

2021 Annual Performance Report

Aberthaw Ash Disposal Site

Permit Number: DP3432SW

March 2022 – Issue 2

Summary

This document gives details on the performance of RWE Generation UK plc's Aberthaw Ash Disposal Site throughout 2021, as required by condition 4.2.1 of the site's Environmental Permit (EP), DP3432SW.

CONTENTS

1.	Operational Update	4
2.	Review of Results for Emission Monitoring	4
2.1.	Hydrogeological Risk Assessment Review	4
2.2.	Groundwater Quality Review	4
2.3.	Surface Water Quality Review	11
3.	Annual Production/Treatment Data 2021	16
4.	Contamination/Decontamination of Site	16
5.	Topographical Surveys	16
6.	Landfill Capacity	16
7.	Waste Acceptance Compliance Testing	17

1. Operational Update

Aberthaw Ash Disposal Site historically reached its maximum allowable height and has been restored as per plans approved by the Local Authorities.

There were no changes to the operational activities and no Environmental Permit variations associated with the Ash Mound during 2021. The Ash Mound, as part of the wider Aberthaw Power Station Site, is in the process of being sold to a new landowner. It is expected that a permit transfer application will be made during 2022.

2. Review of Results for Emission Monitoring

Monitoring has continued where possible during 2021, however the site has had to manage sampling visits within the evolving Coronavirus Pandemic restrictions. The four groundwater sampling visits, undertaken by specialist contractor, were spread throughout the year, taking account of changing working requirements and access to external accredited laboratory provision.

The four visits were undertaken:

- 27th April 2021 (Q1 Visit)
- 30th June 2021 (Q2 Visit)
- 1st September 2021 (Q3 Visit)
- 19th October 2021 (Q4 Visit)

2.1. Hydrogeological Risk Assessment Review

In accordance with Environmental Permit DP3432SW there is a requirement to undertake a 6-yearly review of the HRA. This was last completed in early 2018 by an external specialist consultant and concluded that whilst there was a discernible effect from the ash on groundwater & surface water, this effect has stabilised over time with little change in quality over the review period.

2.2. Groundwater Quality Review

Monitoring Objective

To carry out routine monitoring of groundwater to monitor the performance of the ash disposal site by measurement of absolute levels and concentrations and trends relative to relevant criteria including background levels and concentrations, control levels and compliance limits.

Number and Location of Monitoring Points

A summary of the monitoring boreholes is provided in Table 1 below and the locations are shown in Appendix A. There are 7 boreholes in natural ground, of which 5 are completed in the Porthkerry Member limestone and 2 in the Alluvium (clay). There are 2 shallow boreholes in fill material, BH7A with a response zone partly in clay fill and BH11A with a response zone partly in fill containing coal ash.

Groundwater flow beneath the ash disposal site is directed towards the River Thaw to the west and the sea to the south. Due to the ash disposal site's contact with the sea, the southern boundary of the site is a downgradient boundary. There are 4 boreholes on this boundary, BH10B, BH11B, BH7B and BH9B, with an average spacing of approximately 250m. The two shallow boreholes, BH7A and BH11A are situated close to boreholes BH7B and BH11B respectively. There is also 1 borehole, BH3B on the western downgradient boundary. Borehole BH8B was found damaged in Q2 2017 and a representative sample was unable to be obtained for the remainder of 2017. Following the outcome of the HRA review in 2018, sampling of BH8B was suspended. Please note that a replacement for BH8A & BH8B was installed in February 2021.

BH6 and BH5 are located on the eastern boundary with an average spacing of approximately 750m and as both response zones are overlain by PFA they cannot be considered truly upgradient. Upgradient monitoring boreholes at the nearby Aberthaw Quarry Ash Disposal Site (Environmental Permit BP3339BH) could be used as an indication of upgradient groundwater quality data for the limestone aquifer.

Table 1: Summary of Monitoring Boreholes

Monitoring Borehole	Formation Sampled	Lithology Type – Natural (N) Imported Fill (F)	Response Zone Depth (m b GL)	Geological Barrier Thickness above Response Zone (m)	Other Lithology above Response Zone
BH3B	Limestone	N	13.5-23.0	6	PFA: 6m
BH5	Limestone	N	2.5-11.5	0	PFA: 1.5m
BH6	Limestone	N	13.0-20.5	0	PFA: 12.2m
BH7A	Clay fill and Gravelly clay	F/N	2.0-9.5	8	PFA: 1.5m
BH7B	Limestone	N	17.0-26.0	3.9	Fill: 7.4m Sand & gravel: 5.7
BH8A	Limestone	N	5.3-7.0m	0	PFA: 5.3m
BH8B	Limestone	N	30.0-38.0m	0	PFA: 5.3m
BH9B	Limestone	N	6.0-13.0	0	PFA: 3m
BH10B	Clay	N	23.0-30.0	6.6	Fill: 2.8m Sand: 13m
BH11A	Fill – ash and clay	F	1.5-5.0	0	N/A
BH11B	Clay	N	9.5–19.0	4.5	Fill: 4.9m

Note: mb GL – metres below ground level

Monitoring Measurements

The groundwater monitoring analytical suite contains a range of parameters which are monitored on a quarterly basis along with groundwater level and standard field measurements in accordance with the Environmental Permit. RWE employ the services of an independent external contractor for the sampling of groundwater boreholes and an independent external laboratory is used for the analysis of those samples.

Figure 1 shows recorded groundwater elevations for the previous 16 years. These vary between +0.5 (BH9A) to +14m OD (BH6) with groundwater elevations in limestone boreholes being characterised by seasonal cyclic water level fluctuations associated with annual winter influxes of rainfall recharge.

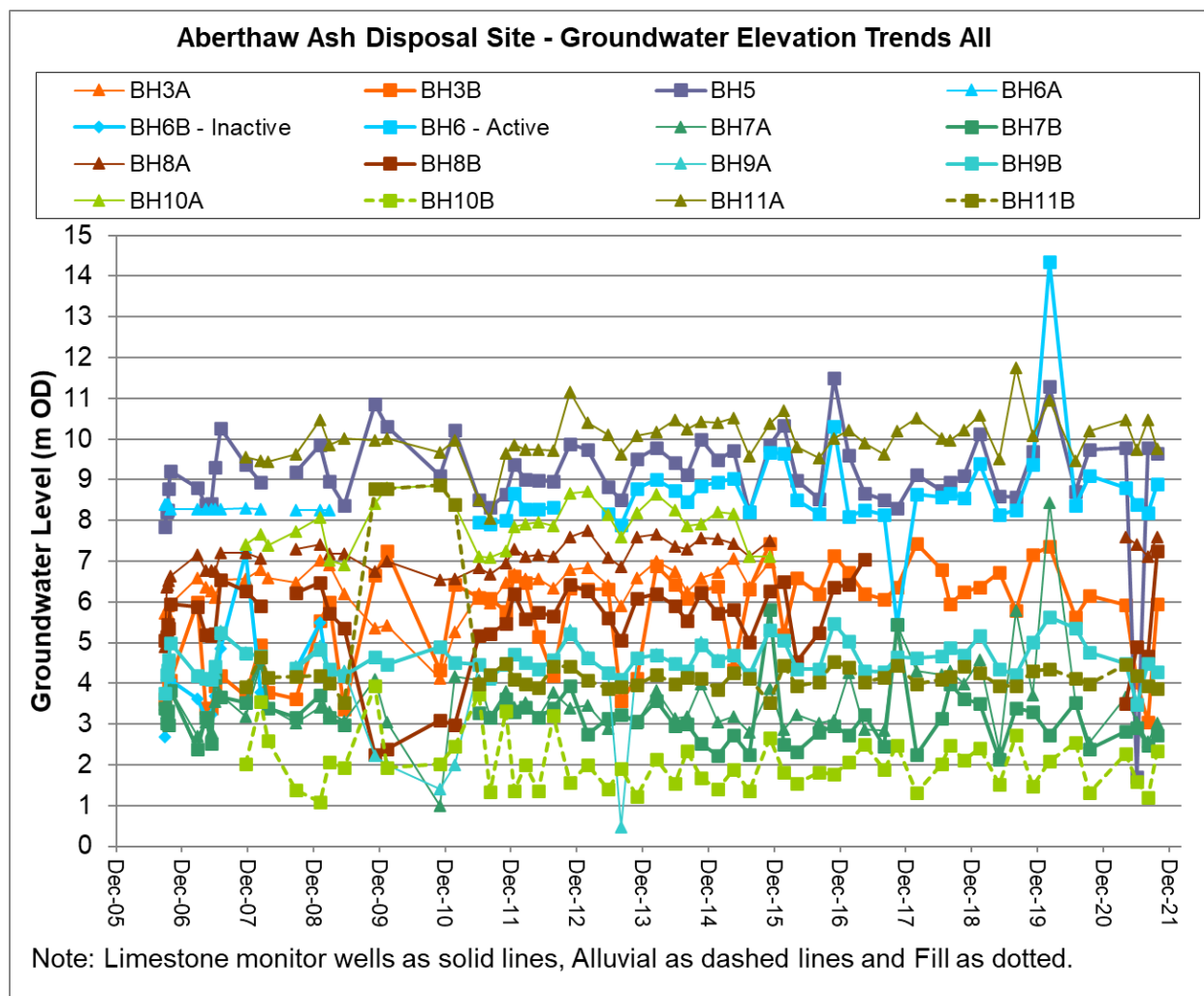
Figure 1: Groundwater Hydrograph

Figure 2 shows the groundwater control charts with concentrations of boreholes plotted. It should be noted that the compliance limits and control levels (where defined) apply to boreholes BH3B and BH7B. An exceedance is defined as a result above the compliance limit or control level for 3 consecutive sampling events.

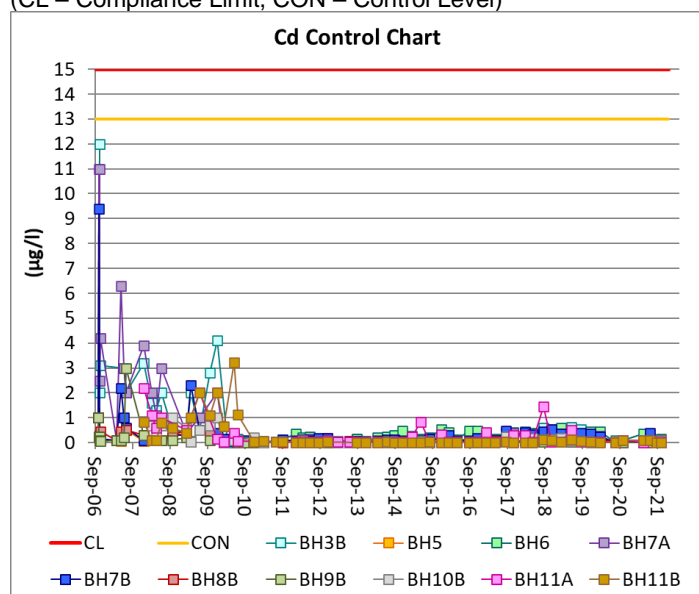
In 2021, there were no exceedances of the compliance limit or control level for any critical parameters for either of the compliance boreholes. In line with historical trends, elevated concentrations in BH3B of arsenic, boron, molybdenum, sulphate and vanadium were observed. In BH7B elevated concentrations of boron, molybdenum, sulphate and ammoniacal-nitrogen were observed.

The control charts show there are no increasing trends in critical parameter concentrations. Other key points to note are:

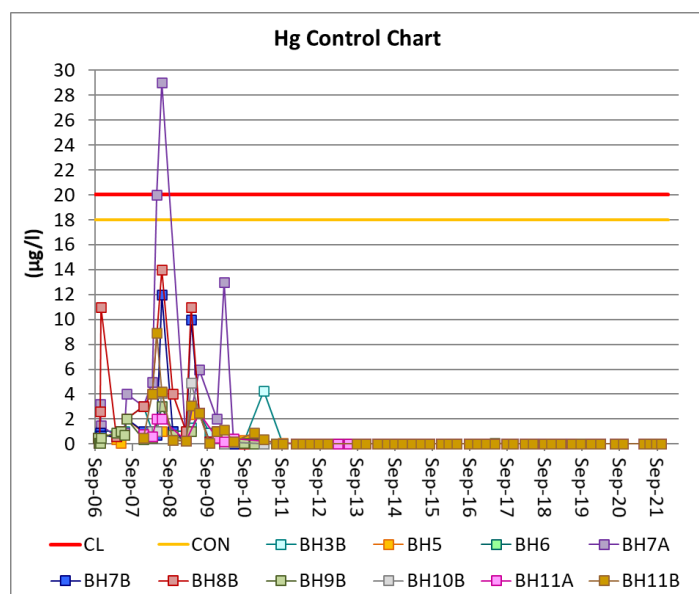
- Decreasing and generally stable trends for cadmium, mercury, aluminium and chromium since sampling began;
- Highly variable ammoniacal nitrogen concentrations in BH10B and;
- Elevated sulphate, boron and molybdenum in most boreholes.

Figure 2: Control charts for groundwater boreholes

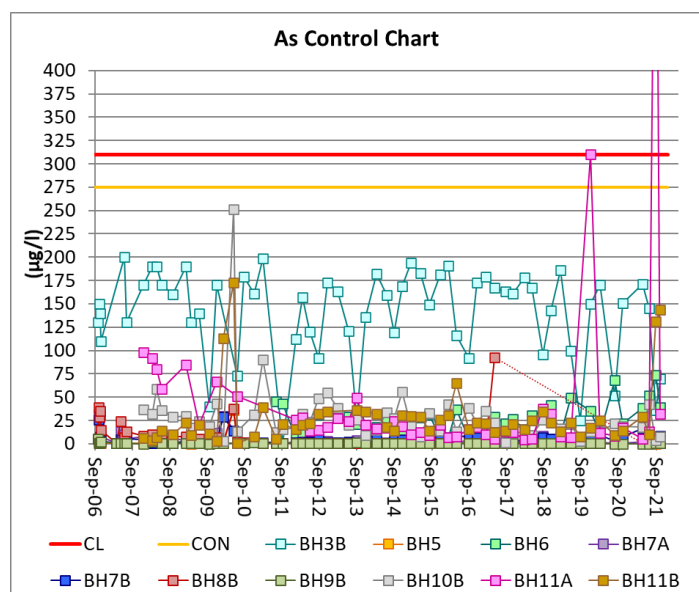
(CL – Compliance Limit, CON – Control Level)



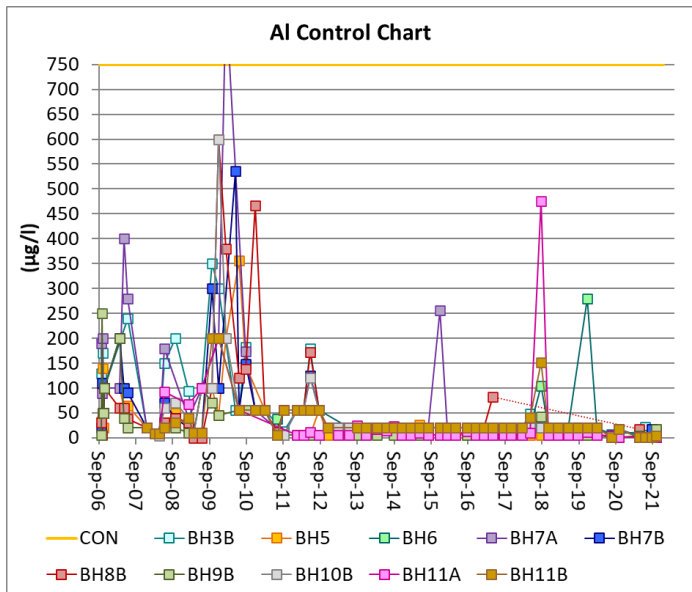
All results within both the Control Level & Compliance Limit over the last year.



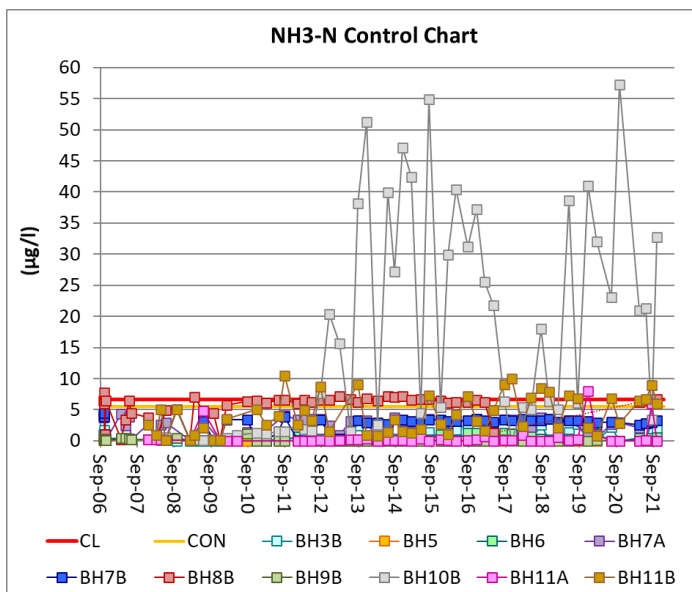
All results within both the Control Level & Compliance Limit over the last year.



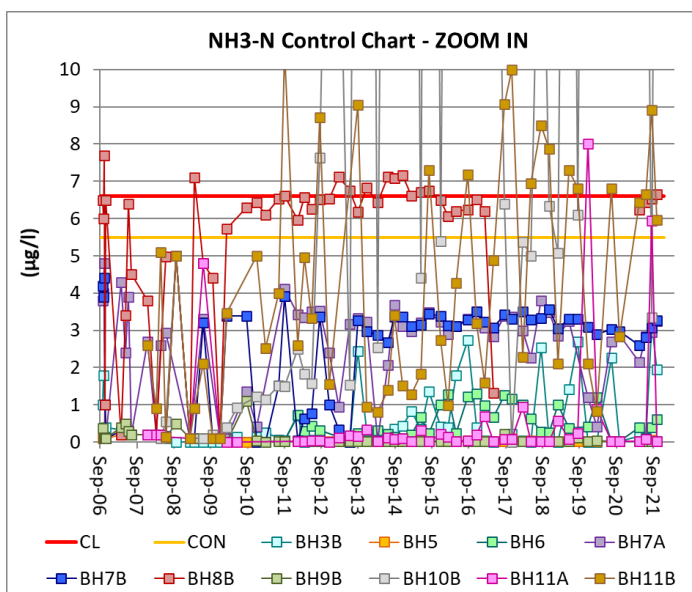
All results within both the Control Level & Compliance Limit over the last year, except for BH11A which exceeded both in September 2021. The result of 787µg/l is considered spurious.



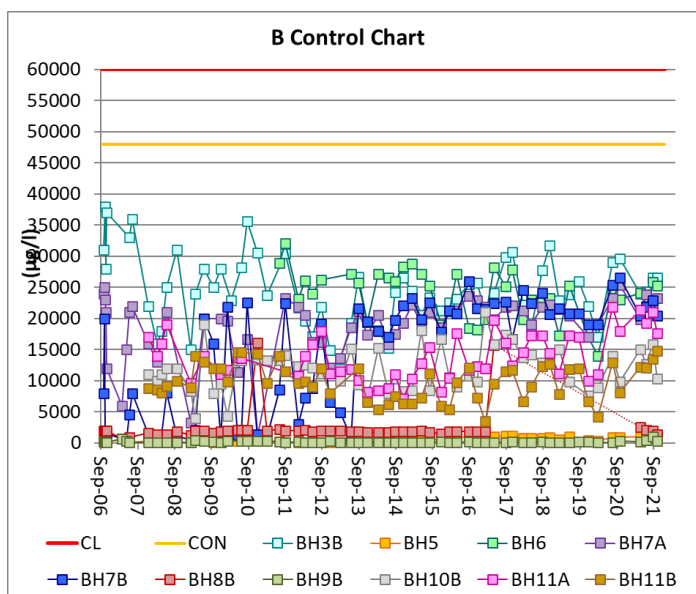
All results within both the Control Level & Compliance Limit over the last year.



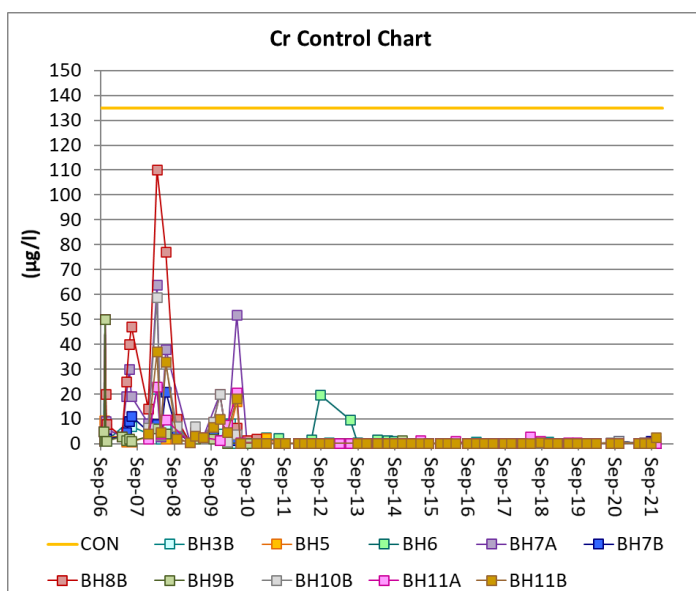
All results within both the Control Level & Compliance Limit over the last year except for BH8B, BH10B, BH11A and BH11B (please see re-ranged graph below). n/b Both the compliance locations remain well below limit.



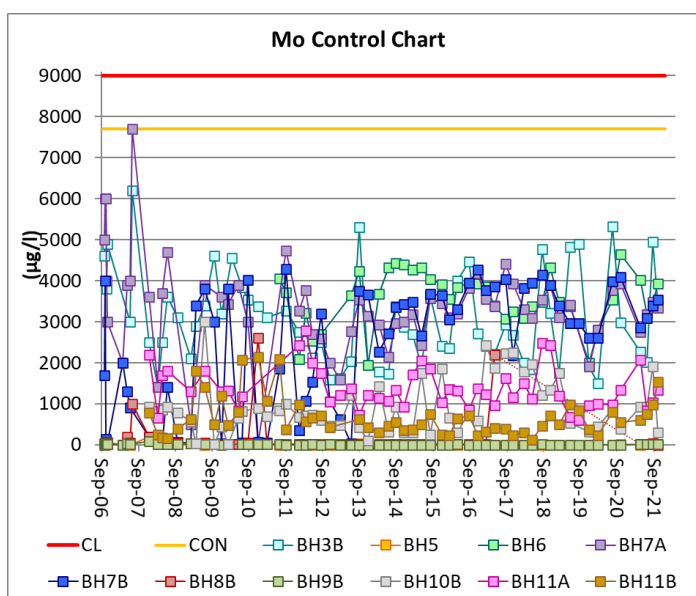
Ammonia continues to fluctuate for some locations. Notably in 2021:
 BH8A: 3 above CON and 1 above CL
 BH10B: 3 above CL
 BH11A: 1 above CON
 BH11B: 2 above CON and 2 above CL.



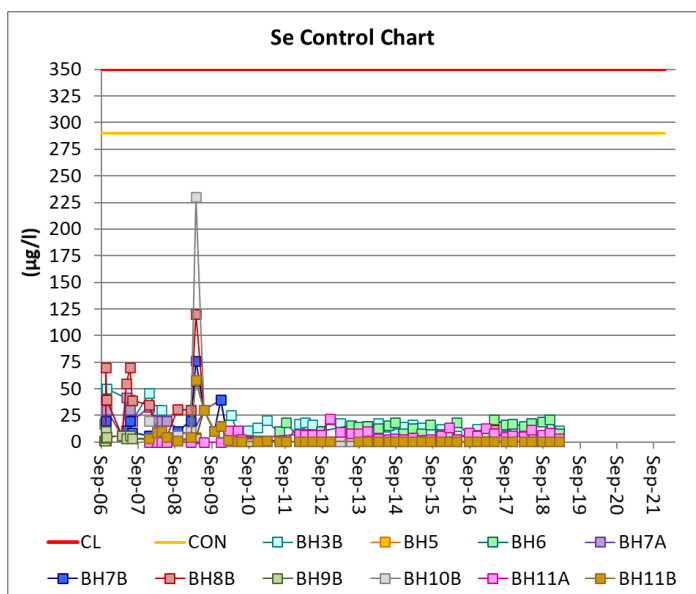
All results within both the Control Level & Compliance Limit over the last year. Although it is noted that levels are generally elevated across several locations.



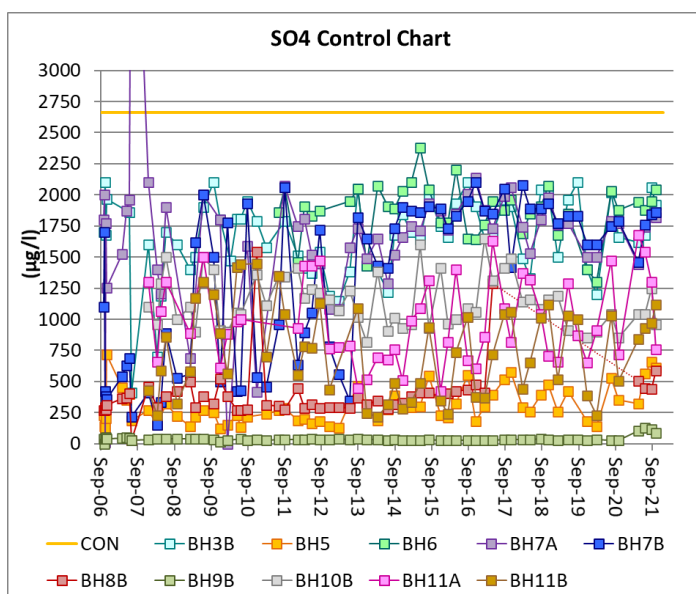
All results within both the Control Level & Compliance Limit over the last year.



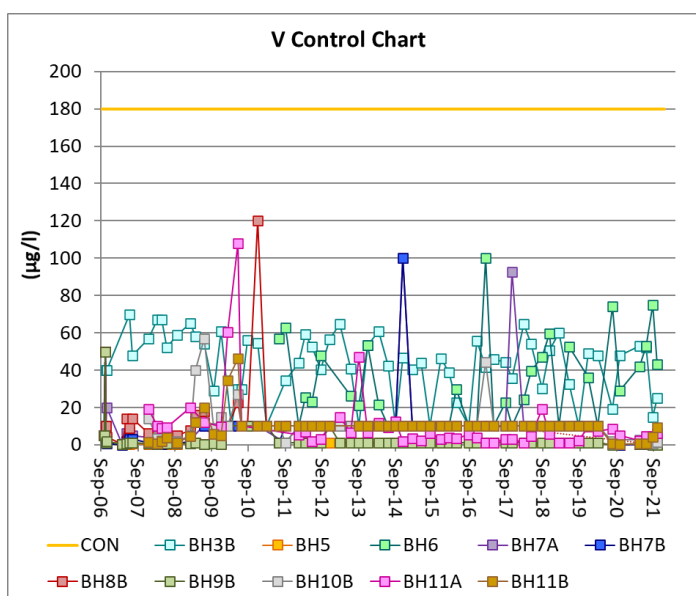
All results within both the Control Level & Compliance Limit over the last year. Although it is noted that levels are generally elevated across several locations.



In line with local EA agreement, this parameter has not been monitored in GW since 2018.



All results within both the Control Level & Compliance Limit over the last year. Although it is noted that levels are generally elevated across several locations.



All results within both the Control Level & Compliance Limit over the last year.

2.3. Surface Water Quality Review

Monitoring Objective

To carry out routine monitoring of surface water to;

- monitor the performance of the ash disposal site by measurement of absolute levels and concentrations and trends relative to relevant criteria including background concentrations and control levels; and;
- identify and quantify effects on surface water receptors.

Number and Location of Monitoring Points

A summary of the surface water monitoring points is provided in Table 3 below and the locations are shown in Appendix A.

Table 3: Summary of Surface water monitoring points

Monitoring Point	Description	Direction from site	Remarks
Eastern Perimeter Drain (EPD)	Western bank of drainage ditch	East	
Brackish Lagoon (BL)	Saline lagoon	South-east	Surface water Receptor
River Thaw (S3)	Eastern bank, tidal mudflats below rail bridge	North upgradient	Surface water Receptor
Group 5 Spring (S1)	Wetland area adjacent to spring within ash disposal site	West	
Mouth of River Thaw	At the mouth of the river as it meets the sea	South West	Surface water receptor (added after suggestion by HRA review 2018)

Monitoring Measurements

The surface water monitoring analytical suite contains a range of parameters which are monitored on a quarterly basis in accordance with the Environmental Permit. A trained RWE operative is responsible for the sampling of the surface water locations and an independent external laboratory is used for the analysis of the samples.

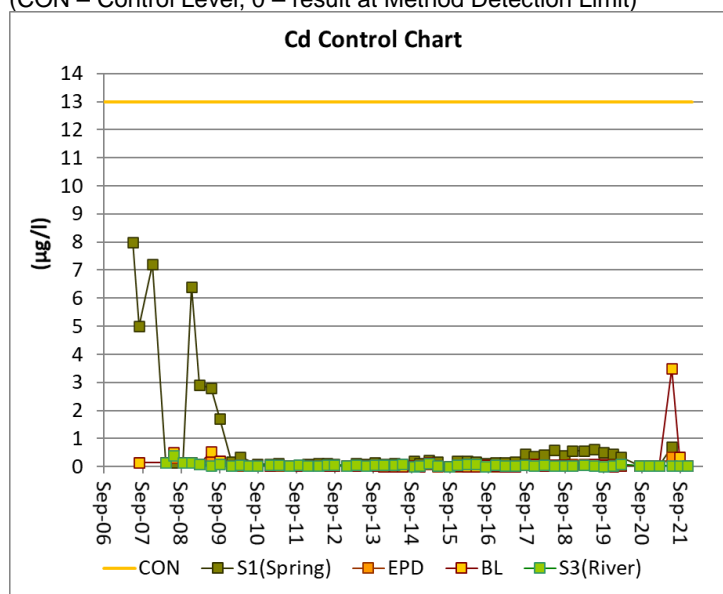
Figure 3 shows the surface water control charts for the associated monitoring points. It should be noted that the control levels apply to all surface water monitoring points and are identical to the respective groundwater control levels. An exceedance is defined as a result above the control level for 3 consecutive sampling events.

In 2021, there were no exceedances of the control level for any critical parameter except for a sporadic Aluminium & Ammonia result (please see below). The control charts show there are no increasing trends in critical parameter concentrations.

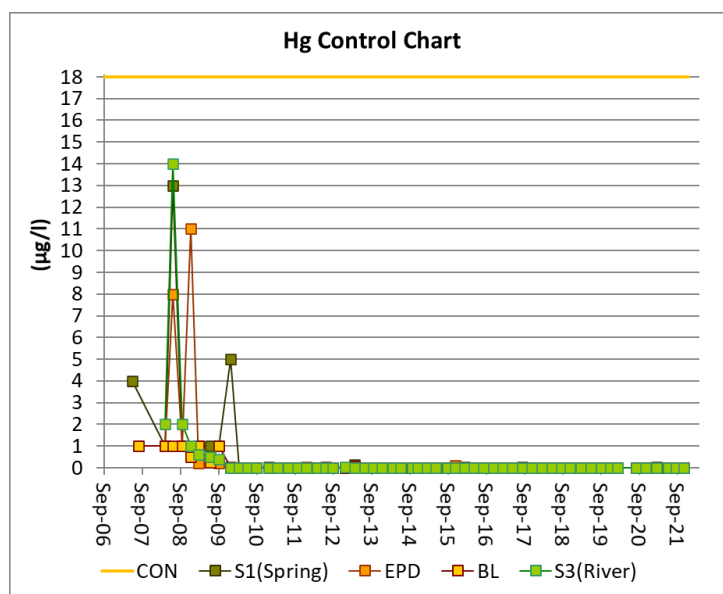
- Ammoniacal-nitrogen levels remain highly variable in Group 5 Spring (S1) with 1 elevated result recorded for Q1 2021.
- Group 5 Spring (S1) also displays the highest concentrations of other critical parameters, in particular boron, molybdenum, sulphate and vanadium, which does suggest that it is affected by water being in contact with PFA. However, it should be noted the spring discharges into a stagnant pond surrounded by wetland with water only lost by evapotranspiration or seepage. Therefore, the samples taken from the pond may not be representative of the spring discharge from the ash mound nor considered as a discharge from the ash disposal site.

Figure 3: Control charts for surface water monitoring points

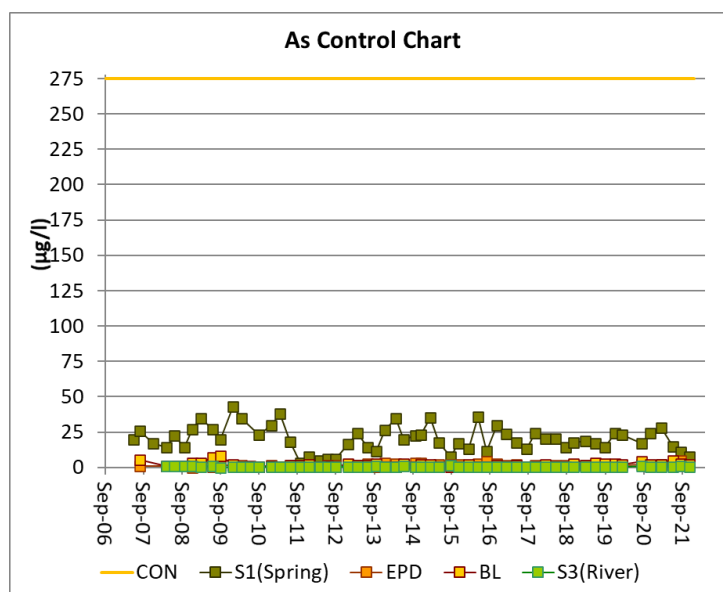
(CON – Control Level, 0 – result at Method Detection Limit)



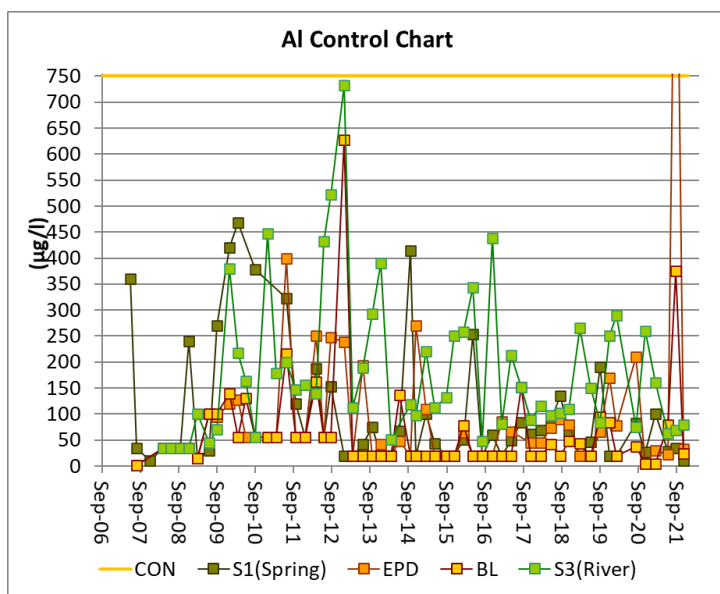
All results below the Control Level over the last year.



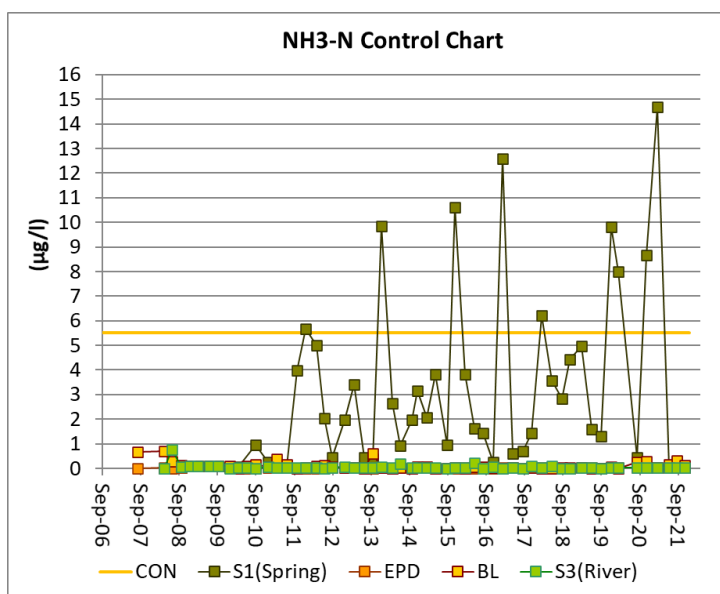
All results below the Control Level over the last year.



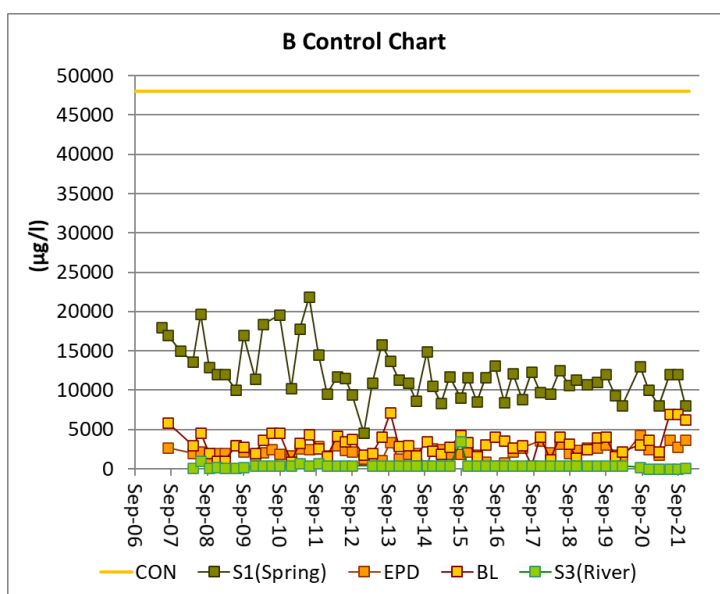
All results below the Control Level over the last year.



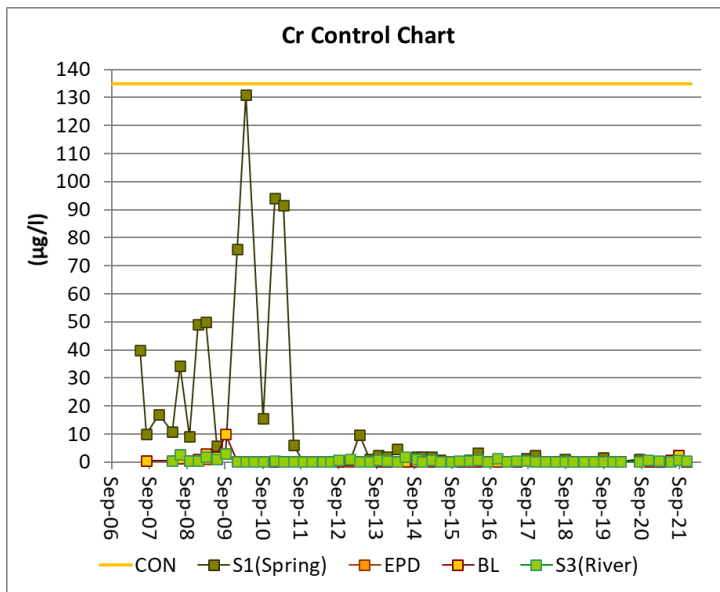
All results below the Control Level over the last year except for the September EPD sample which is considered spurious (result 1,300ug/l). The BL sample also appears elevated, however it should be noted that this is plotted as half MDL value (result <750ug/l)



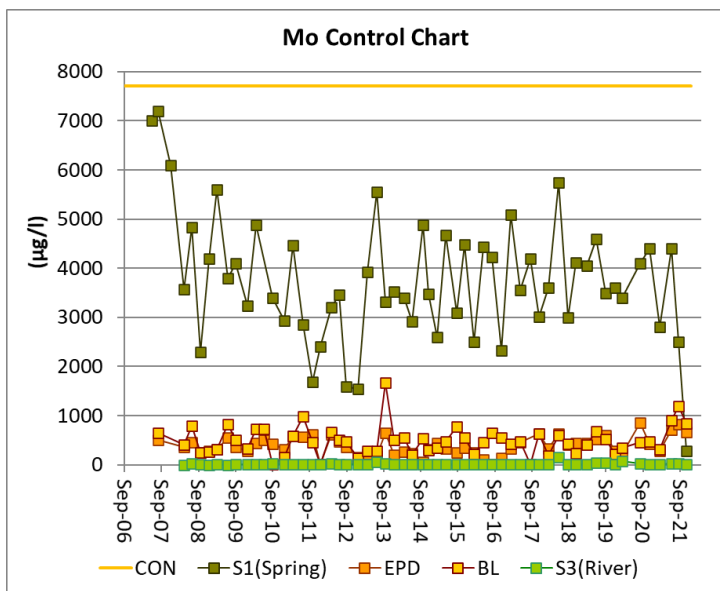
All results below the Control Level over the last year except for the S1 Sample which recorded 14.7ug/l in Feb-21.



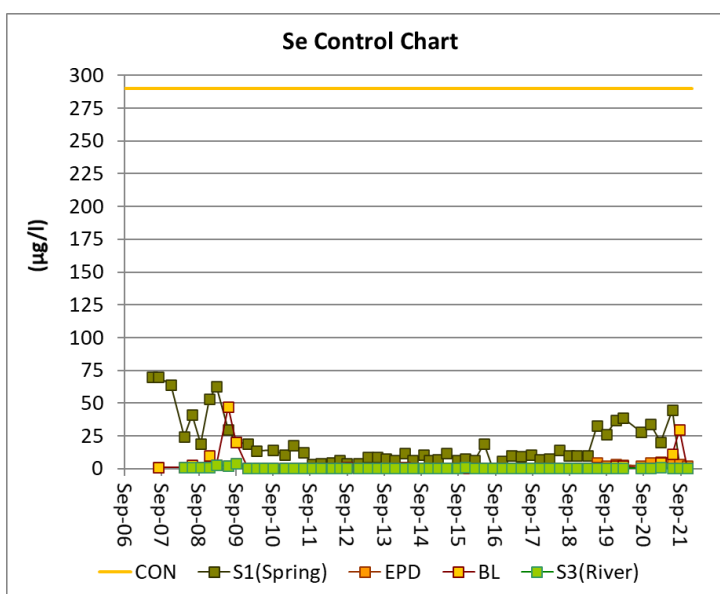
All results below the Control Level over the last year although it is noted that levels are generally elevated for S1.



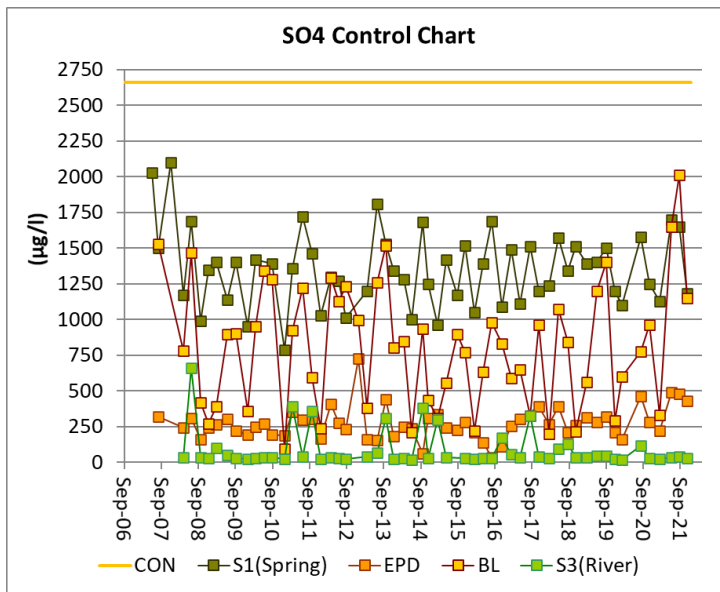
All results below the Control Level over the last year.



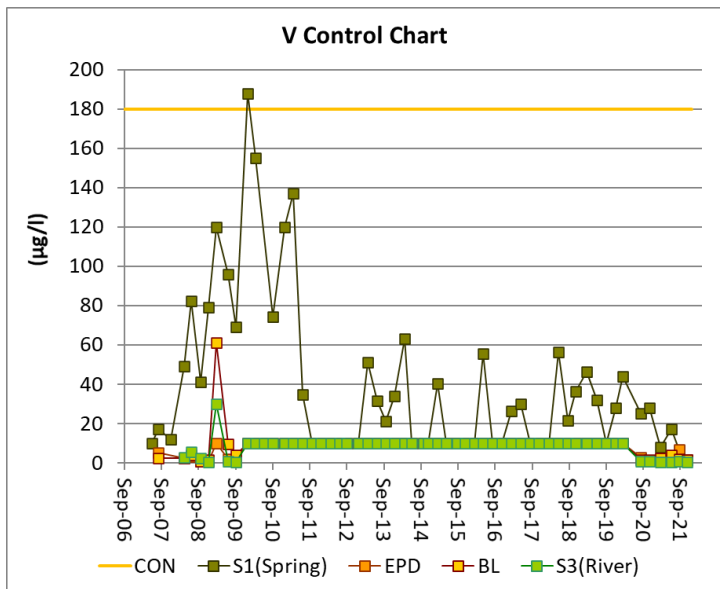
All results below the Control Level over the last year although it is noted that levels are generally elevated for S1.



All results below the Control Level over the last year.



All results below the Control Level over the last year although it is noted that levels are generally elevated for BL and S1.



All results below the Control Level over the last year.

3. Annual Production/Treatment Data 2021

Table 5: Annual Production/Treatment Data (Table S5.2 EP)

Parameter	Value	Unit
Surface water disposed off site	0	m ³ /yr
Groundwater disposed off site	0	m ³ /yr

4. Contamination/Decontamination of Site

There have been no incidents or emissions which may have caused any site contamination during 2021, and, therefore, no requirement to decontaminate the site during 2021.

5. Topographical Surveys

The last topographical survey to ordnance datum was carried out in March 2021 as part of the wider Aberthaw Power Station sale preparatory survey works. The drawings from this are attached in Appendix B.

6. Landfill Capacity

Aberthaw Ash Disposal Site historically reached its maximum permissible height and the only area used for depositing Pulverised Fuel Ash (PFA) over the last few operational years was the temporary 'short tip' storage area on the western side (utilised for ash sales). This was reprofiled as part of the main Aberthaw Power Station closure and decommissioning process during 2020. The WRA calculations and associated payment, associated with the restoration of the area, was made in early 2021. .

Table 6 below, represents the total reported to Natural Resource Wales via the Waste Return form route

Table 6: PFA Deposited

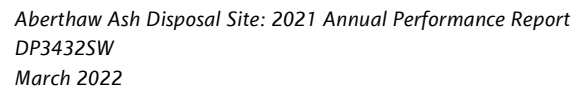
Reporting Period	PFA Deposited (tonnes)
1 st January – 31 st December 2021	8,044 tonnes (as estimated for Short Tip area restoration)

7. Waste Acceptance Compliance Testing

Aberthaw Ash Disposal Site is a mono-landfill site under the direct operational control of Aberthaw Power Station. All ash was transported directly from the Power Station to the Ash Disposal Site.

The exact composition of PFA was dependent upon the composition of the fuel utilised by the Power Station. RWE has well established procedures which control the quality of fuel supplied to its stations. Analytical data was obtained from leachate tests performed on composite samples of conditioned PFA from Aberthaw Power Station between 2012 and 2017. The CEN two-stage method for leachate analysis was used (BS EN 12457-3:2002 Characterisation of waste – Leaching – Compliance test for leaching of granular waste materials and sludges of which Part 3). A summary of this data can be seen in the historical annual performance reports for the site.

Page 18



Appendix B. 2021 As Mound Topographical Survey