to discharge consents (Consent Number AN0394301 and AN0401301 respectively) with compliance limit values as set by NRW. In addition, sampling location C3_Asb has compliance limit values which are set out in the Environmental Permit.

2.2.2 SW25

In the last 12 months, SW25 has been sampled four times (January, February, November and December 2017) as a result of being recorded as dry on each of the other monthly monitoring visits.

The following provides commentary on the laboratory test results compared to the consented compliance limit values:

- On each occasion that SW25 was sampled, the results were significantly below the discharge consent limit (30mg/l) for Ammoniacal Nitrogen. The concentrations of Ammoniacal Nitrogen recorded in SW25 appear to show an overall gradual decrease since commencement of monitoring in 2004.
- The discharge limit (40mg/l) for Biological Oxygen Demand (BOD) was not exceeded during any of the four monitoring events in 2017 for SW25.
- The recorded pH values were within the required limits of between 6 and 9 on each occasion.
- The recorded concentrations of Total Suspended Solids (TSS) were below the discharge consent limit (60mg/l) on three of the four monitoring occasions. However, in December 2017 the TSS concentration at SW25 was recorded above the discharge consent limit, at 141mg/l. Although the concentration recorded in December is above the discharge consent limit, it is within the temporal range of the dataset.

There is currently no evidence to suggest that there are any detrimental temporal trends with regard to surface water quality at this location.

2.2.3 SW26

Surface water monitoring point SW26 was included in the monitoring programme for Area 1 at the start of 2013, and has been sampled on seventeen out of sixty occasions since commencement (being recorded as dry on each other occasion).

During 2017, SW26 was sampled on three occasions (January, February and November), and on the remaining months recorded as dry.

The following provides commentary on the laboratory test results compared to the consented limit values:

- The results of the testing undertaken indicate that although there is no limit for Ammoniacal Nitrogen in the discharge consent for SW26, the concentrations recorded in 2017 are all below 1mg/l and within the general normal range recorded at this location.
- The results of the TSS testing undertaken on the three samples obtained from SW26 during 2017 recorded concentrations significantly below the discharge consent limit for TSS (60mg/l).
- During 2017, pH values were not recorded outside of the required limits of between 6 and 9, in accordance with the discharge consent.

There is currently no evidence to suggest that there are any detrimental temporal trends with regard to surface water quality at this location.

2.2.4 C3_Asb

Surface water monitoring point C3_Asb is the settling lagoon for surface water from the SNRHW cell. A specific testing requirement for this location is for the presence of asbestos fibres. Due to complications with the testing process for asbestos fibres in water, although a sample was obtained from C3_Asb on

eleven occasions during 2017, the test for asbestos presence was completed on only five occasions. On each of the five occasions where the asbestos presence test was completed, the laboratory did not identify the presence of asbestos fibres in the sample on any occasion.

2.2.5 Ammoniacal Nitrogen

Appendix 1/1 presents the results of Ammoniacal Nitrogen concentrations since 2003 at each of the surface water monitoring locations.

It can be seen that Ammoniacal Nitrogen concentrations in SW1A have been recorded below the method detection limit (MDL) for the laboratory (0.2mg/l) in the last 12 months. This is consistent with the longer term dataset.

SW11 was sampled once during 2017, in September as part of the annual screen. The Ammoniacal Nitrogen concentration was recorded below the method detection limit (MDL) for the laboratory (0.2mg/l).

In SW23 the Ammoniacal Nitrogen concentrations have been relatively consistent over the last 5 to 6 years, continuing a general gradual decrease in concentrations since 2003, and below 50mg/l in the last 6 years, and below 25mg/l in the last 12 months.

The remaining surface water monitoring point (SW24) shows a generally consistent trend since commencement of monitoring, with concentrations predominantly below 1mg/l.

2.2.6 BOD and COD

Appendices 1/2 and **1/3** present Biological and Chemical Oxygen Demand concentrations since 2003 at each of the surface water monitoring locations.

All locations appear to be displaying a generally stable trend in BOD concentrations with the majority of results recorded at concentrations below 10mg/l in the last 6 years. A concentration of 16.4mg/l was recorded in SW24 in June 2017, but the subsequent sampling visit in July 2017 recorded a significantly lower concentration of 2.71mg/l.

In general, COD concentrations appeared to be relatively stable at most monitoring locations during 2017 with results generally below or around 100mg/l. The exceptions to this are SW11 and SW24 which have recorded concentrations of 138mg/l and 187mg/l in September and November 2017 respectively. These concentrations are within the range of results previously recorded at these monitoring locations.

2.2.7 DO and Chloride

The Dissolved Oxygen (DO) concentrations at the surface water monitoring locations in the last 12 months has been recorded generally between about 8mg/l and 11mg/l, and this is consistent with the overall dataset.

Appendix 1/4 presents Chloride concentrations at each of the surface water monitoring locations since 2003. The data indicates that most surface water monitoring locations are showing a generally stable trend of Chloride concentrations over the last 12 months with concentrations at most locations predominantly below 100mg/l. The exceptions to this are SW23 where concentrations of Chloride have fluctuated significantly (from below 100mg/l up to 1000mg/l) from month to month, as they have done since monitoring commenced, and C3Asb where concentrations have fluctuated between about 100mg/l and 200mg/l.

2.2.8 pH and Electrical Conductivity

Appendix 1/5 presents the results of pH monitoring of surface water since 2003 at each of the current Area 1 surface water monitoring locations. In the past 12 months the majority of the pH readings have

generally been recorded between about pH 7.5 and pH 8.5, which is within the normal range for all of the monitoring locations in the last 5 years.

Appendix 1/6 presents Electrical Conductivity (EC) readings in each of the surface water monitoring locations since 2003. The data indicates a stable trend of Electrical Conductivity readings, below 5mS/cm at all monitoring locations in the last 12 months. This is within the range of the overall dataset.

2.2.9 Total Suspended Solids

Appendix 1/7 presents the concentrations of Total Suspended Solids (TSS) at SW25 since 2007, SW26 since 2013, and C3Asb since 2017. The data does not currently indicate trends of increasing concentrations of TSS.

2.3 Review of Potential Risks and Future Monitoring

The environmental data obtained for January to December 2017 for surface water quality does not indicate any significant adverse trends developing in surface water quality, and over the last 12 months does not indicate any significant decrease in surface water quality since the previous Annual Environmental Review for Area 2 - 2016^[4].

3 Groundwater Quality Monitoring

3.1 Monitoring Programme

A groundwater monitoring/sampling programme commenced at Docksway Disposal Site in September 2003 to monitor groundwater quality within the underlying River Terrace Gravel deposits present beneath the site.

Details of the monitoring methodology and protocols for the site (including the frequency of testing and the range of chemical testing suites used) were presented in the Monitoring Plan for Area 2: Landfill Extension, dated 2005^[2], which was accepted by the Environment Agency (now NRW) at that time.

The locations of the boreholes used in the current monitoring and sampling programme are indicated on **Figure 2**.

Interim groundwater quality reports have previously been provided to NRW on a quarterly basis (in accordance with the PPC Permit Conditions 3.6.1 and 3.6.2) providing both factual data and interpretive comments where appropriate.

3.2 Monitoring Locations and Compliance Levels

There are fourteen monitoring wells across Area 2, although only eleven of these currently have agreed compliance limits. Proposed compliance limits for the remaining three wells (GW12_30, GW12_33 and GW12_38) are presented in Section 3.4.

Table 3.1 – Groundwater Monitoring Locations

Monitoring Location	Easting	Northing
GW07_40	331007	185204
GW12_30	331089	185194
GW09_31	331165	185095
GW03_09	331166	184999
GW09_32	331118	184919
GW12_33	331055	184834
GW06_34	331015	184732
GW09_35	330904	184755
GW06_36	330811	184777
GW06_37	330715	184801
GW06_13	330602	184887
GW12_38	330705	184986
GW06_14a	330829	185098
GW06_39	330932	185137

Control levels and Compliance limits for eight of the compliance monitoring wells were proposed as part of the four yearly review of the Hydrogeological Risk Assessment (HRA) for Area 2 produced in December 2010^[3] and accepted by NRW in August 2013. In addition, Control and Compliance limits for the three 'GW09' compliance wells (31, 32, and 35) were proposed in September 2013, and following amendment were subsequently accepted by NRW.

The current control and compliance levels are reproduced in Table 3.2. It is noted that in relation to Benzene, Naphthalene, Xylene and arsenic only Compliance levels have been set, other determinands having lower target control levels set.

Table 3.2 – Accepted Area 2 Groundwater PPC Permit Compliance Limits for Emissions to Groundwater

Monitoring Well	Benzene	Naphthalene	Xylene	Arsenic
	Compliance Limit	Compliance Limit	Compliance Limit	Compliance Limit
	ug/l	ug/l	ug/l	ug/l
GW03_09	2	5	3	35
GW06_13	2	5	3	50
GW06_14a	2	5	3	25
GW06_34	2	5	3	65
GW06_36	2	5	3	30
GW06_37	2	5	3	60
GW06_39	2	5	3	50
GW07_40	2	5	3	35
GW09_31	13	5	3	80
GW09_32	3	5	3	30
GW09_35	2	5	3	50

Monitoring Well	Nickel		Potassium		Ammoniacal Nitrogen	
	Control Level	Compliance Limit	Control Level	Compliance Limit	Control Level	Compliance Limit
	ug/l	ug/l	mg/l	mg/l	mg/l	mg/l
GW03_09	8	10	160	180	30	35
GW06_13	12	14	100	110	30	35
GW06_14a	12	14	160	180	53	60
GW06_34	12	14	310	350	30	35
GW06_36	8	10	100	110	20	23
GW06_37	8	10	100	110	30	35
GW06_39	26.4	30	100	110	20	23
GW07_40	8	10	39.6	45	20	23
GW09_31	8	10	100	110	50	50
GW09_32	8	10	160	180	50	50
GW09_35	8	10	100	110	30	35

3.3 Groundwater Quality

3.3.1 Ammoniacal Nitrogen

Appendices 2/1 to 2/4 present the recorded concentrations of Ammoniacal Nitrogen for the Area 2 groundwater monitoring locations. Ammoniacal Nitrogen concentrations in all monitoring wells have been relatively consistent in the last 12 months and also in the longer term. There have generally been no exceedances of the Compliance Limits for Ammoniacal Nitrogen in 2017, except for two marginal exceedances at GW06_14a in September and at GW06_37 in December. The recorded concentrations were 73.6mg/l and 36.3mg/l respectively. At GW12_33 the concentration recorded in December was the highest ever at that location, at 19.6mg/l, however there are no Compliance Limits for GW12_33 at the current time- see Section 3.4 below for proposed compliance limit values

All other monitoring locations remained below the compliance limits throughout the monitoring period.

3.3.2 Arsenic

Appendices 2/5 to 2/12 present the recorded Arsenic concentrations for the current Area 2 groundwater monitoring locations. Arsenic concentrations at the majority of Area 2 groundwater monitoring wells are consistent with generally no distinct trends or exceedances of the well-specific compliance limits in the last 12 months. The exception to this is GW06_34 where a concentration of 192ug/l was recorded in September and 126ug/l was recorded in December 2017, which is above the Compliance Limit (65ug/l) and the highest concentrations of Arsenic recorded at this location.

3.3.3 Benzene, Naphthalene and o-Xylene

Appendices 2/13 to 2/20 present the results of Benzene, Naphthalene and o-Xylene concentrations.

Benzene concentrations in all Area 2 compliance wells have been consistent in the last 12 months, with no exceedances of the compliance limits and no concentrations recorded above the method detection limit (MDL).

All current Area 2 groundwater monitoring locations are showing stable trends of Naphthalene and o-Xylene concentrations at or below the MDL.

It should be noted that the laboratory MDL has changed a number of times since 2004 for Benzene, Naphthalene and o-Xylene which gives a false impression that some of the results have occasionally exceeded the compliance limit, because the compliance limit tracks the MDL.

3.3.4 Extractable Petroleum Hydrocarbons

Appendices 2/21 and 2/22 present the results of Extractable Petroleum Hydrocarbons (EPH) concentrations. Concentrations of EPH have generally been recorded below 400µg/l in all of the monitoring wells in Area 2 during 2017, with the exception of GW06_34 and GW12_38 in December 2017. At these locations, the concentrations recorded in December were 1730ug/l and 576ug/l respectively. There are no compliance limits required for EPH.

3.3.5 Nickel and Potassium

Appendices 2/23 to 2/31 present the results of Nickel and Potassium concentrations in the monitoring wells.

Nickel and Potassium concentrations at the majority of the compliance wells have remained stable throughout the 12-month monitoring period, with no recorded compliance limit exceedances.

3.4 Proposed Compliance Limits for GW12_30, GW12_33 and GW12_38

Monitoring wells GW12_30, GW12_33 and GW12_38 were installed in 2012 to replace damaged and lost perimeter groundwater monitoring wells at Area 2 of Docksway Disposal Site. Since installation, baseline data from each of these monitoring wells has been collected in accordance with the monitoring requirements in the Environmental Permit and the following Table 3.4 sets out the proposed Compliance Limits for these monitoring wells.

Table 3.4 - Provisional Compliance Limits for Emissions to Groundwater

Monitoring Well	Benzene	Naphthalene	Xylene	EPH	Arsenic
	Compliance Limit*	Compliance Limit*	Compliance Limit*	Compliance Limit	Compliance Limit
	ug/l	ug/l	ug/l	ug/l	ug/l
GW12_30	1	1	1	Not Required	160
GW12_33	1	1	1	Not Required	560
GW12_38	1	1	1	Not Required	26

* Based on current MDL – Compliance Limit will track the MDL

Monitoring Well	Nickel		Potassium		Ammoniacal Nitrogen	
	Control Level	Compliance Limit	Control Level	Compliance Limit	Control Level	Compliance Limit
	ug/l	ug/l	mg/l	mg/l	mg/l	mg/l
GW12_30	25	30	35	40	10	12
GW12_33	5	6	50	55	15	18
GW12_38	25	30	65	70	10	12

The provisional compliance limits have been calculated in accordance with the existing and agreed compliance limits, using statistical analysis to determine normality and identifying outliers prior to calculation of the proposed compliance limits using baseline plus 10% for the control level (where appropriate) and baseline plus 25% for the compliance limit.

3.5 Review of Potential Risks and Future Monitoring

The environmental data obtained for the groundwater monitoring wells in Area 2 indicates that in general the River Terrace Gravel groundwater chemistry is in a stable condition and that there is therefore no significant deterioration in water quality since the previous Annual Environmental Review for Area 2 - 2016^[4].

During 2017, a small number of exceedances of compliance limits were recorded in some monitoring wells, however, these are not generally considered to represent a significant risk to the groundwater quality because they are not consistently exceeding the compliance limits at the current time. Arsenic concentrations in GW06_34 will however be reviewed in the first 6 months of 2018 to determine whether there is a deteriorating trend developing at this monitoring well location.

4 Leachate Monitoring

4.1 Leachate Control Measures and Management System

In accordance with Condition 2.7.1 of the PPC Permit, leachate levels are recorded monthly (when access permits) at five locations in Cell 1 and three locations in Cell 2 with samples recovered for analytical testing on a quarterly basis at LF08_07 located within Cell 1 of Area 2, and C2B (when access permits) within Cell 2 of Area 2.

Cell 2 in Area 2 began receiving waste in 2010, and in 2012 analytical testing commenced on leachate samples obtained from Cell 2 on a quarterly basis.

Leachate generated in Area 2 is pumped directly to tankers and removed off site for disposal.

4.2 Leachate Measurements

Leachate head levels at LF08_07, C1A, C1B, C1D, C1E (Cell 1), C2A, C2B, C2C (Cell 2) and from Cell 3 are scheduled to be recorded on a monthly basis at the site. In accordance with Schedule 3, Table S3.1 of the PPC Permit, leachate head levels should not exceed 2m above the base of any cell.

Total leachate tonnage removed from Area 2 and associated leachate head levels in all cells, recorded over the last 12 months, are presented in Table 4.1.

Table 4.1 – Leachate Measurements at Cell 1 and Cell 2

Monitoring Round	Leachate Head Level above base of cell (m)								Leachate Removed (tonnes)
	LF08_07 (Cell 1)	C1A (Cell 1)	C1B (Cell 1)	C1D (Cell 1)	C1E (Cell 1)	C2A (Cell 2)	C2B (Cell 2)	C2C (Cell 2)	
January 2017	Not Measured – no access								10,950
February 2017	Not Measured – no access								
March 2017	Dip data lost					0.69	3.16	N/A	
April 2017	0.64	1.30	1.47	0.60	N/A	0.80	3.06	N/A	
May 2017	0.63	1.35	1.52	0.50	N/A	0.60	3.11	N/A	
June 2017	0.69	1.20	1.47	0.60	N/A	0.64	3.11	N/A	
July 2017	0.59	1.60	1.84	0.42	N/A	1.42	2.41	N/A	
August 2017	0.54	1.85	2.02	0.50	N/A	0.64	2.56	N/A	
September 2017	1.09	N/A	1.97	0.85	N/A	1.42	N/A	N/A	
October 2016	Not Measured – no access								
November 2017	Not Measured – no access								
December 2017	2.69	N/A	2.03	2.20	N/A	1.12	4.34	N/A	

Bold text indicates leachate head levels above the permitted leachate head level (2m).

The leachate wells have been connected to the gas abstraction system and therefore there is currently no access for sampling leachate directly from the leachate wells. Leachate samples have however been obtained from the side risers in lieu of access to C2B and LF08_07, and submitted for laboratory analysis.

4.3 Leachate Chemistry

As described above, samples have been obtained from locations associated with LF08_07 (Cell 1) and C2B (Cell 2). Therefore, the information below relates only to these locations. Cell 2 wells were not monitored during 2015 due to access restrictions, and therefore the data for C2B was incomplete for that year. In 2017, samples were obtained from Cell 1 on one occasion in March and from Cell 2 on three occasions in March, June and December 2017. No samples of leachate from Area 2 were submitted for the annual Hazardous Substances screen.

4.3.1 Ammoniacal Nitrogen

Appendix 3/1 presents the results of Ammoniacal Nitrogen concentrations. There was only one sample of leachate obtained from LF08_07 during 2017, in March. The Ammoniacal Nitrogen concentration recorded at LF08_07 in March 2017 was 566mg/l, within the general range of the dataset.

An Ammoniacal Nitrogen concentration of 1610mg/l was recorded in C2B in March 2017, the second highest concentration since monitoring of this well commenced. The recorded concentrations then fell during the subsequent monitoring visits to below 1500mg/l. The rising trend of Ammoniacal Concentrations in C2B since 2012 appears to be levelling out.

4.3.2 Arsenic

Appendix 3/2 presents the results of Arsenic concentrations over time in leachate in Area 2. Arsenic concentrations at C2B appear to have fluctuated throughout the year, varying from <0.5µg/l to 78.3µg/l, and these concentrations are within the range established during previous monitoring. In the LF08_07 leachate, the concentration recorded in March 2017 was <0.5ug/l, the lowest concentration recorded at this location.

4.3.3 Benzene and Naphthalene

Appendices 3/3 and **3/4** present the results of Benzene and Naphthalene concentrations in leachate from LF08_07 and C2B.

Benzene was recorded at a concentration in LF08_07 of 3.06ug/l in March 2017, within the established range of previously recorded concentrations. In C2B the Benzene concentrations recorded have been between 2.81ug/l and 3.5ug/l in 2017, the lowest recorded concentrations since monitoring commenced.

Naphthalene concentrations in LF08_07 leachate have been recorded below the MDL during all monitoring rounds since 2013, and in C2B have been recorded below the MDL during 2017.

4.3.4 o-Xylene and EPH

Appendices 3/5 and **3/6** present the results of o-Xylene and EPH concentrations in the Area 2 leachate.

Concentrations of o-Xylene in C2B leachate appear to be gradually falling since commencement of monitoring in 2012 and have been recorded below 5ug/l in 2017. The concentration of o-Xylene recorded in LF08_07 in March 2017 was 2ug/l, within the normal range of concentrations typically recorded at this location.

At LF08_07 the concentration of EPH recorded in March 2017 was 1,490ug/l, and this is within the range of the overall dataset, and significantly below the concentrations recorded during 2016. Concentrations of EPH in C2B during 2017 were recorded between 2020ug/l and 16,200ug/l. The concentration of 16,200ug/l recorded in June 2017 is the highest ever concentration recorded at this location, however the concentration recorded during the following monitoring round in December 2017 was the lowest ever concentration recorded.

4.3.5 Nickel and Potassium

Appendices 3/7 and 3/8 present the results of Nickel and Potassium concentrations at LF08_07 (Cell 1) and Cell 2 since commencement of monitoring.

During 2017, Nickel concentrations in C2B have fluctuated between less than 1ug/l and over 200ug/l, and these are within the overall dataset range. At LF08_07 the Nickel concentration recorded in March 2017 was 0.449ug/l.

The Potassium concentration recorded in LF08_07 in March 2017 was 311mg/l, within the range of the dataset, and lower than concentrations recorded in the latter half of 2016. At C2B the concentrations recorded were between about 700mg/l and 850mg/l, within the range of the dataset.

4.4 Review of Potential Risks and Future Monitoring

The environmental monitoring data for LF08_07 and C2B indicates that the leachate chemistry has been variable throughout the 12-month monitoring period in both cells, with occasions where the highest concentration of a determinand has been recorded since commencement of monitoring. Parameters such as arsenic, nickel, potassium and EPH have recorded fluctuating concentrations during 2017 whilst benzene and o-xylene appear to be displaying a general trend of reducing concentrations over time. The remaining parameters appear to be displaying a relatively stable trend of concentrations.

Leachate head levels recorded in Cell 1 have generally been below the permitted level (of 2m above the base) during 2017. In Cell 2, particularly at C2B the leachate head levels during 2017 have been recorded generally above the permitted head level, up to a maximum head of 4.3m. This is currently being reviewed by NCC and provisions to reduce this will be made in due course.

5 External Landfill Gas Monitoring

5.1 Gas Monitoring Locations

There are currently thirteen purpose drilled gas monitoring boreholes present around the perimeter of Area 2. The locations of the boreholes are shown on **Figure 2** and coordinates of the gas monitoring boreholes are shown within Table 5.1.

Table 5.1 – Area 2 Landfill Gas Monitoring Boreholes

Monitoring Point	Easting	Northing
GP03_06	331150	185227
GP06_08a	331830	185104
GP05_14	331172	185144
GP05_15	331187	185055
GP05_16	331153	184977
GP05_17	331091	184884
GP09_18	331033	184804
GP05_20	330676	184817
GP05_21	330602	184887
GP05_22	330649	184963
GP12_23	330781	185028
GP06_24	330973	185165
GP06_25	331060	185236

These boreholes all have their response zones situated in the shallow strata (the Alluvial Deposits and the Made Ground above, where it is present). Monitoring started at these boreholes before the commencement of landfilling in Cell 1 to enable comparison of the historical (baseline) soil gas regime around the perimeter of the site with the regime once waste disposal operations had commenced.

5.2 Monitoring Requirements and Trigger Levels

Landfill gas monitoring has generally been undertaken on a monthly basis with reports being produced for NRW quarterly in accordance with Condition 3.1.7 of the PPC Permit.

Trigger Levels for all the Area 2 wells have previously been submitted to and accepted by NRW.

Well-specific trigger levels for landfill gas as set out in the PPC Permit are presented in Table 5.2 below. There are no trigger levels for carbon dioxide or methane in GP06_24 and GP06_25 or for carbon dioxide in GP05_20 and GP05_21 – in accordance with NRW (formerly EA) requirements.

Table 5.2 – Well-Specific Trigger Levels for Landfill Gas Monitoring for Area 2

Well	Methane (%Volume)	Carbon Dioxide (%Volume)
GP03_06	1.0	6.1
GP06_08A	1.0	2.4
GP05_14	1.0	2.2
GP05_15	1.0	10.4
GP05_16	1.0	7.7
GP05_17	1.0	13.5
GP09_18	1.0	19.0
GP05_20	1.5	n/a
GP05_21	1.5	n/a
GP05_22	1.0	8.3
GP06_24	n/a	n/a
GP06_25	n/a	n/a

5.3 External Landfill Gas Monitoring

5.3.1 Methane

Appendices 4/1, 4/2 and 4/3 present the results of Methane concentrations in the Area 2 gas monitoring wells since commencement of monitoring.

Appendix 4/1 indicates that the majority of the Area 2 wells did not typically detect Methane above the trigger level of 1% during 2017. The exception to this is GP09_18, where Methane concentrations were recorded above the 1% trigger level during all twelve of the monthly monitoring visits, with a maximum concentration of 54.7% recorded in October 2017 – the highest ever concentration recorded at this location. The methane concentrations at GP09_18 were typically recorded below the trigger level between commencement of monitoring in this well in 2009 (installation date) and mid 2016. Since September 2016, the methane concentration in GP09_18 has been recorded above the trigger level on every monitoring occasion with concentrations typically ranging between about 5% and 50%. The reason for this sudden trend of increased methane concentrations at this location is not currently known. It is proposed to install a series of new gas monitoring wells around the existing GP09_18 to determine the concentrations of methane in the areas surrounding GP09_18 and review following an initial 6 month period of monitoring.

Appendix 4/2 presents the Methane concentrations in GP06_24 and GP06_25, constructed on the Area 2 side of the in-ground barrier installed between Area 1 and Area 2. Methane concentrations have typically fluctuated significantly in GP06_24 since mid-2008 and in GP06_25 since the start of 2012. GP06_24 has recorded a maximum Methane concentration of 88.8%v/v in July 2017, and this is within the range of the dataset in the last 4 years. Since July 2017, Methane concentrations have shown an overall decreasing trend.

GP06_25 was monitored three times during 2017 (Oct to Dec) and was recorded as flooded during the other monitoring visits. On the three occasions that GP06_25 was monitored, Methane concentrations were recorded in the range 46.6%v/v to 53.9%v/v during 2017 which is within the overall range for the dataset.

It is not known why GP06_24 is recording elevated Methane concentrations, however the well response zone is constructed in the lower alluvial deposits, between approximately 3.5mbgl and 6.5mbgl. It is therefore possible that the elevated concentrations may be linked with the generation of natural gas in the Alluvium.

It is not currently known why Methane concentrations in GP06_25 started fluctuating in 2012, however there doesn't appear to be a distinct trend in the dataset since this time.

Appendix 4/3 indicates that concentrations of Methane in GP05_20 and GP05_21 were generally recorded below the 1% trigger level throughout 2017 with the exception of GP05_20 in July and August when concentrations of 15.4% and 1.9% were recorded respectively. Since August 2017 concentrations of Methane have been recorded below the trigger level on each monitoring visit.

5.3.2 Carbon Dioxide

Carbon Dioxide concentrations have generally varied with time since the commencement of the landfill gas monitoring programme in the thirteen monitoring wells within Area 2. Graphs indicating the Carbon Dioxide concentrations recorded over time and showing well specific trigger levels are presented in **Appendices 4/4 to 4/15**.

The majority of wells with trigger levels have recorded Carbon Dioxide concentrations below the well-specific trigger levels during 2017. The exception to this is a marginal exceedance at GP05_16 in May 2017, which recorded a concentration of 8.6% with a well-specific trigger level of 7.7%.

Concentrations of Carbon Dioxide recorded within GP03_06 have shown an overall decreasing trend throughout 2017, compared with increasing concentrations observed in the previous five years.

The graphs indicate that in general most data sets show stable trends with two wells (GP05_20, and GP09_18) indicating a gradual rising trend, however the concentrations remain below the trigger level (GP09_18) and are still at relatively low levels in GP05_20.

It should be noted that GP05_22 was flooded during the majority of monitoring rounds in 2017, and was therefore only monitored on two occasions (January and April) when concentrations were recorded below the well-specific trigger levels on both occasions.

5.4 Review of Risks and Future Monitoring

Adverse trends (rising or uncommonly fluctuating concentrations) have been observed in GP09_18 (Methane and Carbon Dioxide), and GP05_20 (Carbon Dioxide) in the last 12 months. No other adverse trends in landfill gas concentrations have been observed. It is considered that ground gas concentrations in GP05_20 should continue to be monitored closely to determine whether the potential trend of rising concentrations continues and whether further investigative or remedial action is required. It is proposed that additional ground gas monitoring wells will be installed around the existing GP09_18, and that following an initial 6 month monitoring period, the data will be reviewed to determine if any remedial action is required.

With the exception of GP09_18 (discussed above), the only monitoring locations that have consistently recorded significant Methane concentrations are GP06_24 since 2006 and GP06_25 since 2012. These wells are located some considerable distance away from the part of the Area 2 site that has to date been used for waste disposal. The elevated Methane concentrations recorded at GP06_24 were present at the time that the in-ground gas barrier was constructed (separating the Area 1 and Area 2 sites) and may therefore represent background concentrations, or natural gas in the Alluvium.

Landfill gas will continue to be monitored on a monthly basis and gas conditions will continue to be reported to NRW on a quarterly basis in accordance with the PPC Permit.

6 Landfill Gas Generation and Usage

6.1 Landfill Gas Utilisation Plant

Docksway Disposal Site has a Landfill Gas Utilisation Plant servicing both Area 1 and Area 2 landfills. It currently comprises one 1MW Jenbacher (320) engine together with one 1500m³/hr flare.

Infinis Energy are currently responsible for the general running and routine maintenance of the gas plant and has provided information to assist in the compilation of this section of the report. The Infinis annual report is presented as **Appendix 5**.

Monitoring of the plant performance and volumes of gas extracted from the gas utilisation plant has been undertaken on a regular basis since 2005 by Novera/Infinis, and the data collected over the last 12 months has been reported directly to NRW.

6.2 Landfill Gas Extraction

In 2017, the total production of energy from the Landfill Gas Utilisation Plant was about 7443MWh with a site efficiency of 33.5%. In 2016 by comparison, the total production of energy was about 7306MWh with a site efficiency of 29.7%. The total energy produced and efficiency has increased from 2016 to 2017.

Engine downtime hours in 2017 were 688, compared to 672 in 2016 which represents a marginal increase in engine downtime from 2016 (7.9% compared to 7.7%). Engine operation time in 2017 was 8072 hours which is a marginal reduction from the 8088 hours in 2016.

The flare operated in 2017 during periods when the engine was not operational. The flare was operating for 667 hours during 2017 based on the availability of the engine, compared to 5941 hours in 2016. This is a significant decrease from 2016 and is due to only being operational when the engine was not working, instead of also being operational during times when the engine was working in 2016.

Environmental Performance Indicators, provided by Infinis Energy, indicate that there has been a slight decrease in Carbon Monoxide emissions in 2017 compared to 2016, and total Oxides of Nitrogen emissions decreased slightly in the same period. Emissions data critically depends on a number of factors including run hours of engines and availability of landfill gas to them, and whilst they are presented as EPI they should be treated with caution. The Annual Report provided by Infinis is presented in **Appendix 5**.

6.3 Monitoring of Extracted Gas

The PPC Permit (LP3135SB) for the gas installation at the site requires that 'emissions to air from the engine stacks, fugitive emissions, and odour are monitored and reported annually'. This data is collated and presented directly to the EA by Infinis Energy.

Flare monitoring is only required if the flare is in operation greater than 10% of the time, in accordance with Condition 58 of the WML. Infinis have indicated that emissions testing of the flare was carried out in 2017 due to the flare hours exceeding the 10% trigger level. The flare emissions summary provided by Infinis is presented in Appendix 5 and indicates the emissions were within the permit Emission Standard.

Monitoring and reporting will continue by Infinis in accordance with the PPC Permit and the WML.

7 Annual Production / Treatment and Performance Parameters

7.1 Annual Production/Treatment

Table 7.1 – Annual production/treatment reported by NCC and Infinis (Landfill gas)

Leachate:	Tonnes/year
Disposed of off-site (Area 2)	10,950
Disposed of to any onsite effluent treatment plant	None
Re-circulated into the waste mass	None
Surface water and/or groundwater:	Cubic metres/year
Disposed of off site	N/A
Disposed of to any onsite effluent treatment plant	None
Landfill Gas: (Whole site)	Normalised cubic metres/year
Combustion in flares	327,098
Combustion in gas engines	3,959,712
Other methods of gas utilisation	None

7.1 Performance Parameters

Table 7.2 – Performance parameters reported by NCC (Whole site)

Parameter	Frequency of Assessment	Annual Total	Unit
Potable Water Use	Annually	3,136 (2016/2017 data)	Cubic metres
Energy Used (including for leachate treatment, Excluding electricity generated)	Annually	182,323	kWh of electricity
Non Potable Water Use	Annually	0	Cubic metres

7.2 Topographic Surveys

The topographical surface of Area 2 of Docksway Disposal Site was surveyed during January 2018 and the results of the survey are presented in **Appendix 6**.

It has been calculated by NCC that 77,494 m³ of waste was placed in Cell 2 in 2017, and this is an increase from 2016 when 51,150 m³ of waste was placed. It has also been calculated by NCC that a total of 13,426 m³ of SNRHW was placed in Cell 3A during 2017, an increase from 1,830 m³ in 2016. As of January 2017, the cumulative waste volume deposited in Area 2 Cell 2 was 914,771m³, and in Cell 3A was 15,256m³.

The maximum elevation of Area 2 Cells 1 and 2 was 31m Above Ordnance Datum (mAOD) as of January 2018.

The cross sections provided indicate that the slope angles of the permanent waste slopes are in accordance with permitted slope angles (no greater than 1:4).

8 Conclusions

8.1 Assessment of Environmental Performance Trends

This document reviews the environmental data from the last 12 months and also provides an indication of data trends both over the last 12 months and since the various monitoring programmes commenced.

Surface water monitoring indicates generally stable trends since the previous Environmental Performance Review, with no evidence of significant adverse trends developing. On the three occasions that SW26 was monitored in 2017, the recorded parameters were within the discharge consent limits. On the four occasions that SW25 was monitored in 2017, the recorded parameters were within the discharge consent limits except for one occasion in December 2017 when the concentration of TSS was 141mg/l which is above the consent limit of 60mg/l. However, the concentration of TSS recorded in December 2017 is within the overall range of the dataset. On the basis of the data available, it is considered that there has been no significant deterioration of the surface water quality in the last 12 months.

Data from the groundwater monitoring wells in Area 2 indicate generally stable trends in the groundwater chemistry since the previous Environmental Performance Review. However, the concentration of Arsenic in GW06_34 in December 2017 was the highest ever recorded at this location. Whilst it is considered that further/remedial action is not required at the current time, the data from this compliance well should be closely monitored in the next 6 to 12 months to determine whether there are continued exceedances or adverse trends developing.

The leachate head levels recorded in Area 2 in 2017 indicate that generally the recorded head levels in Cell 1 and parts of Cell 2 were below the permitted level. However, in C2B in Cell 2, the recorded head levels were above the permitted level. It is understood that NCC are currently working to reduce this.

Samples could not be recovered from the leachate wells in Area 2 during 2016 and therefore samples of leachate were obtained from side risers closest to the monitoring wells, in Cell 1 (LF08_07) and Cell 2 (C2B). The environmental monitoring data for both cells indicates variable leachate chemistry, including occasions where the highest concentration of a parameter since commencement of monitoring has been recorded. Parameters such as arsenic, nickel, potassium and EPH have recorded fluctuating concentrations during 2017 whilst benzene and o-xylene appear to be displaying a general trend of reducing concentrations over time. The remaining parameters appear to be displaying a relatively stable trend of concentrations.

External landfill gas concentrations at Area 2 are predominantly indicating generally stable trends in methane and carbon dioxide, although concentrations of methane and carbon dioxide have risen considerably in GP09_18 and continue to be high in GP06_24, and regularly high in GP06_25. Concentrations in GP09_18 are displaying an abnormal trend for the last 24 months and it is proposed to install additional gas monitoring wells adjacent to GP09_18 to determine the local ground gas regime in this area. The data from the new wells will be reviewed once sufficient initial data (about 6 months) has been collected.

8.2 Future Monitoring Requirements

It is intended that the Docksway Disposal Site Area 2 monitoring programmes shall continue in line with the Permit requirements (and as approved by NRW), providing data which will enable the ongoing assessment of the environmental performance of the site and the provision of environmental performance reports on an annual basis.

9 References

- [1] PBA (2011) Docksway Disposal Site, Newport. 2011 Monitoring Plan for Area 1. Peter Brett Associates, August 2011.
- [2] PBA (2004). Docksway Disposal Site, Newport. Monitoring Plan for Area 2: Landfill Extension. Peter Brett Associates LLP report reference 14739/010B/CBH. October 2004.
- [3] PBA (2010) Docksway Disposal Site, Newport. Review of the Hydrogeological Risk Assessment for Area 2. Peter Brett Associates, December 2010.
- [4] PBA (2017) Docksway Disposal Site, Annual Environmental Review for Area 2 - 2016. Peter Brett Associates, April 2017.

10 Guidance for Readers of the Report

This report has been prepared within an agreed timeframe and to an agreed budget that will necessarily apply some constraints on its content and usage. The remarks below are presented to assist the reader in understanding the context of this report and any general limitations or constraints. If there are any specific limitations and constraints they are described in the report text.

- 1 The opinions and recommendations expressed in this report are based on statute, guidance, and appropriate practice current at the date of its preparation. Peter Brett Associates LLP (PBA) does not accept any liability whatsoever for the consequences of any future legislative changes or the release of subsequent guidance documentation, etc. Such changes may render some of the opinions and advice in this report inappropriate or incorrect and we will be pleased to advise if any report requires revision due to changing circumstances, especially those over one year old. Following delivery of any report PBA has no obligation to advise the Client or any other party of such changes or their repercussions.
- 2 Some of the conclusions in this report may be based on third party data. No guarantee can be given for the accuracy or completeness of any of the third party data used.
- 3 The conclusions and recommendations made in this report and the opinions expressed are based on the information reviewed and/or the ground conditions encountered in exploratory holes and the results of any field or laboratory testing undertaken. There may be ground conditions at the site that have not been disclosed by the information reviewed or by the investigative work undertaken. Such undisclosed conditions cannot be taken into account in any analysis and reporting.
- 4 It should be noted that groundwater levels, groundwater chemistry, surface water levels, surface water chemistry, soil gas concentrations and soil gas flow rates can vary due to seasonal, climatic, tidal and manmade effects.
- 5 This report has been written for the sole use of the Client stated at the front of the report. This report shall not be relied upon or transferred to any other party without the express written authorisation of PBA. Any such party relies upon the report at its own risk.
- 6 The interpretation carried out in this report is based on scientific and engineering appraisal carried out by suitably experienced and qualified technical consultants based on the scope of our engagement. We have not taken into account the perceptions of, for example, banks, insurers, other funders, lay people, etc., unless the report has been prepared specifically for that purpose. Advice from other specialists may be required such as the legal, planning and architecture professions, whether specifically recommended in our report or not.
- 7 Public or legal consultations or enquiries, or consultation with any Regulatory Bodies (such as Natural Resources Wales, Natural England or Local Authority) have taken place only as part of this work where specifically stated.

Figures

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Site Grid Reference: ST 309 852

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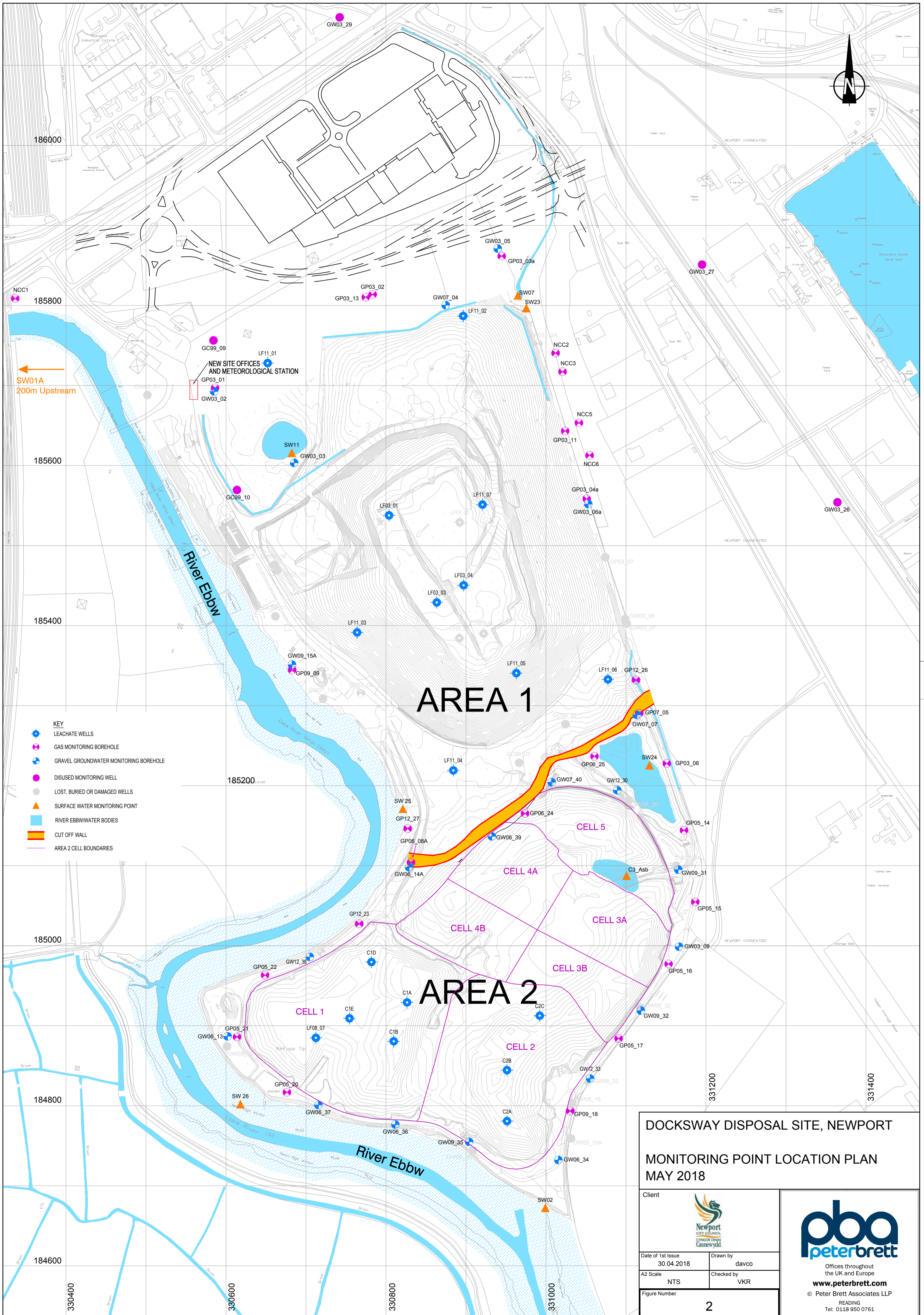
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**DOCKSWAY DISPOSAL SITE
 NEWPORT**

SITE LOCATION PLAN

Date	01.04.2015
A4 Scale	1:50 000
Drawn by	davco
Checked by	VKR
Revision	0

FIGURE 1




- KEY**
- LEACHATE WELLS
 - GAS MONITORING BOREHOLE
 - GRAVEL GROUNDWATER MONITORING BOREHOLE
 - DISUSED MONITORING WELL
 - LOST, BURIED OR DAMAGED WELLS
 - ▲ SURFACE WATER MONITORING POINT
 - RIVER EBBWATER BODIES
 - CUT OFF WALL
 - AREA 2 CELL BOUNDARIES

AREA 1

AREA 2

DOCKSWAY DISPOSAL SITE, NEWPORT
MONITORING POINT LOCATION PLAN
MAY 2018

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Date of 1st Issue	30.04.2018	Drawn by	davco
A2 Scale	NTS	Checked by	VKR
Figure Number	2		

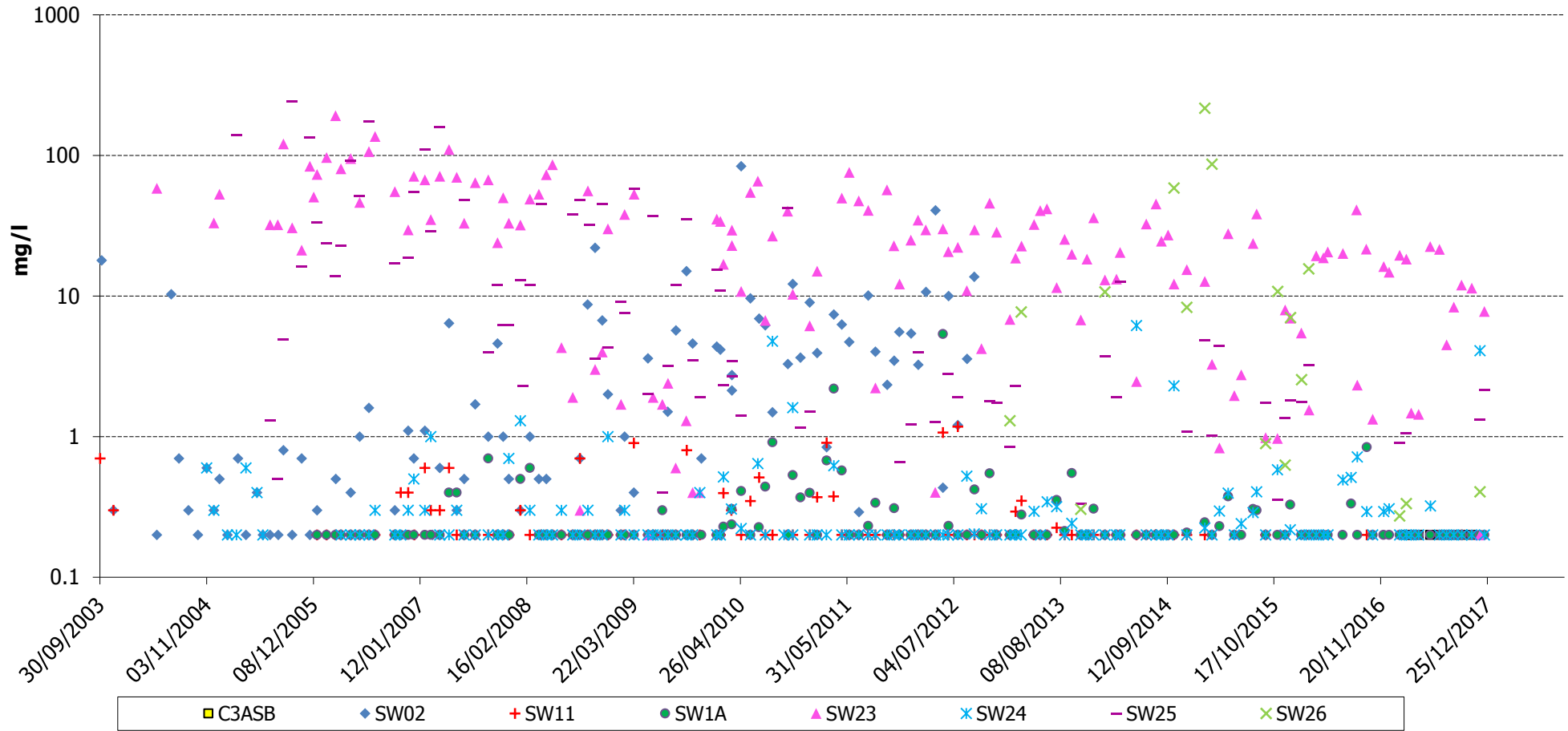


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Appendix 1

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**Appendix 1/1
Docksway Disposal Site - Ammoniacal Nitrogen in Surface Water**



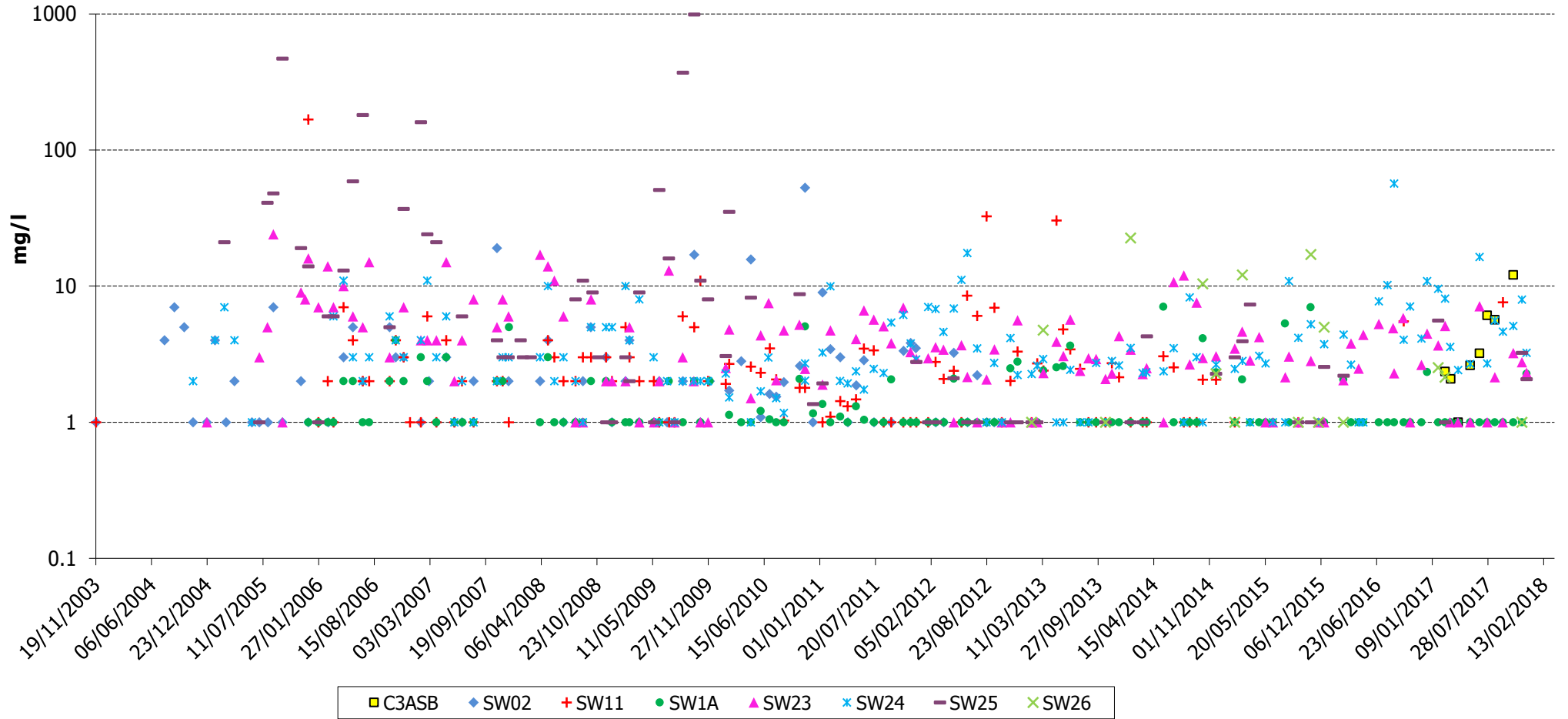
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Appendix 1-1	

**Appendix 1/2
Docksway Disposal Site - Biochemical Oxygen Demand**



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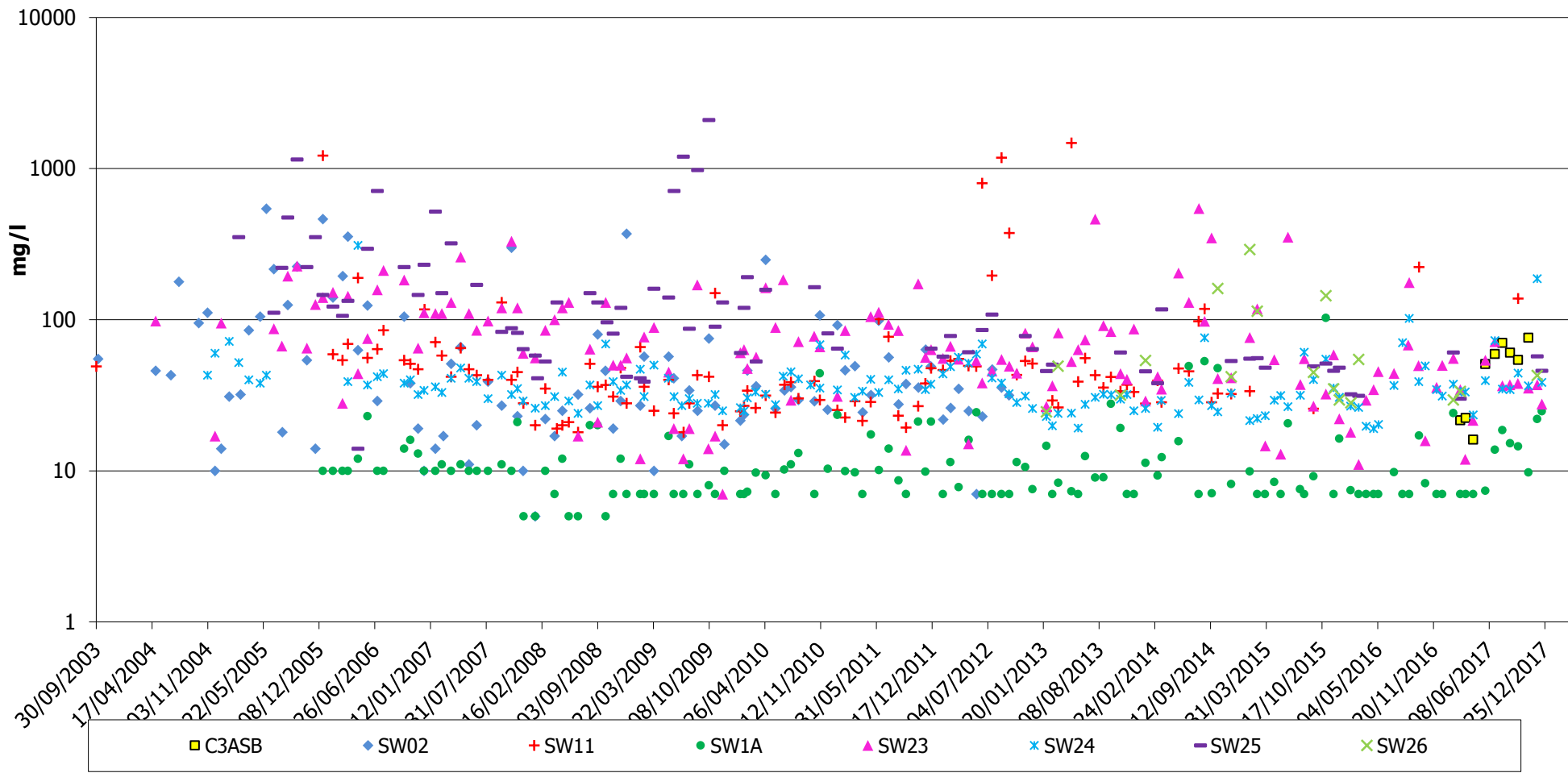
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Appendix 1-2

**Appendix 1/3
Docksway Disposal Site - Chemical Oxygen Demand in Surface Water**



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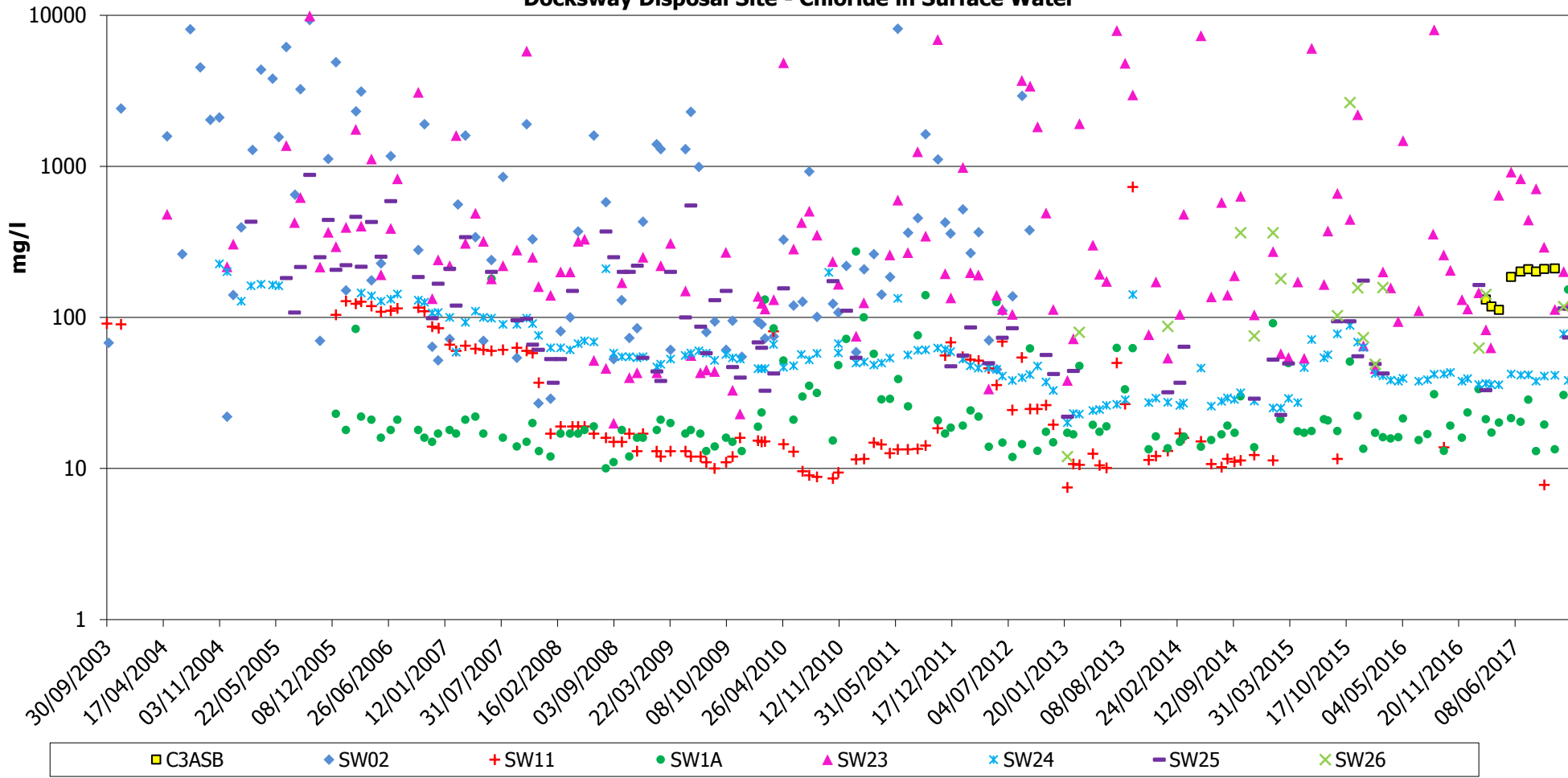
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Appendix 1-3

**Appendix 1/4
Docksway Disposal Site - Chloride in Surface Water**



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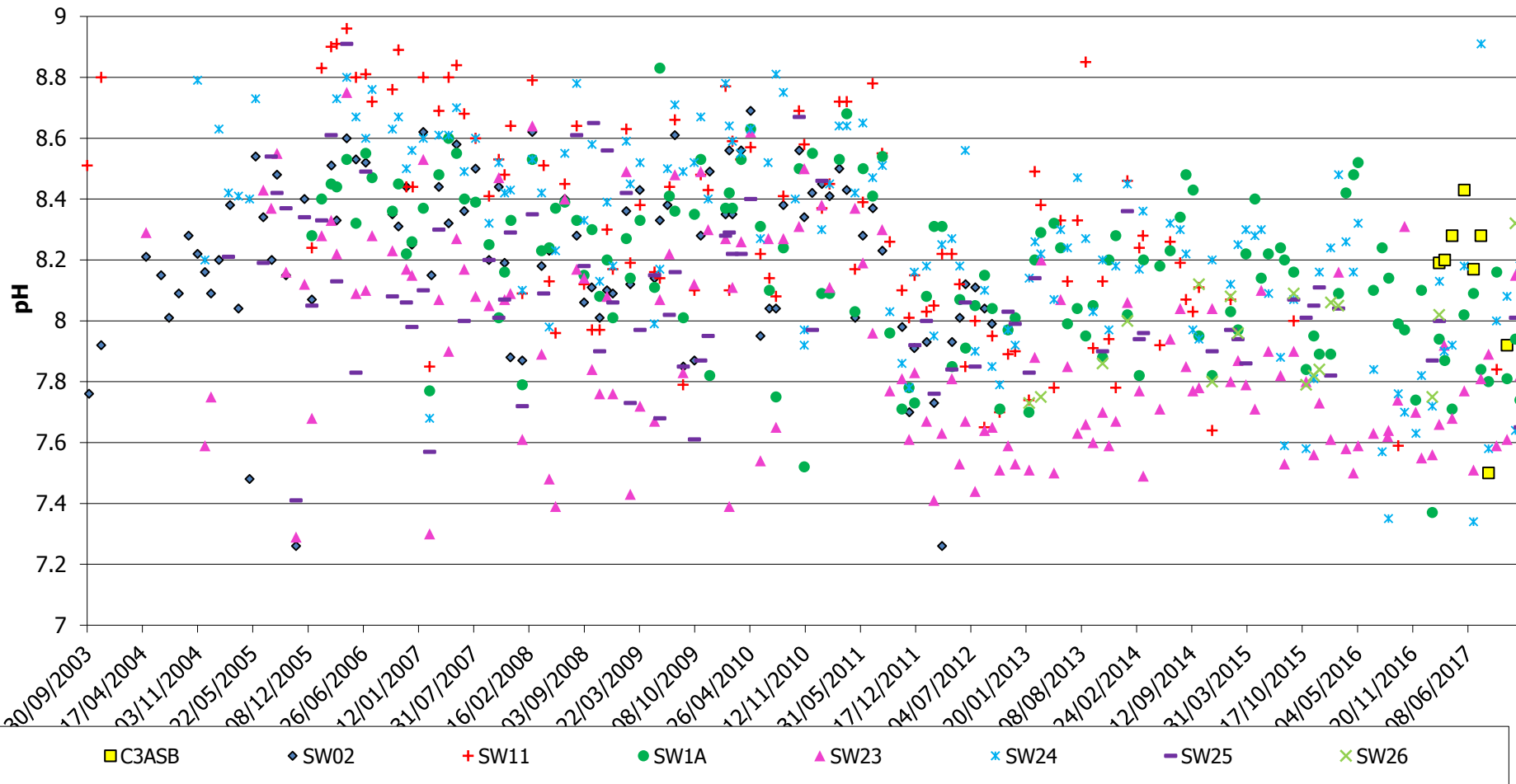
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Appendix 1-4	

Appendix 1/5 Docksway Disposal Site - pH in Surface Water



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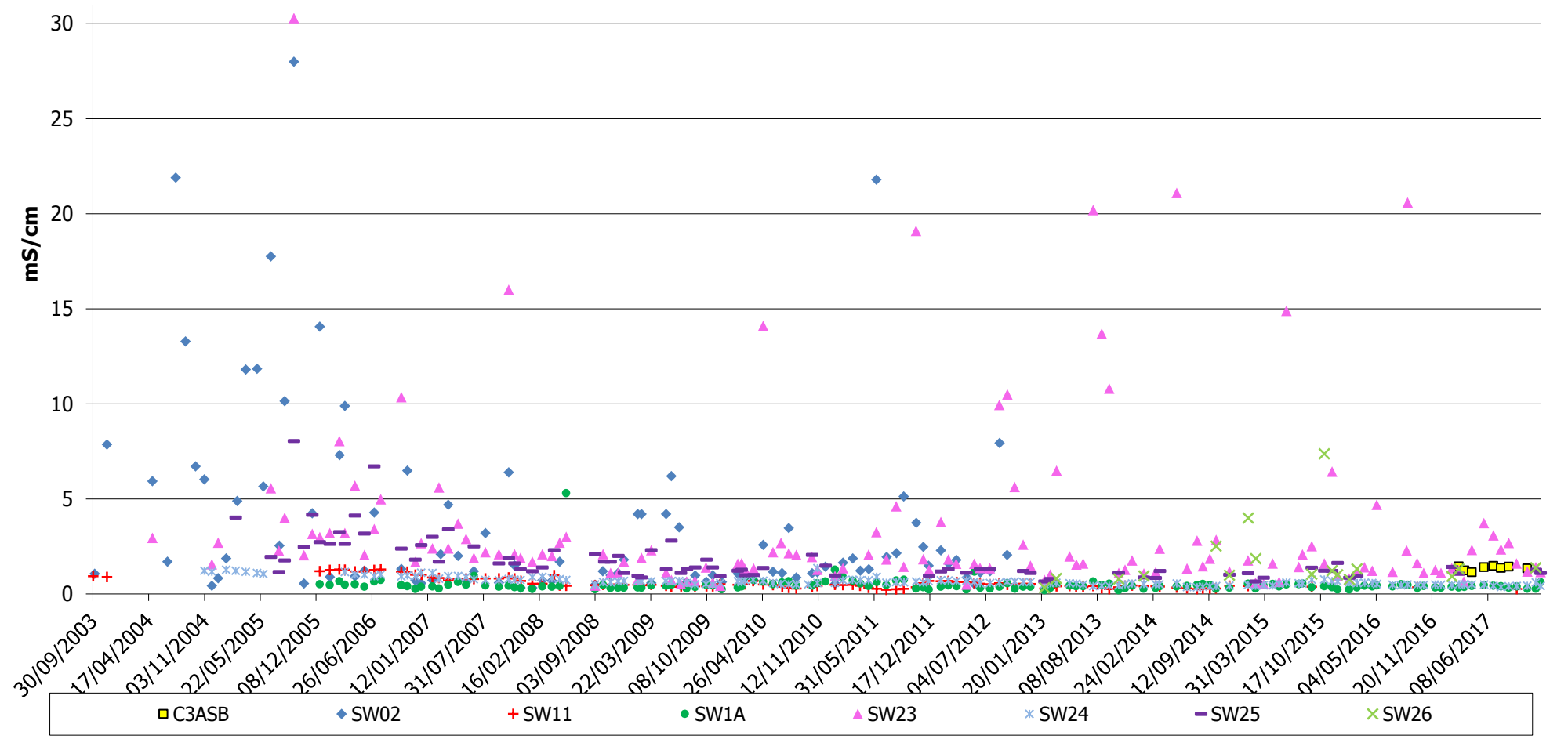
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Appendix 1-5

**Appendix 1/6
Docksway Disposal Site - Electrical Conductivity in Surface Water**



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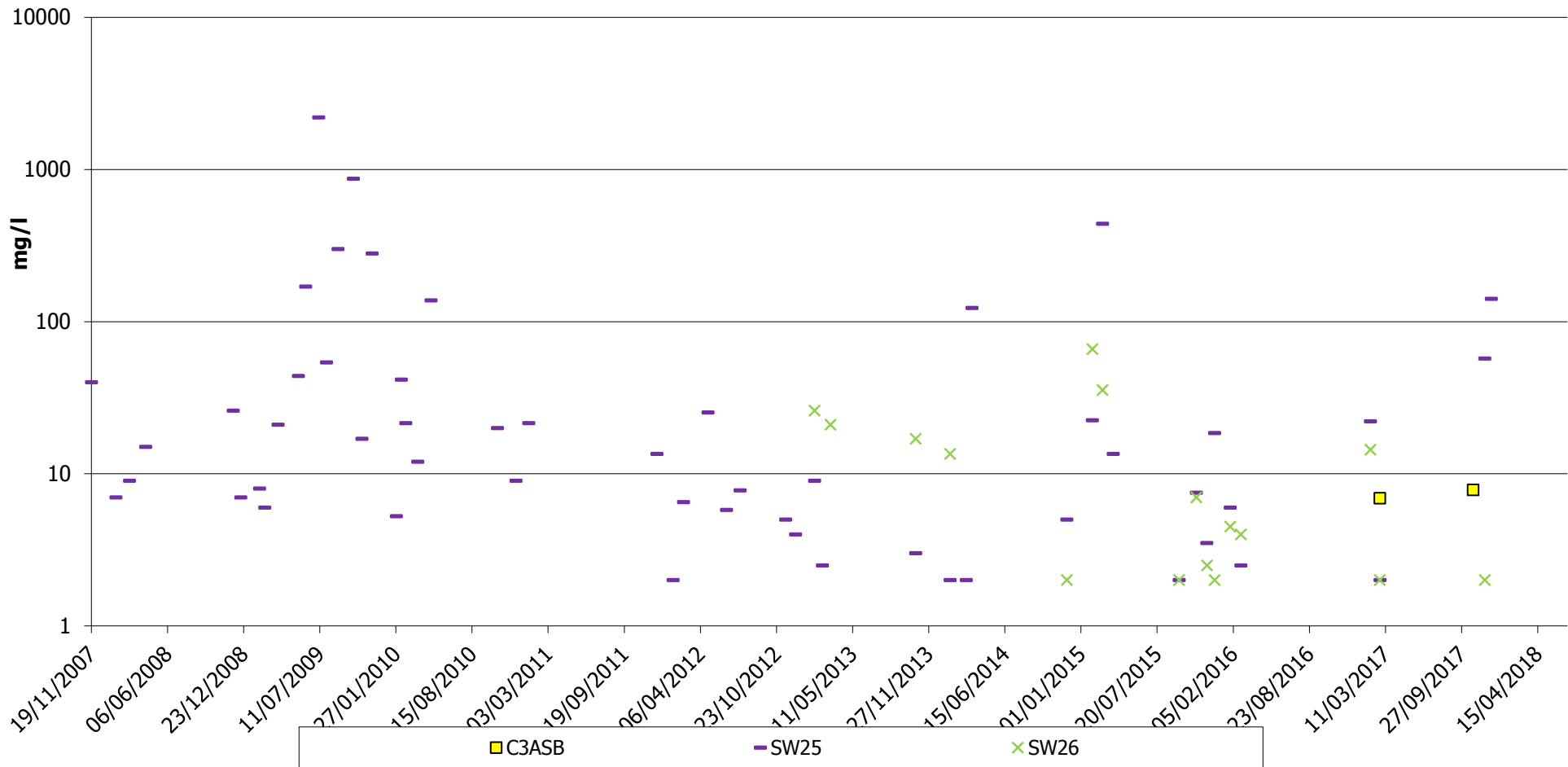
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Appendix 1-6

**Appendix 1/7
Docksway Disposal Site - Total Suspended Solids in Surface Water**



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Docksway Disposal Site

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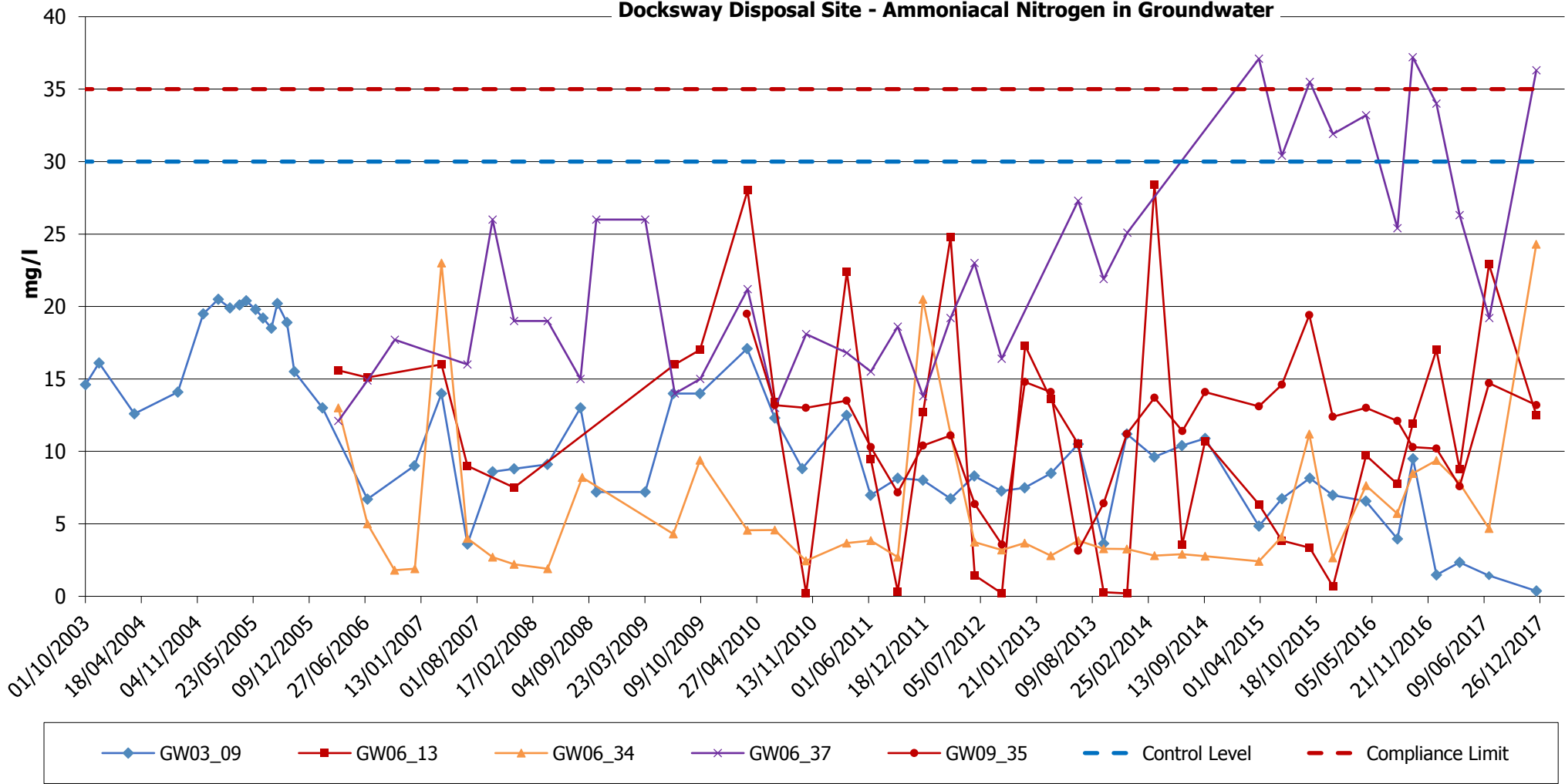
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Appendix 1-7

Appendix 2

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**Appendix 2/1
Docksway Disposal Site - Ammoniacal Nitrogen in Groundwater**



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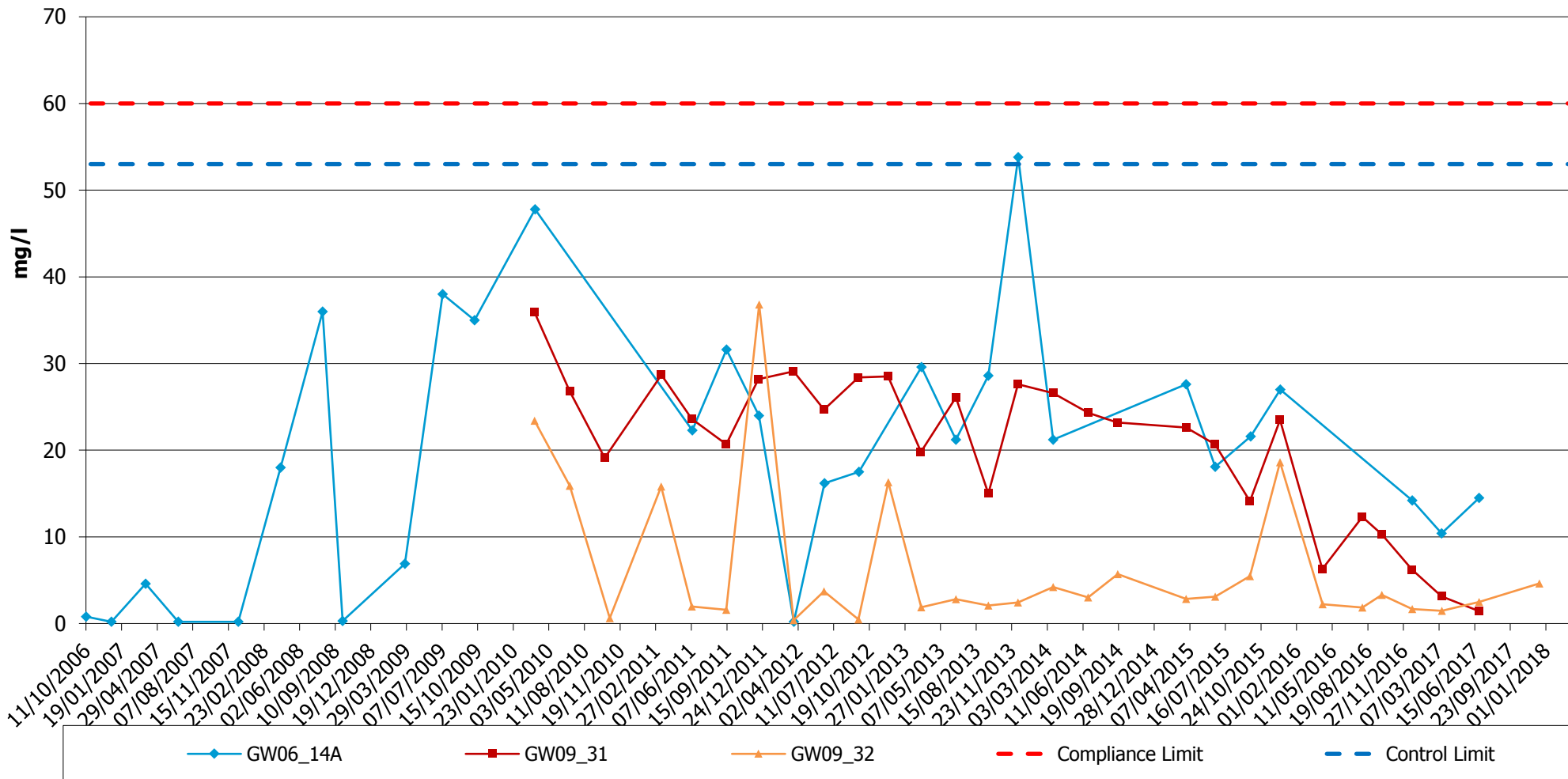
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Appendix 2-1

**Appendix 2/2
Docksway Disposal Site - Ammoniacal Nitrogen (Nitrogen)**



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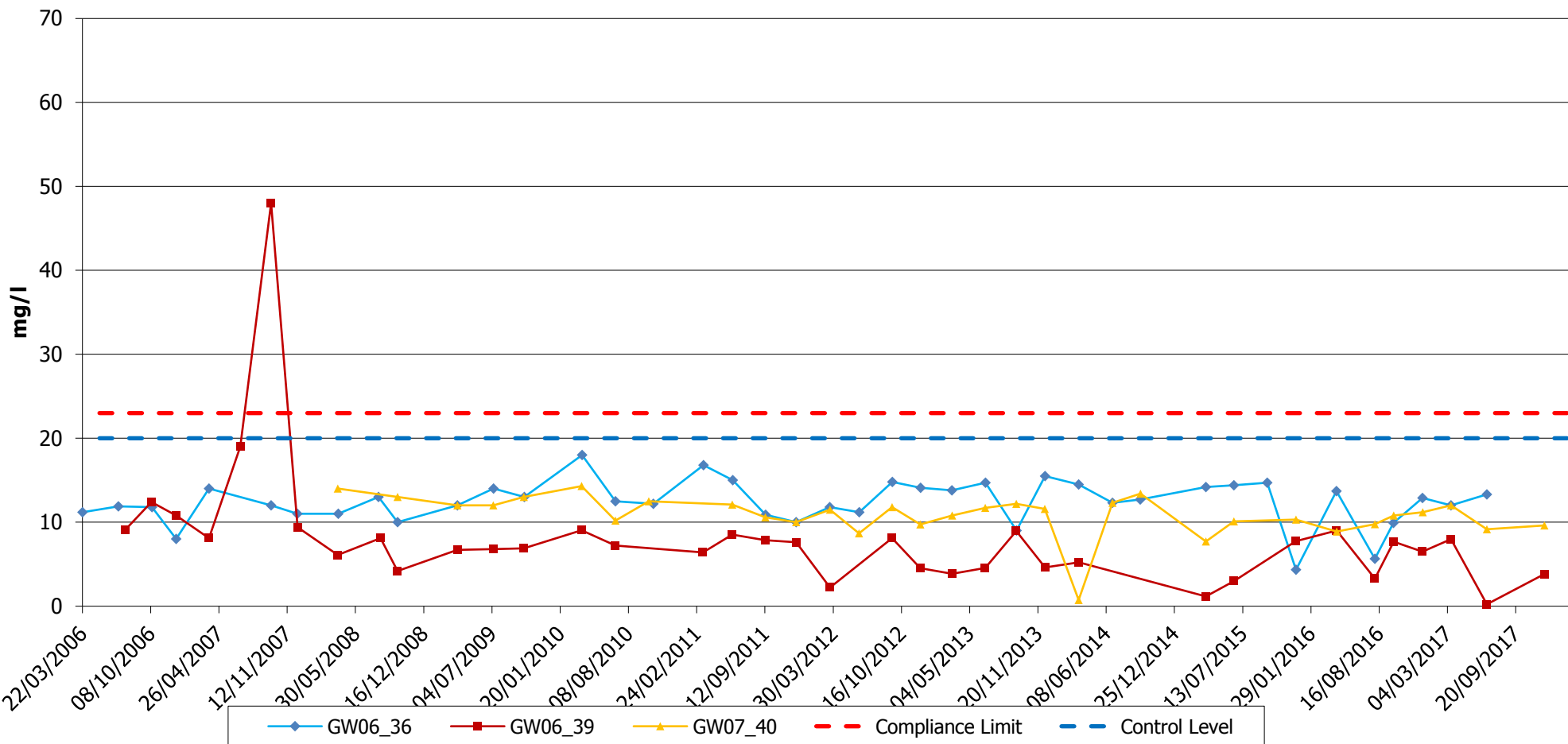
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Appendix 2-2

**Appendix 2/3
Docksway Disposal Site - Ammoniacal Nitrogen in Groundwater**



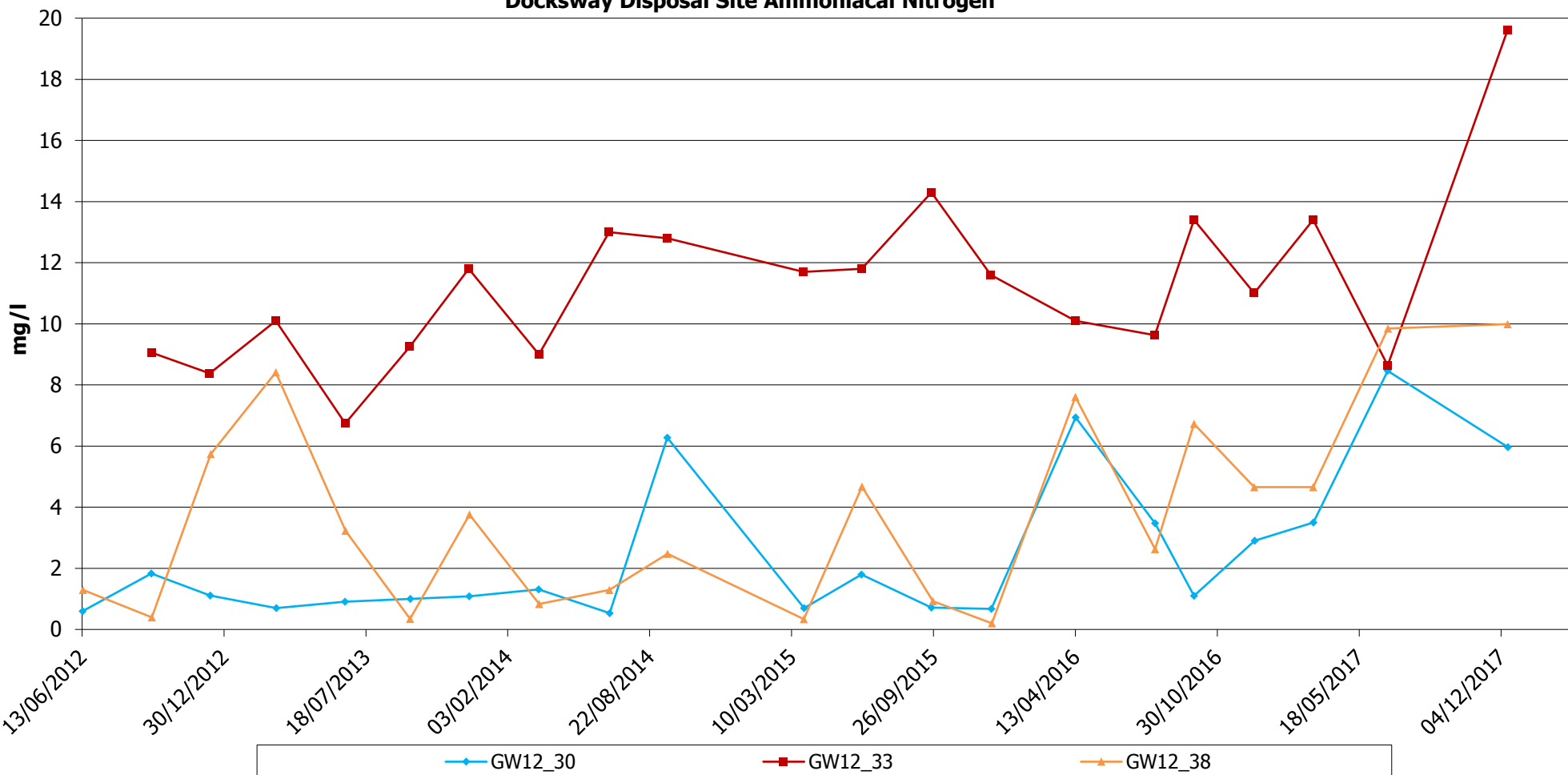
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Appendix 2-3	

**Appendix 2/4
Docksway Disposal Site Ammoniacal Nitrogen**



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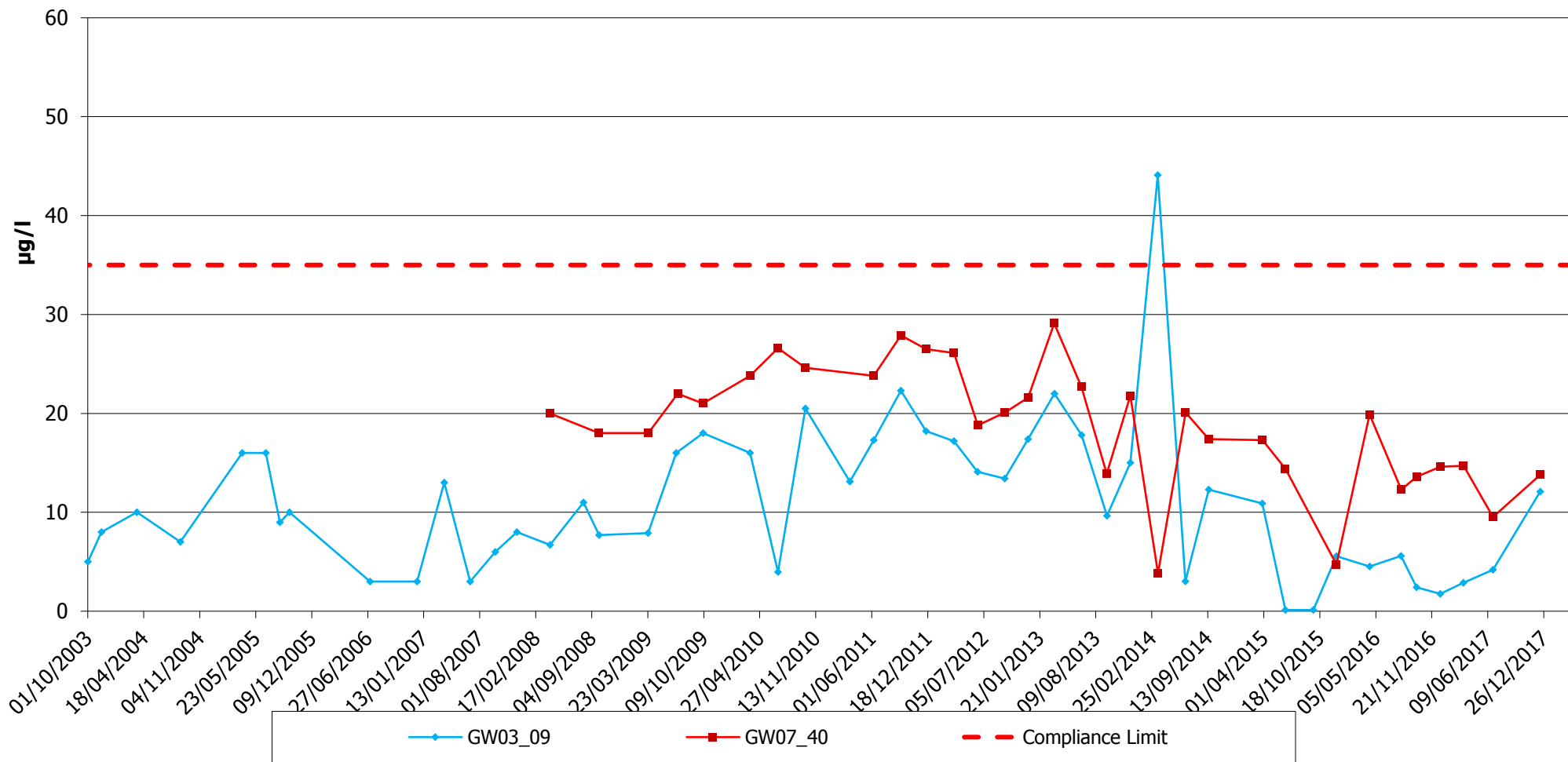
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Appendix 2-4

**Appendix 2/5
Docksway Disposal Site - Arsenic in Groundwater**



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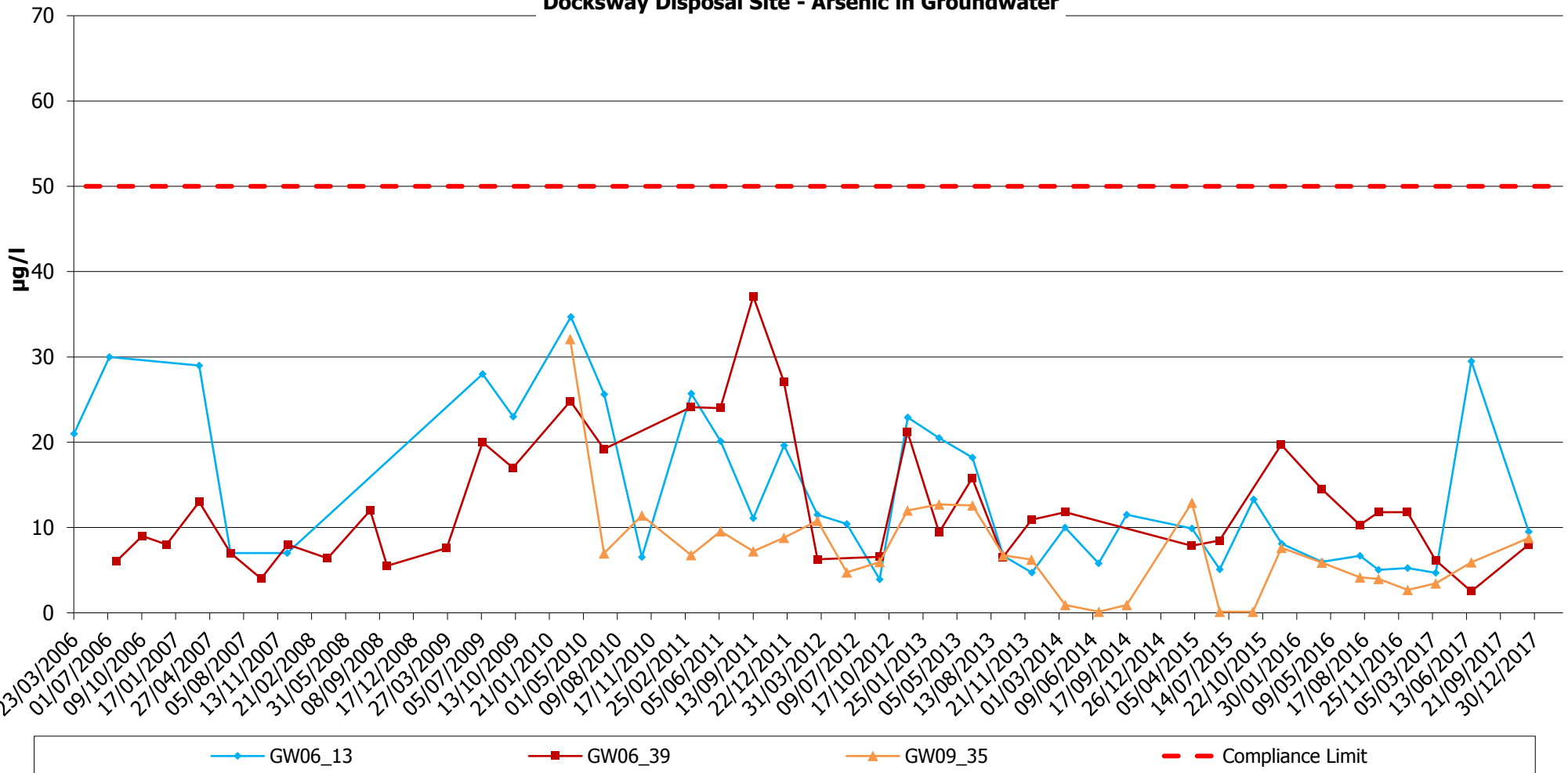
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Appendix 2-5

**Appendix 2/6
Docksway Disposal Site - Arsenic in Groundwater**



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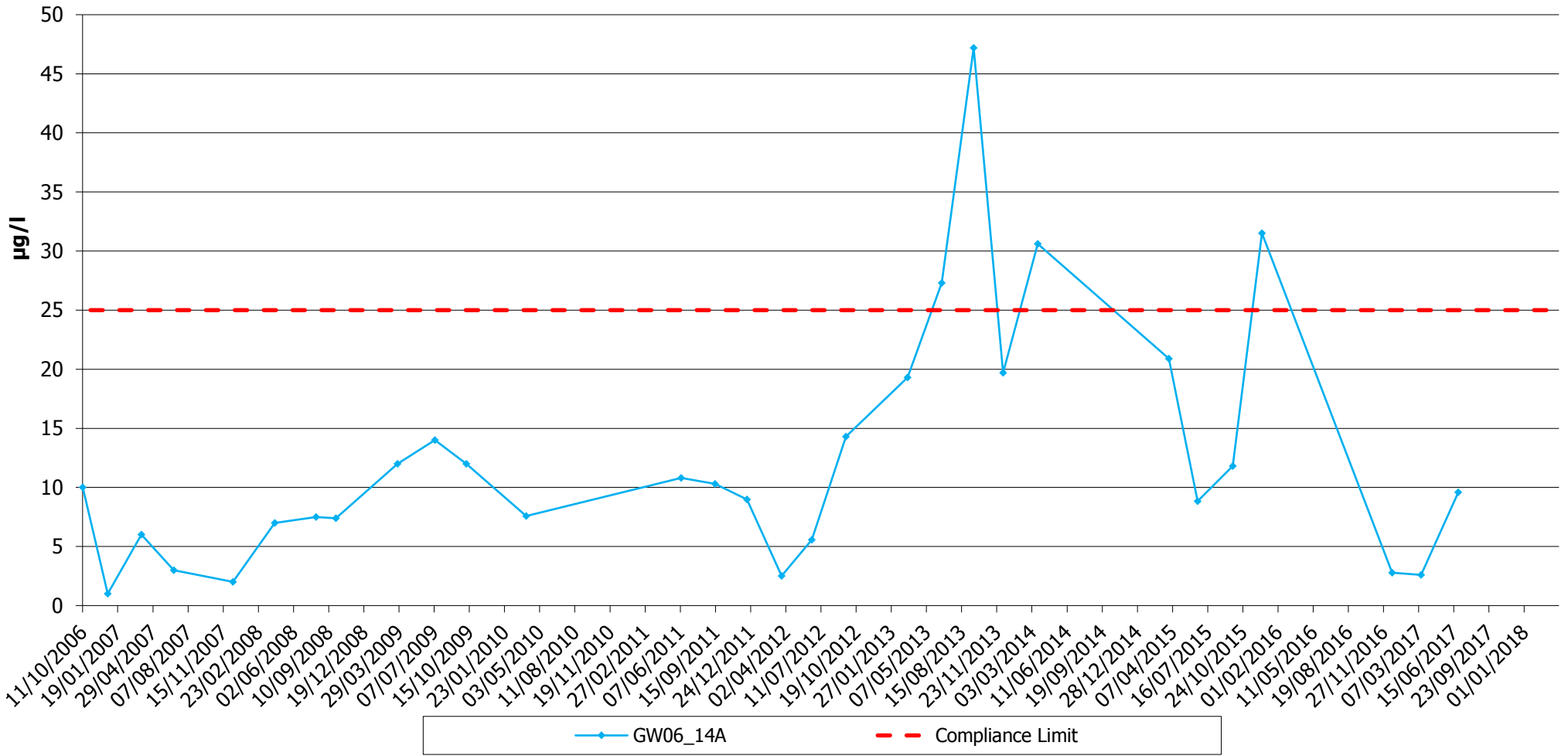
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Appendix 2-6

**Appendix 2/7
Docksway Disposal Site - Arsenic in Groundwater**



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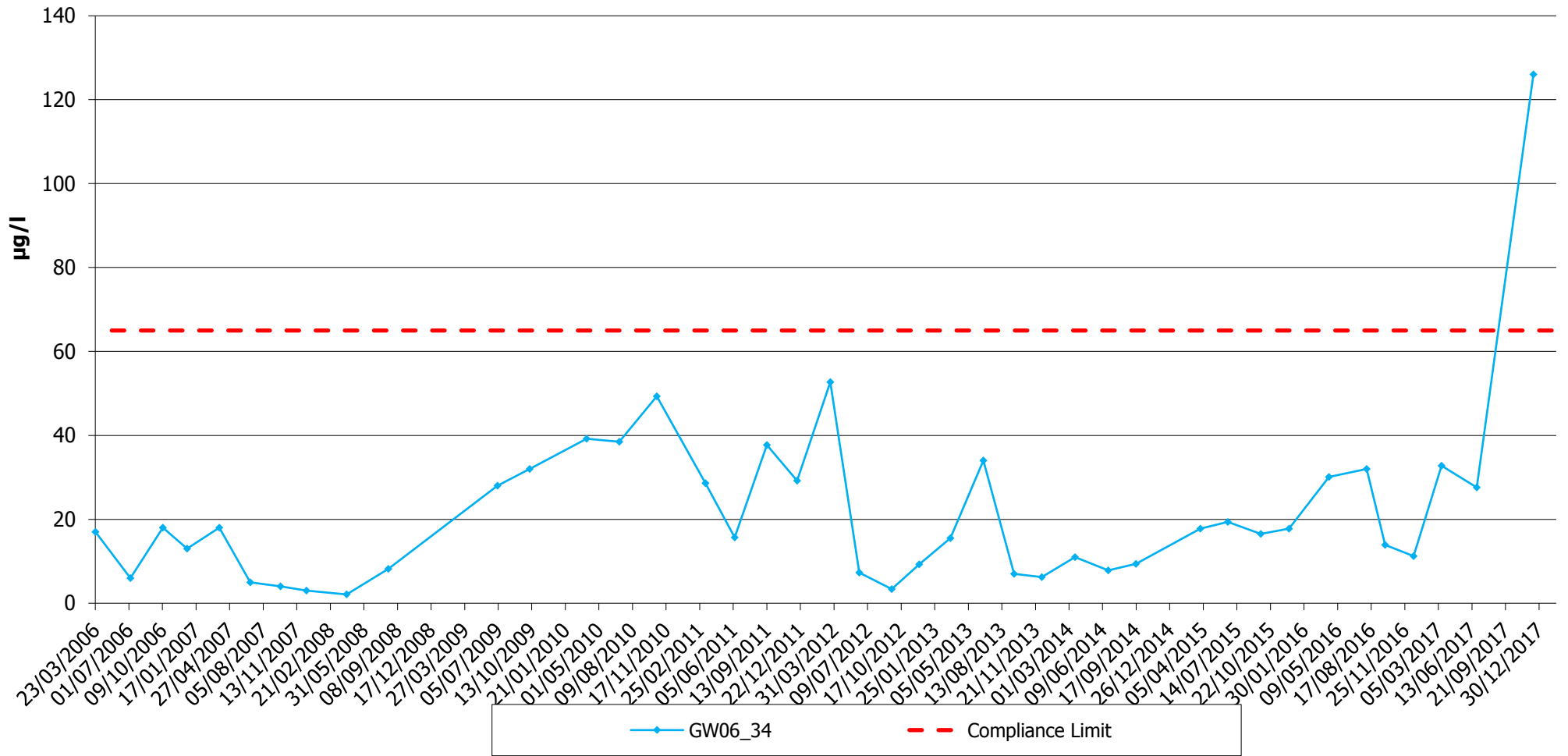
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Appendix 2-7

**Appendix 2/8
Dockway Disposal Site - Arsenic in Groundwater**



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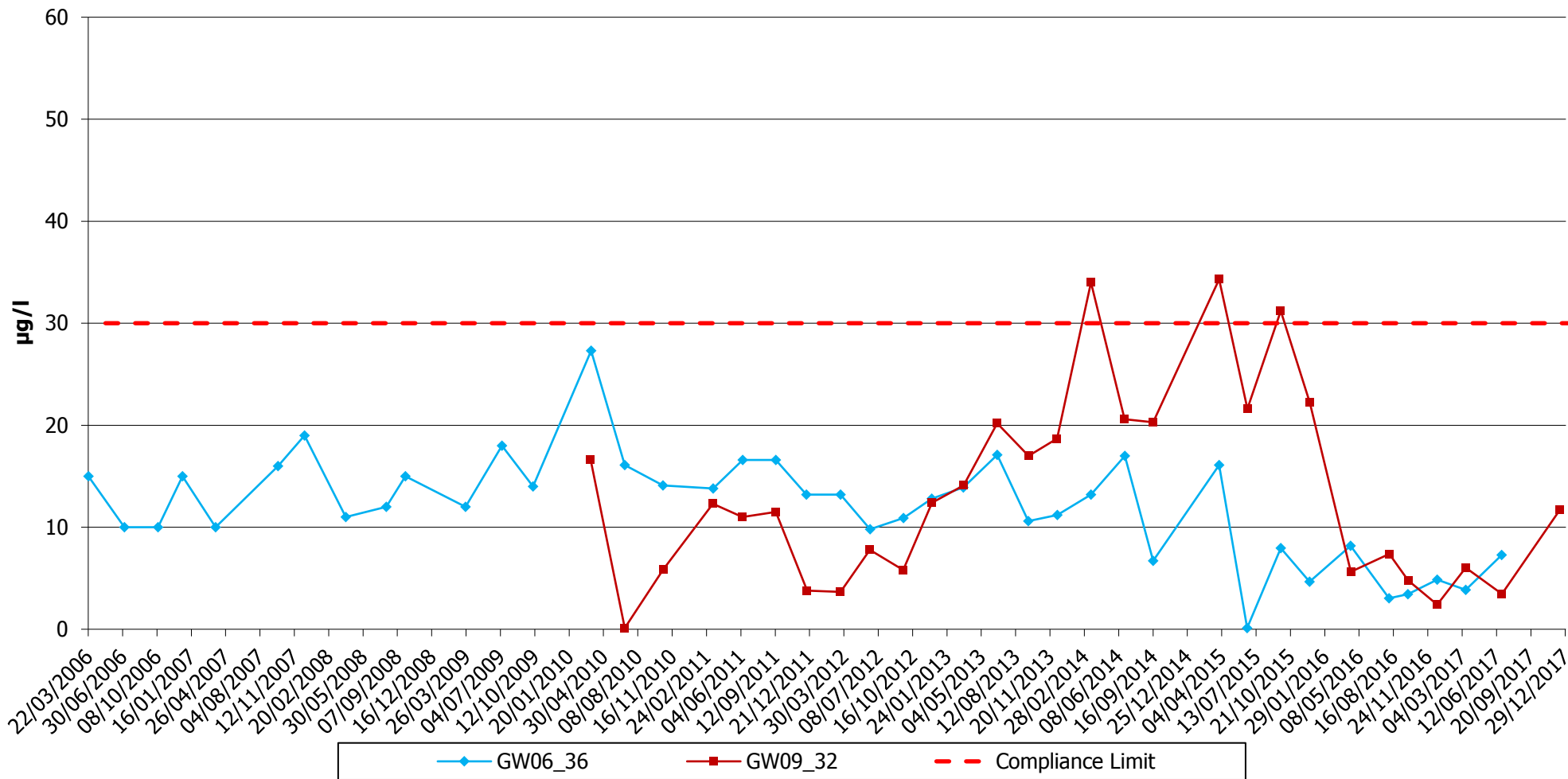
Dockway Disposal Site

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Appendix 2-8

**Appendix 2/9
Docksway Disposal Site - Arsenic in Groundwater**



Client
Newport City Council

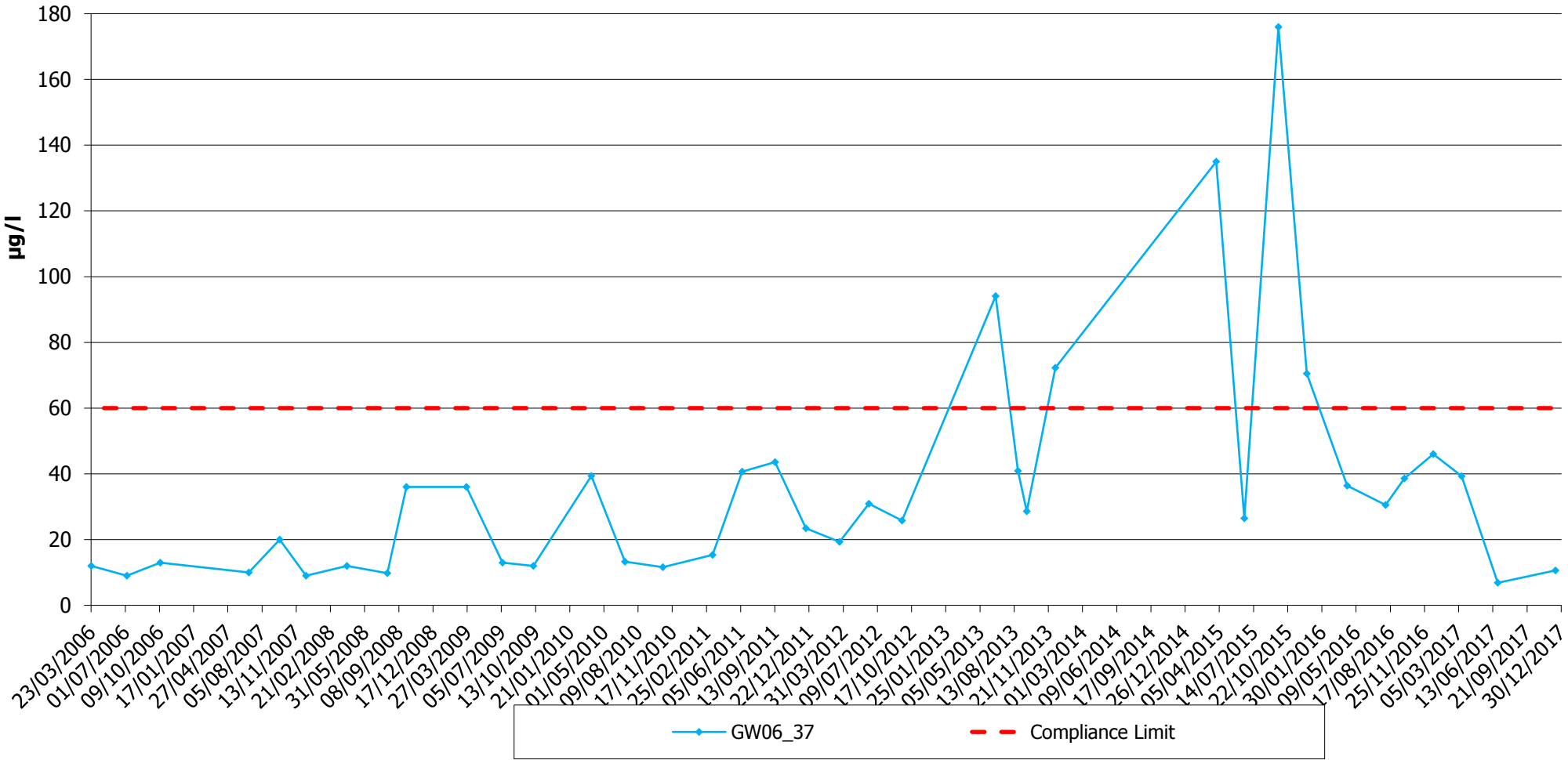
Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Docksway Disposal Site

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

Appendix 2-9

**Appendix 2/10
Docksway Disposal Site - Arsenic in Groundwater**



Client
Newport City Council

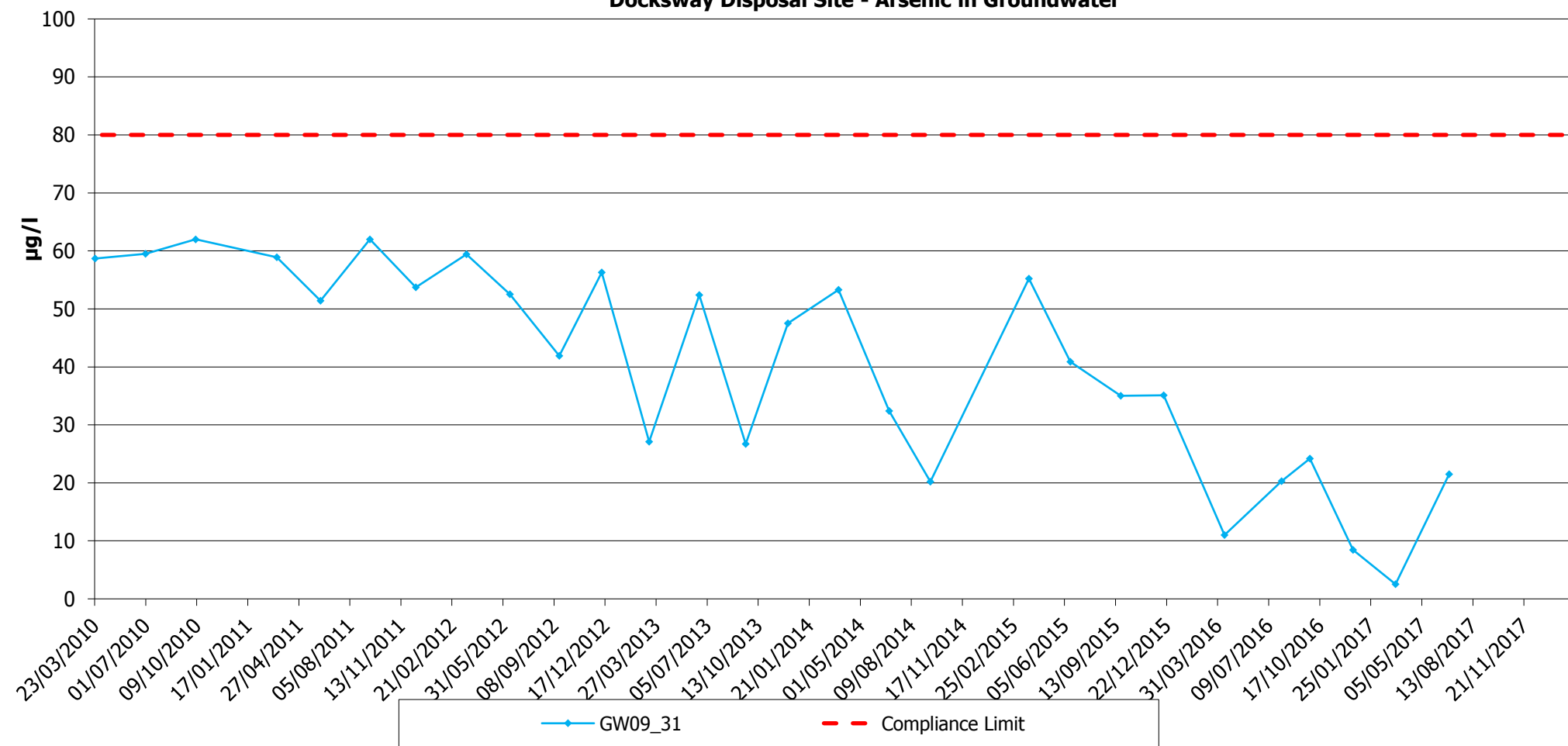
Docksway Disposal Site

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Appendix 2-10

**Appendix 2/11
Docksway Disposal Site - Arsenic in Groundwater**



Client
Newport City Council

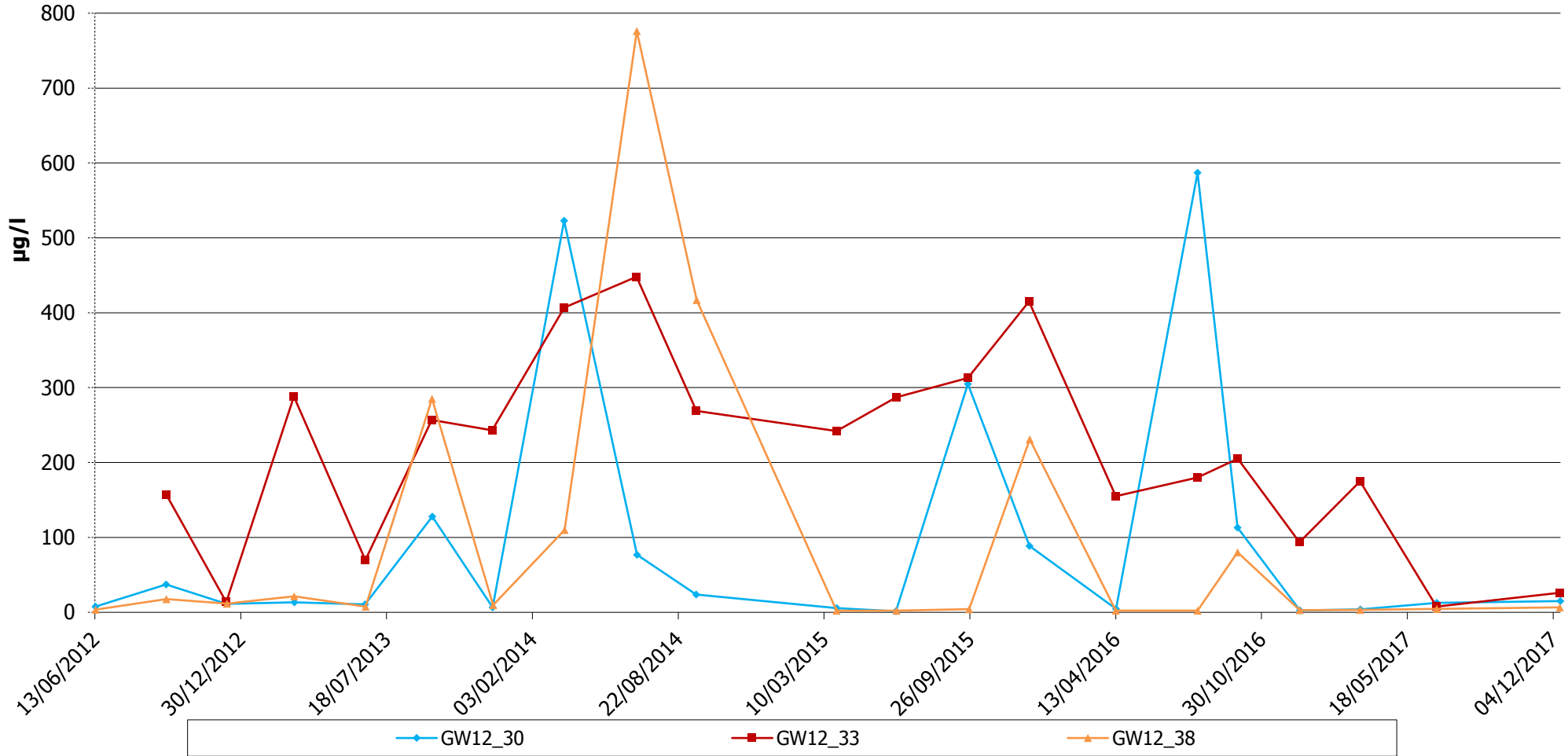
Docksway Disposal Site

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Appendix 2-11

**Appendix 2/12
Dockway Disposal Site - Arsenic in Groundwater**



Client
Newport City Council

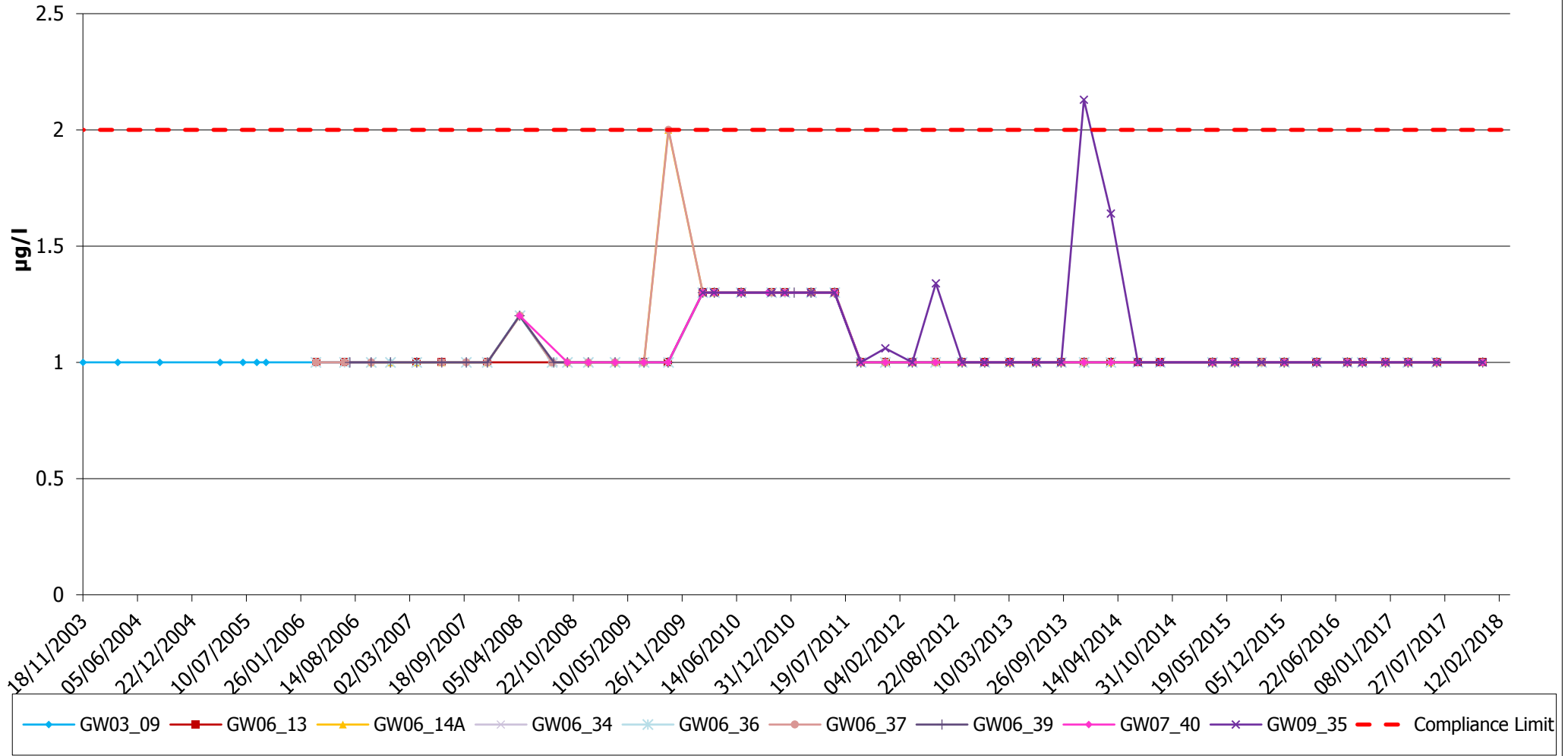
Dockway Disposal Site

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

Appendix 2-12

**Appendix 2/13
Docksway Disposal Site - Benzene in Groundwater**



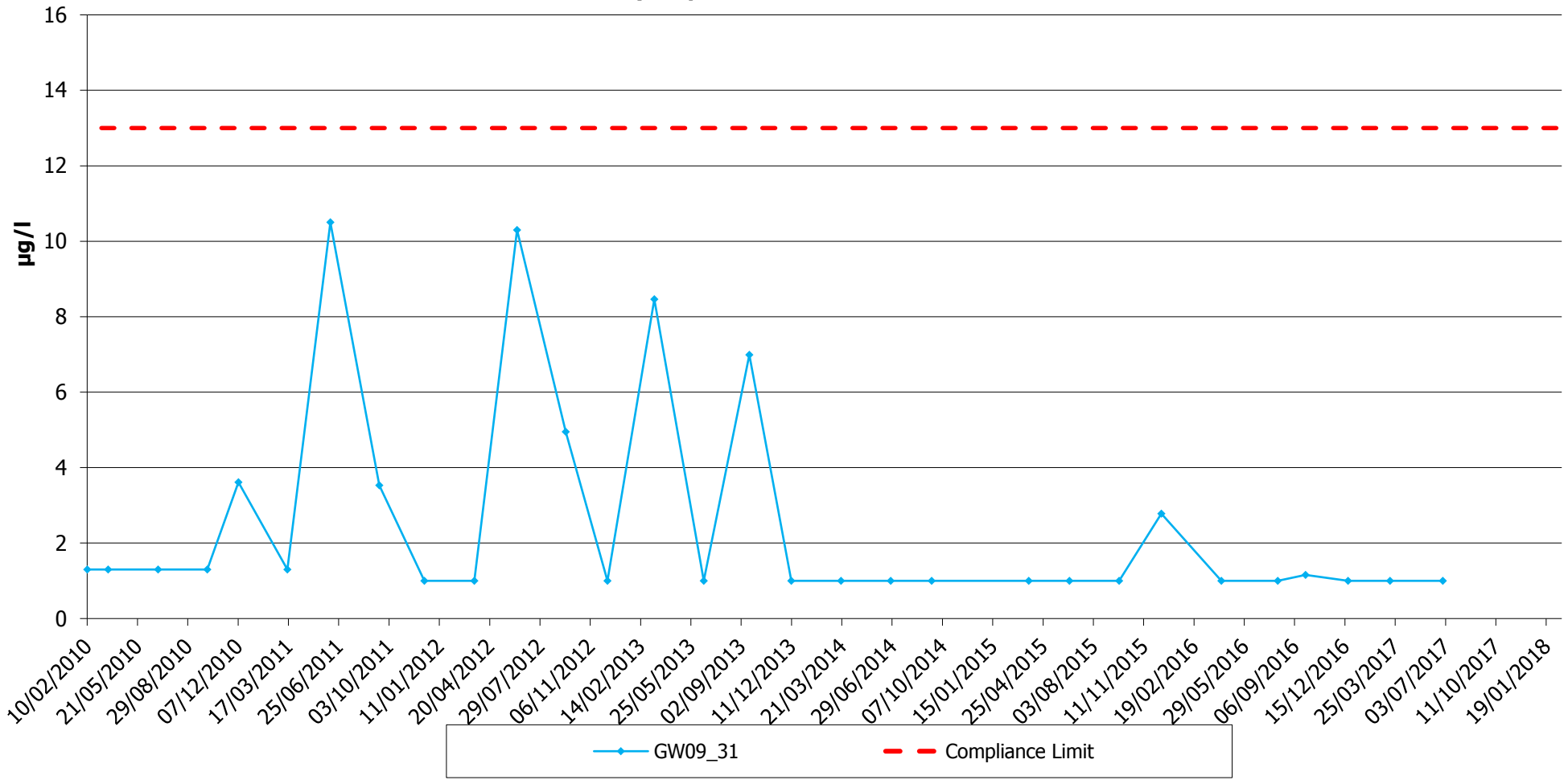
Client
Newport City Council

Docksway Disposal Site

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR
Appendix 2-13	

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

**Appendix 2/14
Docksway Disposal Site - Benzene in Groundwater**



Client
Newport City Council

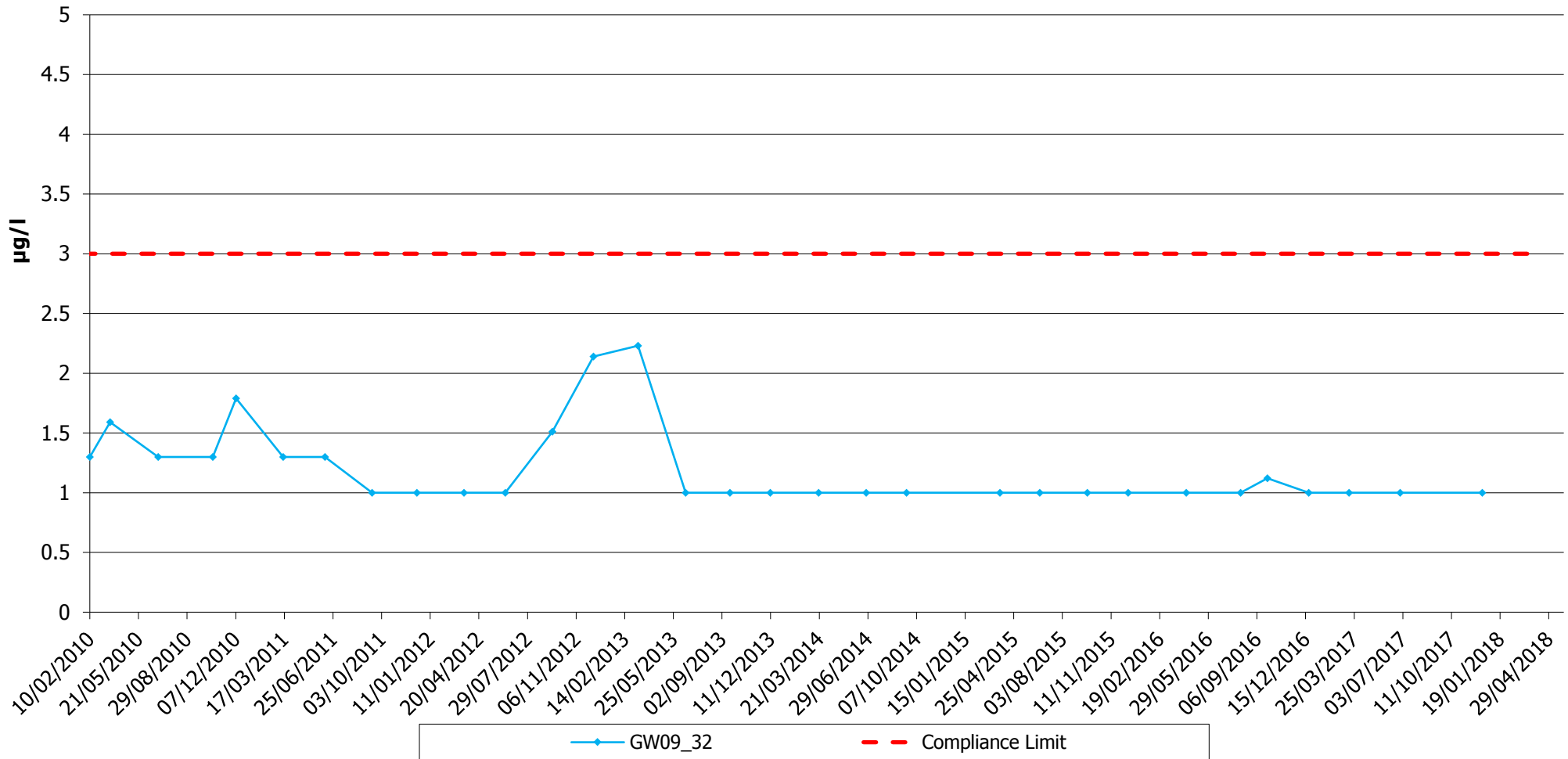
Docksway Disposal Site

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Appendix 2-14

**Appendix 2/15
Docksway Disposal Site - Benzene in Groundwater**



Client
Newport City Council

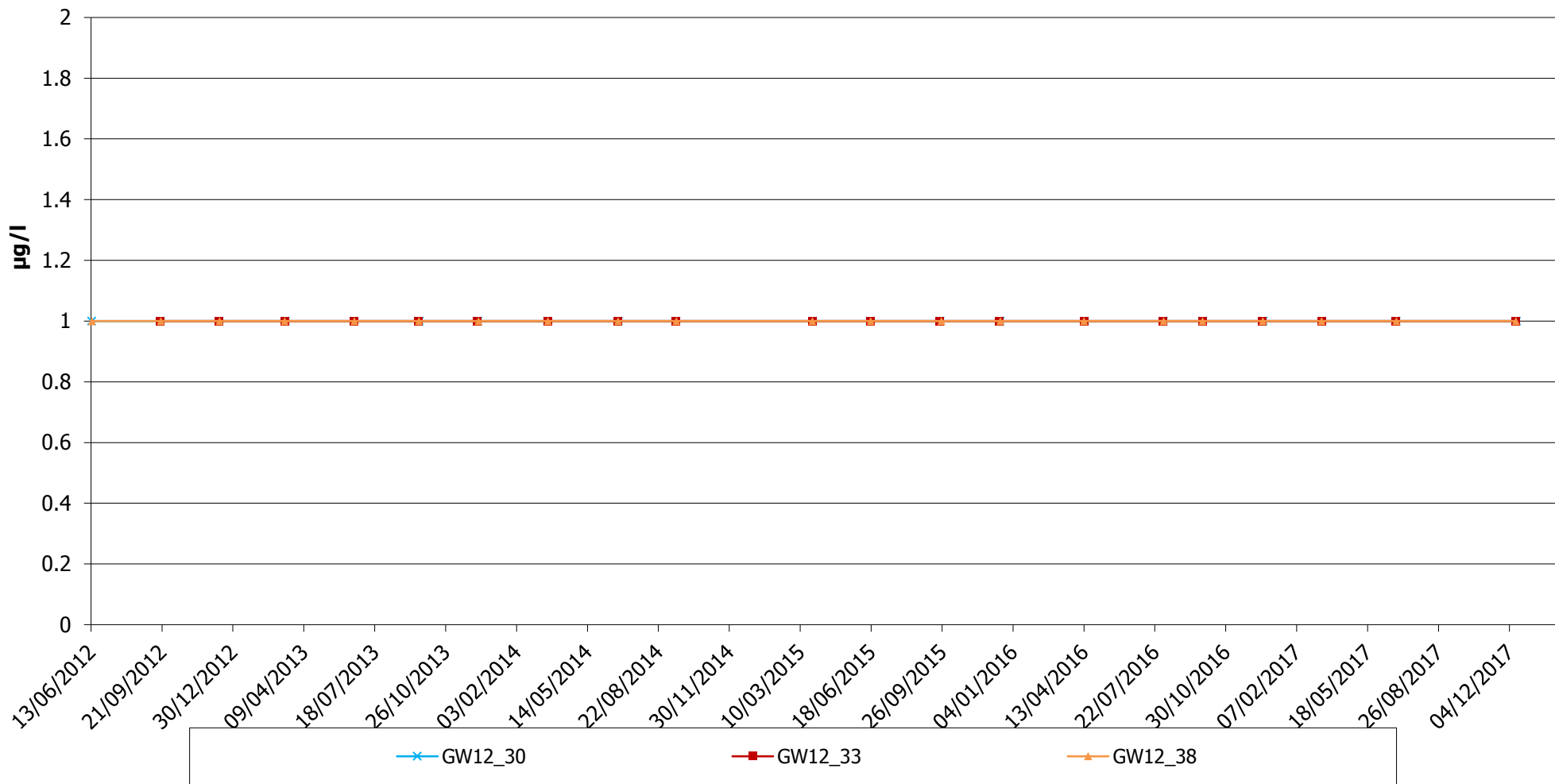
Docksway Disposal Site

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Appendix 2-15

**Appendix 2/16
Docksway Disposal - Benzene in Groundwater**



Client

Newport City Council

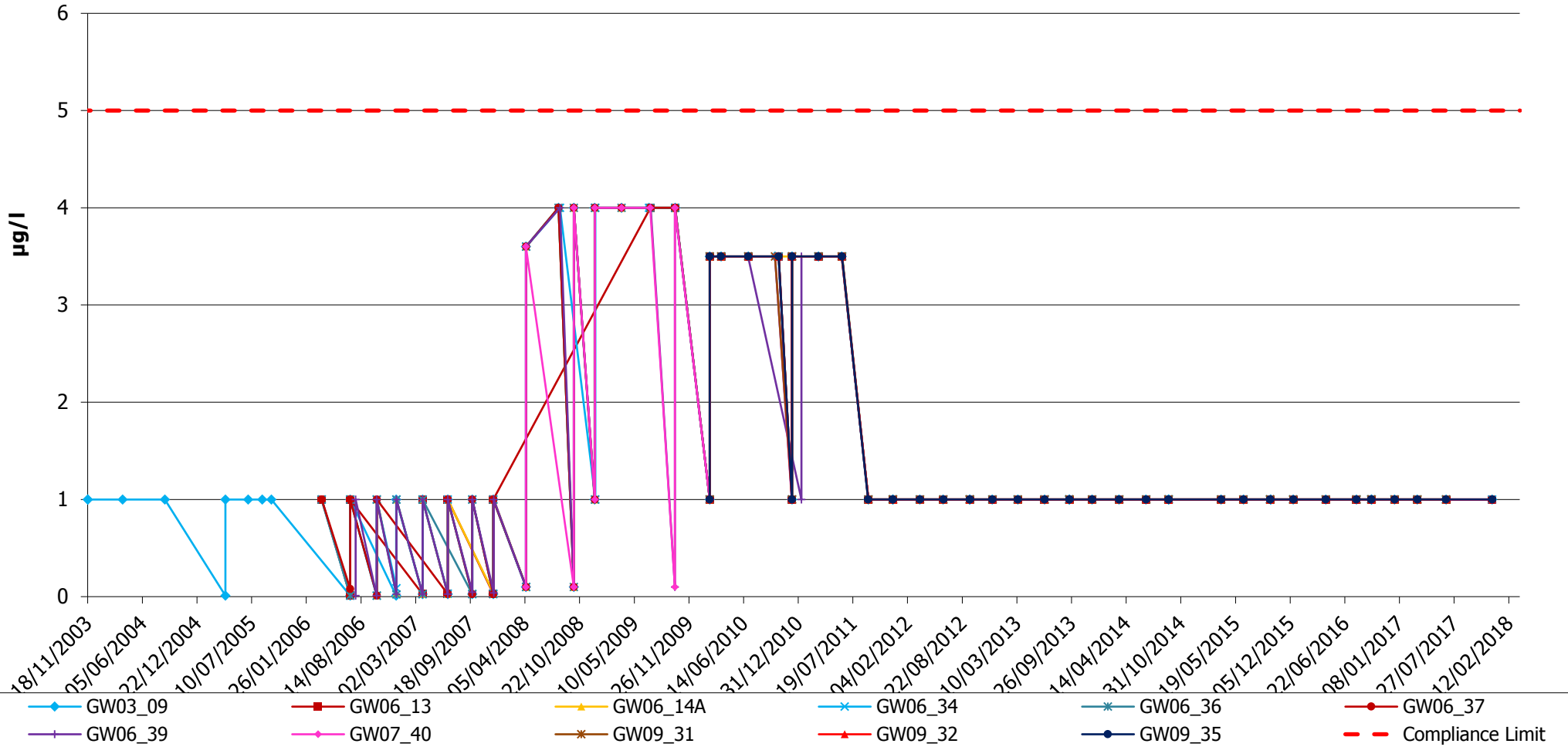
Docksway Disposal Site

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

Appendix 2-16

**Appendix 2/17
Docksway Disposal Site - Naphthalene in Groundwater**



Client
Newport City Council

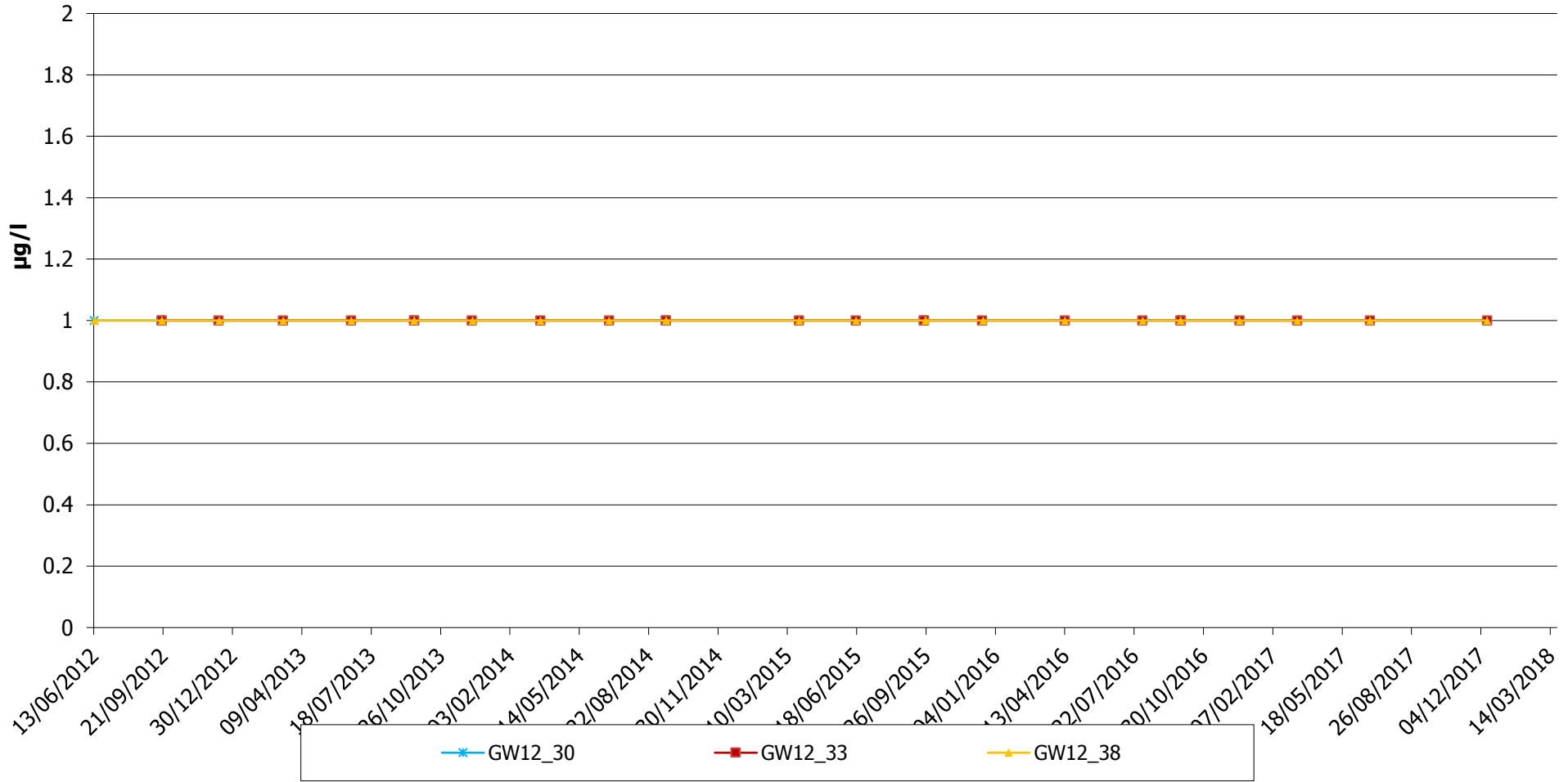
Docksway Disposal Site

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Appendix 2-17

**Appendix 2/18
Docksway Disposal Site - Naphthalene in Groundwater**



Client
Newport City Council

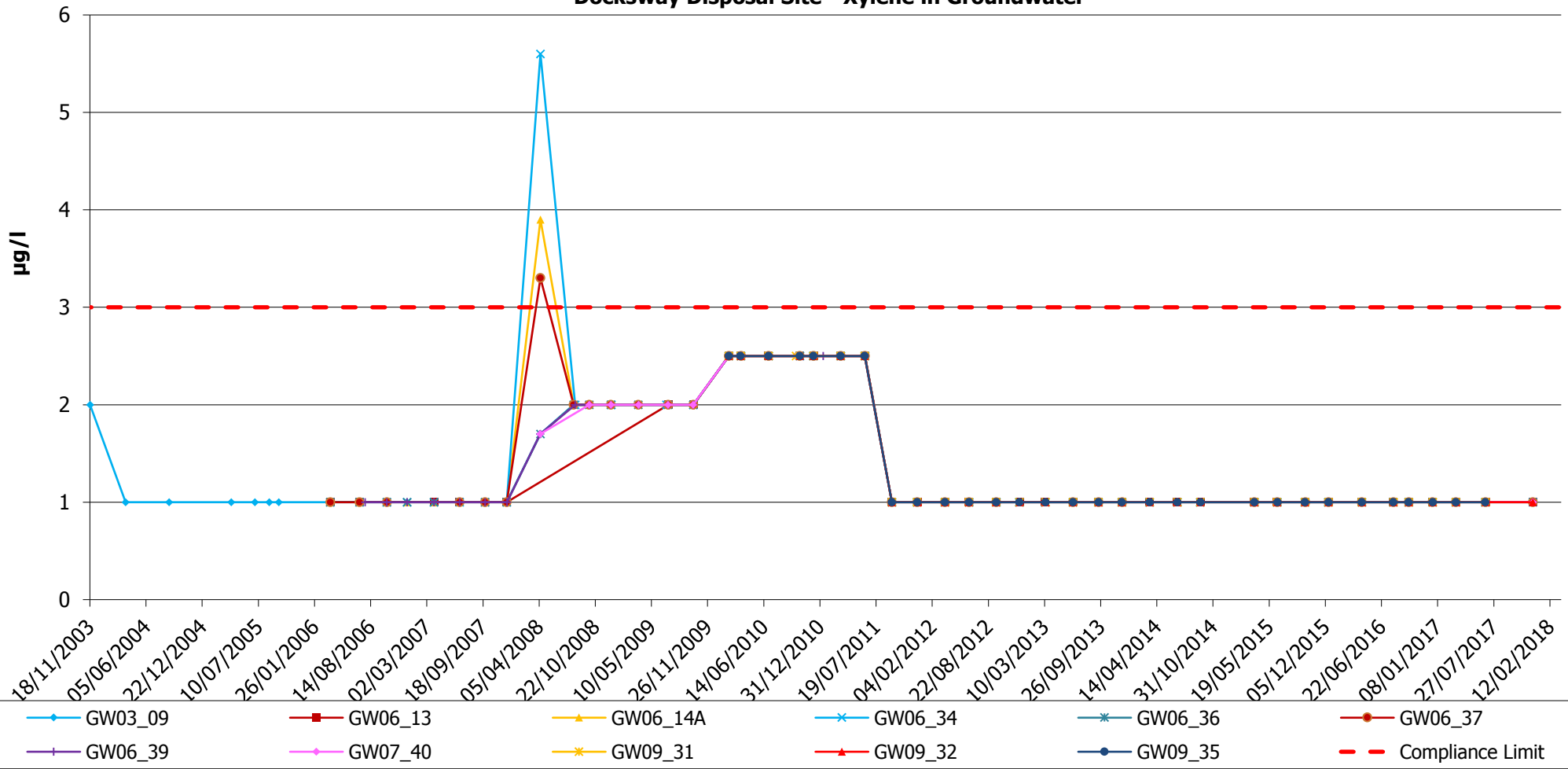
Docksway Disposal Site

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Appendix 2-18

**Appendix 2/19
Docksway Disposal Site - Xylene in Groundwater**



Client
Newport City Council

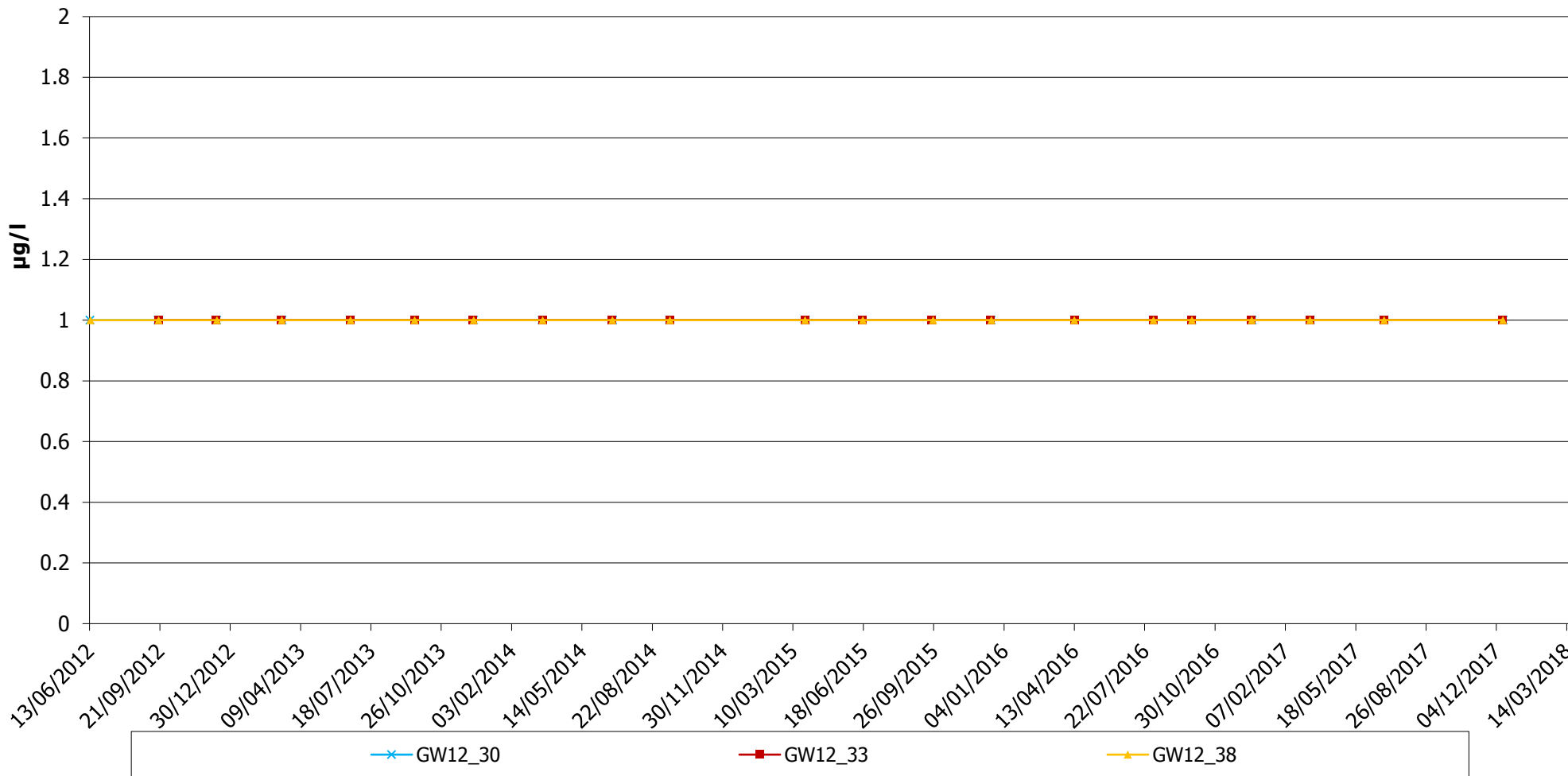
Docksway Disposal Site

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Appendix 2-19

**Appendix 2/20
Docksway Disposal Site Xylene in Groundwater**



Client
Newport City Council

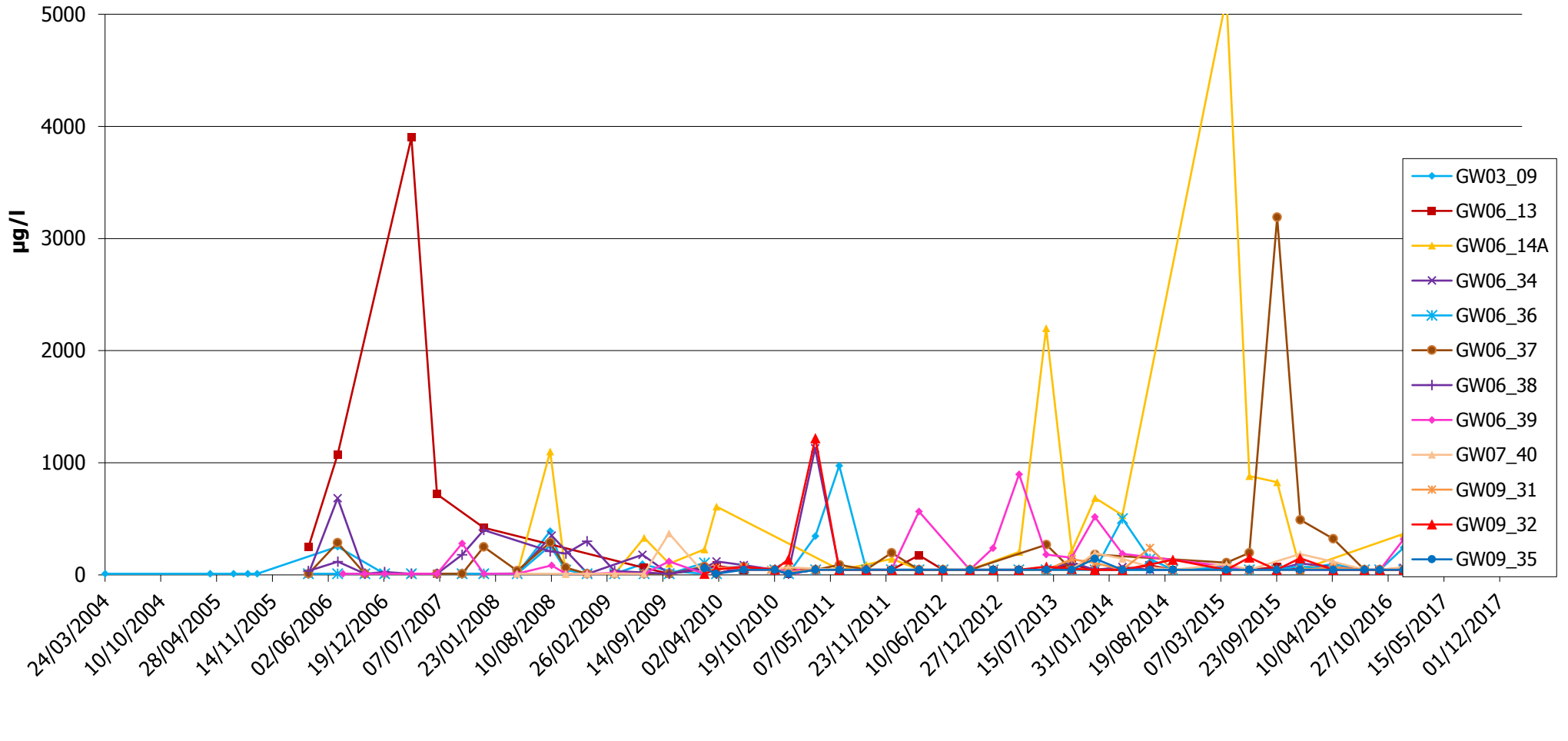
Docksway Disposal Site

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Appendix 2-20

**Appendix 2/21
Docksway Disposal Site - EPH in Groundwater**



Client
Newport City Council

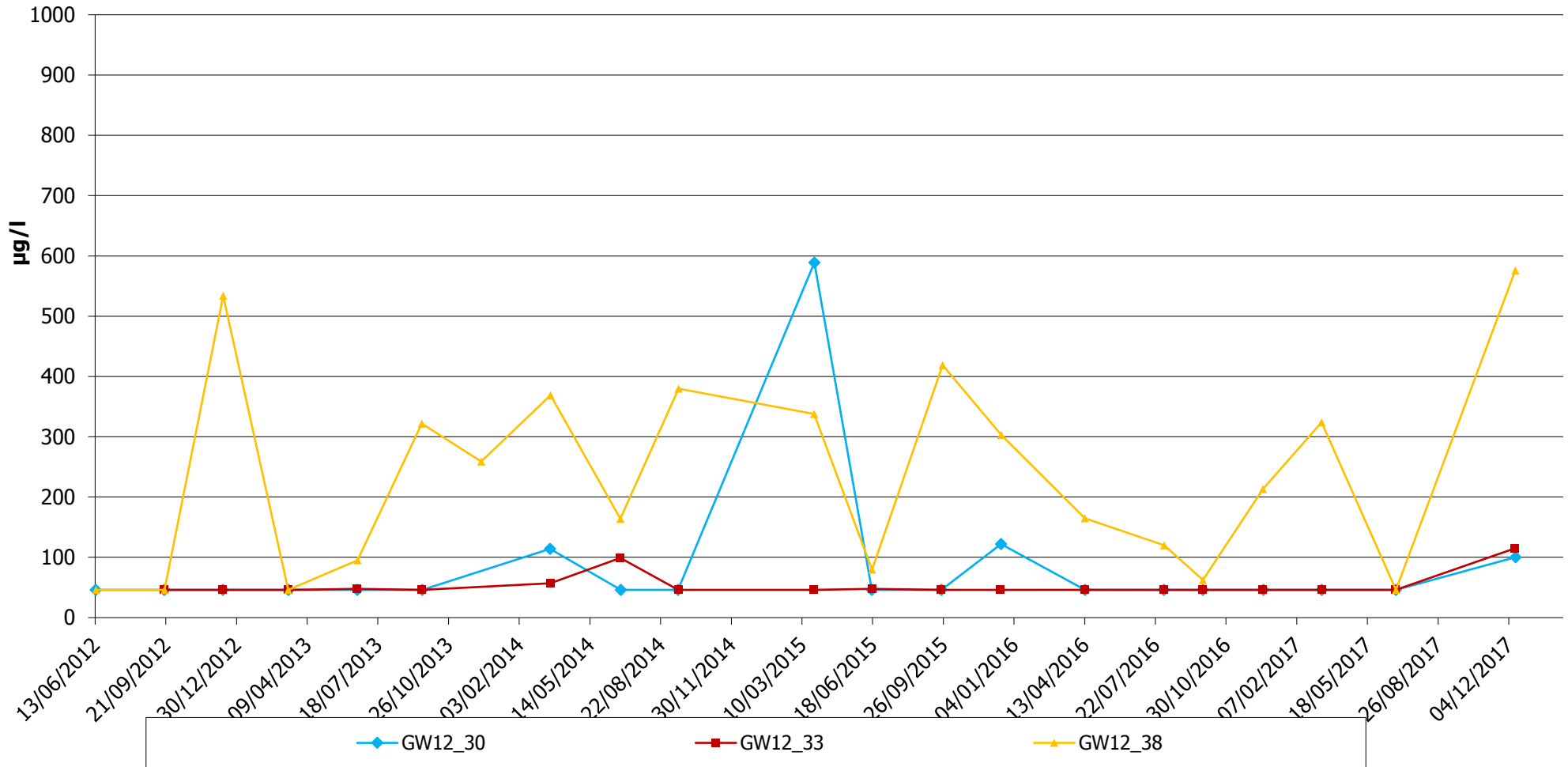
Docksway Disposal Site

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

Appendix 2-21

**Appendix 2/22
Docksway Disposal Site - EPH in Groundwater**



Client
Newport City Council

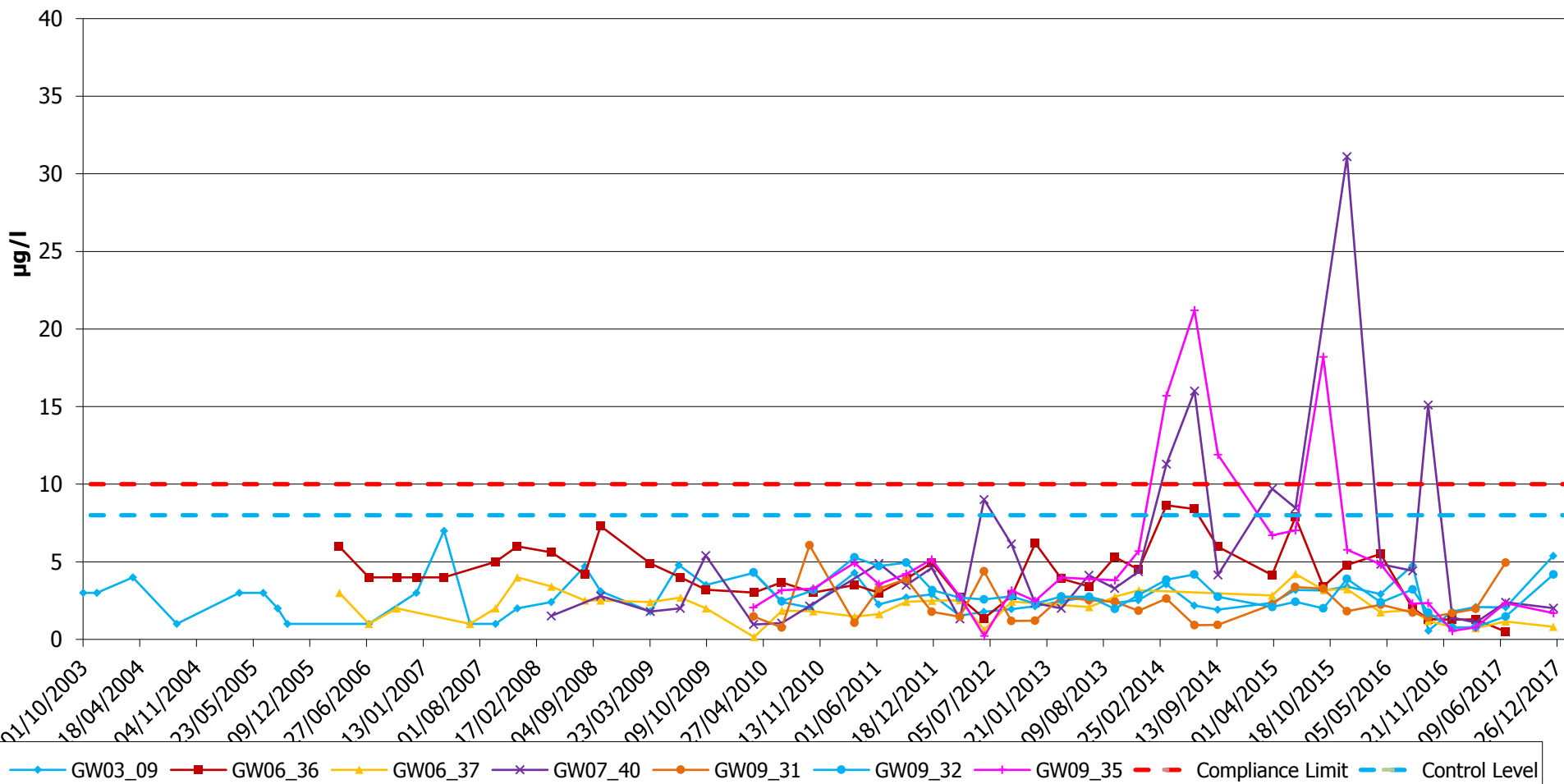
Docksway Disposal Site

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Appendix 2-22

**Appendix 2/23
Dockway Disposal Site - Nickel in Groundwater**



Client
Newport City Council

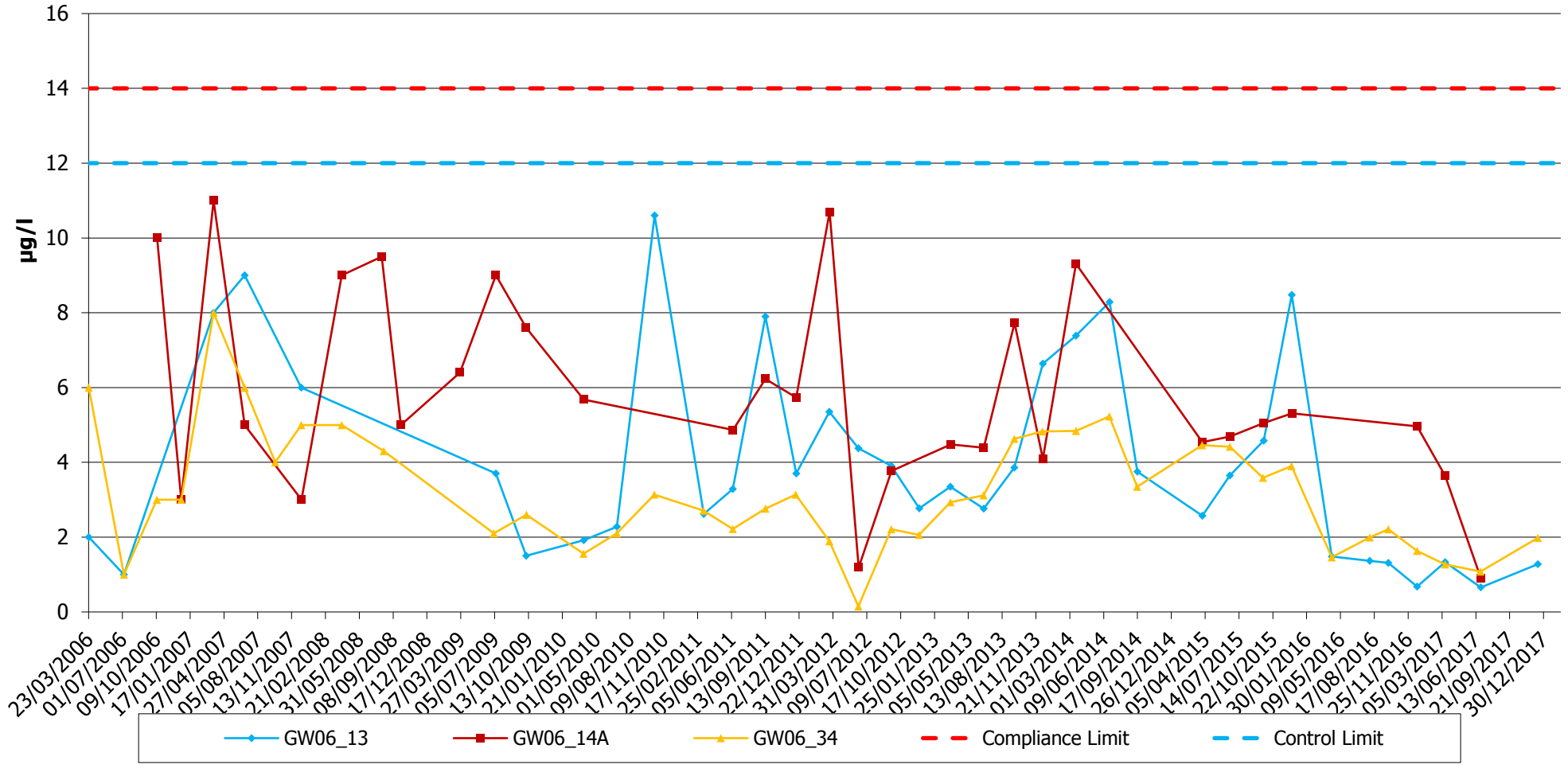
Dockway Disposal Site

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

Appendix 2-23

**Appendix 2/24
Dockway Disposal Site - Nickel in Groundwater**



Client
Newport City Council

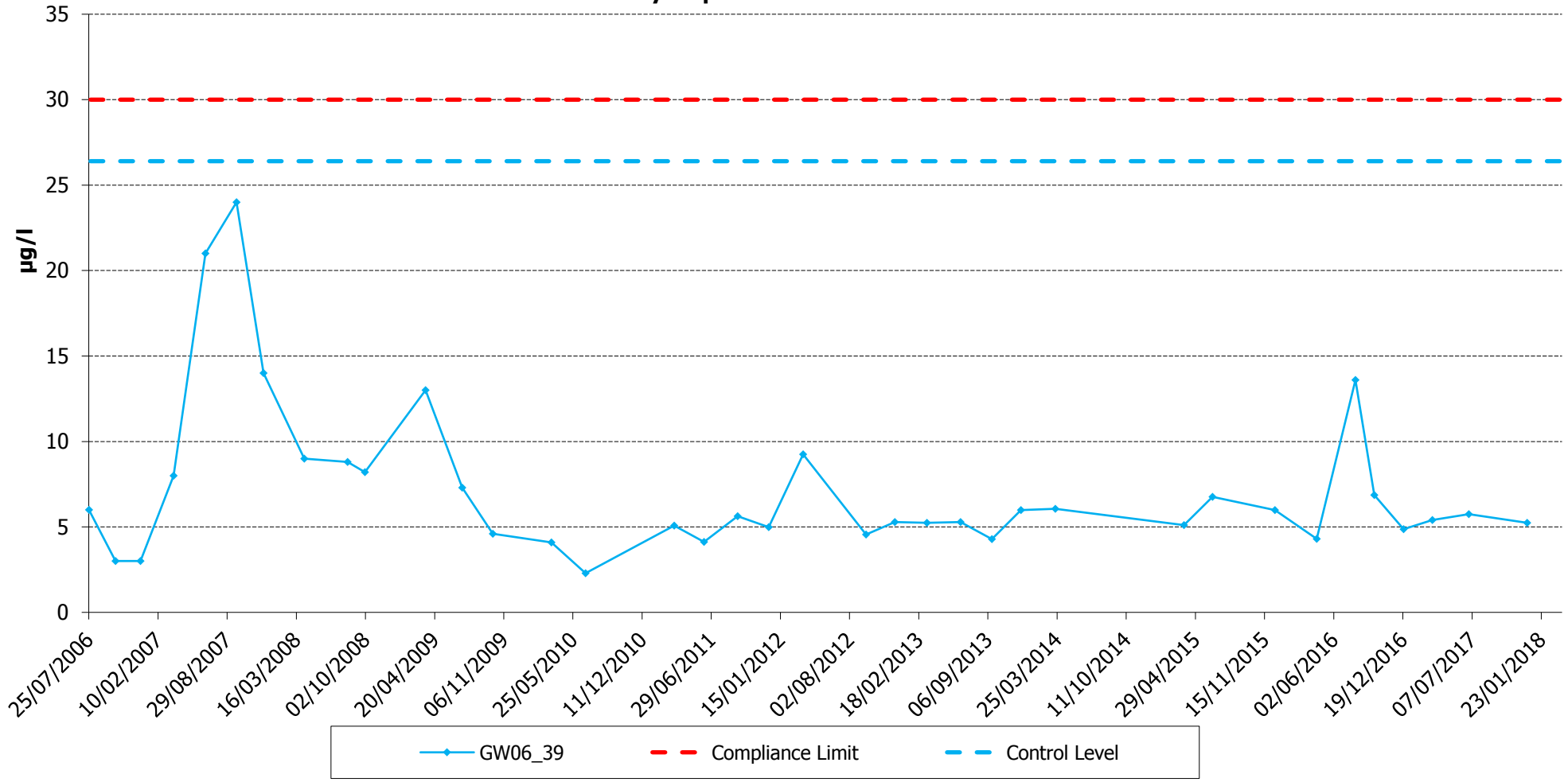
Dockway Disposal Site

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Appendix 2-24

**Appendix 2/25
Docksway Disposal Site - Nickel in Groundwater**



Client
Newport City Council

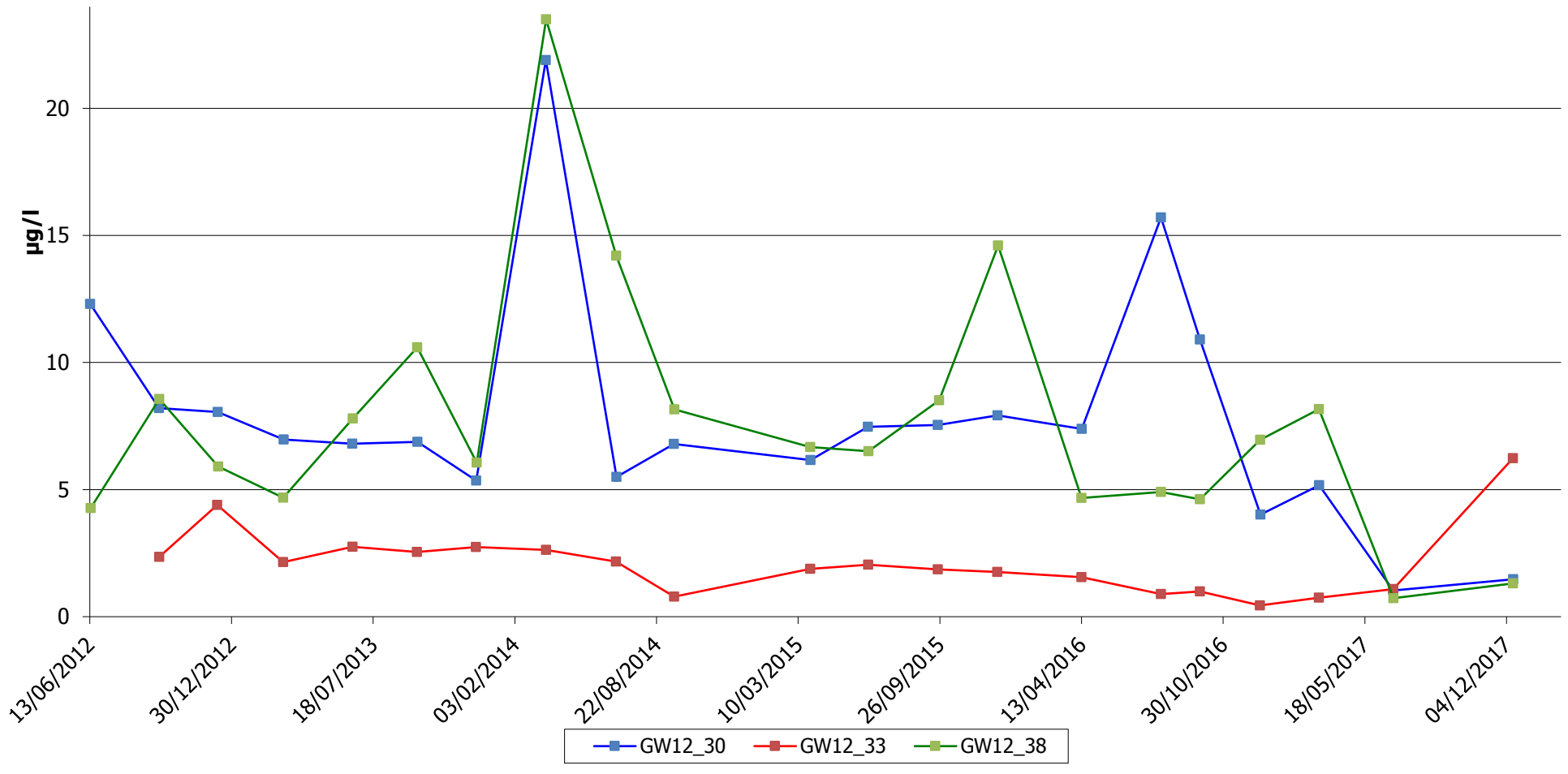
Docksway Disposal Site

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Appendix 2-25

**Appendix 2/26
Docksway Disposal Site - Nickel in Groundwater**



Client
Newport City Council

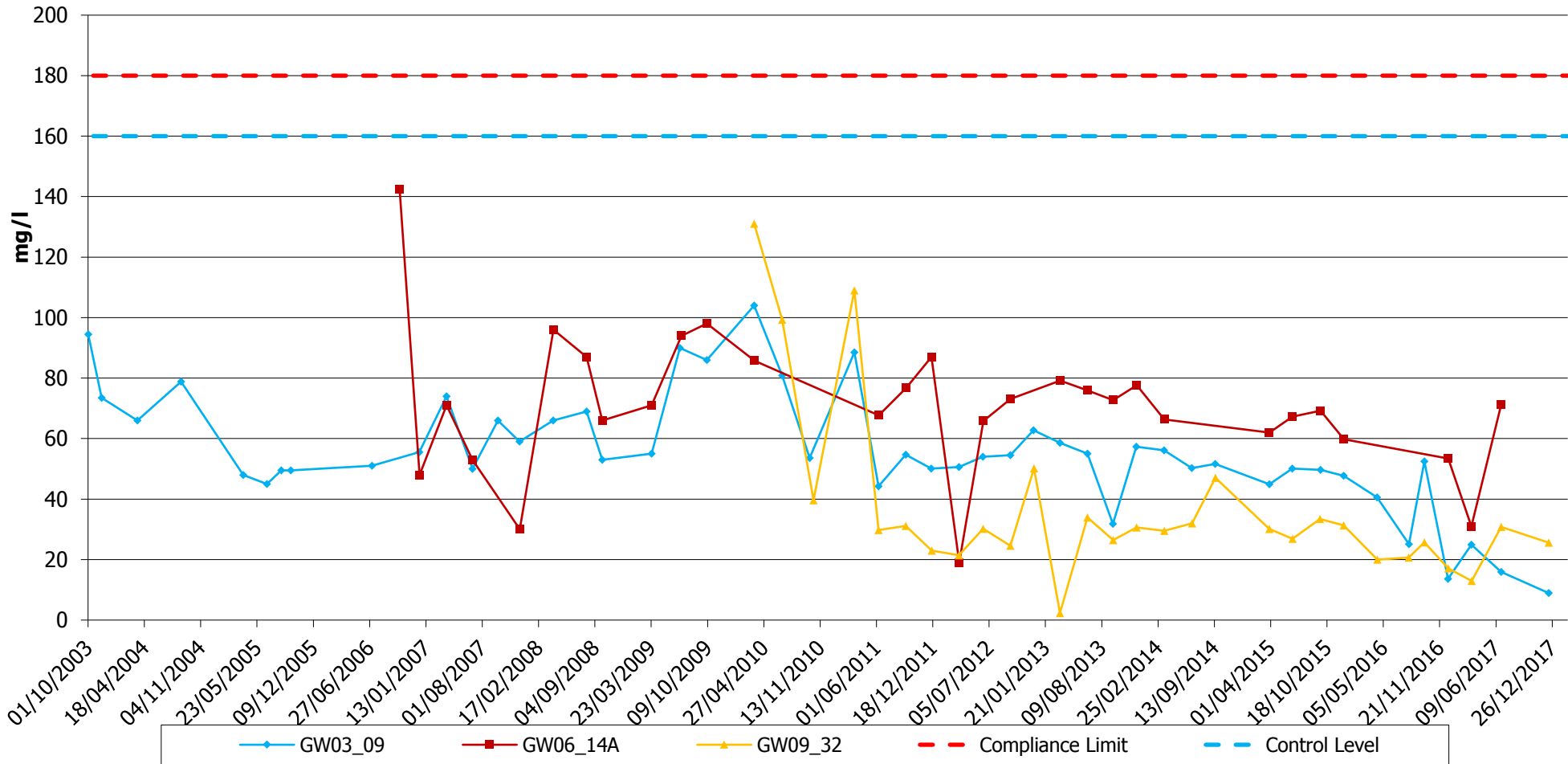
Docksway Disposal Site

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Appendix 2-26

**Appendix 2/27
Docksway Disposal Site - Potassium in Groundwater**



Client

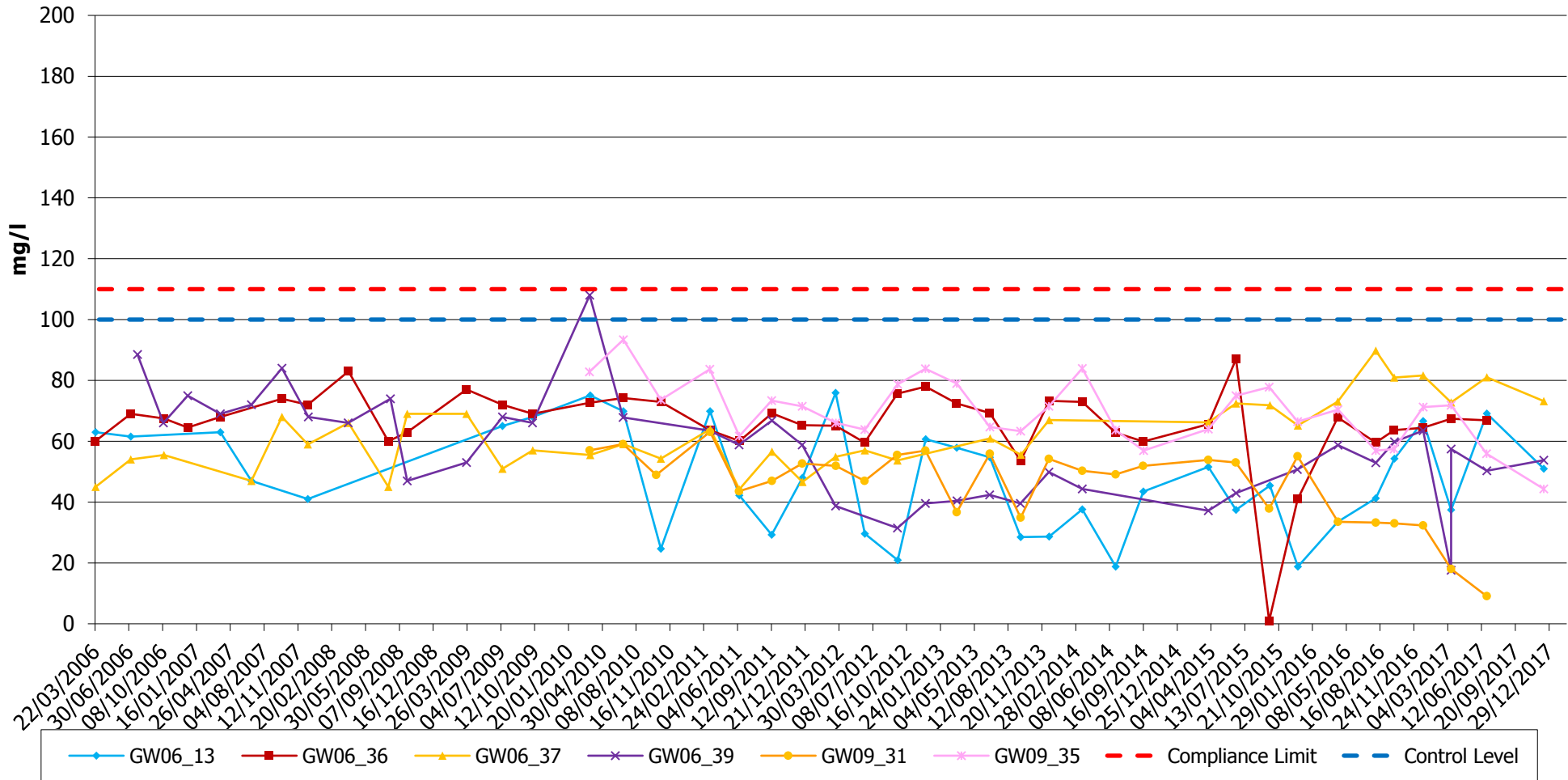
Newport City Council

Docksway Disposal Site

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR
Appendix 2-27	

**Appendix 2/28 Docksway Disposal Site
Potassium in Groundwater**



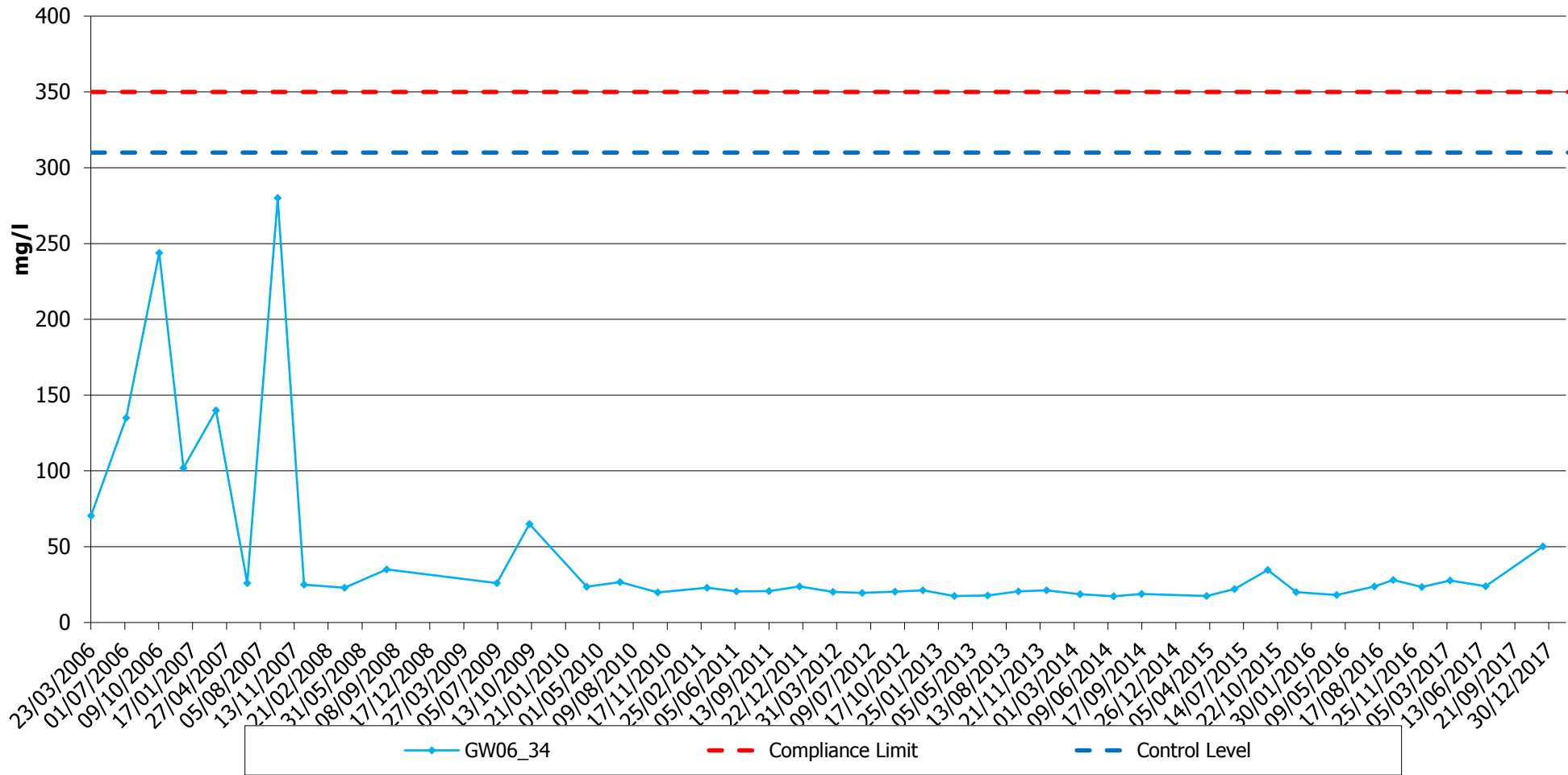
Client
Newport City Council

Docksway Disposal Site

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR
Appendix 2-28	

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

**Appendix 2/29
Docksway Disposal Site - Potassium in Groundwater**



Client
Newport City Council

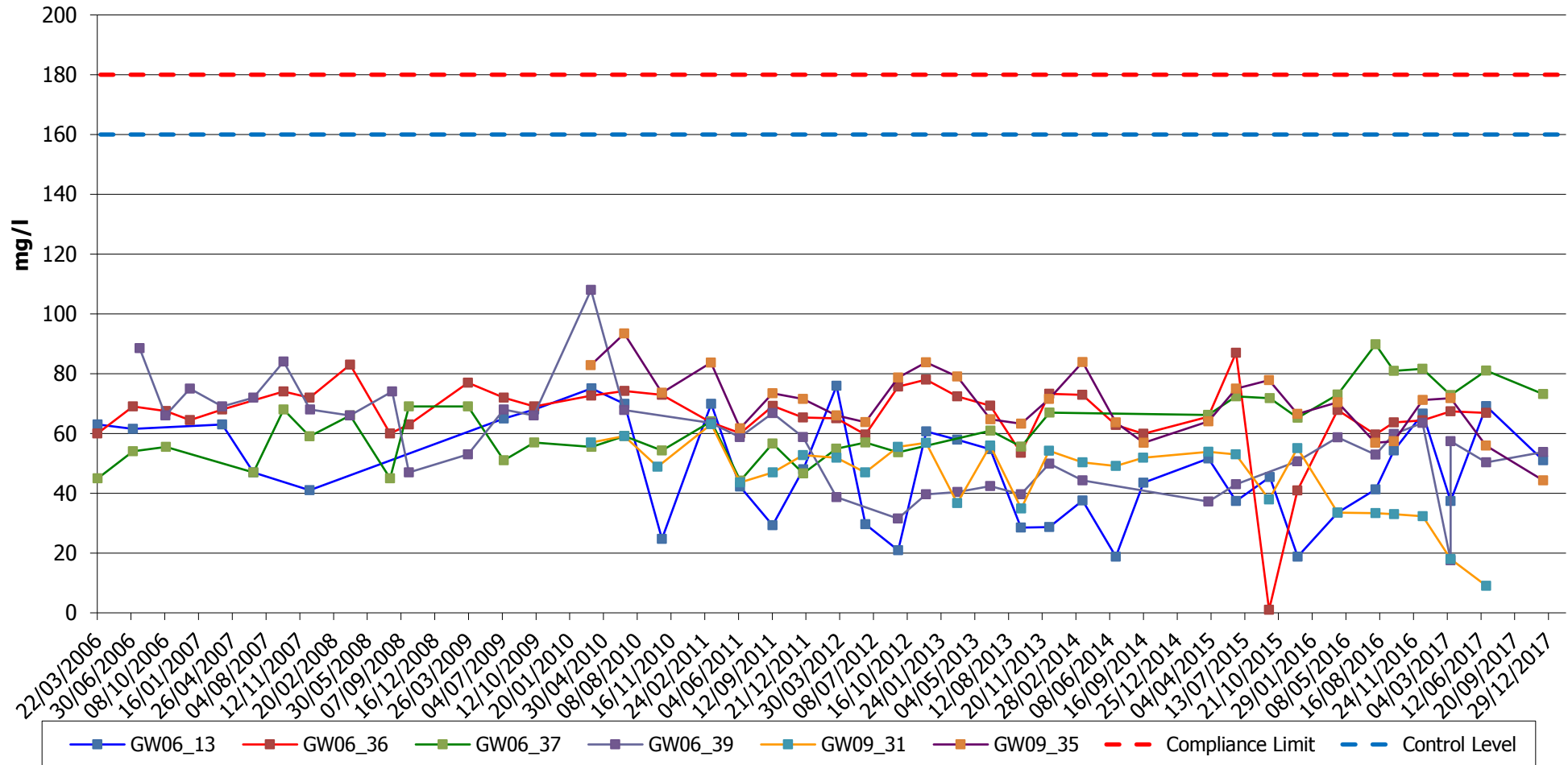
Docksway Disposal Site

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Appendix 2-29

**Appendix 2/30
Dockway Disposal Site - Potassium in Groundwater**



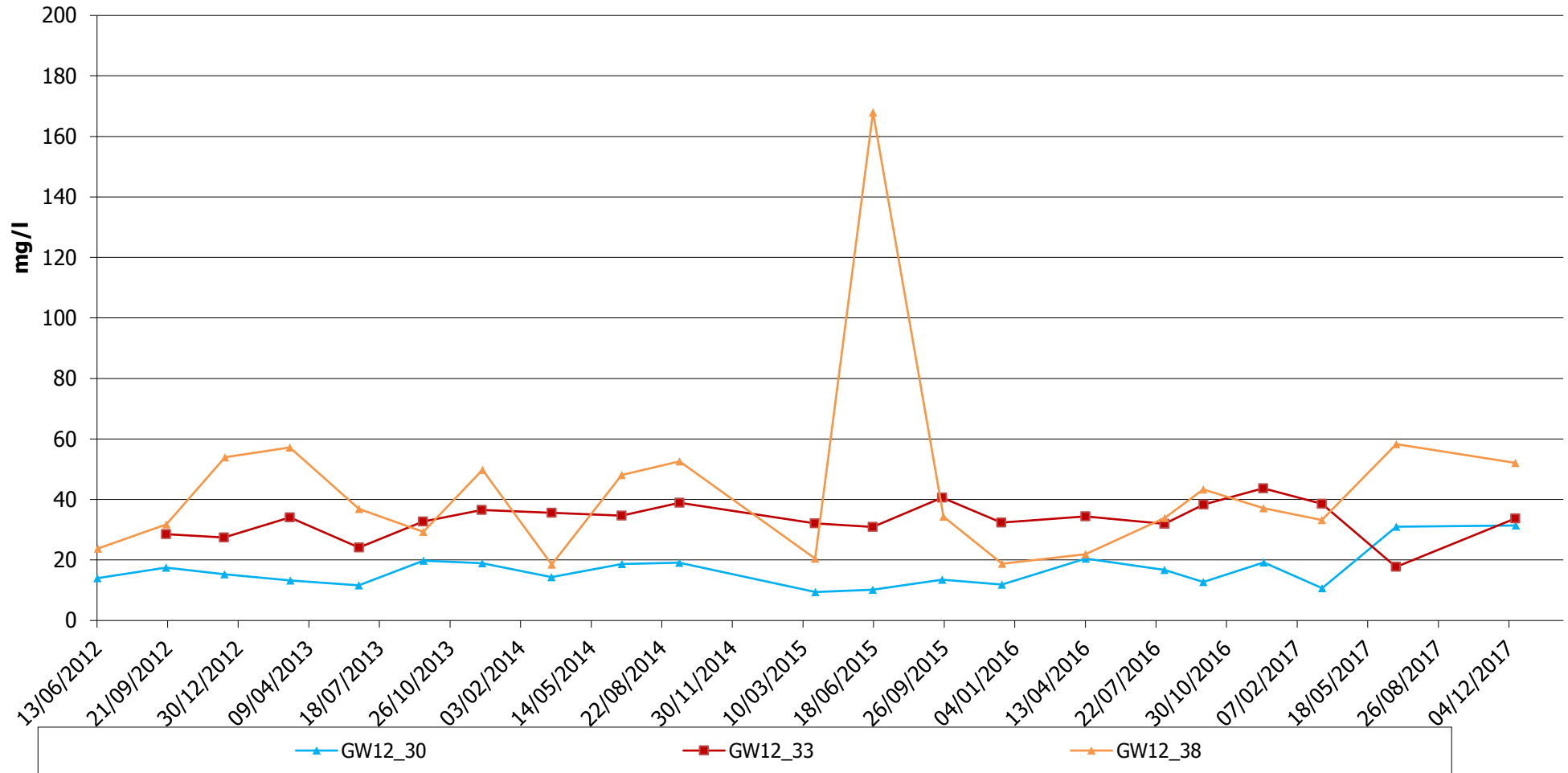
Client
Newport City Council

Dockway Disposal Site

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR
Appendix 2-30	

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

**Appendix 2/31
Dockway Disposal Site - Potassium in Groundwater**



Client
Newport City Council

Dockway Disposal Site

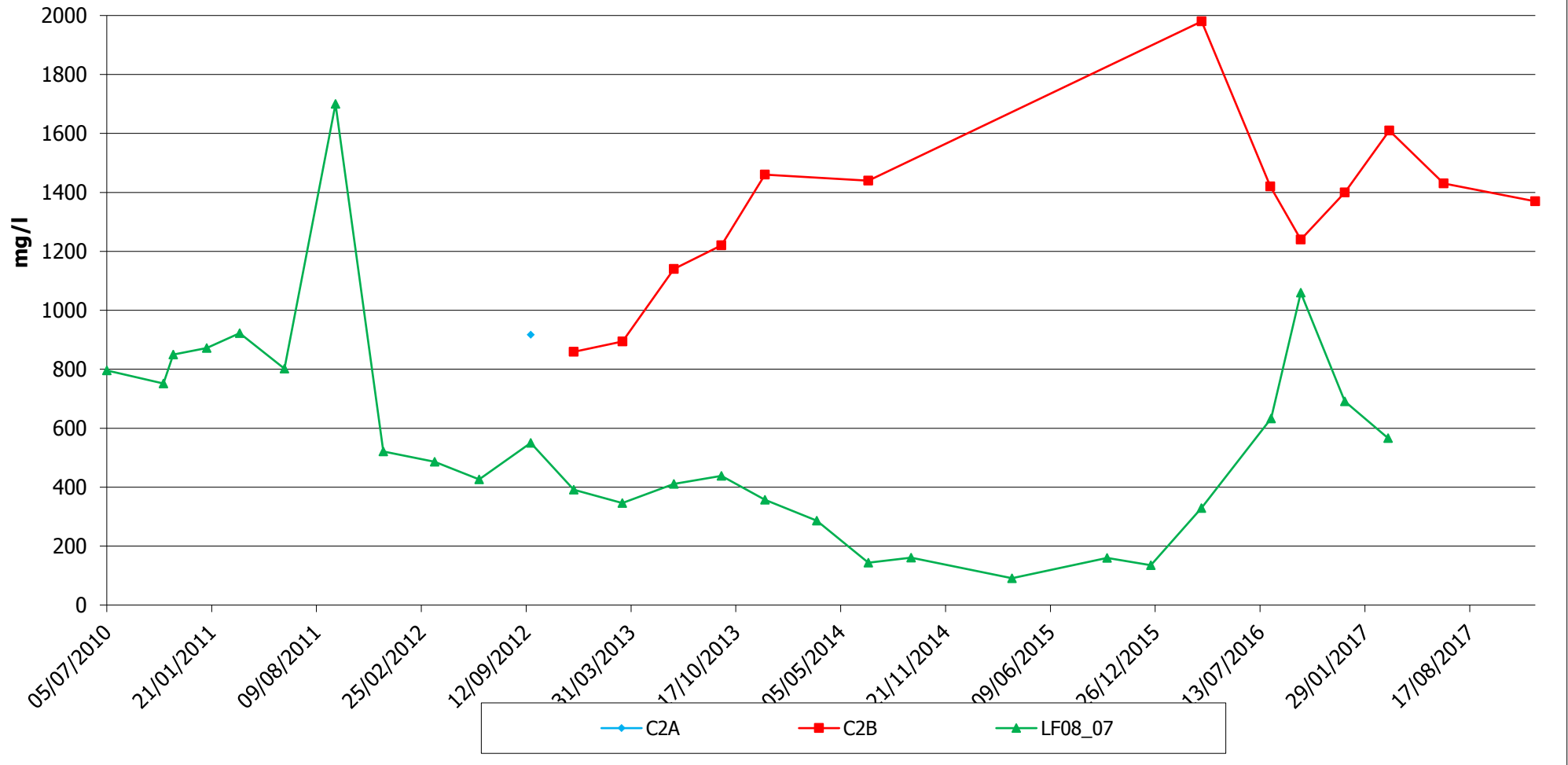
Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR
Appendix 2-31	

Appendix 3

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**Appendix 3/1
Docksway Disposal Site - Ammoniacal Nitrogen in Leachate**



Client

Newport City Council

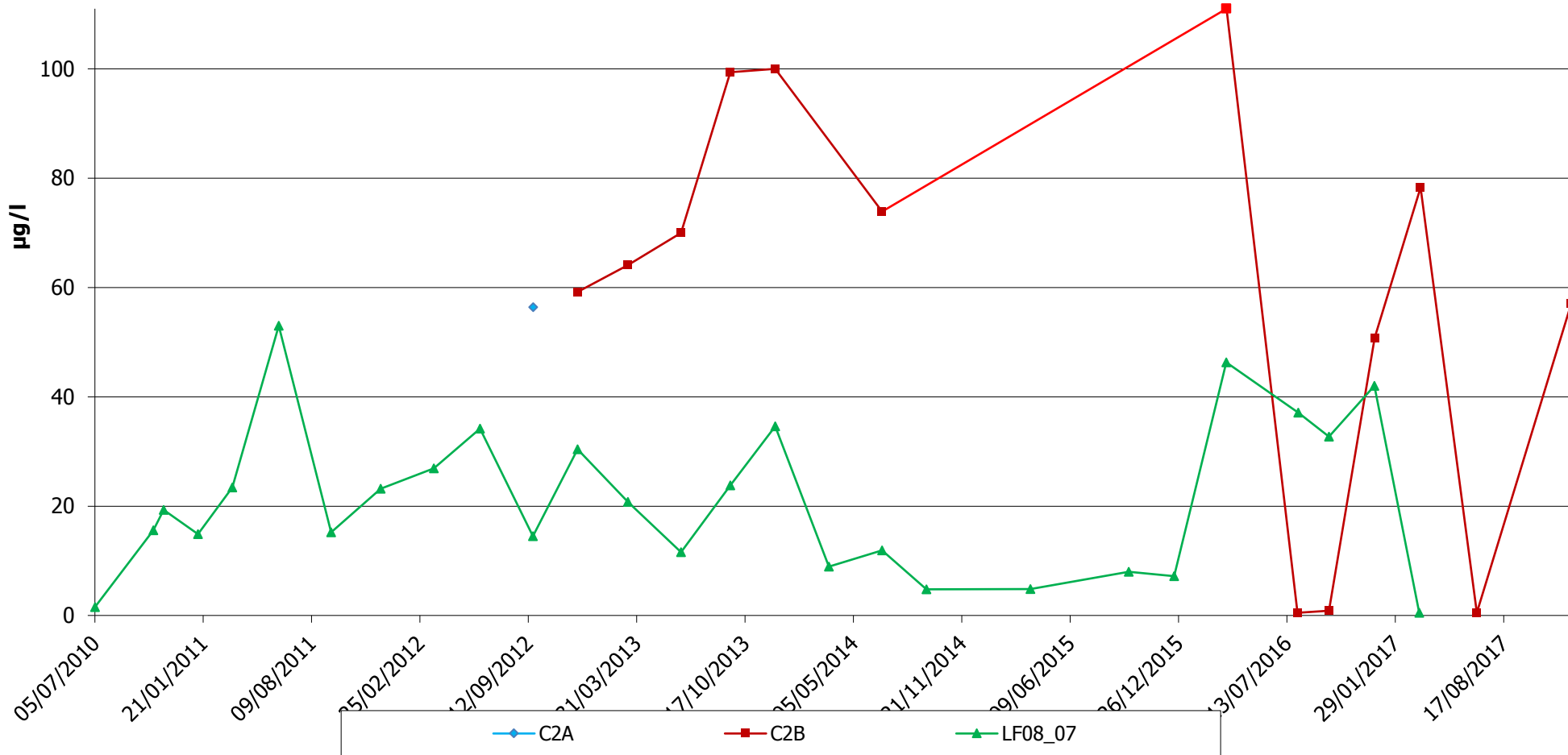
Docksway Disposal Site

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

Appendix 3-1

**Appendix 3/2
Docksway Disposal Site - Arsenic in Leachate**



Client
Newport City Council

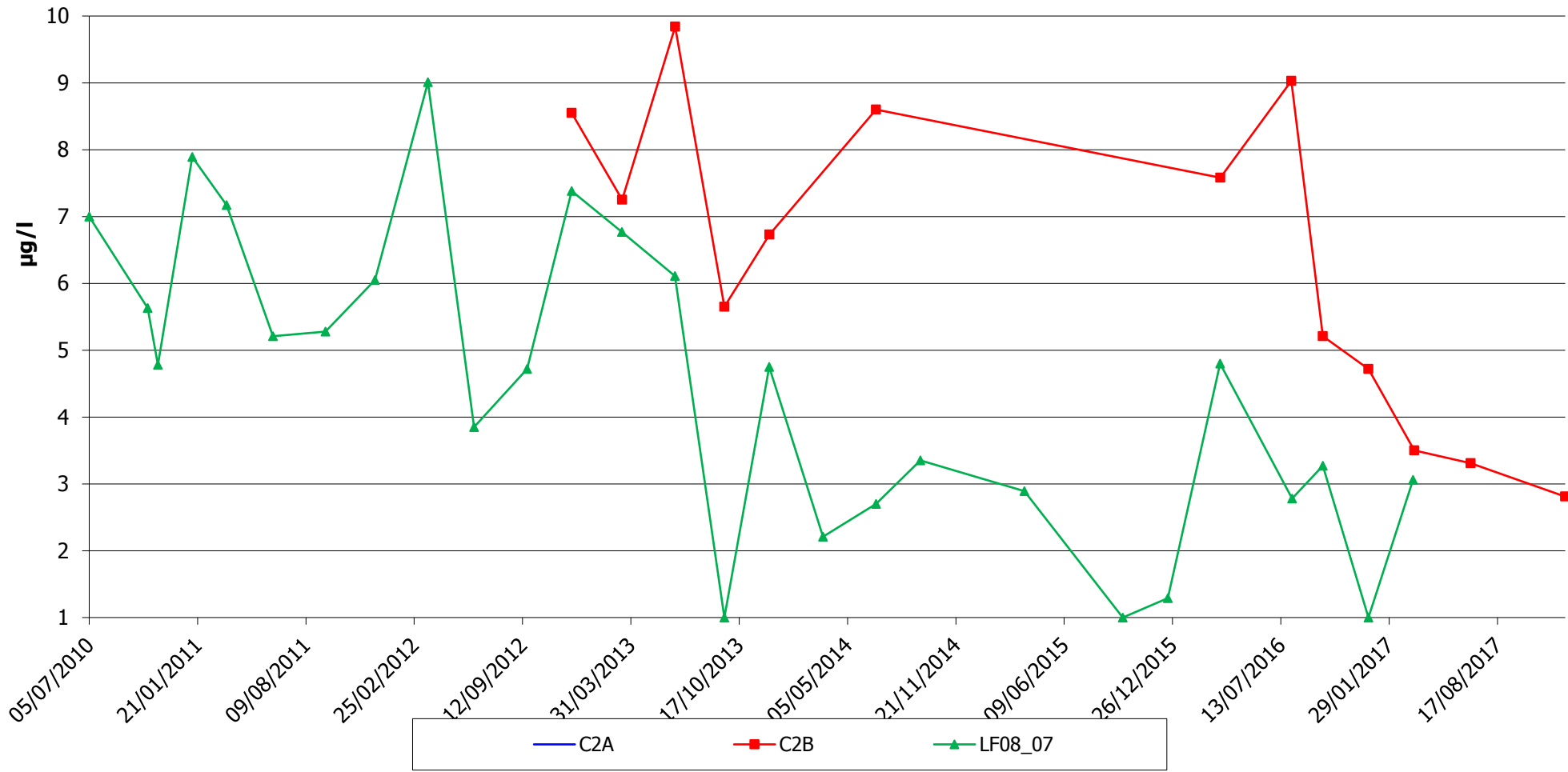
Docksway Disposal Site

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

Appendix 3-2

**Appendix 3/3
Docksway Disposal Site - Benzene in Leachate**



Client
Newport City Council

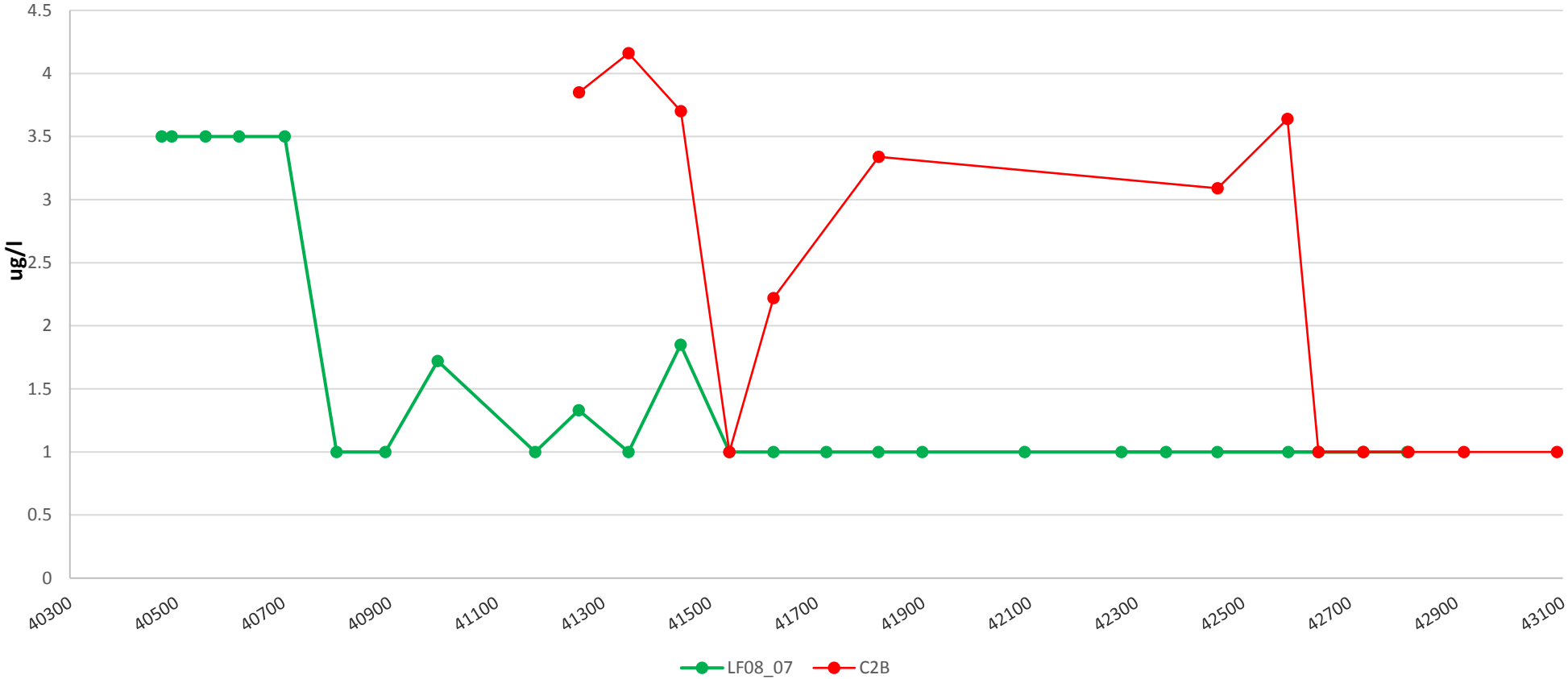
Docksway Disposal Site

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Appendix 3-3

**Appendix 3/4
Docksway Disposal Site - Naphthalene in Leachate**



Client
Newport City Council

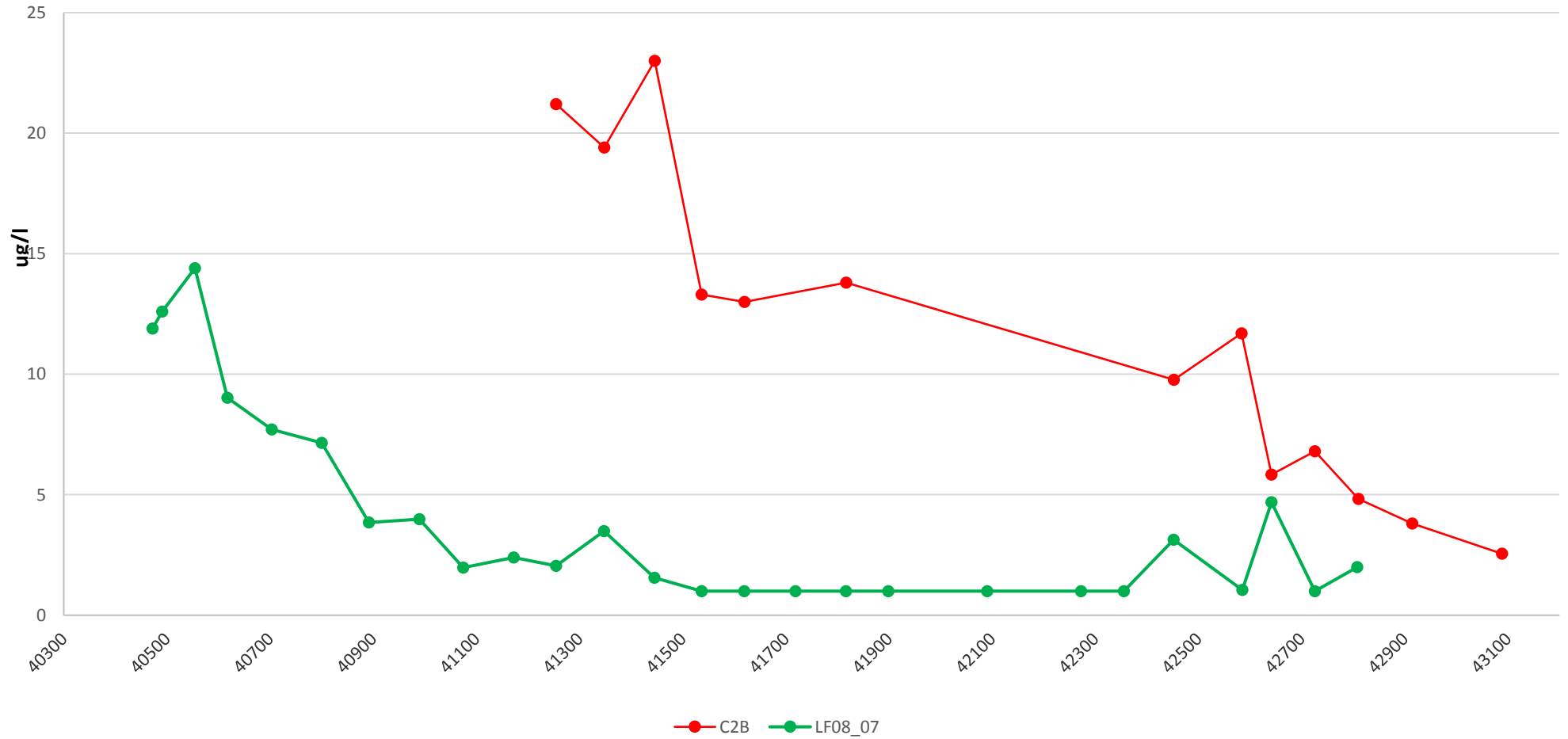
Docksway Disposal Site

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

Appendix 3-4

**Appendix 3/5
Docksway Disposal Site - O Xylene in Leachate**



Client
Newport City Council

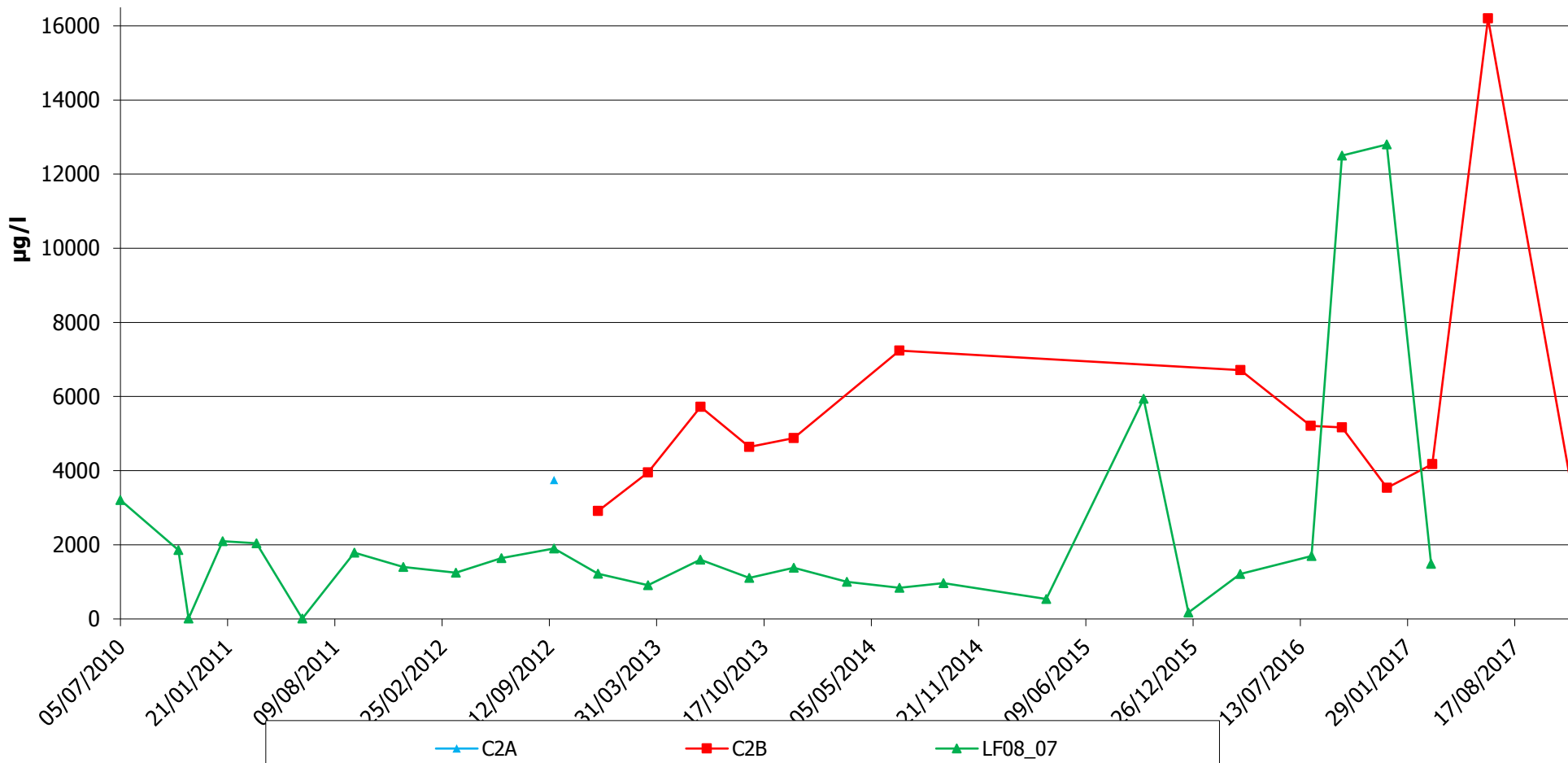
Docksway Disposal Site

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Appendix 3-5

**Appendix 3/6
Docksway Disposal Site - EPH in Leachate**



Client
Newport City Council

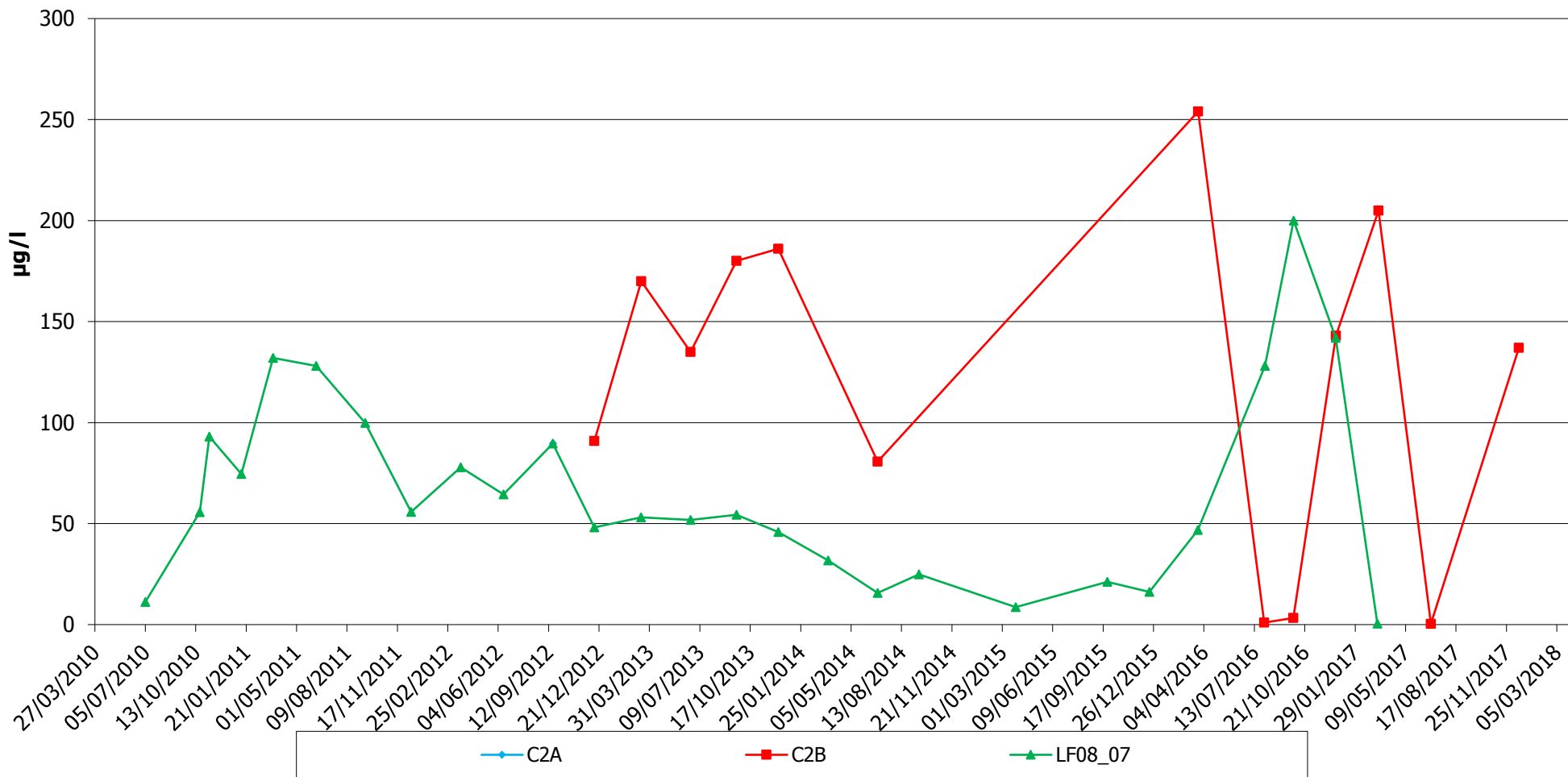
Docksway Disposal Site

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Appendix 3-6

**Appendix 3/7
Docksway Disposal Site - Nickel in Leachate**



Client
Newport City Council

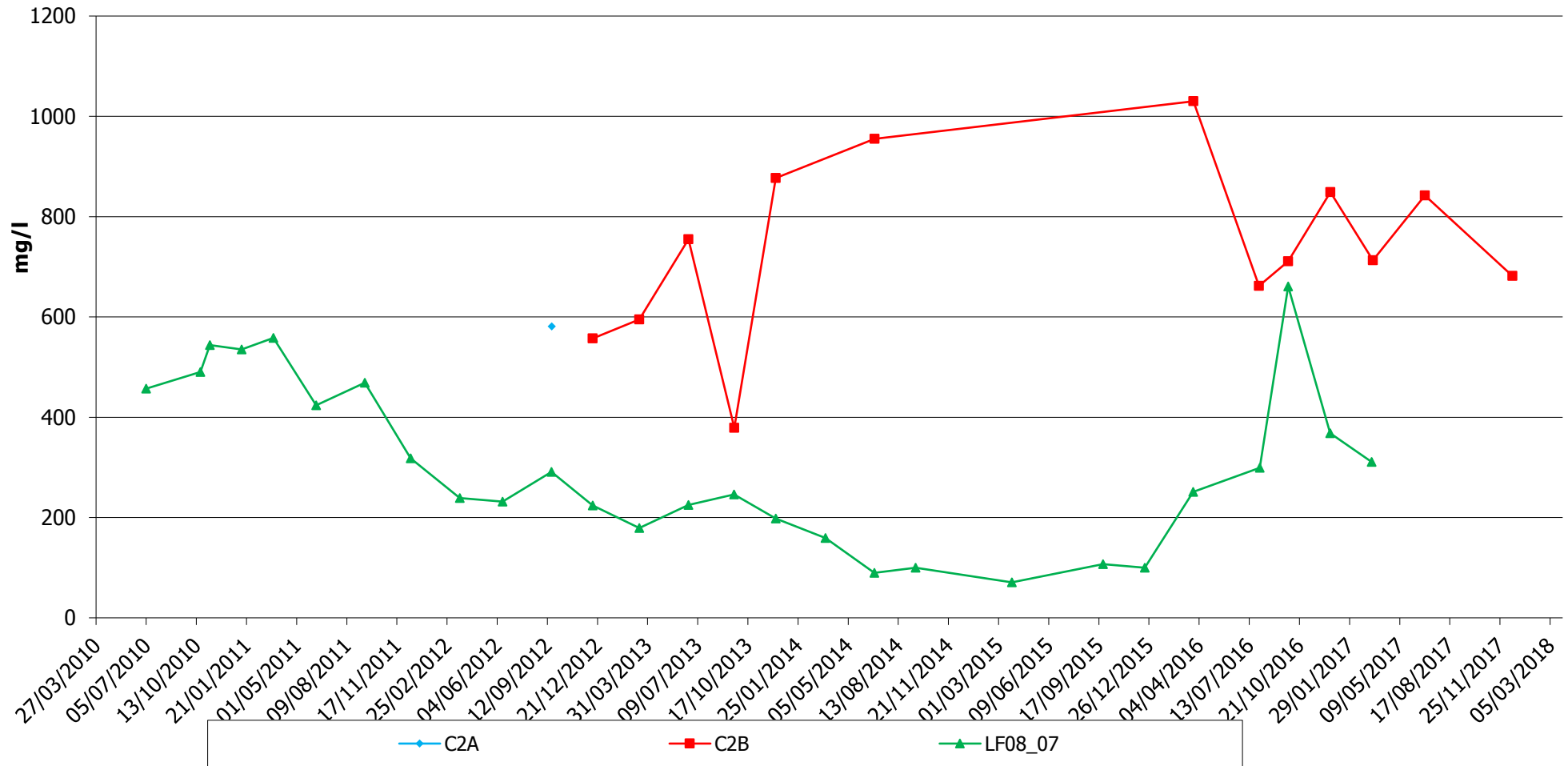
Docksway Disposal Site

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Appendix 3-7

**Appendix 3/8
Potassium in Leachate**



Client

Newport City Council

Docksway Disposal Site

Caversham Bridge House, Waterman Place, Reading, RG1 8DN
Tel 0118 950 0761 Fax 0118 959 7499

Date	February 2018
A4 Scale	nts
Drawn	CB
Checked	VKR

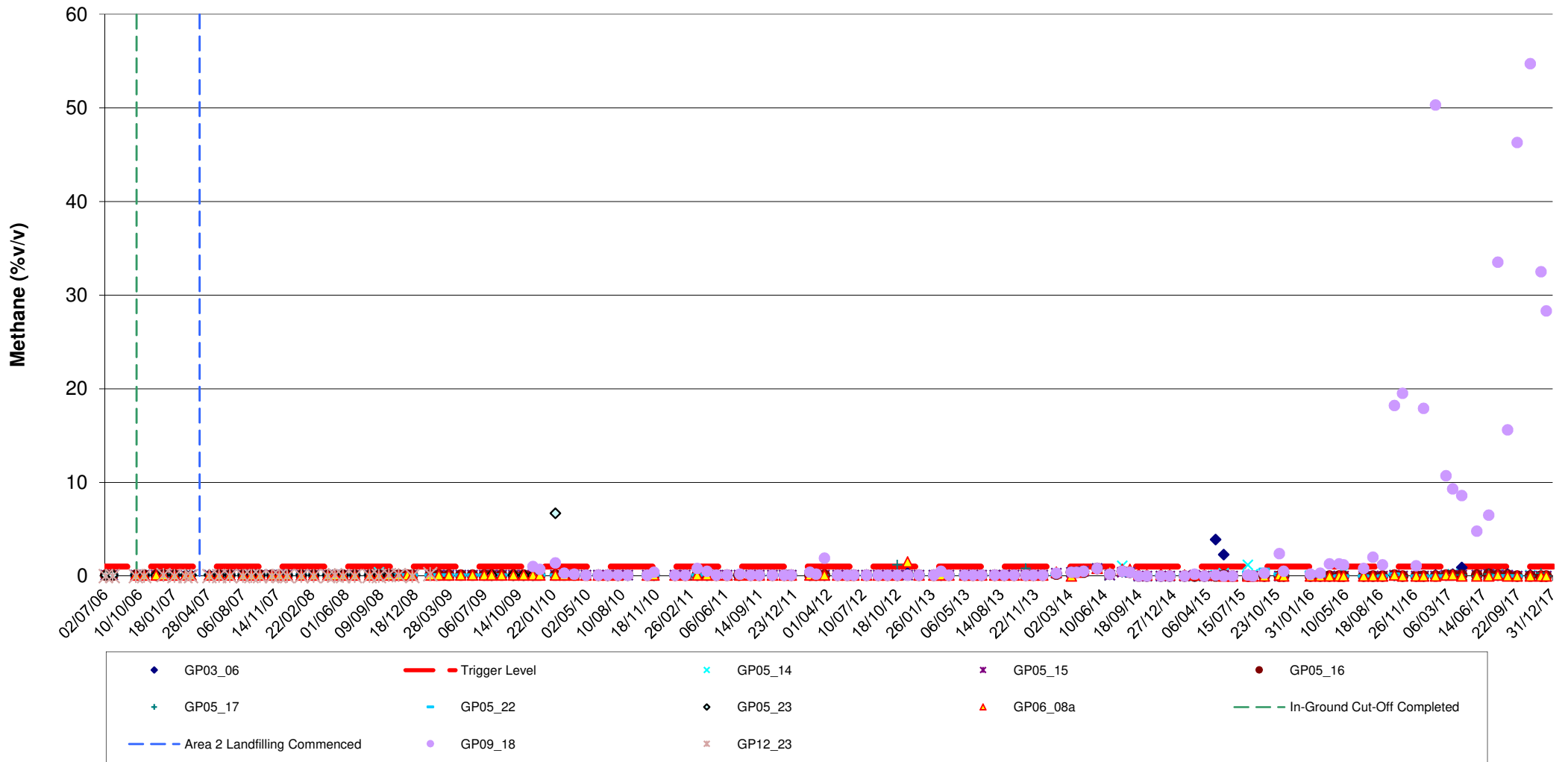
Appendix 3-8

Appendix 4

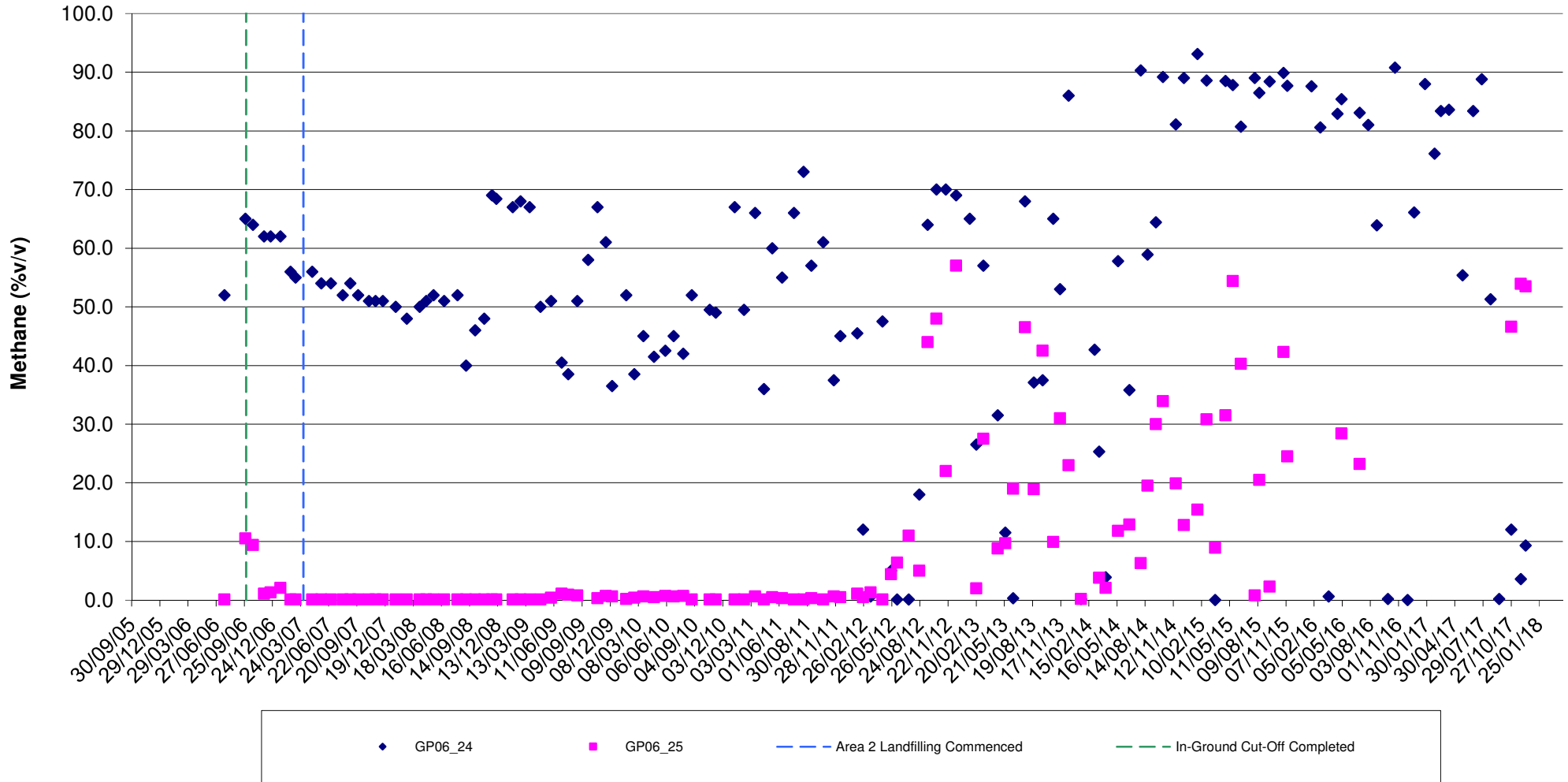


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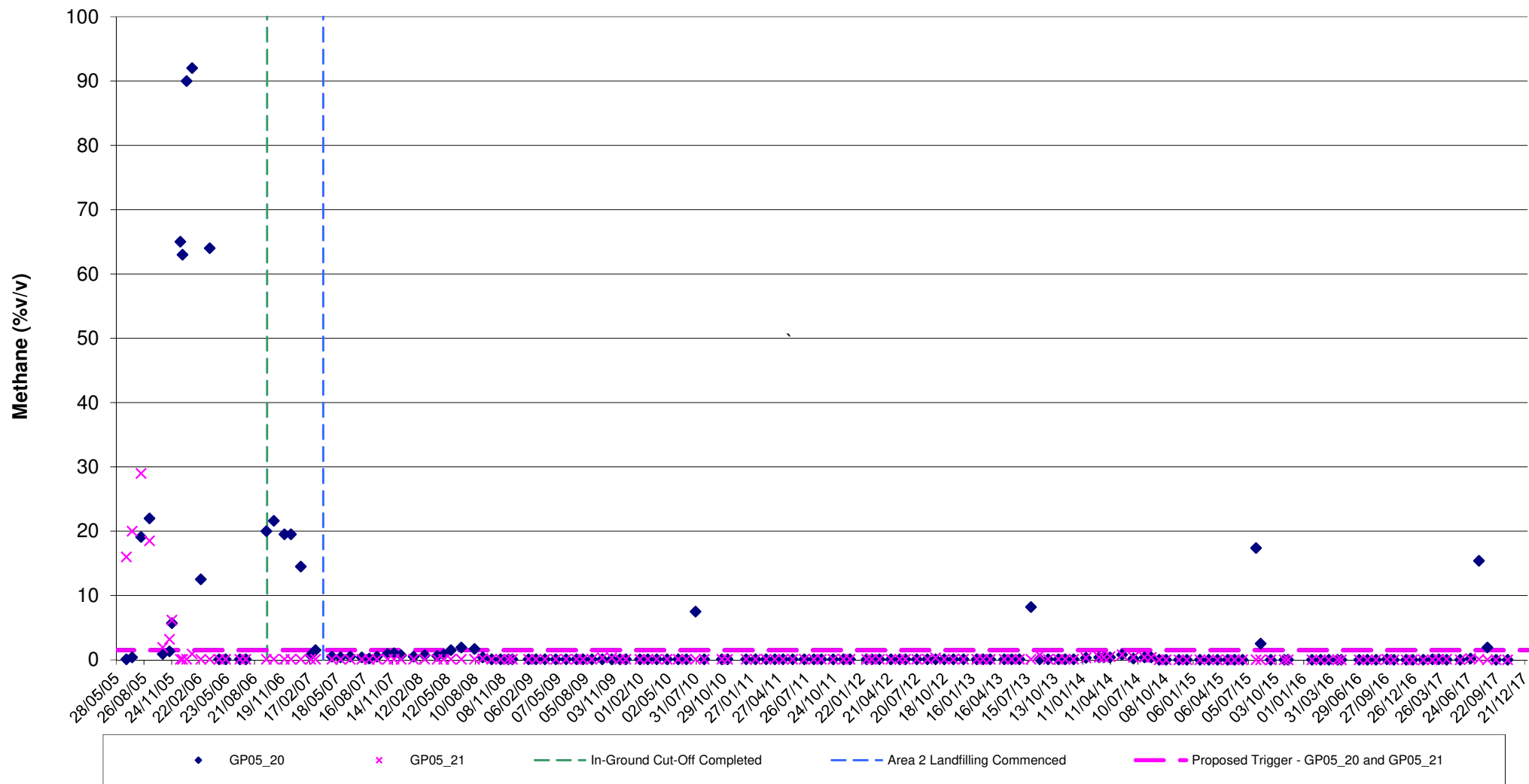
Appendix 4/1
Dockway Disposal Site - Methane Concentrations in Area 2 Gas Monitoring Wells
(Excluding GP05_20, GP05_21, GP06_24, GP06_25)



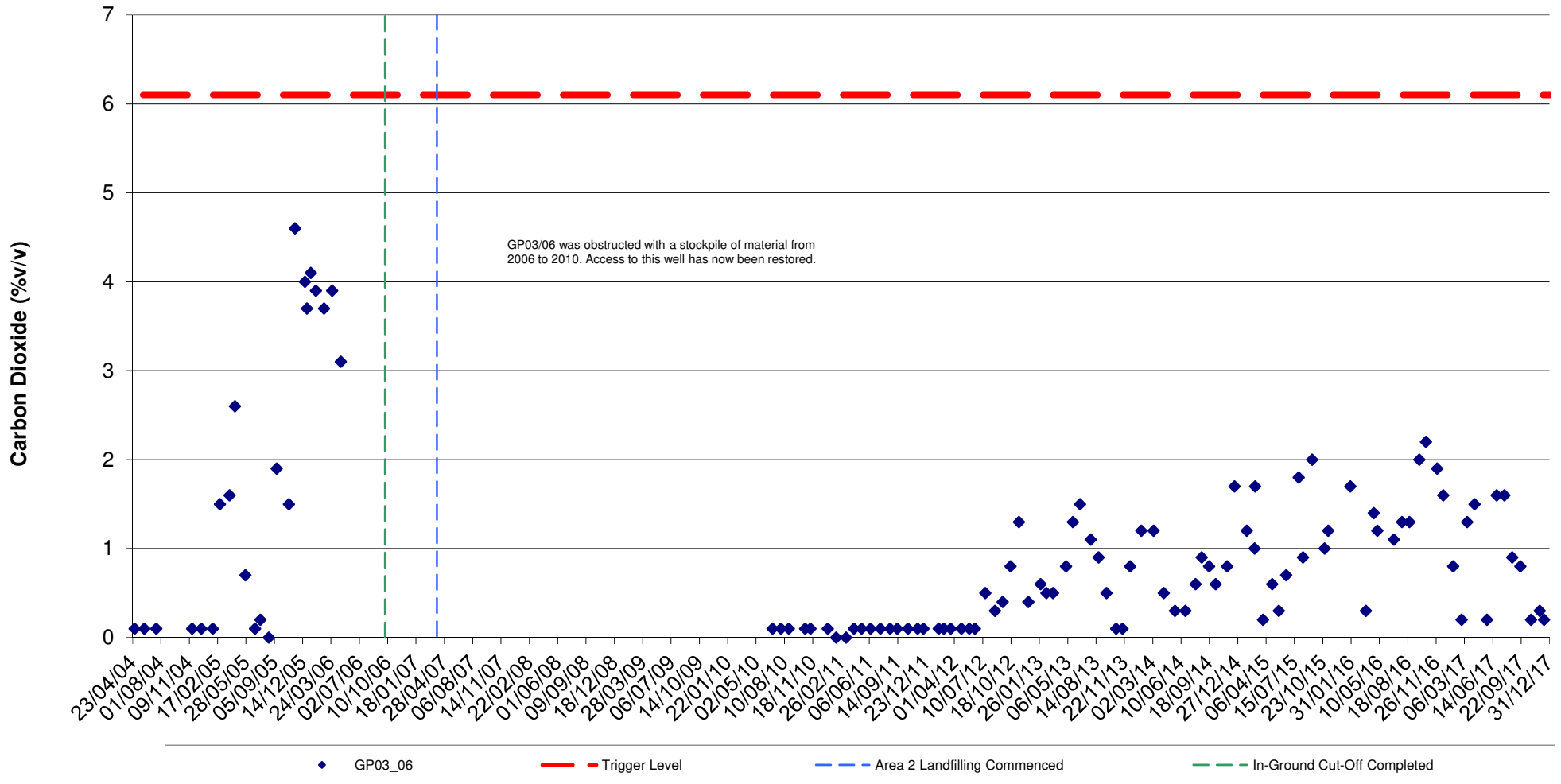
Appendix 4/2
Docksway Disposal Site
Recorded Methane Concentrations for GP06_24 and GP06_25



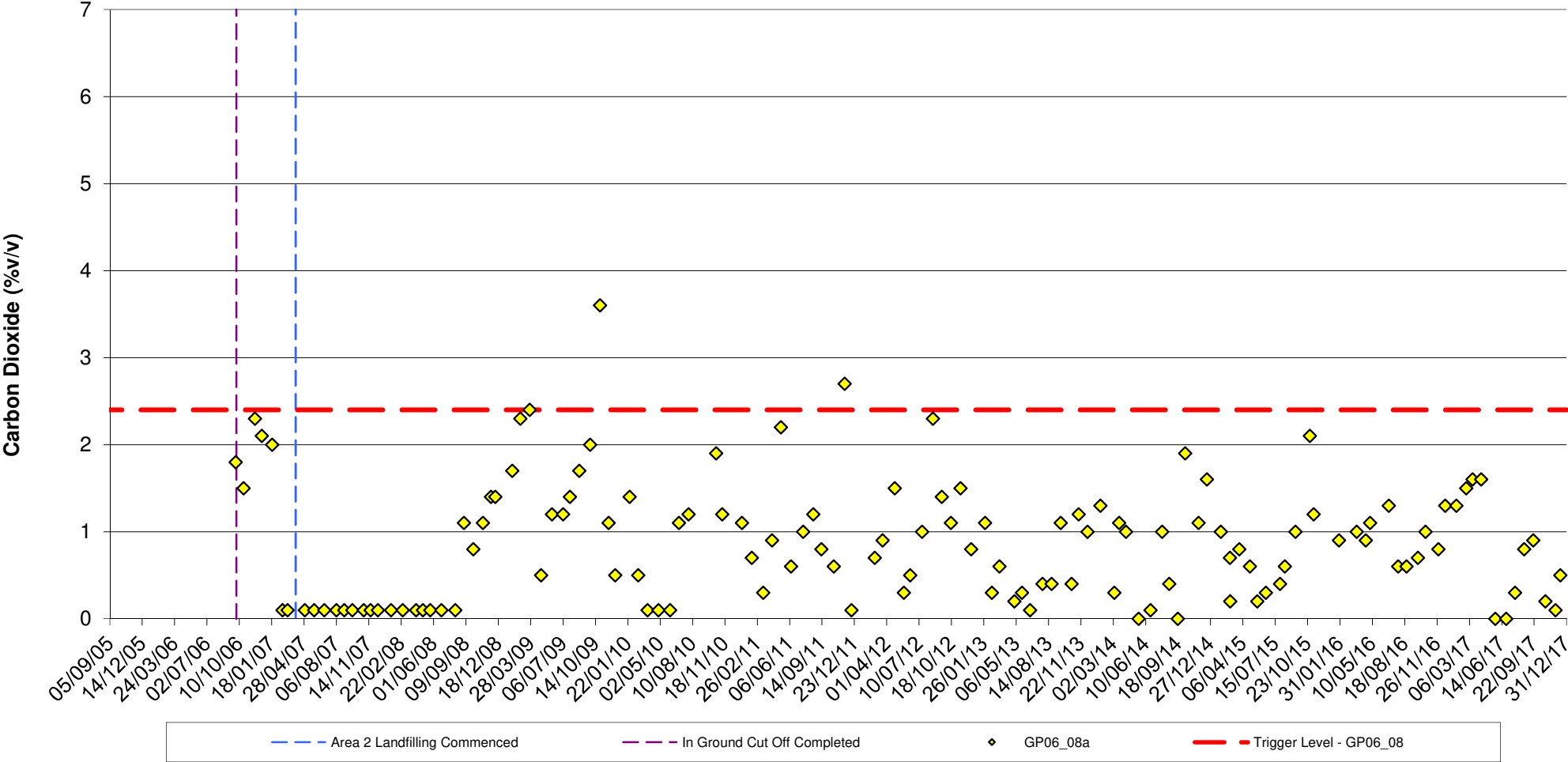
Appendix 4/3 Docksway Disposal Site Recorded Methane Concentrations in GP05_20 and GP05_21



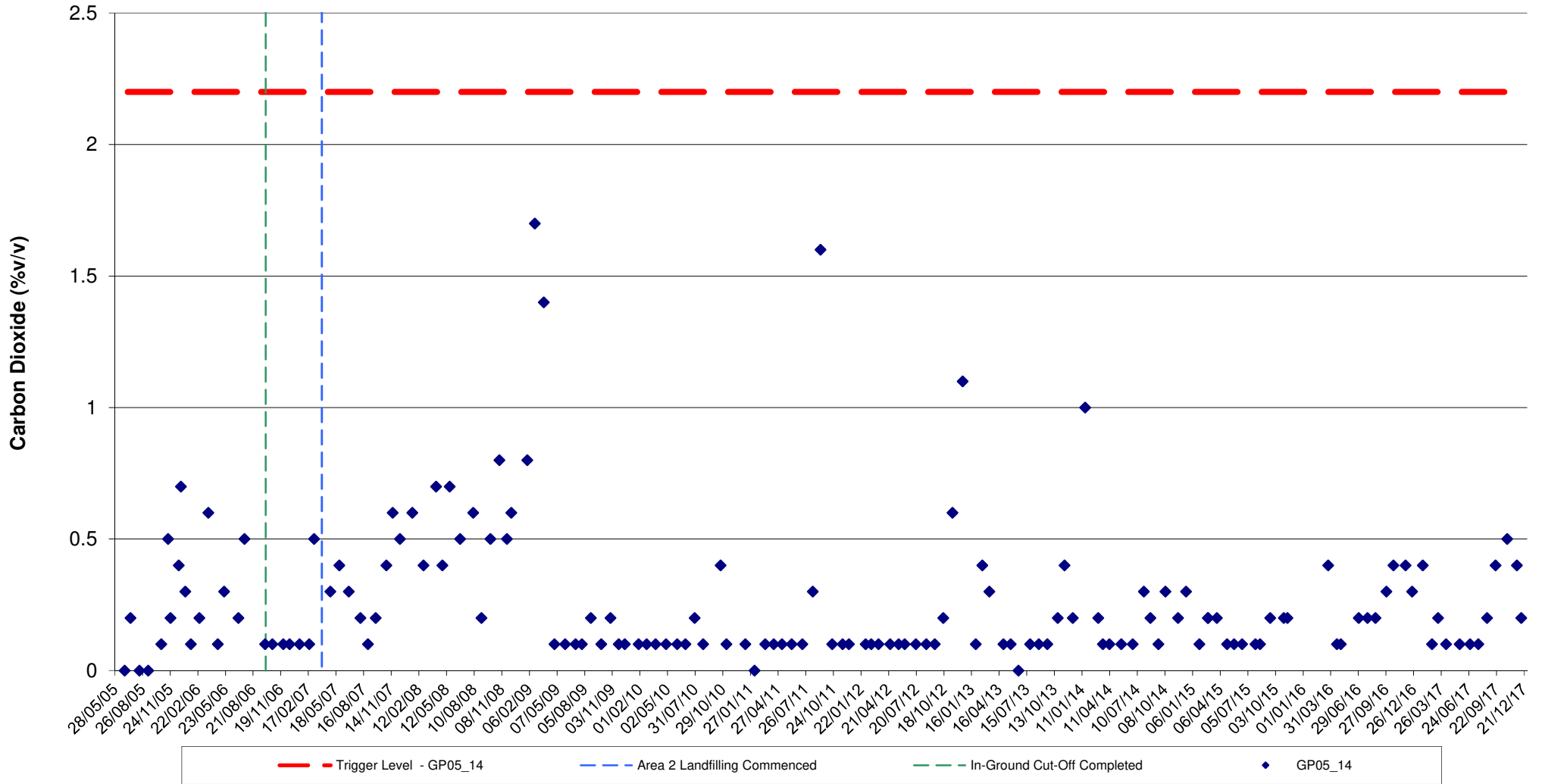
Appendix 4/4 Docksway Disposal Site Recorded Carbon Dioxide Concentrations in GP03_06



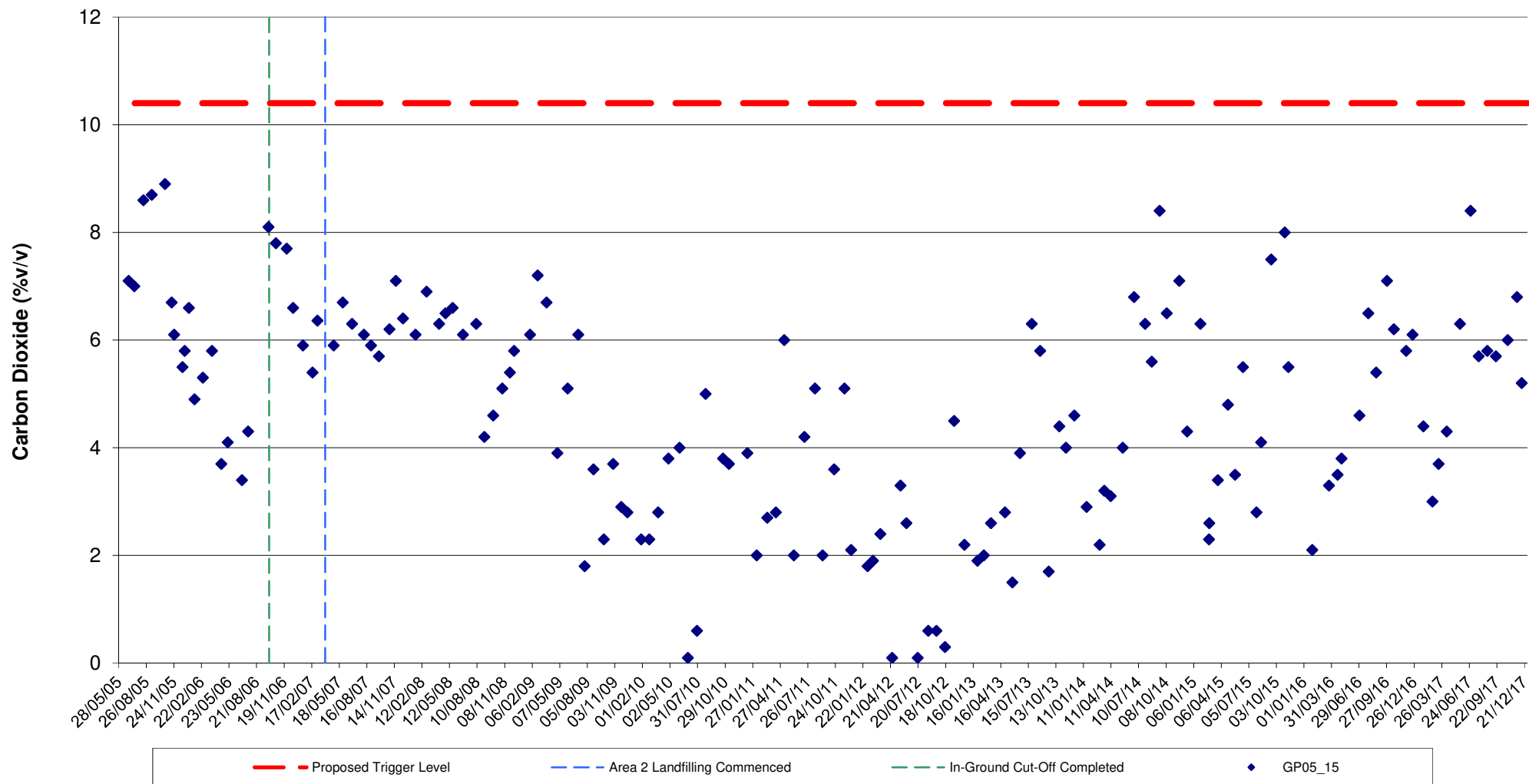
Appendix 4/5
Docksway Disposal Site
Recorded Carbon Dioxide Concentrations in GP06_08a



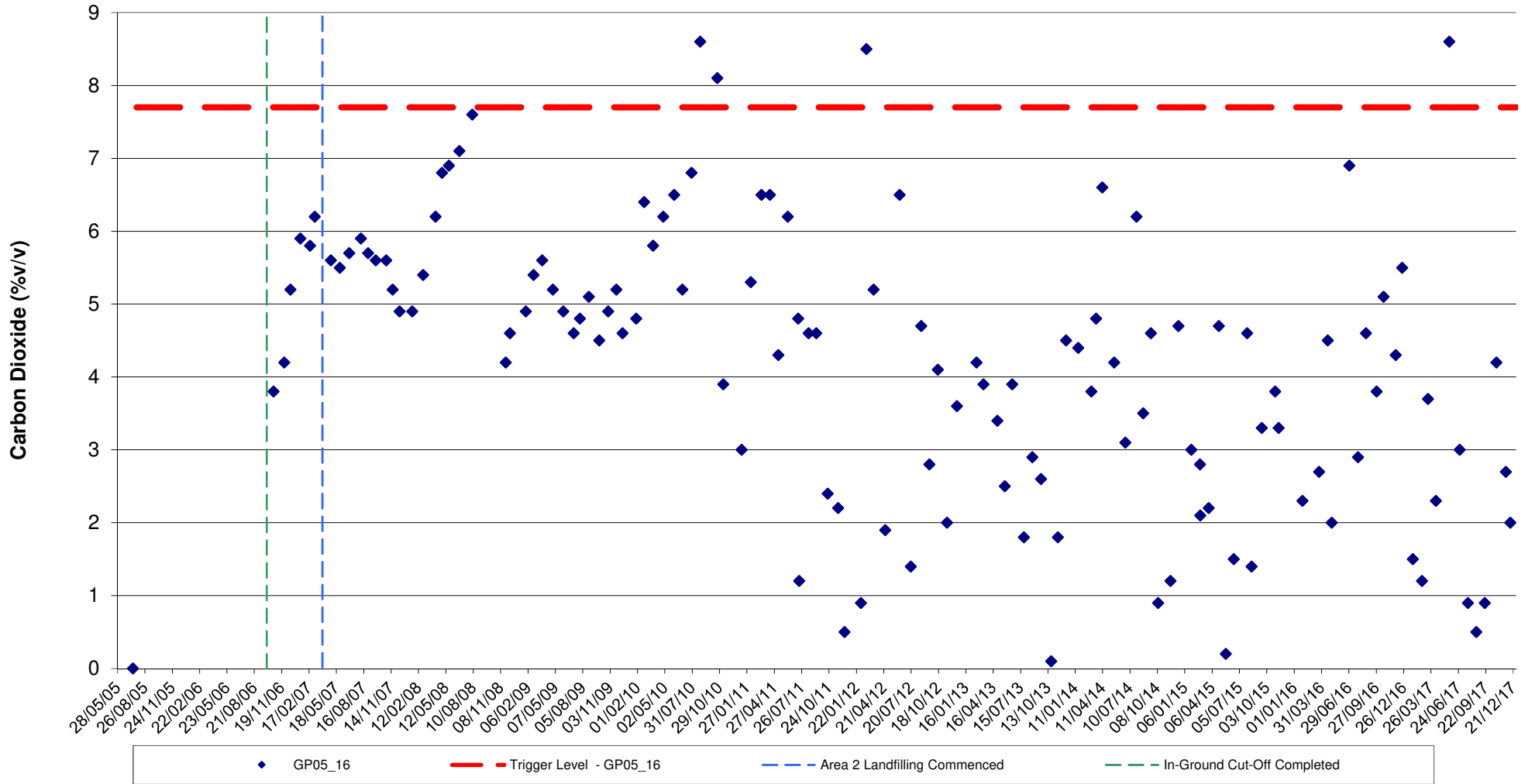
Appendix 4/6
Docksway Disposal Site
Recorded Carbon Dioxide Concentrations in GP05_14



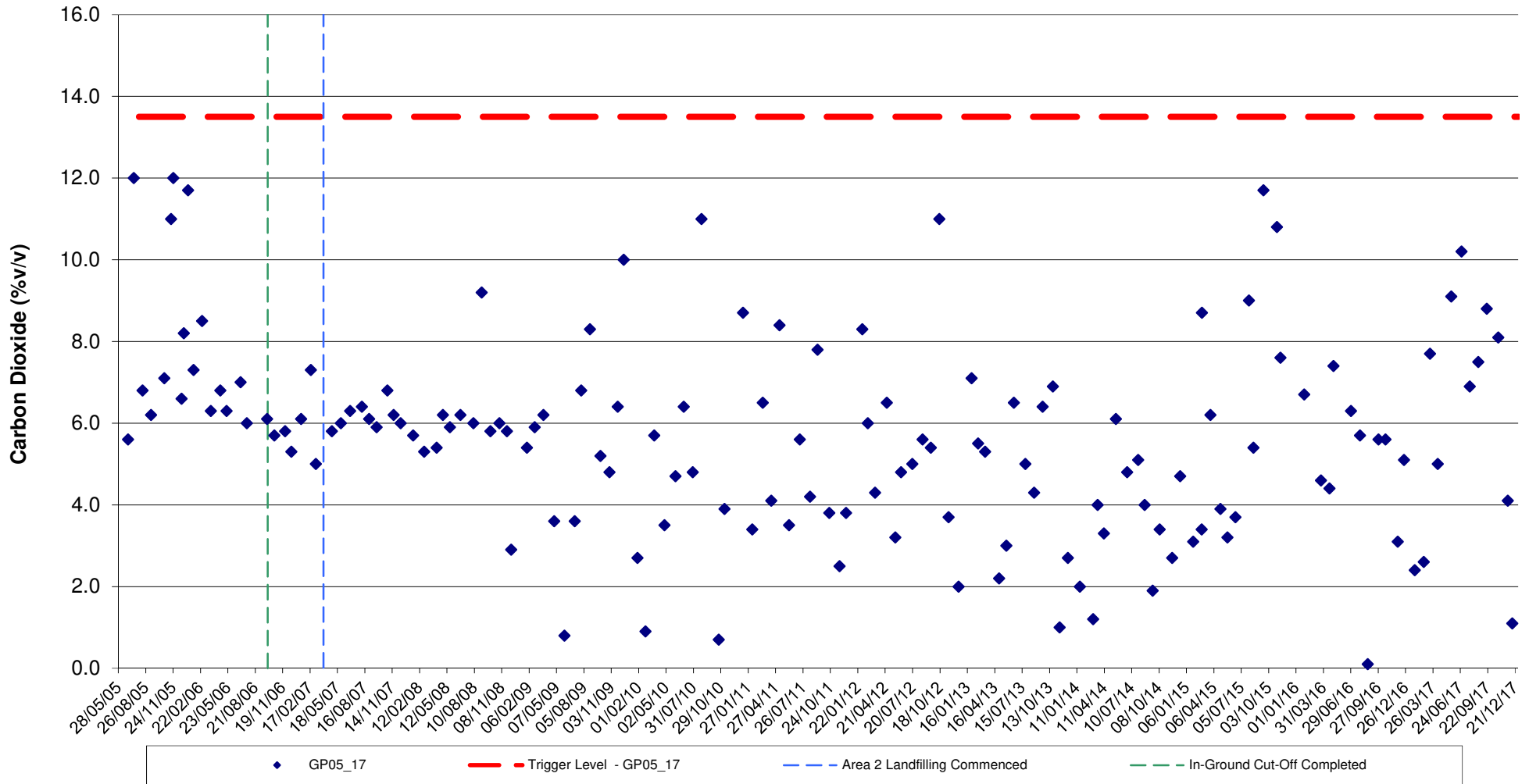
Appendix 4/7
Docksway Disposal Site
Recorded Carbon Dioxide Concentrations in GP05_15



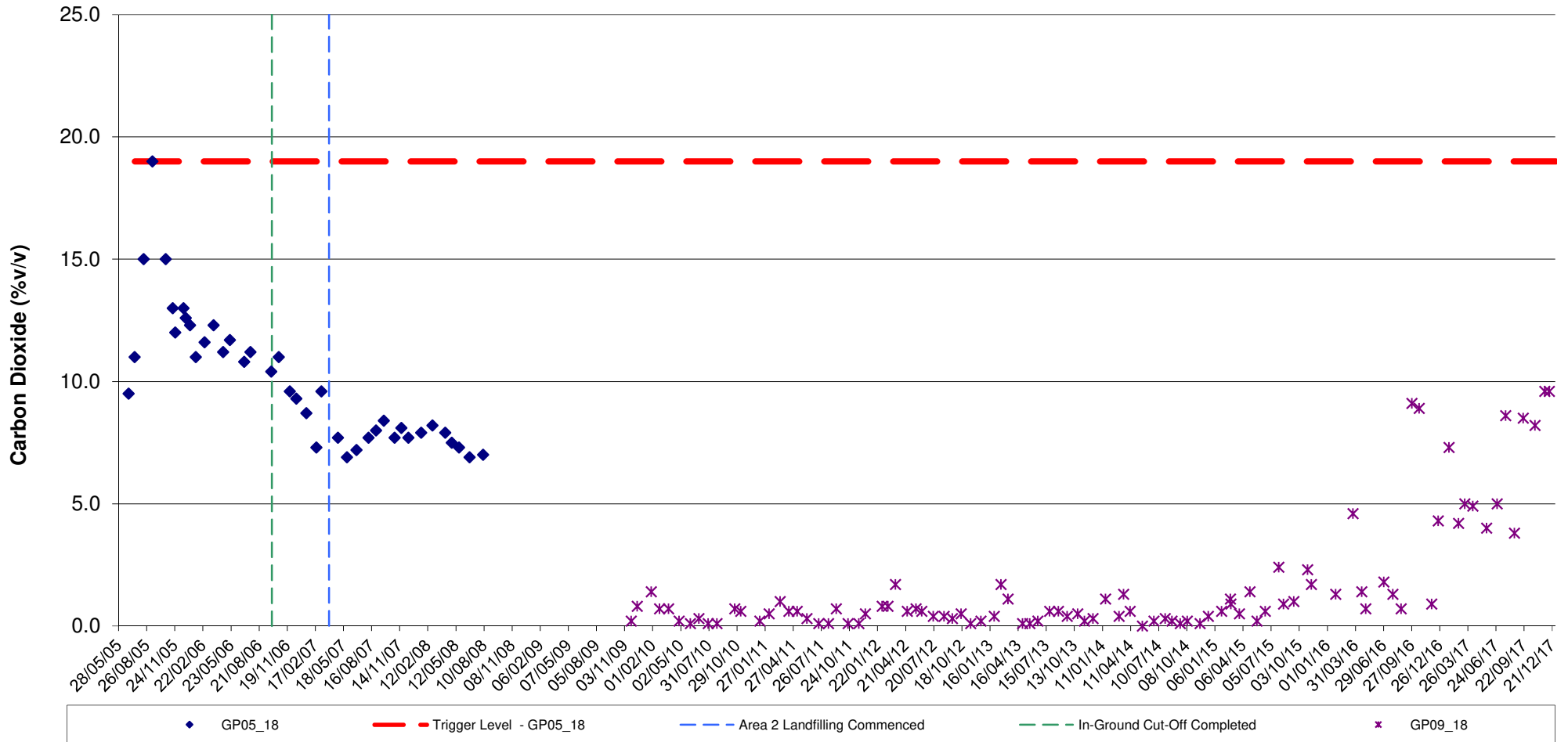
Appendix 4/8
Docksway Disposal Site
Recorded Carbon Dioxide Concentrations in GP05_16



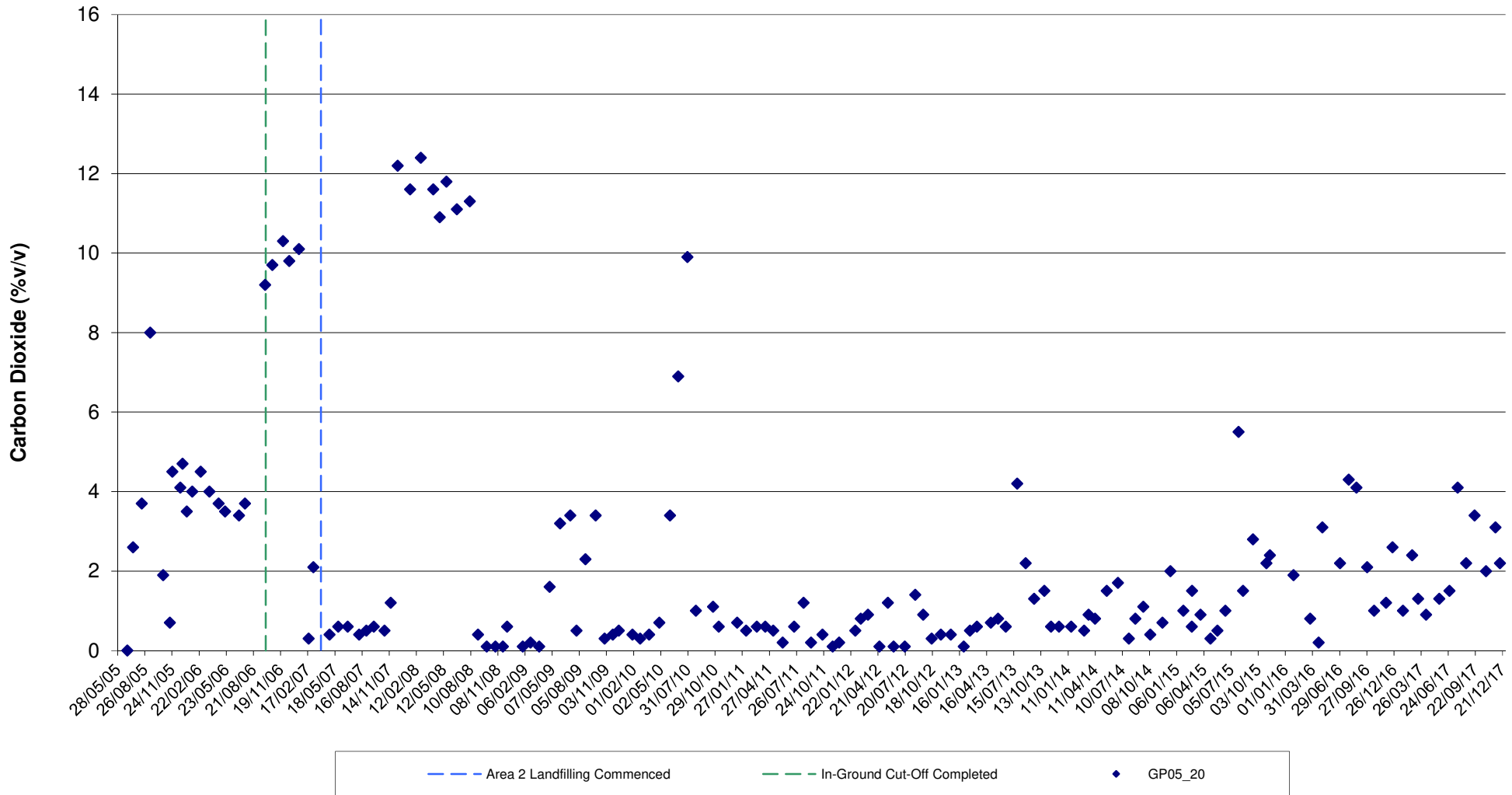
Appendix 4/9
Docksway Disposal Site
Recorded Carbon Dioxide Concentrations in GP05_17



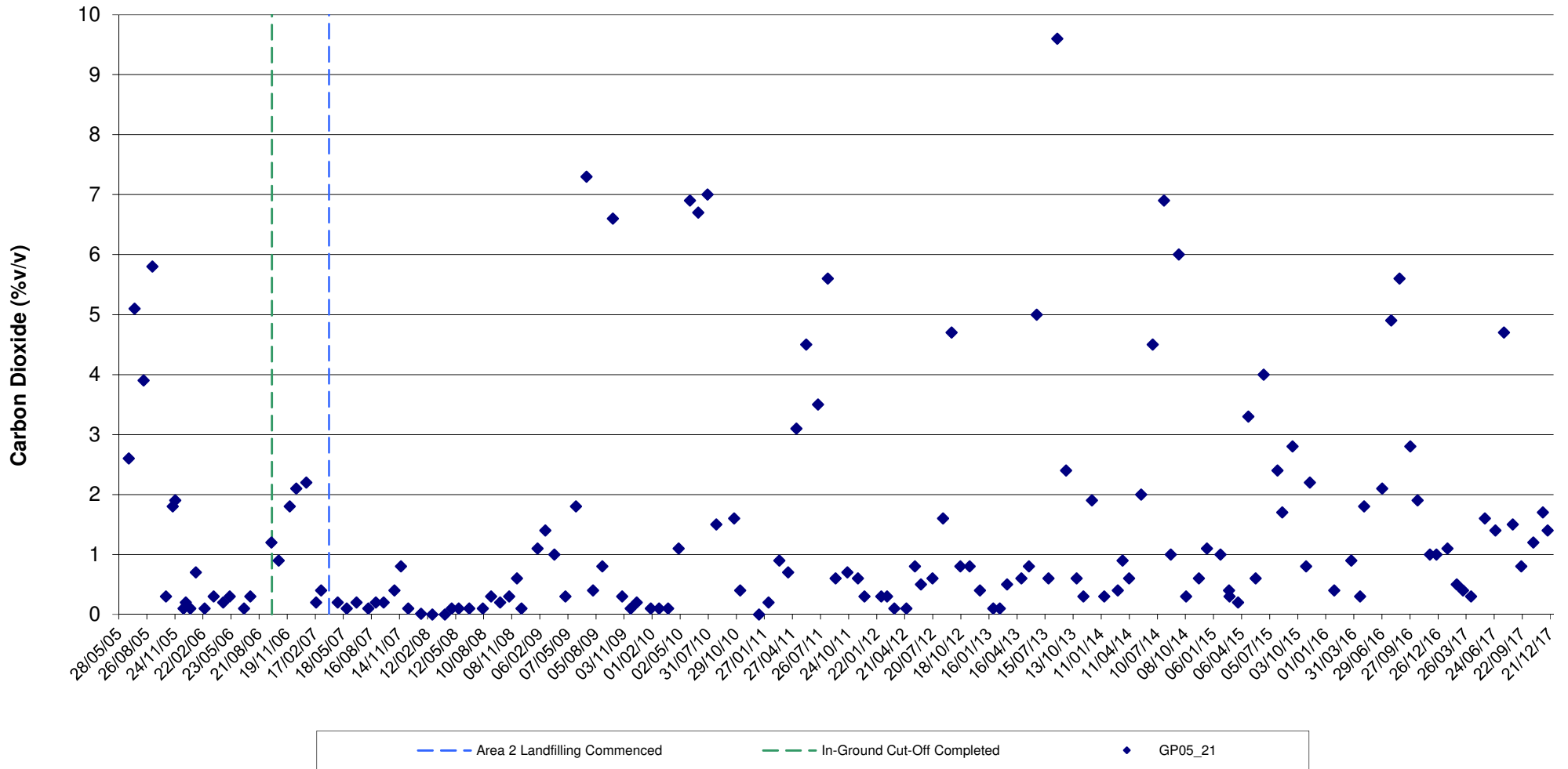
Appendix 4/10
Dockway Disposal Site
Recorded Carbon Dioxide Concentrations in GP05_18 and GP09_18



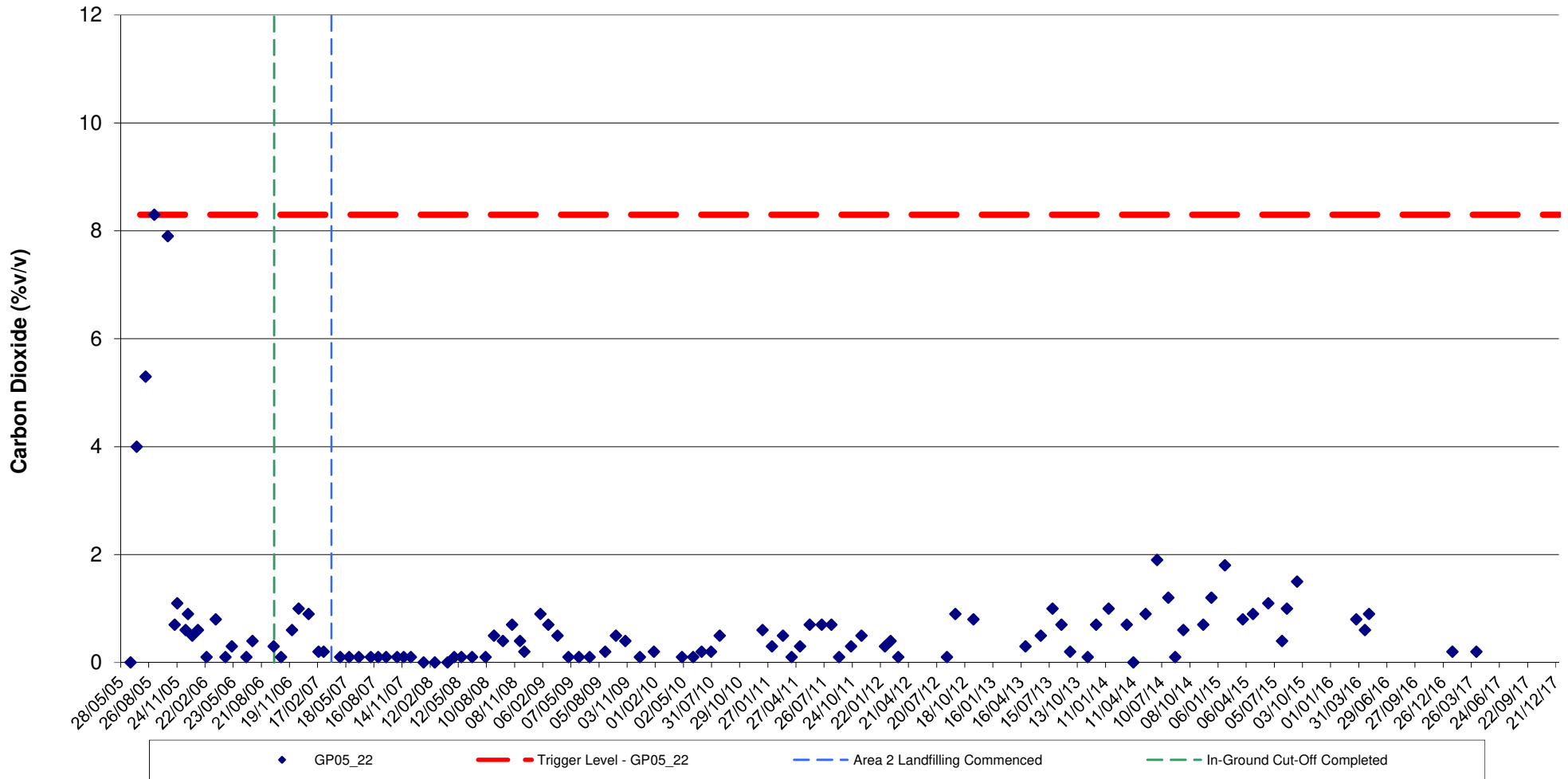
Appendix 4/11
Docksway Disposal Site
Recorded Carbon Dioxide Concentrations in GP05_20



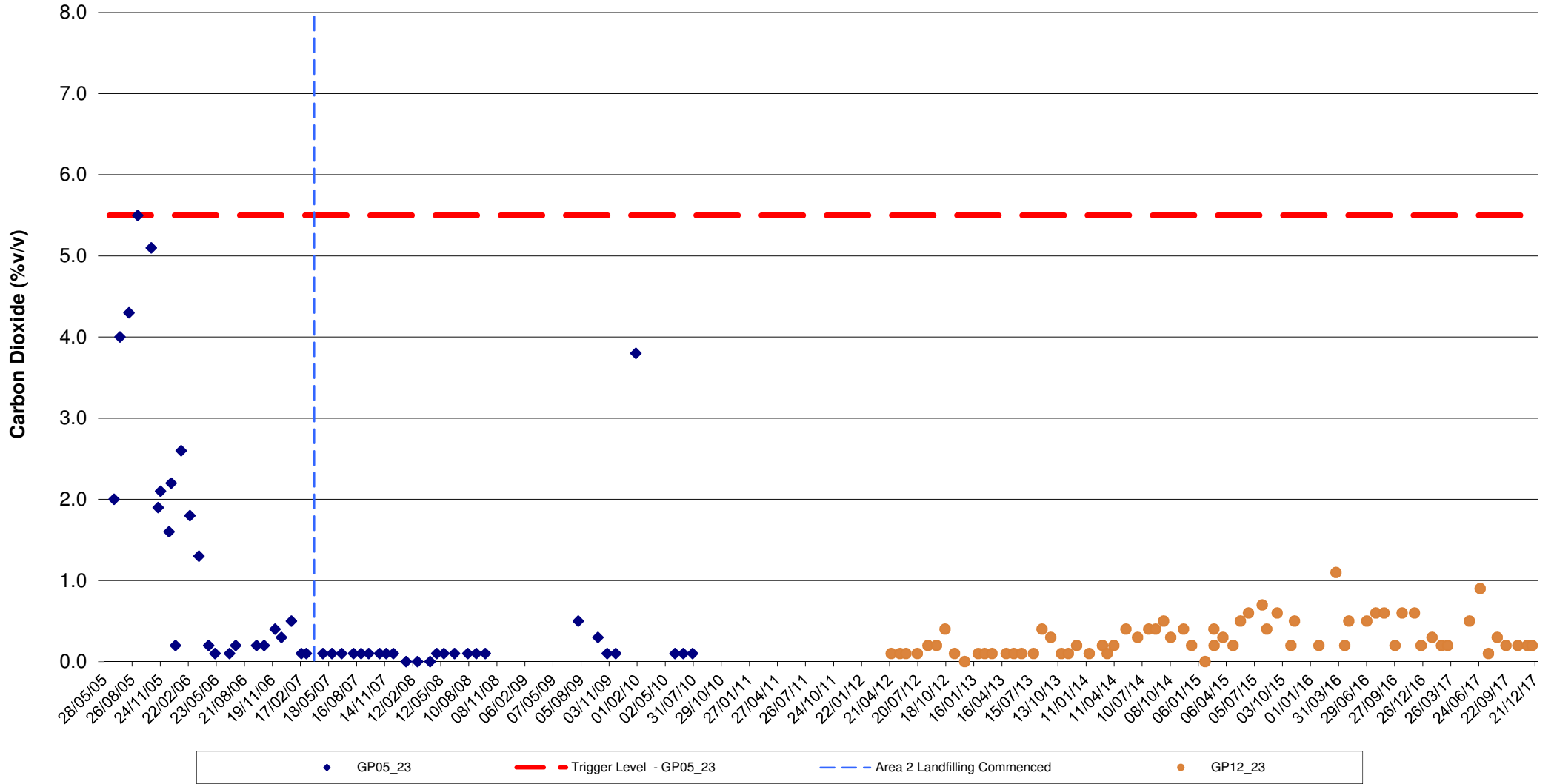
Appendix 4/12
Docksway Disposal Site
Recorded Carbon Dioxide Concentrations in GP05_21



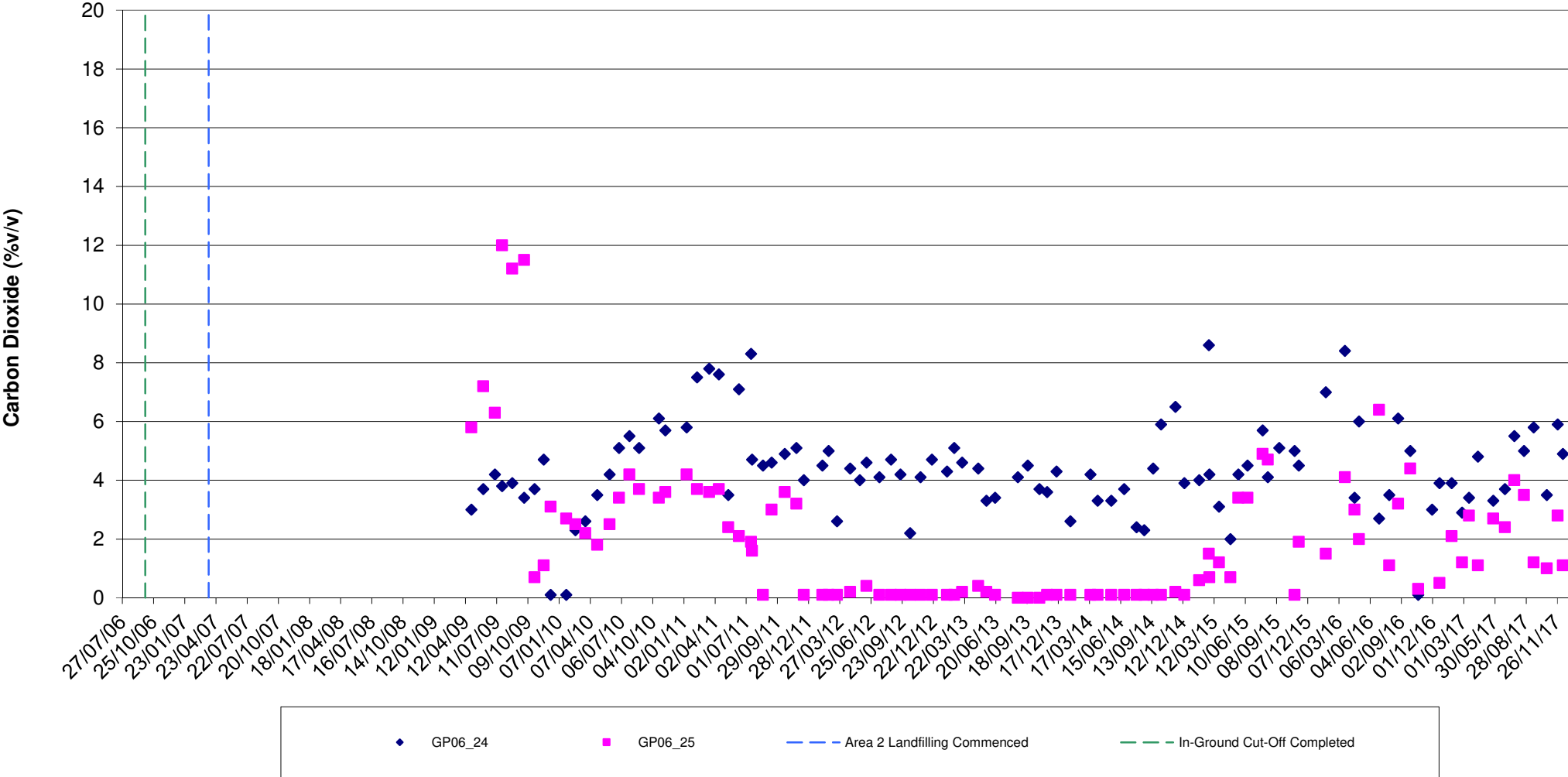
Appendix 4/13
Docksway Disposal Site
Recorded Carbon Dioxide Concentrations in GP05_22



Appendix 4/14
Docksway Disposal Site
Recorded Carbon Dioxide Concentrations in GP05_23 and GP12_23



Appendix 4/15
Docksway Disposal Site
Recorded Carbon Dioxide Concentrations for GP06_24 and GP06_25



Appendix 5



Business Management System

Document No.:CAS 2.8
Revision No.:2
25/01/11

Annual permit report

Installation	Docksway
Permit reference	LP3135SB
Reporting period	Jan - Dec 2017
Permit Operator	Novera Energy

Author: Kate Phillips

Date: 26/01/2018

Authorised to sign as representative of the Operator

Fugitive Emissions Review		Reporting period:	Jan - Dec 2017
Installation Name:		Docksway Landfill gas utilisation plant	Permit reference
			LP3135SB
Substances Released/Potentially	Description of event and any contamination/decontamination of the site which has occurred		
Landfill gas	Details of any notifiable events have been submitted to NRW in accordance with our notification procedure		
Spillages	No significant spillages, contamination or decontamination to report for this installation		

The Site Protection and Monitoring Programme is incorporated into Infinis Environmental Management Systems (as part of a Site Management System).

Raw Materials (& Water) Assessment Table							
Site: Docksway		Reporting period: Jan - Dec 2017			Permit Reference: LP3135SB		
Raw Materials	Application	Current Measures to Ensure Efficiency and Waste Minimisation	Annual Quantity Used	Fate of Material	Environmental Impact Potential	Reason Alternatives are Not Practicable	Details of Process Modifications which Could Result in Savings
Landfill gas	Fuel for engines to produce electricity	Kilowatt generation from volumes processed is maximised through effective operation, maintenance and servicing of plant	Variable depending on site conditions	Combustion	Potentially flammable, explosive, toxic, asphyxiant, ecotoxic, corrosive and odorous, greenhouse gas	N/A - Combustion of landfill gas essential for environmental control	N/A - environmental benefits to be gained from conversion of methane to CO2
Lubricating oils	To ensure efficiency of utilisation plant is maintained in accordance with manufacturer's instructions	Efficient use of lubricating oil is maximised through oil analysis to identify requirement for oil changes	Oil used is continually under review as part of the budgeting process	Reprocessing	Ecotoxic and odorous	Specification determined by engine manufacturer to ensure maximum performance and efficiency	Oil used is specialised for landfill gas fuel as recommended by the OEM. Oil change intervals are based on oil analysis therefore maximising efficiency and minimising use
Water	Coolant for engine block and domestic water supply	Cooling water is recirculated around the engines to maximise efficiency and minimise consumption	No water supply on site.	Treatment	Inert	N/A - Inert therefore best practicable environmental option	Re-use of water for coolant purposes ensures volumes used are as low as reasonably practicable. Cleaning practices assessed and minimal volumes used, cleaning practices are infrequent.
	Hygiene purposes	handwashing and (where available) toilet facilities		where installed toilet waste is removed from site and treated as sewerage	Inert	n/a	n/a
Glycol	Antifreeze for use in coolant water	Glycol is recirculated around the engines to maximise efficiency and minimise consumption	Glycol contained within enclosed-loop system is drained into a container for re-use. OEM* recommends change of glycol every 20,000 hours. Infnis policy is to change following natural depletion or contamination.	Reprocessing	Toxic, ecotoxic	Specification determined by engine manufacturer to ensure maximum performance and efficiency	Antifreeze mix is specific to engine type and pre-determined by the OEM*. Levels are topped-up following natural depletion or contamination
Battery Acid	In batteries used for engine start-up and to provide back-up power to ensure rapid restart following any loss of mains power supply	Battery use is essential minimised to the applications listed (see left)		Recycled	Corrosive	Portable electrical supply required for start-up	Minimal use of battery during start-up only therefore opportunity for savings is insignificant

*OEM: Original Engine Manufacturer

Waste Minimisation, Recovery and Disposal Assessment

Installation Name: Docksway Gas Utilisation Plant	Permit Reference: LP3135SB	Reporting period: Jan - Dec 2017
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Waste Stream	Application/Source	Current Measures to Ensure Efficiency and Waste Minimisation	Fate of Material	Reason Alternatives are Not Practicable	Details of Process Modifications which Could Result in Savings
Oil Filters (205ltr Drum)	Engine maintenance	Predetermined by manufacturers' recommendations to ensure efficiency	Reprocessing	Oil and filtration devices predetermined by manufacturers to ensure efficiency	Not applicable: oil filters changed at pre-determined life based on oil analysis and differential pressure
Oil Contaminated Rags & Absorbents (205ltr Drum)	Engine maintenance and housekeeping	Control measures in place to prevent spillage	Reprocessing	As above	No further modifications considered possible: Preventative maintenance and procedural practices minimise spillage and the requirement for oil absorbency products
Waste Engine Oil (Bulk)	Engine maintenance	Efficient use of lubricating oil is maximised through oil analysis to identify requirement for oil changes	Reprocessing	As above	No further modifications considered possible: Oil used is specific to the landfill gas fuel in use and as recommended by the OEM*. Oil change intervals are based on oil analysis therefore maximising efficiency and minimising use
Batteries	Engine maintenance	Recharged	Recycled	Batteries essential for engine start-up and ensuring rapid restart	Batteries only replaced when they no longer hold a charge. Maintenance practices are in place to lengthen battery life
Fluorescent Tubes	Lighting	Replacement when faulty or damaged	Reprocessing	Alternatives not considered practicable due to warm-up time of energy saving bulbs	Tubes are only replaced when they have expired
General Waste	Packaging	Waste streams which can be reprocessed or recycled are identified and segregation facilities provided where appropriate	Disposal	Materials not segregated/ reprocessed are produced in small quantities only making alternatives not viable	Not applicable as a result of small quantities only being produced
Waste water/effluent	Welfare facilities	Facilities are maintained to ensure minimal water usage	Road tanker to treatment plant	Connection to mains sewer not practical - quantities produced are small.	Not applicable as a result of small quantities only being produced

*Original Engine Manufacturer



Business Management System

Document No.:CAS 2.8
Revision No.:2
25/01/11

Annual permit report

Installation	Docksway
Permit reference	LP3135SB
Reporting period	Jan - Dec 2017
Permit Operator	Novera Energy

Author: Kate Phillips

Date: 26/01/2018

Authorised to sign as representative of the Operator

Fugitive Emissions Review		Reporting period:	Jan - Dec 2017
Installation Name:		Docksway Landfill gas utilisation plant	Permit reference
			LP3135SB
Substances Released/Potentially	Description of event and any contamination/decontamination of the site which has occurred		
Landfill gas	Details of any notifiable events have been submitted to NRW in accordance with our notification procedure		
Spillages	No significant spillages, contamination or decontamination to report for this installation		

The Site Protection and Monitoring Programme is incorporated into Infinis Environmental Management Systems (as part of a Site Management System).

Raw Materials (& Water) Assessment Table							
Site: Docksway		Reporting period: Jan - Dec 2017			Permit Reference: LP3135SB		
Raw Materials	Application	Current Measures to Ensure Efficiency and Waste Minimisation	Annual Quantity Used	Fate of Material	Environmental Impact Potential	Reason Alternatives are Not Practicable	Details of Process Modifications which Could Result in Savings
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Lubricating oils	To ensure efficiency of utilisation plant is maintained in accordance with manufacturer's instructions	Efficient use of lubricating oil is maximised through oil analysis to identify requirement for oil changes	Oil used is continually under review as part of the budgeting process	Reprocessing	Ecotoxic and odorous	Specification determined by engine manufacturer to ensure maximum performance and efficiency	Oil used is specialised for landfill gas fuel as recommended by the OEM. Oil change intervals are based on oil analysis therefore maximising efficiency and minimising use
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	Hygiene purposes	handwashing and (where available) toilet facilities		where installed toilet waste is removed from site and treated as sewerage	Inert	n/a	n/a
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*OEM: Original Engine Manufacturer

Waste Minimisation, Recovery and Disposal Assessment

Installation Name: Docksway Gas Utilisation Plant	Permit Reference: LP3135SB	Reporting period: Jan - Dec 2017
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*Original Engine Manufacturer

Annual Reporting of Other Performance Indicators

Installation:	Docksway Landfill Gas Utilisation Plant	Permit Reference: LP3135SB
Parameter	Jan - Dec 2017	Units
Flare operation hours	667	hrs
Gas engine downtime hours	688	hrs*
Gas engine operation hours	8072	hrs
Volume of landfill gas combusted	327,098	m3 (treated by flare)
	3,959,712	m3 (treated by engines)
	4,286,810	m3 (total treated by engines & flare)

Operator's Comments:

An engine was removed from the site in January 2014. Please contact permit-compliance@infinis.com for any queries regarding the above

Reporting of Performance Indicators (Form Ref: PI1)

Installation:	Docksway Landfill Gas Utilisation Plant	Permit Reference: LP3135SB
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Annual Production/Treatment (MWh)

Total production of energy	7443
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Environmental Performance Indicators

Parameter	Annual Average Jan - Dec 2017	Units	Trends in Environmental Performance	
			2015	2016
Total oxides of nitrogen (expressed as NO2) emission	1.2	Kg/MWh	2.0	2.0
Total carbon monoxide emission	4.1	Kg/MWh	4.4	4.4
Total engine downtime (downtime hrs/available operation time in hrs)	7.9	%	6.7	7.7

Reporting period	Energy Imported (Primary Energy Usage) (MWh)	Parasitics (MWh)	Energy Exported (MWh)	Energy Used on Site (MWh)	Site Efficiency
Jan - Dec 2017	9	327	7116	336	33.5

*site efficiency has been calculated as follows: ((Engine efficiency (%) x (gas to generation/total gas) x (power export / (power generation + imported power))).

Installation:	Docksway Landfill Gas Utilisation Plant	Permit Reference:	LP3135SB
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Accident Management Plan Review	Jan - Dec 2017
Date of next review	
Reviewed monthly following a review of notifiable events	

Permit requires that the accident management plan is reviewed at least every 2 years, or as soon as practicable after an accident (whichever is the earlier).

Operator's comments:
No accidents occurred during this period which would require amendment to the Accident Management Plan for this installation.

Installation: Docksway Landfill Gas Utilisation Plant	Permit Reference: LP3135SB
Emissions to Air Reporting Jan - Dec 2017	
Report Submission Date	17-May-17
Submitted to	David Willey

Appendix 6

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Cell 2 Topo Survey Dec 2017



Section 2.3 @ 710 m

