HUNTER VALLEY OPERATIONS

Monthly Environmental Monitoring Report September 2021

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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 30th September 2021 (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 2019, 2020 and 2021 trends are shown in **Figure 1**.

Table 1 - Rainfall data for the Reporting Period

2021	Monthly Rainfall (mm)	Cumulative Rainfall (mm)
January	50.6	50.6
February	106.4	157.0
March	178.0	335.0
April	12.8	347.8
May	28.2	376
June	60.2	436.2
July	22.8	459.0
August	38.0	497.0
September	26.0	523.0

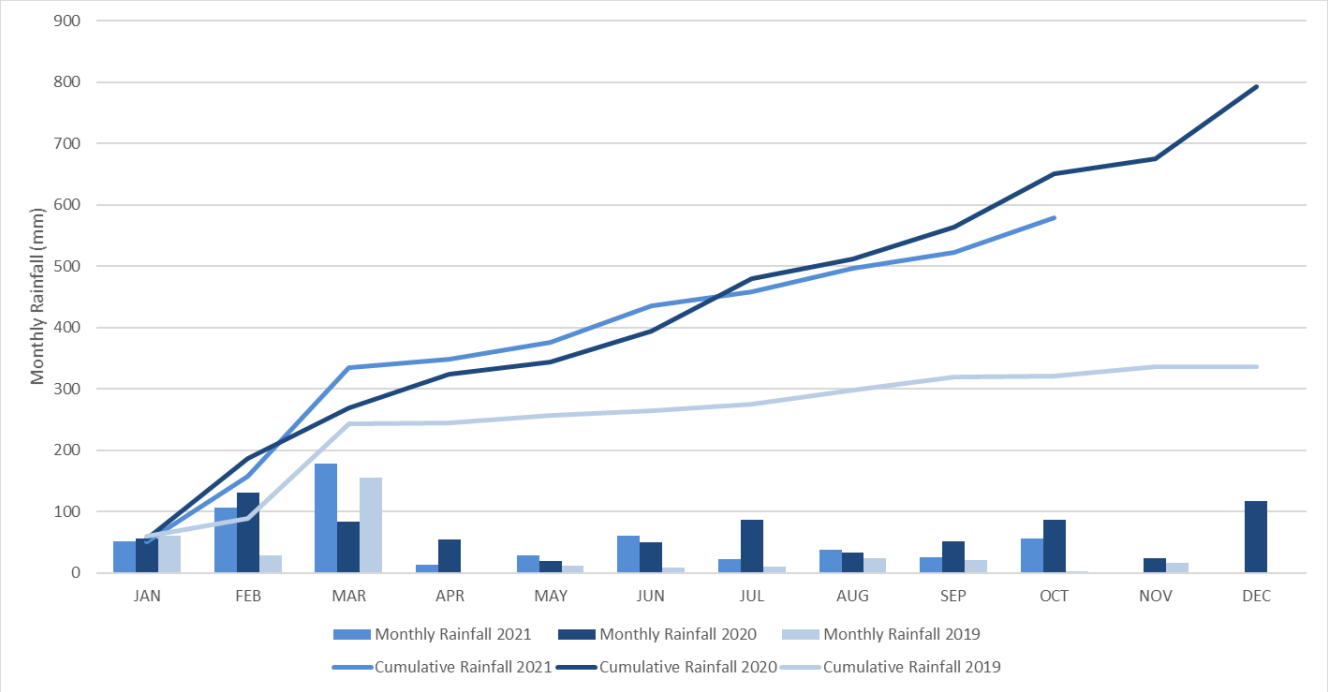


Figure 1 - Rainfall Summary 2021

2.1.2 Wind Speed and Direction

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

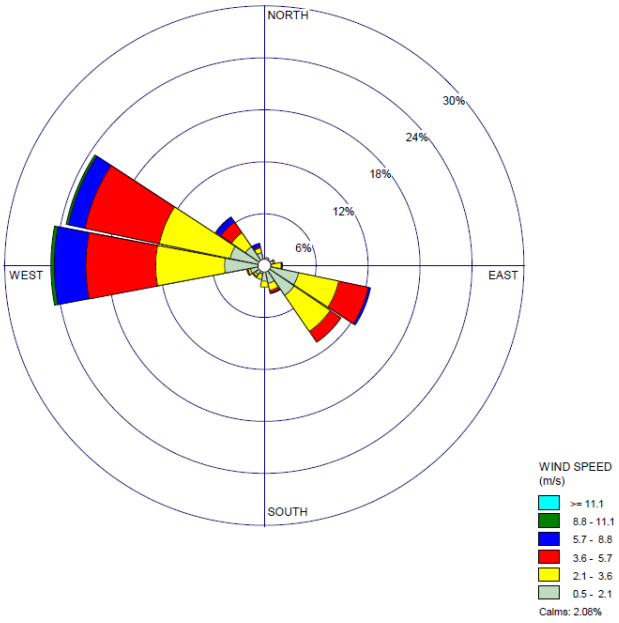


Figure 2 - HVO Corporate Wind Rose for the Reporting Period

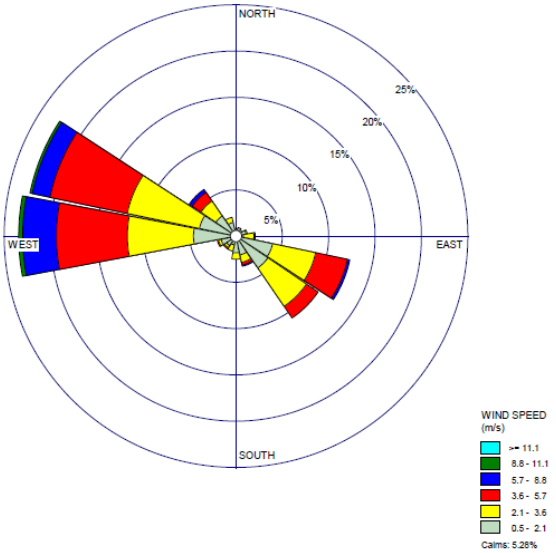


Figure 3 - HVO Cheshunt Wind Rose for the Reporting Period

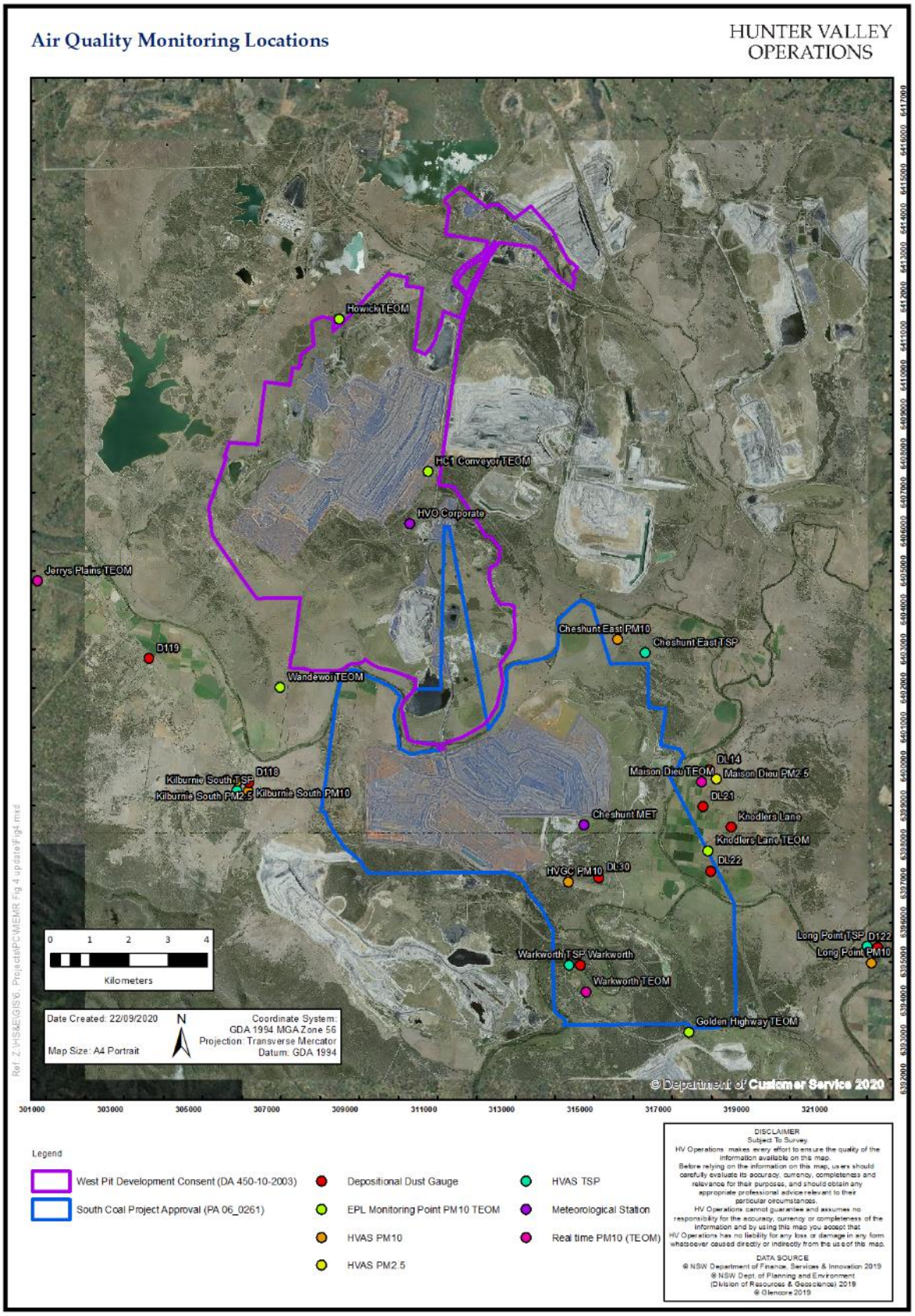


Figure 4 - Air Quality Monitoring Location Plan

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 2021 Annual Review.

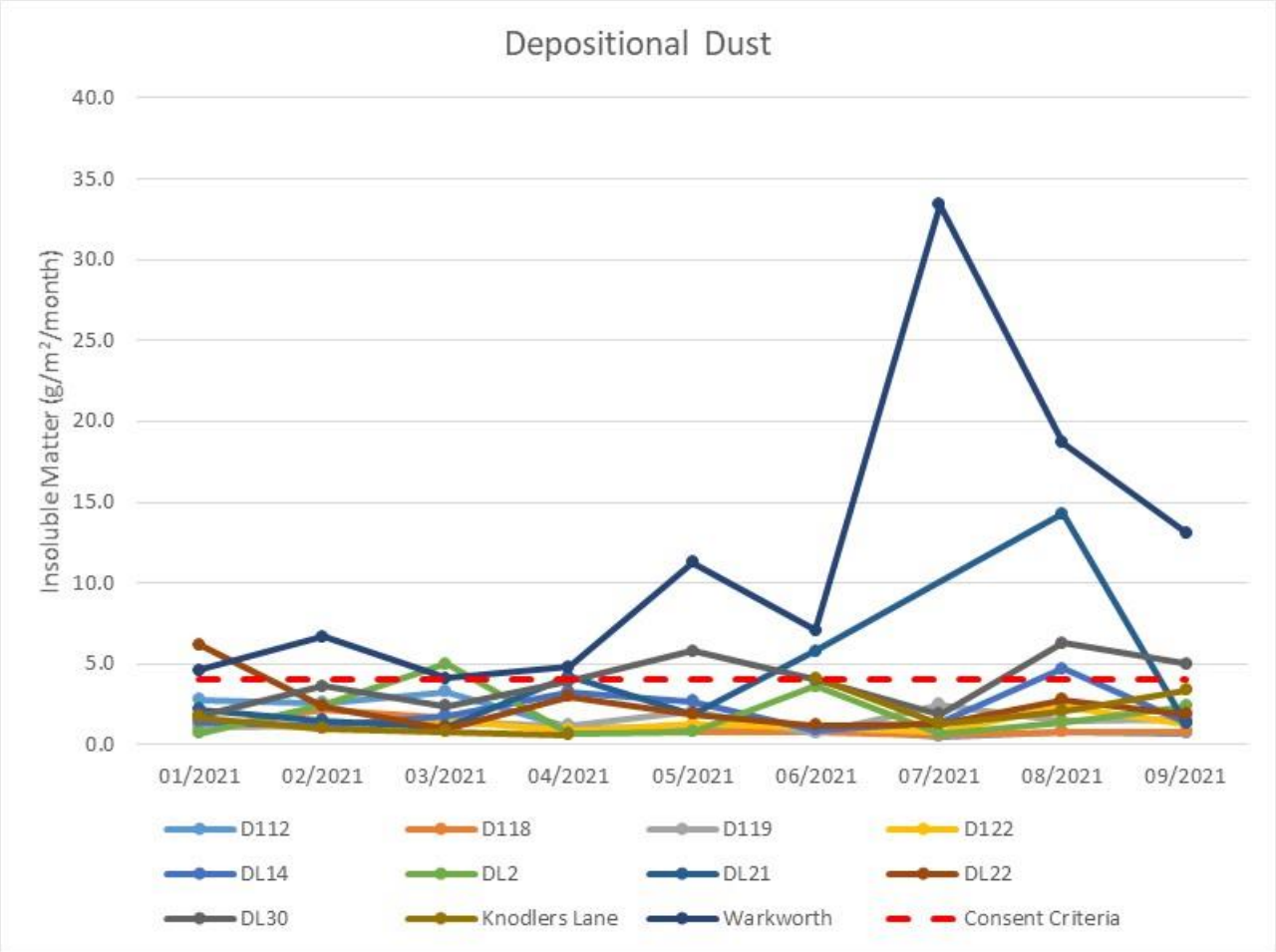


Figure 5 - Depositional Dust Results for the Reporting Period

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. Cheshunt East, Gliding Club and Long Point were above the relevant short-term impact assessment criteria during the reporting period and following investigations, it was found that the maximum calculated contribution from HVO respectively was 31.2µg/$m^{3,,}$ 48.1µg/$m^{3,}$ and 38.0µg/$m^{3,}$.

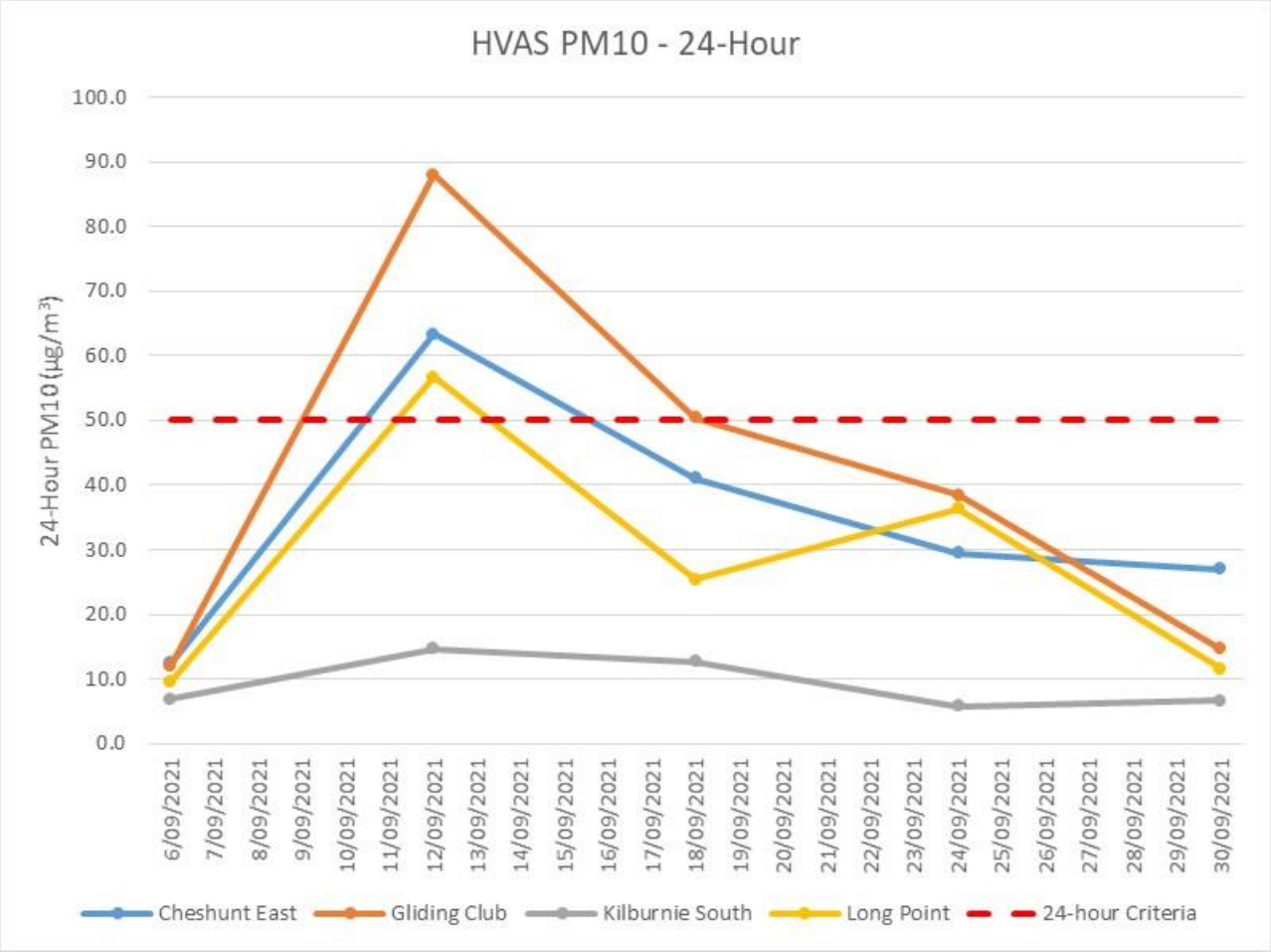


Figure 6 - Individual PM_{10} Results for the Reporting Period

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 2021 Annual Review.

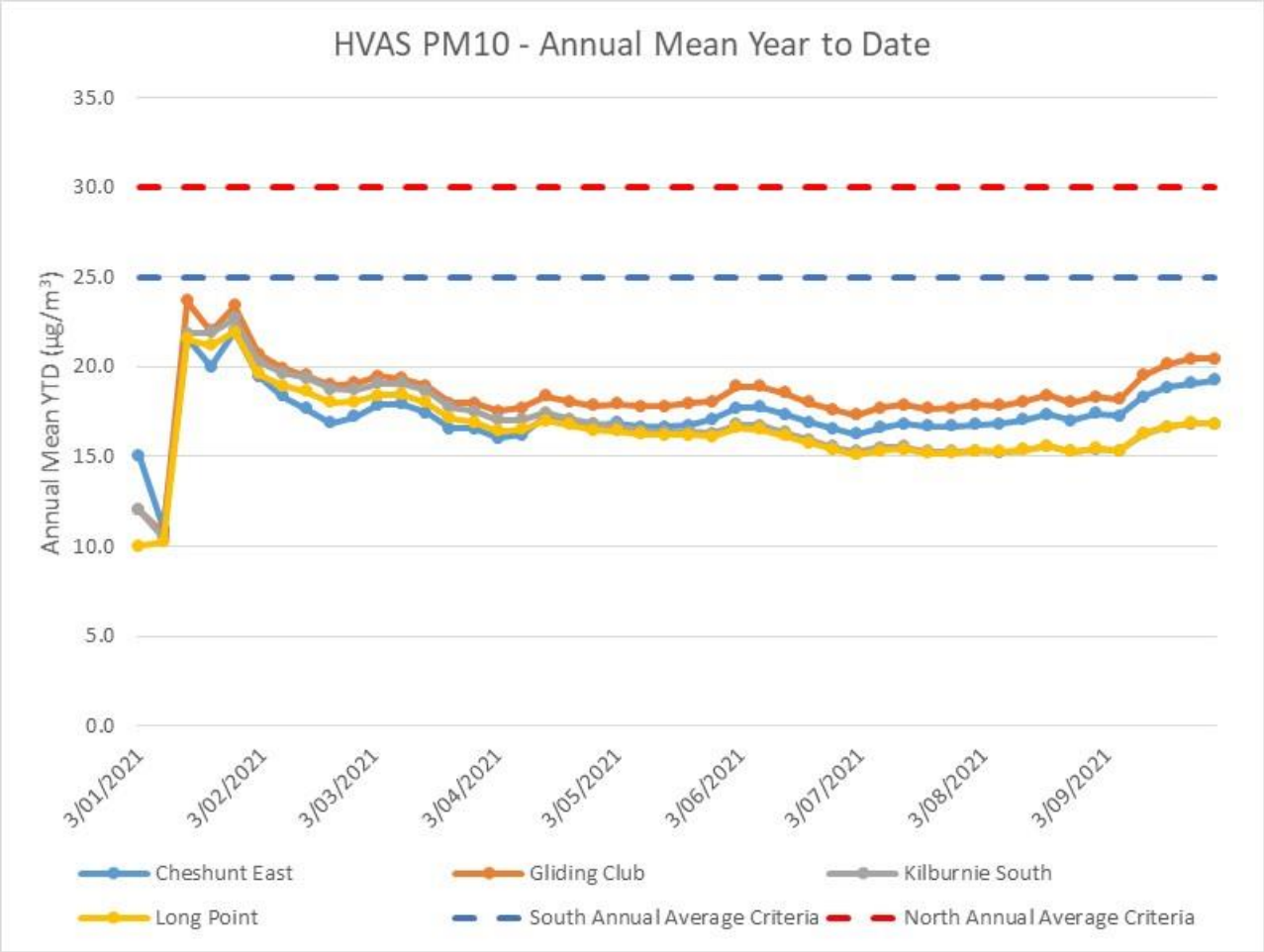


Figure 7 - Year to Date Average PM_{10} as at end of the Reporting Period

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.

The Maison Dieu monitor was above the relevant short-term impact assessment criteria during the reporting period however following an investigation, it was found that the maximum calculated contribution from HVO was 14.75 µg/m^3

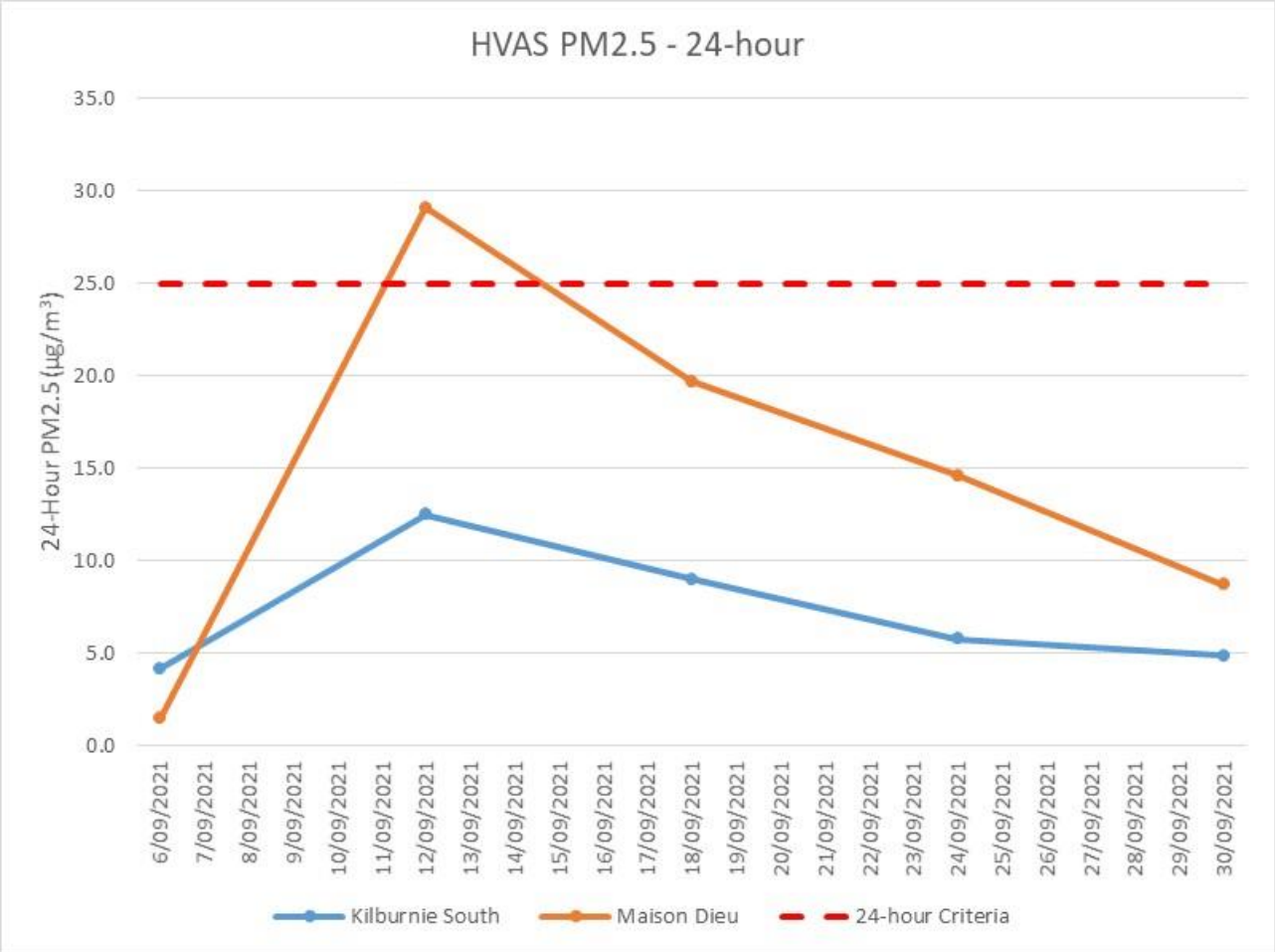


Figure 8 - Individual $PM_{2.5}$ Results for the Reporting Period

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 recorded an annual average 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 2021 Annual Review.

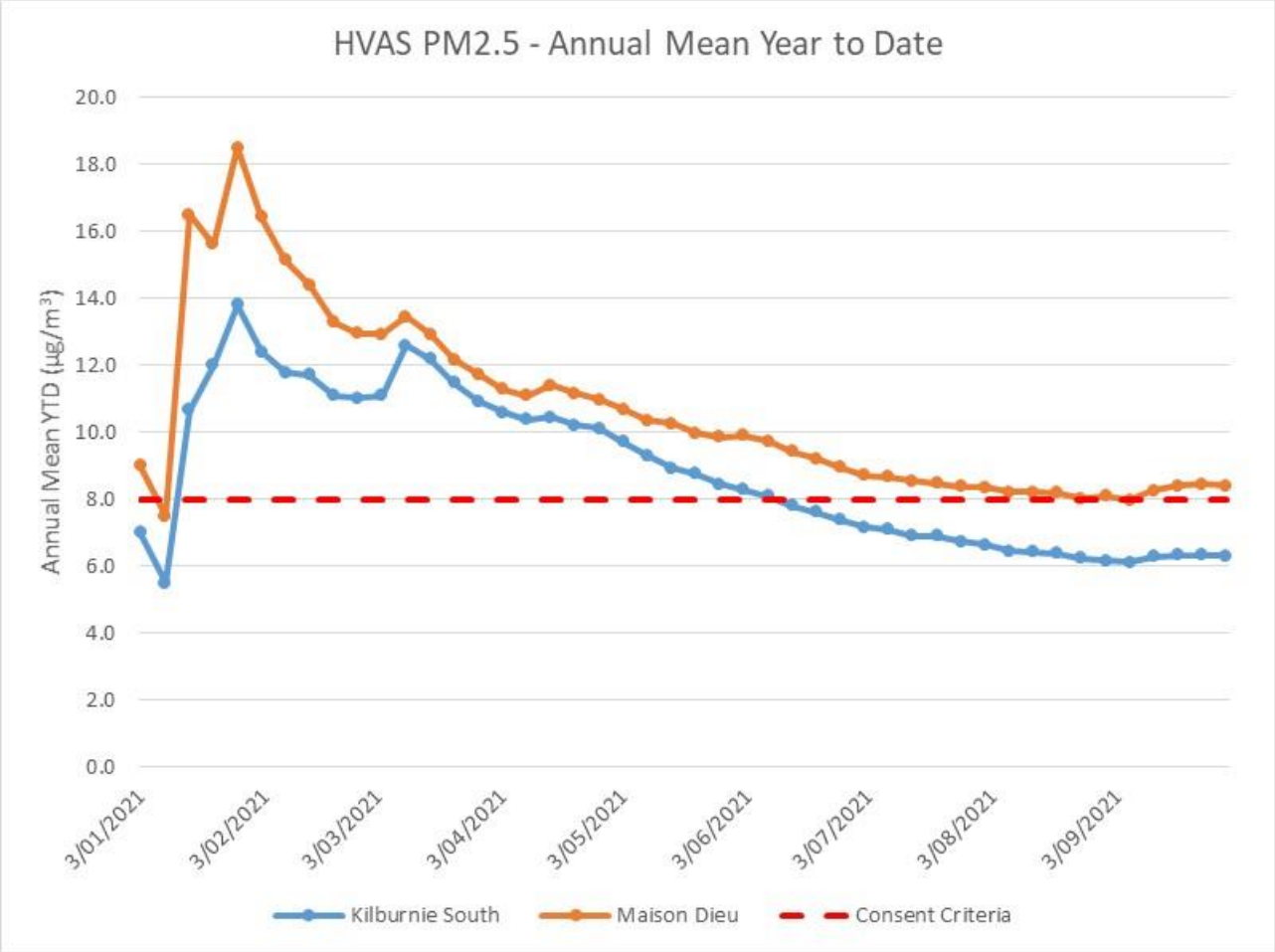


Figure 9 - Year to Date Average $PM_{2.5}$ as at end of the Reporting Period

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 2021 Annual Review.

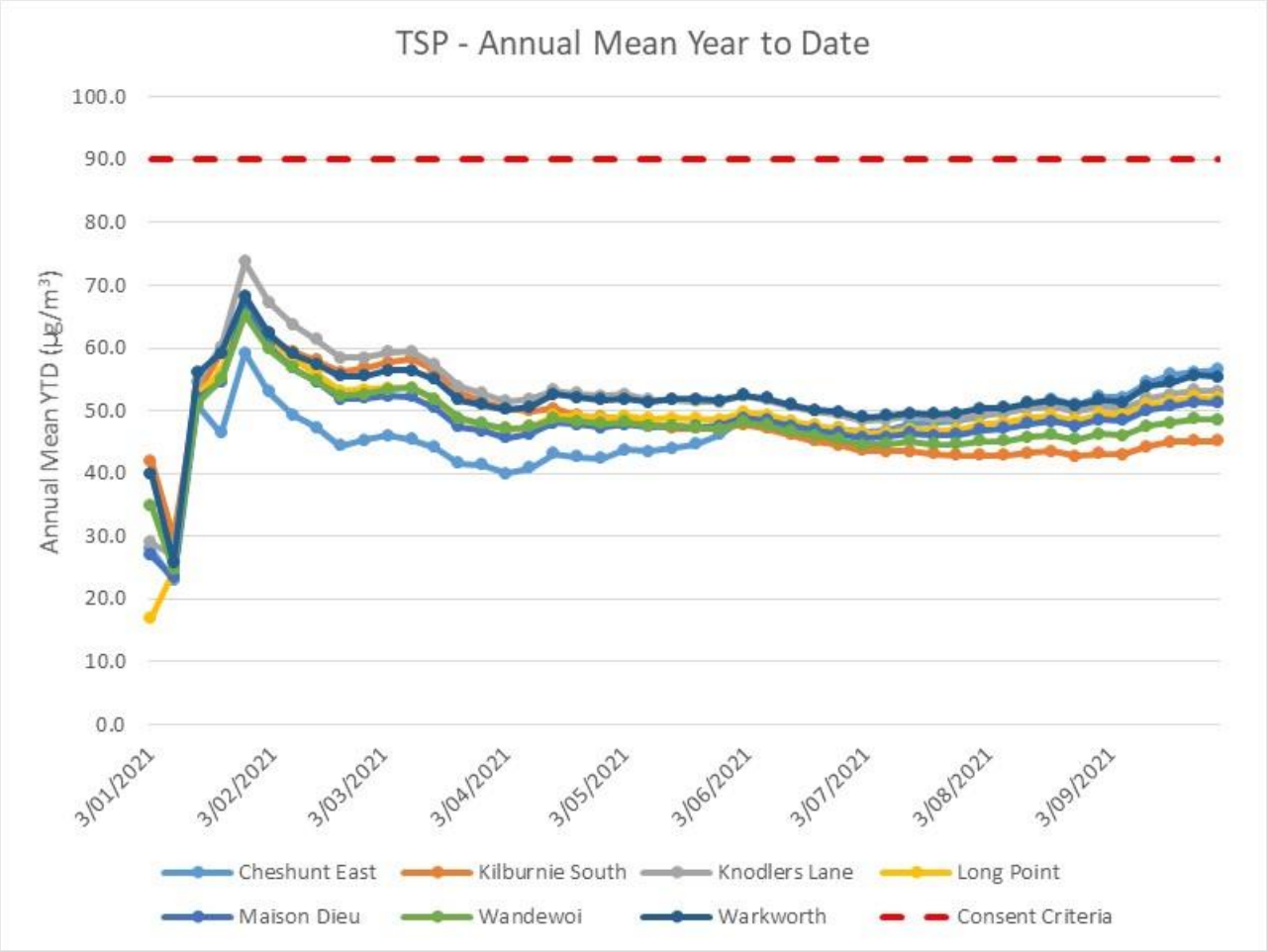


Figure 10 - Year to Date Average Total Suspended Particulates as at end of the Reporting Period

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 that the Knodlers Lane TEOM exceeded the PM10 24 hour average on 12th, 24th and 25th September and that the Warkworth TEOM exceeded the average on 12 September. These exceedances were investigated and it was found that the maximum calculated HVO contribution was below the compliance limit. The year to date annual averages for each monitoring site are shown in **Figure 12**.

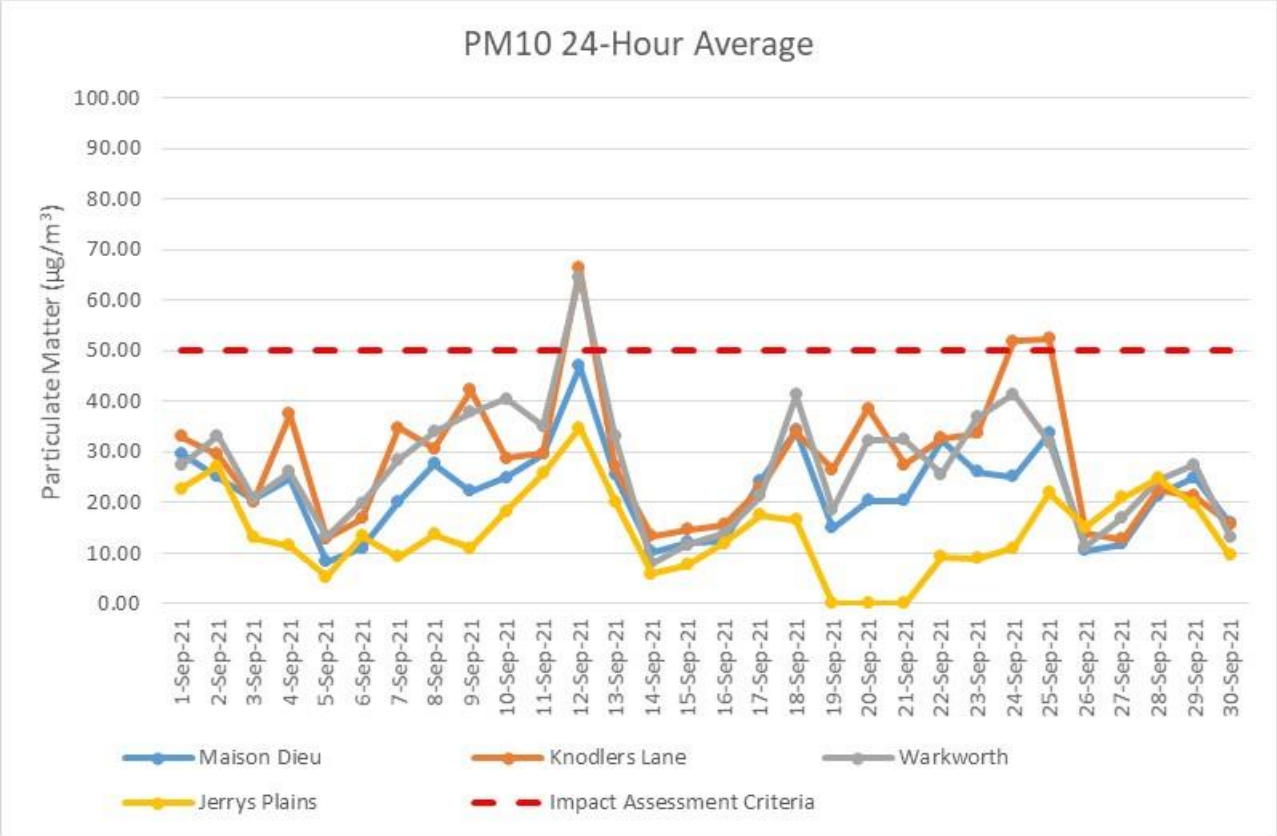


Figure 11 - Real Time PM_{10} 24hr for the Reporting Period

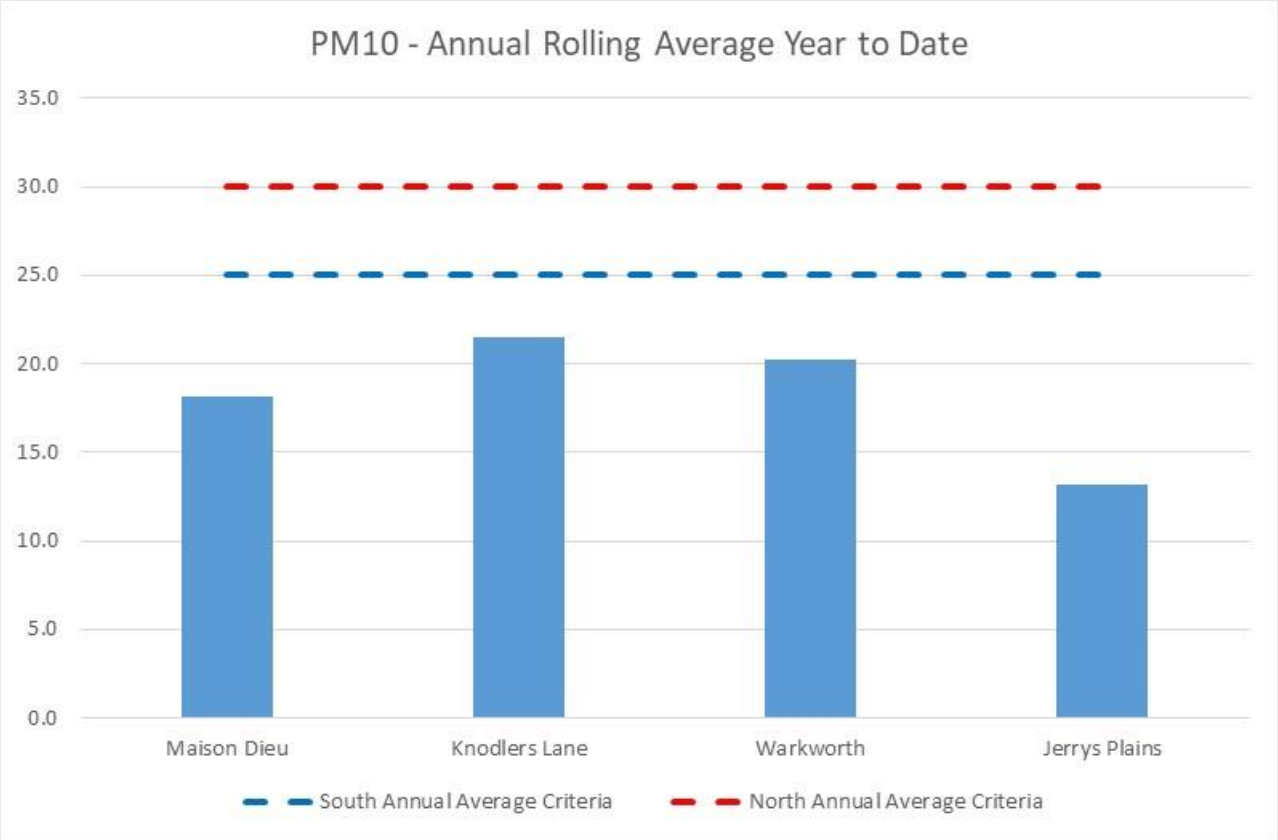


Figure 12 - Real Time PM_{10} Annual Average at the end of the Reporting Period

2.3.5 Real Time Alarms for Air Quality

The real time monitoring system generated 107 automated air quality related alarms during the reporting period. 64 alarms related to adverse weather conditions and 43 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**

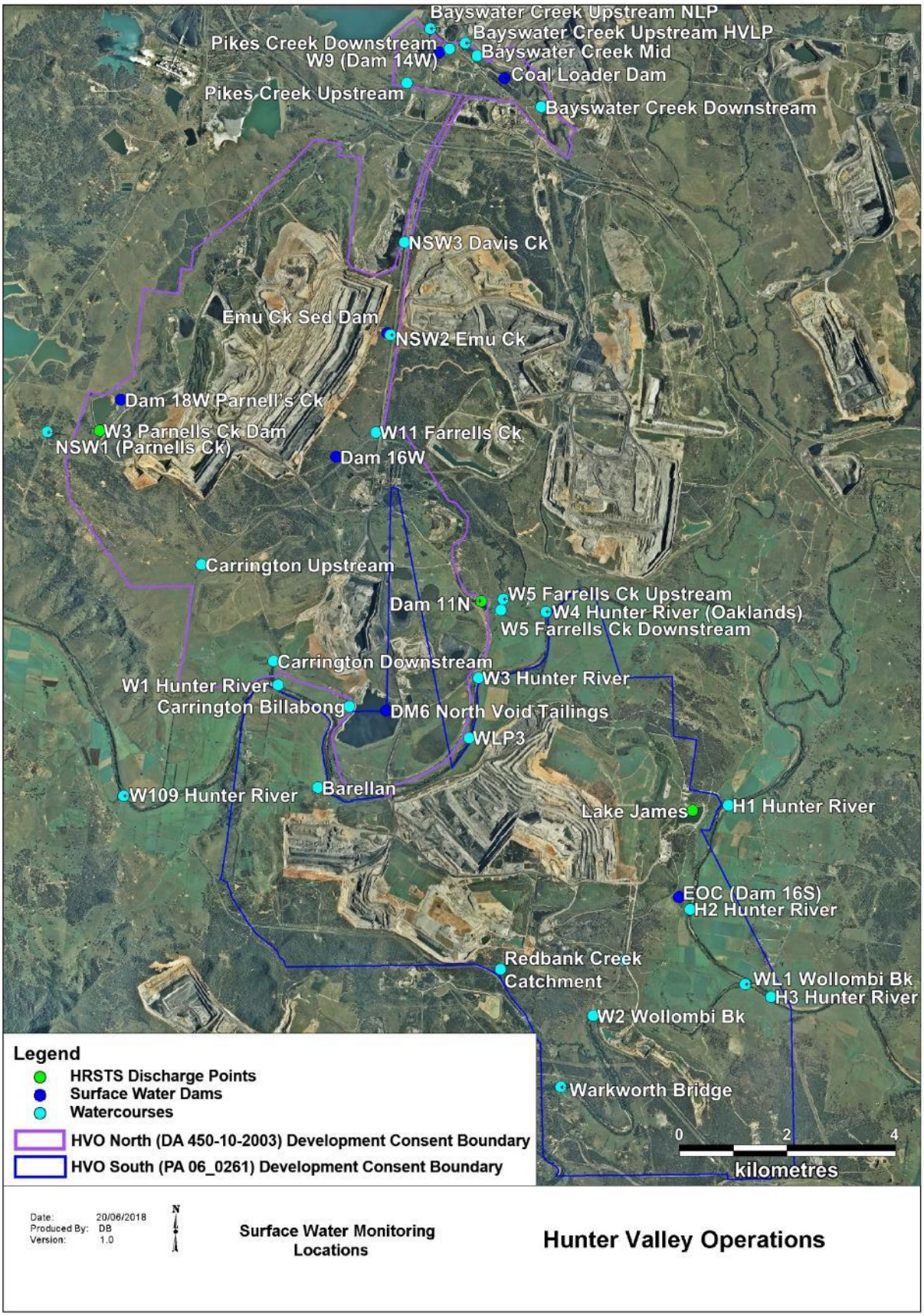


Figure 13 - HVO Surface Water Monitoring Locations

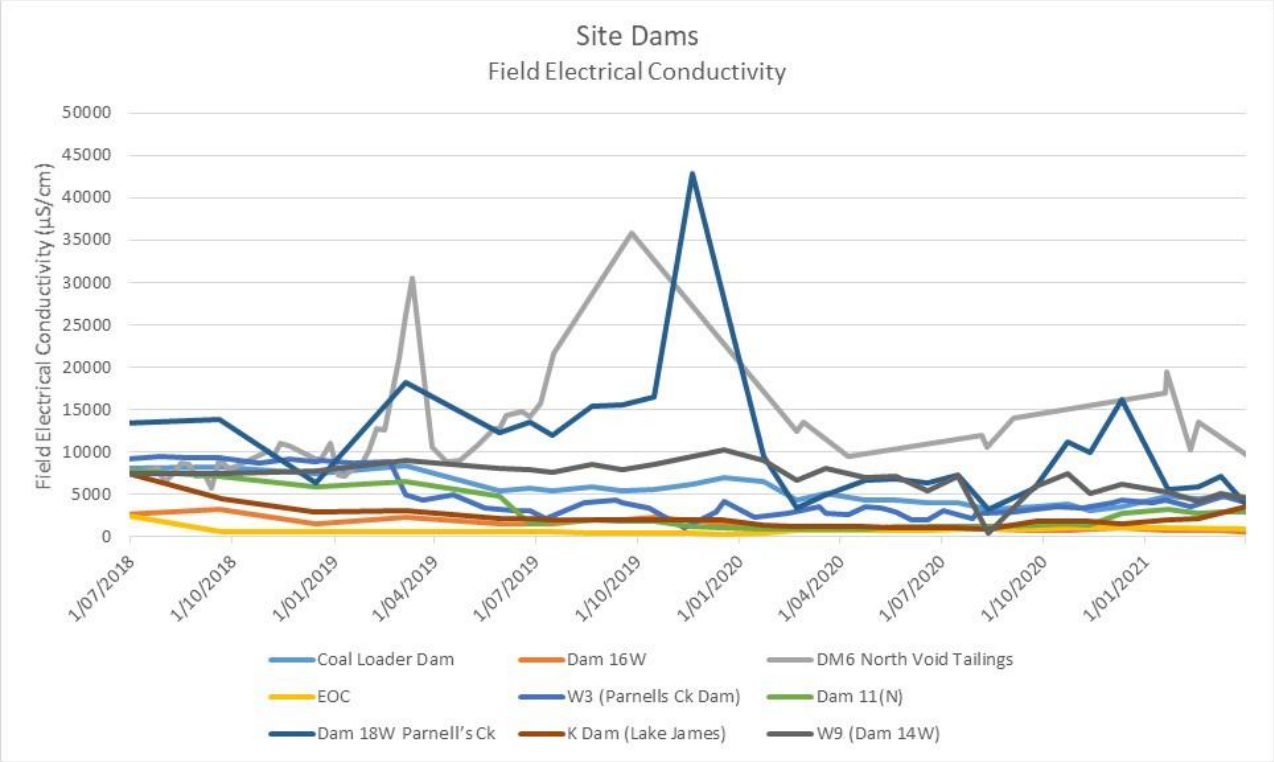


Figure 14 - Site Dams Electrical Conductivity – September 2021

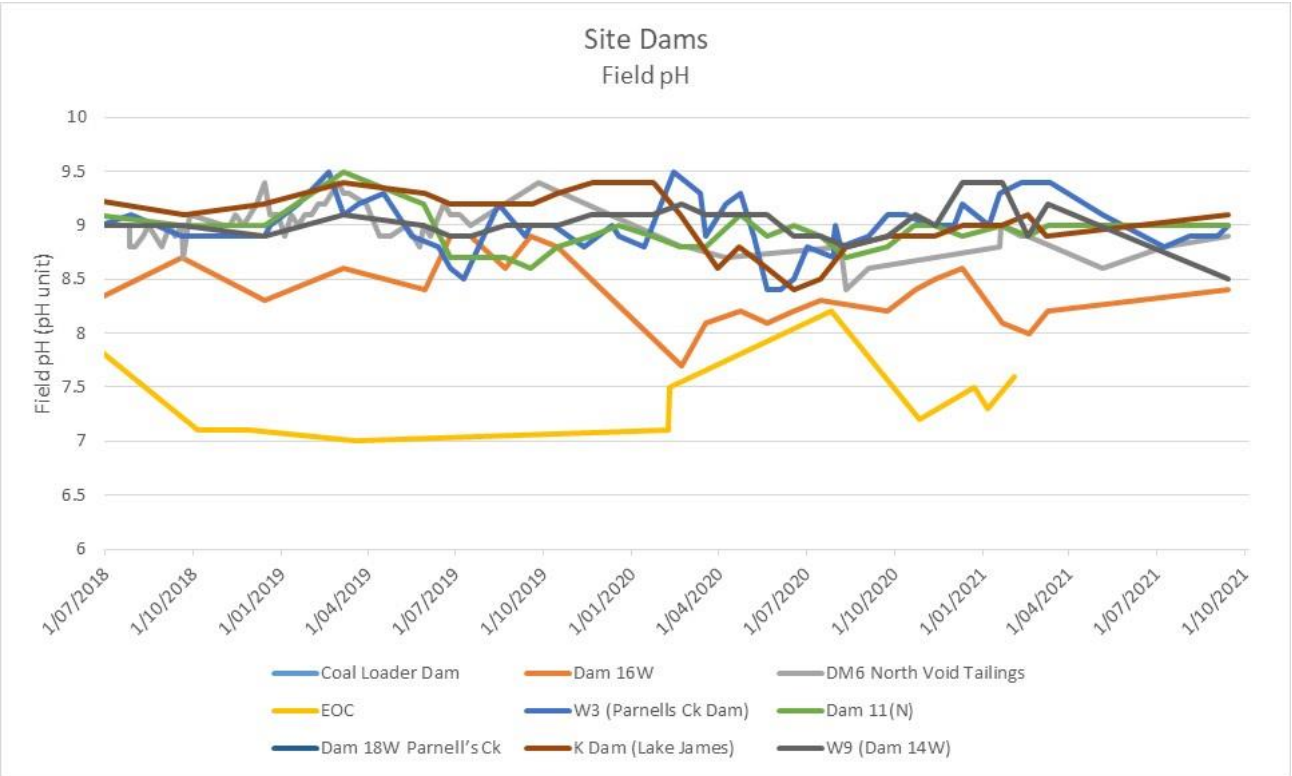


Figure 15 - Site Dams Field pH - September 2021

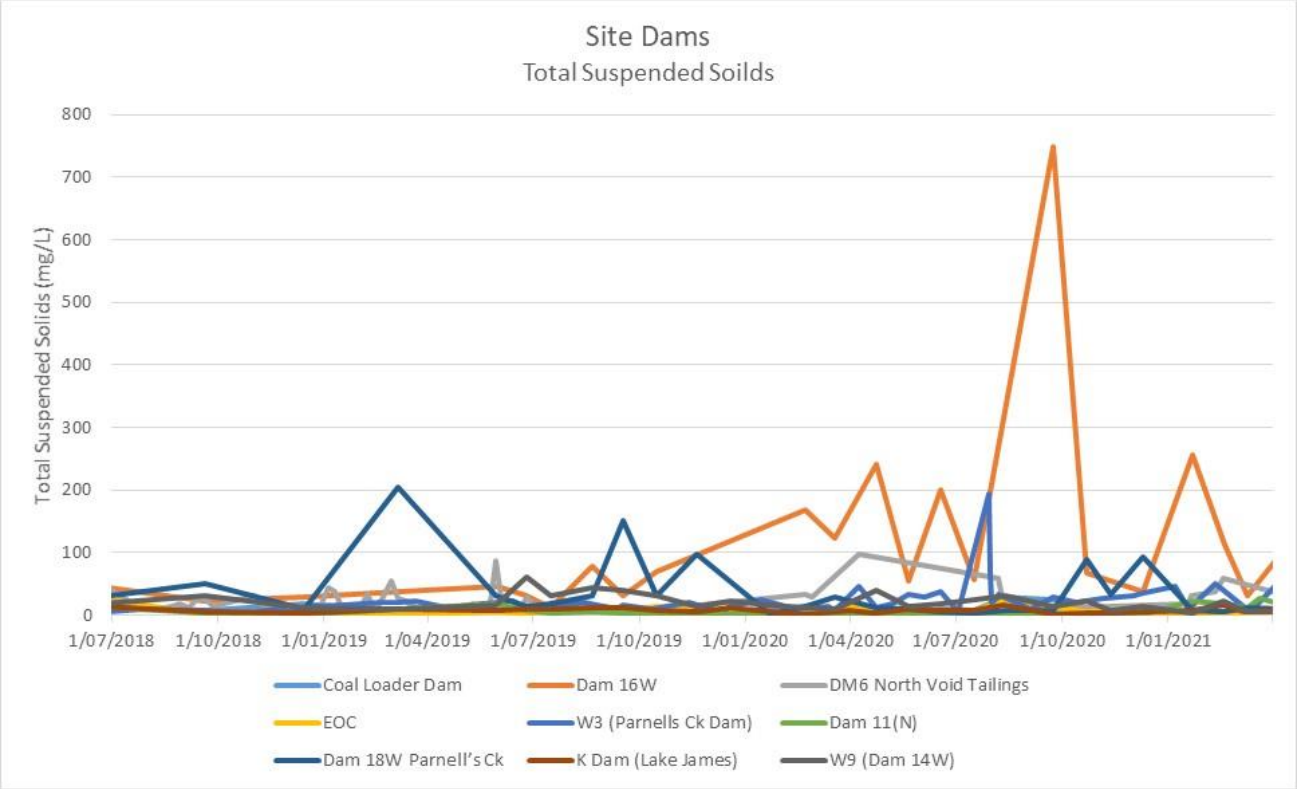


Figure 16 - Site Dams Total Suspended Solids - September 2021

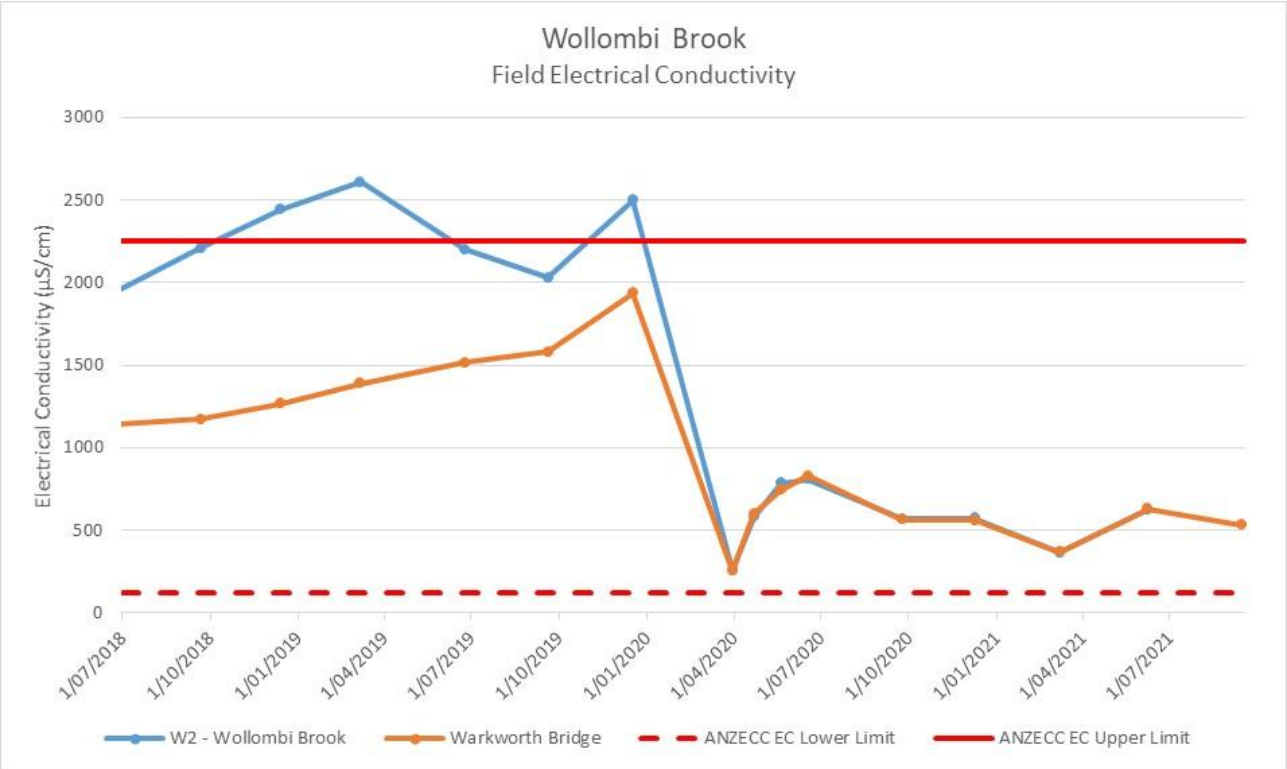


Figure 17 - Wollombi Brook Electrical Conductivity - September 2021

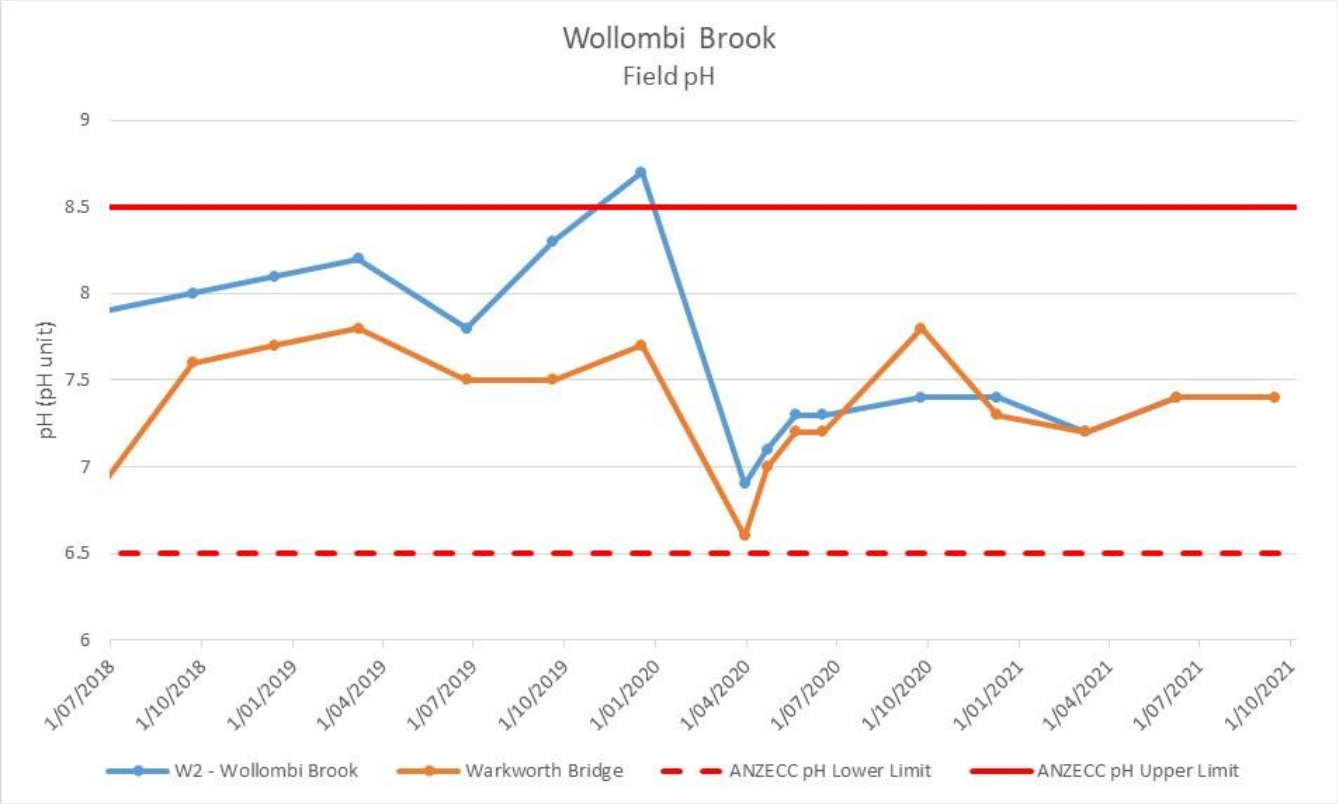


Figure 18 - Wollombi Brook Field pH – September 2021

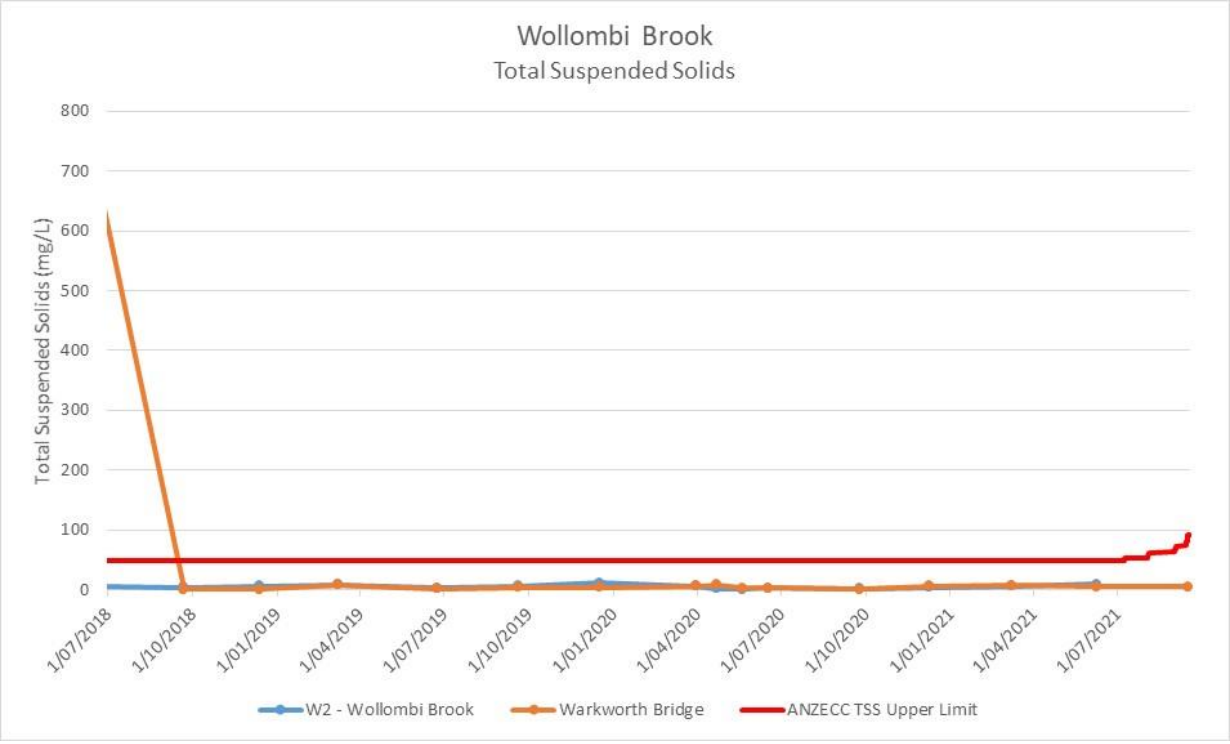


Figure 19 - Wollombi Brook Total Suspended Solids – September 2021

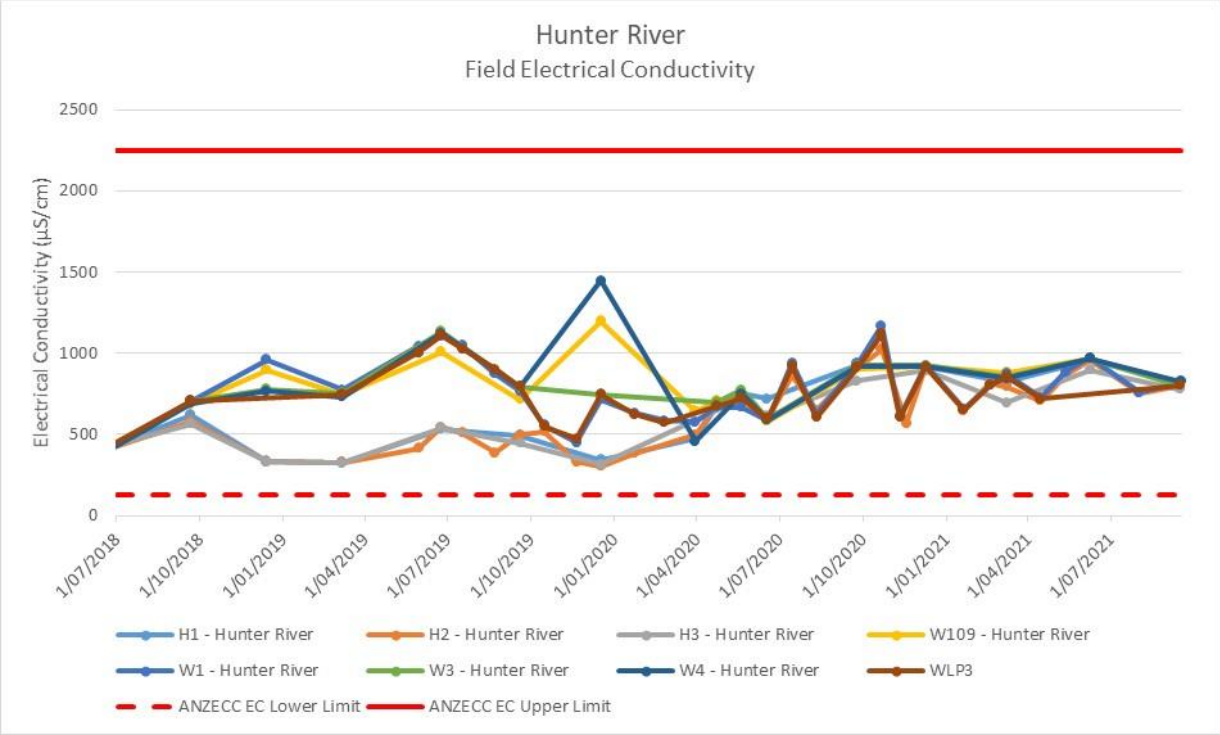


Figure 20 - Hunter River Electrical Conductivity - September 2021

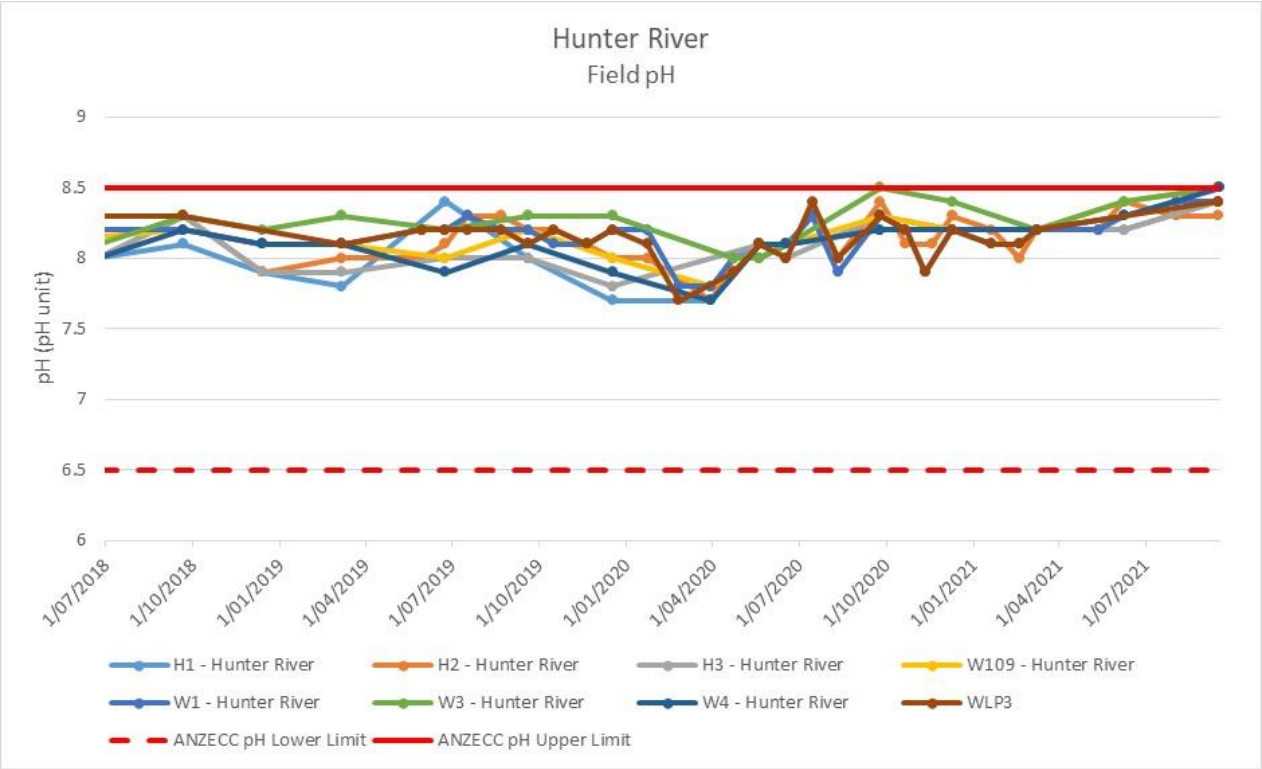


Figure 21 - Hunter River Field pH – September 2021

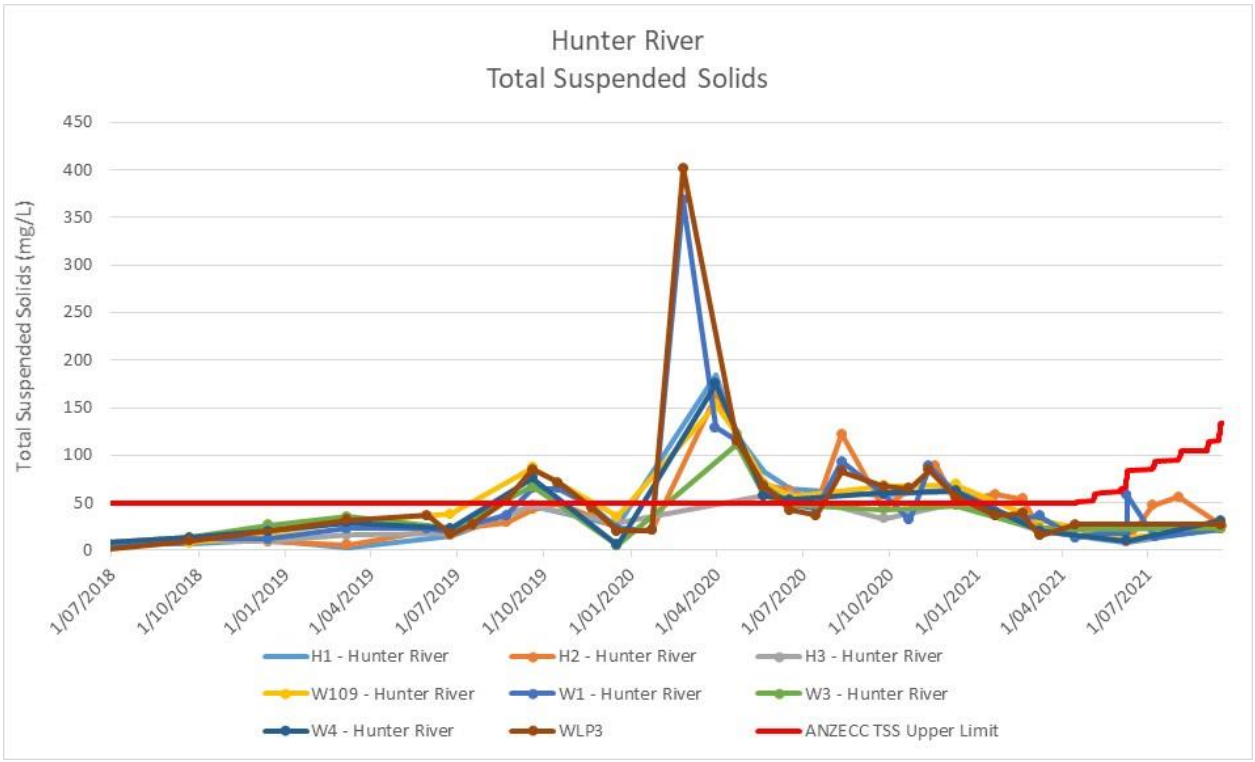


Figure 22 - Hunter River Total Suspended Solids - September 2021

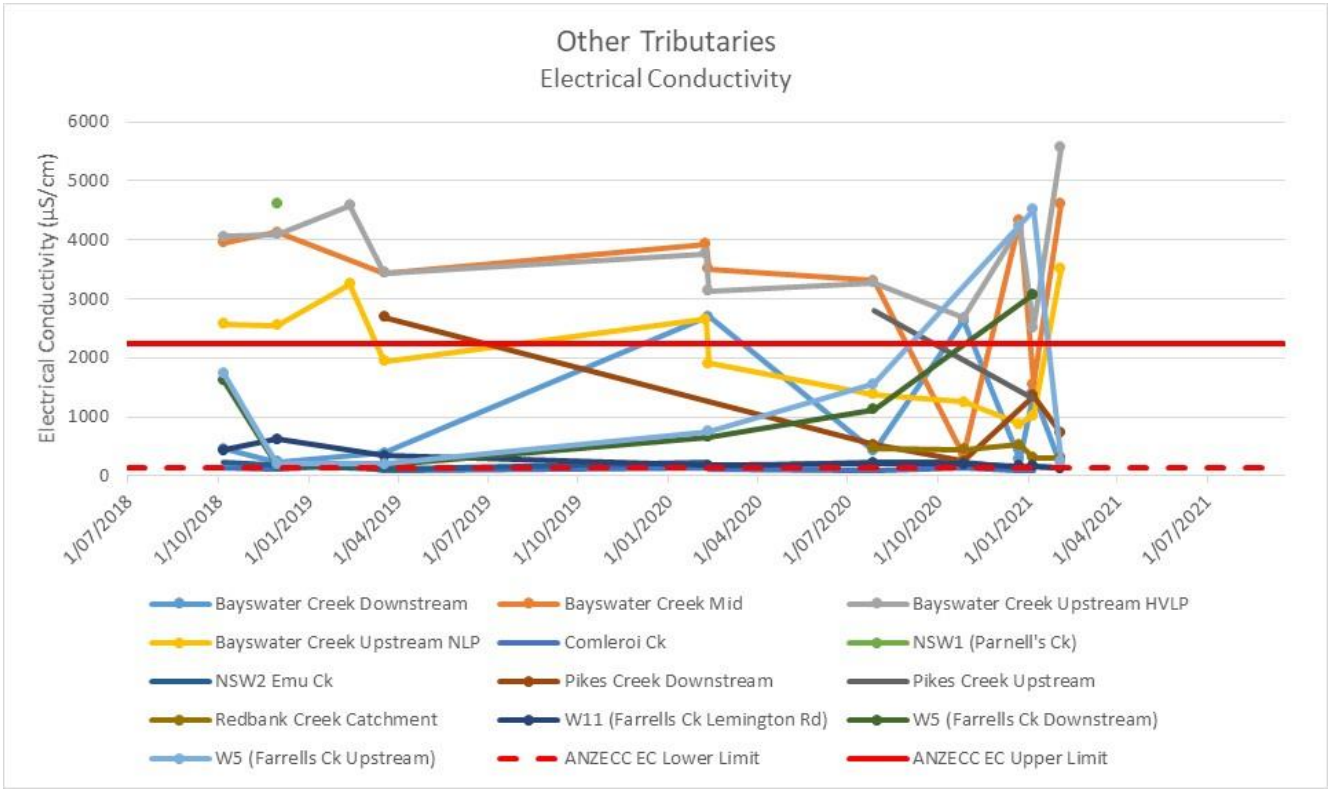


Figure 23 - Other Tributaries Electrical Conductivity - September 2021

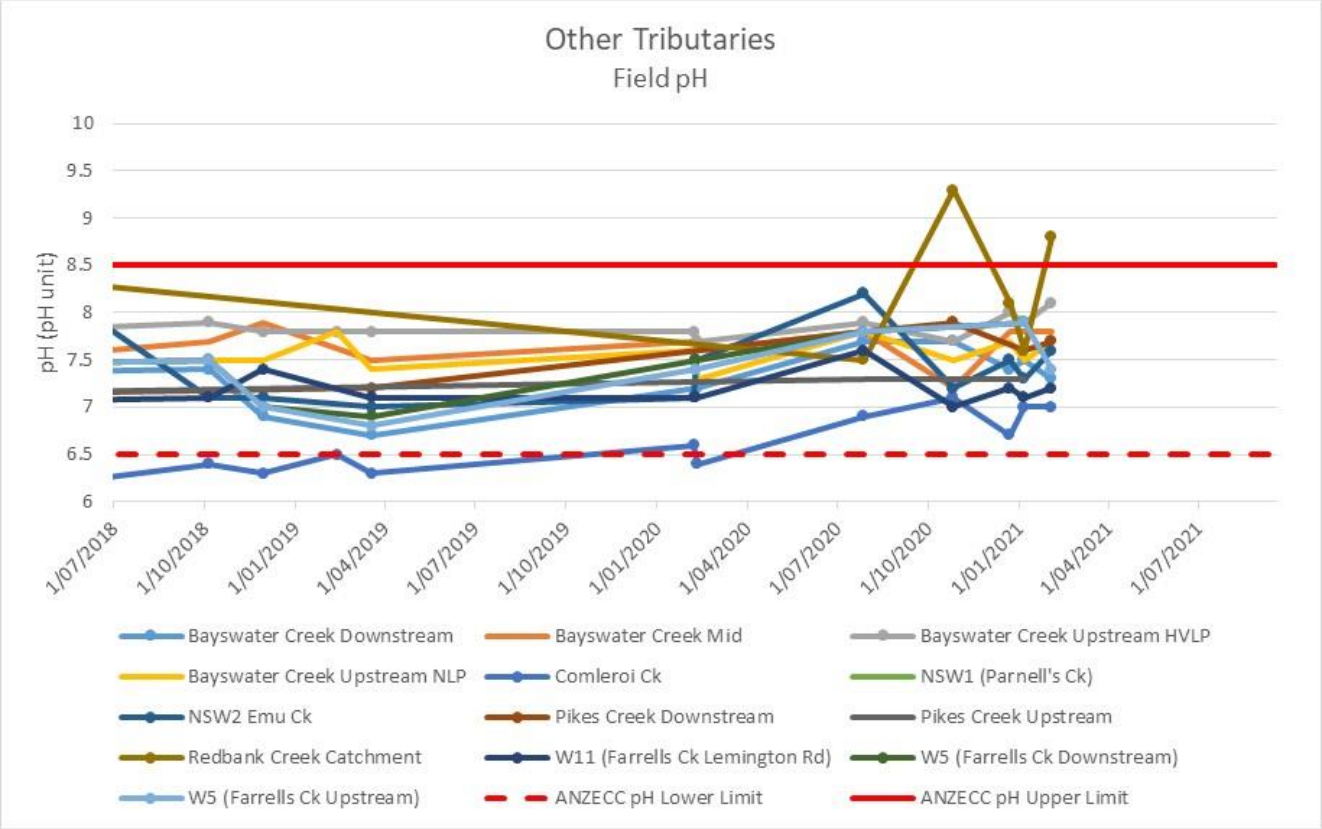


Figure 24 - Other Tributaries Field pH - September 2021

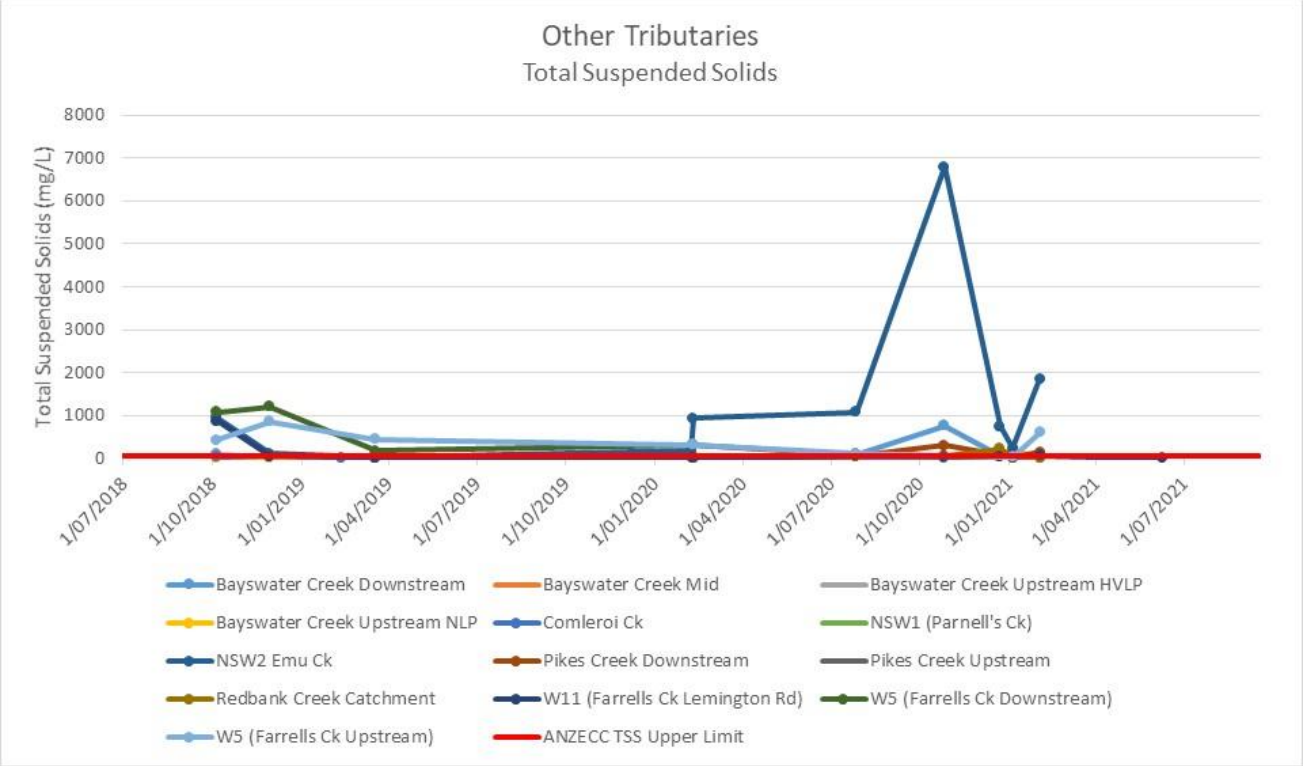


Figure 25 - Other Tributaries Total Suspended Solids - September 2021

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 – Q3 2021

Site	Date	Trigger Limit Breached	Response Action
W1 – Hunter River	5/7/2021	TSS	1st Exceedance of trigger value
H2 – Hunter River	2/8/2021	TSS	1st Exceedance of trigger value

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 did not discharge water 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**

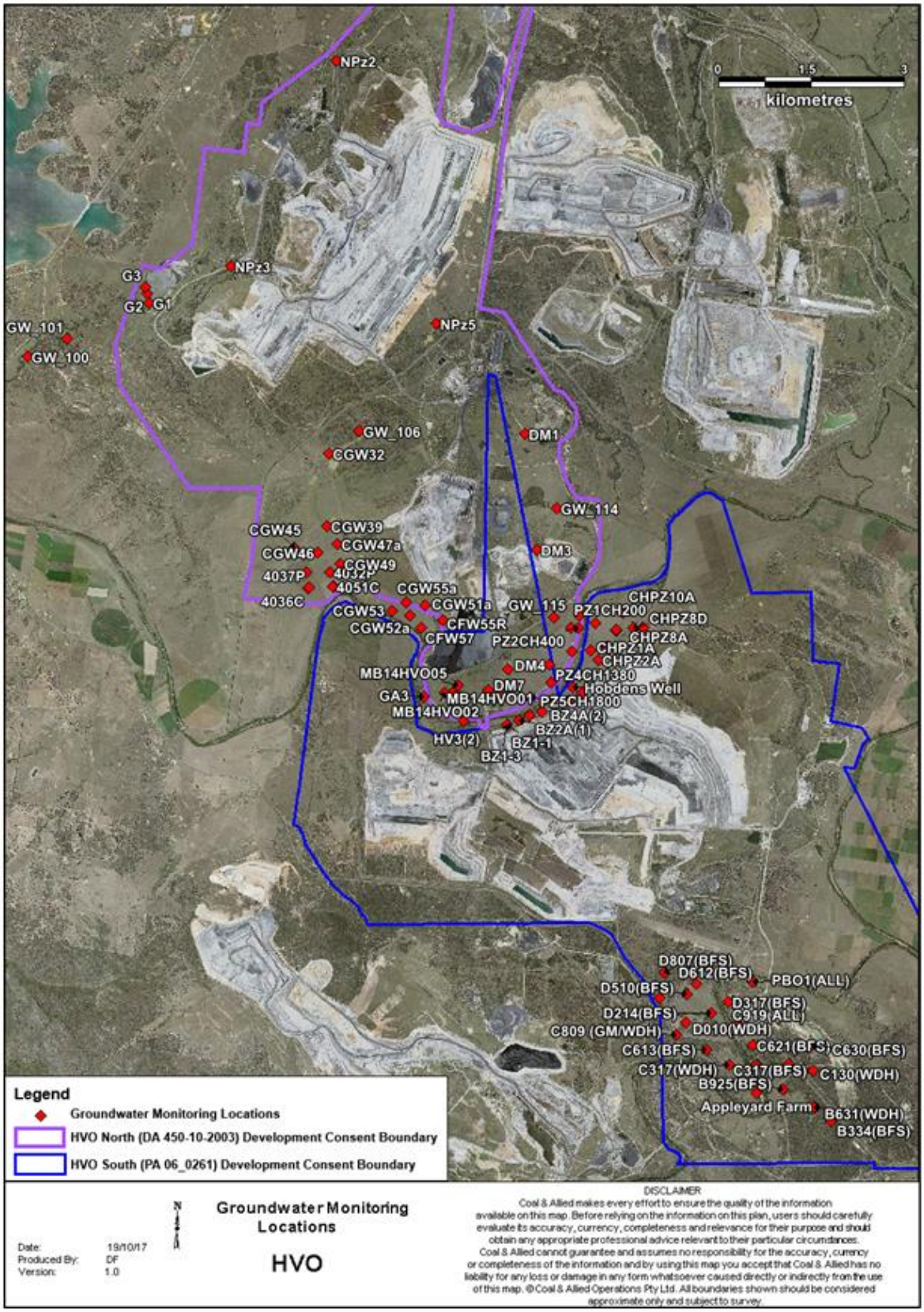


Figure 26 Groundwater monitoring Locations at HVO

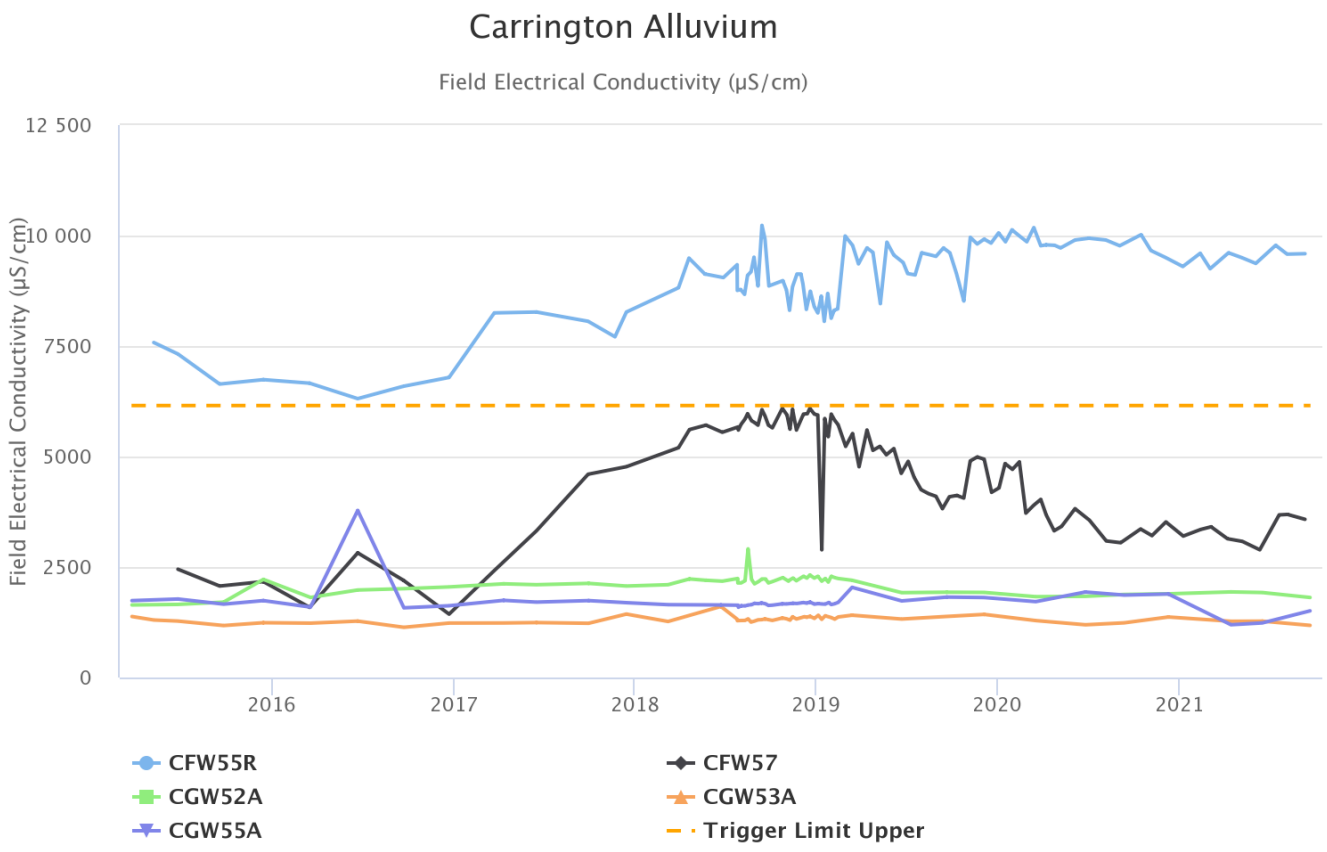


Figure 27 - Carrington Alluvium Electrical Conductivity Trend – Q3 2021

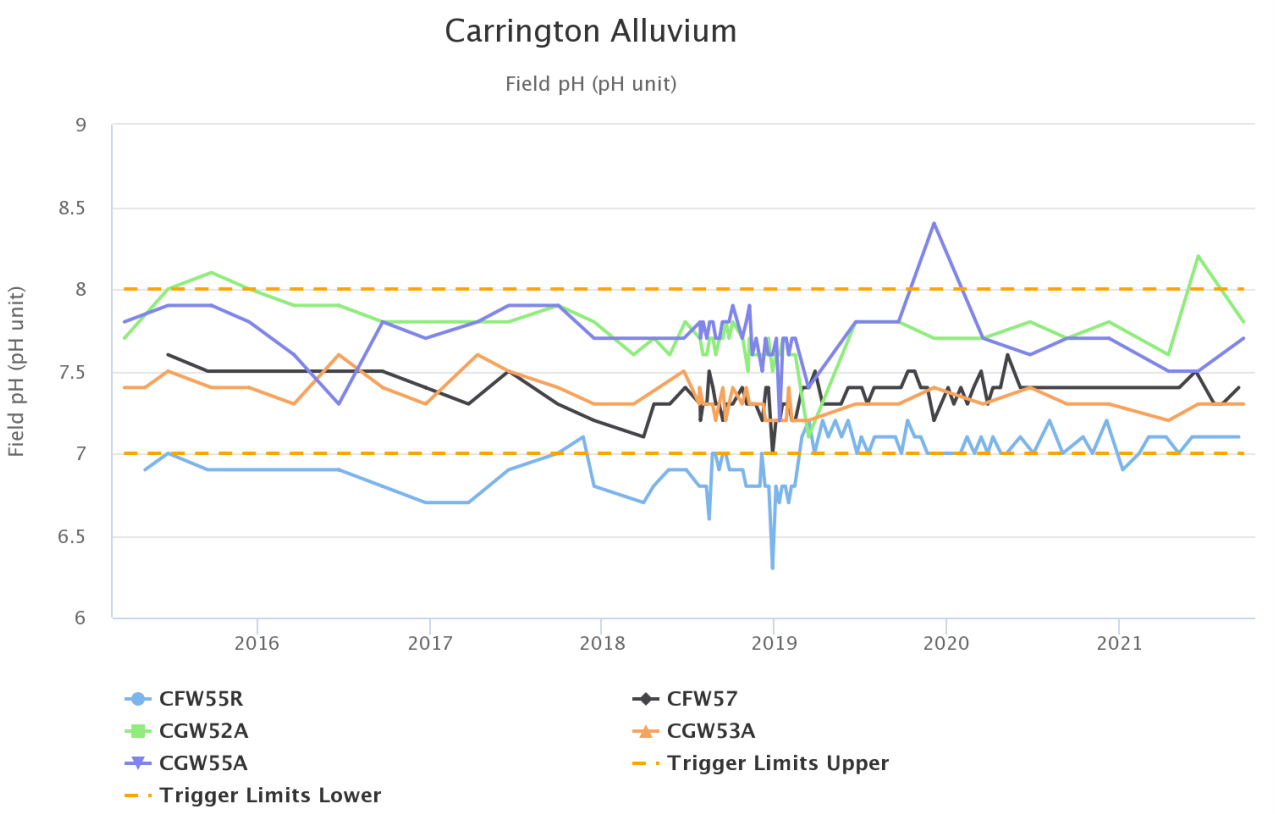


Figure 28 - Carrington Alluvium Field pH Trend - Q3 2021

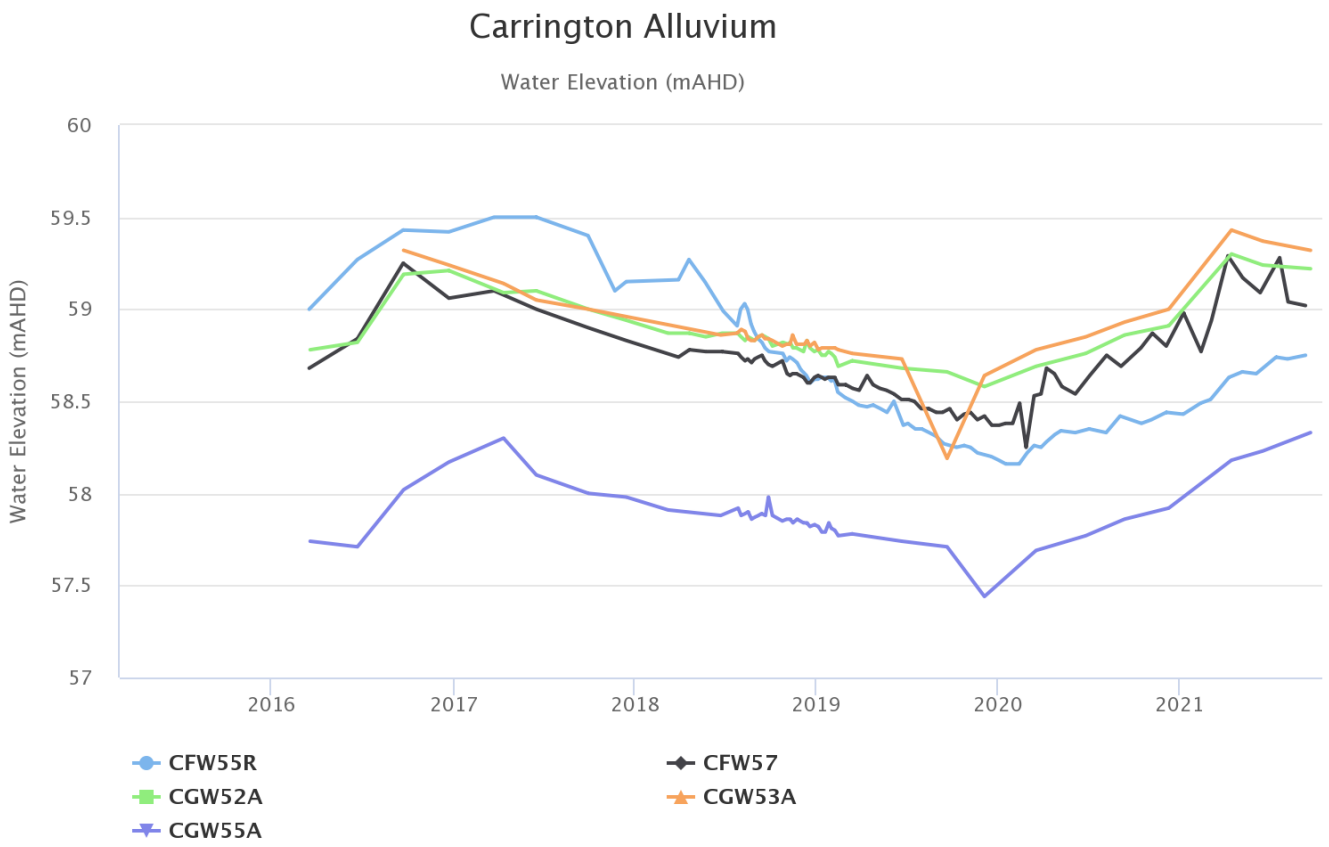


Figure 29 - Carrington Alluvium Water Elevation Trend - Q3 2021

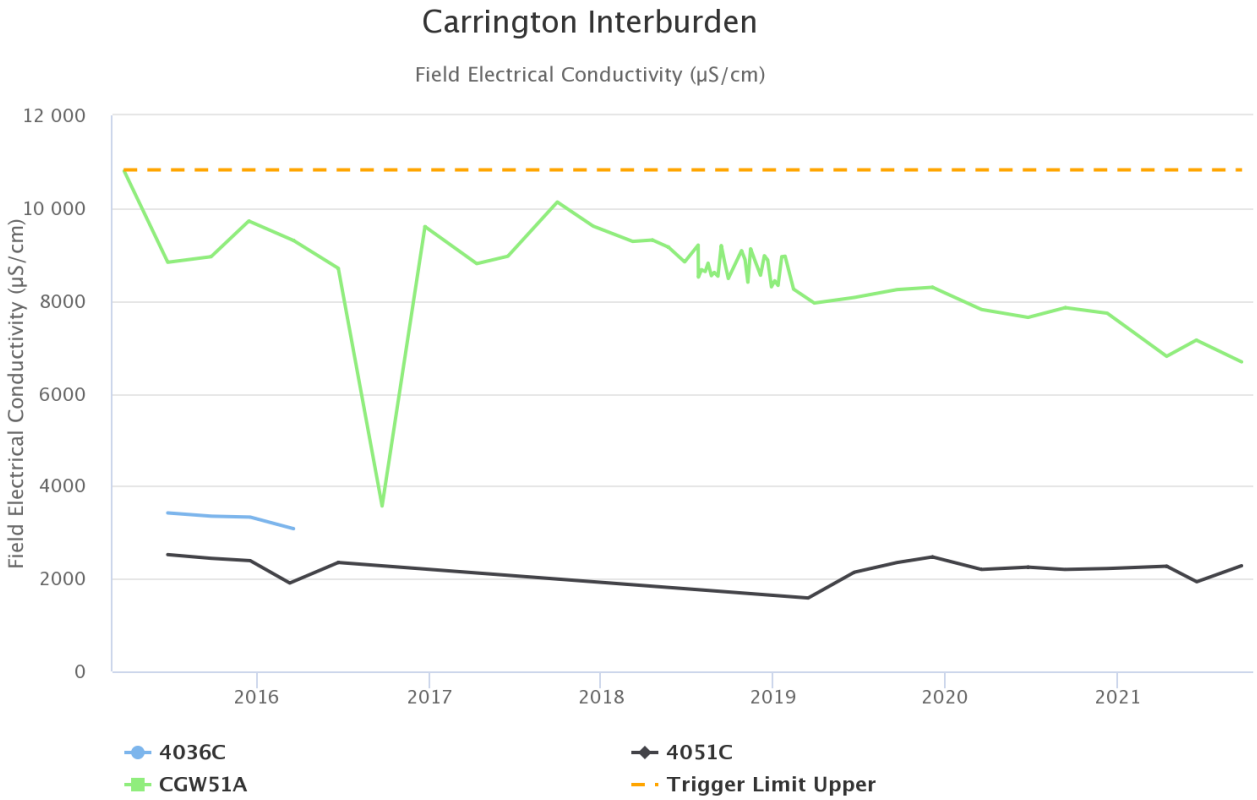


Figure 30 - Carrington Interburden Electrical Conductivity Trend - Q3 2021

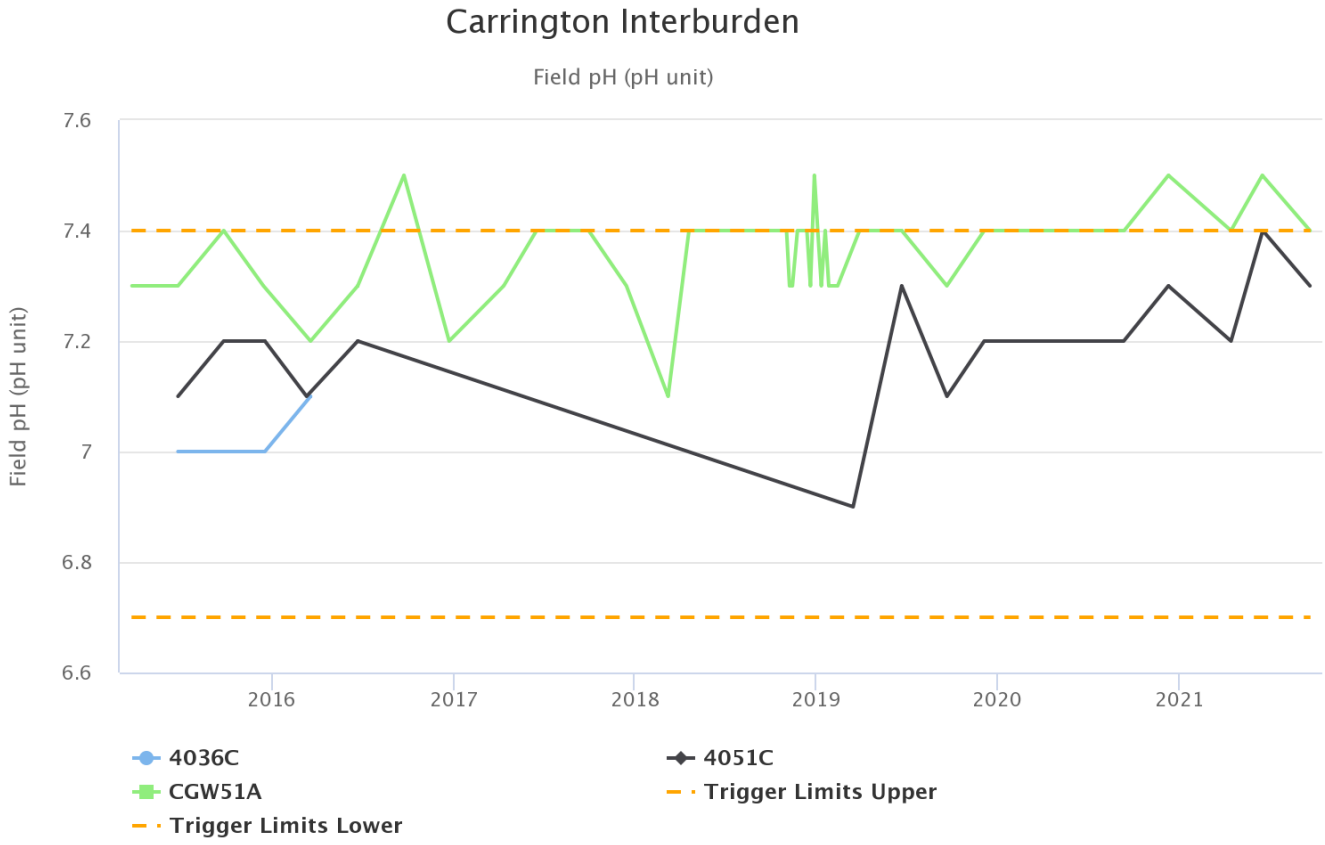
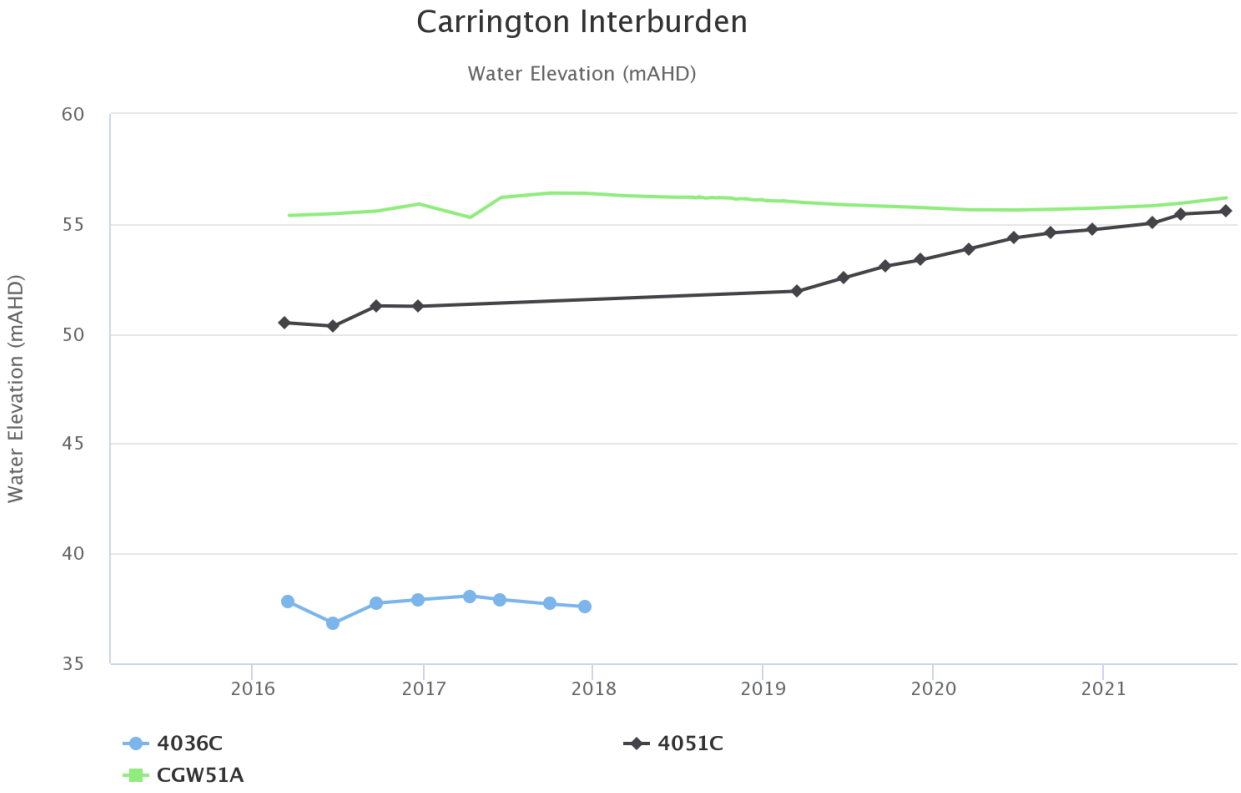


Figure 31 - Carrington Interburden Field pH Trend - Q3 2021



** 4036C had insufficient water for sampling*

Figure 32 - Carrington Interburden Water Elevation Trend - Q3 2021

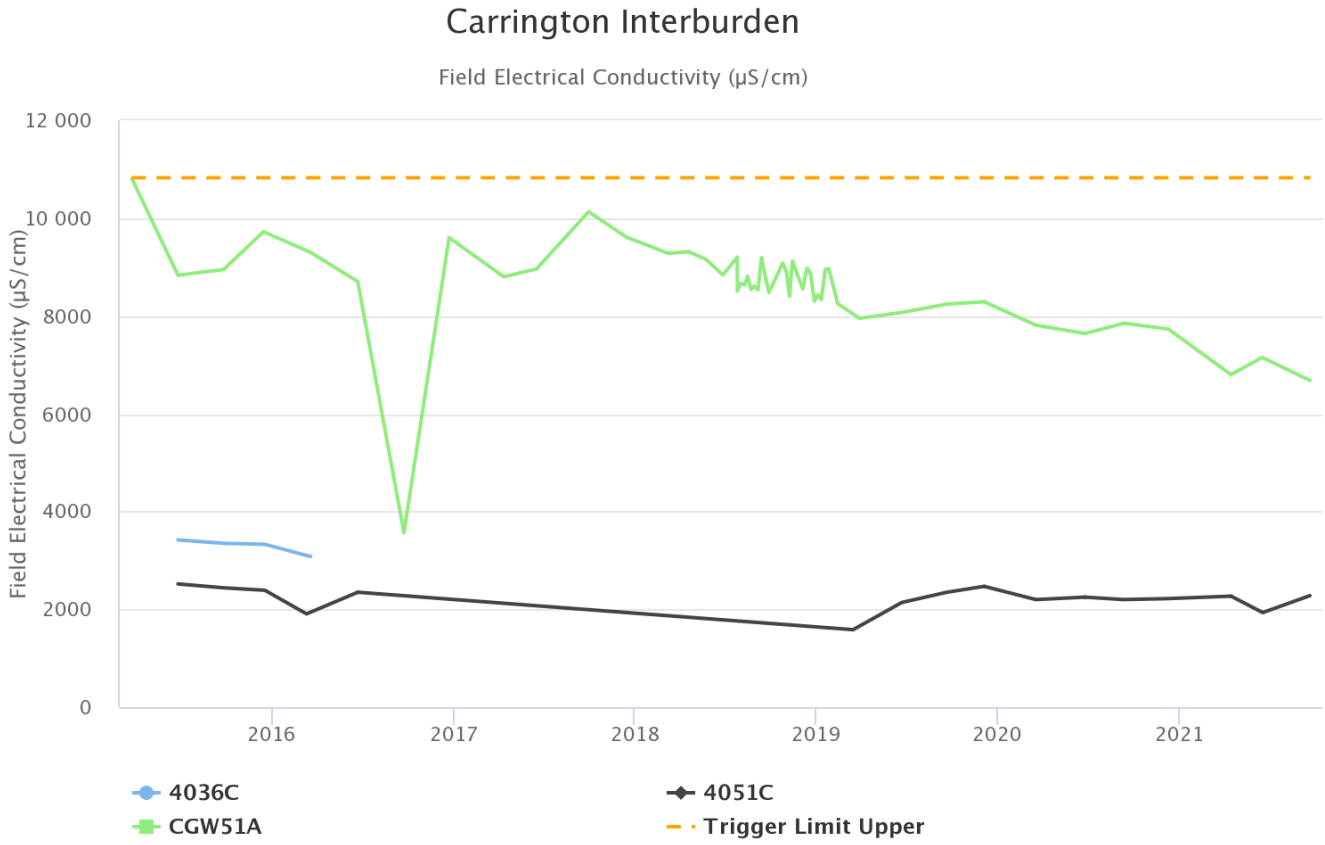


Figure 33 - Cheshunt Interburden Electrical Conductivity Trend - Q3 2021

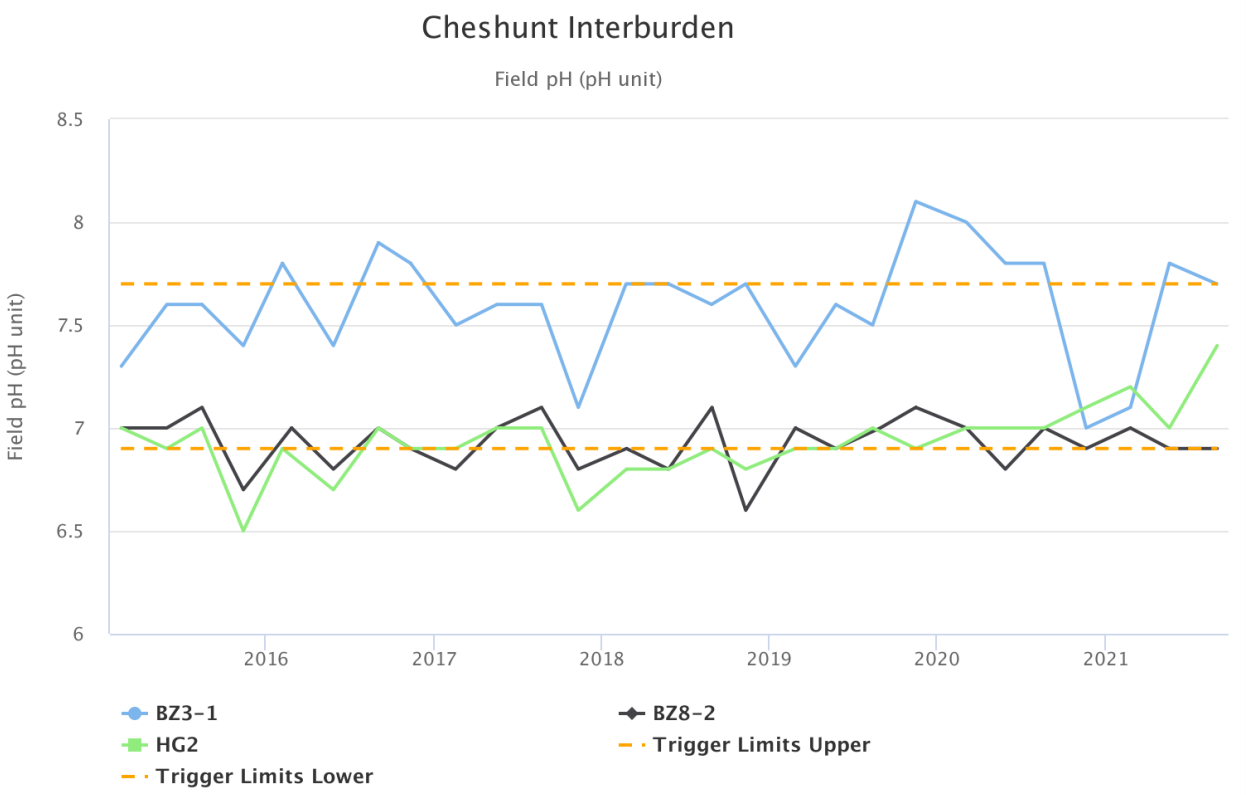


Figure 34 - Cheshunt Interburden Field pH Trend - Q3 2021

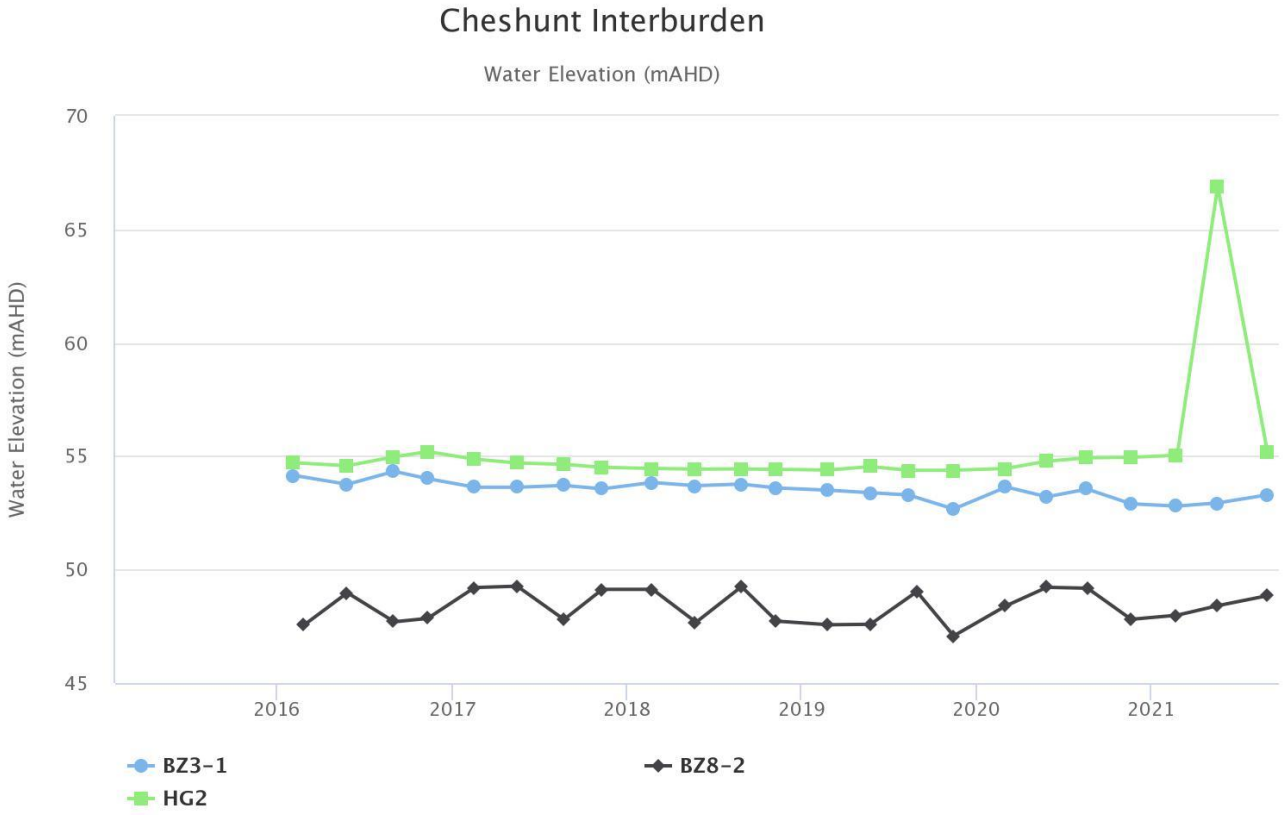


Figure 35 – Cheshunt Interburden Water Elevation Trend - Q3 2021

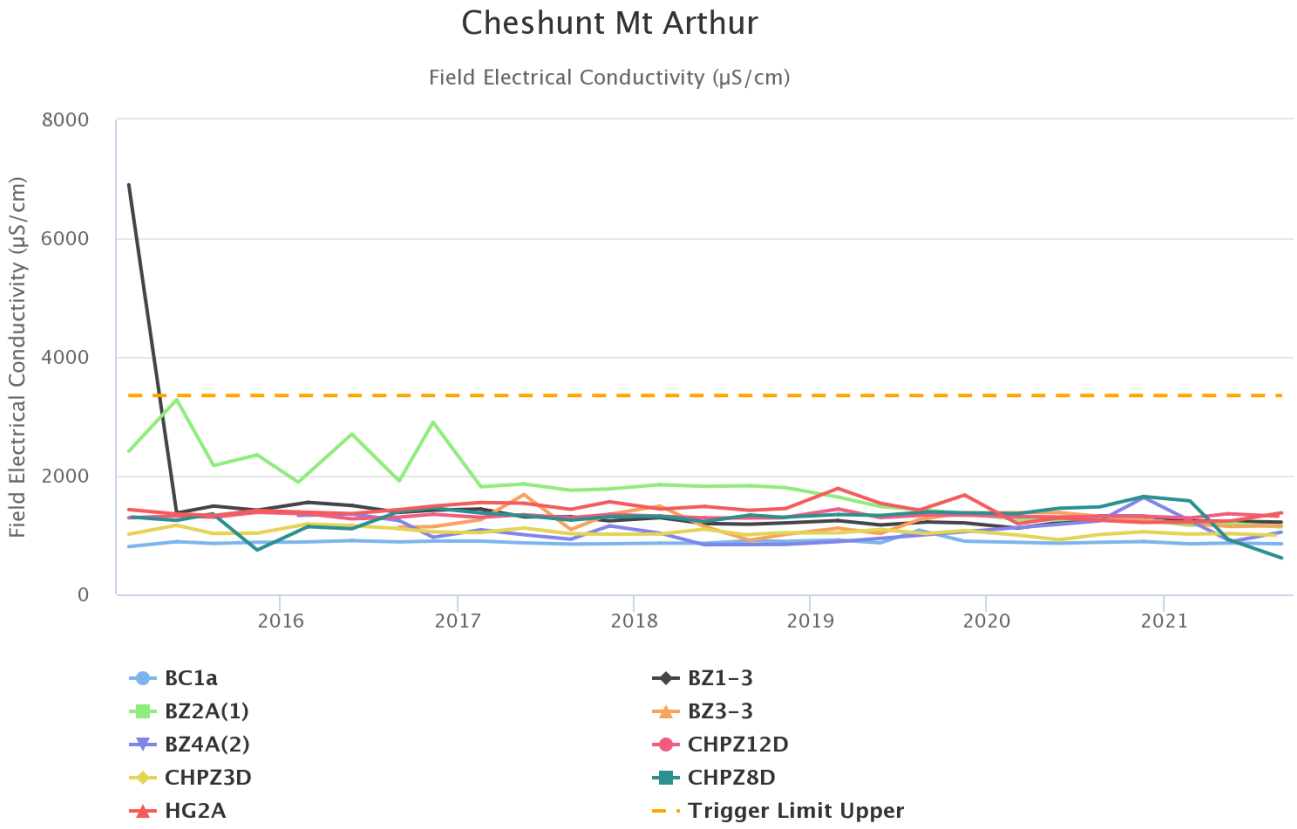


Figure 36 - Cheshunt Mt Arthur Electrical Conductivity Trend - Q3 2021

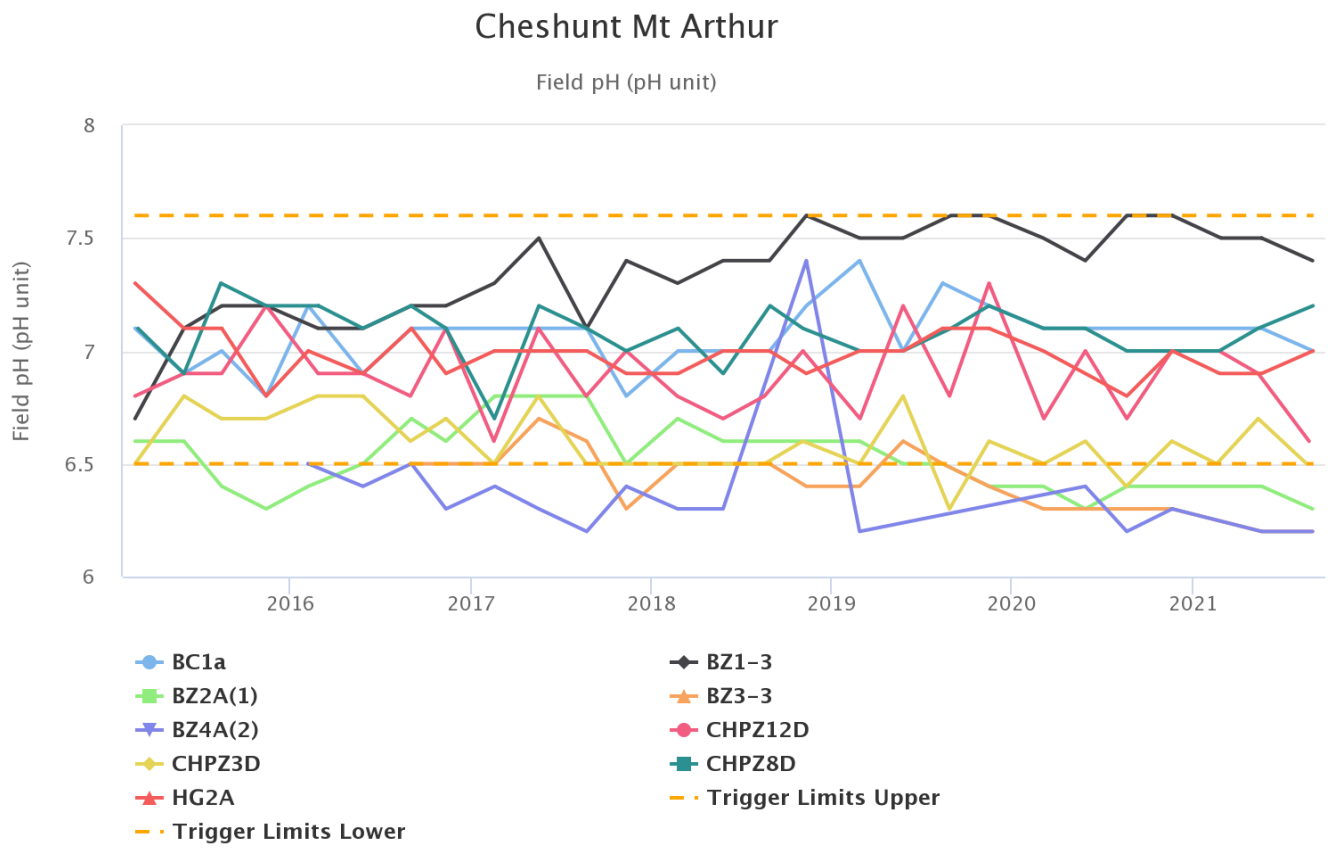


Figure 37 - Cheshunt Mt Arthur Field pH Trend - Q3 2021

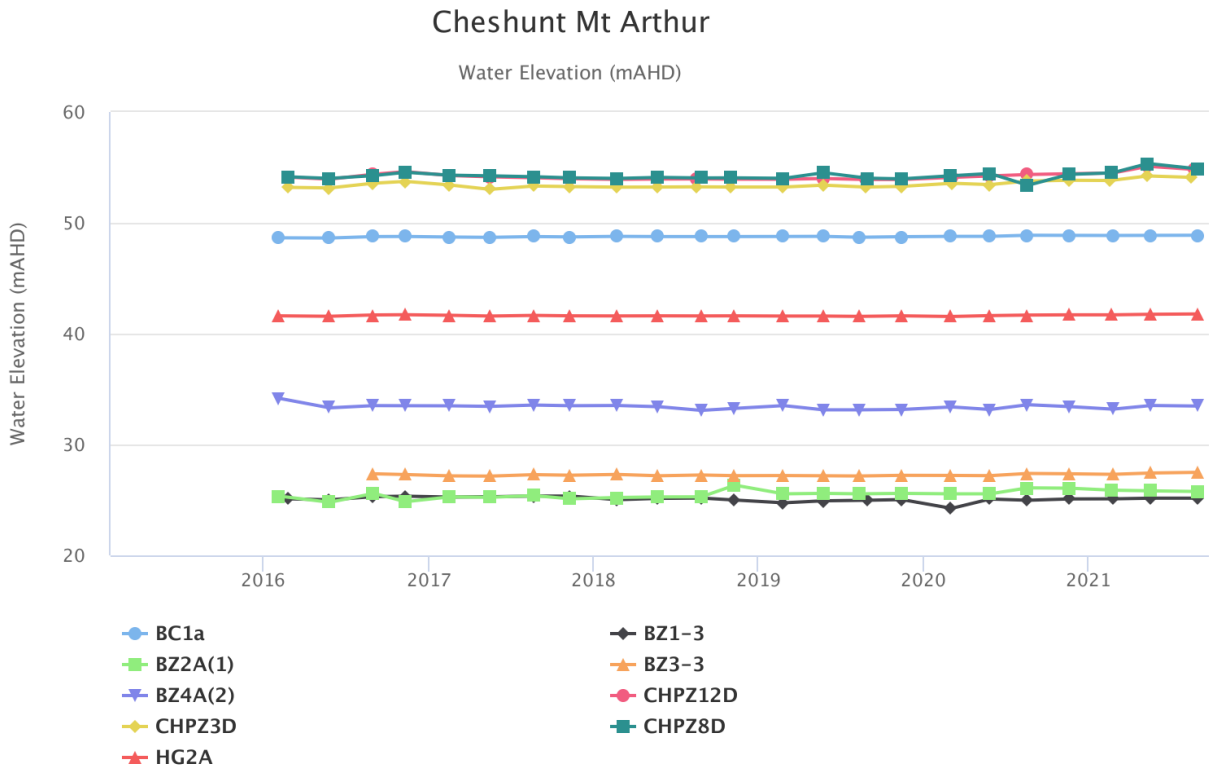


Figure 38 - Cheshunt Mt Arthur Water Elevation Trend - Q3 2021

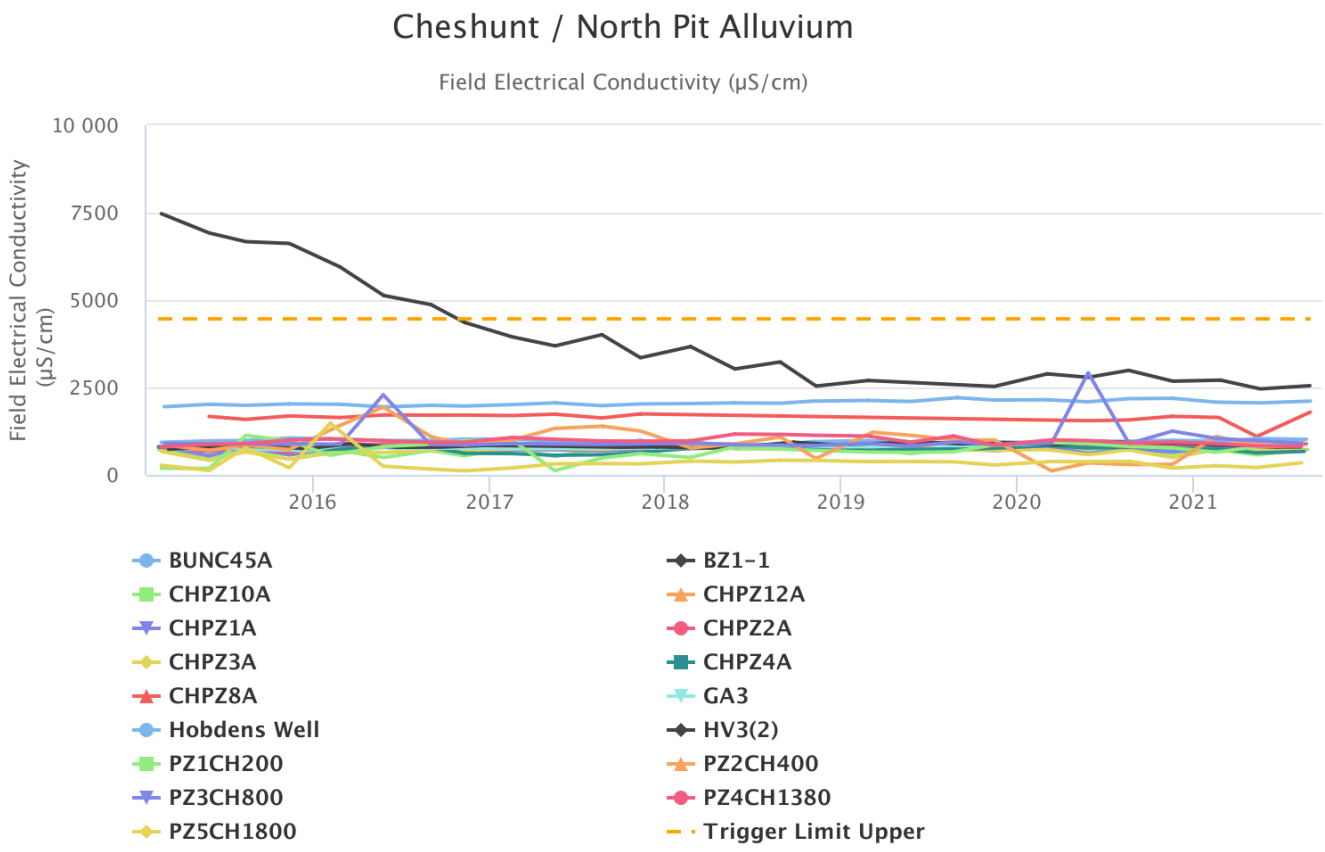


Figure 39 - Cheshunt North Pit Alluvium Electrical Conductivity Trend - Q3 2021

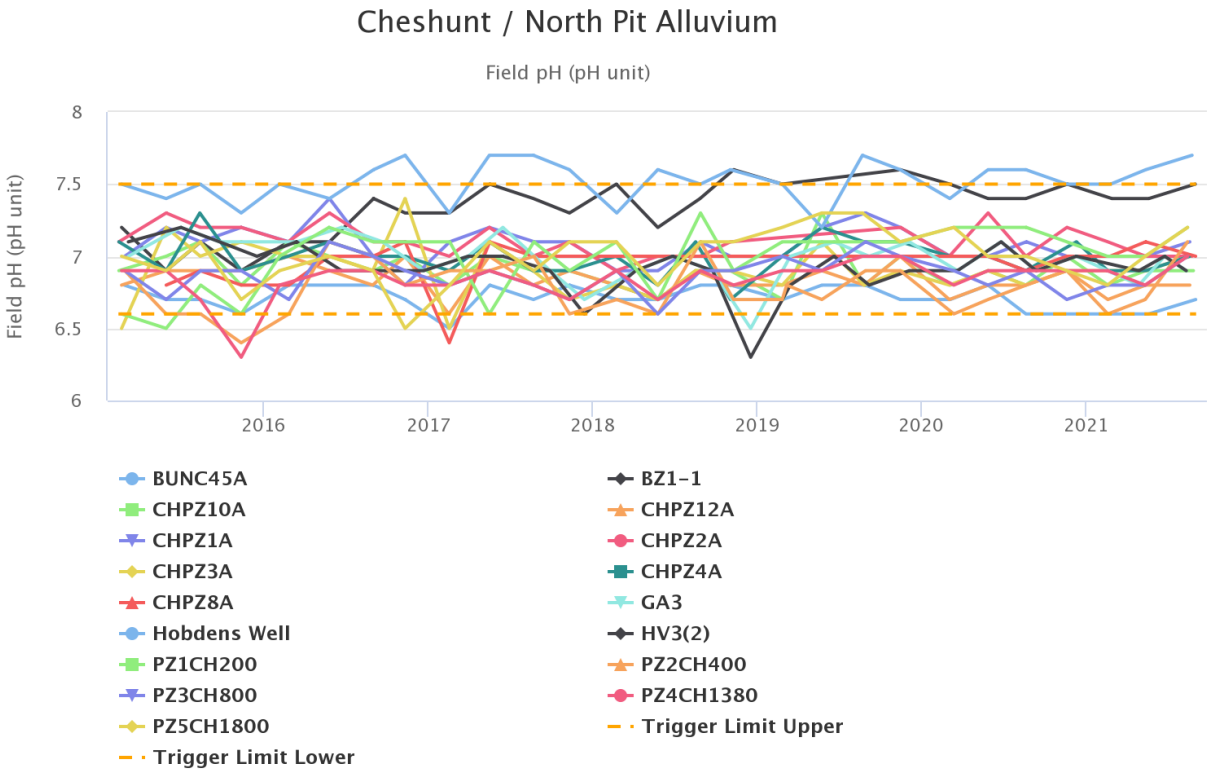


Figure 40 - Cheshunt North Pit Alluvium Field pH Trend - Q3 2021

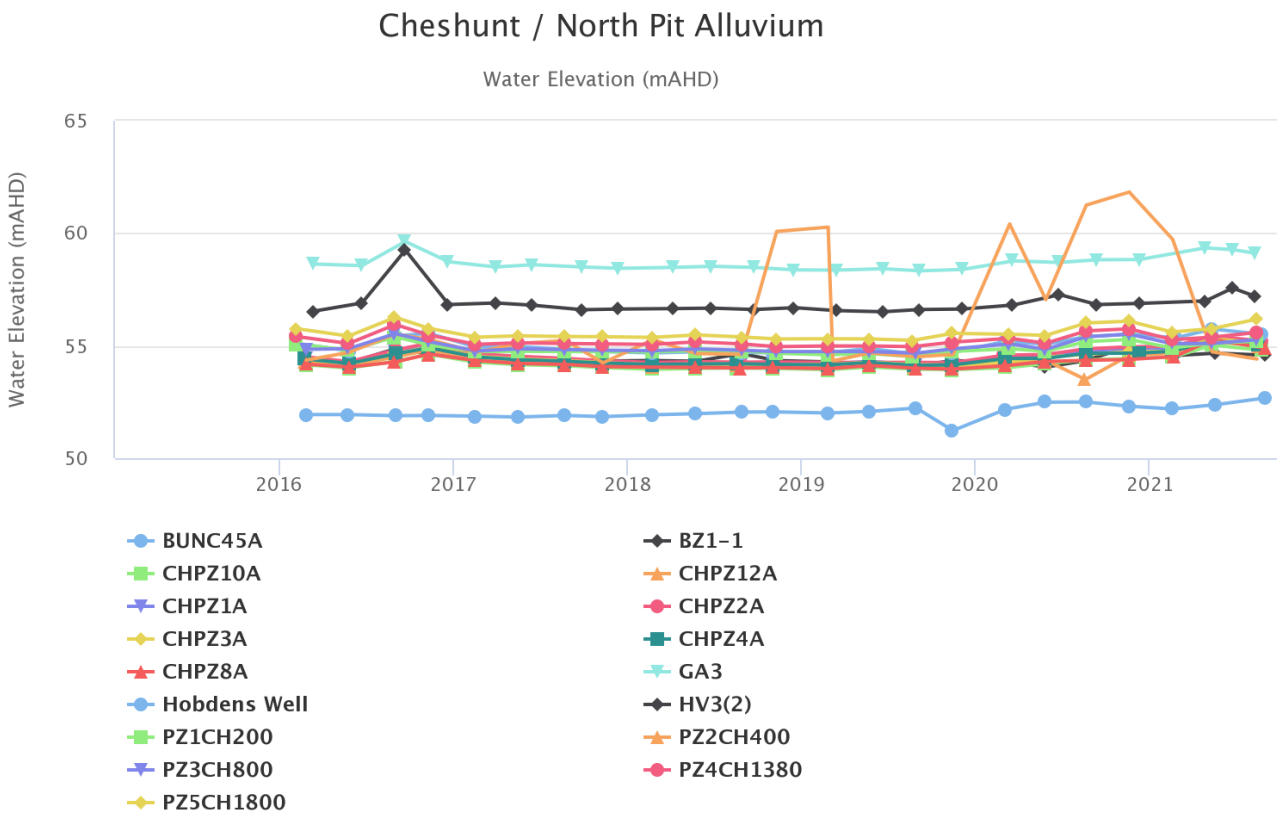


Figure 41 - Cheshunt North Pit Alluvium Water Elevation Trend - Q3 2021

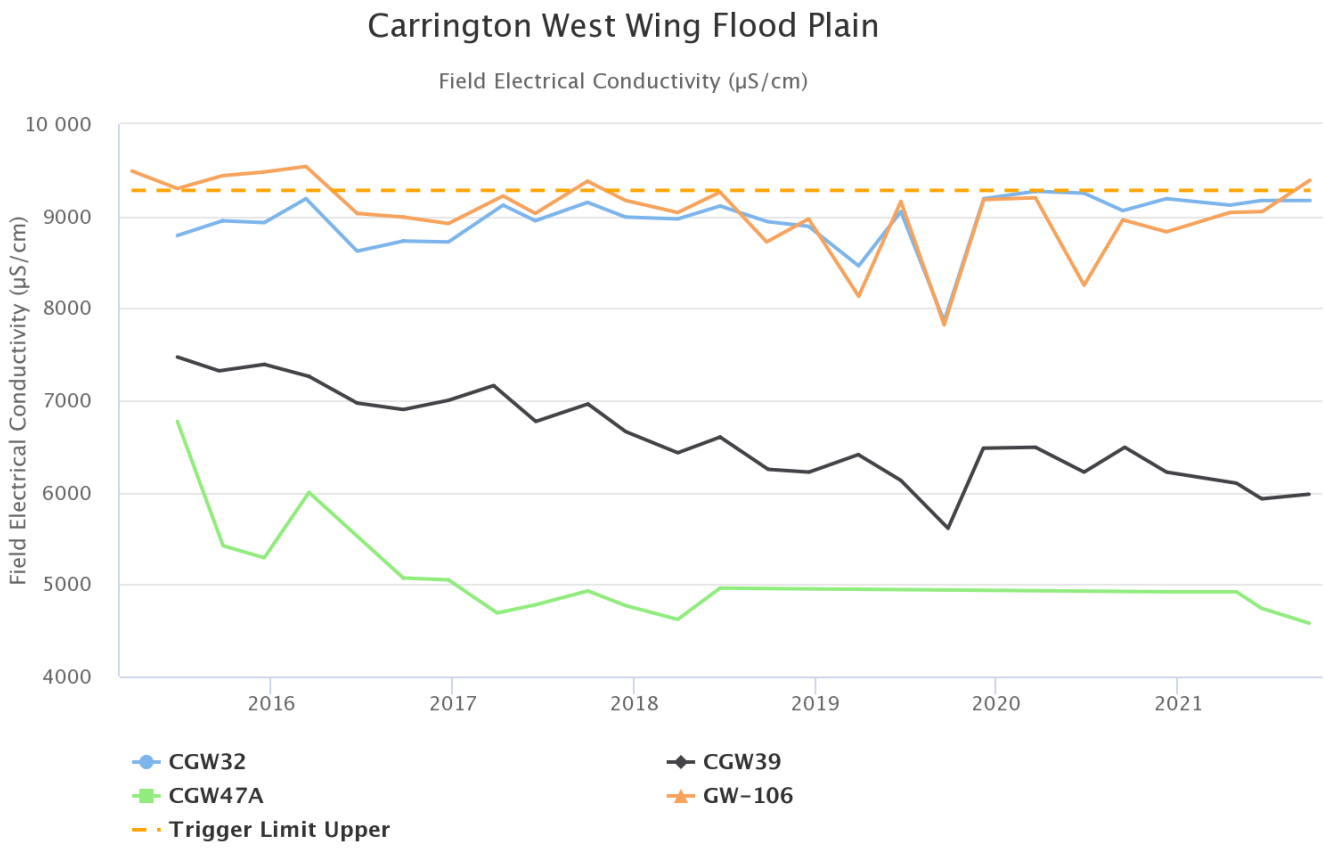


Figure 42 - Carrington West Wing Flood Plain Electrical Conductivity trend - Q3 2021

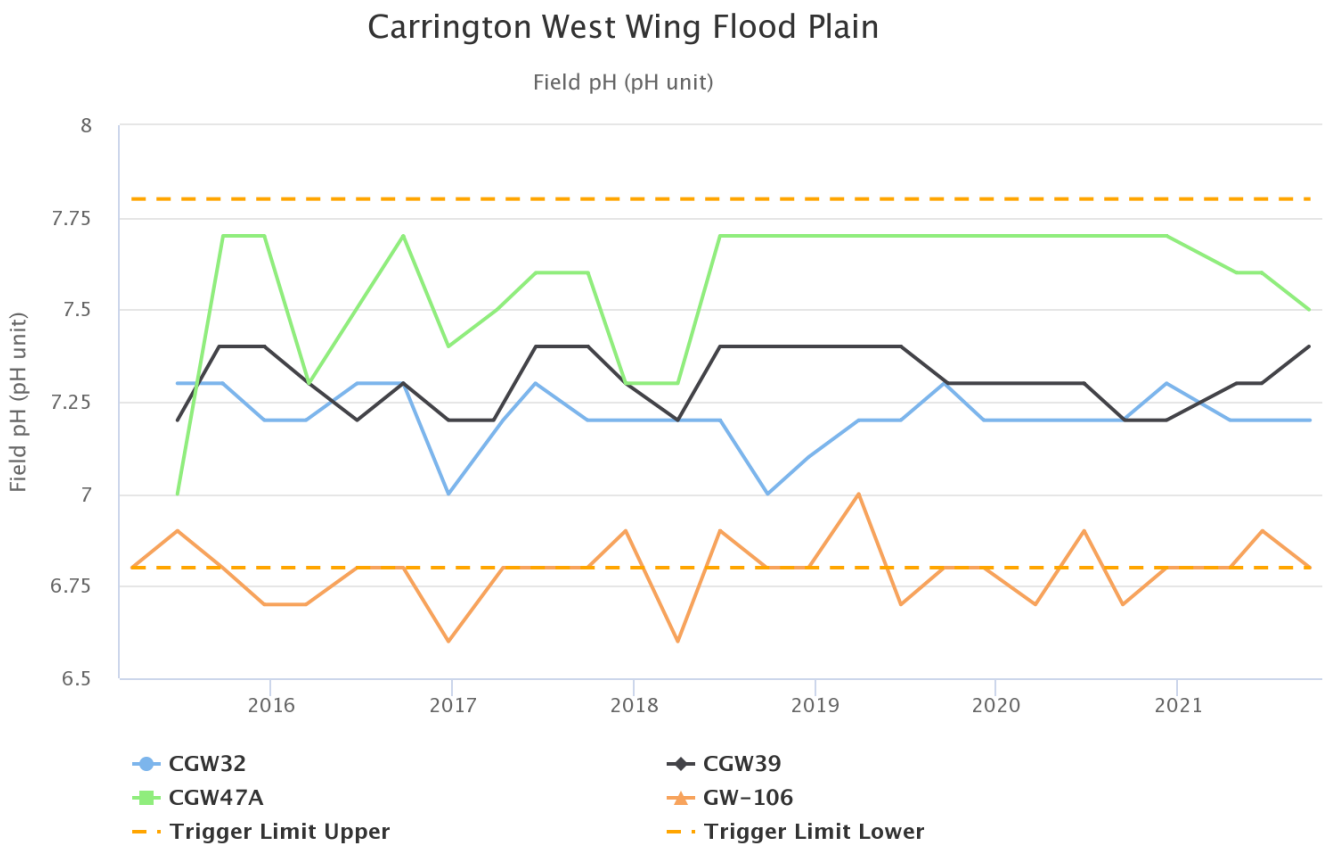


Figure 43 - Carrington West Wing Flood Plain Field pH Trend - Q3 2021

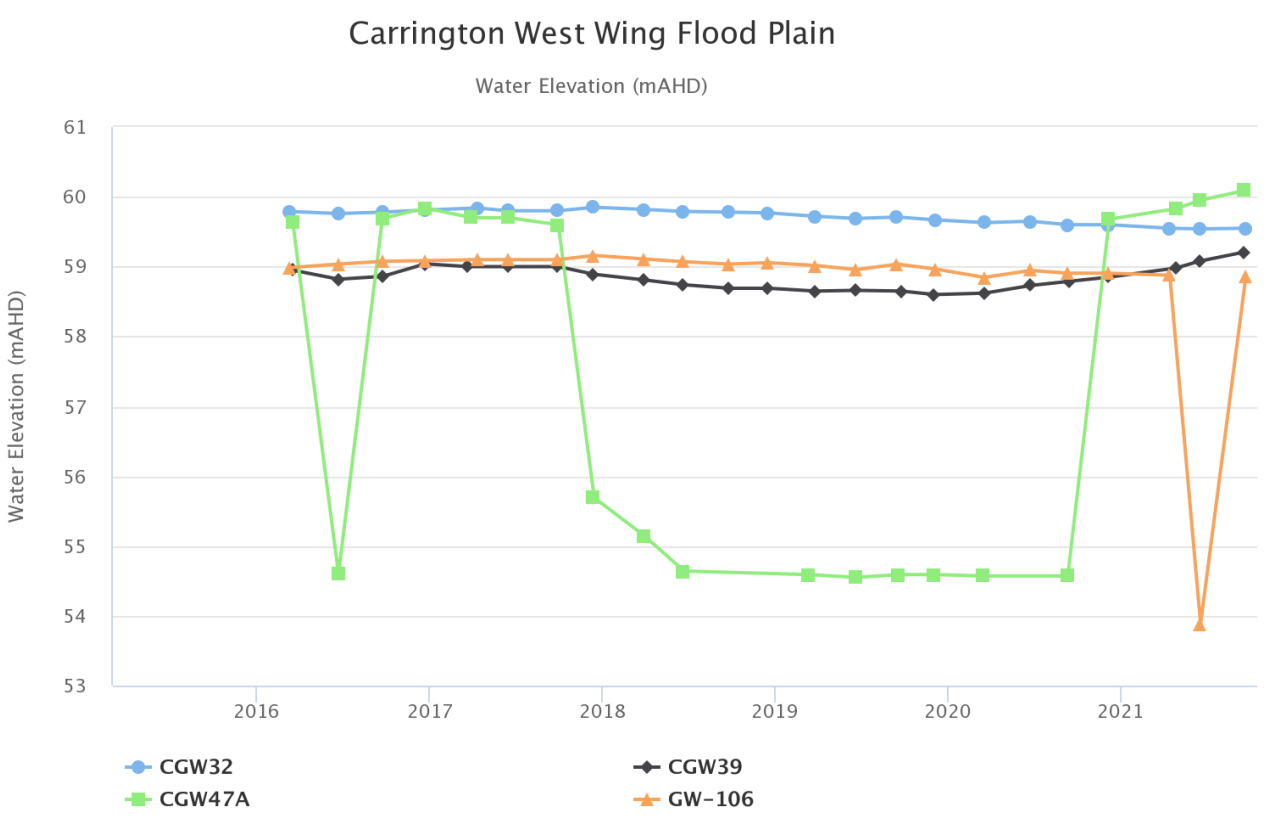


Figure 44 - Carrington West Wing Flood Plain Water Elevation Trend - Q3 2021

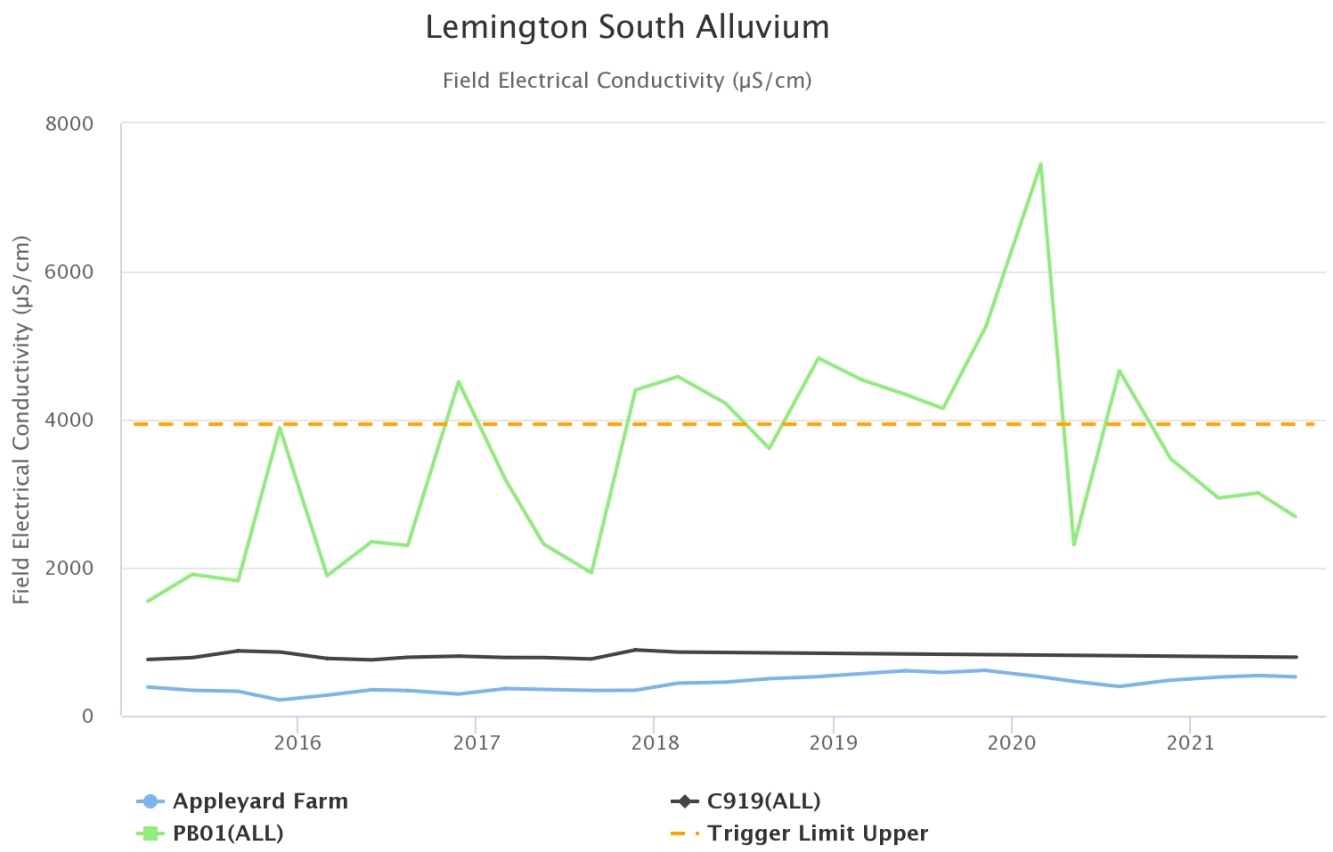


Figure 45 - Lemington South Alluvium Electrical Conductivity Trend - Q3 2021

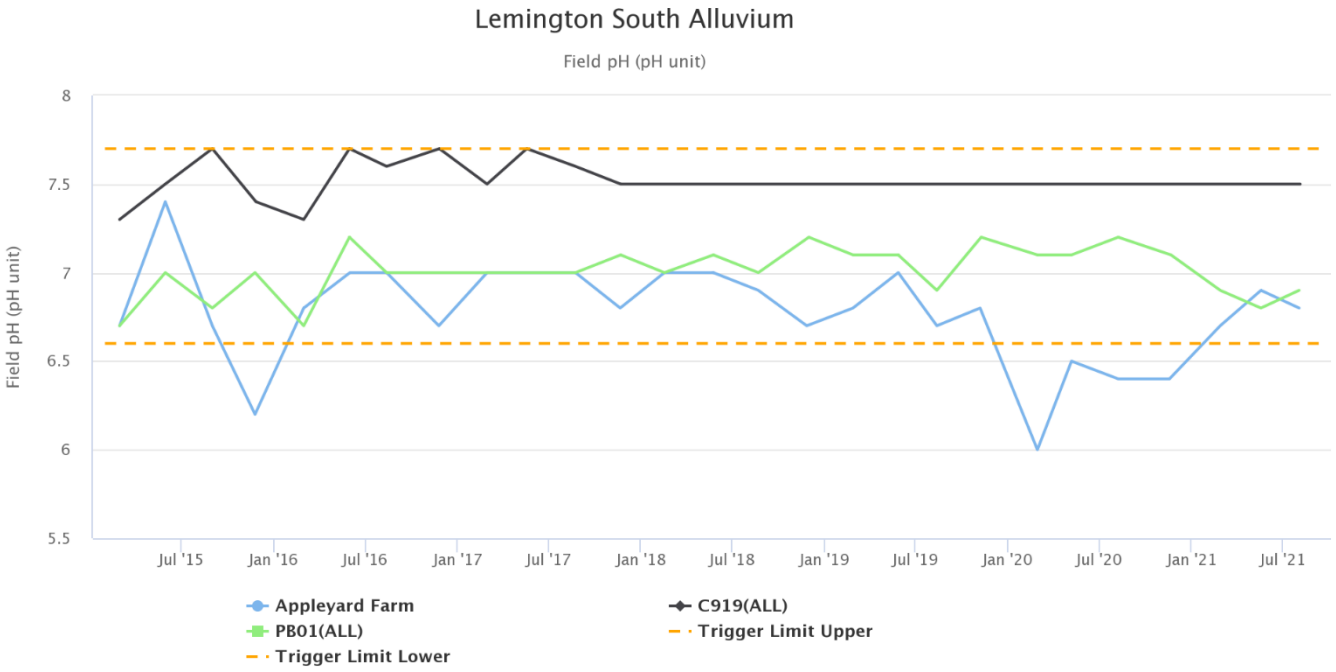


Figure 46 Lemington South Alluvium Field pH Trend - Q3 2021

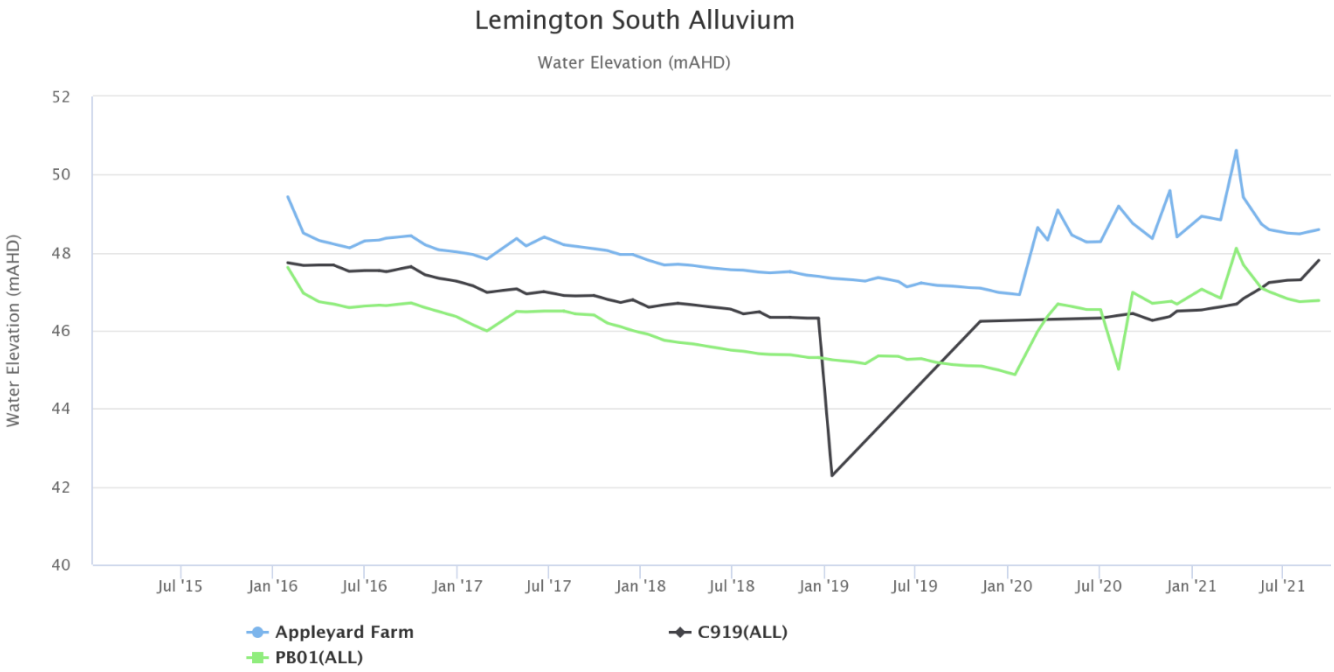


Figure 47 - Lemington South Alluvium Water Elevation Trend - Q3 2021

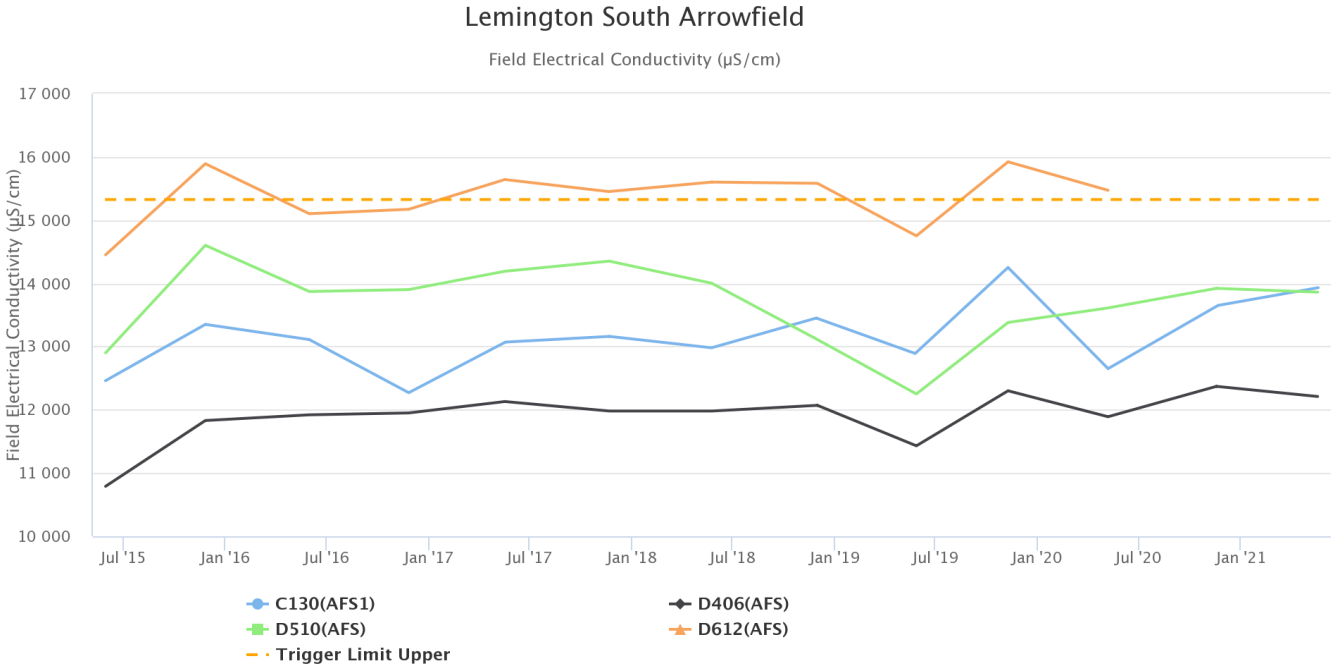


Figure 48 - Lemington South Arrowfield Electrical Conductivity Trend - Q3 2021

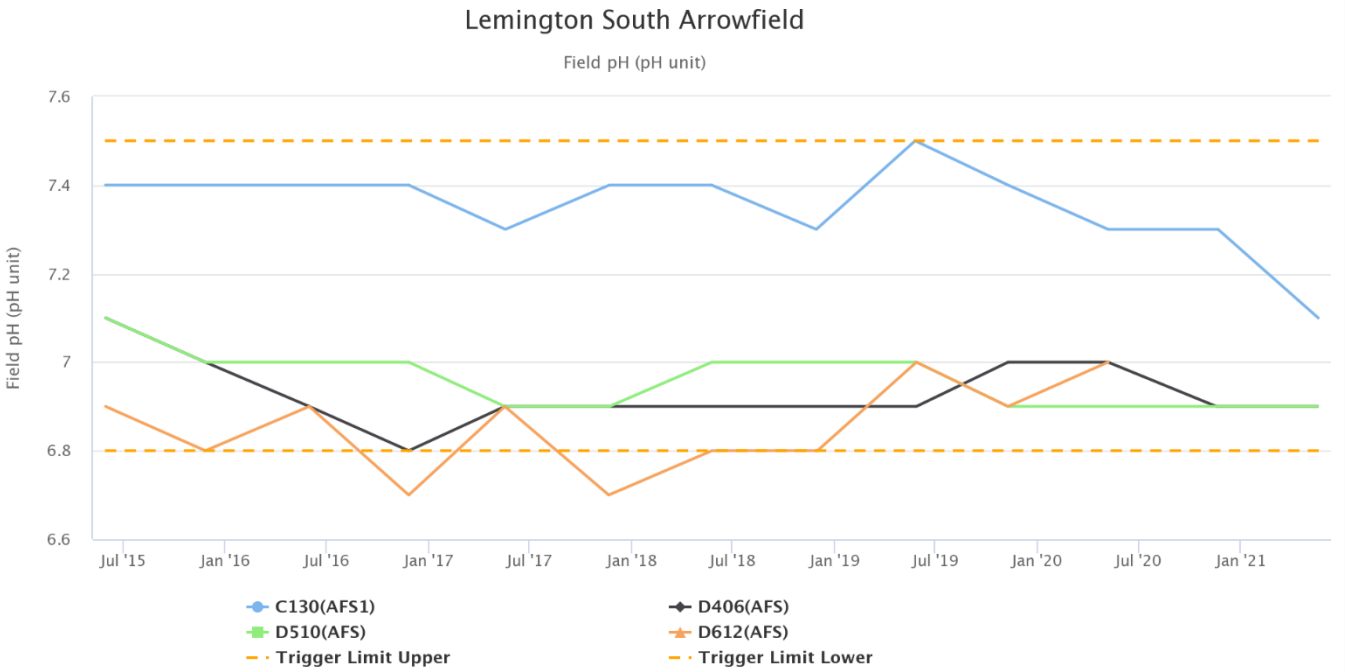


Figure 49 - Lemington South Arrowfield Field pH Trend - Q3 2021

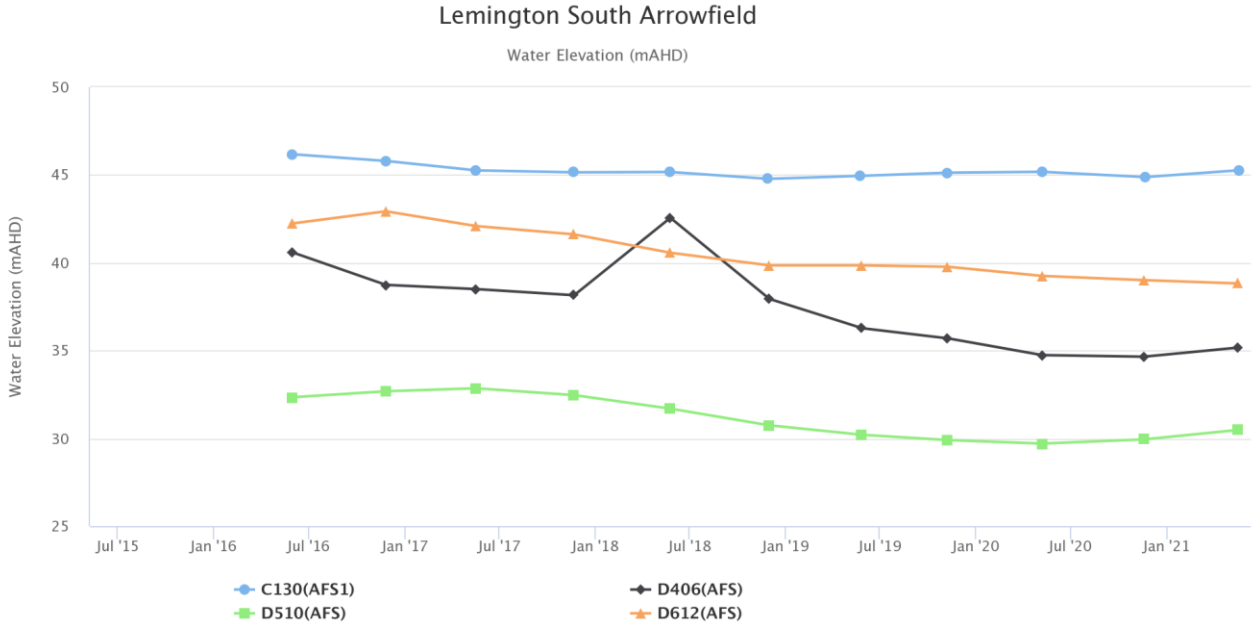


Figure 50 - Lemington South Arrowfield Water Elevation Trend - Q3 2021

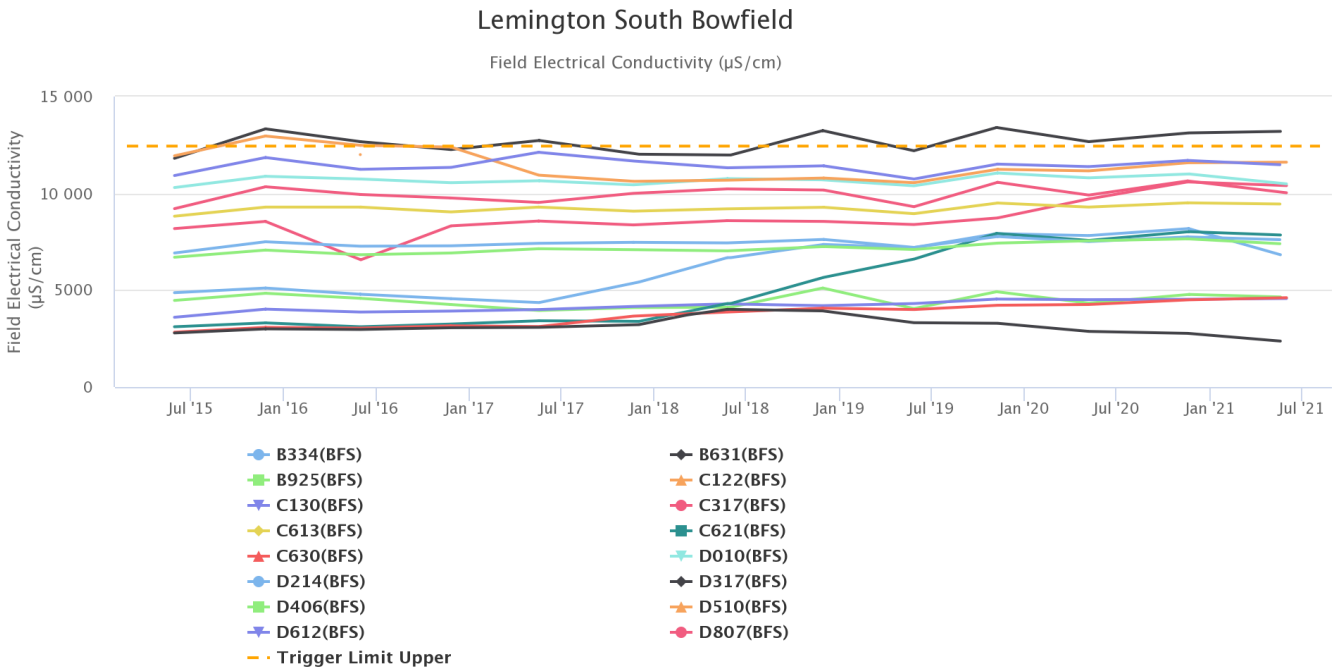


Figure 51 - Lemington South Bowfield Electrical Conductivity Trend - Q3 2021

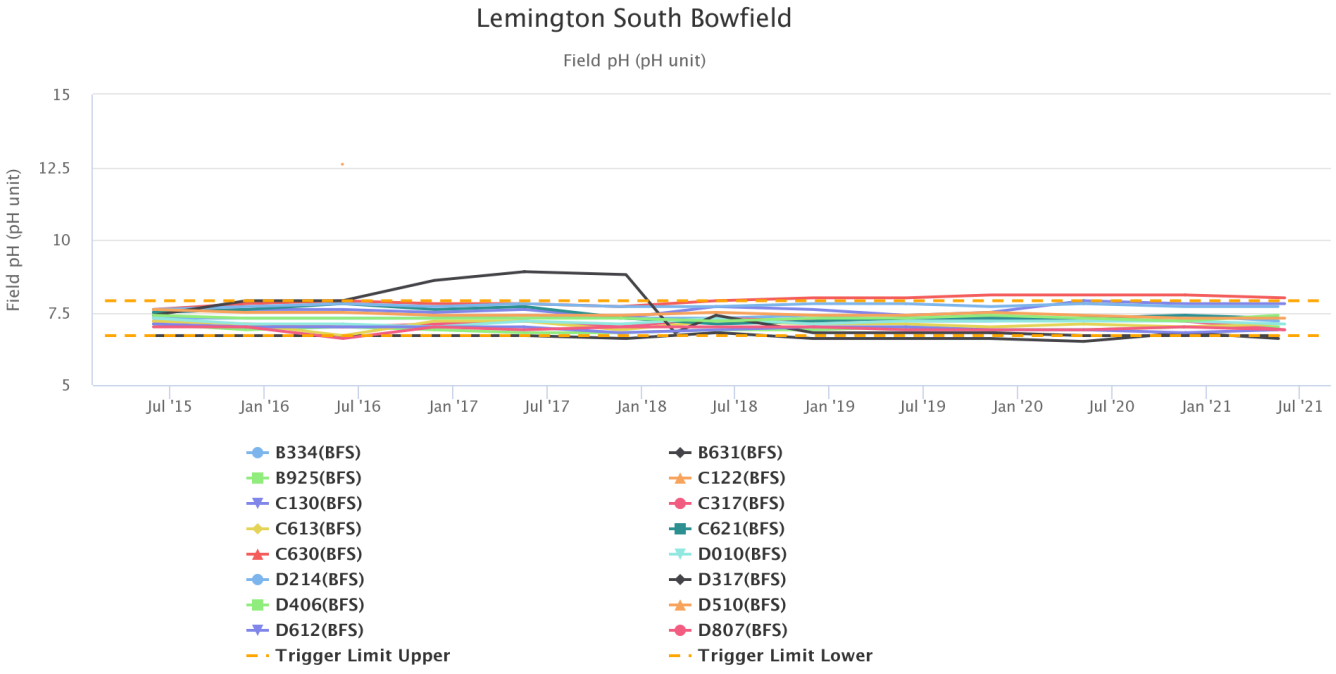


Figure 52 - Lemington South Bowfield Field pH Trend - Q3 2021

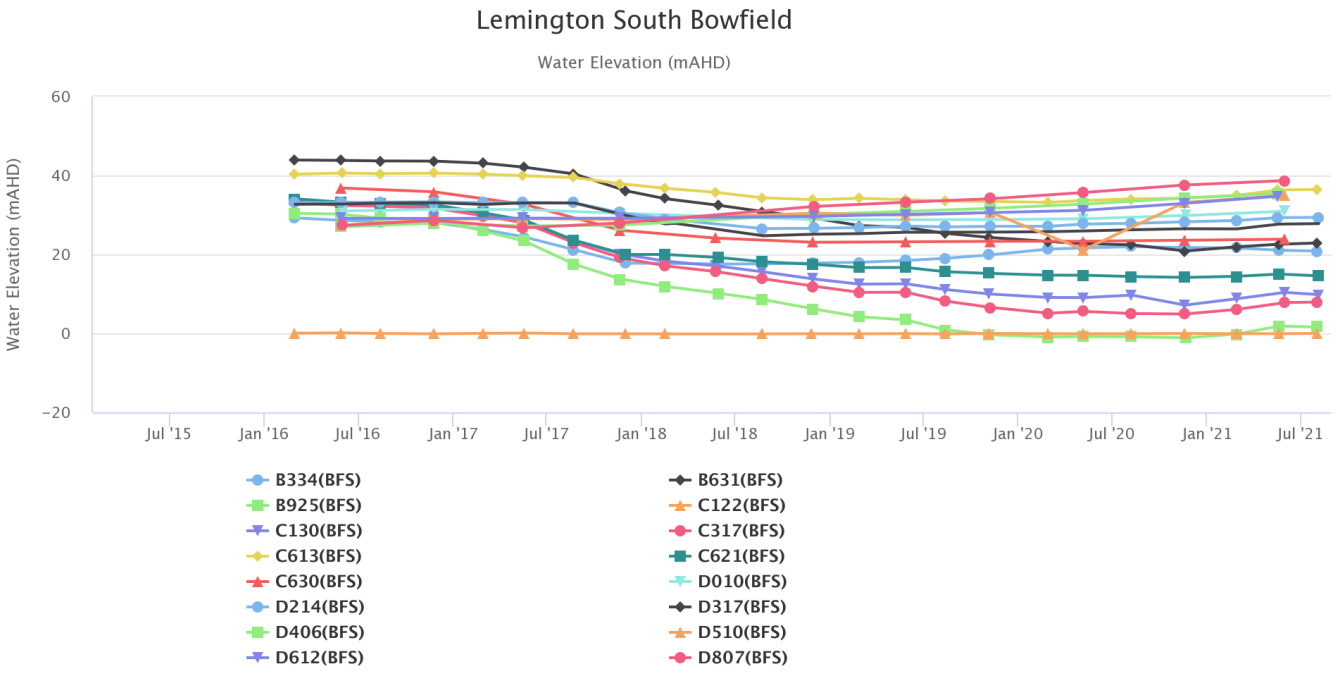


Figure 53 - Lemington South Bowfield Water Elevation Trend - Q3 2021

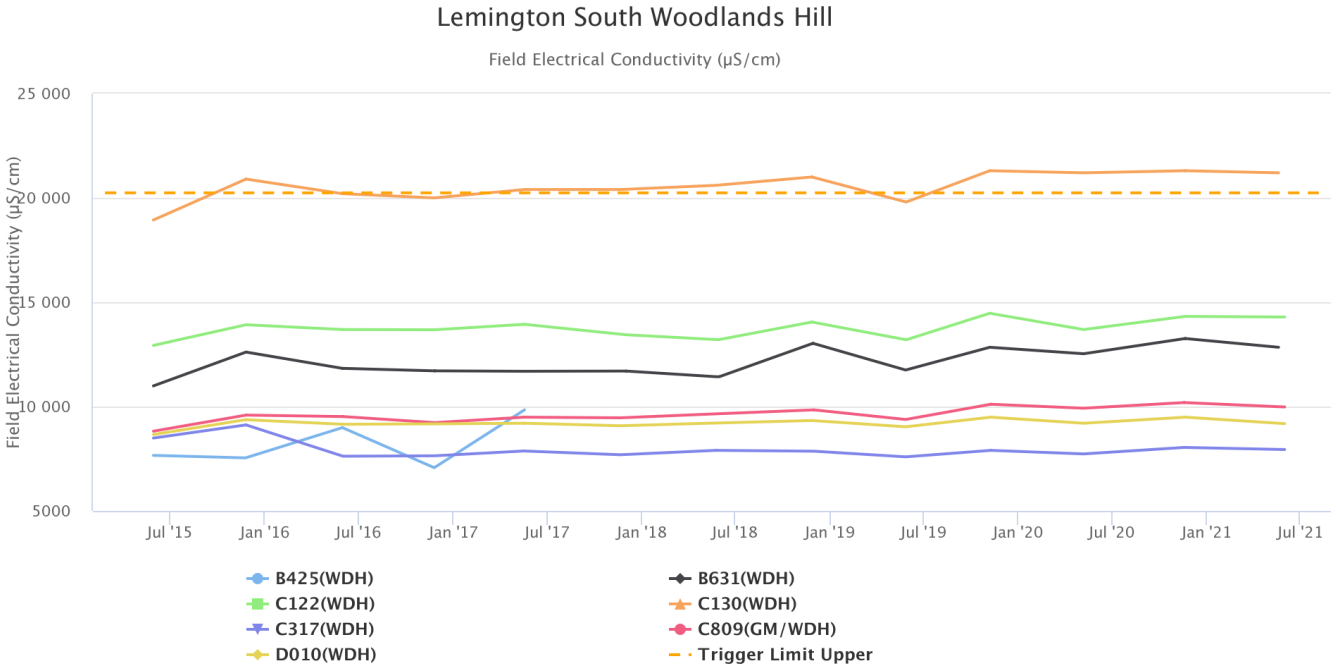


Figure 54 - Lemington South Woodlands Hill Electrical Conductivity Trend - Q3 2021

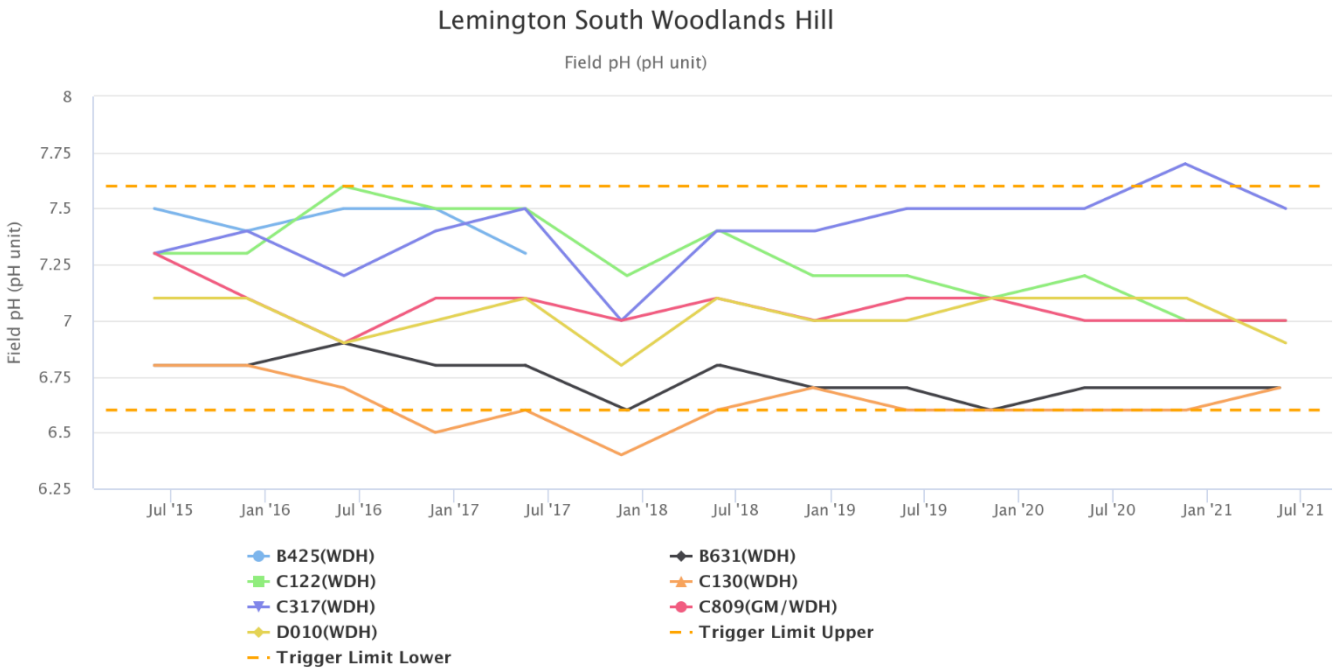


Figure 55 - Lemington South Woodlands Hill Field pH Trend - Q3 2021

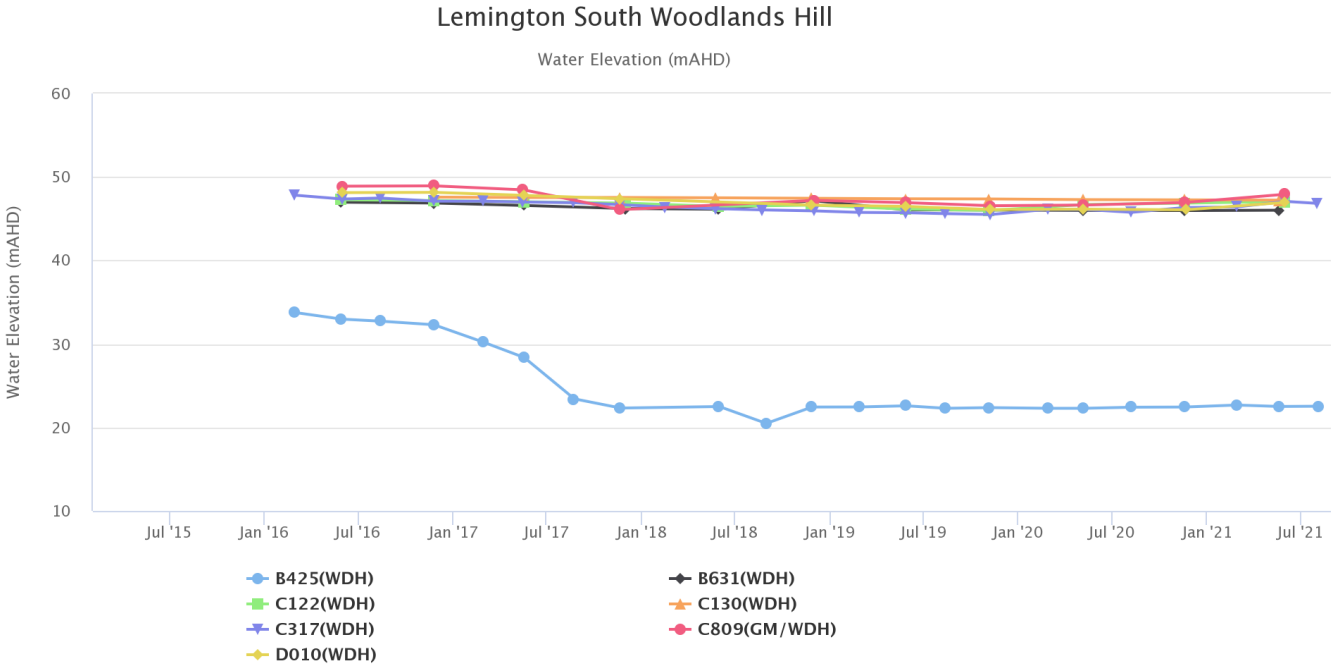


Figure 56 - Lemington South Woodlands Hill Water Elevation Trend - Q3 2021

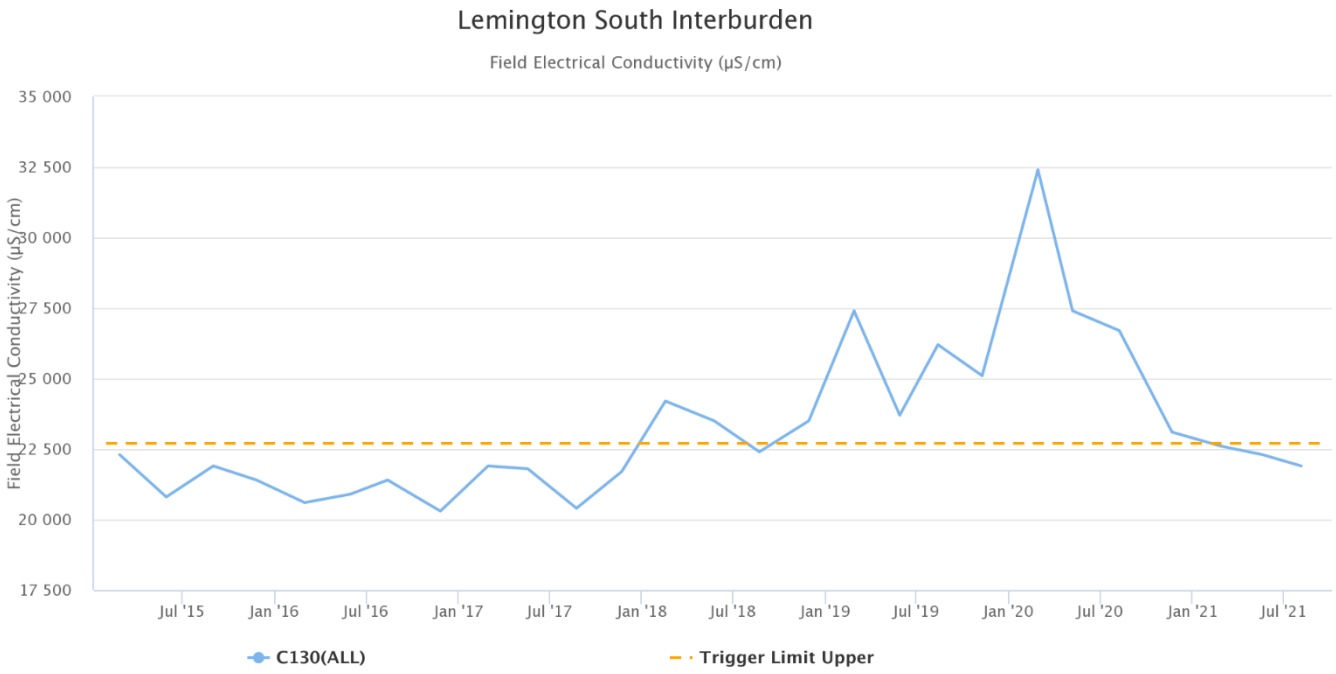


Figure 57 - Lemington South Interburden Electrical Conductivity Trend - Q3 2021

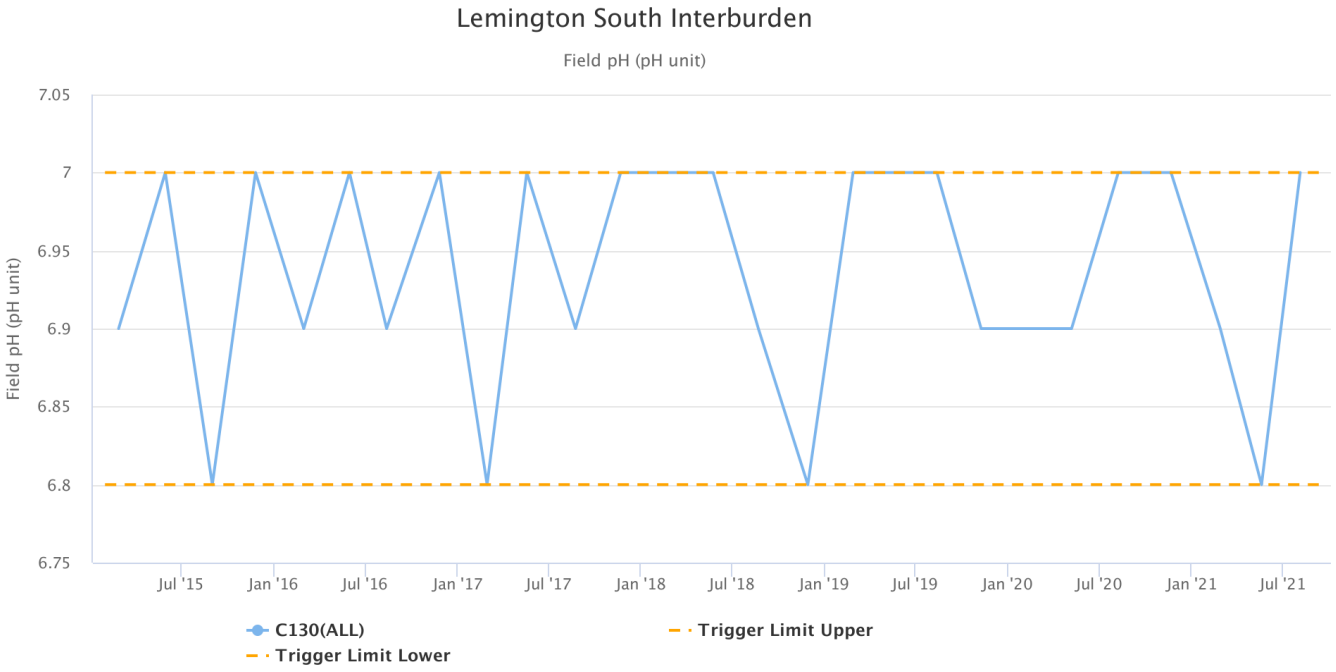


Figure 58 - Lemington South Interburden Field pH Trend - Q3 2021

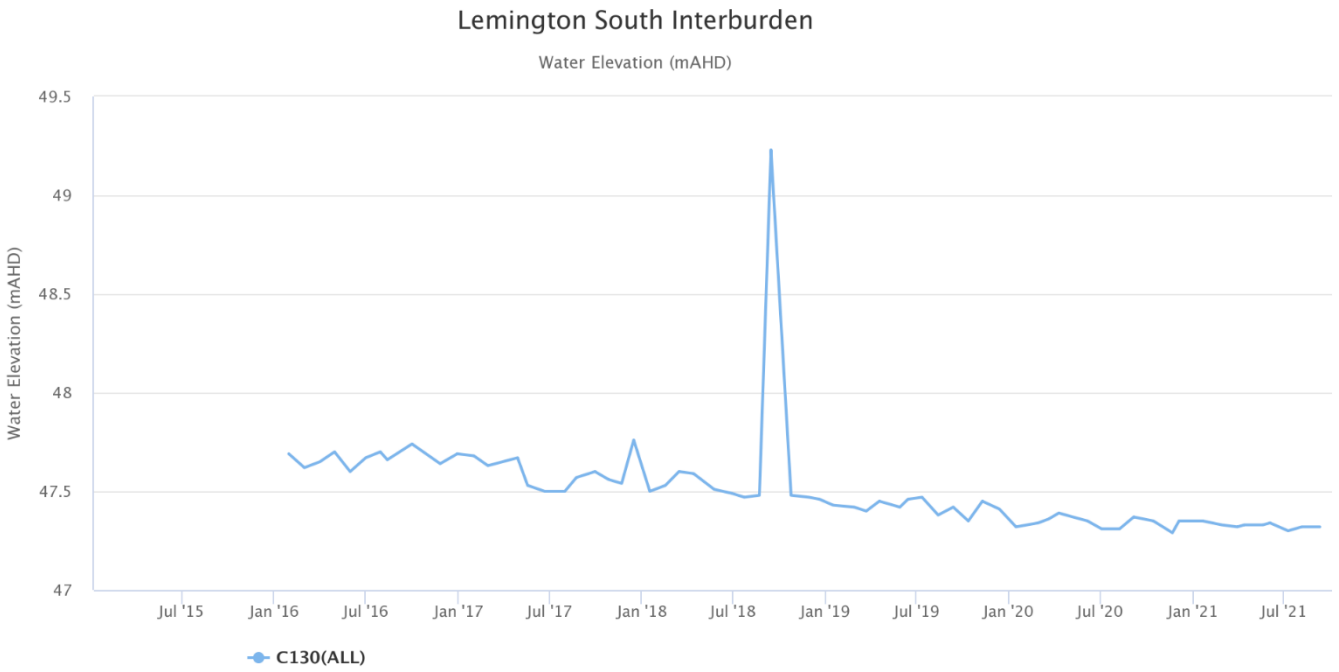


Figure 59 - Lemington South Interburden Water Elevation Trend - Q3 2021

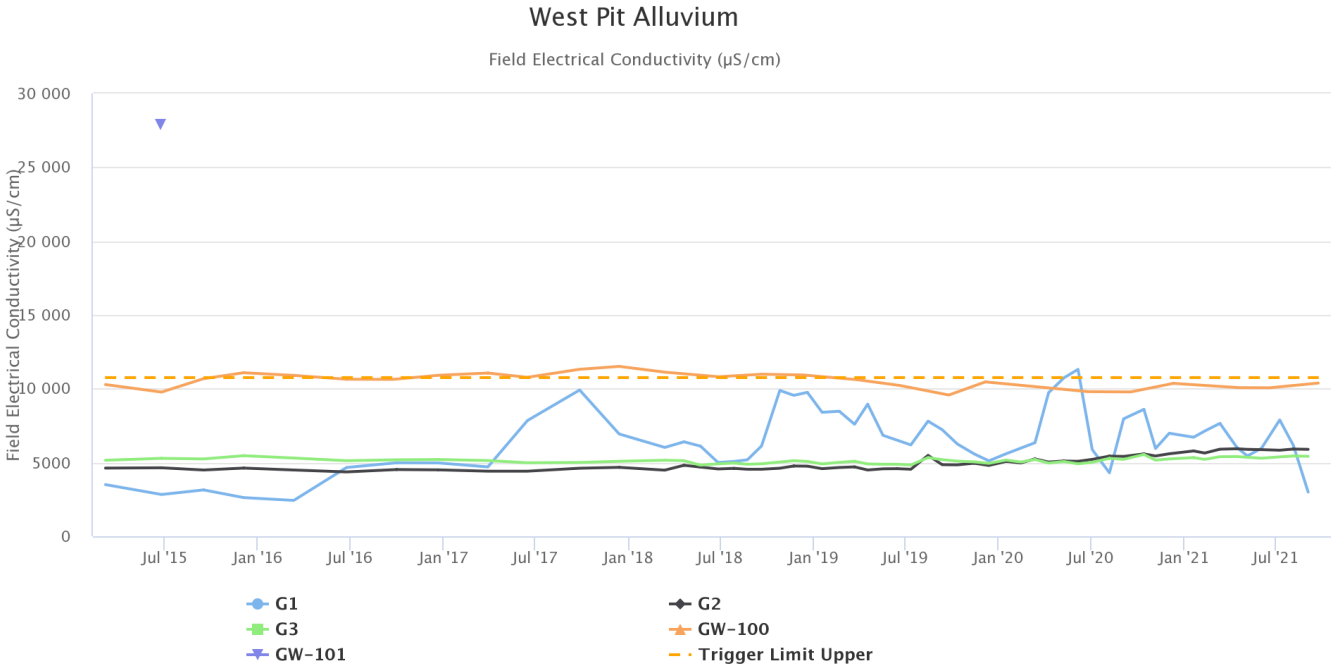


Figure 60 - West Pit Alluvium Electrical Conductivity Trend - Q3 2021

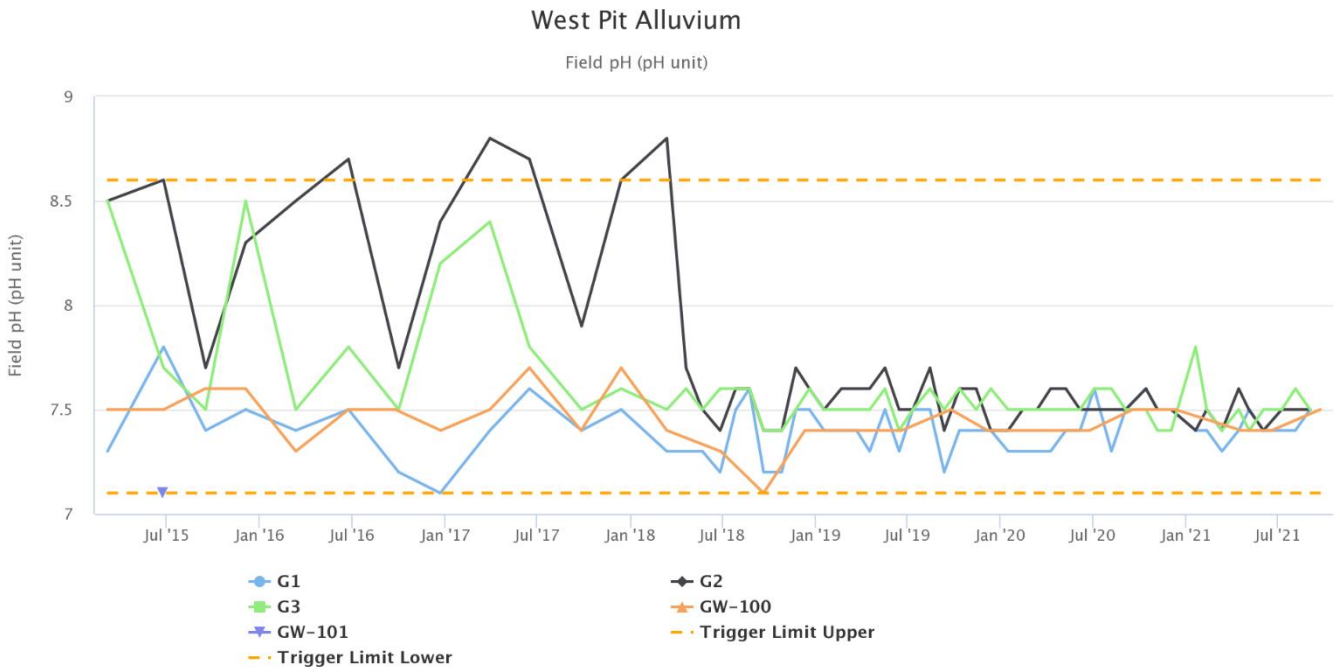
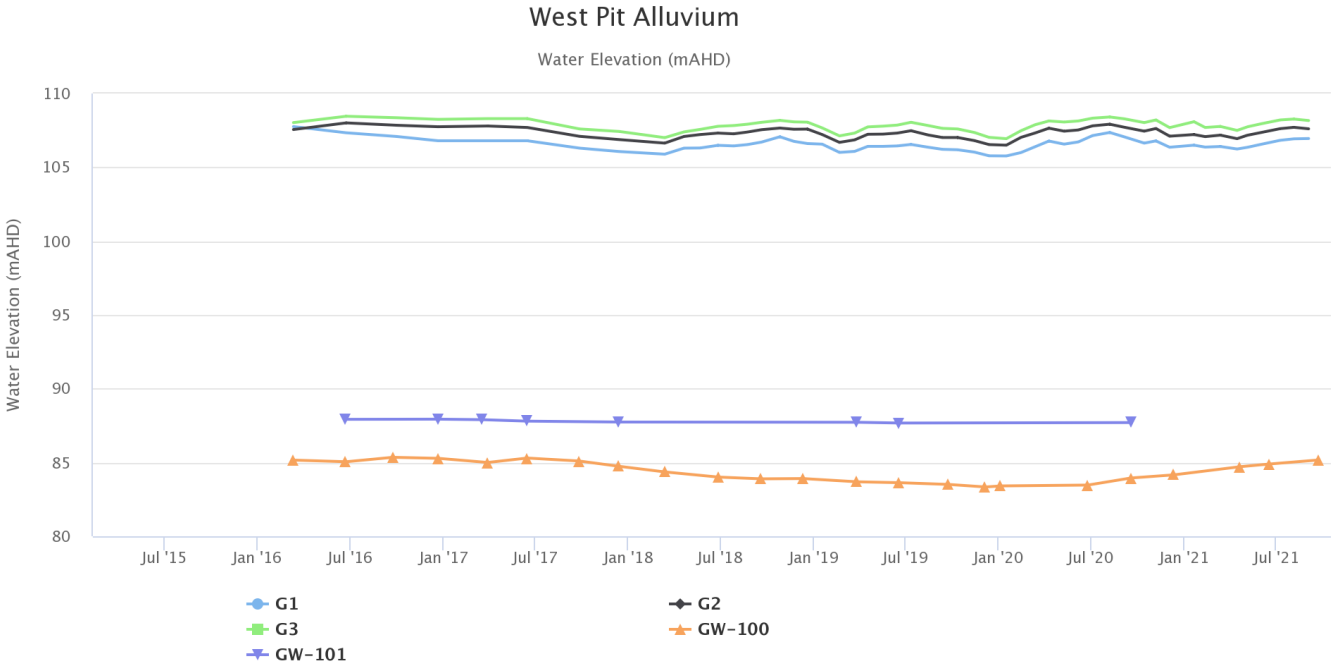


Figure 61 - West Pit Alluvium Field pH Trend - Q3 2021



** GW -101 had insufficient water for sampling*

Figure 62 - West Pit Alluvium Water Elevation Trend - Q3 2021

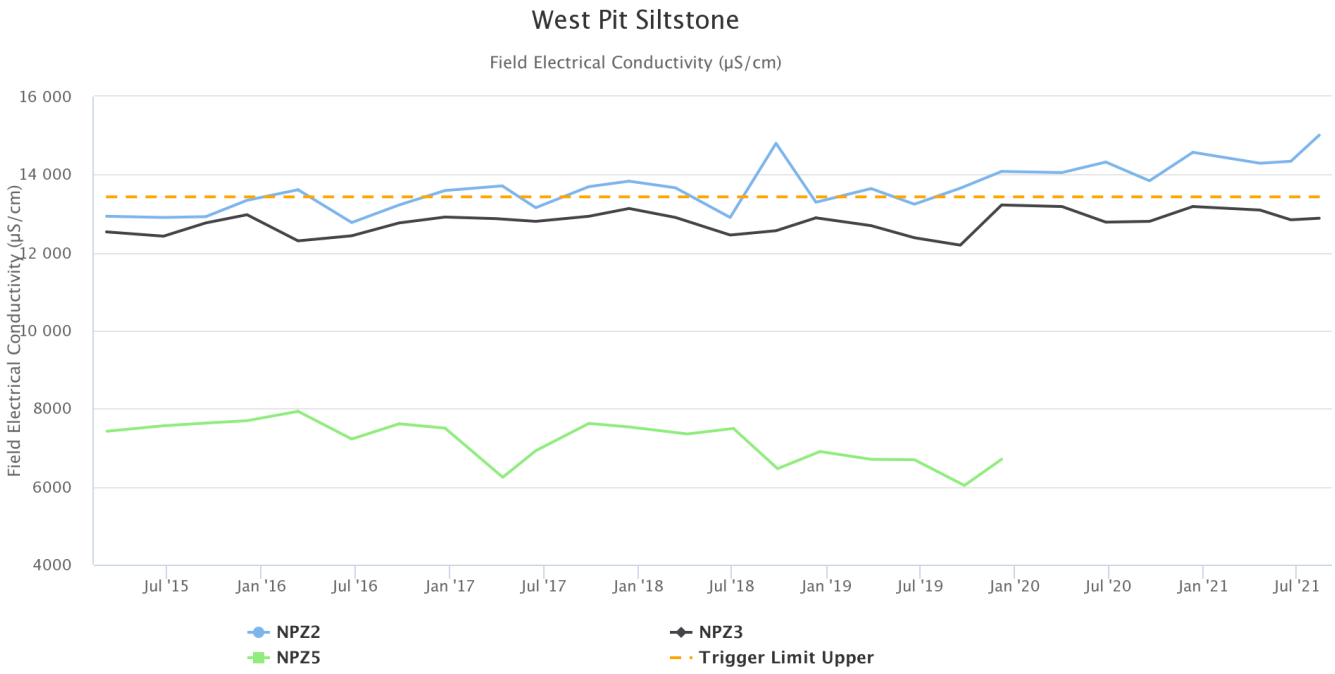


Figure 63 - West Pit Siltstone Electrical Conductivity Trend - Q3 2021

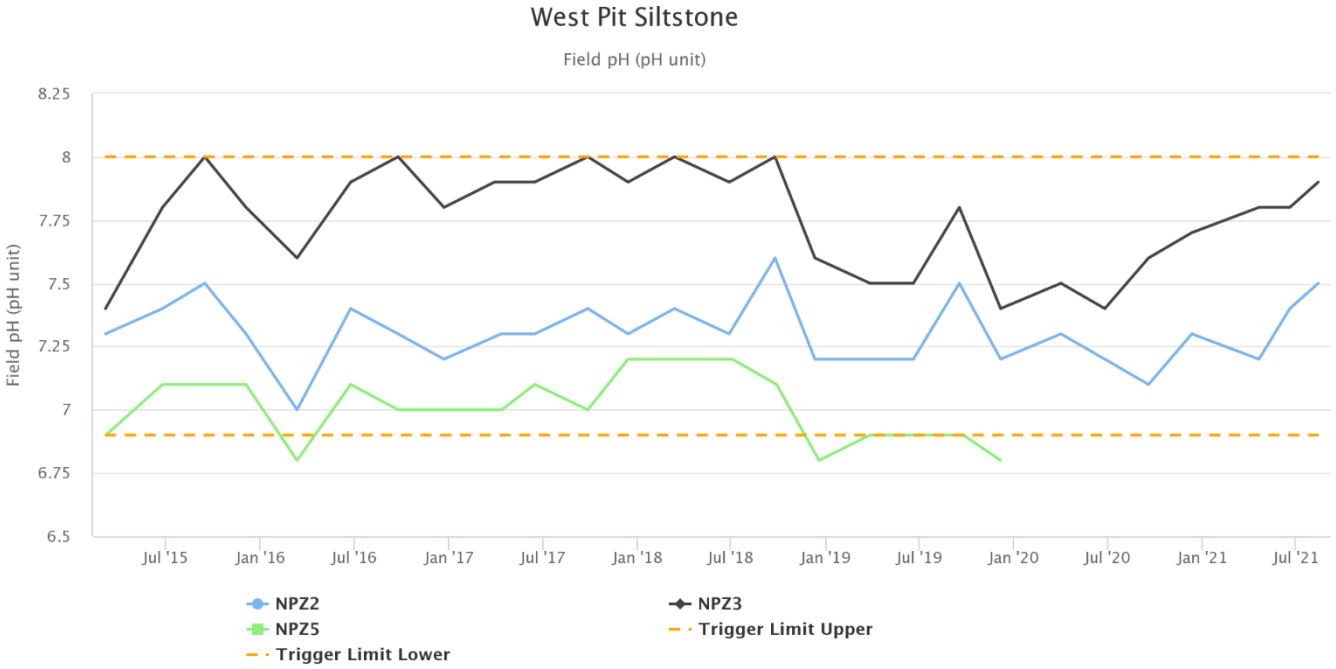


Figure 64 - West Pit Siltstone Field pH Trend - Q3 2021

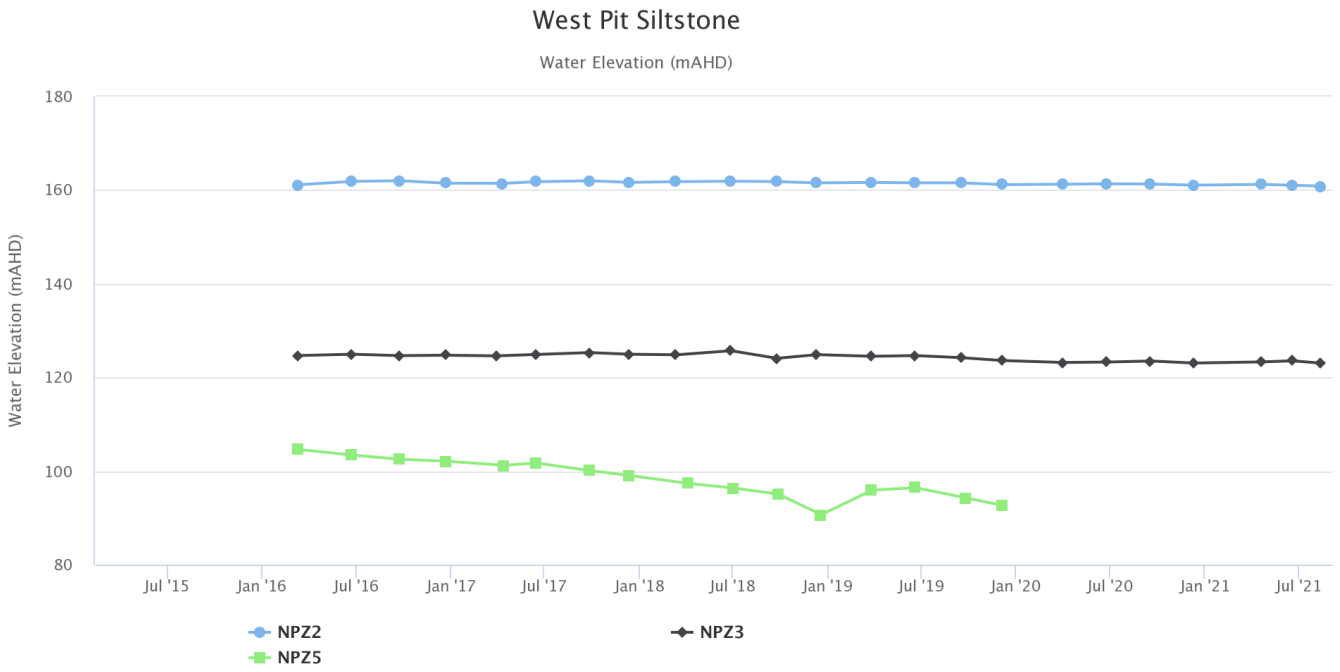


Figure 65 - West Pit Siltstone Water Elevation Trend - Q3 2021

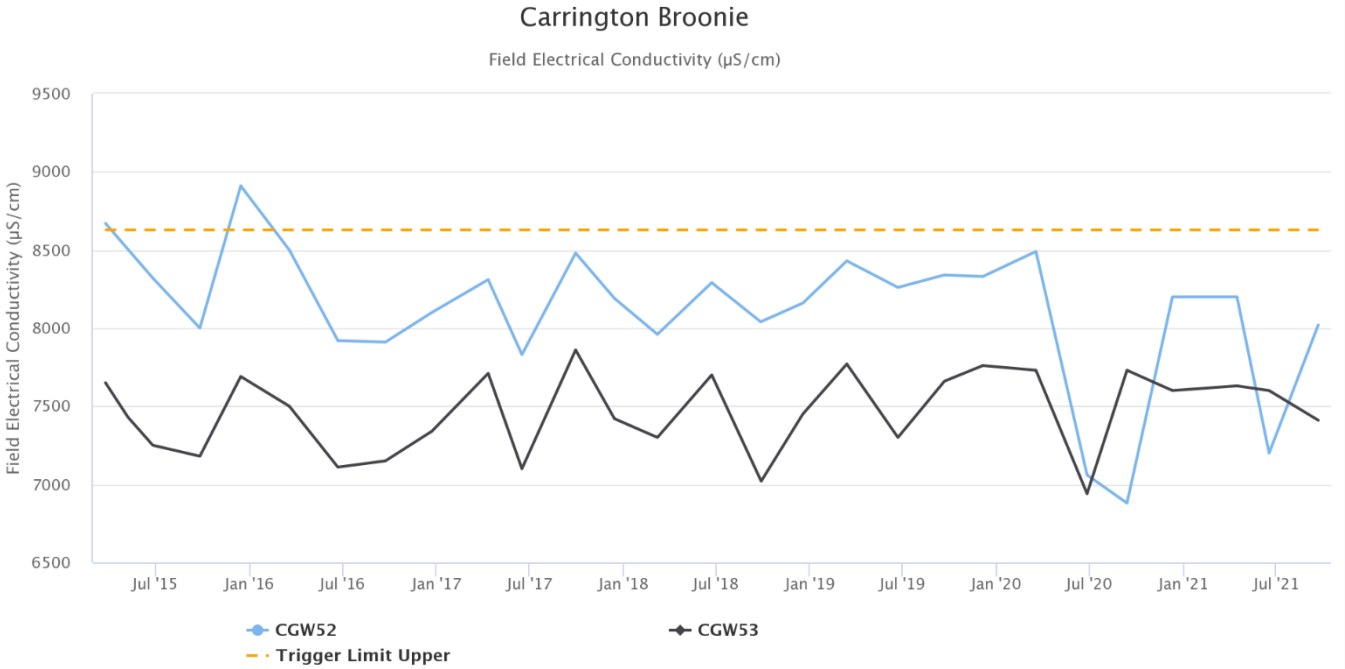


Figure 66 - Carrington Broonie Electrical Conductivity Trend - Q3 2021

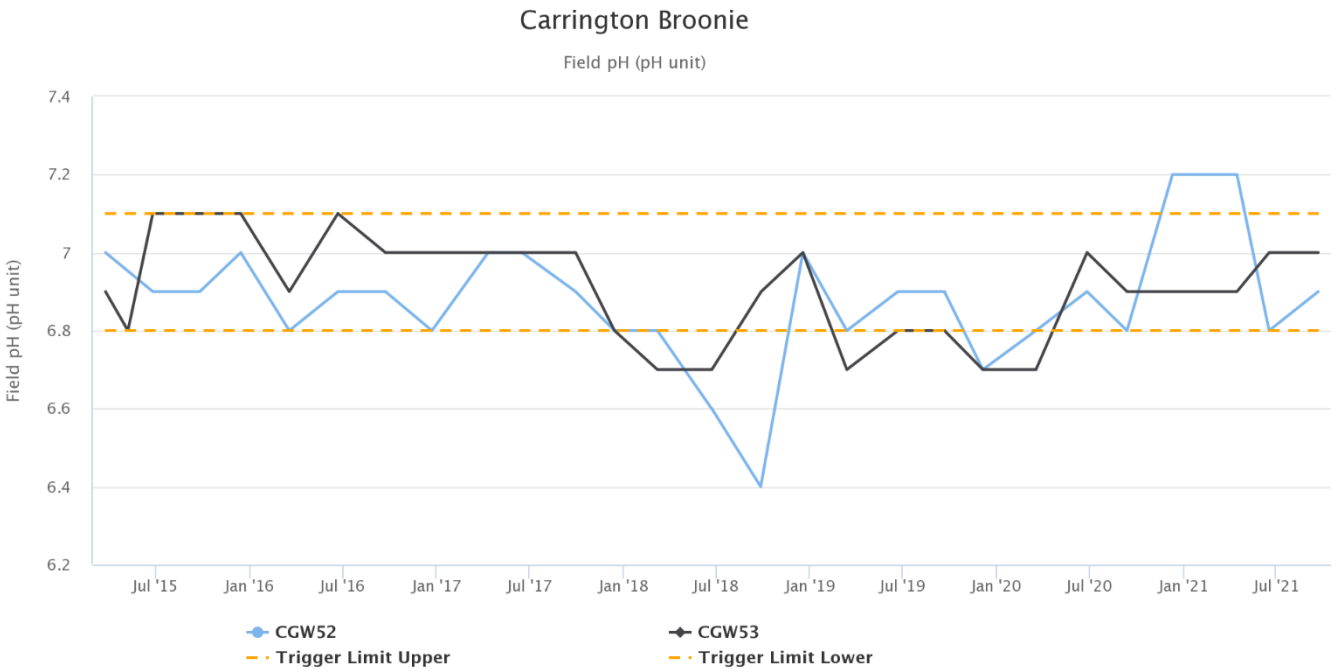


Figure 67 - Carrington Broonie Field pH Trend - Q3 2021

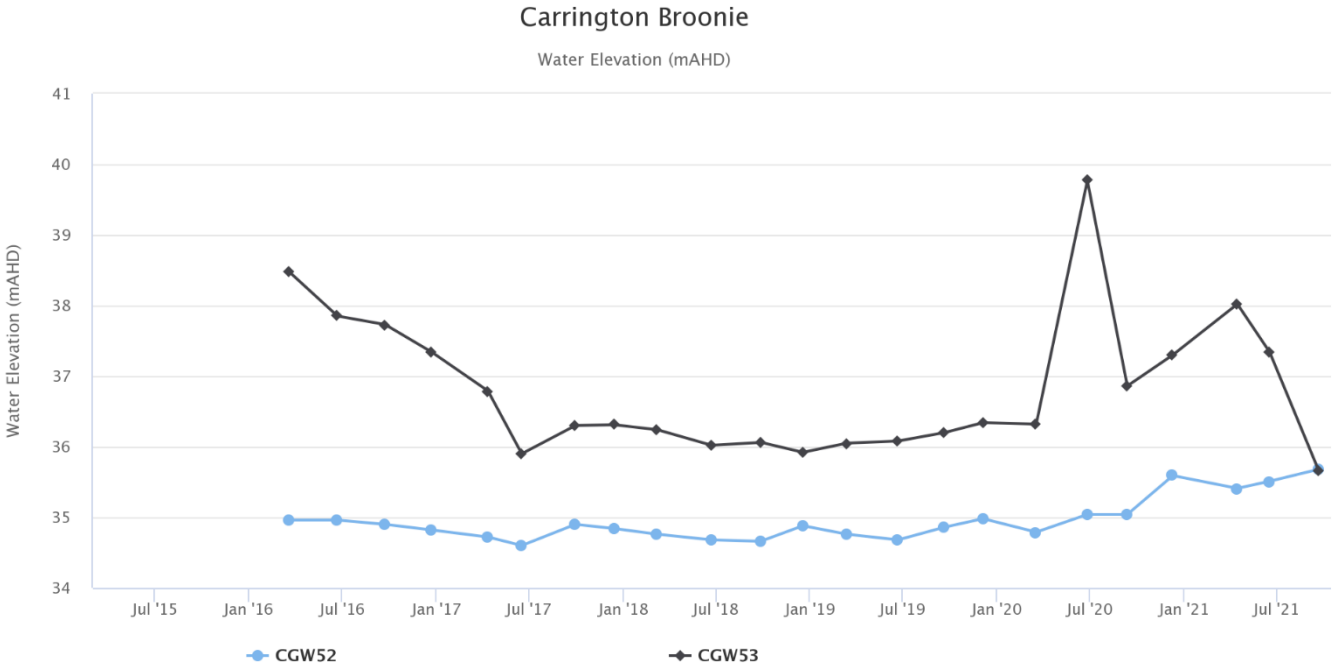


Figure 68 - Carrington Broonie Water Elevation Trend - Q3 2021

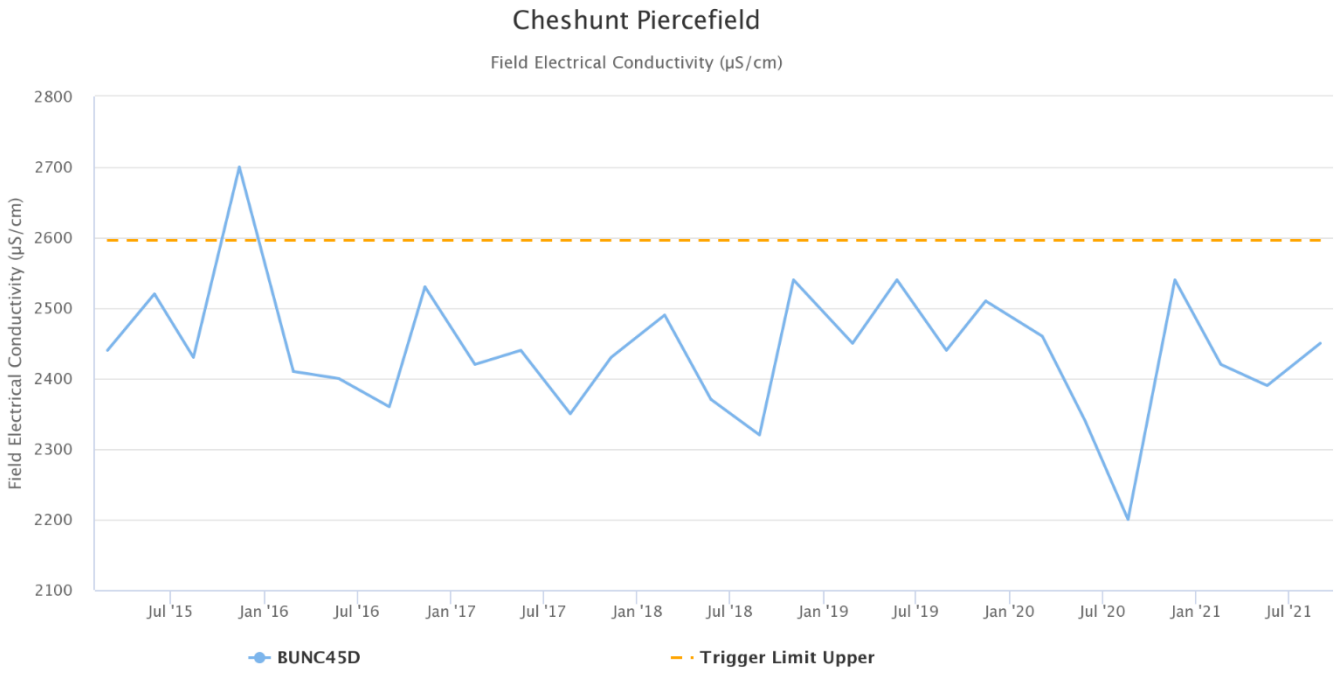


Figure 69 - Cheshunt Piercefield Electrical Conductivity Trend - Q3 2021

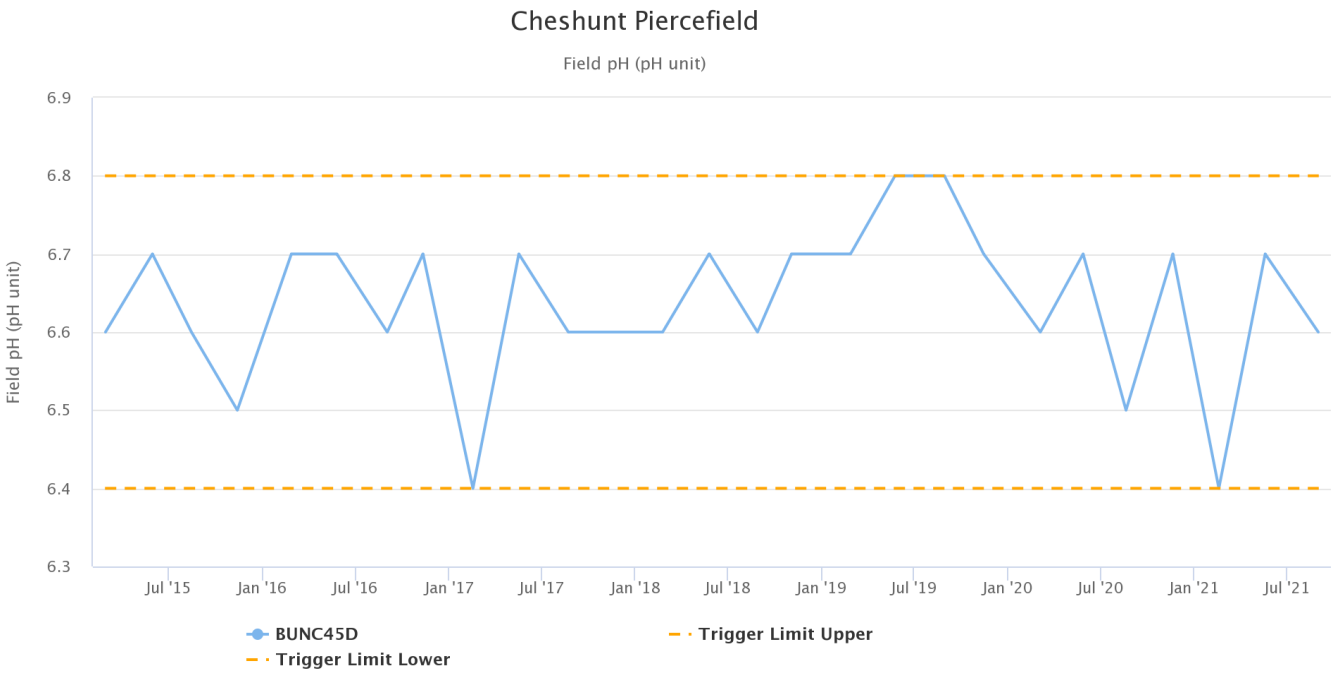


Figure 70 - Cheshunt Piercefield Field pH Trend - Q3 2021

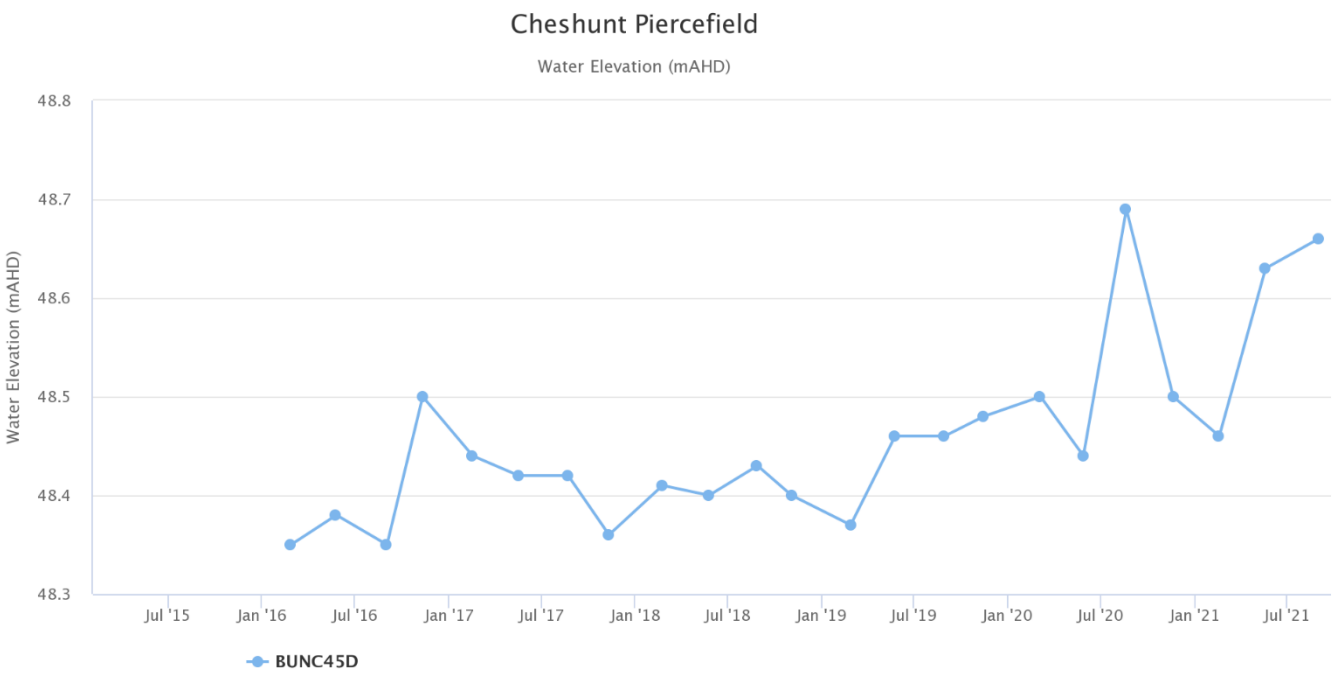


Figure 71 - Cheshunt Piercefield Water Elevation Trend - Q3 2021

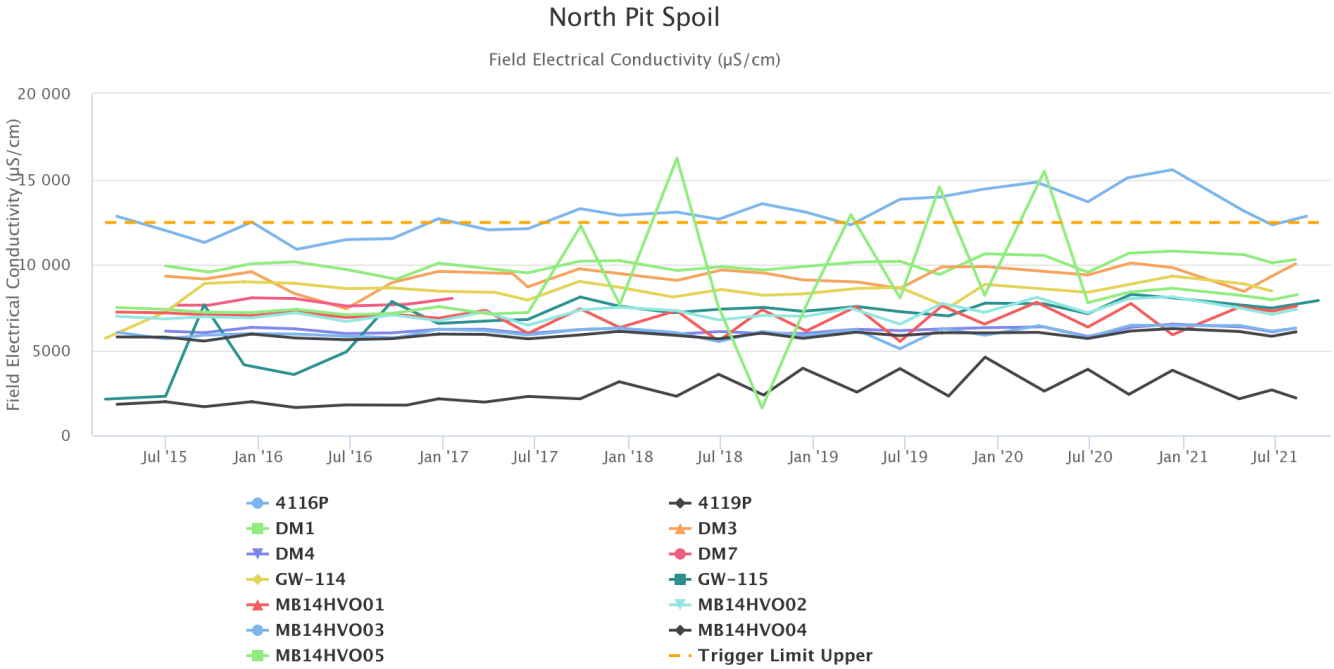


Figure 72 - North Pit Spoil Electrical Conductivity Trend - Q3 2021

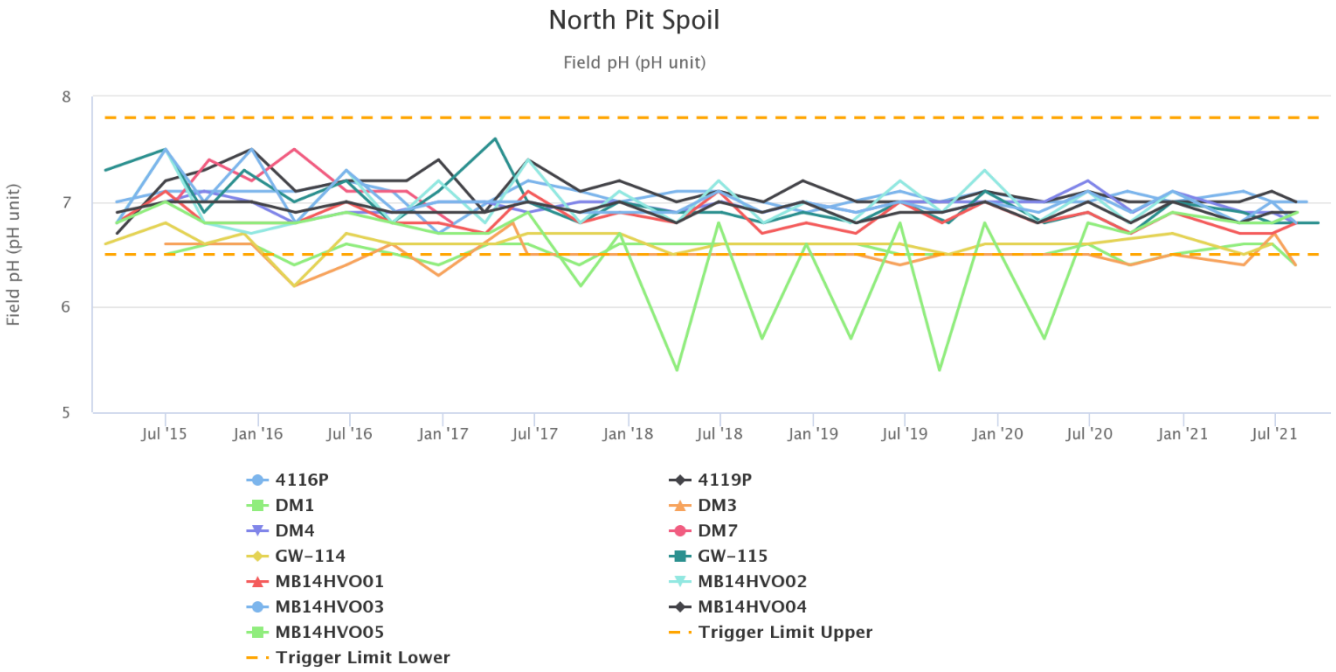


Figure 73 - North Pit Spoil Field pH Trend - Q3 2021

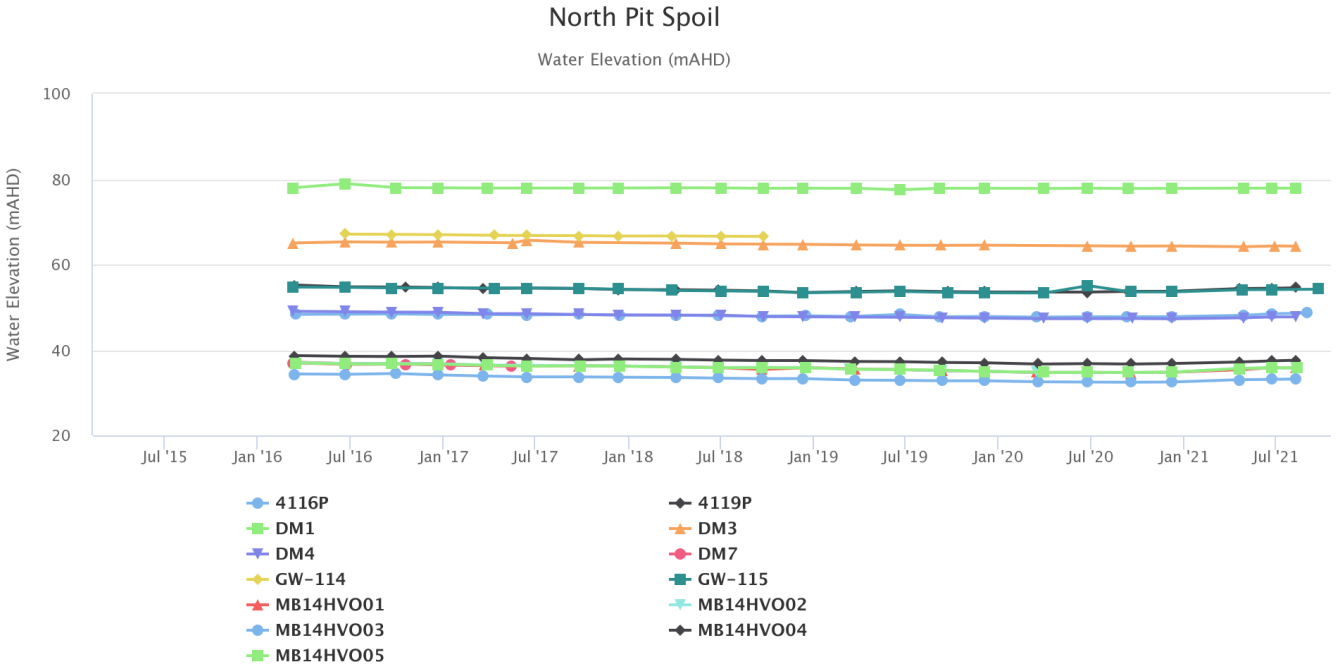


Figure 74 - North Pit Spoil Water Elevation Trend - Q3 2021

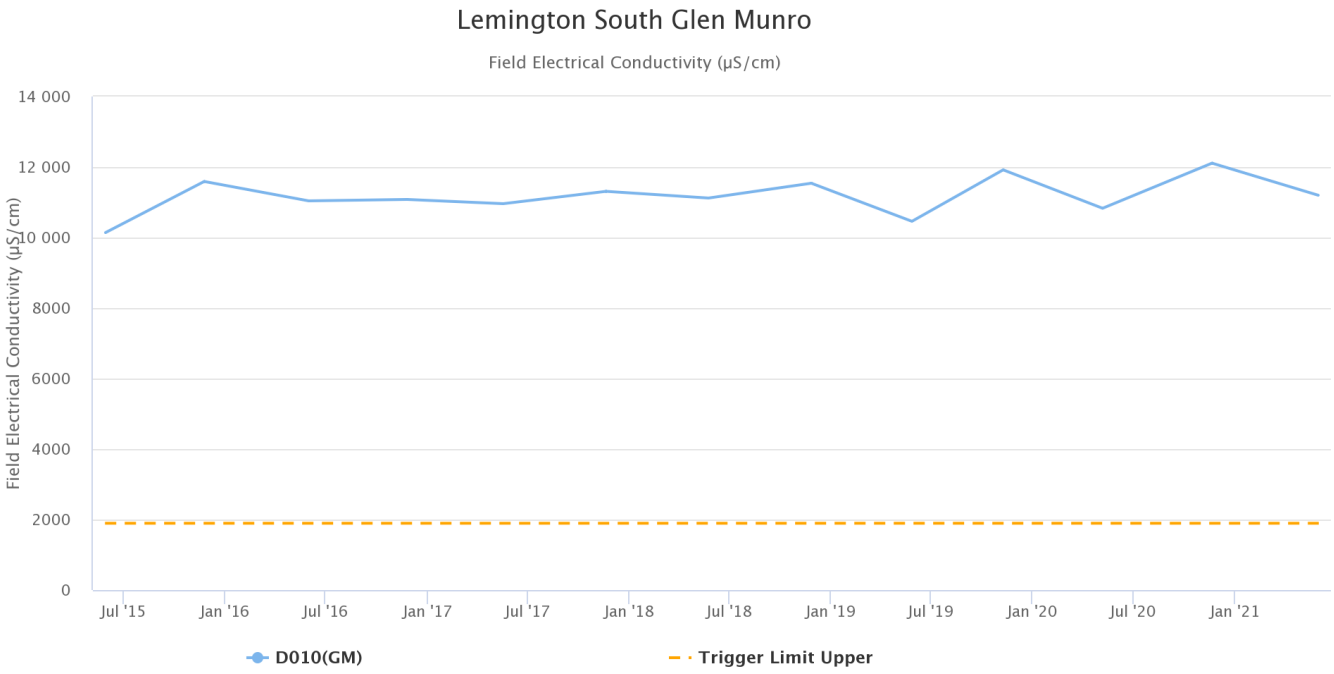


Figure 75 - Lemington South Glen Munro Electrical Conductivity Trend - Q3 2021

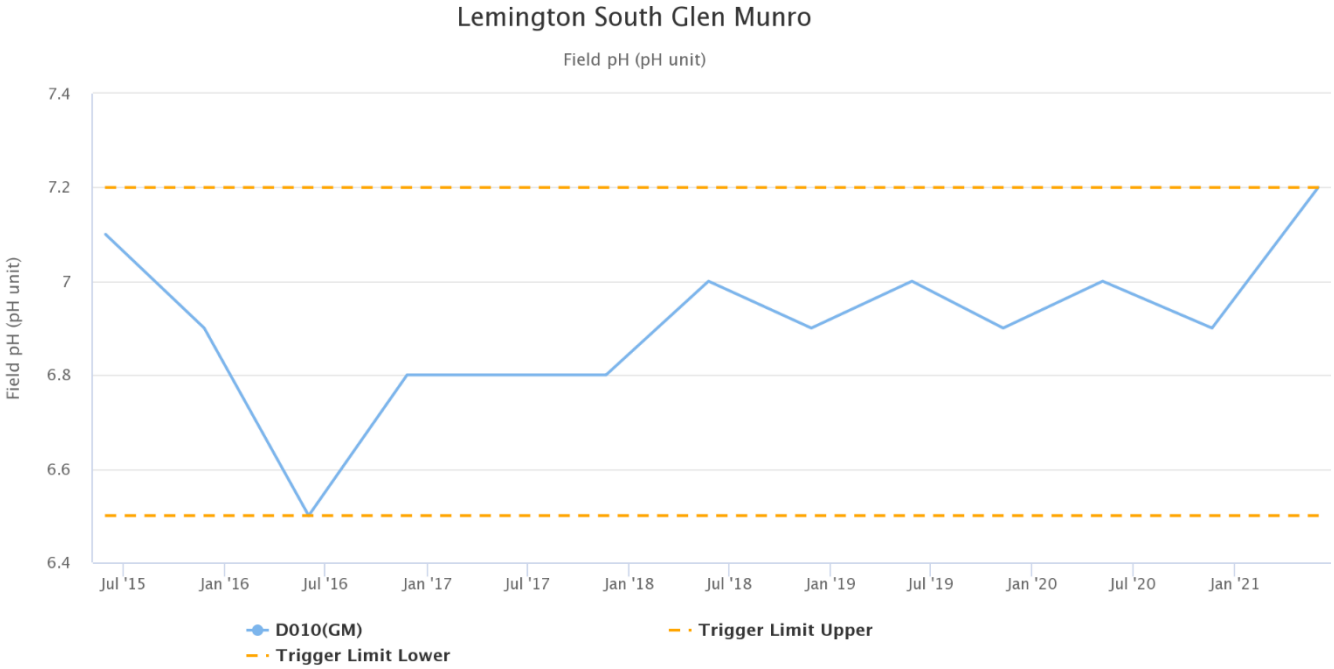


Figure 76 - Lemington South Glen Munro Field pH Trend - Q3 2021

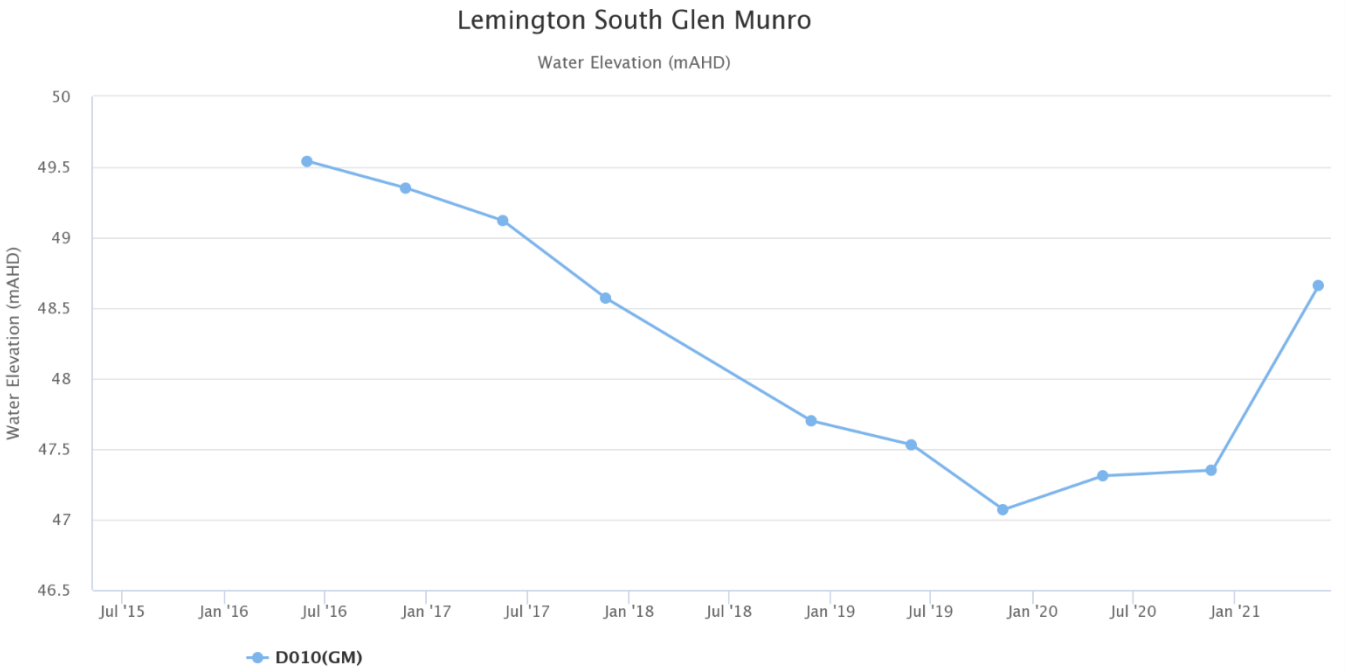


Figure 77 - Lemington South Glen Munro Water Elevation Trend - Q3 2021

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 – Q3 2021

Site	Date	Trigger Limit Breached	Response Action
CFW55R	13/07/2021	EC	Investigation Ongoing
CFW57	20/07/2021	Water Elevation	First consecutive trigger exceedance - watching brief established
C130 (All)	4/08/2021	EC	Investigation Ongoing
C919(ALL)	4/08/2021	pH	
CFW55R	5/08/2021	EC	Investigation Ongoing
DM1	9/08/2021	pH	First consecutive trigger exceedance – watching brief established
DM3	9/08/2021	pH	Second consecutive trigger exceedance – watching brief established
NPZ2	12/08/2021	EC	Investigation Ongoing
4116P	31/08/2021	EC	Investigation Ongoing
Hobdens Well	23/08/2021	pH	Second consecutive trigger exceedance – watching brief established
BZ2A(1)	30/08/2021	pH	Third consecutive trigger exceedance – investigation commenced
BZ3-3	30/08/2021	pH	Second consecutive trigger exceedance - watching brief established
BZ4A(2)	30/08/2021	pH	Second consecutive trigger exceedance - watching brief established
CFW55R	10/09/2021	EC	Investigation Ongoing
CGW53A	20/09/2021	Water Elevation	Third consecutive trigger exceedance – investigation commenced

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 ((L))	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 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 (dB)	Jerrys Plains Village (dB)	Maison Dieu (dB)	Warkworth (dB)	Knodlers Lane (dB)
1/09/2021 13:07	72.52	85.26	80.37	86.33	79.74
4/09/2021 13:21	84.09	107.74	95.04	98.04	91.61
4/09/2021 16:02	72.45	88.72	98.38	95.9	109.6
8/09/2021 11:07	91.06	80.54	82.58	89.14	90.87
8/09/2021 13:09	91.03	89.14	94.83	90.62	94.49
13/09/2021 13:11	99.28	97.29	94.82	101.62	99.88
13/09/2021 13:12	83.22	93.42	93.64	95.62	105.43
14/09/2021 13:17	105.47	88.51	99.76	95.30	114.20
14/09/2021 13:18	97.42	86.38	98.74	101.12	113.35
17/09/2021 13:23	84.42	86.52	90.29	82.63	95.65
22/09/2021 14:45	88.08	83.67	97.62	99.63	96.63
25/09/2021 13:06	107.27	106.78	97.08	96.41	111.03
27/09/2021 13:33	95.45	96.46	94.38	96.45	98.72
29/09/2021 14:59	101.56	92.15	91.66	111.02	98.73
29/09/2021 15:00	101.37	94.07	90.02	103.14	94.28
29/09/2021 15:55	100.27	101.46	92.78	96.37	95.86
30/09/2021 13:08	110.64	99.31	103.25	93.76	108.34

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)
1/09/2021 13:07	0.09	0.21	0.07	0.27	0.09
4/09/2021 13:21	0.1	0.08	0.3	0.3	0.25
4/09/2021 16:02	0.09	0.08	0.05	0.1	0.08
8/09/2021 11:07	0.16	0.06	0.05	0.18	0.08
8/09/2021 13:09	0.15	0.07	0.23	0.5	0.37
13/09/2021 13:11	0.17	0.17	0.11	0.69	0.12
13/09/2021 13:12	0.28	0.23	0.19	0.2	0.11
14/09/2021 13:17	0.11	0.04	0.05	1.04	0.08
14/09/2021 13:18	0.1	0.03	0.05	0.23	0.08
17/09/2021 13:23	0.11	0.07	0.06	0.14	0.08
22/09/2021 14:45	0.2	0.1	0.43	1.32	0.37
25/09/2021 13:06	0.1	0.05	0.05	0.11	0.08
27/09/2021 13:33	0.22	0.2	1.32	1.44	1.12
29/09/2021 14:59	0.13	0.04	0.22	0.6	0.23
29/09/2021 15:00	0.12	0.04	0.1	0.81	0.14
29/09/2021 15:55	0.16	0.13	0.08	0.21	0.09
30/09/2021 13:08	0.11	0.04	0.04	0.14	0.09
1/09/2021 13:07	0.09	0.21	0.07	0.27	0.09

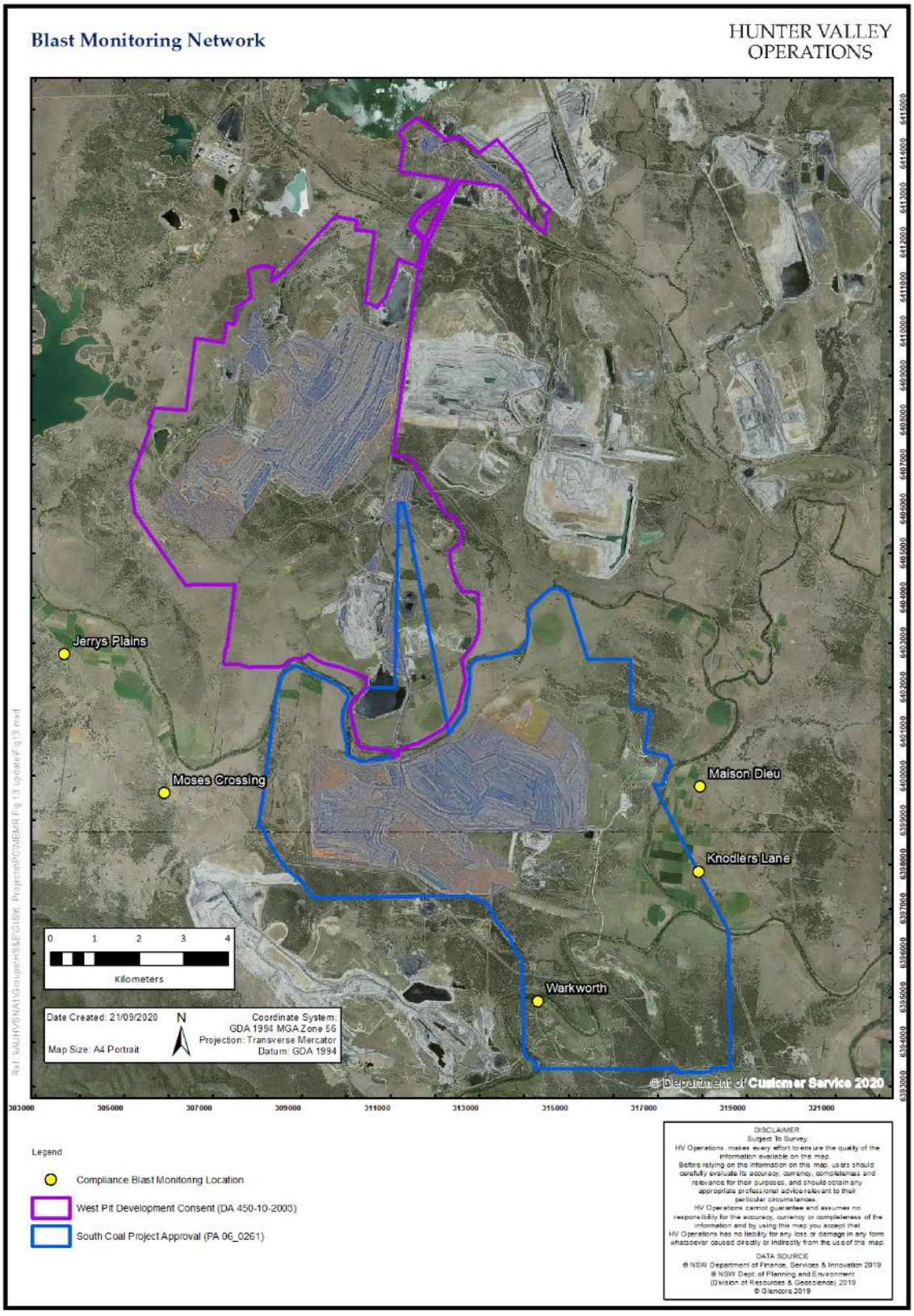


Figure 78 - Blast Monitoring Location Plan

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 on the nights of 31 August and 6 September 2021.

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	*6/09/2021 21:00*	1.7	E	35	Yes	IA	Nil
Knodlers Lane	*6/09/2021 21:45*	0.5	F	35	Yes	IA	Nil
Maison Dieu	*6/09/2021 21:23*	0.9	E	35	Yes	IA	Nil
Long Point (Dights Crossing)	*6/09/2021 22:40*	0.8	E	35	Yes	IA	Nil
Kilburnie South	*6/09/2021 23:14*	1.8	D	39	Yes	IA	Nil
Jerrys Plains East	*6/09/2021 21:00*	1.7	E	39	Yes	NM	Nil
Jerrys Plains Village	*6/09/2021 21:46*	0.5	F	40	Yes	IA	Nil
Jerrys Plains West	*6/09/2021 21:23*	0.9	E	40	Yes	IA	Nil
HVGC	*6/09/2021 23:42*	2.3	D	NA	Yes	IA	Nil
Kilburnie South	*31/08/2021 21:00*	1.2	E	39	Yes	29	Nil
Jerrys Plains East	*31/08/2021 21:24*	1.5	E	39	Yes	30	Nil
Jerrys Plains Village	*31/08/2021 21:44*	1.3	E	40	Yes	<30	Nil

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 3m/s measured at 10 metres above ground level, or temperature inversion conditions greater than 3 degrees C/100m (G stability class);

3. Site-only L_{A1} 1 minute attributed to HVO North Pit Area;

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	*6/09/2021 21:00*	1.7	E	41	Yes	IA	Nil
Knodlers Lane	*6/09/2021 21:45*	0.5	F	41	Yes	IA	Nil
Maison Dieu	*6/09/2021 21:23*	0.9	E	41	Yes	IA	Nil
Long Point (Dights Crossing)	*6/09/2021 22:40*	0.8	E	41	Yes	IA	Nil
Kilburnie South	*6/09/2021 23:14*	1.8	D	41	Yes	IA	Nil
Jerrys Plains East	*6/09/2021 21:00*	1.7	E	41	Yes	NM	Nil
Jerrys Plains Village	*6/09/2021 21:46*	0.5	F	41	Yes	IA	Nil
Jerrys Plains West	*6/09/2021 21:23*	0.9	E	41	Yes	IA	Nil
HVGC	*6/09/2021 23:42*	2.3	D	NA	Yes	IA	Nil
Kilburnie South	*31/08/2021 21:00*	1.2	E	41	Yes	IA	Nil
Jerrys Plains East	*31/08/2021 21:24*	1.5	E	41	Yes	IA	Nil
Jerrys Plains Village	*31/08/2021 21:44*	1.3	E	41	Yes	IA	Nil

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 3m/s measured at 10 metres above ground level, or temperature inversion conditions greater than 3 degrees C/100m (G stability class);

3. Site-only L_{A1} 1 minute attributed to HVO North Pit Area;

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 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	*6/09/2021 21:00*	1.7	E	46	Yes	IA	Nil
Knodlers Lane	*6/09/2021 21:45*	0.5	F	46	Yes	IA	Nil
Maison Dieu	*6/09/2021 21:23*	0.9	E	46	Yes	IA	Nil
Long Point (Dights Crossing)	*6/09/2021 22:40*	0.8	E	46	Yes	IA	Nil
Kilburnie South	*6/09/2021 23:14*	1.8	D	46	Yes	IA	Nil
Jerrys Plains East	*6/09/2021 21:00*	1.7	E	46	Yes	NM	Nil
Jerrys Plains Village	*6/09/2021 21:46*	0.5	F	46	Yes	IA	Nil
Jerrys Plains West	*6/09/2021 21:23*	0.9	E	46	Yes	IA	Nil
HVGC	*6/09/2021 23:42*	2.3	D	NA	Yes	IA	Nil
Kilburnie South	*31/08/2021 21:00*	1.2	E	46	Yes	IA	Nil
Jerrys Plains East	*31/08/2021 21:24*	1.5	E	46	Yes	IA	Nil
Jerrys Plains Village	*31/08/2021 21:44*	1.3	E	46	Yes	IA	Nil

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 3m/s measured at 10 metres above ground level, or temperature inversion conditions greater than 3 degrees C/100m (G stability class);

3. Site-only L_{A1} 1 minute attributed to HVO North Pit Area;

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 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	*6/09/2021 21:00*	1.5	E	41	Yes	IA	Nil
Knodlers Lane	*6/09/2021 21:45*	0.8	D	40	Yes	IA	Nil
Maison Dieu	*6/09/2021 21:23*	0.6	E	39	Yes	IA	Nil
Long Point (Dights Crossing)	*6/09/2021 22:40*	1.7	E	37	Yes	IA	Nil
Kilburnie South	*6/09/2021 23:14*	2.6	E	39	Yes	IA	Nil
Jerrys Plains East	*6/09/2021 21:00*	1.5	E	38	Yes	IA	Nil
Jerrys Plains Village	*6/09/2021 21:46*	0.8	D	38	Yes	IA	Nil
Jerrys Plains West	*6/09/2021 21:23*	0.6	E	35	Yes	IA	Nil
HVGC	*6/09/2021 23:42*	3.3	E	55	No	IA	NA

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

2. Noise criteria apply for wind speeds up to 3m/s (at a height of 10m), or during stability class G conditions. Criterion may or may not apply due to rounding of meteorological data values;

3. Site-only L_{Aeq} 15 minute attributed to HVO South 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 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	*6/09/2021 21:00*	1.5	E	45	Yes	IA	Nil
Knodlers Lane	*6/09/2021 21:45*	0.8	D	45	Yes	IA	Nil
Maison Dieu	*6/09/2021 21:23*	0.6	E	45	Yes	IA	Nil
Long Point (Dights Crossing)	*6/09/2021 22:40*	1.7	E	45	Yes	IA	Nil
Kilburnie South	*6/09/2021 23:14*	2.6	E	45	Yes	IA	Nil
Jerrys Plains East	*6/09/2021 21:00*	1.5	E	45	Yes	IA	Nil
Jerrys Plains Village	*6/09/2021 21:46*	0.8	D	45	Yes	IA	Nil
Jerrys Plains West	*6/09/2021 21:23*	0.6	E	45	Yes	IA	Nil
HVGC	*6/09/2021 23:42*	3.3	E	NA	No	IA	NA

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

2. Noise criteria apply for wind speeds up to 3m/s (at a height of 10m), or during stability class G conditions. Criterion may or may not apply due to rounding of meteorological data values;

3. Site-only L_{Aeq} 15 minute attributed to HVO South 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;

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	*6/09/2021 21:00*	IA	Yes	No	No	NA	No	NA	Nil
Knodlers Lane	*6/09/2021 21:45*	IA	Yes	No	No	NA	No	NA	Nil
Maison Dieu	*6/09/2021 21:23*	IA	Yes	No	No	NA	No	NA	Nil
Long Point (Dights Crossing)	*6/09/2021 22:40*	IA	Yes	No	No	NA	No	NA	Nil
Kilburnie South	*6/09/2021 23:14*	IA	Yes	No	No	NA	No	NA	Nil
Jerrys Plains East	*6/09/2021 21:00*	NM	Yes	No	No	NA	No	NA	Nil
Jerrys Plains Village	*6/09/2021 21:46*	IA	Yes	No	No	NA	No	NA	Nil
Jerrys Plains West	*6/09/2021 21:23*	IA	Yes	No	No	NA	No	NA	Nil
HVGC	*6/09/2021 23:42*	IA	Yes	No	No	NA	No	NA	Nil
Kilburnie South	*31/08/2021 21:00*	29	Yes	No	No	NA	No	NA	Nil
Jerrys Plains East	*31/08/2021 21:24*	30	Yes	No	No	NA	No	NA	Nil
Jerrys Plains Village	*31/08/2021 21:44*	<30	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

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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	*6/09/2021 21:00*	IA	Yes	No	No	NA	No	NA	Nil
Knodlers Lane	*6/09/2021 21:45*	IA	Yes	No	No	NA	No	NA	Nil
Maison Dieu	*6/09/2021 21:23*	IA	Yes	No	No	NA	No	NA	Nil
Long Point (Dights Crossing)	*6/09/2021 22:40*	IA	Yes	No	No	NA	No	NA	Nil
Kilburnie South	*6/09/2021 23:14*	IA	Yes	No	No	NA	No	NA	Nil
Jerrys Plains East	*6/09/2021 21:00*	IA	Yes	No	No	NA	No	NA	Nil
Jerrys Plains Village	*6/09/2021 21:46*	IA	Yes	No	No	NA	No	NA	Nil
Jerrys Plains West	*6/09/2021 21:23*	IA	Yes	No	No	NA	No	NA	Nil
HVGC	*6/09/2021 23:42*	IA	No	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

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.

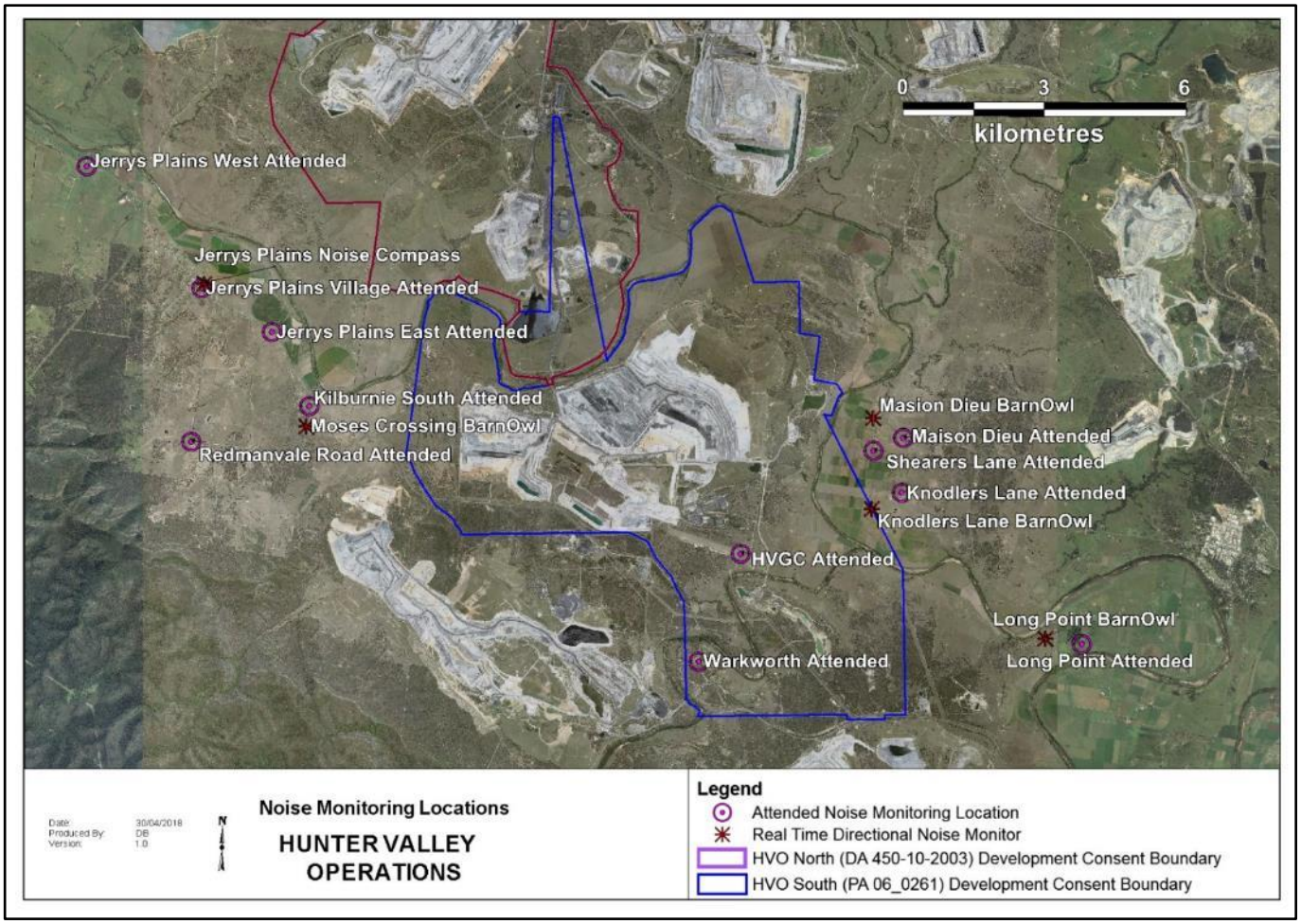

Figure 79 - Noise Monitoring Location Plan

6 Operational Downtime

A total of 151.9 hours of equipment downtime were 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).

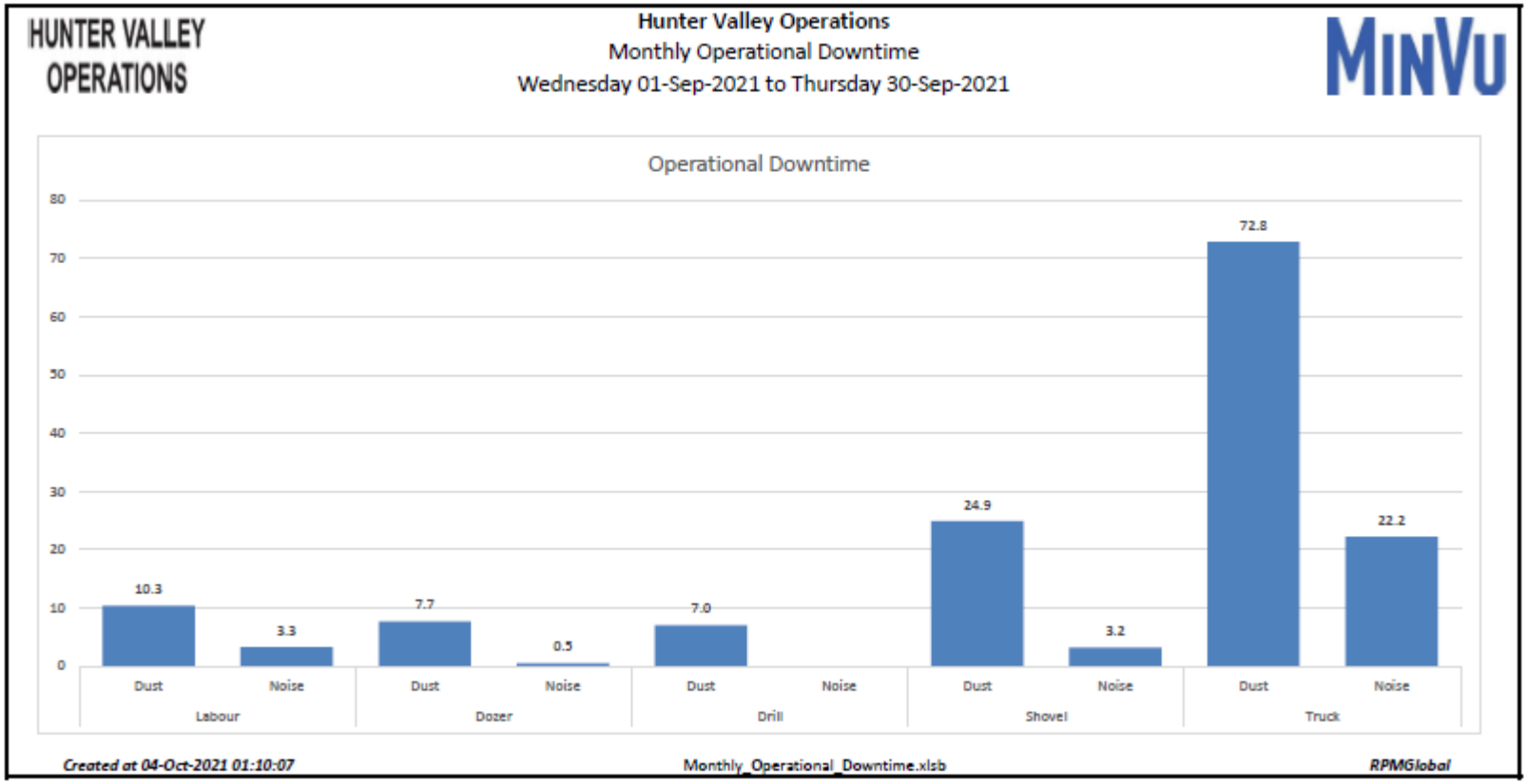

Figure 80 - Operational Downtime by Equipment Type for the reporting period

7 Rehabilitation

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

- 2.34 Ha of land was reshaped
- 2.34 Ha of land was released (became available for the application of topsoil)
- 8.92 Ha of land was topsoiled
- 7.90 Ha of land was rehabilitated

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

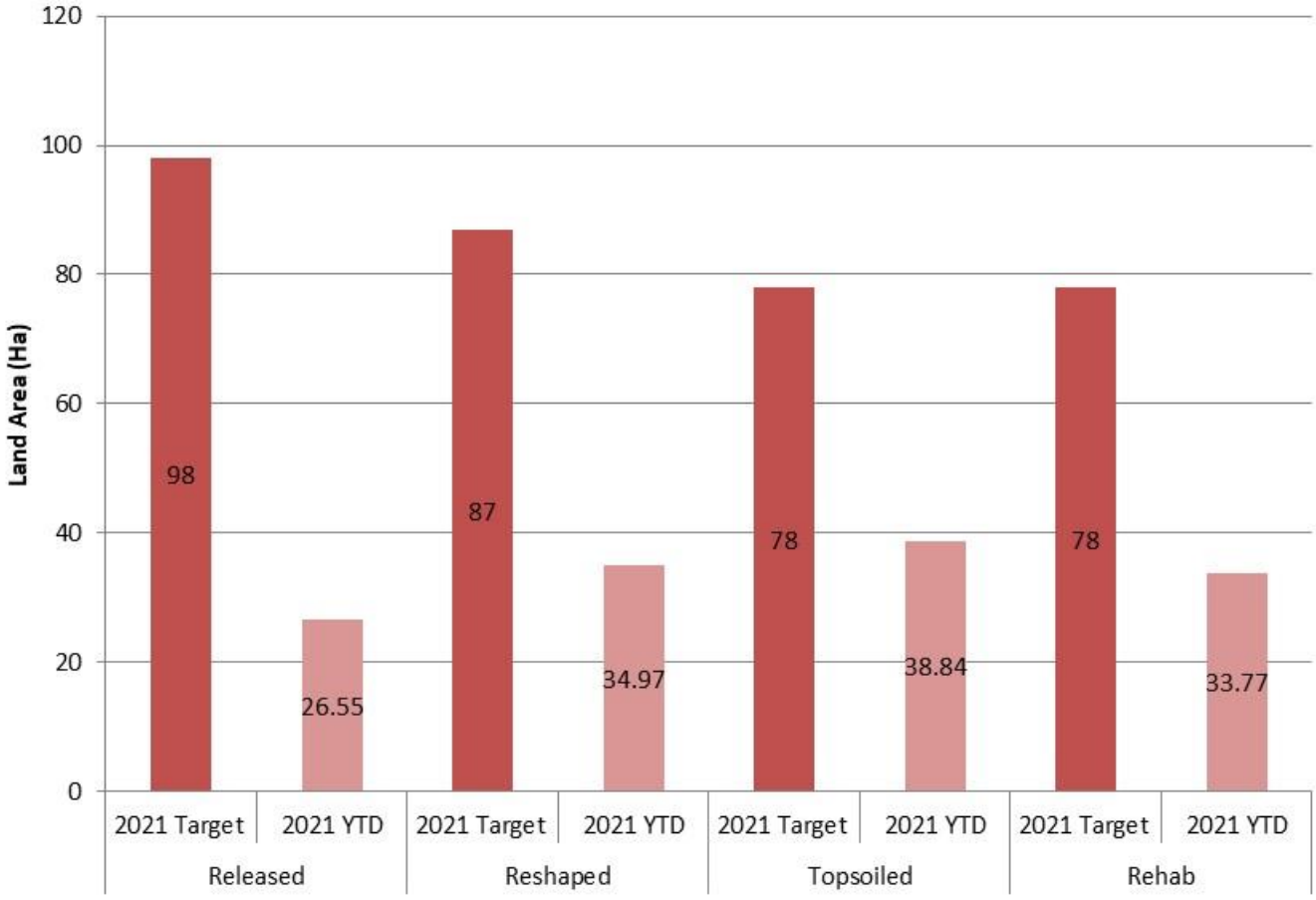

Figure 81 - Rehabilitation YTD September 2021

8 Complaints

Three complaints were received during the reporting period. Details of complaints received are shown in **Table 14**.

Table 14 - Complaints Summary 2021

Month	Noise	Dust	Blast	Lighting	Other	Total
January	1	-	-	1	-	**2**
February	-	-	-	-	-	**-**
March	-	-	-	-	-	**-**
April	-	-	3	1	-	**4**
May	2	-	2	1	-	**5**
June	1		3			**4**
July		1				**1**
August		2			1	**3**
September	1		2			
October						
November						
December						
Total	**5**	**3**	**10**	**3**	**1**	**22**

9 Environmental Incidents

There were two reportable environmental incidents during the reporting period:

- 7/09/2021 – Warkworth TSP HVAS failure to monitor

HVO was notified by the environmental monitoring contractor that the TSP High Volume Air Sampler (HVAS) at the Warkworth site had failed to run for the full 24 hour period on 6 September due to failure of the flow sensor. The incident was reported to Environment and Community Coordinator and a hire unit arranged until the unit was repaired. A notification was sent to the DPIE.

- 19/09/2021 – Jerrys Plains TEOM data mis-capture

The Jerrys Plains TEOM was not producing valid data from 6:20am on 19 September to 1:10pm on 21 September, resulting in a data capture less than the required 75% capture rate on 19, 20 and 21 September. The DPIE technician was contacted who confirmed that the failure was likely due to a fault with the analyser on the TEOM. DPIE was notified of the mis-capture.

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)
1/09/2021	25.08	1.661	100	8.6	789.9	190.7	2.1	0
2/09/2021	24.52	3.761	110.8	49.55	843	139.7	1.7	0
3/09/2021	24.81	2.994	100	20.57	779.1	225.2	1.7	0
4/09/2021	24.02	5.751	108.5	35.3	856	265	2.8	1.2
5/09/2021	16.17	2.566	108.2	31.97	1133	282.2	5.5	5.4
6/09/2021	19.59	-1.662	90.5	19.88	958	224.4	2.7	0.2
7/09/2021	22.72	-1.504	89.8	7.985	848	278	3.6	0
8/09/2021	22.23	0.635	87.3	28.6	831	274.3	1.5	0
9/09/2021	25.46	2.667	84	11.39	906	282.1	4.2	0
10/09/2021	26.94	6.457	100	12.78	886	259	4.0	0
11/09/2021	28.14	2.899	110.2	12.67	857	271.2	3.5	0
12/09/2021	28.75	8.37	49.27	2.905	858	285.3	4.7	0
13/09/2021	21.04	1.256	100	19.11	1109	170.1	2.7	6.8
14/09/2021	16.54	0.993	100	48.45	1282	150.6	2.8	3
15/09/2021	18.95	0.379	96.6	31.09	1253	157	1.6	0
16/09/2021	18.56	1.251	100	44.2	1117	137.8	1.8	0
17/09/2021	23.07	0.041	110	25.73	866	213.3	1.2	0
18/09/2021	26.27	5.203	100	29.33	1113	260.7	4.2	1.4
19/09/2021	22.69	2.969	100	18.06	921	276.6	3.8	0.2
20/09/2021	24.6	2.059	81.6	8.57	922	257.2	4.3	0
21/09/2021	16.12	1.385	87	25.13	1229	217.6	2.7	0
22/09/2021	20.3	-1.843	87.5	31.4	1059	249.9	1.7	0
23/09/2021	24.86	1.594	82.2	21.54	914	285.5	3.4	0
24/09/2021	25.8	3.84	88.2	19.92	1232	279.1	4.1	0
25/09/2021	25.8	6.323	89.3	4.959	927	217.8	4.3	0

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)
26/09/2021	15.19	1.998	100	58.39	1065	116.9	3.698	0
27/09/2021	20.43	0.722	100	39.5	1253	120.9	3.044	0
28/09/2021	24.87	1.722	100	32.92	1023	132.7	1.269	0
29/09/2021	20.69	5.142	108.8	54.07	887	172.4	1.483	7.8
30/09/2021	24.62	3.706	110.7	44.71	1328	225.5	2.349	0.2