HUNTER VALLEY OPERATIONS

Monthly Environmental Monitoring Report March 2022

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1 Introduction

This report has been compiled to provide a monthly summary of environmental monitoring results for Hunter Valley Operations (HVO). This report includes all monitoring data collected for the period 1st to 31st March 2022 (the 'Reporting Period').

2 Air Quality

2.1 Meteorological Monitoring

HVO maintains two meteorological stations: 'HVO Corporate' and 'Cheshunt' (refer to **Figure 4**).

2.1.1 Rainfall

Rainfall for the period is summarised in **Table 1**. The 2020, 2021 and 2022 trends are shown in **Figure 1**.

Table 1 - Rainfall data for the reporting period

2022	Monthly Rainfall (mm)	Cumulative Rainfall (mm)
March	256.2	385.2

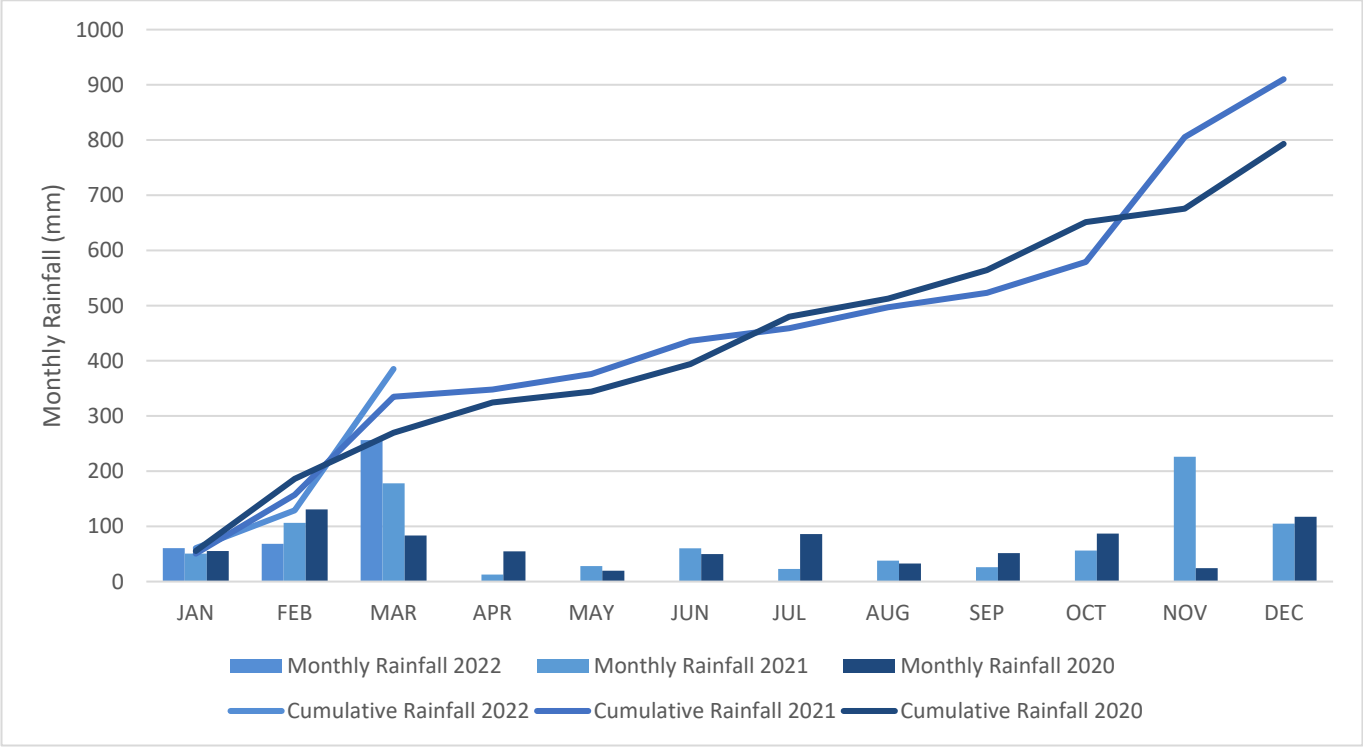


Figure 1 - Rainfall Summary 2022

2.1.2 Wind Speed and Direction

South easterly winds were prevailing during the reporting period as shown in **Figure 2** (HVO Corporate) and **Figure 3** (HVO Cheshunt).

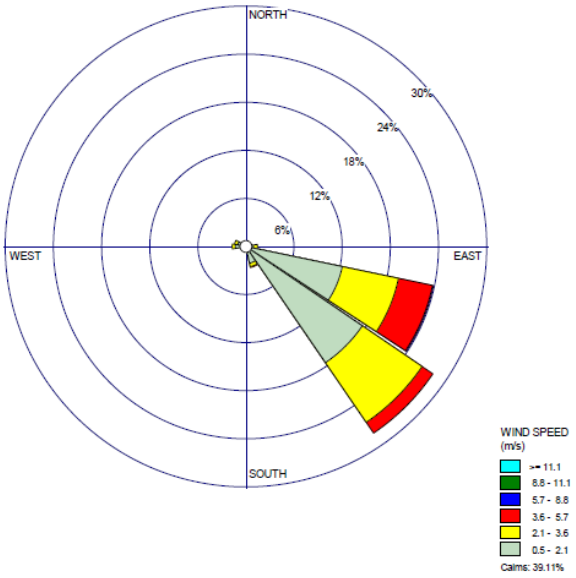


Figure 2 - HVO Corporate Wind Rose for the Reporting Period

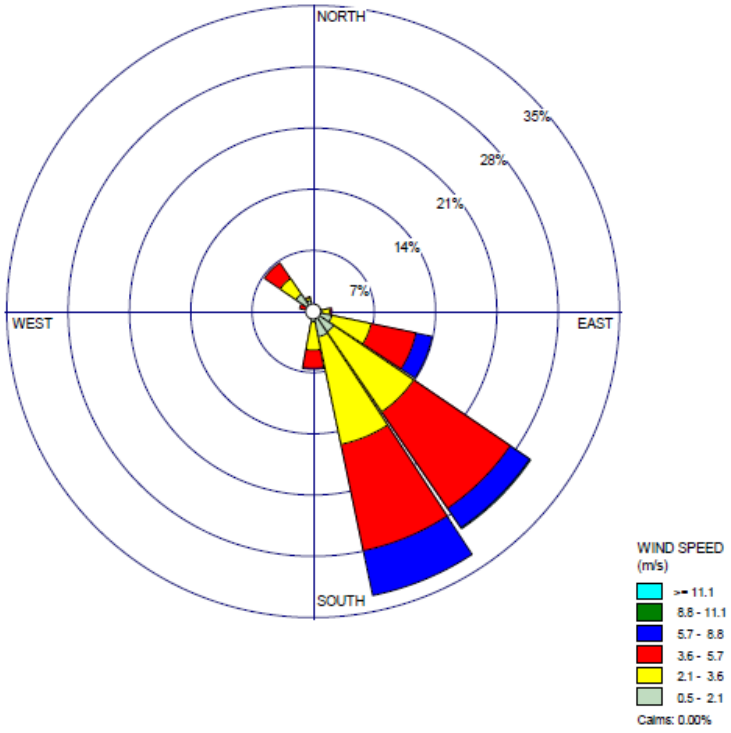


Figure 3 - HVO Cheshunt Wind Rose for the Reporting Period

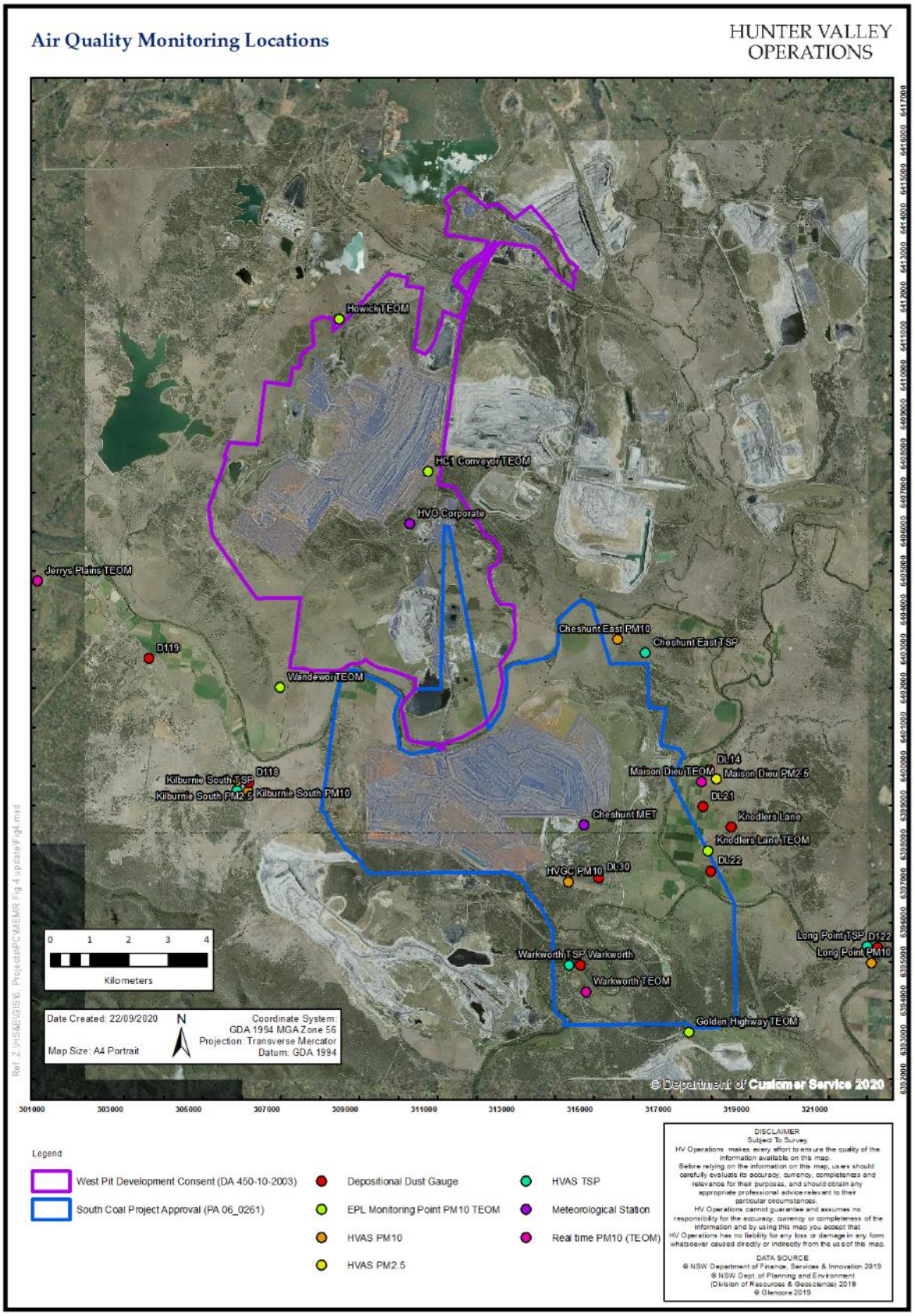


Figure 4 - Air Quality Monitoring Location Plan

2.2 Depositional Dust

HVO operates and maintains a network of nine depositional dust gauges situated on private and mine owned land surrounding HVO to monitor regional air quality.

Figure 5 displays insoluble solids results from depositional dust gauges during the reporting period compared against the annual impact assessment criteria. Any monthly results deemed to be contaminated (due to presence of bird droppings, insects, etc.) are not displayed. An assessment of HVO's contribution against the long-term impact assessment criteria will be provided in the 2022 Annual Review.

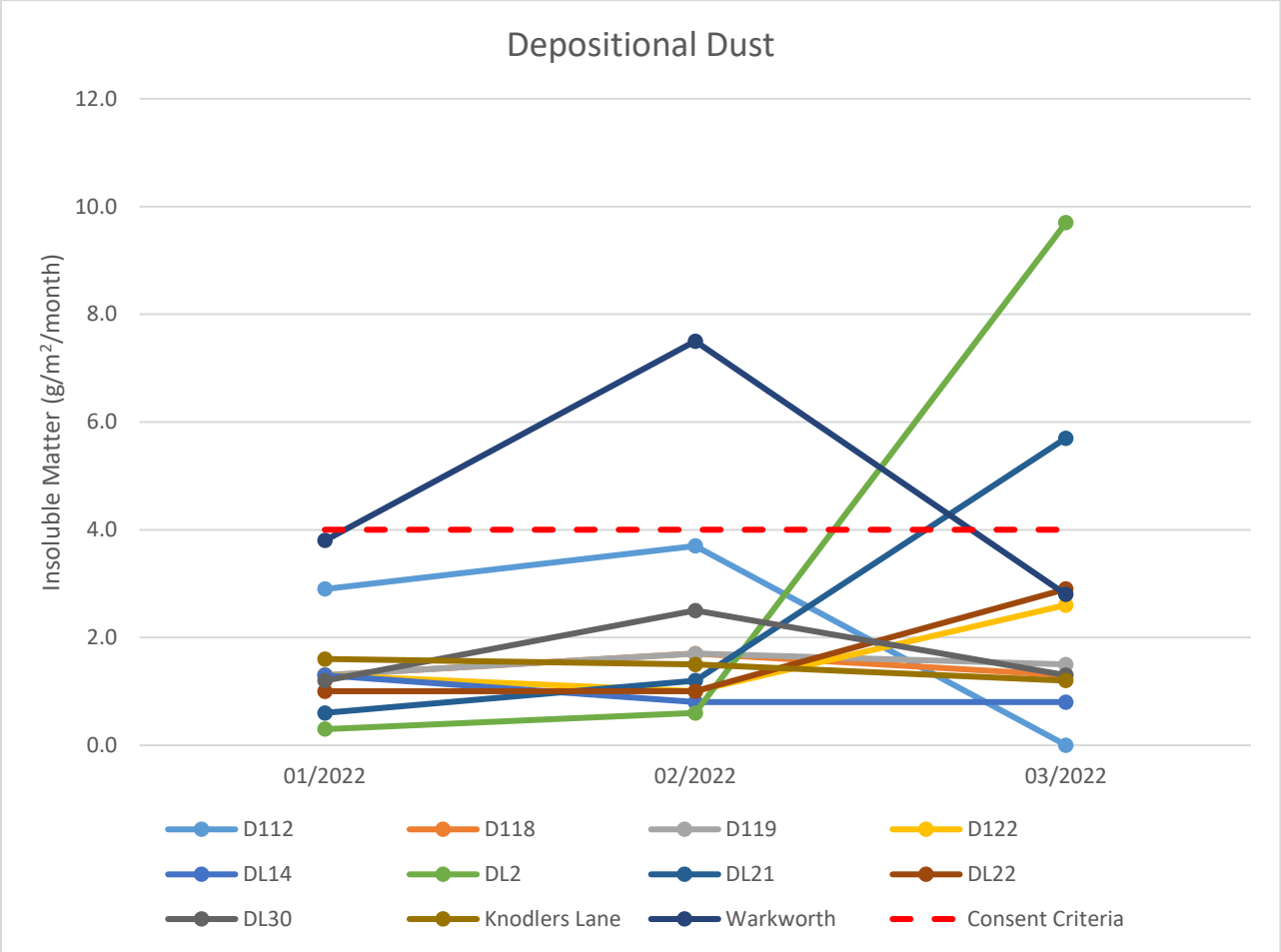


Figure 5 - Depositional Dust Results for the Reporting Period

2.3 Suspended Particles

Suspended particles are measured by a network of High Volume Air Samplers (HVAS) measuring Total Suspended Particulates (TSP) and Particulate Matter <10µm (PM_{10}). The Kilburnie South and Maison Dieu HVAS also monitor Particulate Matter <2.5µm ($PM_{2.5}$). The location of these monitors can be seen in **Figure 4**. Each HVAS runs for 24-hours on a six-day cycle.

2.3.1 HVAS PM_{10} Results

2.3.1.1 Performance against short term impact assessment criteria

Figure 6 shows individual PM_{10} results at each monitoring station against the short-term impact assessment criteria of 50µg/m^3. No exceedances were recorded.

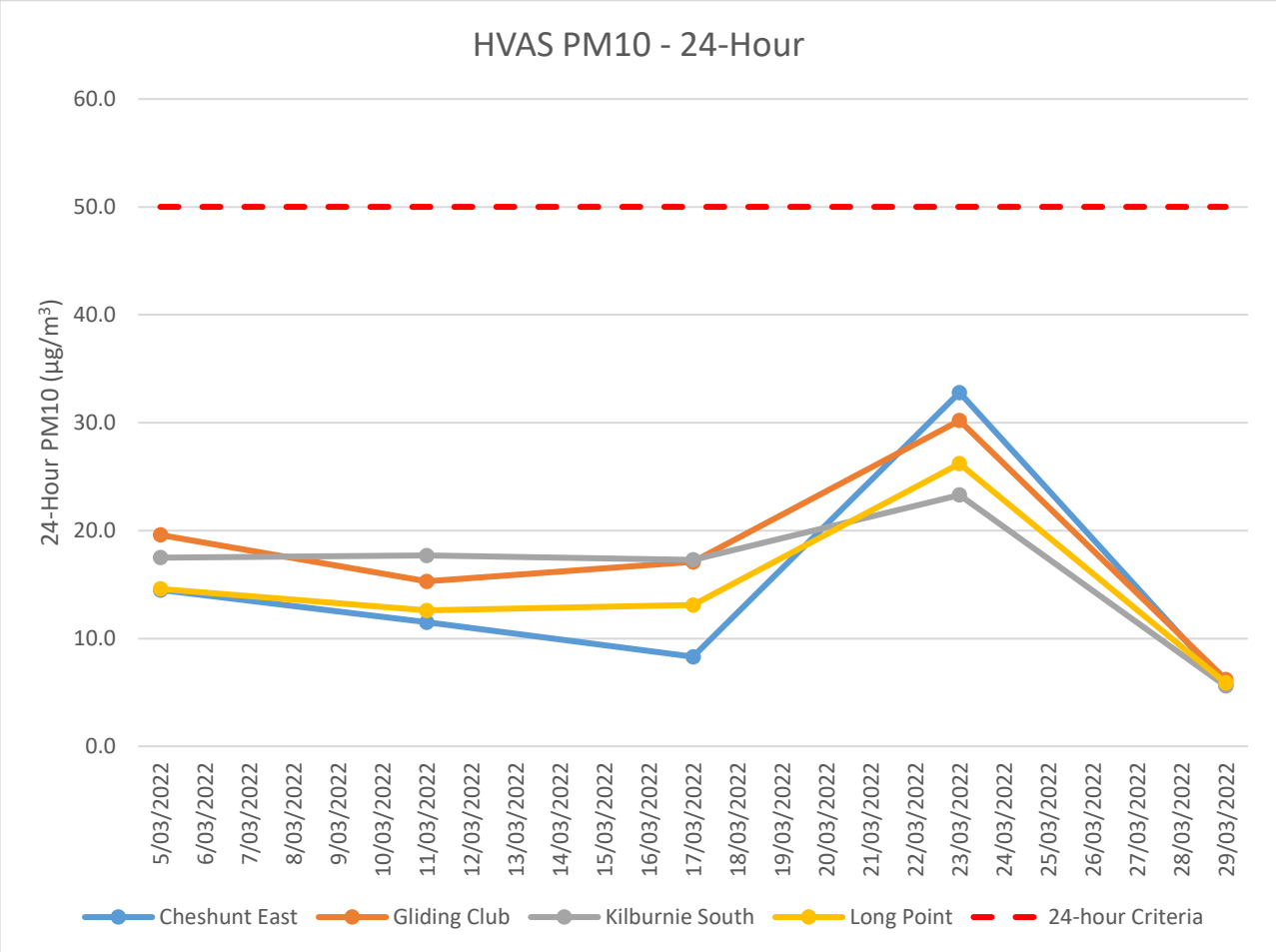


Figure 6 - Individual PM_{10} Results for the Reporting Period

2.3.1.2 Performance against long term impact assessment criteria

Figure 7 shows the year to date annual average PM_{10} results. All monitors were below the relevant long term impact assessment criteria during the reporting period. An assessment of HVO's contribution against the long-term impact assessment criteria will be provided in the 2022 Annual Review.

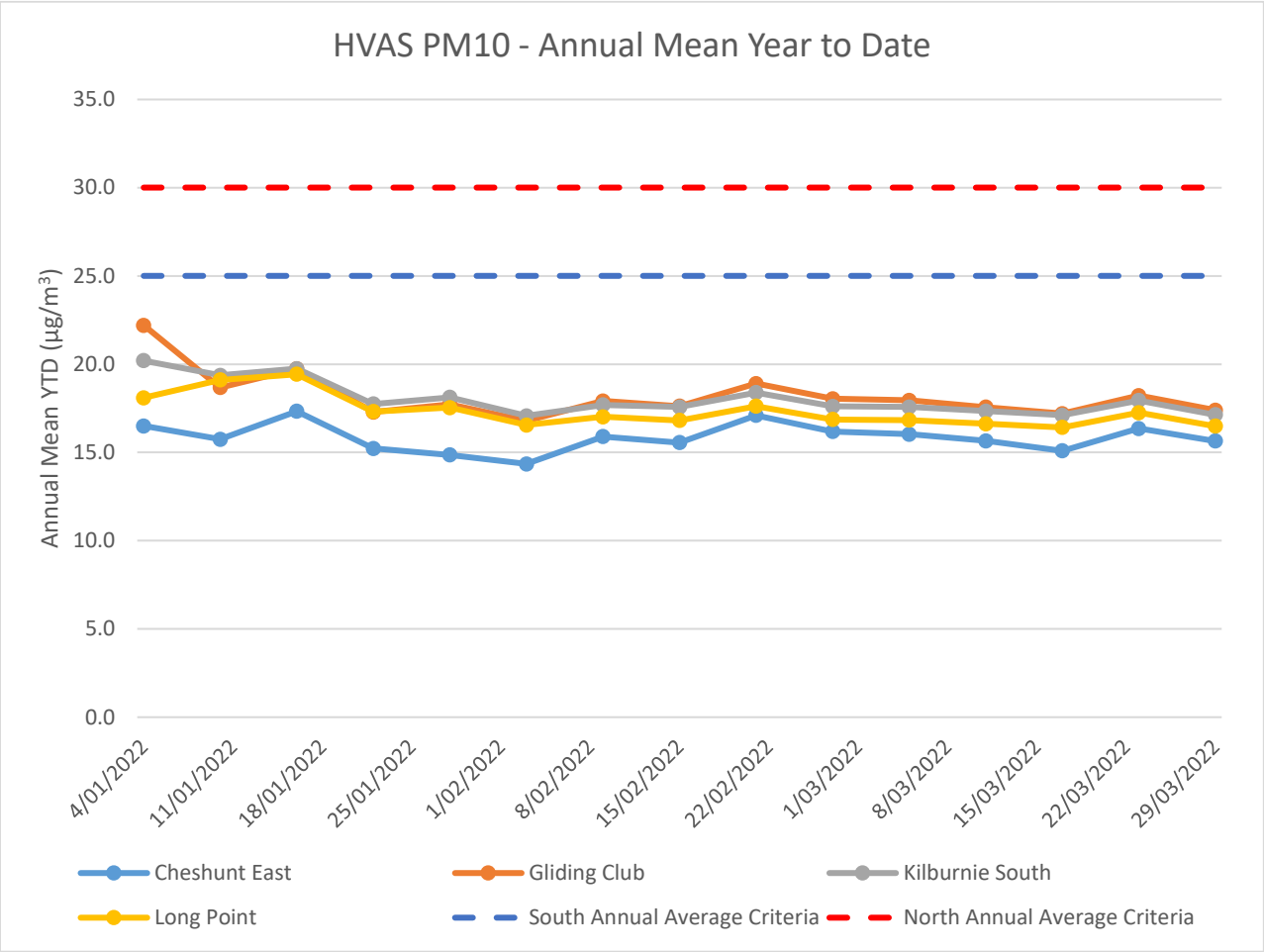


Figure 7 - Year to Date Average PM_{10} as at end of the Reporting Period

2.3.2 HVAS $PM_{2.5}$ Results

HVO monitors $PM_{2.5}$ at two HVAS locations, Kilburnie South and Maison Dieu.

2.3.2.1 Performance against short term impact assessment criteria

Figure 8 shows individual $PM_{2.5}$ results at each monitoring station against the HVO South short-term impact assessment criteria of 25µg/m^3.

All monitors were below the relevant short-term impact assessment criteria during the reporting period.

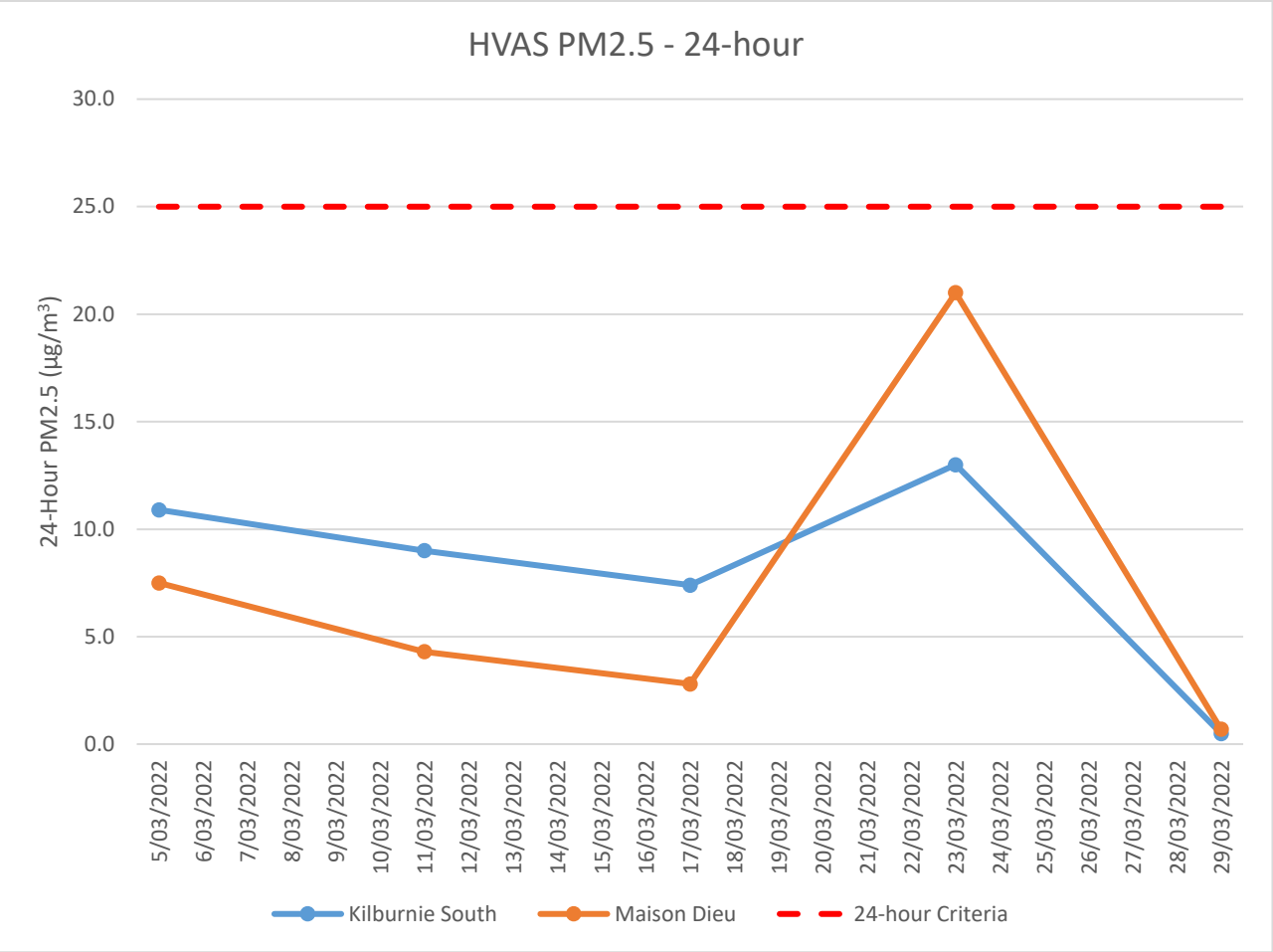


Figure 8 - Individual $PM_{2.5}$ Results for the Reporting Period

2.3.2.2 Performance against long term impact assessment criteria

Figure 9 shows the year to date annual average $PM_{2.5}$ results. During the reporting period, the Maison Dieu monitor and Kilburnie South monitor annual average year to date was above the $PM_{2.5}$ Annual Rolling Mean criteria of 8µg/m^3.

An assessment of HVO's contribution against the long term impact assessment criteria will be provided in the 2022 Annual Review.

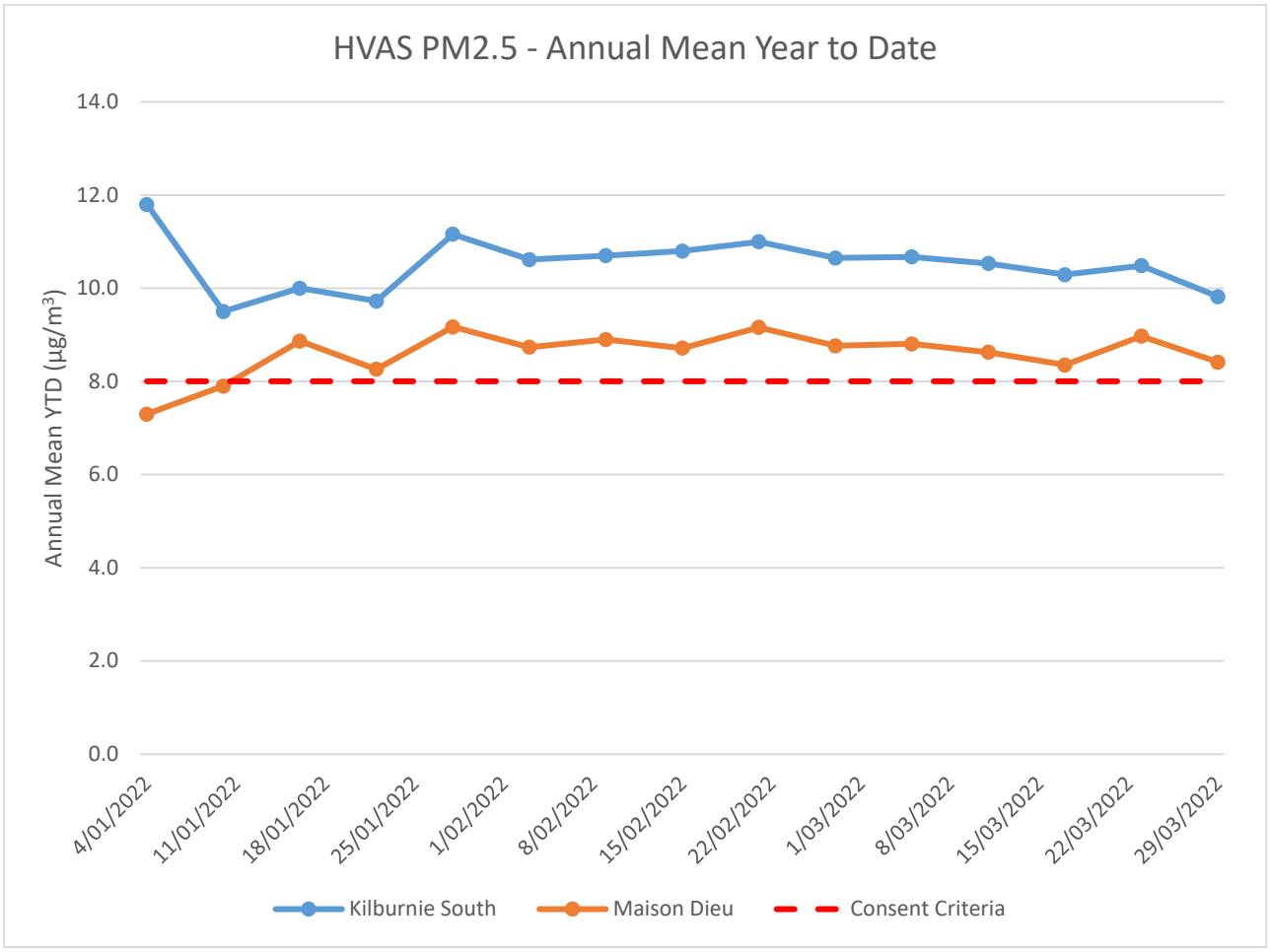


Figure 9 - Year to Date Average $PM_{2.5}$ as at end of the Reporting Period

2.3.3 TSP Results

2.3.3.1 Performance against long term impact assessment criteria

Figure 10 shows the annual average TSP results compared against the long-term impact assessment criteria of 90µg/m^3.

All monitors were below the relevant long-term impact assessment criteria during the reporting period*.

An assessment of HVO's contribution against the long-term impact assessment criteria will be provided in the 2022 Annual Review.

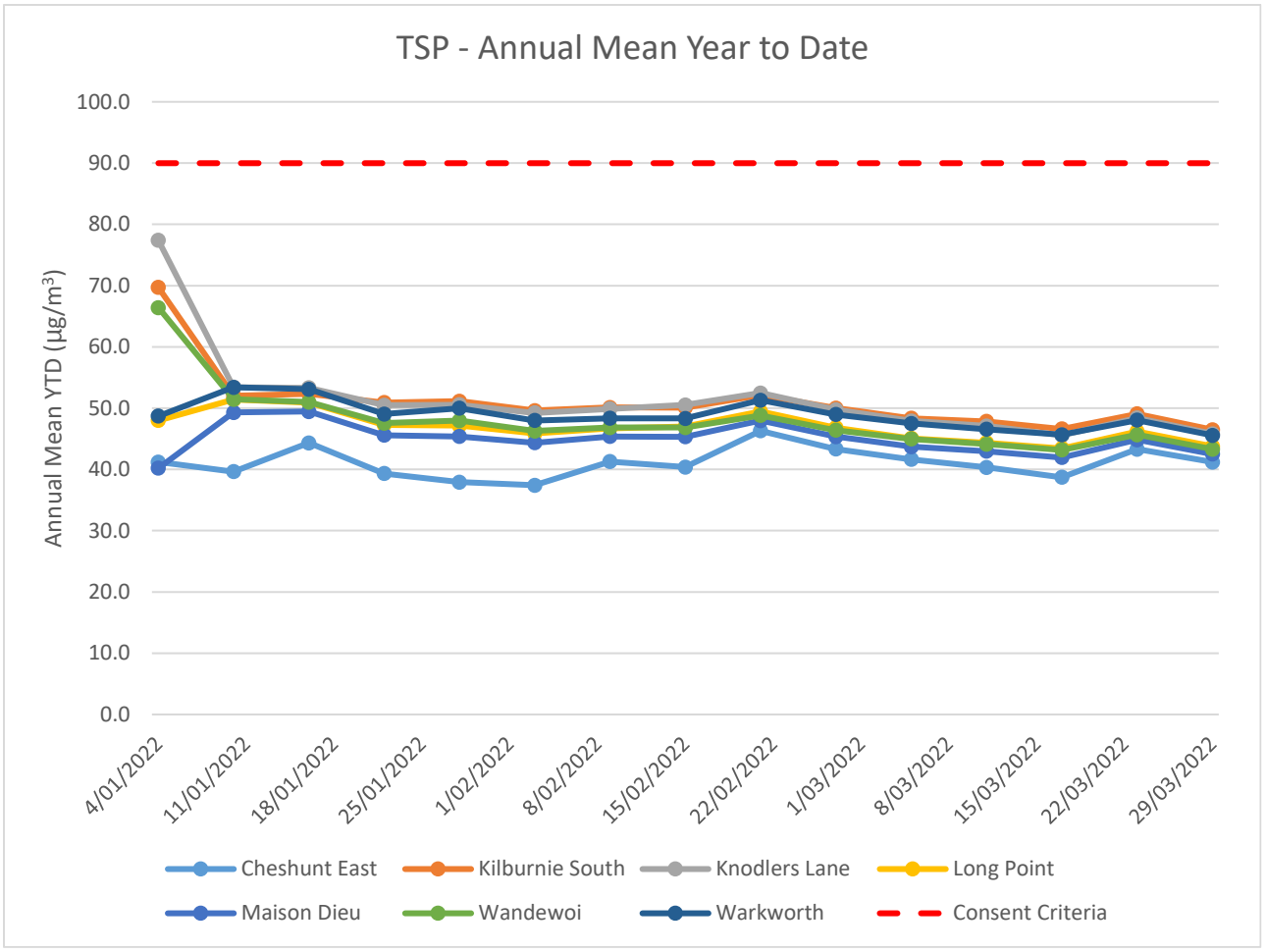


Figure 10 - Year to Date Average Total Suspended Particulates as at end of the Reporting Period

* Note that the Wandewoi TSP is located on HVO owned land

2.3.4 Real Time PM_{10} Results

HVO maintains a network of real time PM_{10} monitors. The real time air quality monitoring stations continuously record information and transmit data to a central database, generating alarms when particulate matter levels exceed internal trigger levels. Results from real time PM_{10} monitoring are used as a reactive measure to guide mining operations to help achieve compliance with the relevant conditions of the project approval.

Figure 11 shows the daily 24-hour average PM_{10} result from the real time monitoring sites which shows no exceedances reported for the period.

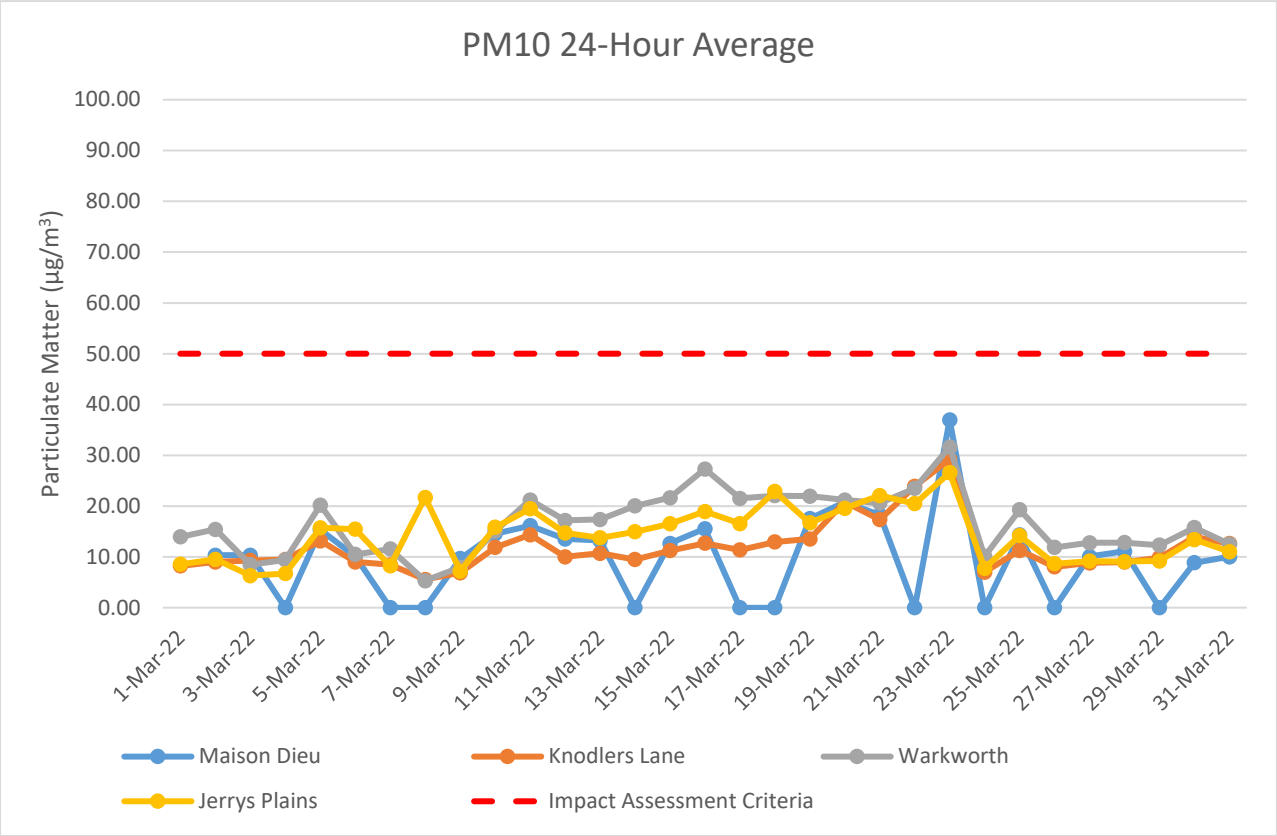


Figure 11 - Real Time PM_{10} 24hr for the Reporting Period

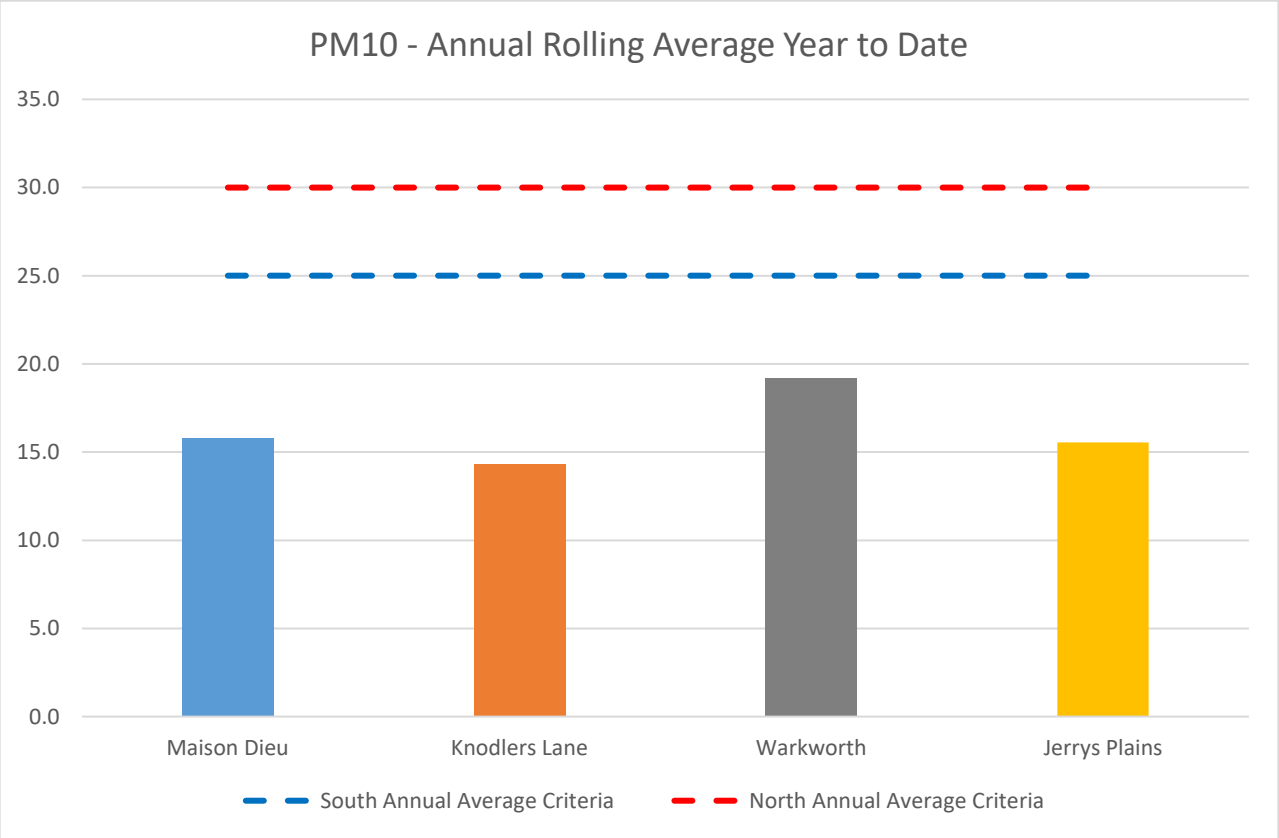


Figure 12 - Real Time PM_{10} Annual Average March 2022

2.3.5 Real Time Alarms for Air Quality

The real time monitoring system generated 28 automated air quality related alarms during the reporting period. 25 alarms related to adverse weather conditions and 3 alarms related to dust conditions.

3 Water Quality

HVO maintains a network of surface water and groundwater monitoring sites.

3.1 Surface Water

Surface watercourses are sampled on a quarterly sampling regime. Water quality is assessed through the parameters of pH, electrical conductivity (EC) and Total Suspended Solids (TSS). The location of surface water monitoring points across HVO are shown in **Figure 13**.

Results from monitoring on site dams, the Hunter River and other natural tributaries are provided in **Figure 14** to **Figure 25**

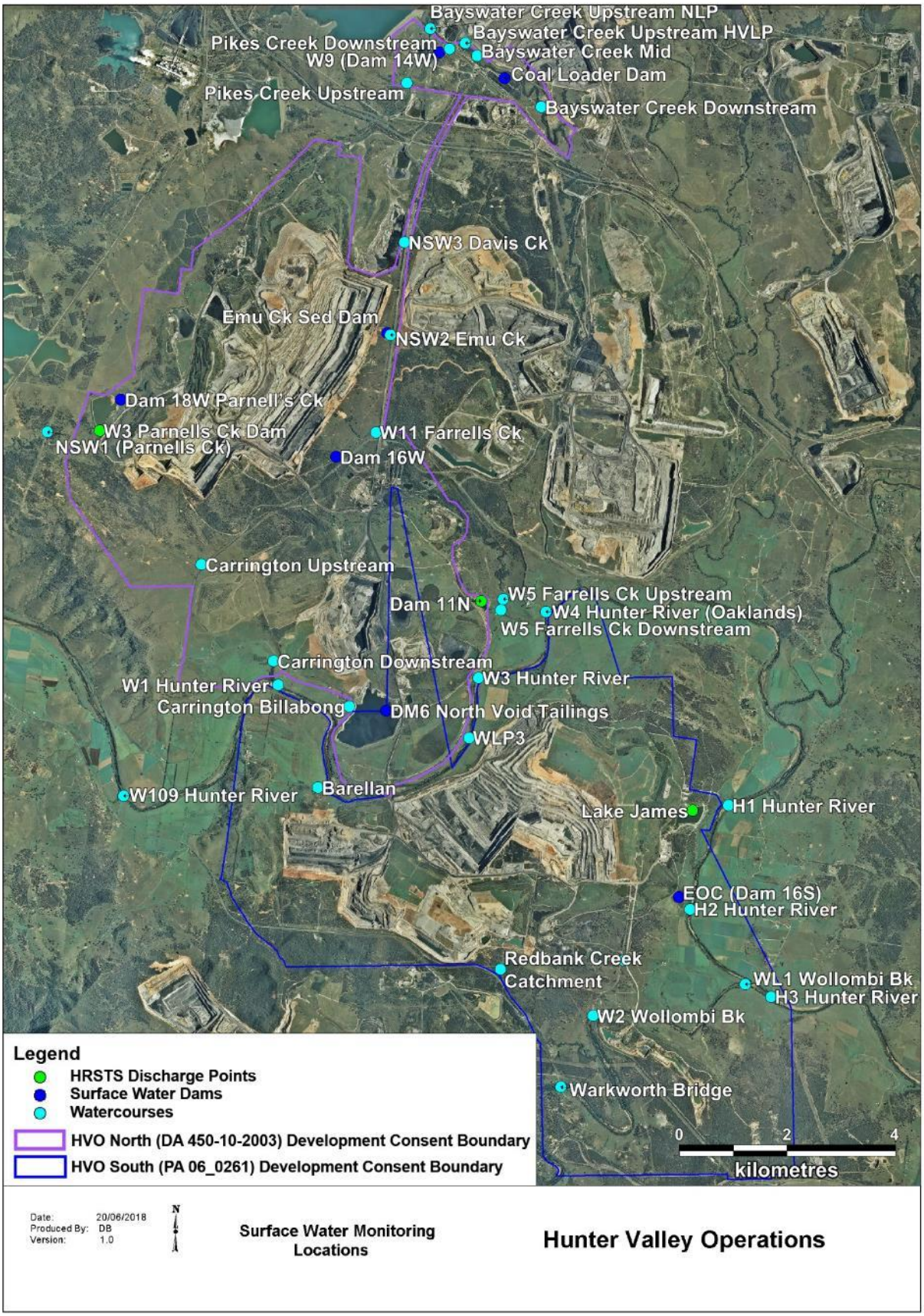


Figure 13 - HVO Surface Water Monitoring Locations

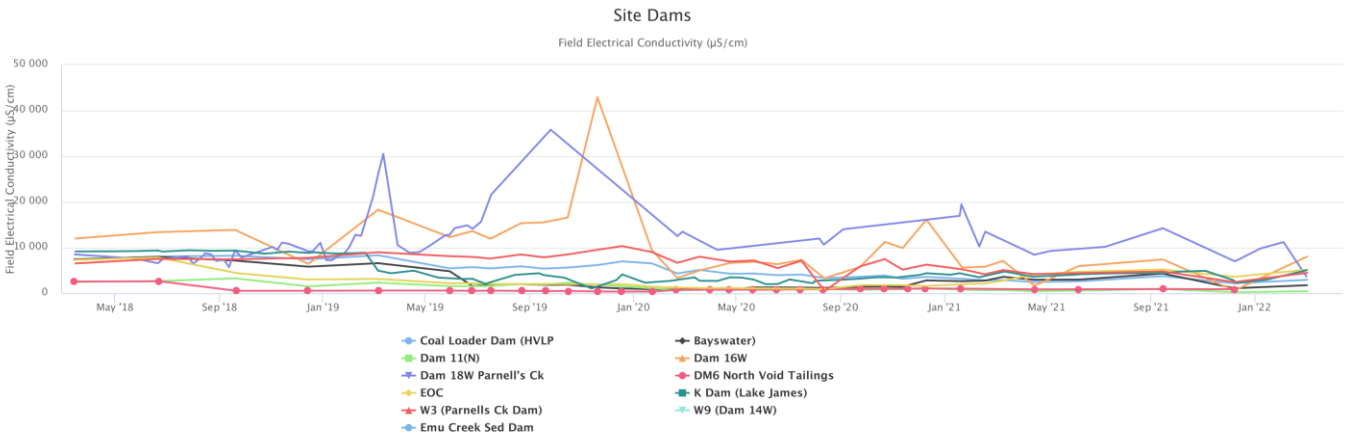


Figure 14 - Site Dams Electrical Conductivity – March 2022

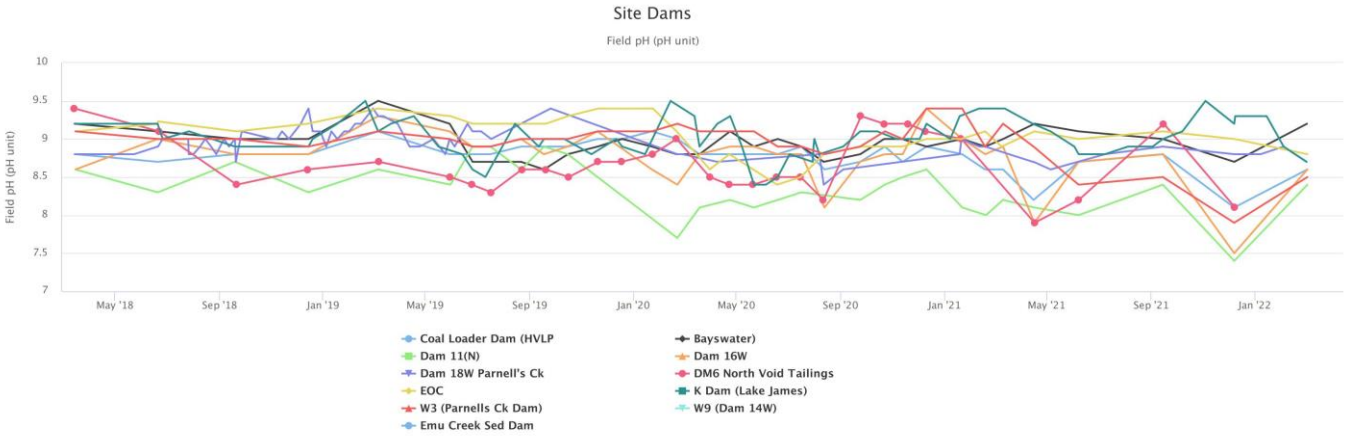


Figure 15 - Site Dams Field pH – March 2022

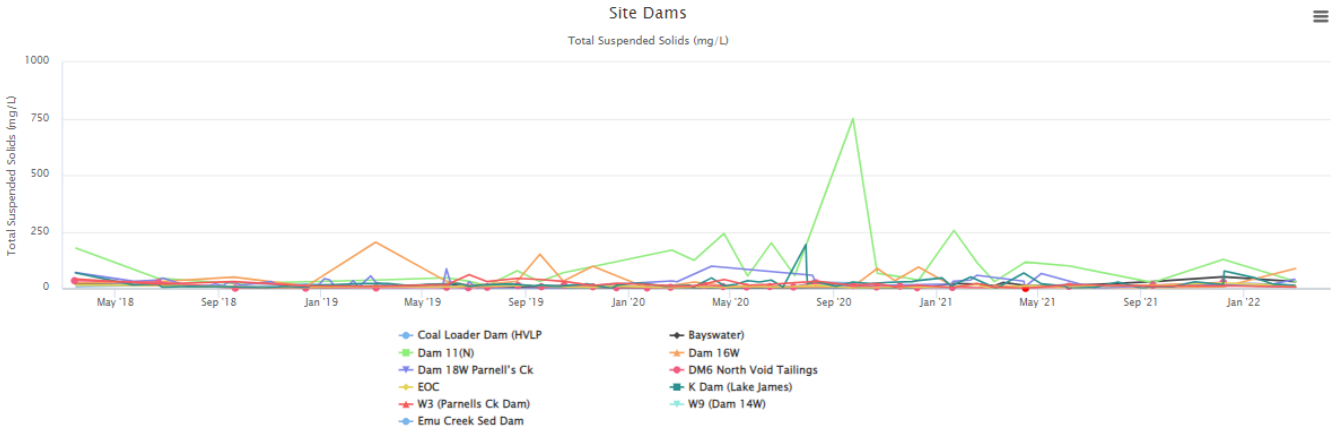


Figure 16 - Site Dams Total Suspended Solids - March 2022

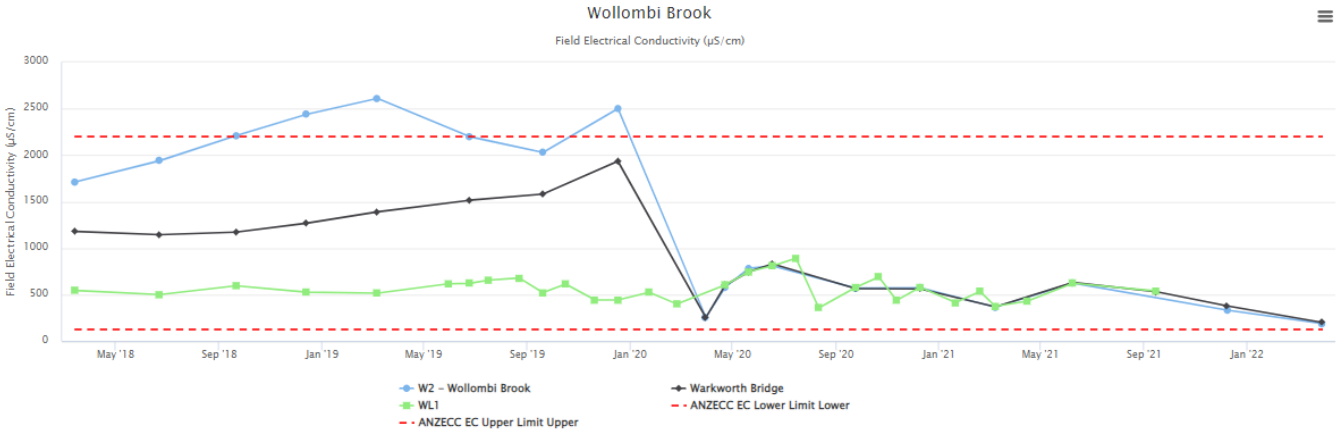


Figure 17 - Wollombi Brook Electrical Conductivity – March 2022

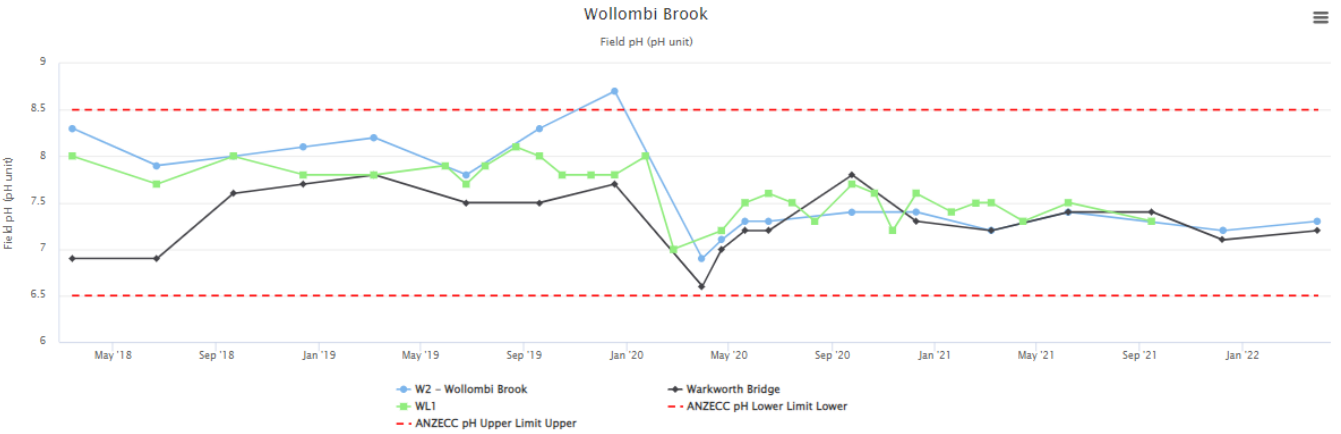


Figure 18 - Wollombi Brook Field pH – March 2022

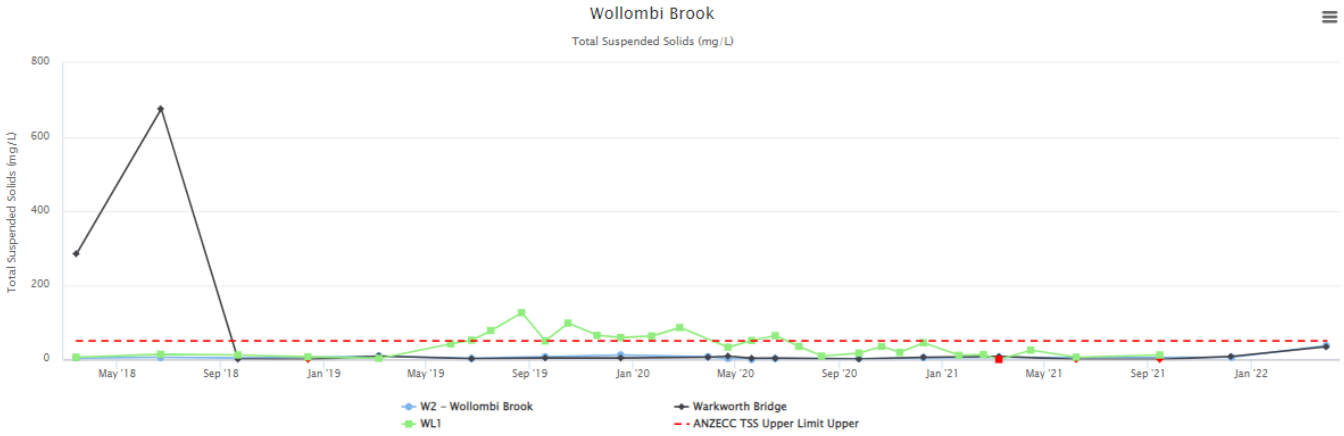


Figure 19 - Wollombi Brook Total Suspended Solids – March 2022

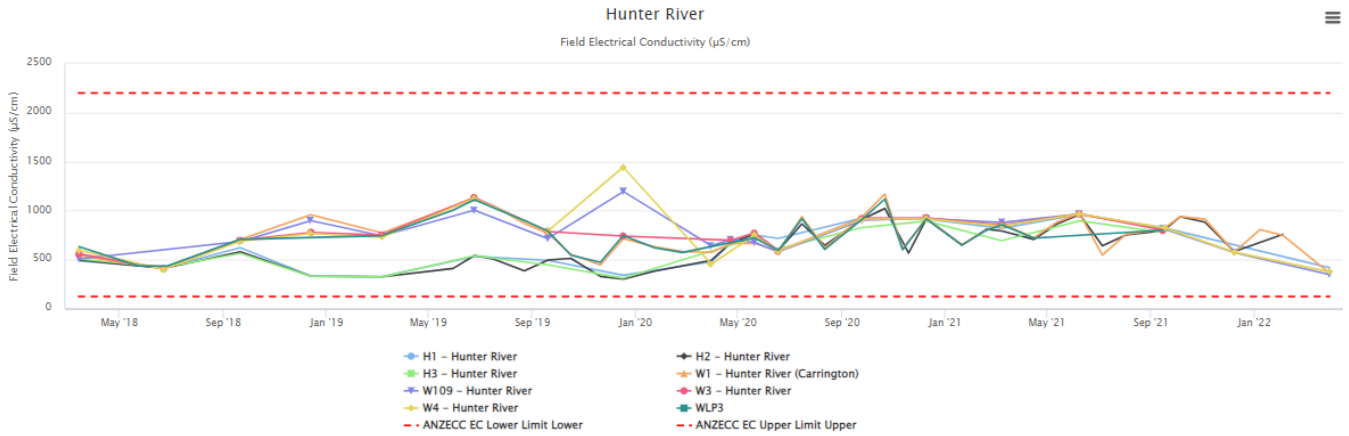


Figure 20 - Hunter River Electrical Conductivity - March 2022

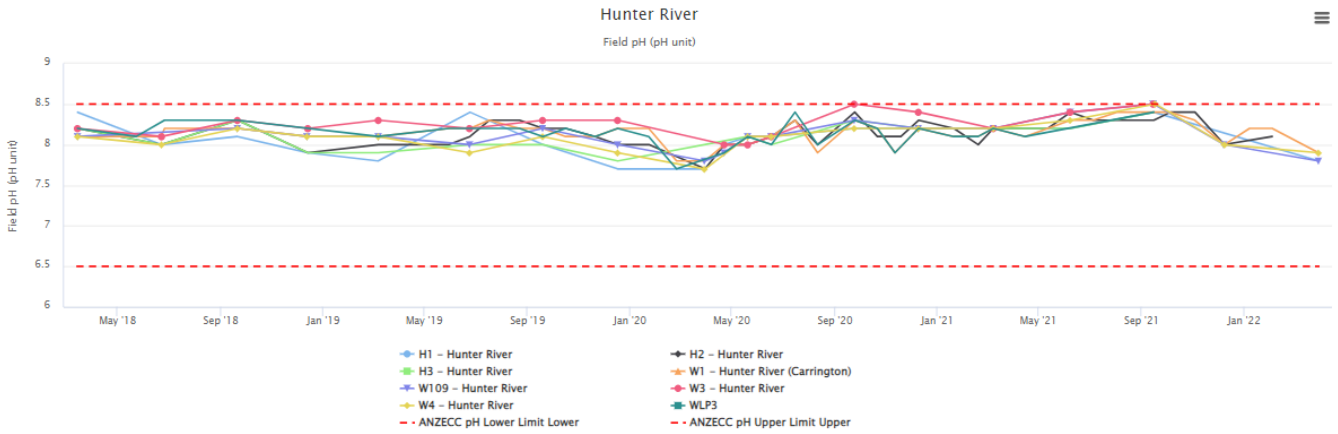


Figure 21 - Hunter River Field pH – March 2022

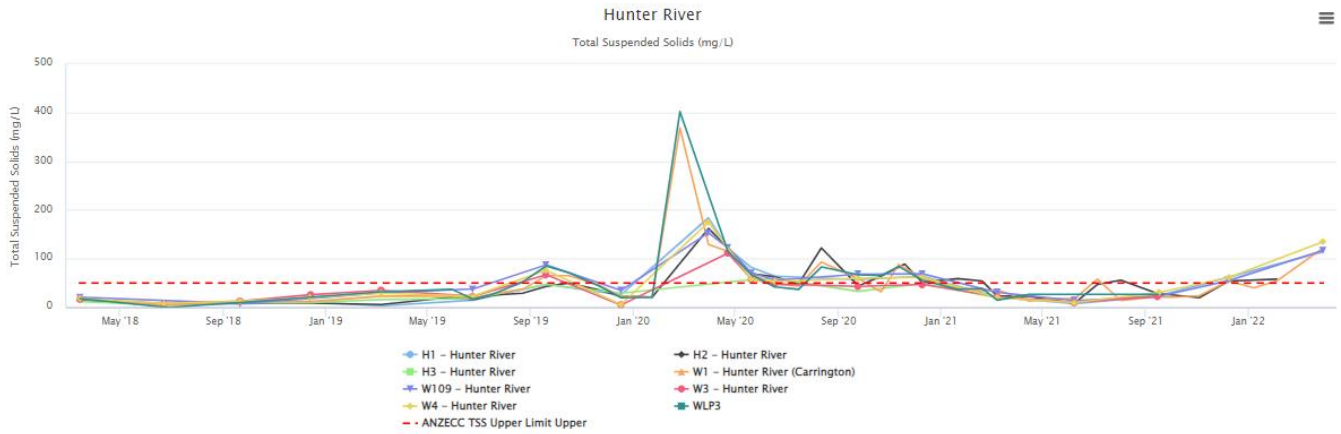


Figure 22 - Hunter River Total Suspended Solids - March 2022

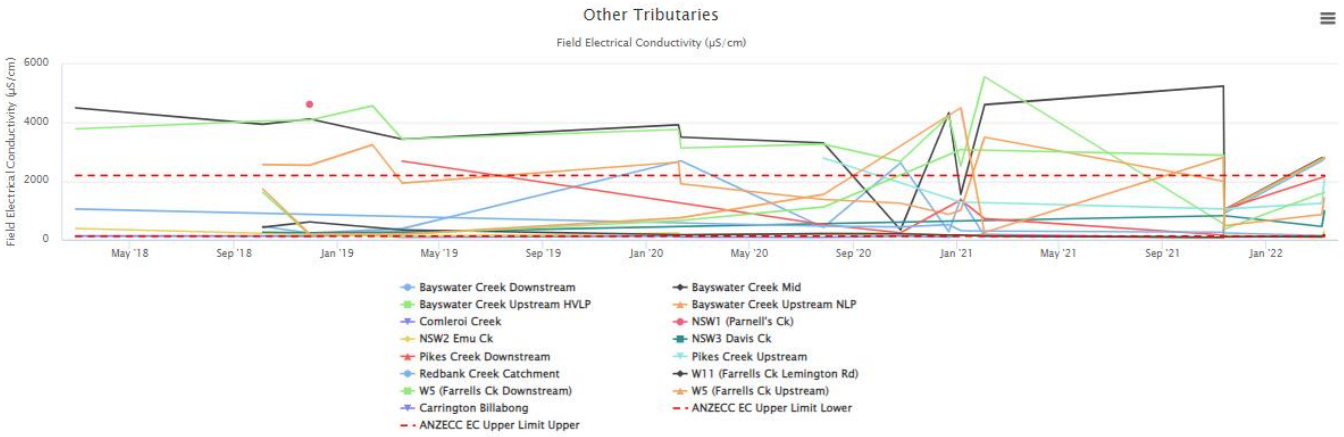


Figure 23 - Other Tributaries Electrical Conductivity - March 2022

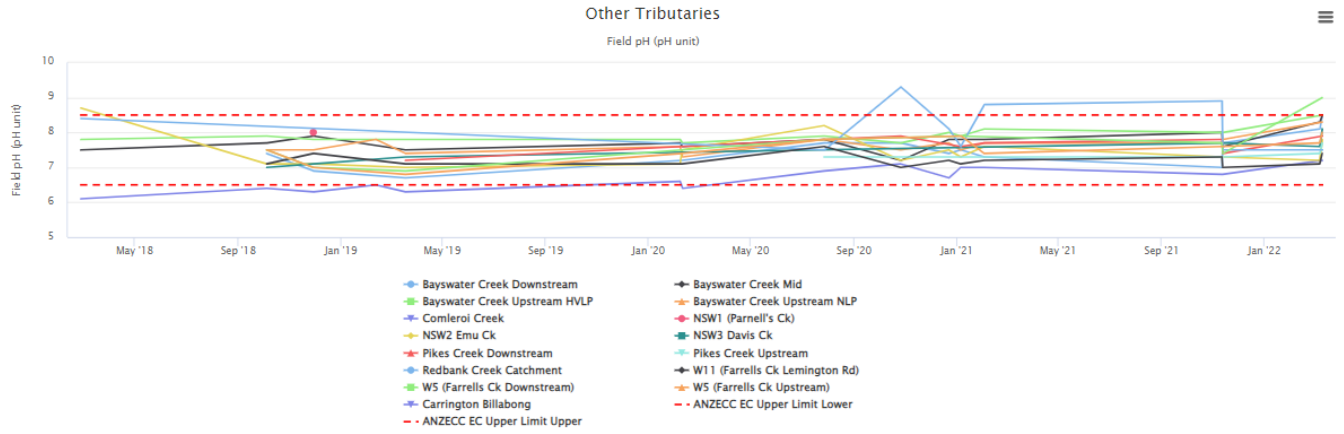


Figure 24 - Other Tributaries Field pH - March 2022

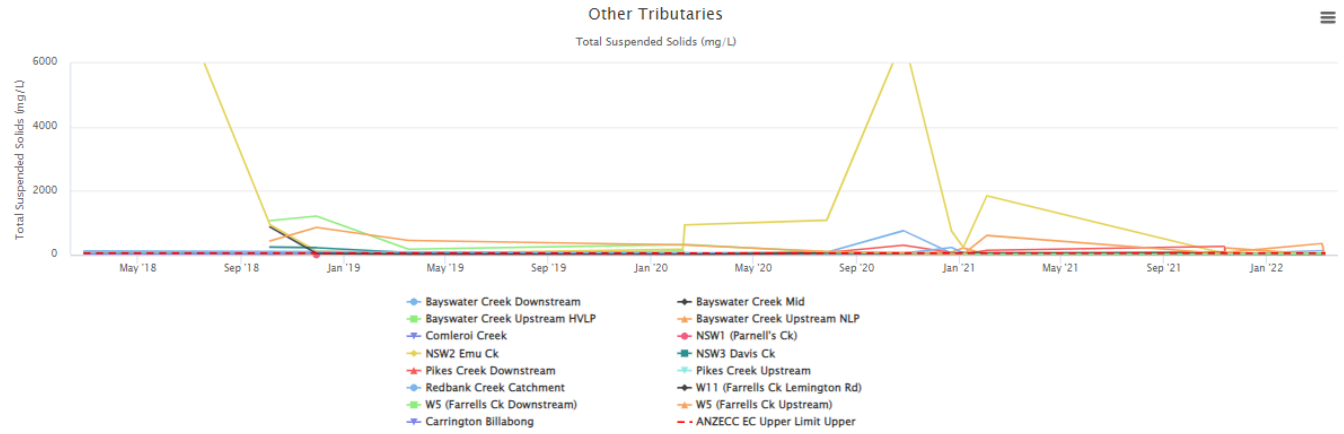


Figure 25 - Other Tributaries Total Suspended Solids - March 2022

3.1.1 Surface Water Trigger Tracking

Internal trigger limits have been developed to assess monitoring data on an on-going basis and to highlight potentially adverse surface water impacts. The process for evaluating monitoring results against the internal triggers and subsequent responses are outlined in the HVO Water Management Plan.

Surface water trigger tracking results are summarised in **Table 2** .

Table 2 - Surface Water Trigger Tracking – Q1 2022

Site	Date	Trigger Limit Breached	Response Action
H2 - Hunter River	3/02/2022	TSS	Investigation outcome: There is no evidence to indicate that the TSS exceedance is associated with a HVO mining impact. Action: Continue monitoring this location for further trigger exceedances.
W1 - Hunter River	3/02/2022	TSS	Investigation outcome: There is no evidence to indicate that the TSS exceedance is associated with a HVO mining impact. Action: Continue monitoring this location for further trigger exceedances.
W11 (Farrell's Creek Lemington Road)	7/03/2022	pH	First breach
Bayswater Creek Downstream	7/03/2022	pH	First breach
Bayswater Creek Downstream	10/03/2022	pH	Second breach
Bayswater Creek Downstream	7/03/2022	TSS	Investigation outcome: There were no spills from the HVLP dams in the sampling time period. Based on the field observations that indicated the sample was light brown in colour, this is more likely runoff from surface disturbance. Potential sources that may be causing higher TSS levels between mid and downstream sample locations are the rail corridor between Dam 32n and the stockpile and the MotoX track. Action: Undertake additional sampling to identify if the potential sources between mid and downstream sample locations that are causing the higher TSS levels during the next rainfall event.
Bayswater Creek Upstream HVLP	10/03/2022	pH	First breach
Bayswater Creek Mid	10/03/2022	pH	First breach
W109 - Hunter River	30/03/2022	TSS	Investigation outcome: W109 because is an upstream reference monitoring location that cannot be

			impacted by HVO mining activities, and the trigger exceedance is considered to be a consequence of high rainfall prior to sampling. Action: Continue monitoring this location for further trigger exceedances.
W1 - Hunter River	30/03/2022	TSS	Investigation outcome: There is no evidence to indicate that the TSS exceedance is associated with a HVO mining impact. Action: Continue monitoring this location for further trigger exceedances.
W4 - Hunter River	30/03/2022	TSS	Investigation outcome: There is no evidence to indicate that the TSS exceedance is associated with a HVO mining impact. Action: Continue monitoring this location for further trigger exceedances.
H1 - Hunter River	30/03/2022	TSS	Investigation outcome: There is no evidence to indicate that the TSS exceedance is associated with a HVO mining impact. Action: Continue monitoring this location for further trigger exceedances.
H1 - Hunter River	30/03/2022	pH	First breach
W1- Hunter River (Carrington)	30/03/2022	pH	First breach
W109 - Hunter River	30/03/2022	pH	First breach
W4 - Hunter River	30/03/2022	pH	First breach

3.2 Site Water Use

HVO is permitted to extract water from the Hunter River under water allocation licenses issued by Water NSW.

HVO did not extract water from the Hunter River during the reporting period.

3.3 HRSTS Discharge

HVO participates in the Hunter River Salinity Trading Scheme (HRSTS), allowing discharge from licensed discharge points Dam 11N (to Farrell's Creek), Lake James (to the Hunter River) and Parnell's Dam (to Parnell's Creek). Discharges can only take place subject to HRSTS regulations.

HVO discharged 973ML under the HRSTS during the reporting period.

3.4 Groundwater Monitoring Results

Groundwater monitoring is undertaken on a quarterly basis in accordance with the HVO Water Management Plan and Groundwater Monitoring Program. The location of groundwater monitoring points across HVO are show in **Figure 26.**

Groundwater monitoring results are provided in **Figure 27** to **Figure 77**

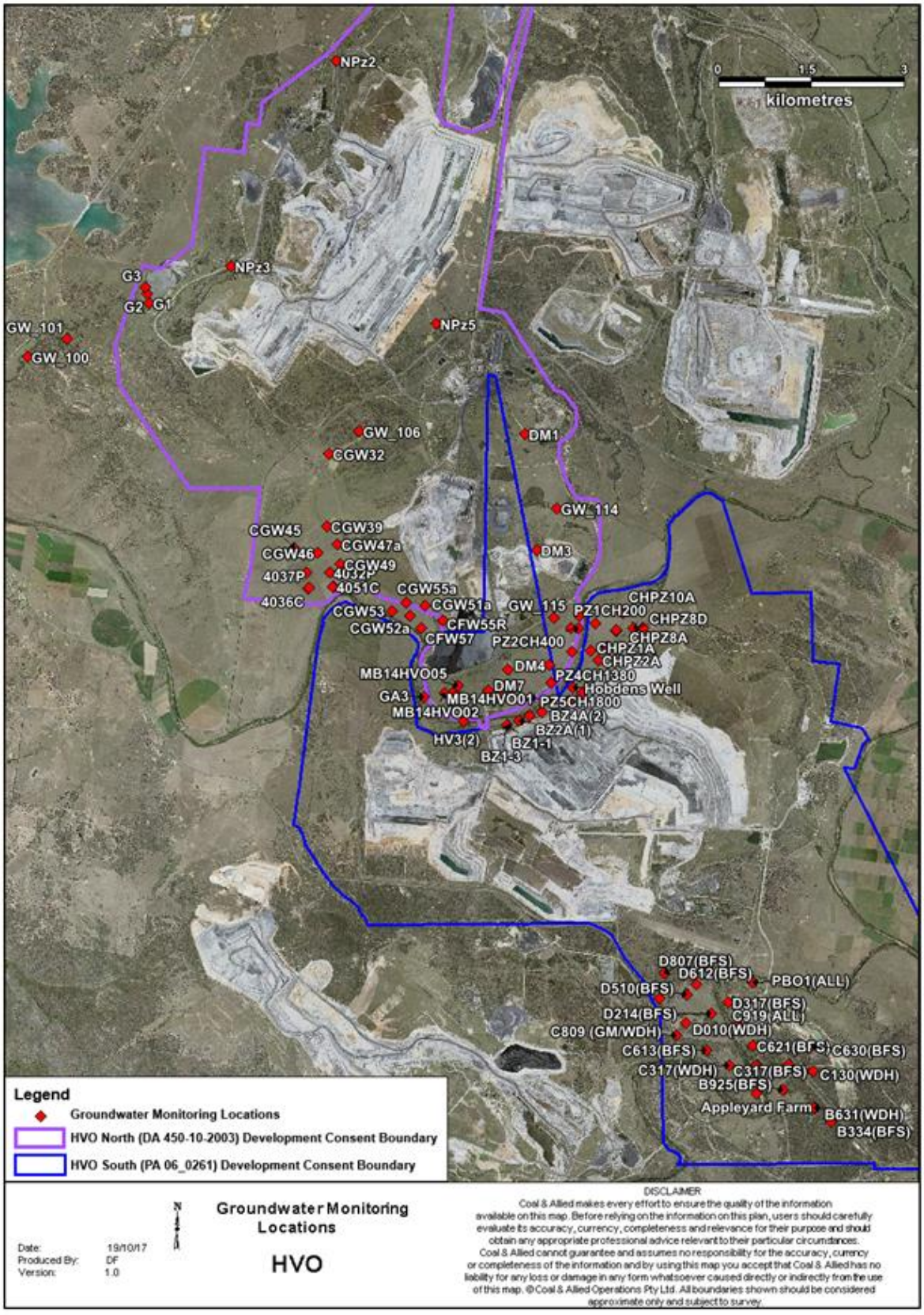


Figure 26 Groundwater monitoring Locations at HVO

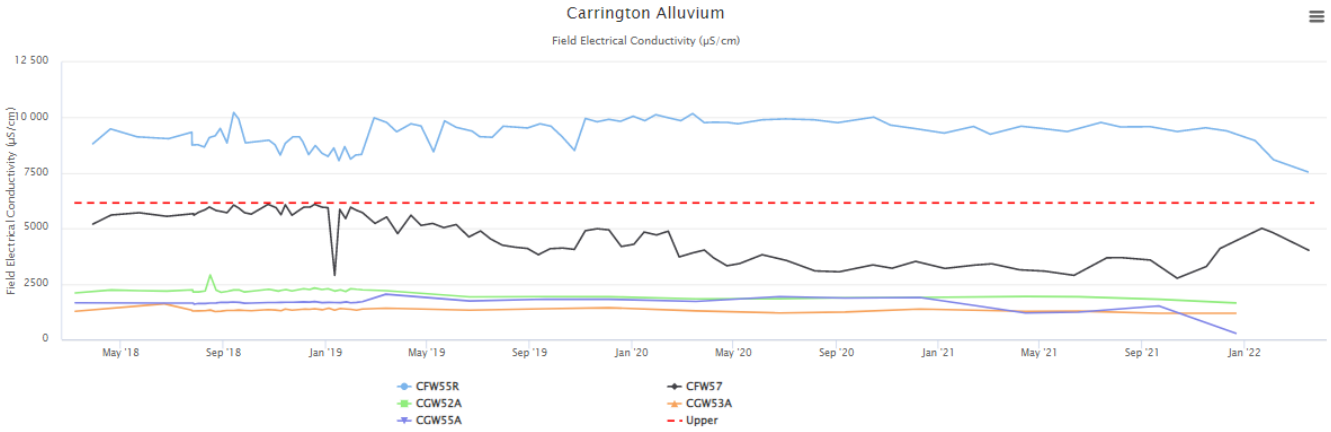


Figure 27 - Carrington Alluvium Electrical Conductivity Trend – Q1 2022

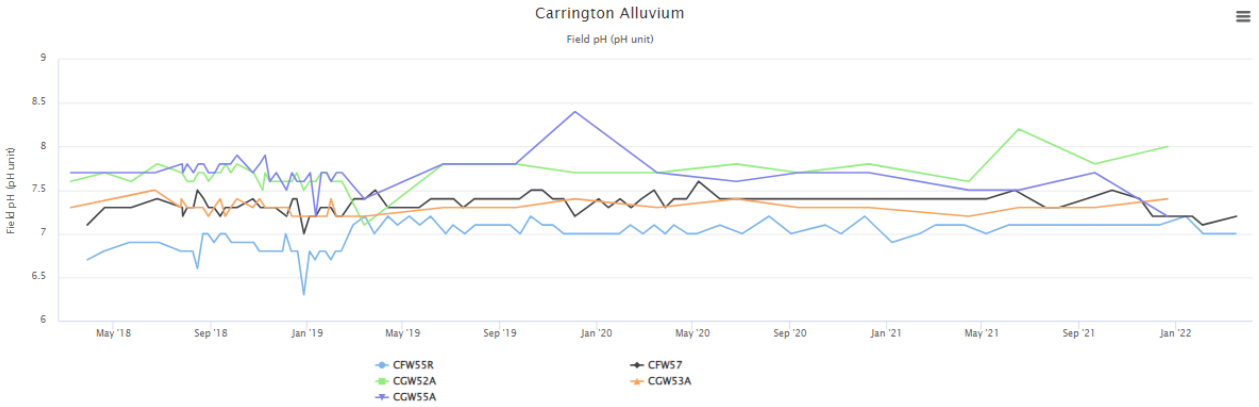


Figure 28 - Carrington Alluvium Field pH Trend – Q1 2022

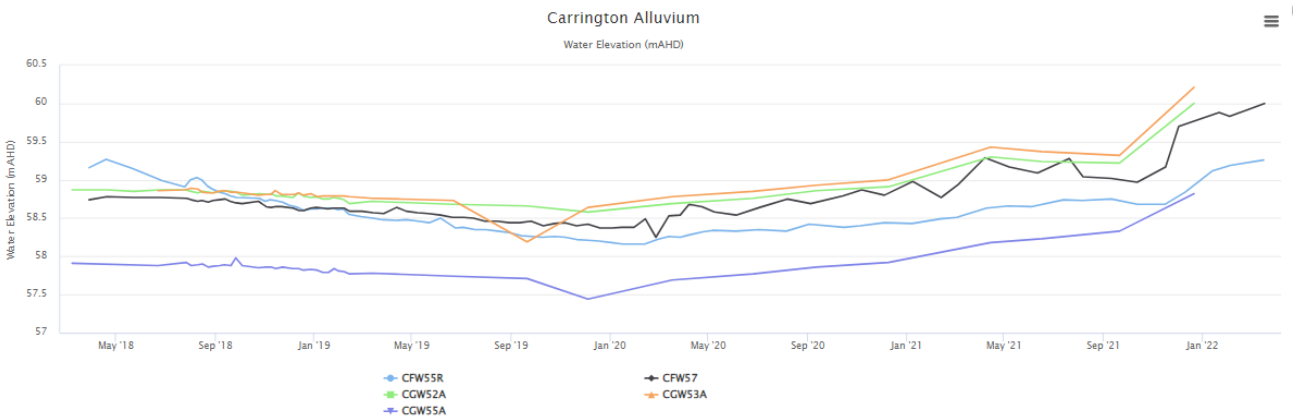


Figure 29 - Carrington Alluvium Water Elevation Trend – Q1 2022

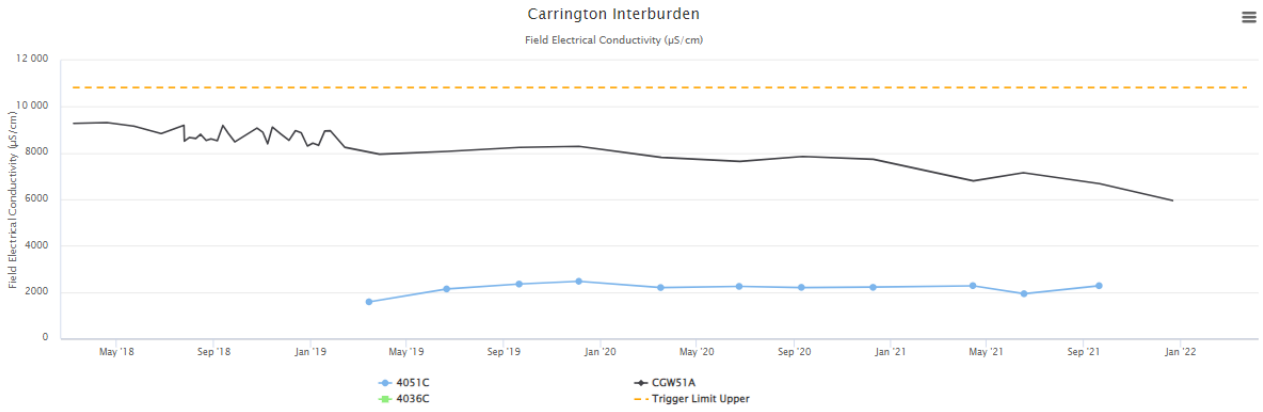


Figure 30 - Carrington Interburden Electrical Conductivity Trend – Q1 2022

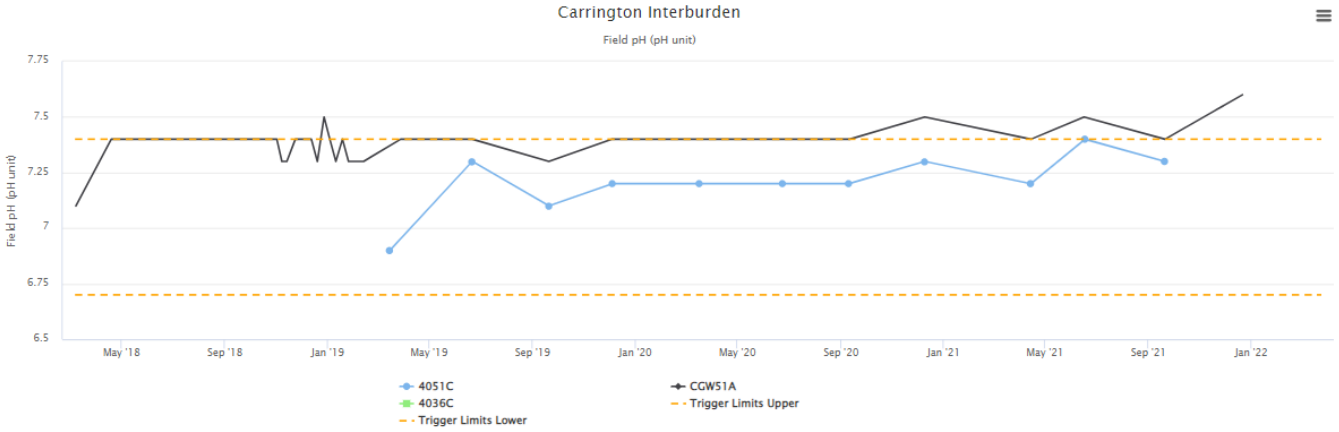
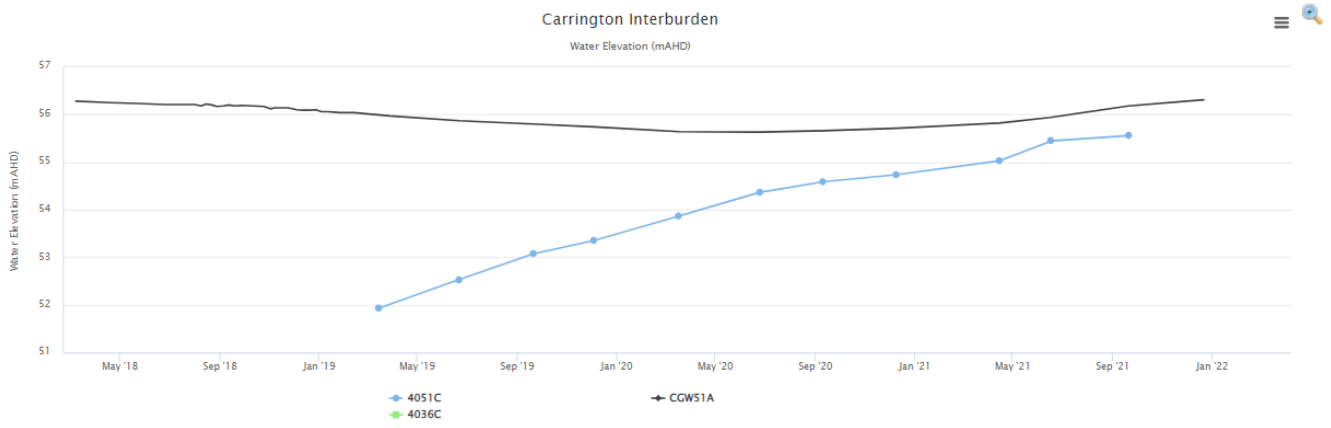


Figure 31 - Carrington Interburden Field pH Trend – Q1 2022



** 4036C had insufficient water for sampling*

Figure 32 - Carrington Interburden Water Elevation Trend – Q1 2022

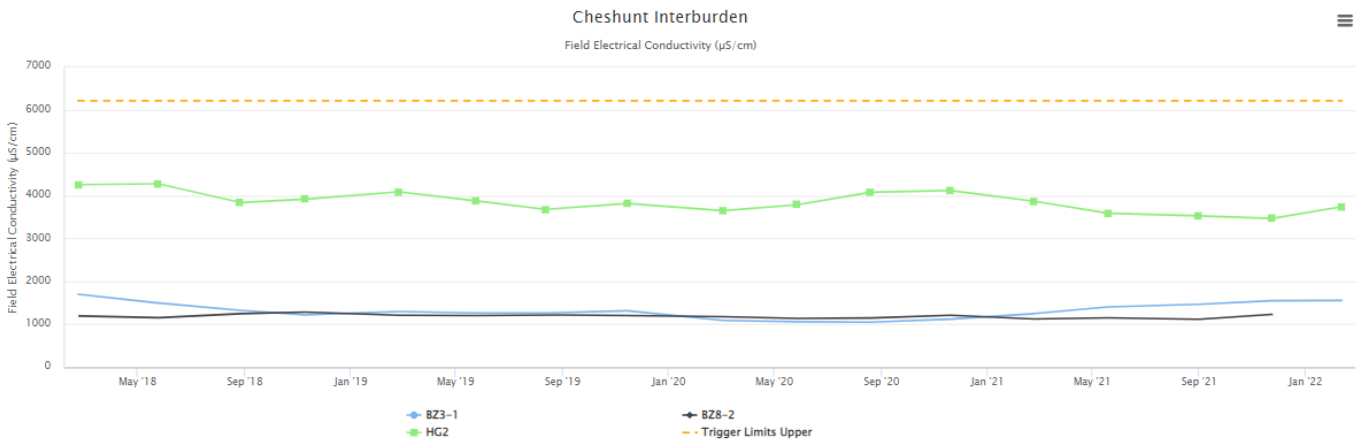


Figure 33 - Cheshunt Interburden Electrical Conductivity Trend – Q1 2022

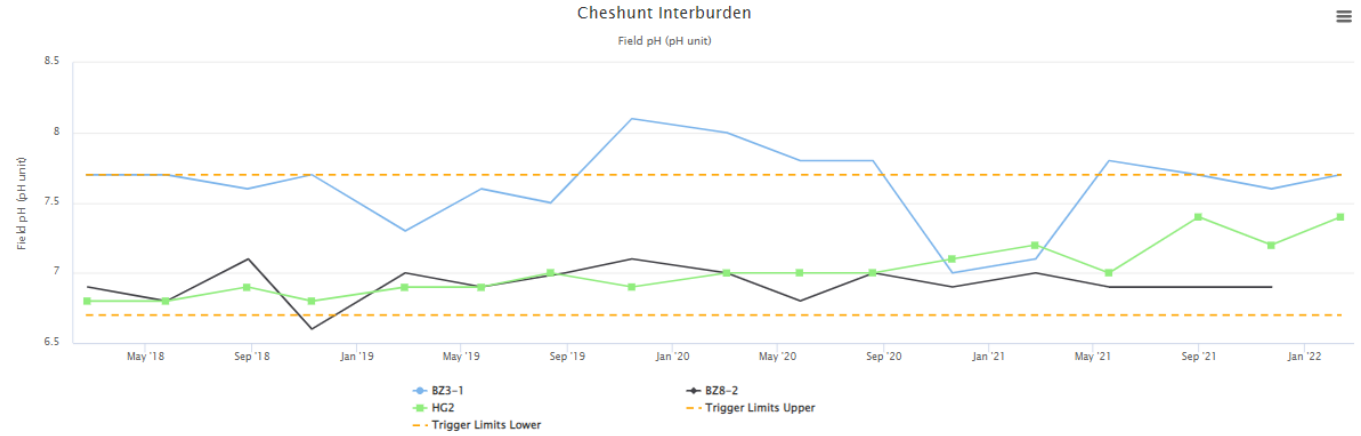


Figure 34 - Cheshunt Interburden Field pH Trend – Q1 2022

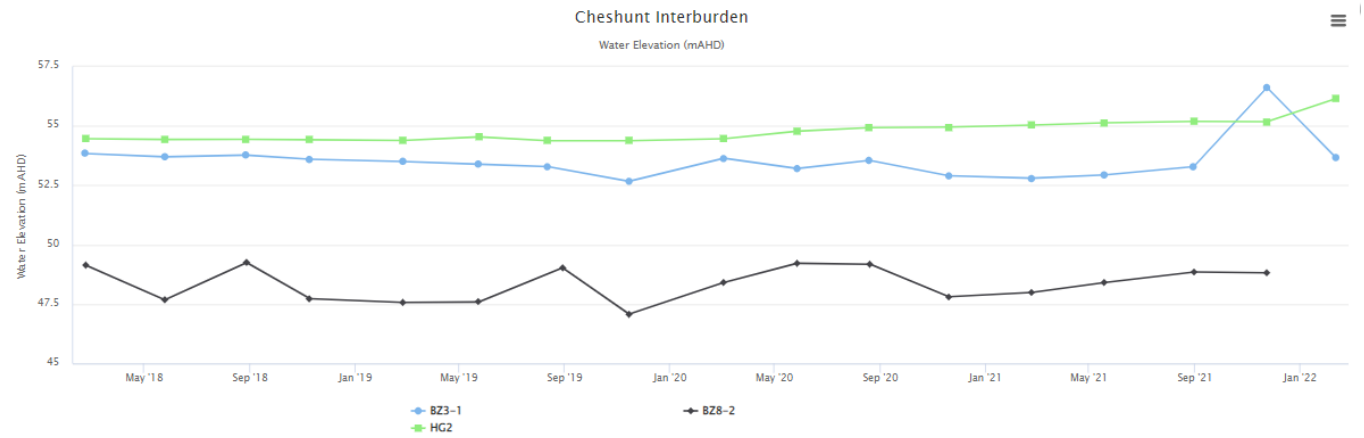


Figure 35 – Cheshunt Interburden Water Elevation Trend – Q1 2022

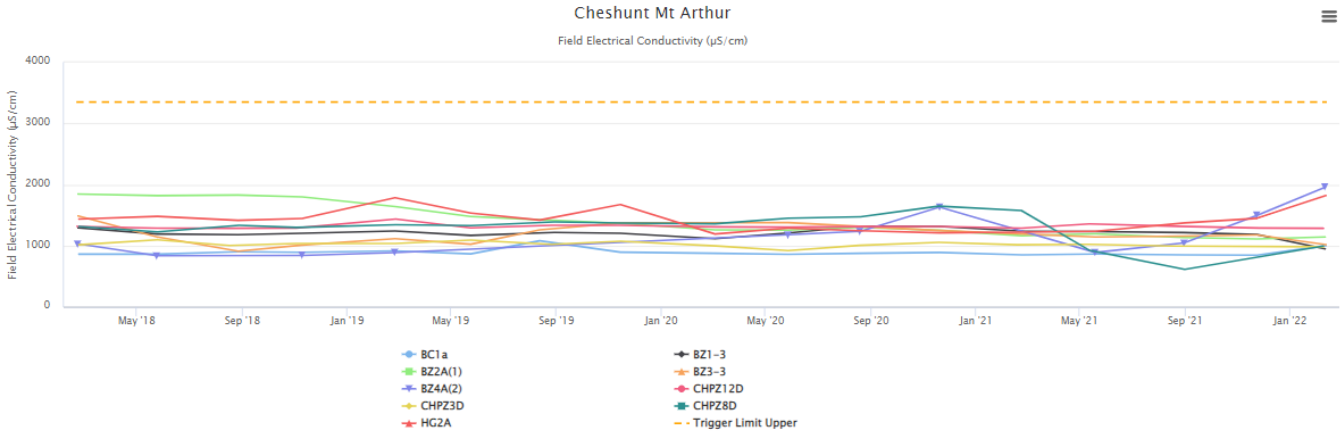


Figure 36 - Cheshunt Mt Arthur Electrical Conductivity Trend – Q1 2022

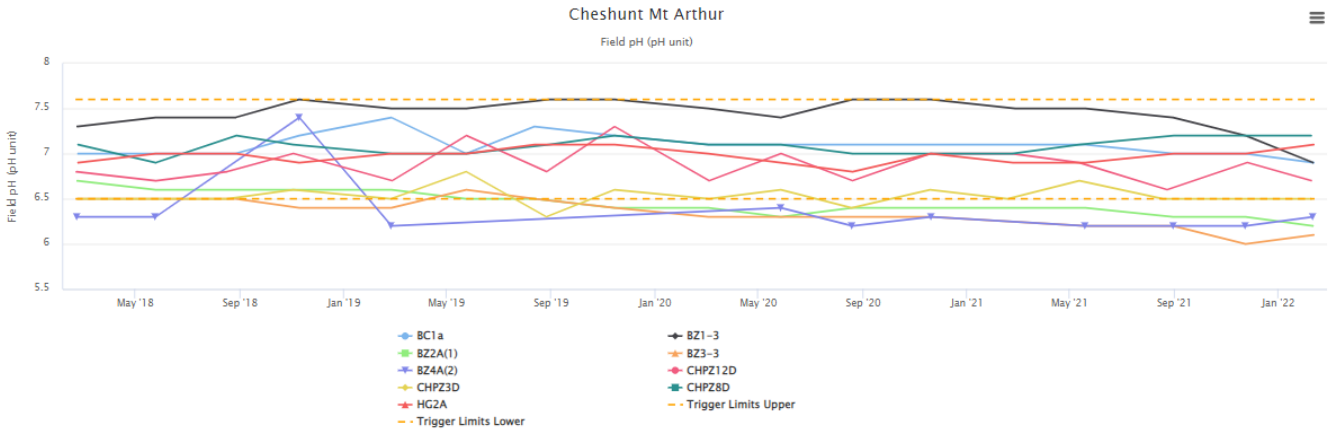


Figure 37 - Cheshunt Mt Arthur Field pH Trend - Q1 2022

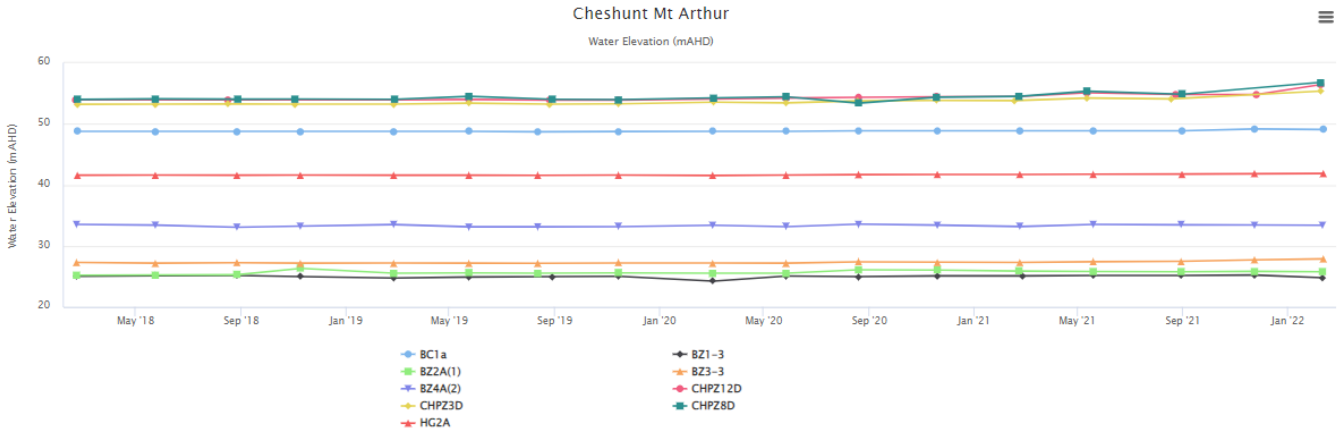


Figure 38 - Cheshunt Mt Arthur Water Elevation Trend – Q1 2022

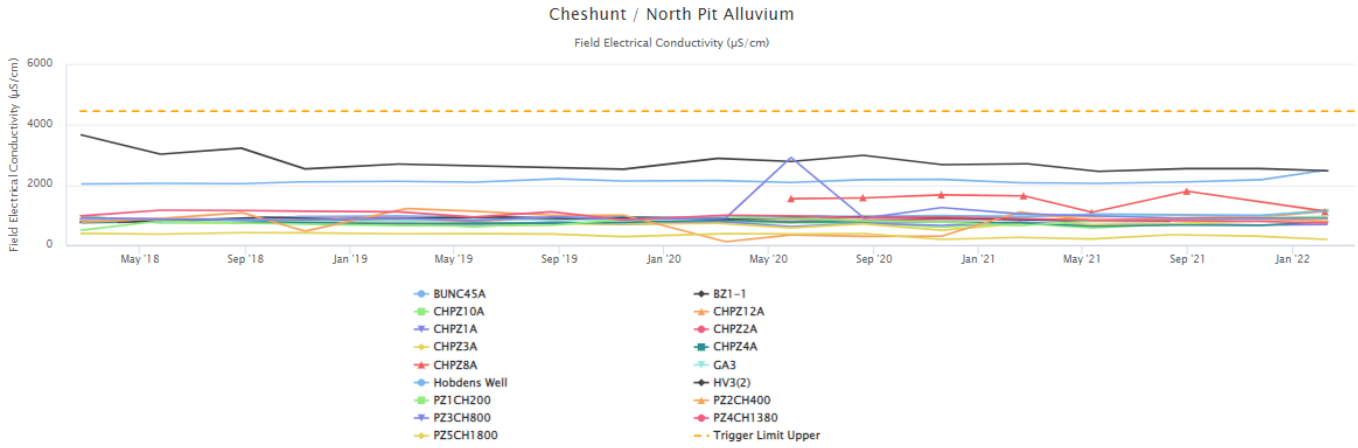


Figure 39 - Cheshunt North Pit Alluvium Electrical Conductivity Trend – Q1 2022

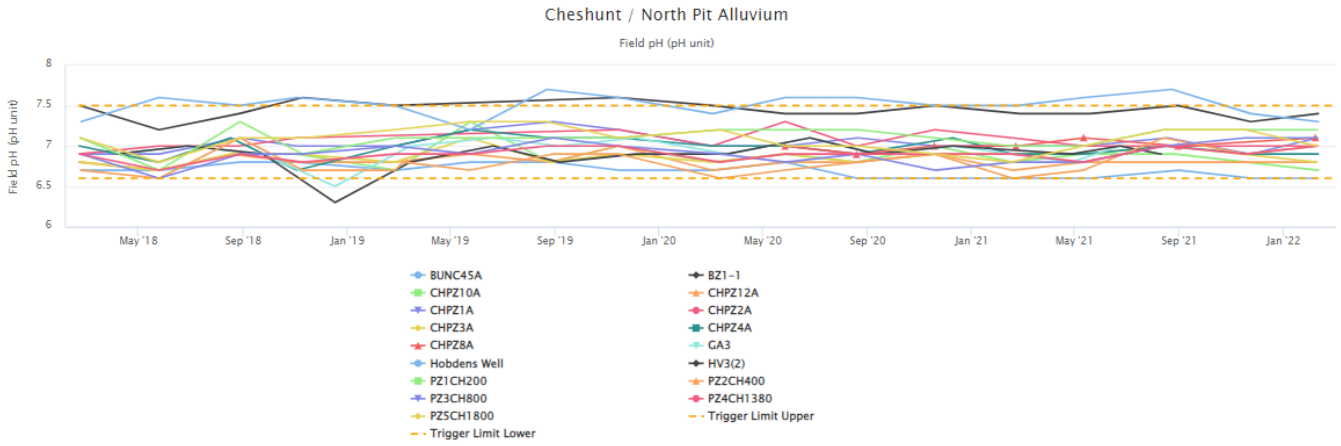


Figure 40 - Cheshunt North Pit Alluvium Field pH Trend – Q1 2022

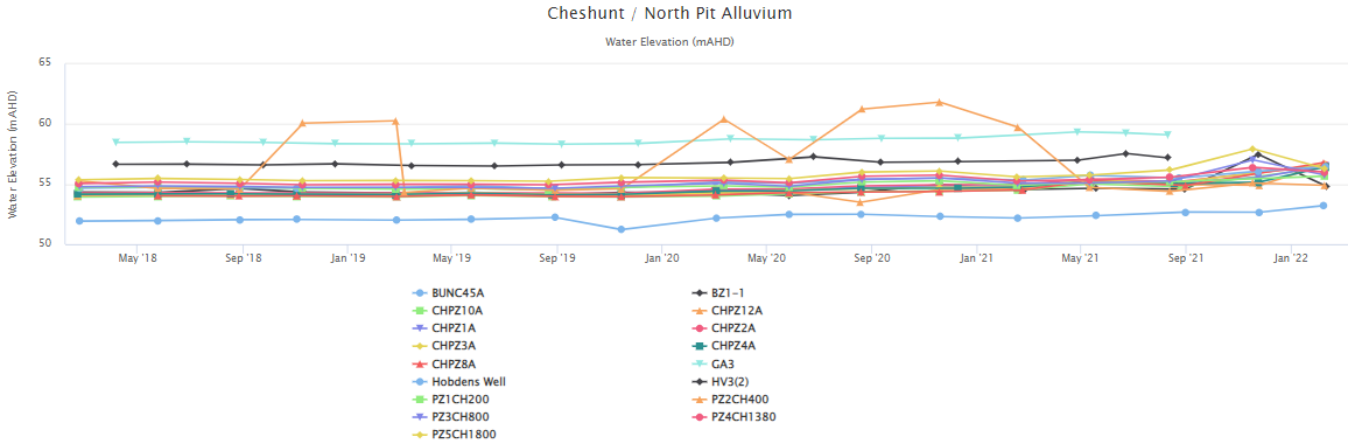


Figure 41 - Cheshunt North Pit Alluvium Water Elevation Trend – Q1 2022

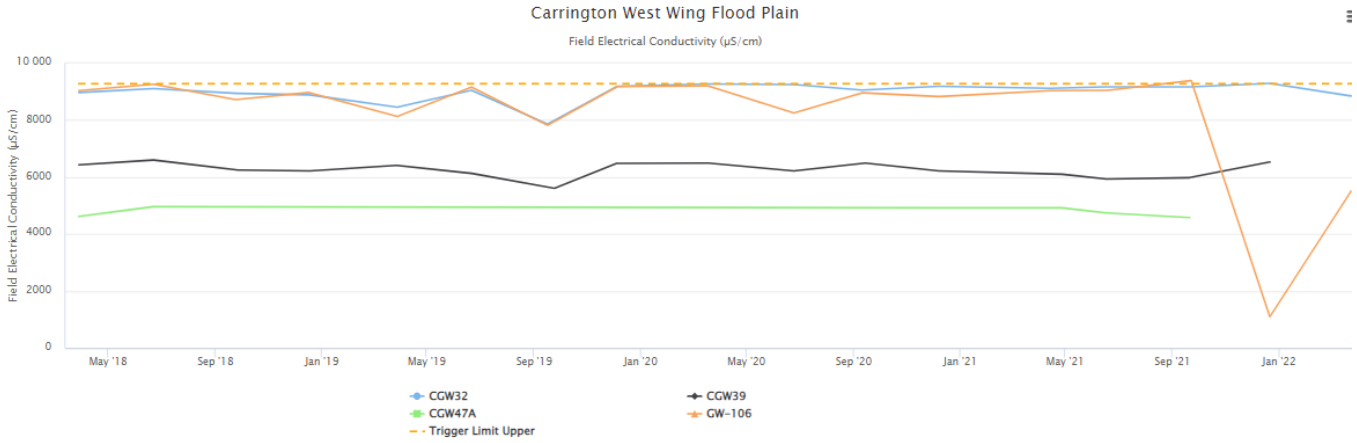


Figure 42 - Carrington West Wing Flood Plain Electrical Conductivity trend – Q1 2022

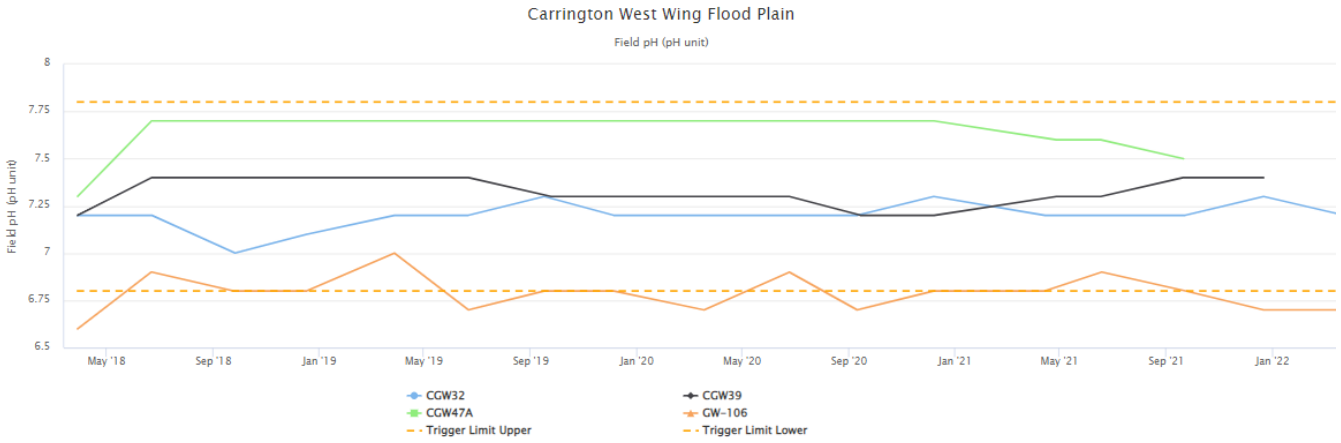


Figure 43 - Carrington West Wing Flood Plain Field pH Trend – Q1 2022

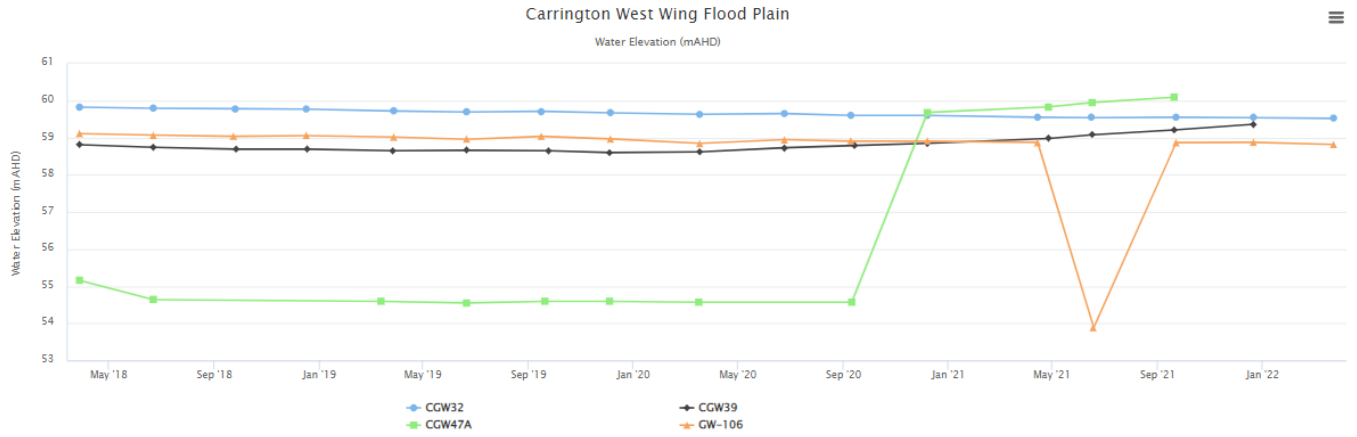


Figure 44 - Carrington West Wing Flood Plain Water Elevation Trend – Q1 2022

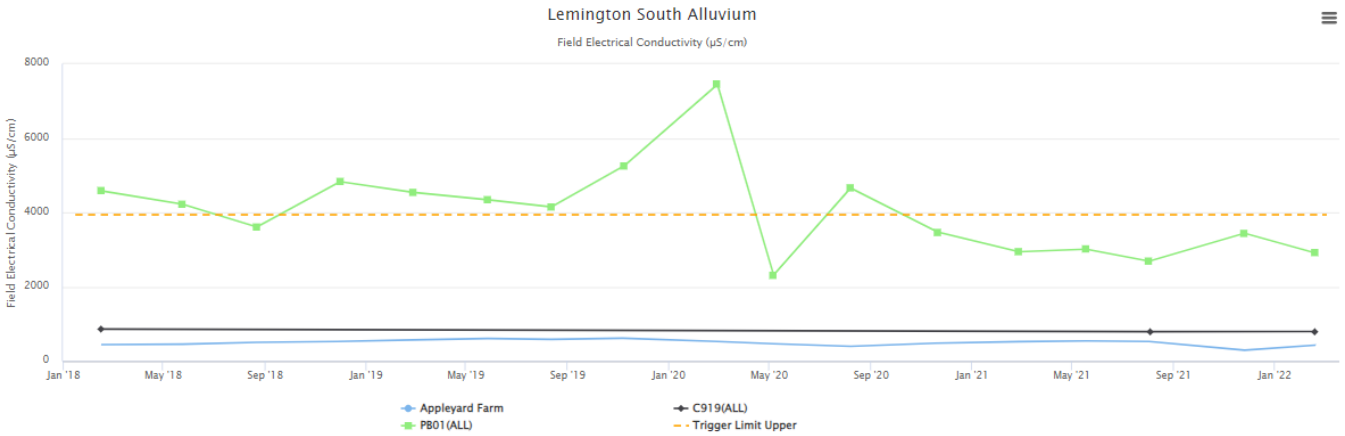


Figure 45 - Lemington South Alluvium Electrical Conductivity Trend – Q1 2022

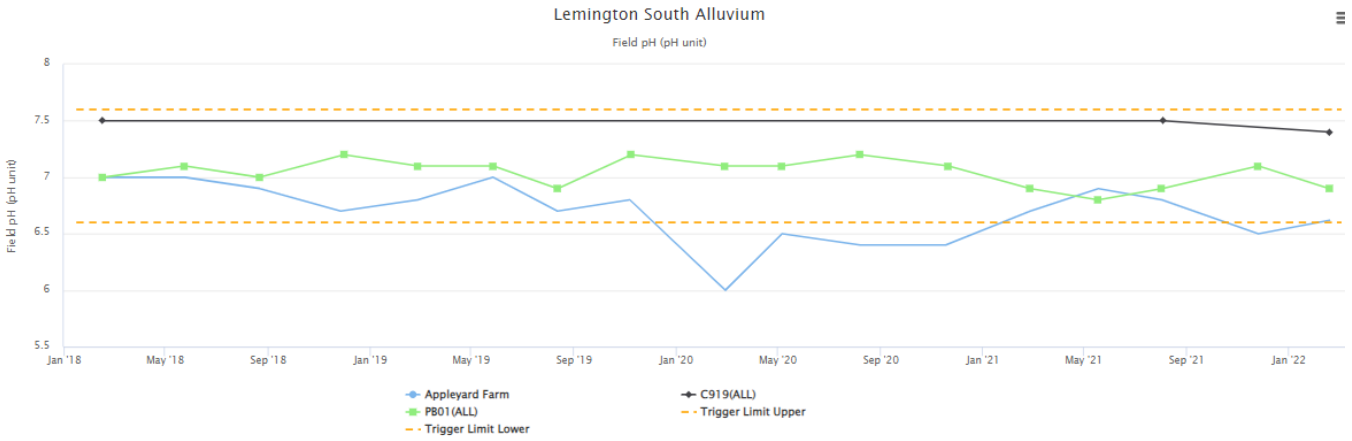


Figure 46 Lemington South Alluvium Field pH Trend – Q1 2022

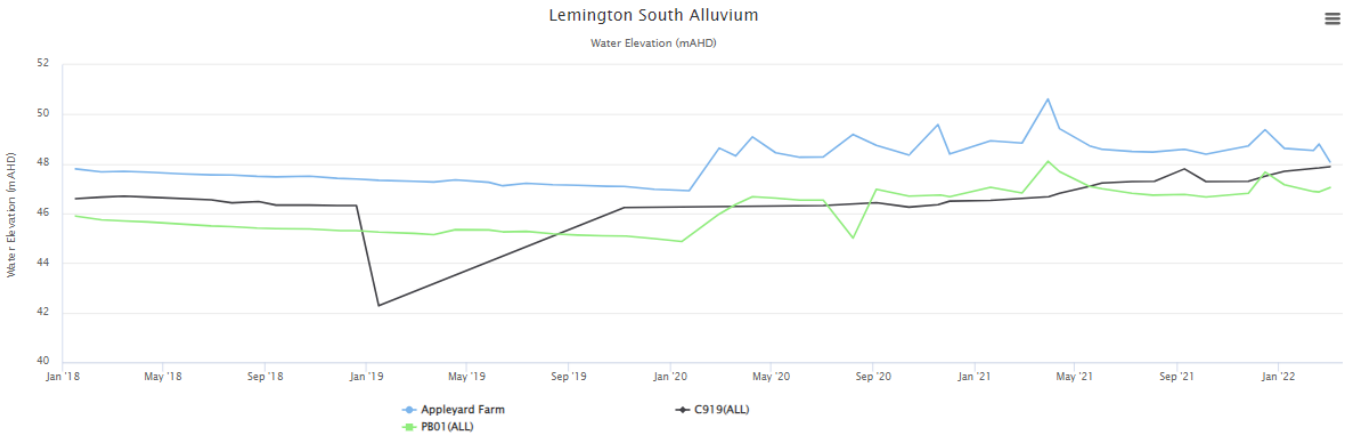


Figure 47 - Lemington South Alluvium Water Elevation Trend – Q1 2022

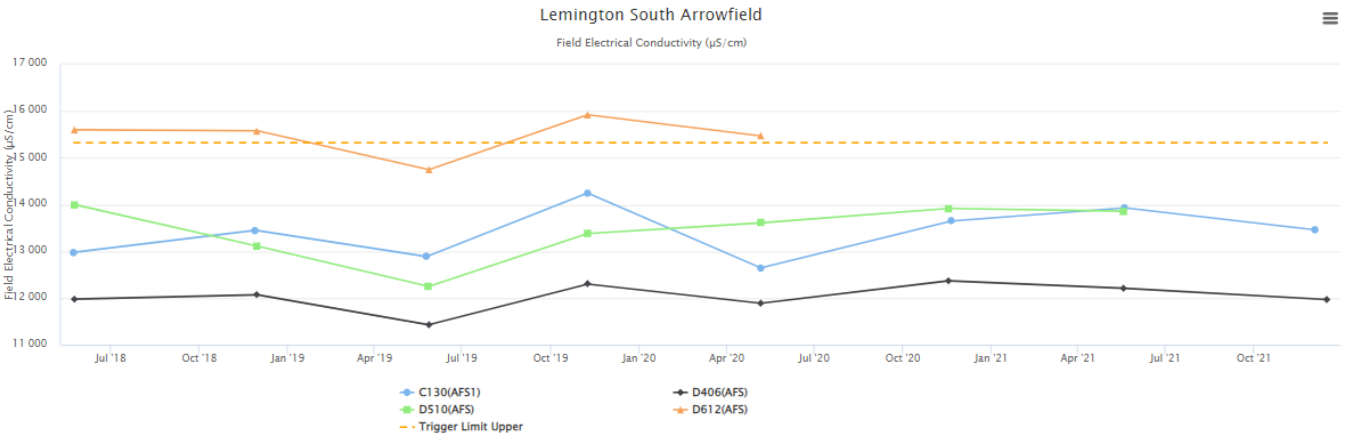


Figure 48 - Lemington South Arrowfield Electrical Conductivity Trend – Q1 2022

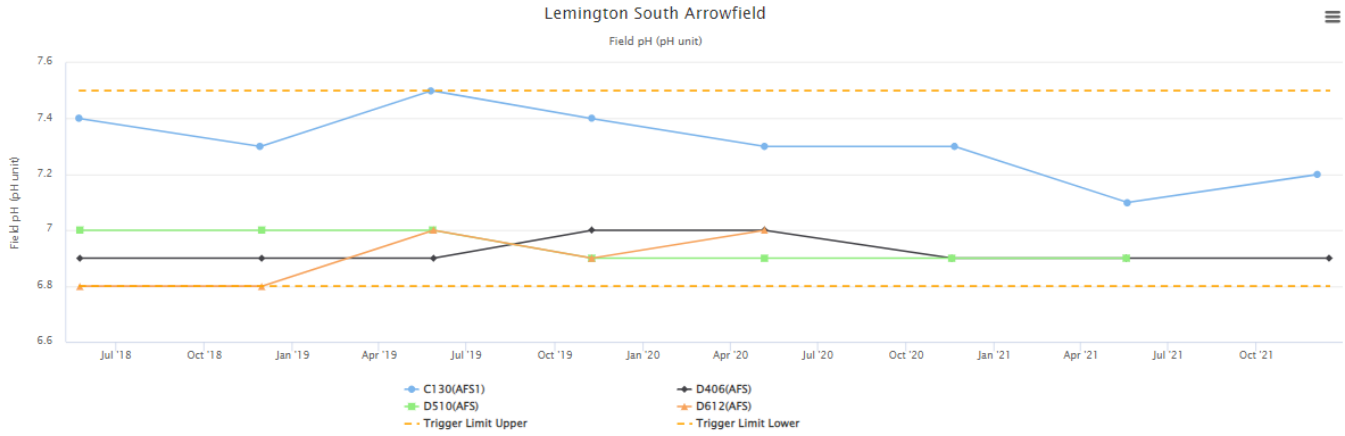


Figure 49 - Lemington South Arrowfield Field pH Trend – Q1 2022

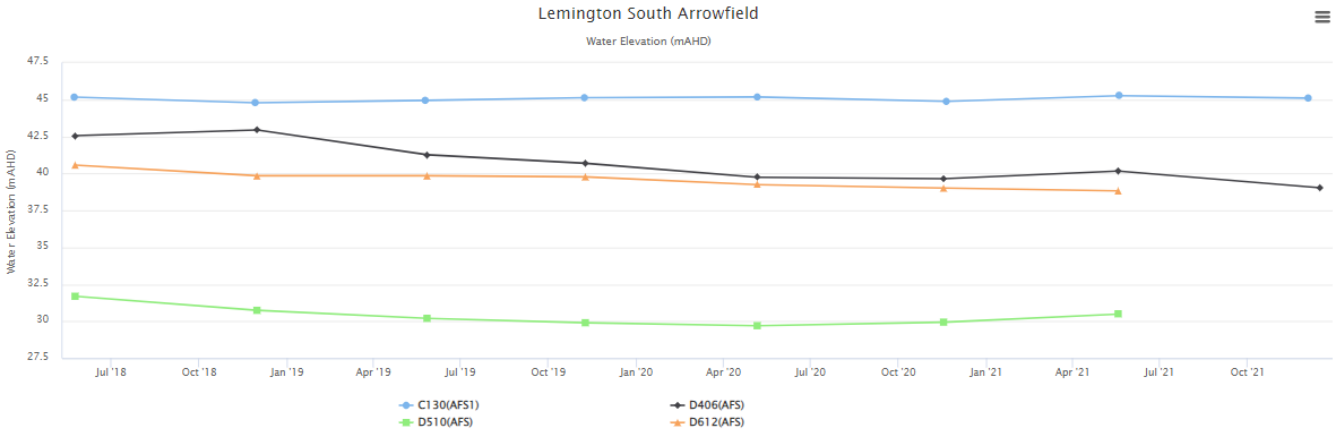


Figure 50 - Lemington South Arrowfield Water Elevation Trend – Q1 2022

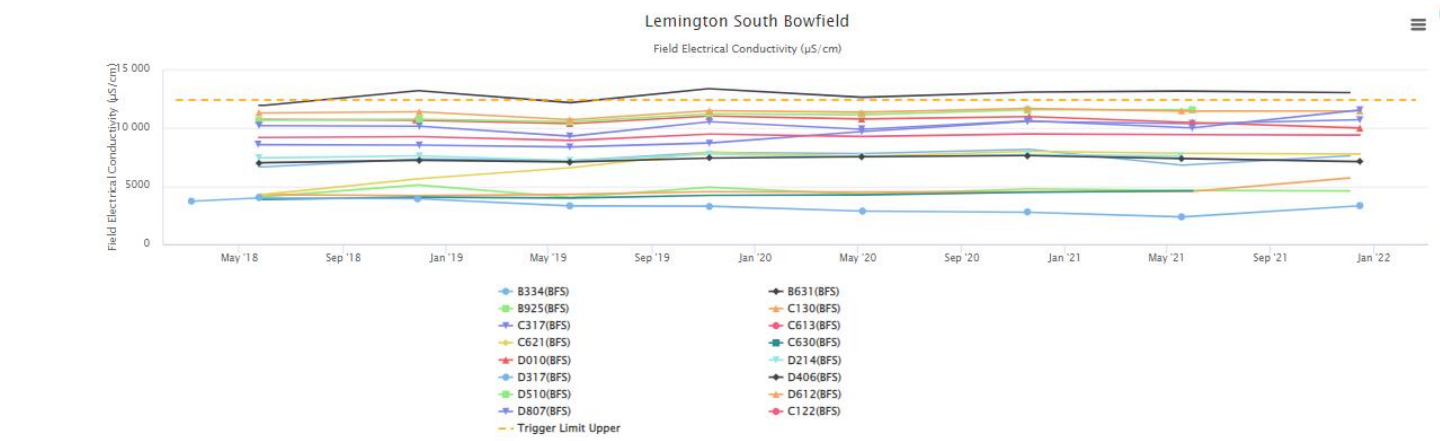


Figure 51 - Lemington South Bowfield Electrical Conductivity Trend – Q1 2022

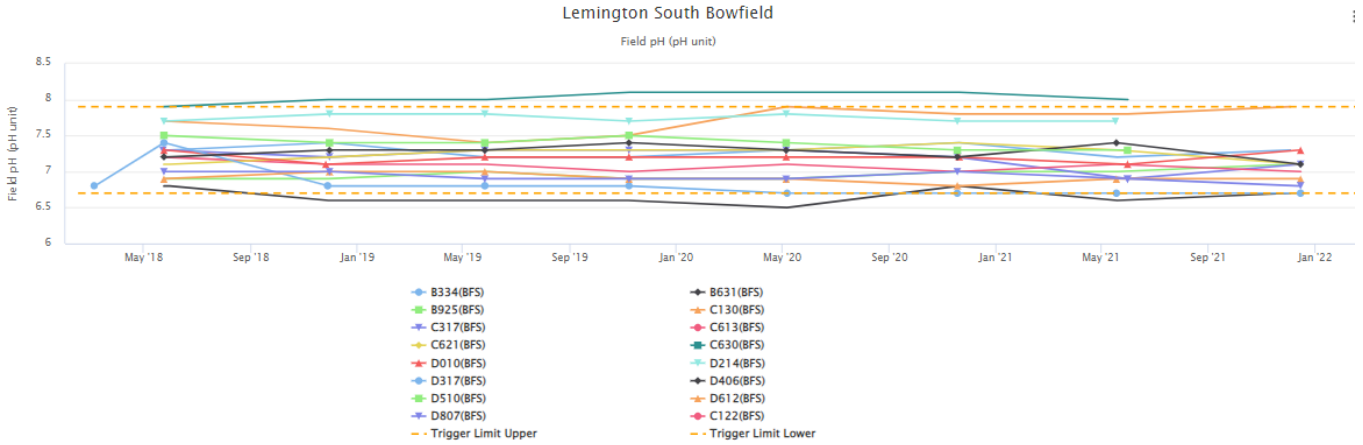


Figure 52 - Lemington South Bowfield Field pH Trend – Q1 2022

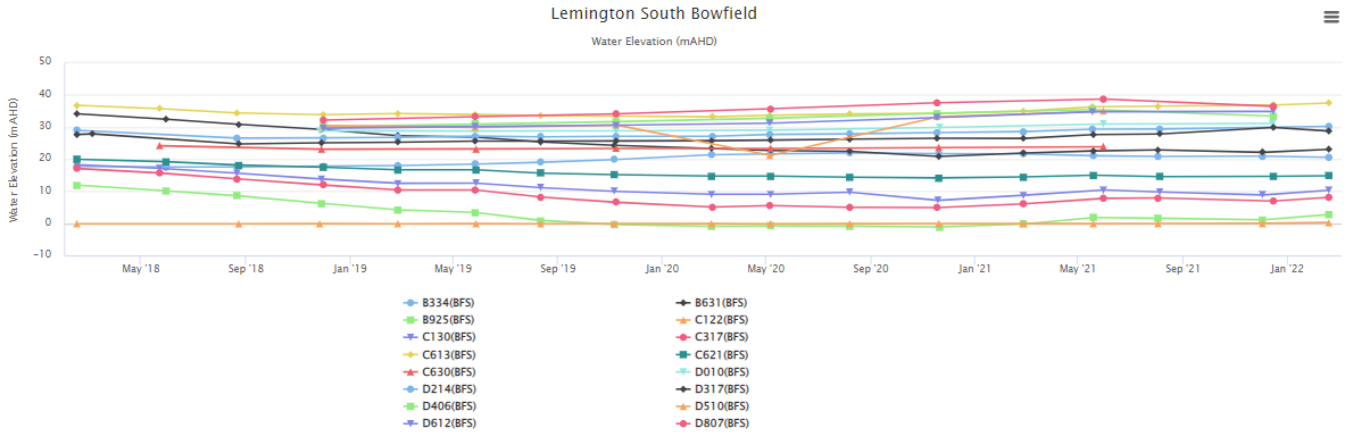


Figure 53 - Lemington South Bowfield Water Elevation Trend – Q1 2022

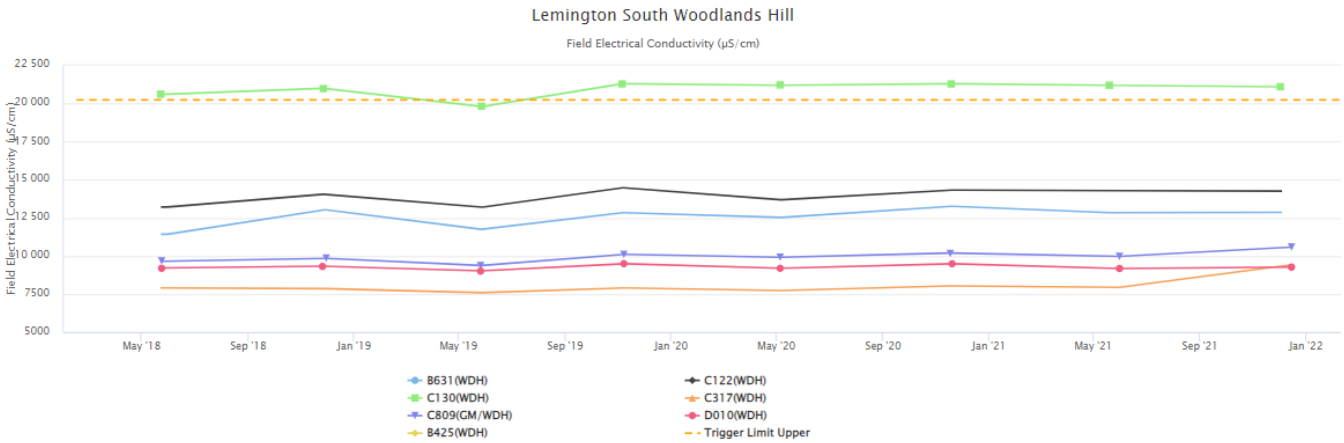


Figure 54 - Lemington South Woodlands Hill Electrical Conductivity Trend – Q1 2022

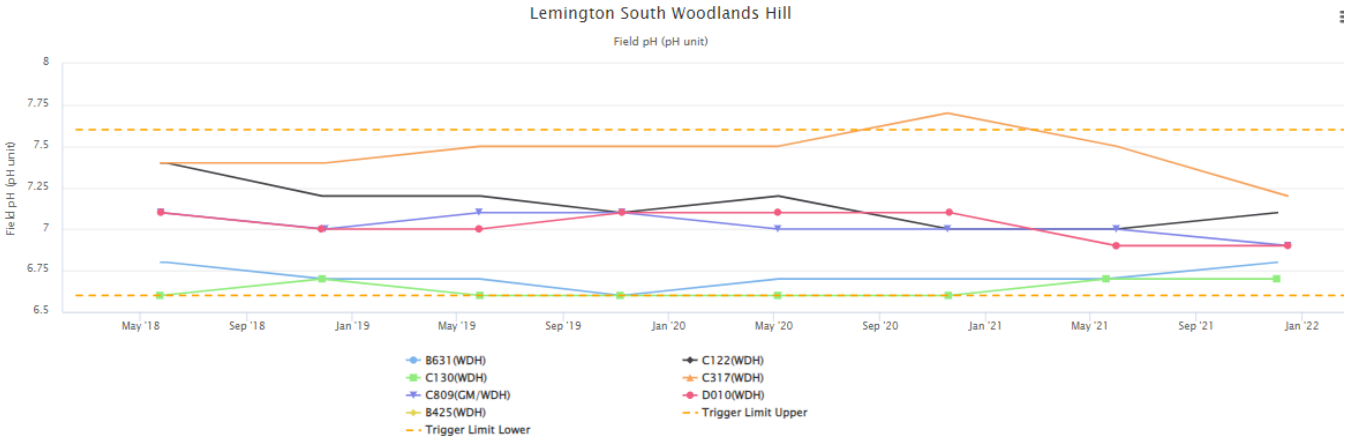


Figure 55 - Lemington South Woodlands Hill Field pH Trend – Q1 2022

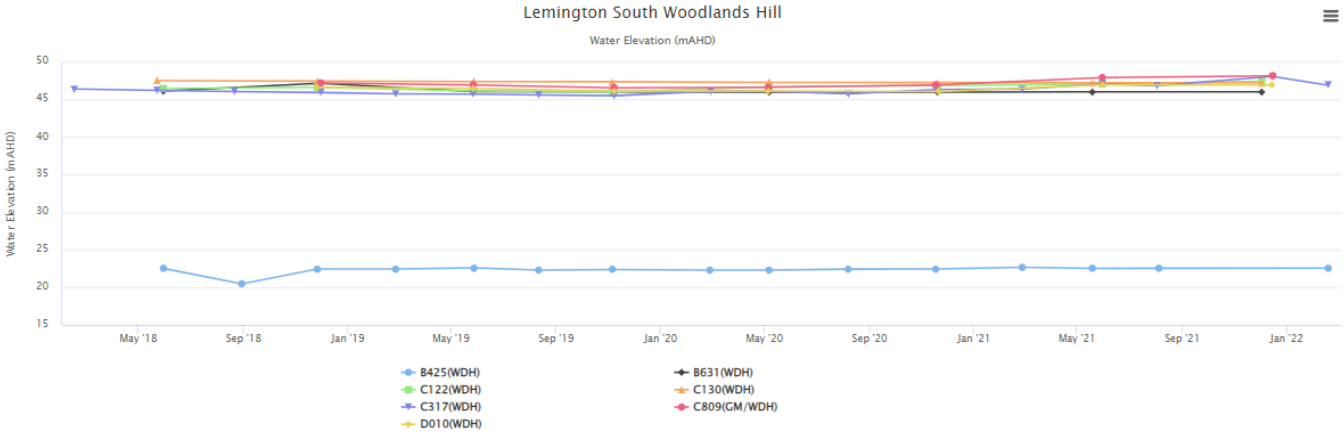


Figure 56 - Lemington South Woodlands Hill Water Elevation Trend – Q1 2022

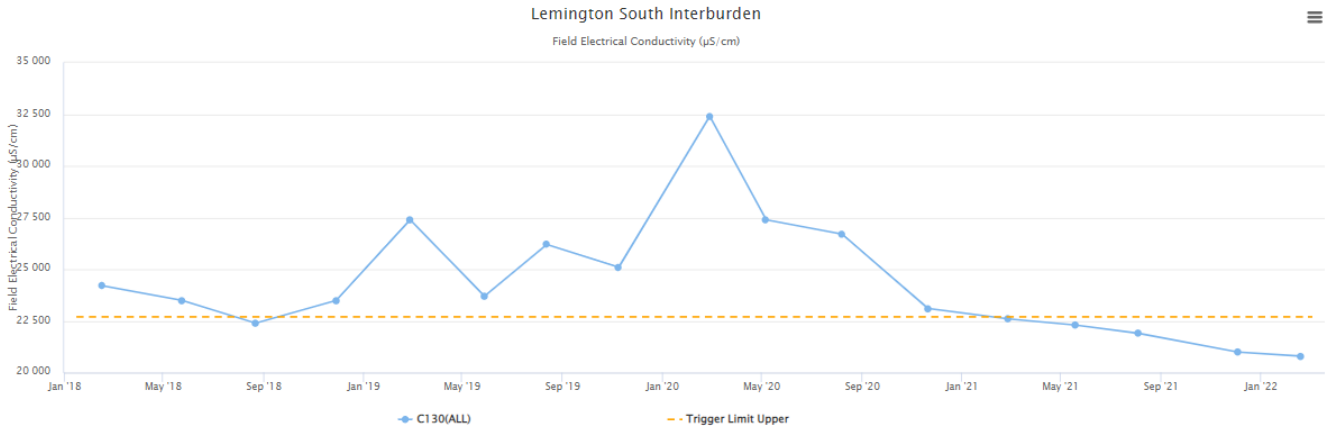


Figure 57 - Lemington South Interburden Electrical Conductivity Trend – Q1 2022

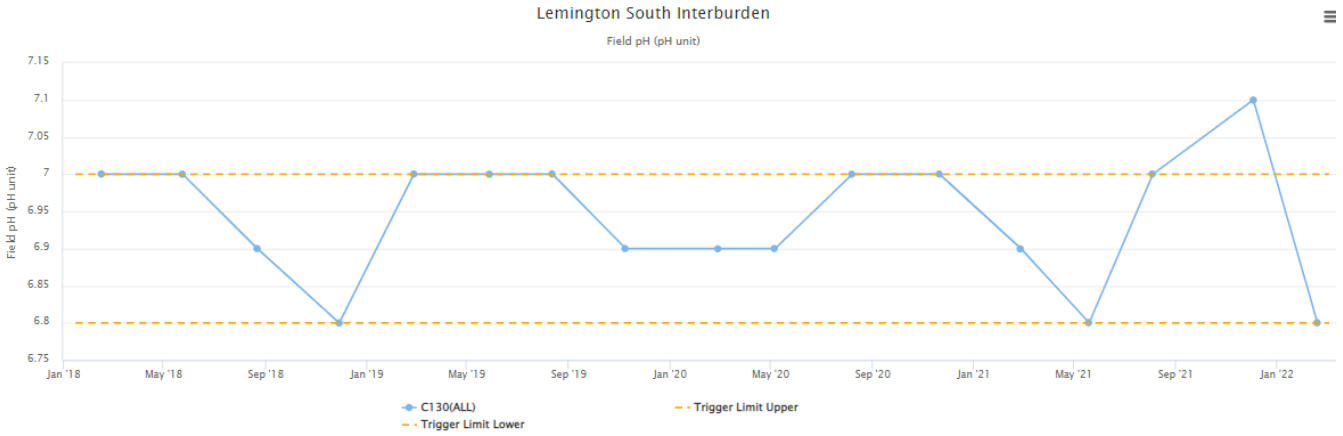


Figure 58 - Lemington South Interburden Field pH Trend – Q1 2022

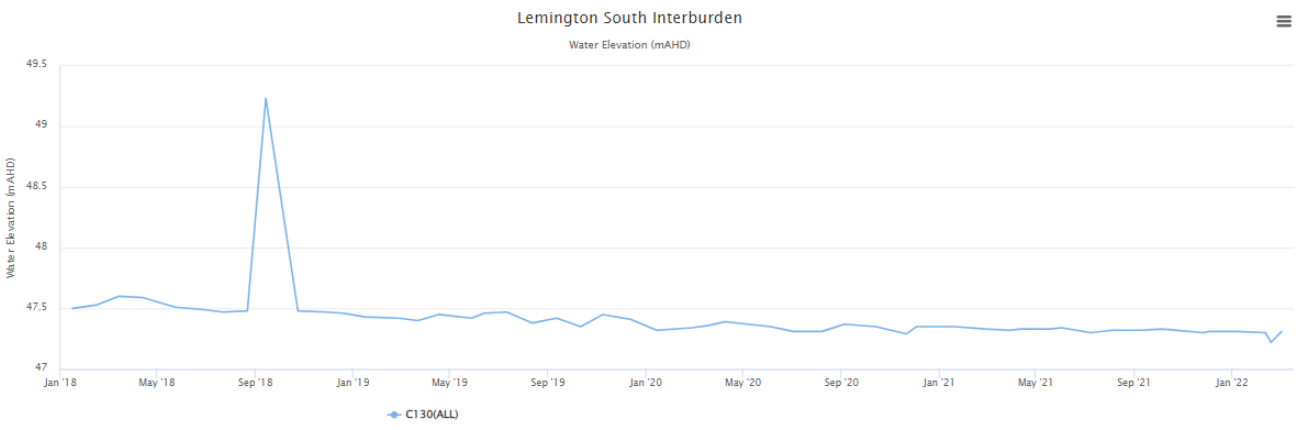


Figure 59 - Lemington South Interburden Water Elevation Trend – Q1 2022

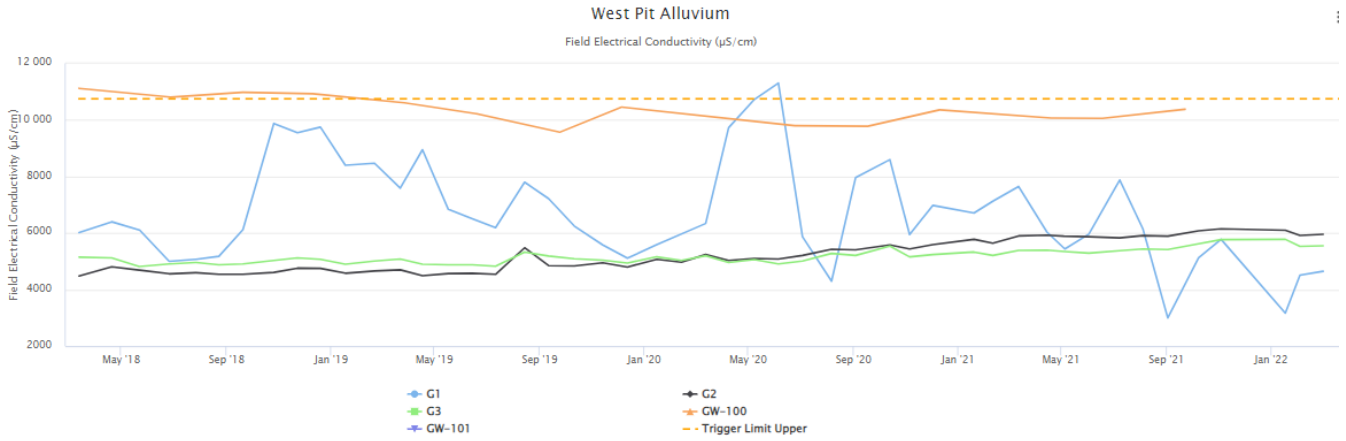


Figure 60 - West Pit Alluvium Electrical Conductivity Trend - Q1 2022

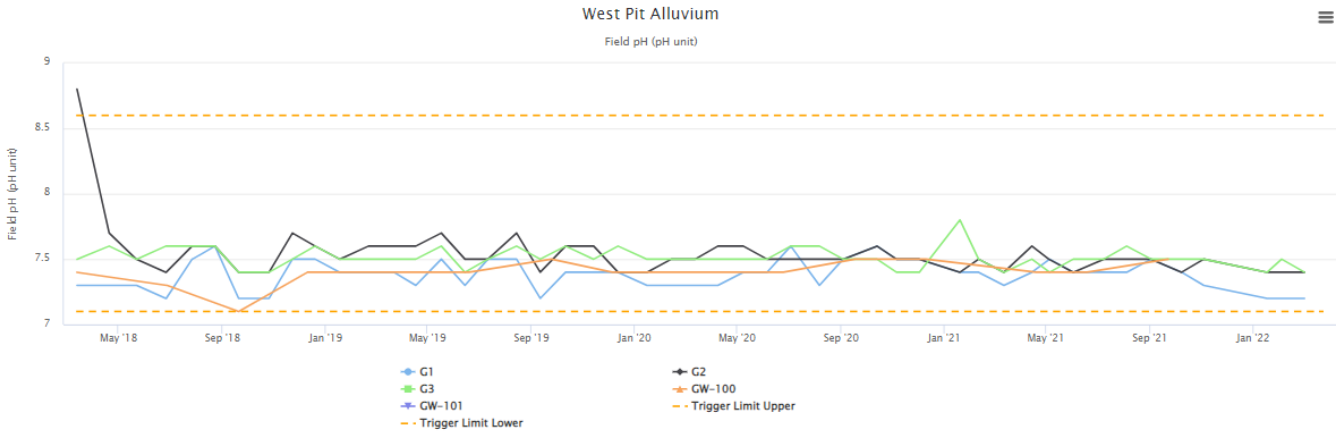


Figure 61 - West Pit Alluvium Field pH Trend – Q1 2022

** GW -101 had insufficient water for sampling*

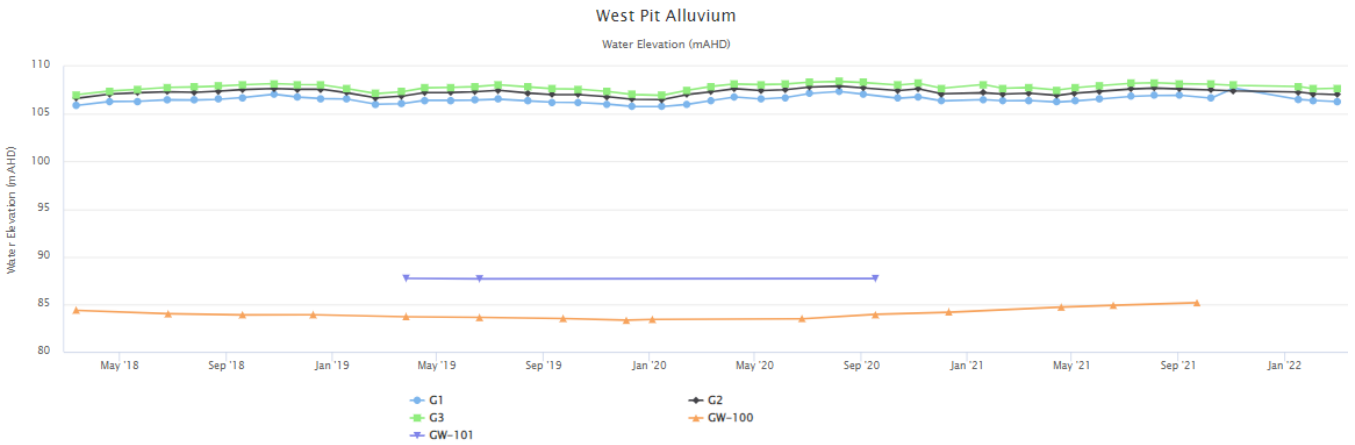


Figure 62 - West Pit Alluvium Water Elevation Trend - Q1 2022

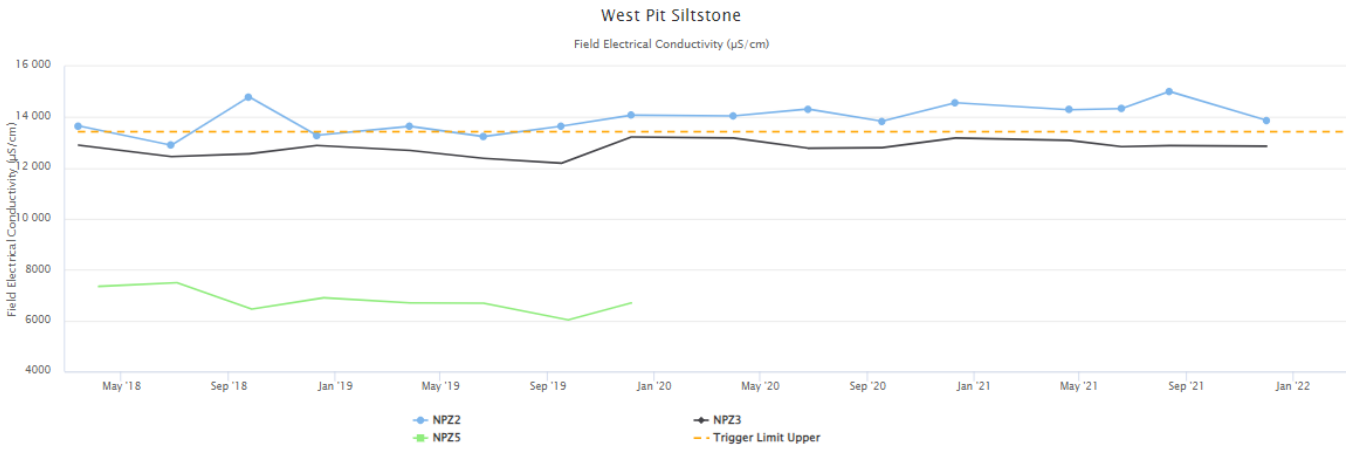


Figure 63 - West Pit Siltstone Electrical Conductivity Trend – Q1 2022

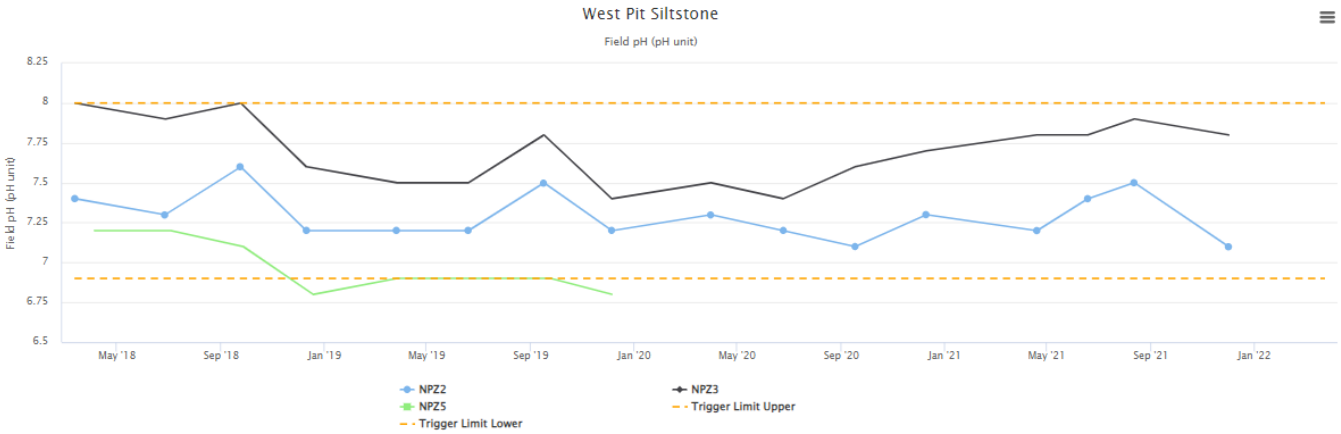


Figure 64 - West Pit Siltstone Field pH Trend - Q1 2022

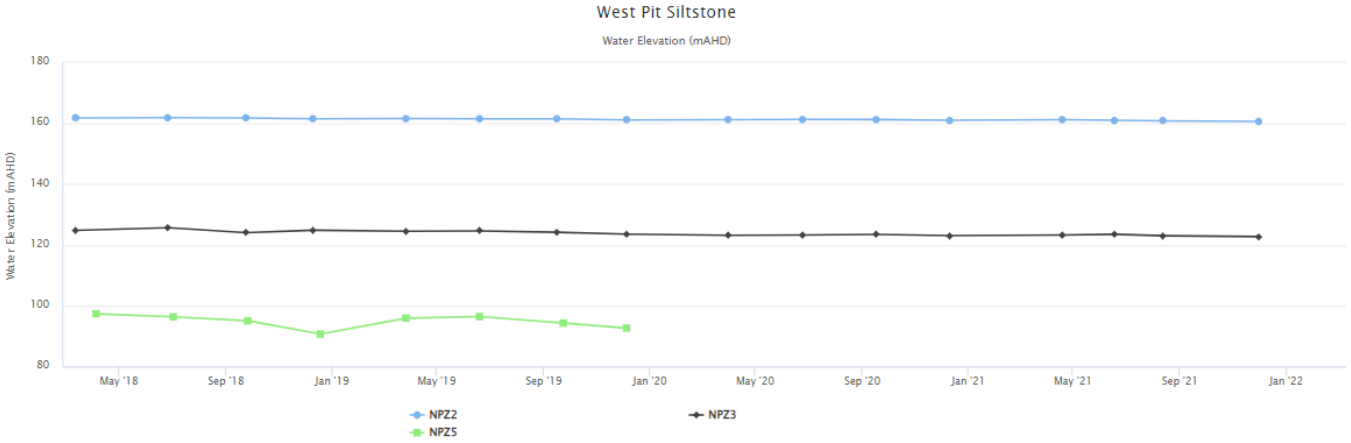


Figure 65 - West Pit Siltstone Water Elevation Trend – Q1 2022

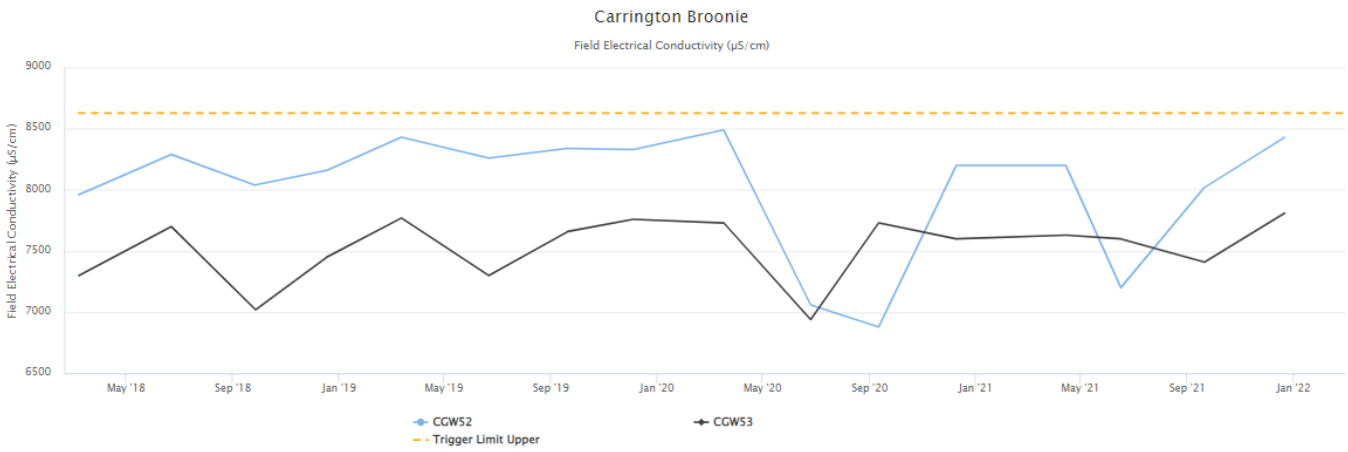


Figure 66 - Carrington Broonie Electrical Conductivity Trend – Q1 2022

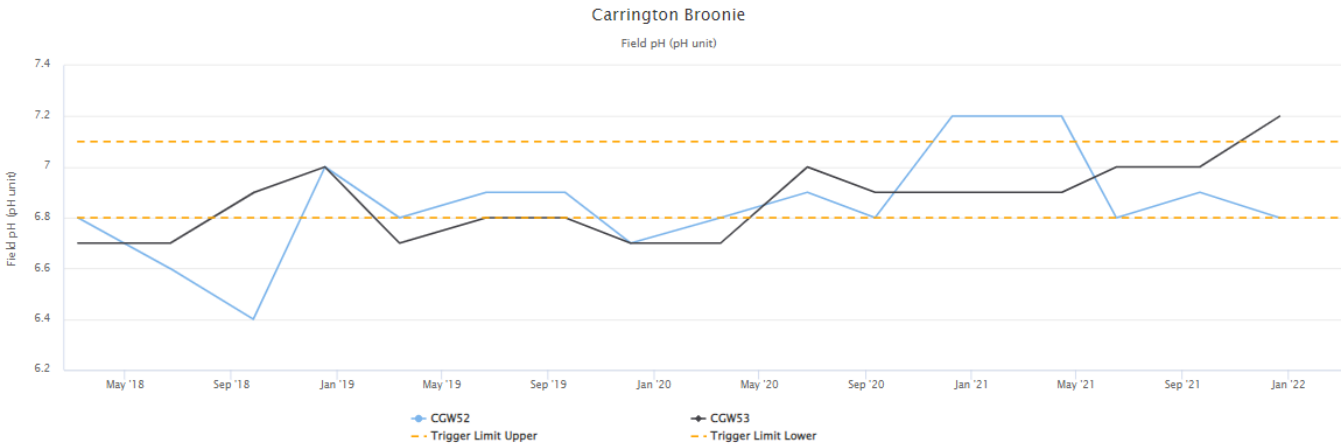


Figure 67 - Carrington Broonie Field pH Trend – Q1 2022

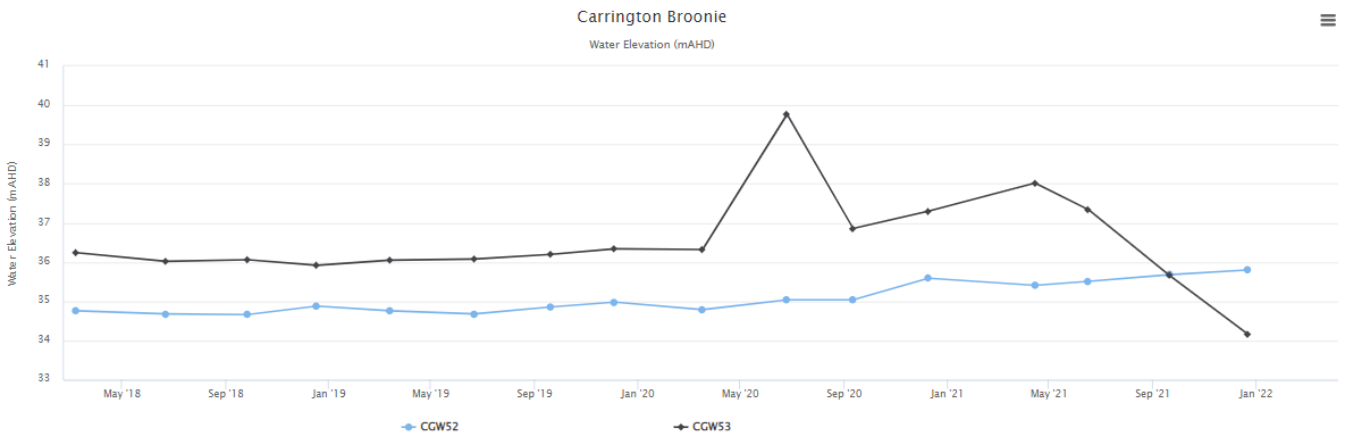


Figure 68 - Carrington Broonie Water Elevation Trend - Q1 2022

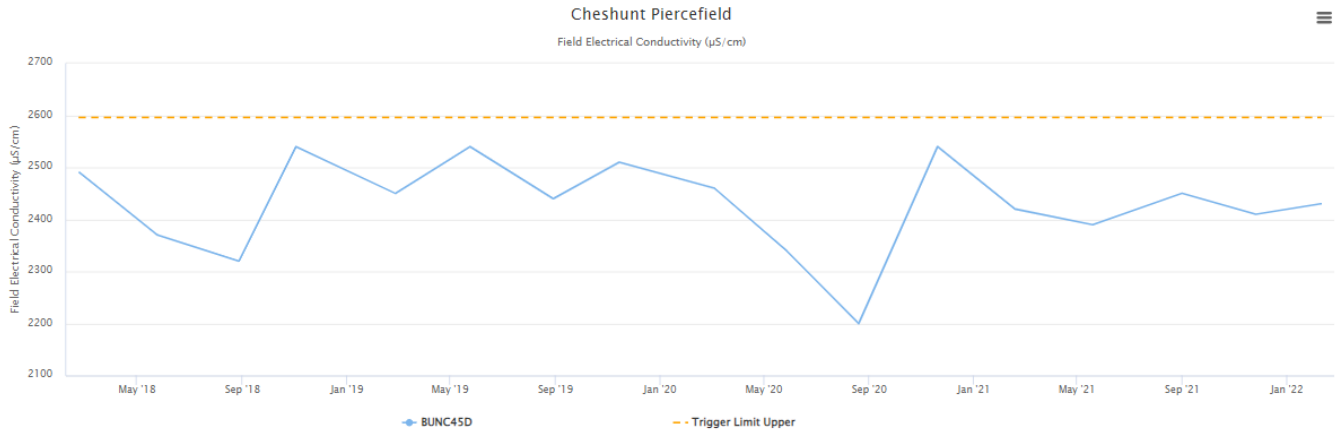


Figure 69 - Cheshunt Piercefield Electrical Conductivity Trend – Q1 2022

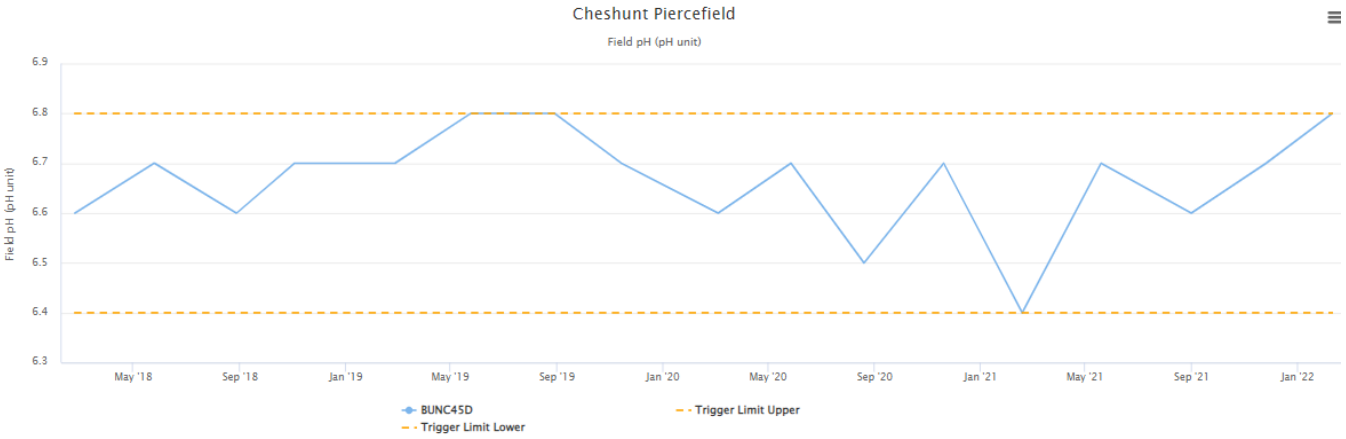


Figure 70 - Cheshunt Piercefield Field pH Trend – Q1 2022

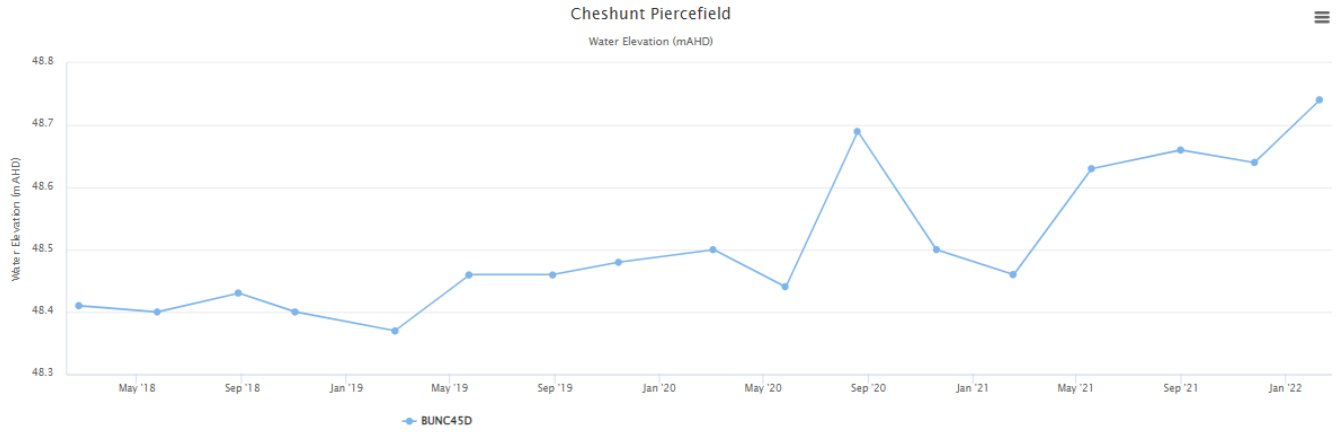


Figure 71 - Cheshunt Piercefield Water Elevation Trend – Q1 2022

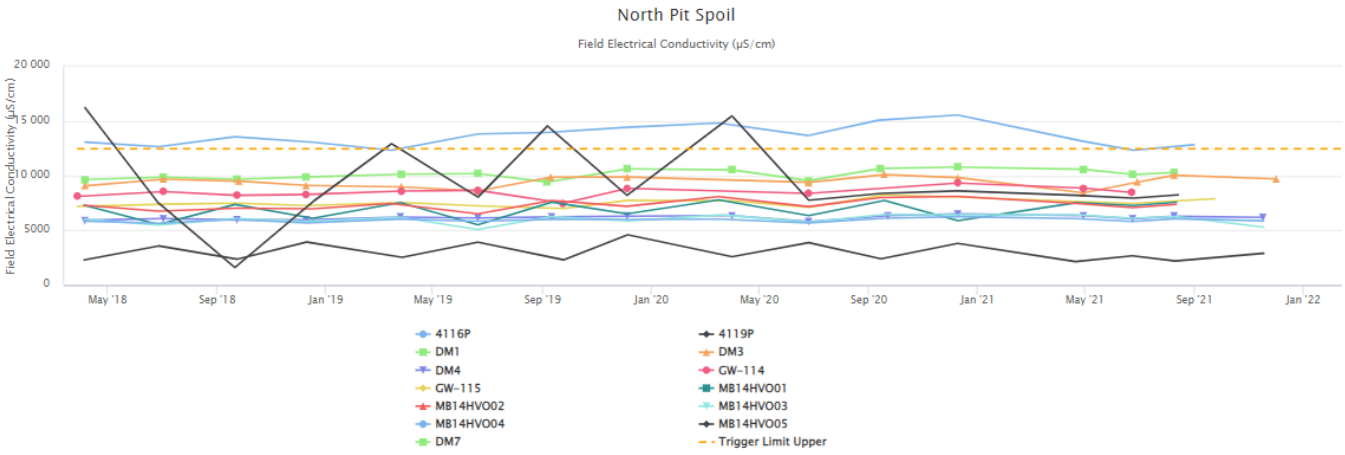


Figure 72 - North Pit Spoil Electrical Conductivity Trend – Q1 2022

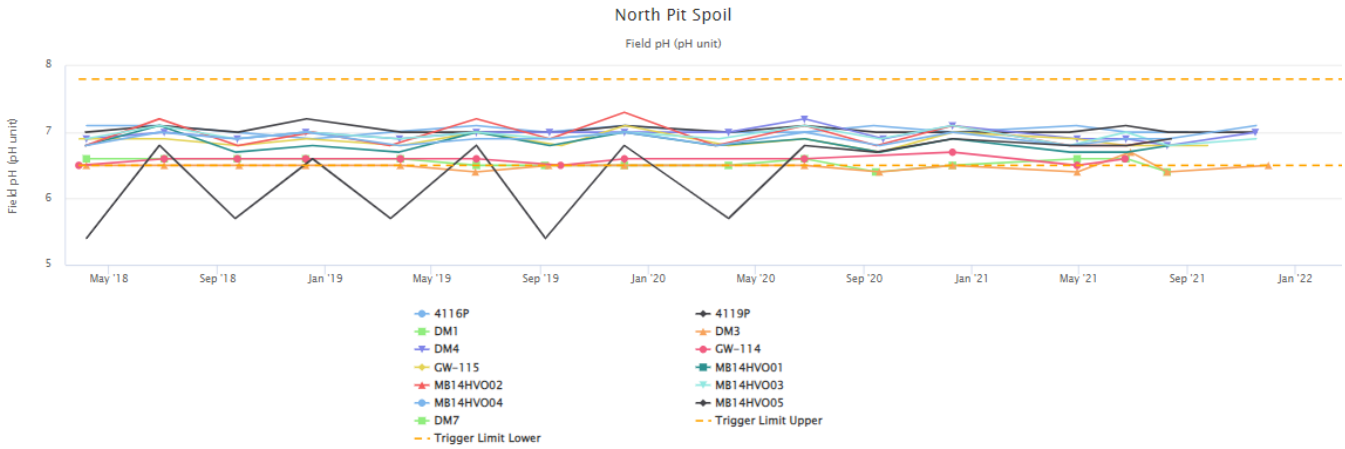


Figure 73 - North Pit Spoil Field pH Trend – Q1 2022

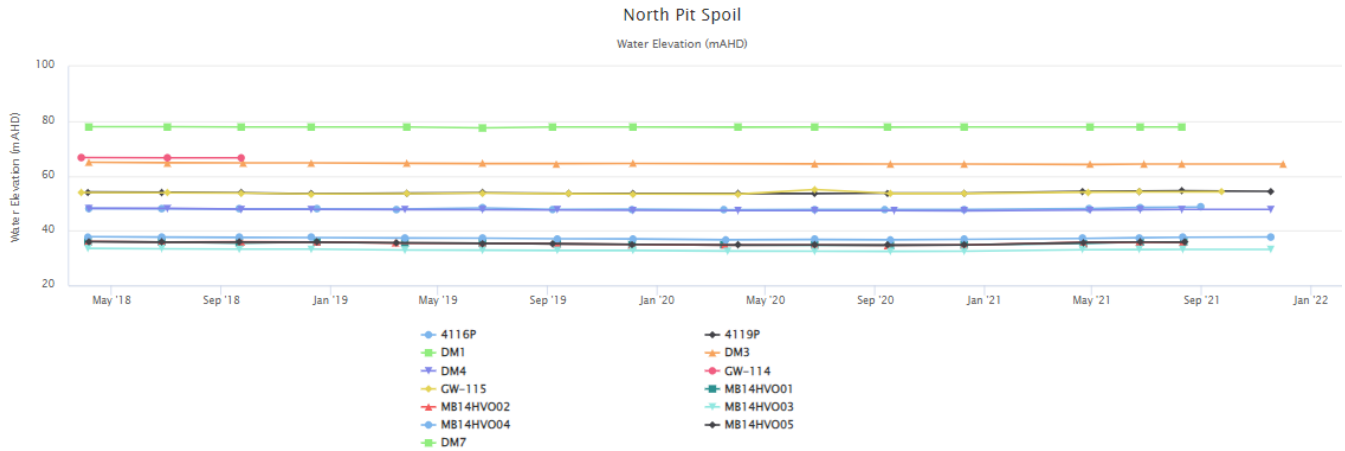


Figure 74 - North Pit Spoil Water Elevation Trend – Q1 2022

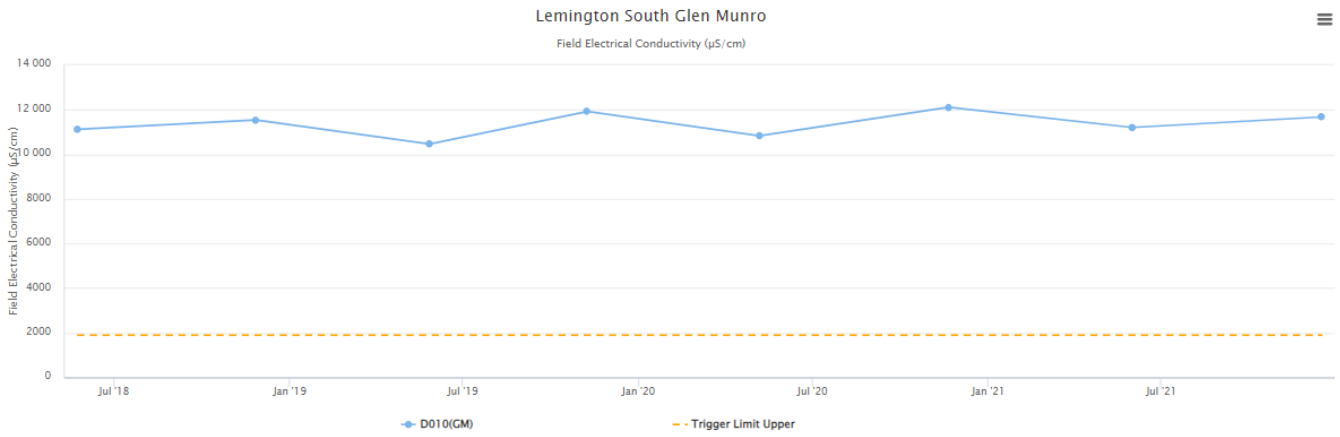


Figure 75 - Lemington South Glen Munro Electrical Conductivity Trend – Q1 2022

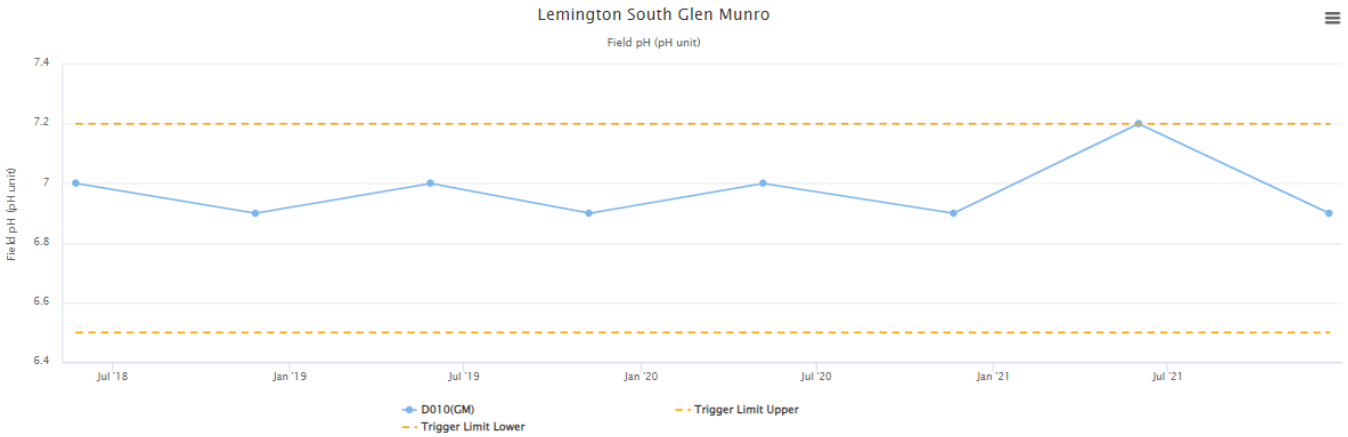


Figure 76 - Lemington South Glen Munro Field pH Trend - Q1 2022

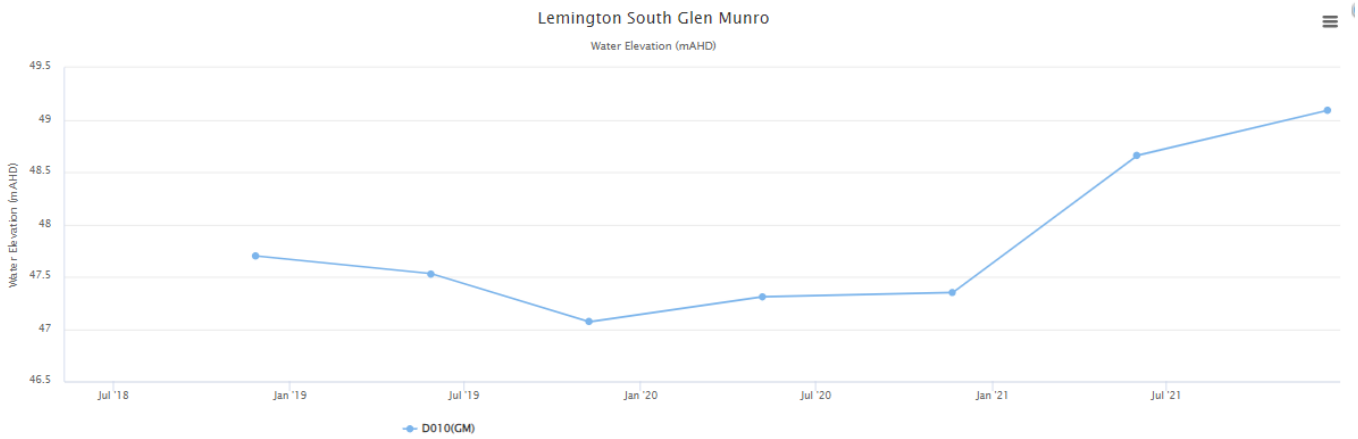


Figure 77 - Lemington South Glen Munro Water Elevation Trend – Q1 2022

3.4.1 Groundwater Trigger Tracking

Internal trigger limits have been developed to assess monitoring data on an on-going basis and to highlight potentially adverse groundwater impacts. The process for evaluating monitoring results against the internal triggers and subsequent responses is outlined in the HVO Water Management Plan.

Groundwater trigger tracking results are summarised below in **Table 3.**

Table 3 - Groundwater Trigger Tracking – Q1 2022

Site	Date	Trigger Limit Breached	Response Action
CFW55R	13/01/2022 11:30	Field Electrical Conductivity (µS/cm)	First breach. Continue to monitor
CFW57	21/01/2022 11:05	Water Elevation (mAHD)	First breach. Continue to monitor
CFW57	3/02/2022 9:30	Water Elevation (mAHD)	Second breach. Continue to monitor
CFW55R	4/02/2022 10:50	Field Electrical Conductivity (µS/cm)	Second breach. Continue to monitor
BZ2A(1)	10/02/2022 12:25	Field pH (pH unit)	First breach. Continue to monitor
BZ4A(2)	10/02/2022 12:05	Field pH (pH unit)	First breach. Continue to monitor
BZ3-3	11/02/2022 9:15	Field pH (pH unit)	First breach. Continue to monitor
Appleyard Farm	18/02/2022 9:10	Field pH (pH unit)	First breach. Continue to monitor
C919(ALL)	18/02/2022 10:50	Field pH (pH unit)	First breach. Continue to monitor
GW-129	17/03/2022 11:10	Water Elevation (mAHD)	First breach. Continue to monitor
CFW55R	17/03/2022 9:30	Field Electrical Conductivity (µS/cm)	The purpose of bore CFW55R is to monitor the groundwater response to mining/recovery in Carrington and North Void Tailings Facility (NV TSF). Bore CFW55R, located approximately 50 m north of the Carrington Billabong and 80 m west of NV TSF, recorded EC declining from 10,840 µS/cm (November 2008) to 1,760 µS/cm in March 2010. EC then increased to 10,230 µS/cm in September 2018. This trend was previously identified as being caused by seepage through spoil between NV TSF and the alluvium. The seepage was reported, and management measures put in place from 2018. Since 2018, EC has fluctuated but shows a decline to 7,550 µS/cm in March 2022. Although above the trigger level of 6,154 µS/cm, readings have remained below the highest historical reading of10,840 µS/cm recorded in November 2008.
CFW57	18/03/2022 10:25	Water Elevation (mAHD)	The purpose of bore CFW57 is monitoring of the groundwater response to mining/recovery in Carrington and the NV TSF. Groundwater levels in bore CFW57 have gradually increased since February 2020 with a sharp increase in November 2021 in response to above average rainfall during the reporting period.

Site	Date	Trigger Limit Breached	Response Action
GW106	24/03/2022 8:45	Field pH (pH unit)	First breach. Continue to monitor

4 Blasting

HVO maintains a network of blast monitoring units located at nearby privately owned residences and function as regulatory compliance monitors. The location of these monitors can be found in **Figure 78**. Blasting criteria for HVO are summarised in **Table 4**.

Table 4 - Blasting Criteria

Airblast Overpressure (dBL)	Comments
115	5% of the total number of blasts in a 12-month period
120	0% of blasts
Ground Vibration (mm/s)	**Comments**
5	5% of the total number of blasts in a 12-month period
10	0% of blasts

4.1 Blast Monitoring Results

Seventeen (17) blasts were initiated at HVO during the reporting period. Blast monitoring results for the period are shown in **Table 5** and **Table 6.**

Table 5 - Overpressure Blast Monitoring Results for the reporting period

Date and Time	Moses Crossing (dBL)	Jerrys Plains Village (dBL)	Maison Dieu (dBL)	Warkworth (dBL)	Knodlers Lane (dBL)
1/03/2022 13:41	105.35	104.02	103.73	86.96	104.81
1/03/2022 13:43	109.54	104.3	105.97	83.82	104.58
3/03/2022 13:31	98.01	89.41	102.21	95.08	103.43
7/03/2022 16:22	92.91	95.5	96.65	86.42	96.37
11/03/2022 13:00	94.14	91.73	87.76	83.01	103.56
12/03/2022 14:56	94.29	106.03	101.58	94.95	97.77
15/03/2022 13:04	94.02	107	102.02	93.56	104.72
16/03/2022 14:01	96.36	99.82	90.65	102.75	103.55
19/03/2022 15:02	90.95	90.96	106.16	89.72	99.58
19/03/2022 15:03	93.04	87.98	98.79	86.77	101.31
21/03/2022 13:04	93.92	104.79	95.94	86.39	106.07
21/03/2022 15:01	101.37	89.35	89.34	91.14	97.04
24/03/2022 13:44	99.94	99.21	100.62	93.51	87.61
24/03/2022 13:45	101.29	101.31	97.61	87.86	93.39
25/03/2022 13:01	97.25	102.58	101.29	86.2	103.14
25/03/2022 14:33	98.31	94.66	85.9	88.24	83.73
26/03/2022 8:54	107.41	104.14	87.65	91.1	88.66

Table 6 - Ground Vibration Blast Monitoring Results for the reporting period

Date and Time	Moses Crossing (mm/s)	Jerrys Plains Village (mm/s)	Maison Dieu (mm/s)	Warkworth (mm/s)	Knodlers Lane (mm/s)
1/03/2022 13:41	0.1	0.02	0.05	0.13	0.08
1/03/2022 13:43	0.11	0.02	0.06	0.12	0.09
3/03/2022 13:31	0.17	0.17	0.11	0.87	0.11
7/03/2022 16:22	0.09	0.02	0.05	0.24	0.08
11/03/2022 13:00	0.11	0.02	0.04	0.23	0.08
12/03/2022 14:56	0.19	0.08	0.38	0.57	0.46
15/03/2022 13:04	0.15	0.05	0.36	0.96	0.49
16/03/2022 14:01	0.26	0.08	0.29	0.96	0.41
19/03/2022 15:02	0.14	0.03	0.23	0.72	0.36
19/03/2022 15:03	0.1	0.02	0.06	0.25	0.08
21/03/2022 13:04	0.13	0.11	0.06	0.09	0.09
21/03/2022 15:01	0.1	0.02	0.06	0.37	0.08
24/03/2022 13:44	0.16	0.05	0.32	0.97	0.25
24/03/2022 13:45	0.1	0.02	0.06	0.24	0.08
25/03/2022 13:01	0.12	0.05	0.07	0.14	0.08
25/03/2022 14:33	0.36	0.09	0.09	0.31	0.09
26/03/2022 8:54	0.19	0.06	0.17	0.89	0.19

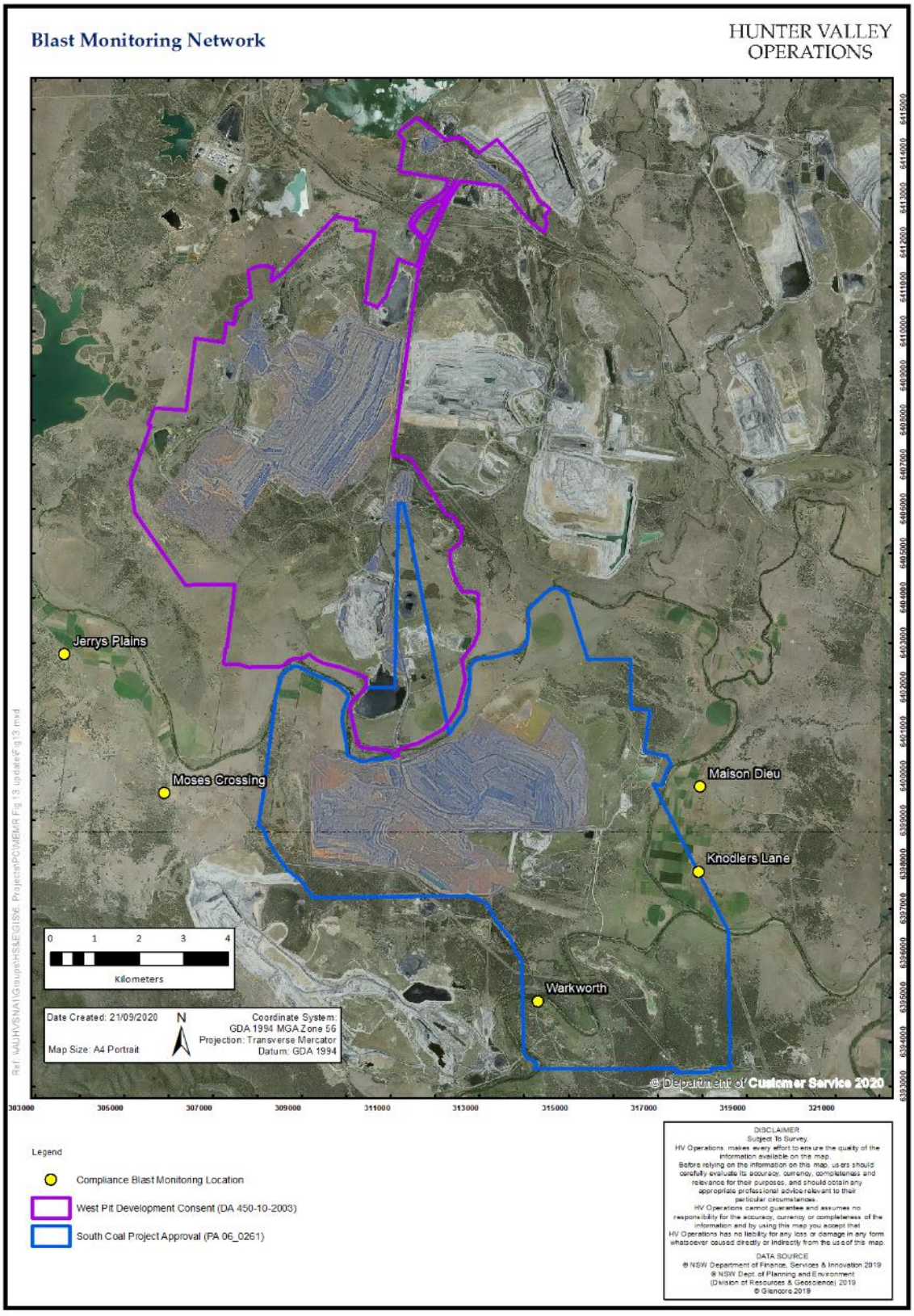


Figure 78 - Blast Monitoring Location Plan

5 Noise

Routine attended noise monitoring occurs at defined locations around HVO, as described in the HVO Noise Monitoring Program. The noise monitoring aims to quantify and describe the acoustic environment around the site and compare results with specified limits. The attended noise monitoring locations are displayed in **Figure 79**.

5.1 Attended Noise Monitoring Results

Attended monitoring was conducted at receiver locations around HVO during the night period of 10 and 17 March 2022.

Monitoring results are detailed in **Table 7** to **Table 11.**

Table 7 - LAeq,15minute HVO North Against Impact Assessment Criteria for the Reporting Period

Location	Date and Time	Wind Speed (m/s)[1]	Stability Class	Criterion (A)	Criterion Applies[2]	HVO North L_{Aeq} [3,4,5,6,]	Exceedance[4,5]
Shearers Lane	*17/03/2022 21:00*	1.1	E	35	Yes	IA	Nil
Knodlers Lane	*17/03/2022 21:45*	0.9	E	35	Yes	IA	Nil
Maison Dieu	*17/03/2022 21:23*	1.5	D	35	Yes	IA	Nil
Long Point (Dights Crossing)	*17/03/2022 22:37*	0.8	D	35	Yes	IA	Nil
Kilburnie South	*17/03/2022 23:17*	0.5	E	39	Yes	<30	Nil
Jerrys Plains East	*17/03/2022 22:56*	0.6	E	39	Yes	<30	Nil
Jerrys Plains Village	*17/03/2022 21:31*	1.5	D	40	Yes	<30	Nil
Jerrys Plains West	*17/03/2022 21:07*	1.4	E	40	Yes	<30	Nil
HVGC	*17/03/2022 23:43*	0.1	D	NA	Yes	IA	Nil
Kilburnie South	*10/03/2022 21:04*	2.2	E	39	Yes	IA	Nil
Jerrys Plains East	*10/03/2022 21:24*	1.3	D	39	Yes	IA	Nil
Jerrys Plains Village	*10/03/2022 21:46*	1.6	D	40	Yes	IA	Nil

1. Atmospheric data is sourced from the HVO Corporate AWS using logged meteorological data;

2. Noise criteria apply under all meteorological conditions except during periods of rain or hail, wind speeds greater than 3 m/s measured at 10 metres above ground level, or temperature inversion conditions greater than 3°C/100m (G stability class);

3. Site-only L_{Aeq} 15 minute attributed to HVO North Pit Area, including modifying factors if applicable;

4. Bold results in red indicate exceedance of criterion;

5. NA in criterion column indicates no criterion is applicable at this location. NA in exceedance column means atmospheric conditions outside specified in approval therefore criterion not applicable;

Table 8 - LAeq,15minute HVO North Against Land Acquisition Criteria for the Reporting Period

Location	Date and Time	Wind Speed (m/s)[1]	Stability Class	Criterion (A)	Criterion Applies[2]	HVO North L_{Aeq} [3,4,6,]	Exceedance[4,5]
Shearers Lane	*17/03/2022 21:00*	1.1	E	41	Yes	IA	Nil
Knodlers Lane	*17/03/2022 21:45*	0.9	E	41	Yes	IA	Nil
Maison Dieu	*17/03/2022 21:23*	1.5	D	41	Yes	IA	Nil
Long Point (Dights Crossing)	*17/03/2022 22:37*	0.8	D	41	Yes	IA	Nil
Kilburnie South	*17/03/2022 23:17*	0.5	E	41	Yes	<30	Nil
Jerrys Plains East	*17/03/2022 22:56*	0.6	E	41	Yes	<30	Nil
Jerrys Plains Village	*17/03/2022 21:31*	1.5	D	41	Yes	<30	Nil
Jerrys Plains West	*17/03/2022 21:07*	1.4	E	41	Yes	<30	Nil
HVGC	*17/03/2022 23:43*	0.1	D	NA	Yes	IA	Nil
Kilburnie South	*10/03/2022 21:04*	2.2	E	41	Yes	IA	Nil
Jerrys Plains East	*10/03/2022 21:24*	1.3	D	41	Yes	IA	Nil
Jerrys Plains Village	*10/03/2022 21:46*	1.6	D	41	Yes	IA	Nil

1. Atmospheric data is sourced from the HVO Corporate AWS using logged meteorological data;

2. Noise criteria apply under all meteorological conditions except during periods of rain or hail, wind speeds greater than 3 m/s measured at 10 metres above ground level, or temperature inversion conditions greater than 3°C/100m (G stability class);

3. Site-only LAeq,15minute attributed to HVO North Pit Area, including modifying factors if applicable;

4. Bold results in red indicate exceedance of criterion; and

5. NA in criterion column indicates no criterion is applicable at this location. NA in exceedance column means atmospheric conditions outside specified in approval, therefore criterion was not applicable.

Table 9 - LA1,1minute HVO North Against Impact Assessment Criteria for the Reporting Period

Location	Date and Time	Wind Speed (m/s)[1]	Stability Class	Criterion (A)	Criterion Applies[2]	HVO North L_{Aeq} [3,4,6,]	Exceedance[4,5]
Shearers Lane	*17/03/2022 21:00*	1.1	E	46	Yes	IA	Nil
Knodlers Lane	*17/03/2022 21:45*	0.9	E	46	Yes	IA	Nil
Maison Dieu	*17/03/2022 21:23*	1.5	D	46	Yes	IA	Nil
Long Point (Dights Crossing)	*17/03/2022 22:37*	0.8	D	46	Yes	IA	Nil
Kilburnie South	*17/03/2022 23:17*	0.5	E	46	Yes	<30	Nil
Jerrys Plains East	*17/03/2022 22:56*	0.6	E	46	Yes	35	Nil
Jerrys Plains Village	*17/03/2022 21:31*	1.5	D	46	Yes	33	Nil
Jerrys Plains West	*17/03/2022 21:07*	1.4	E	46	Yes	<30	Nil
HVGC	*17/03/2022 23:43*	0.1	D	NA	Yes	IA	Nil
Kilburnie South	*10/03/2022 21:04*	2.2	E	46	Yes	IA	Nil
Jerrys Plains East	*10/03/2022 21:24*	1.3	D	46	Yes	IA	Nil
Jerrys Plains Village	*10/03/2022 21:46*	1.6	D	46	Yes	IA	Nil

1. Atmospheric data is sourced from the HVO Corporate AWS using logged meteorological data;

2. Noise criteria apply under all meteorological conditions except during periods of rain or hail, wind speeds greater than 3 m/s measured at 10 metres above ground level, or temperature inversion conditions greater than 3°C/100m (G stability class);

3. Site-only LA1,1minute attributed to HVO North Pit Area;

4. Bold results in red indicate exceedance of criterion; and

5. NA in criterion column indicates no criterion is applicable at this location. NA in exceedance column means atmospheric conditions outside specified in approval, therefore criterion was not applicable.

Table 10 - LAeq,15minute HVO South Against Impact Assessment Criteria for the Reporting Period

Location	Date and Time	Wind Speed (m/s)[1]	Stability Class	Criterion (A)	Criterion Applies[2]	HVO South L_{Aeq} [3,4,6,]	Exceedance[4,5]
Shearers Lane	*17/03/2022 21:00*	2.9	E	41	Yes	IA	Nil
Knodlers Lane	*17/03/2022 21:45*	3	E	40	No	IA	NA
Maison Dieu	*17/03/2022 21:23*	3.8	D	39	No	IA	NA
Long Point (Dights Crossing)	*17/03/2022 22:37*	3.6	E	37	No	IA	NA
Kilburnie South	*17/03/2022 23:17*	2.8	E	39	Yes	IA	Nil
Jerrys Plains East	*17/03/2022 22:56*	2.9	E	38	Yes	<30	Nil
Jerrys Plains Village	*17/03/2022 21:31*	3.8	D	35	No	IA	NA
Jerrys Plains West	*17/03/2022 21:07*	3.1	D	35	No	IA	NA
HVGC	*17/03/2022 23:43*	3.1	E	55	No	IA	NA

1. Atmospheric data is sourced from the HVO Cheshunt AWS using logged meteorological data;

2. Noise criteria apply under meteorological conditions of wind speeds up to 3 m/s measured at 10 metres above ground level and temperature inversion conditions of up to 3°C/100m (G stability class);

3. Site-only LAeq,15minute attributed to HVO South Pit Area, including modifying factors if applicable;

4. Bold results in red indicate exceedance of criterion; and

5. NA in criterion column indicates no criterion is applicable at this location. NA in exceedance column means atmospheric conditions outside specified in approval, therefore criterion was not applicable.

Table 11 - LA1,1minute HVO South Against Impact Assessment Criteria for the Reporting Period

Location	Date and Time	Wind Speed (m/s)[1]	Stability Class	Criterion (A)	Criterion Applies[2]	HVO South L_{Aeq} [3,4,6,7]	Exceedance[4,5]
Shearers Lane	*17/03/2022 21:00*	2.9	E	45	Yes	IA	Nil
Knodlers Lane	*17/03/2022 21:45*	3	E	45	No	IA	NA
Maison Dieu	*17/03/2022 21:23*	3.8	D	45	No	IA	NA
Long Point (Dights Crossing)	*17/03/2022 22:37*	3.6	E	45	No	IA	NA
Kilburnie South	*17/03/2022 23:17*	2.8	E	45	Yes	IA	Nil
Jerrys Plains East	*17/03/2022 22:56*	2.9	E	45	Yes	31	Nil
Jerrys Plains Village	*17/03/2022 21:31*	3.8	D	45	No	IA	NA
Jerrys Plains West	*17/03/2022 21:07*	3.1	D	45	No	IA	NA
HVGC	*17/03/2022 23:43*	3.1	E	NA	No	IA	NA

1. Atmospheric data is sourced from the HVO Cheshunt AWS using logged meteorological data;

2. Noise criteria apply under all meteorological conditions except during periods of rain or hail, wind speeds greater than 3 m/s measured at 10 metres above ground level, stability category F conditions and wind speeds greater than 2 m/s measured at 10m above ground level, or stability category G conditions;

3. Site-only LA1,1minute attributed to HVO;

4. Bold results in red indicate exceedance of criterion; and

5. NA in criterion column indicates no criterion is applicable at this location. NA in exceedance column means atmospheric conditions outside specified in approval, therefore criterion was not applicable.

5.2 Low Frequency Assessment

In accordance with the requirements of the EPA's Noise Policy for Industry (NPfI), the applicability of the low frequency modification penalty has been assessed. No penalties were applied for monitoring undertaken through the reporting period. The assessments for the low frequency noise are shown in **Table 12** and **Table 13**.

Table 12 - Modifying Factor Assessment HVO North for the Reporting Period

Location	Date and Time	Measured HVO North L_{Aeq}	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?	Frequency of Tonality[1]	Low-frequency Modifying Factor?	Maximum Exceedance of NPfI Reference Spectrum[1,2]	Total Penalty [2]
Shearers Lane	*17/03/2022 21:00*	IA	Yes	No	No	NA	No	NA	Nil
Knodlers Lane	*17/03/2022 21:45*	IA	Yes	No	No	NA	No	NA	Nil
Maison Dieu	*17/03/2022 21:23*	IA	Yes	No	No	NA	No	NA	Nil
Long Point (Dights Crossing)	*17/03/2022 22:37*	IA	Yes	No	No	NA	No	NA	Nil
Kilburnie South	*17/03/2022 23:17*	<30	Yes	No	No	NA	No	NA	Nil
Jerrys Plains East	*17/03/2022 22:56*	<30	Yes	No	No	NA	No	NA	Nil
Jerrys Plains Village	*17/03/2022 21:31*	<30	Yes	No	No	NA	No	NA	Nil
Jerrys Plains West	*17/03/2022 21:07*	<30	Yes	No	No	NA	No	NA	Nil
HVGC	*17/03/2022 23:43*	IA	Yes	No	No	NA	No	NA	Nil
Kilburnie South	*10/03/2022 21:04*	IA	Yes	No	No	NA	No	NA	Nil
Jerrys Plains East	*10/03/2022 21:24*	IA	Yes	No	No	NA	No	NA	Nil
Jerrys Plains Village	*10/03/2022 21:46*	IA	Yes	No	No	NA	No	NA	Nil

1. NA denotes 'not applicable'; and

2. Bold results indicate that application of NPfI modifying factor/s is required

.

Table 13 - Modifying Factor Assessment HVO South for the Reporting Period

Location	Date and Time	Measured HVO South L_{Aeq}	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?	Frequency of Tonality[1]	Low-frequency Modifying Factor?	Maximum Exceedance of NPfI Reference Spectrum [1,2]	Total Penalty [2]
Shearers Lane	*17/03/2022 21:00*	IA	Yes	No	No	NA	No	NA	Nil
Knodlers Lane	*17/03/2022 21:45*	IA	No	NA	NA	NA	NA	NA	NA
Maison Dieu	*17/03/2022 21:23*	IA	No	NA	NA	NA	NA	NA	NA
Long Point (Dights Crossing)	*17/03/2022 22:37*	IA	No	NA	NA	NA	NA	NA	NA
Kilburnie South	*17/03/2022 23:17*	IA	Yes	No	No	NA	No	NA	Nil
Jerrys Plains East	*17/03/2022 22:56*	<30	Yes	No	No	NA	No	NA	Nil
Jerrys Plains Village	*17/03/2022 21:31*	IA	No	NA	NA	NA	NA	NA	NA
Jerrys Plains West	*17/03/2022 21:07*	IA	No	NA	NA	NA	NA	NA	NA
HVGC	*17/03/2022 23:43*	IA	No	NA	NA	NA	NA	NA	NA

1. NA denotes 'not applicable'; and

2. Bold results indicate that application of NPfI modifying factor/s is required

5.3 Real Time Noise Monitoring

HVO utilises a network of real-time directional noise monitors to manage noise impacts on a continuous basis, shown in **Figure 79**. Noise alarms are in place at five monitoring locations (Knodlers Lane, Maison Dieu, Jerrys Plains, Moses Crossing, and Long Point) which alert HVO staff to elevated noise levels that require investigation.

HVO investigates and responds to noise alarms with appropriate modification to operations. Changes in response to a noise alarm can include replacing equipment with alternative units, changing or relocating tasks, or shutting down equipment. It should be noted that this assessment does not compliment or conflict with attended noise monitoring detailed in **Section 5.1**. Real time monitoring data includes non-mine noise sources such as animals, road traffic and weather.

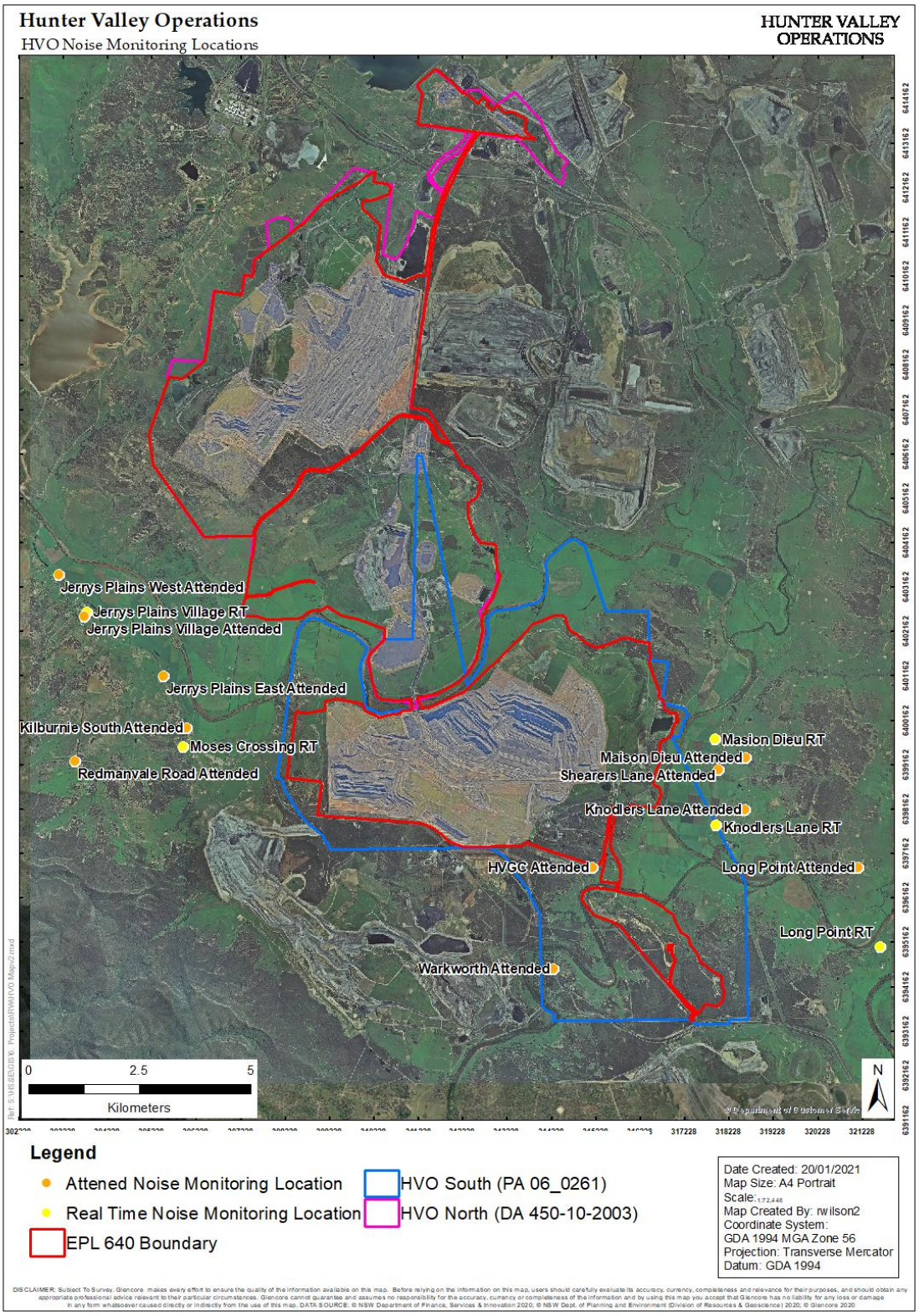


Figure 79 - Noise Monitoring Location Plan

6 Operational Downtime

A total of 27.8 hours of equipment downtime was logged in response to real time monitoring and inspections for environmental factors such as noise and dust during the reporting period. Operational downtime by equipment type is show in **Figure 80.** Note that these delays are instances where operations were completely stopped and does not include occasions where operations were changed/modified but not stopped (e.g. changed from exposed dump to in-pit dump).

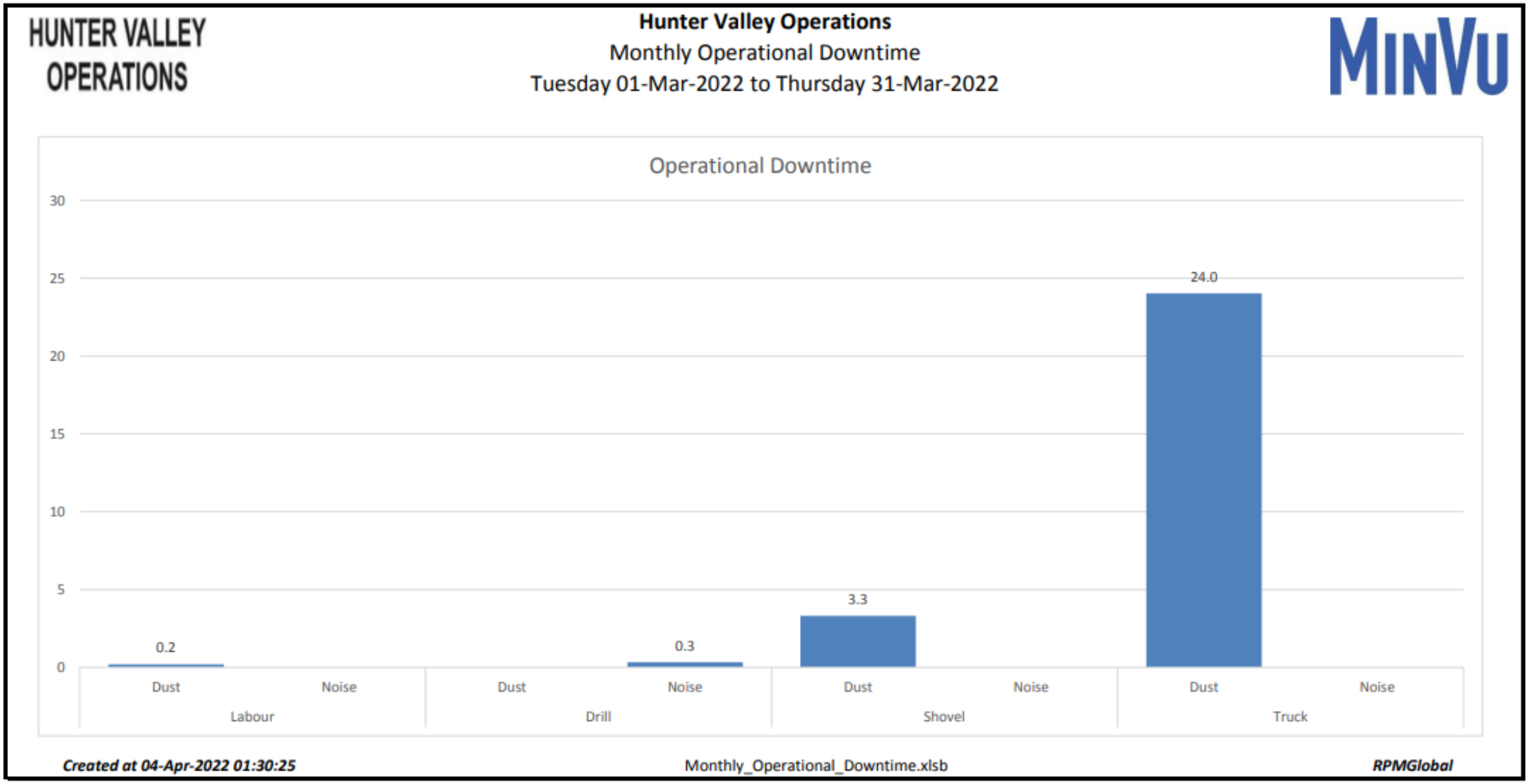


Figure 80 - Operational Downtime by Equipment Type for the reporting period

7 Rehabilitation

The following activities related to rehabilitation were completed during the reporting period:

- 6.51 Ha of land was reshaped
- 6.51 Ha of land was released (became available for the application of topsoil)
- 4.26 Ha of land was topsoiled
- 0 Ha of land was rehabilitated

Year to date progress is shown in **Figure 81**.

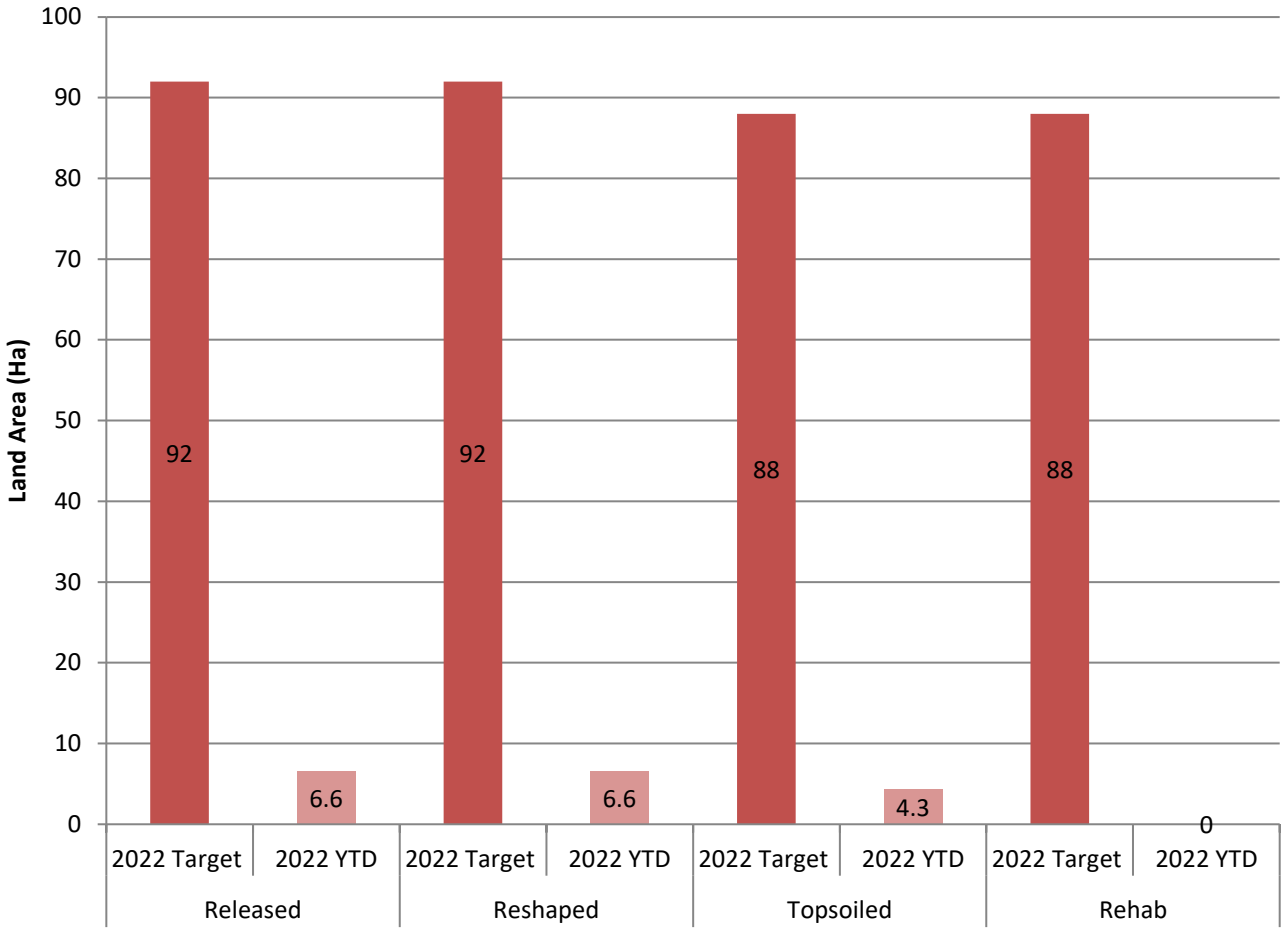


Figure 81 - Rehabilitation YTD March 2022

8 Complaints

One complaint was received during the reporting period. Details of complaints received are shown in **Table 14**.

Table 14 - Complaints Summary 2022

Month	Noise	Dust	Blast	Lighting	Other	Total
January			1			**1**
March			1			**1**
March					1	**1**
April						
May						
June						
July						
August						
September						
October						
November						
March						
Total			**2**		**1**	**3**

9 Environmental Incidents

There were two environmental incidents during the reporting period:

- **8/3/2022 – Dam 2N, 35S, 39S and 15N overflow event.**

  During consecutive rain days between 6 and 9 March 2022, Hunter Valley Operations (HVO) recorded 141.2mm and 141.6mm of rainfall at its North and South weather stations respectively. The rainfall recorded significantly exceeded the design rainfall depth for sediment dams 2N, 35S and 39S. It also exceeded the capacity of mine stormwater containment Dam 15N. It was deemed that the incident would not have caused environmental harm. The incident was notified to DPE, EPA and Resource Regulator.

- **28/3/2022 – Dam 32N (Coffeys) overflow event**

  During March, Hunter Valley Operations (HVO) recorded between 256.2mm and 265.6mm of rainfall at its North and South weather stations respectively. The rainfall recorded exceeded the capacity of the mine stormwater containment Dam 32N (Coffeys Dam) resulting in it spilling to Bayswater Creek at the HVLP. Incident reported to DPE, EPA and the Resources Regulator. Classified as a mine-water dam, samples indicate spilling water was of fresh quality receiving runoff predominantly from clean catchment. A pump has been installed and is being dewatered to Ravensworth CHPP. Spilling ceased 3 April.

Appendix A - Meteorological Data

Date	Air Temp Max (°C)	Air Temp Min (°C)	Relative Humidity (Max %)	Relative Humidity (Min %)	Solar Radiation Maximum (W/Sq. M)	Average Wind Direction (°)	Average Wind Speed (m/sec)	Rainfall (mm)
1/3/2022	24.6	10.0	109.7	73.0	1557	123.7	2.6	3
2/3/2022	27.0	10.1	109.8	62.2	1450	124.4	2.3	0.8
3/3/2022	25.0	9.7	110.3	76.4	1491	144	1.8	16.4
4/3/2022	27.4	11.8	108.7	68.3	1476	128.3	2.3	3.6
5/3/2022	28.5	11.5	109	59.2	1357	132.6	0.5	0
6/3/2022	25.3	9.5	111.1	67.9	1297	150.1	1.5	42.4
7/3/2022	25.4	10.4	111	84.8	1396	128.9	1.7	33.8
8/3/2022	20.0	9.4	110.9	76.3	286.6	207.6	1.0	60.6
9/3/2022	23.8	8.2	109.5	59.7	1418	182.7	0.6	6
10/3/2022	22.4	6.1	98.2	45.8	1463	114.1	1.1	0
11/3/2022	24.5	4.8	100	45.4	1289	114.2	1.4	0
12/3/2022	24.6	4.5	100	43.7	1216	116.2	1.6	0
13/3/2022	24.3	4.1	100	47.5	1397	127.3	0.7	0
14/3/2022	25.5	5.6	110.2	53.1	1217	136.2	1.2	0
15/3/2022	24.9	6.4	108.9	46.4	1319	119.1	1.6	0
16/3/2022	26.4	6.2	100	45.9	1245	117	1.5	0
17/3/2022	27.7	7.5	110	49.1	1025	129	0.4	0
18/3/2022	27.8	8.4	108.4	47.0	1061	113.9	1.1	0
19/3/2022	22.0	8.4	100	66.1	921	121.3	1.0	1
20/3/2022	26.0	6.2	100	42.3	1042	175	0.4	0
21/3/2022	24.7	5.6	100	39.6	1264	144.8	0.5	0
22/3/2022	30.2	4.5	100	37.8	858	218.6	0.4	0
23/3/2022	30.1	9.2	109.6	35.6	1165	206.2	2.0	15.4
24/3/2022	18.5	6.4	110	87.2	534.6	125.8	2.1	25
25/3/2022	21.8	5.6	100	72.3	1386	110.9	0.6	0.2

Date	Air Temp Max (°C)	Air Temp Min (°C)	Relative Humidity (Max %)	Relative Humidity (Min %)	Solar Radiation Maximum (W/Sq. M)	Average Wind Direction (°)	Average Wind Speed (m/sec)	Rainfall (mm)
26/3/2022	21.0	6.3	110.2	57.0	1253	115.1	1.2	20.8
27/3/2022	20.3	6.8	109.6	88.8	397.2	125.9	0.7	3.6
28/3/2022	22.9	7.6	110.9	72.9	873	152.9	0.1	1
29/3/2022	19.8	8.9	110.8	95.1	364.6	127.6	0.7	22.8
30/3/2022	23.0	8.9	108.1	74.1	991	132.6	1.8	0.6
31/3/2022	20.9	5.3	100	60.8	1263	140.4	2.4	1.2