HUNTER VALLEY OPERATIONS

Monthly Environmental Monitoring Report March 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 28th February 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**. 2021 and historical 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
March	178	335

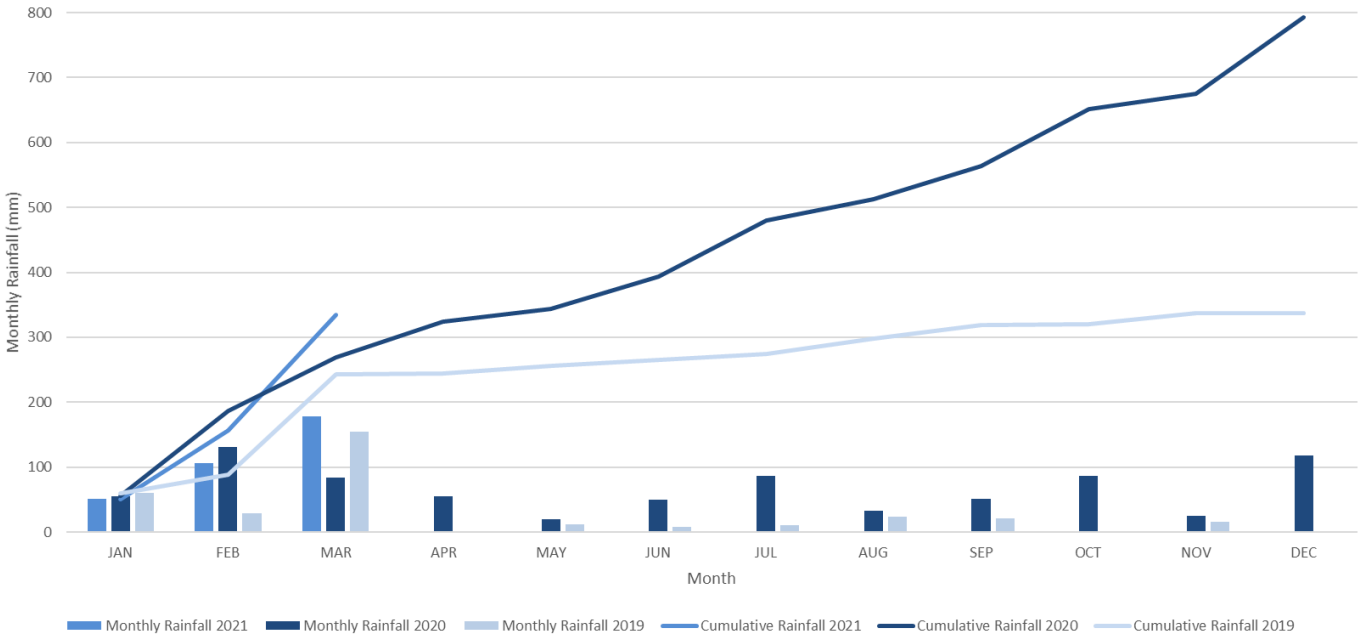


Figure 1 - Rainfalll Summary 2021

2.1.2 Wind Speed and Direction

South Easterly winds were prevailing during February, as shown in **Figure 2** (HVO Corporate) and **Figure 3** (HVO Cheshunt).

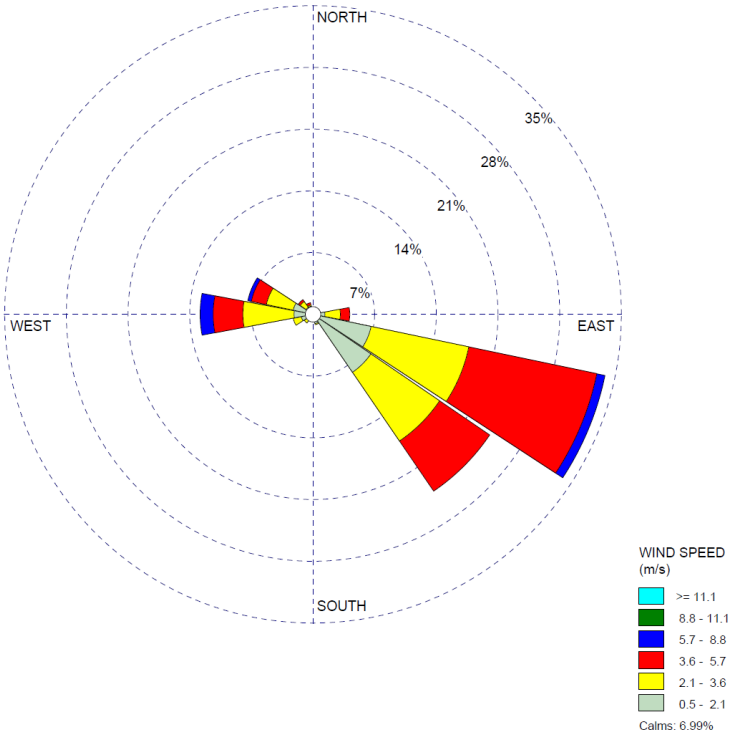


Figure 2 - HVO Corporate Wind Rose for the reporting period

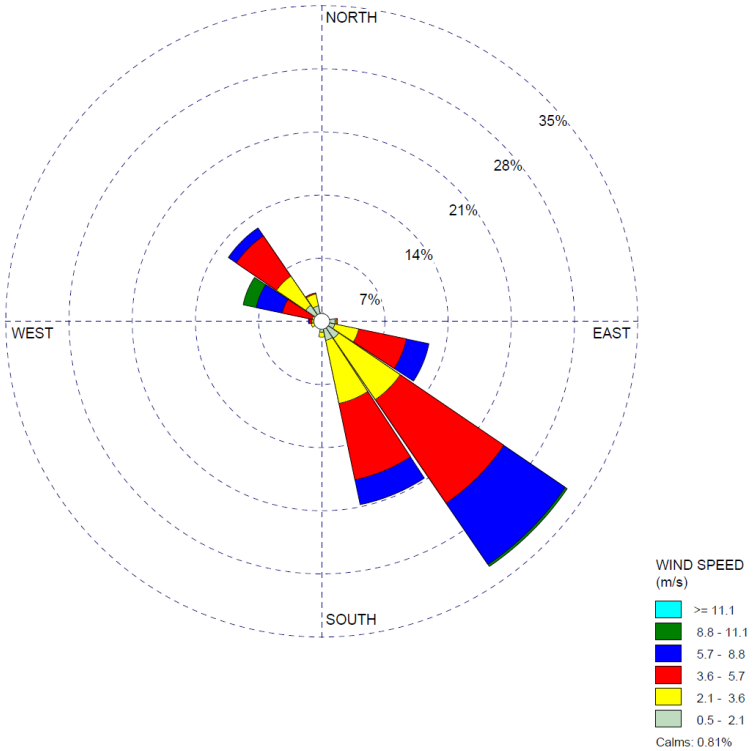


Figure 3 - HVO Cheshunt Wind Rose for the reporting period

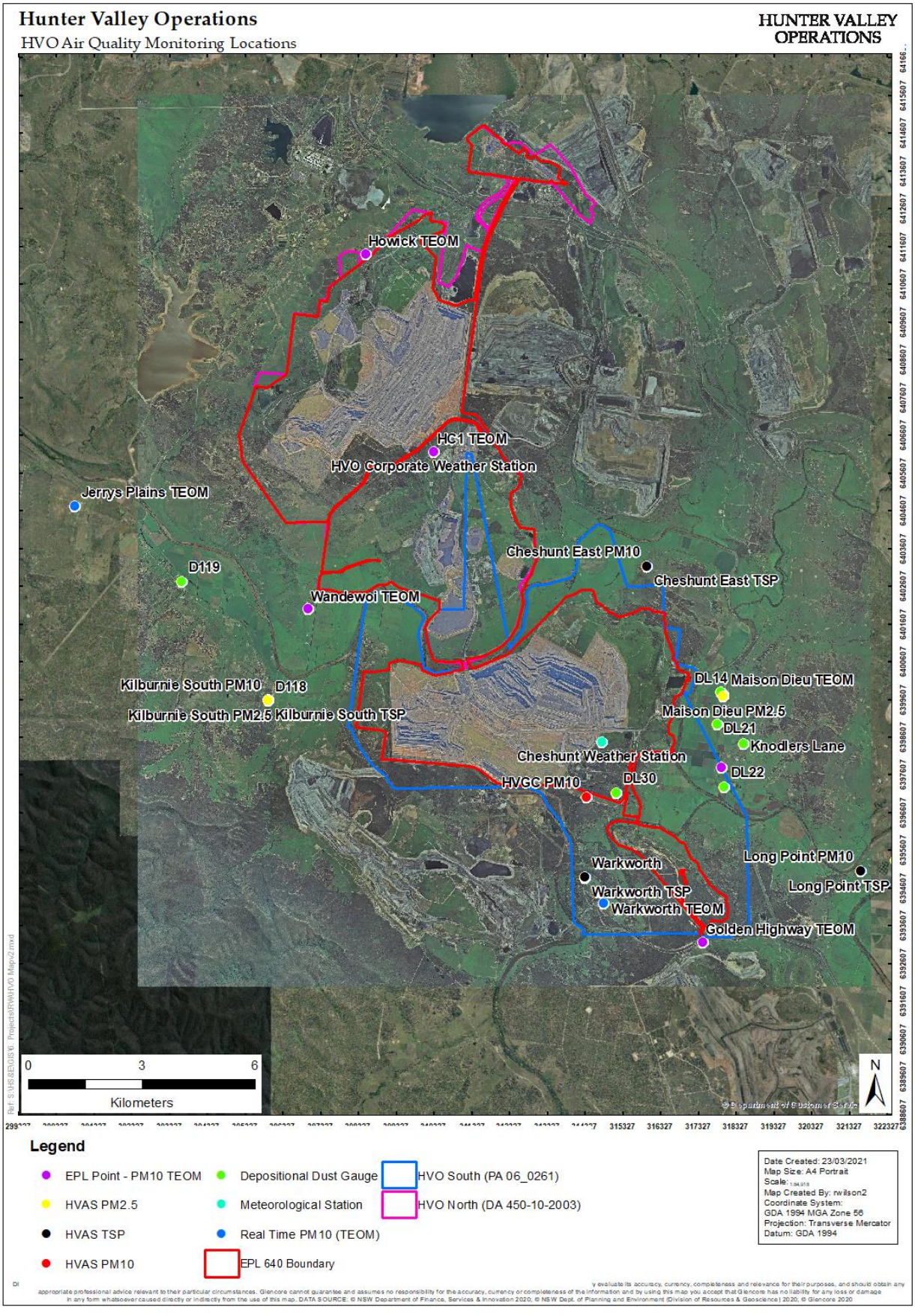


Figure 4 - Air Quality Monitoring Location Plan

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.

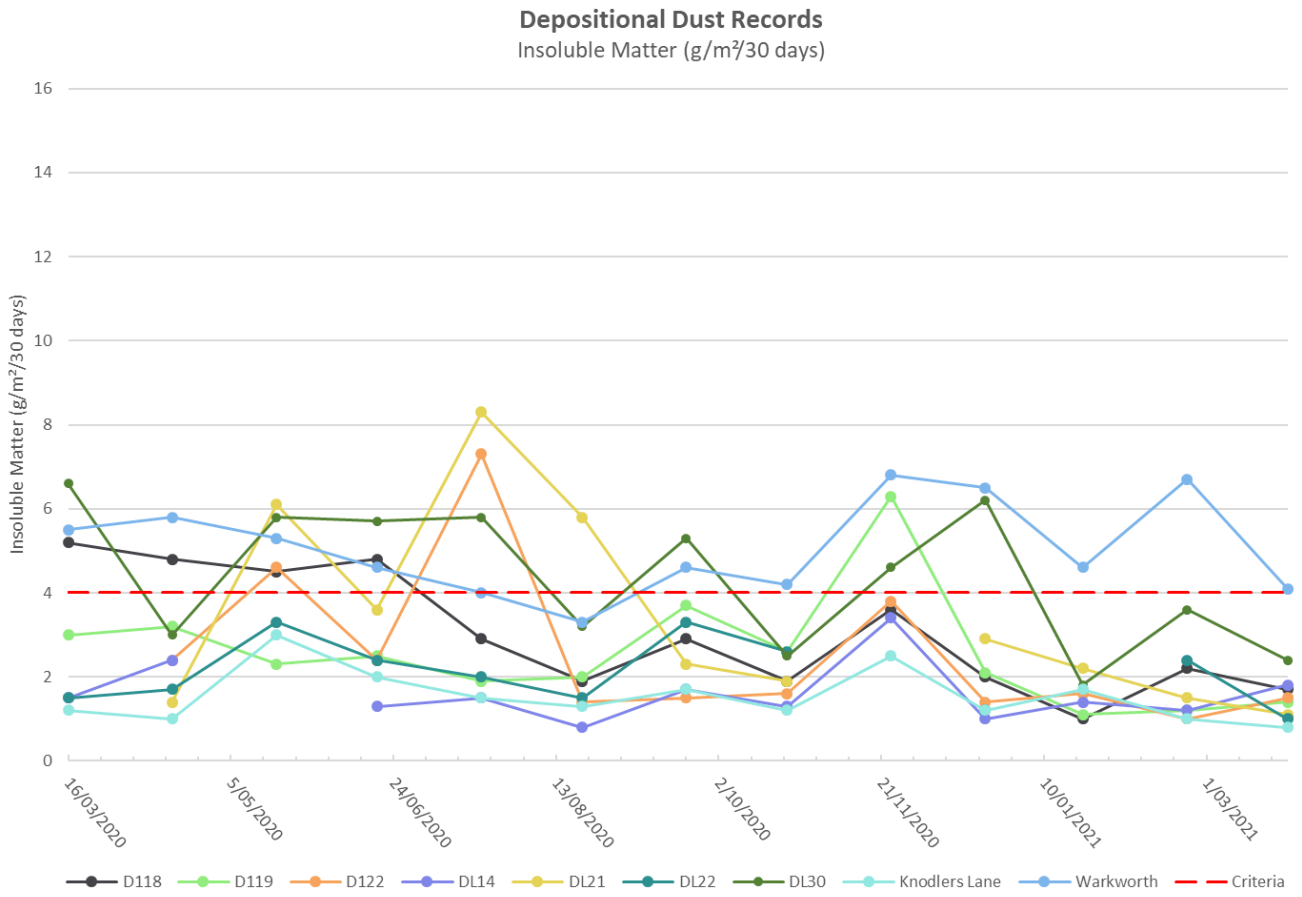


Figure** 5 - **Depositional Dust Results for the reporting period

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.

All monitoring levels were below relevant criteria.

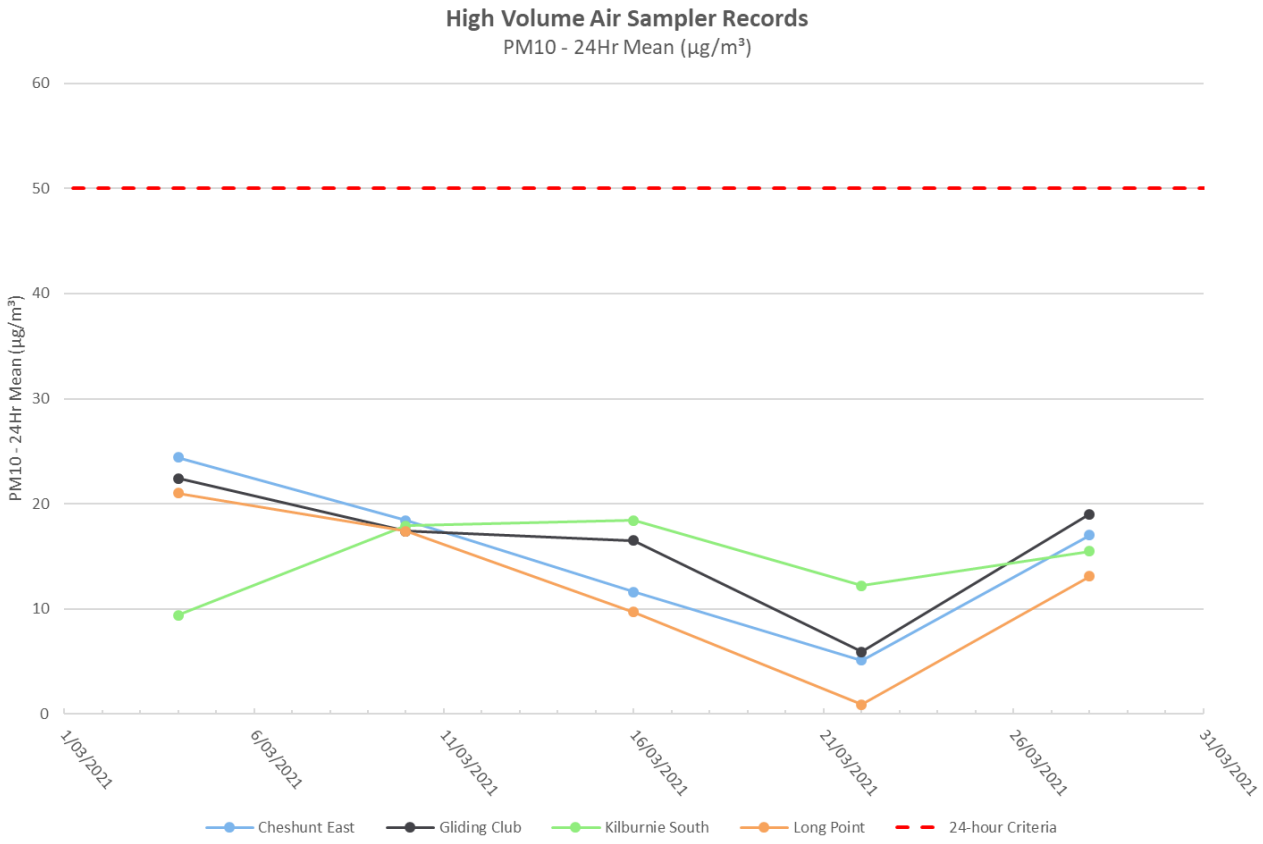


Figure 6 - Individual PM_{10} Results for the reporting period

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.

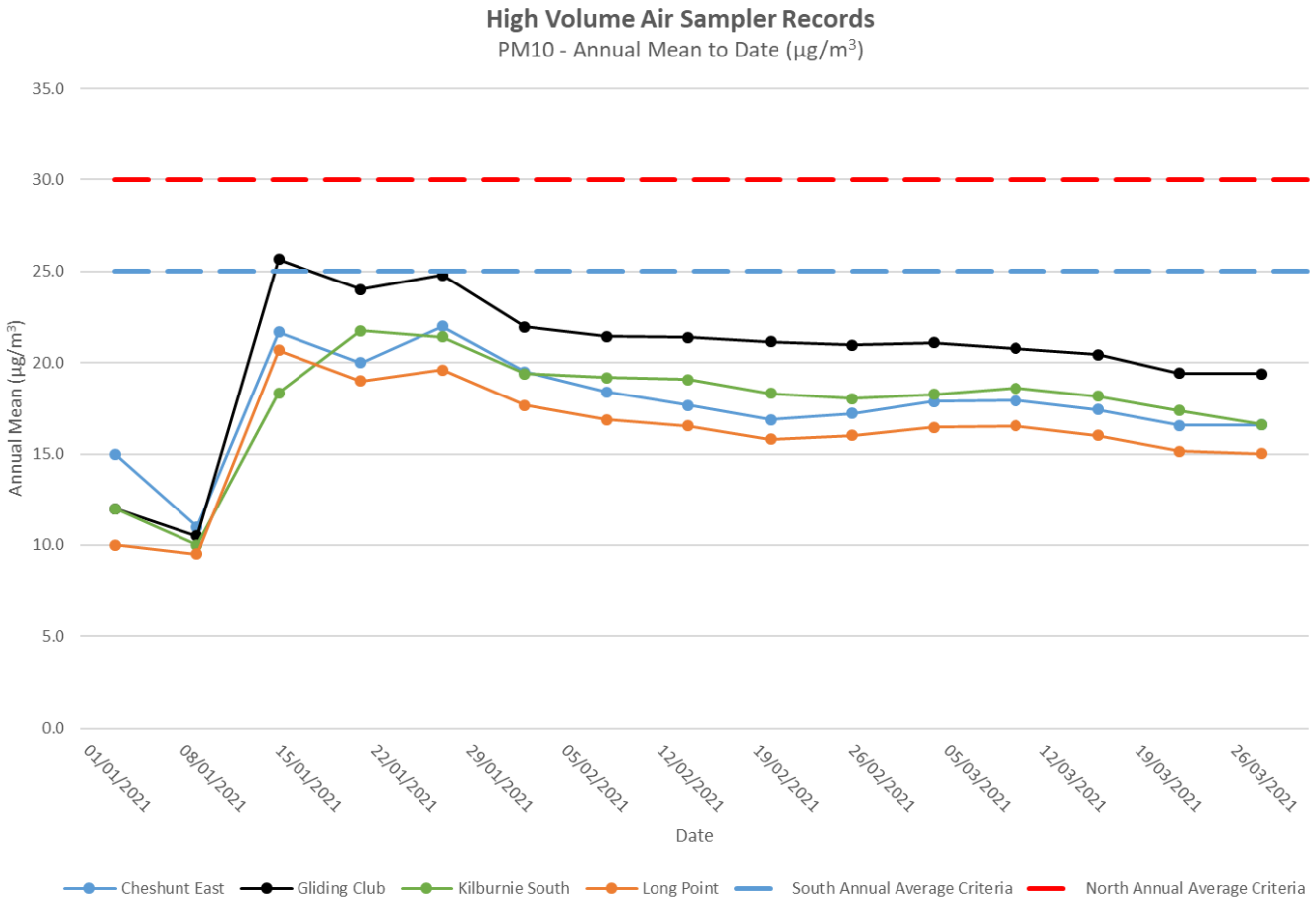


Figure 7 - Year to Date Average PM 10 as at end of March 2021

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 Kilburnie South $PM_{2.5}$ HVAS recorded an elevated result of 29.5µg/m^3 which is above the impact assessment criteria. An internal investigation determined that HVO did not significantly contribute to this elevated result. Further information will be provided in the 2021 annual review.

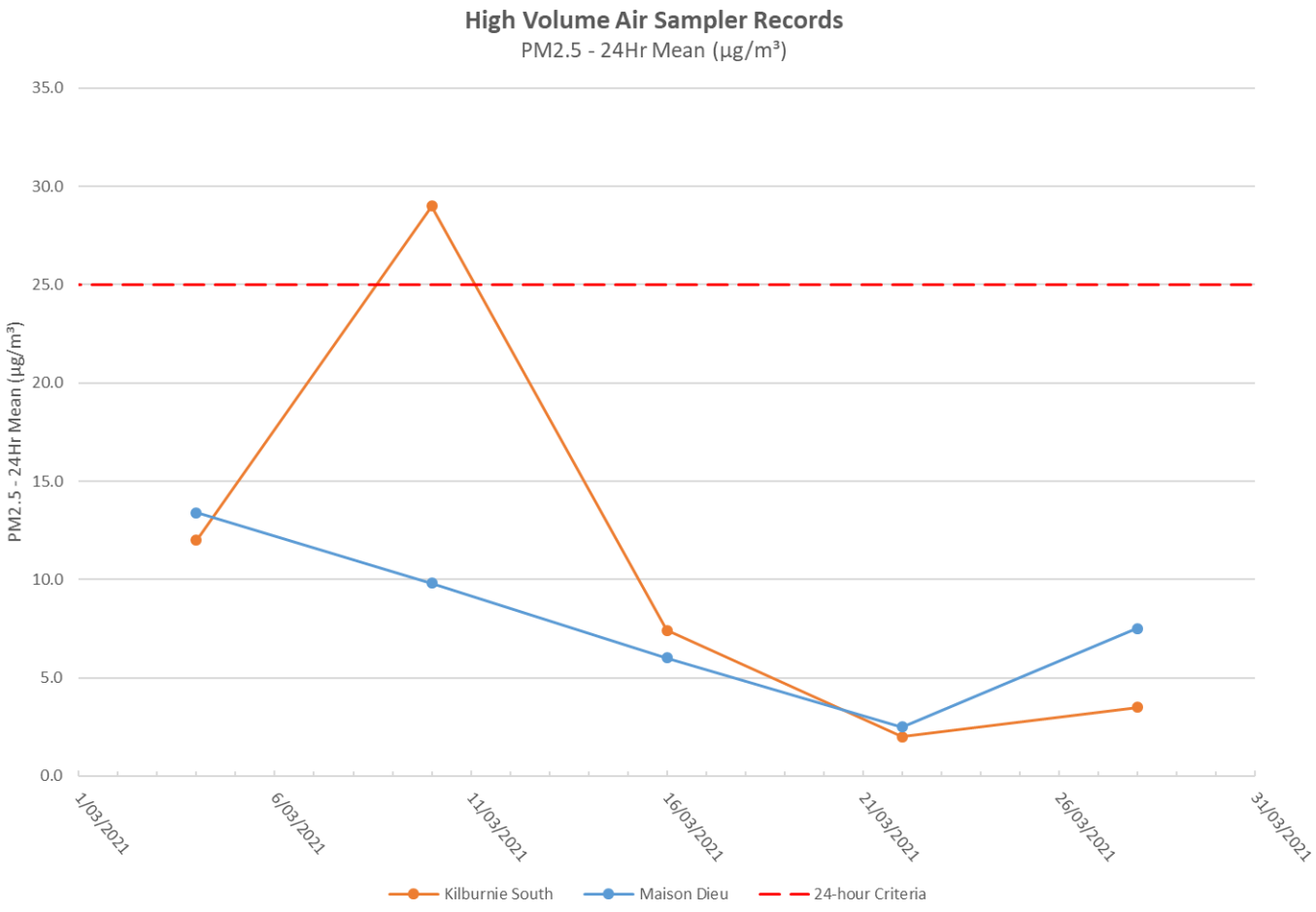


Figure 8 - Individual $PM_{2.5}$ Results for the reporting period

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, both monitors 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.

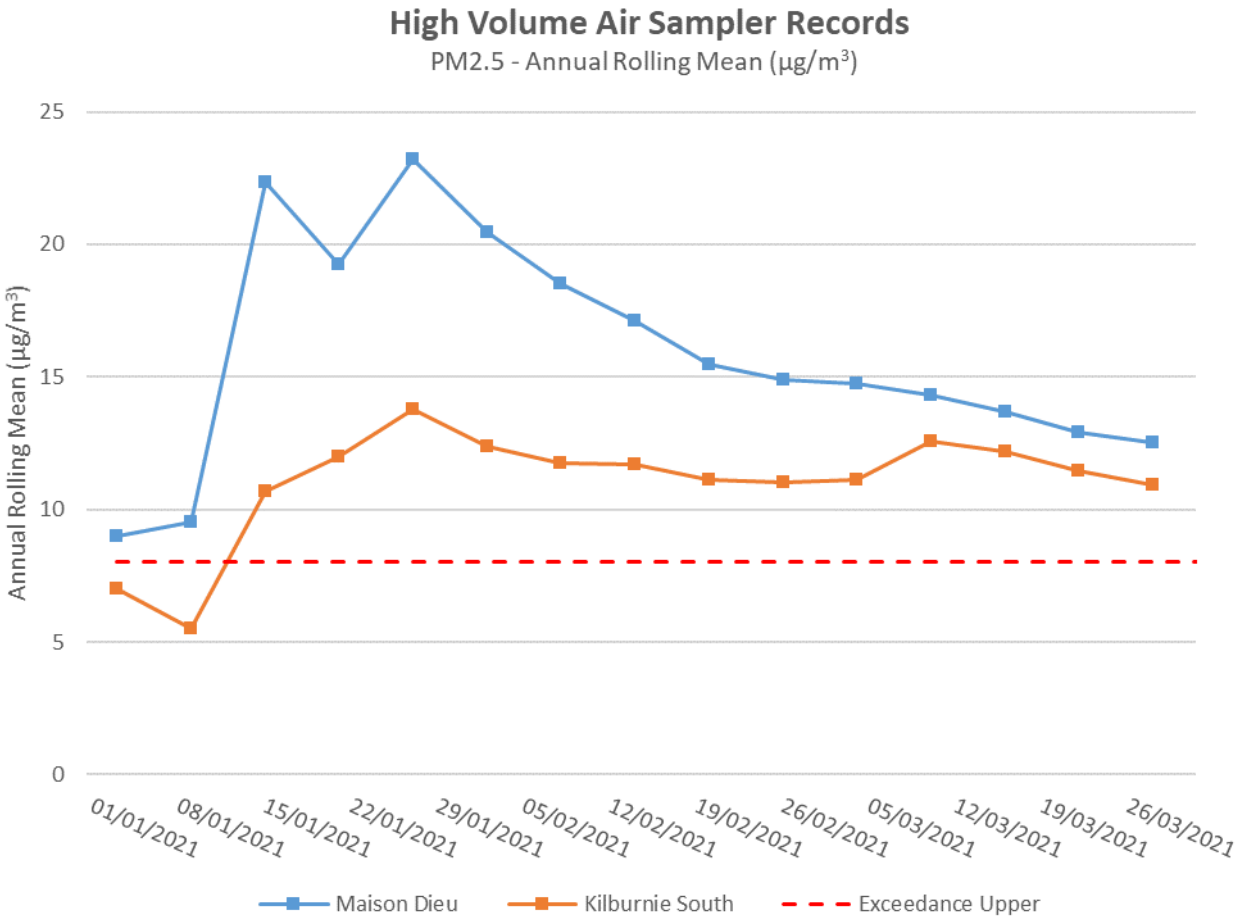


Figure 9 - Year to Date Average $PM_{2.5}$ as at end of March 2021

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.

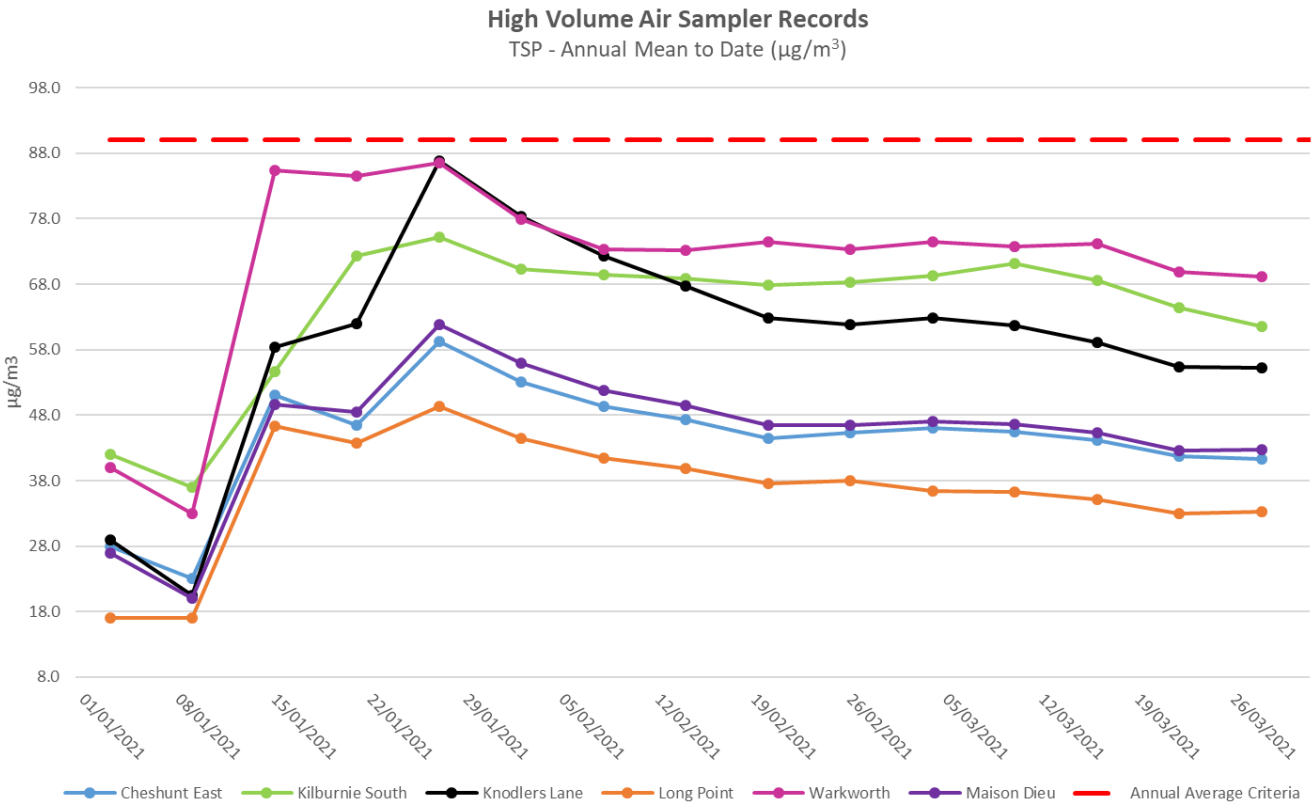


Figure 10 - Year to Date Average Total Suspended Particulates as at end of March 2021

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. The year to date annual averages for each monitoring site are shown in **Figure 12**.

All results were below the relevant short or long term impact assessment criteria during the reporting period.

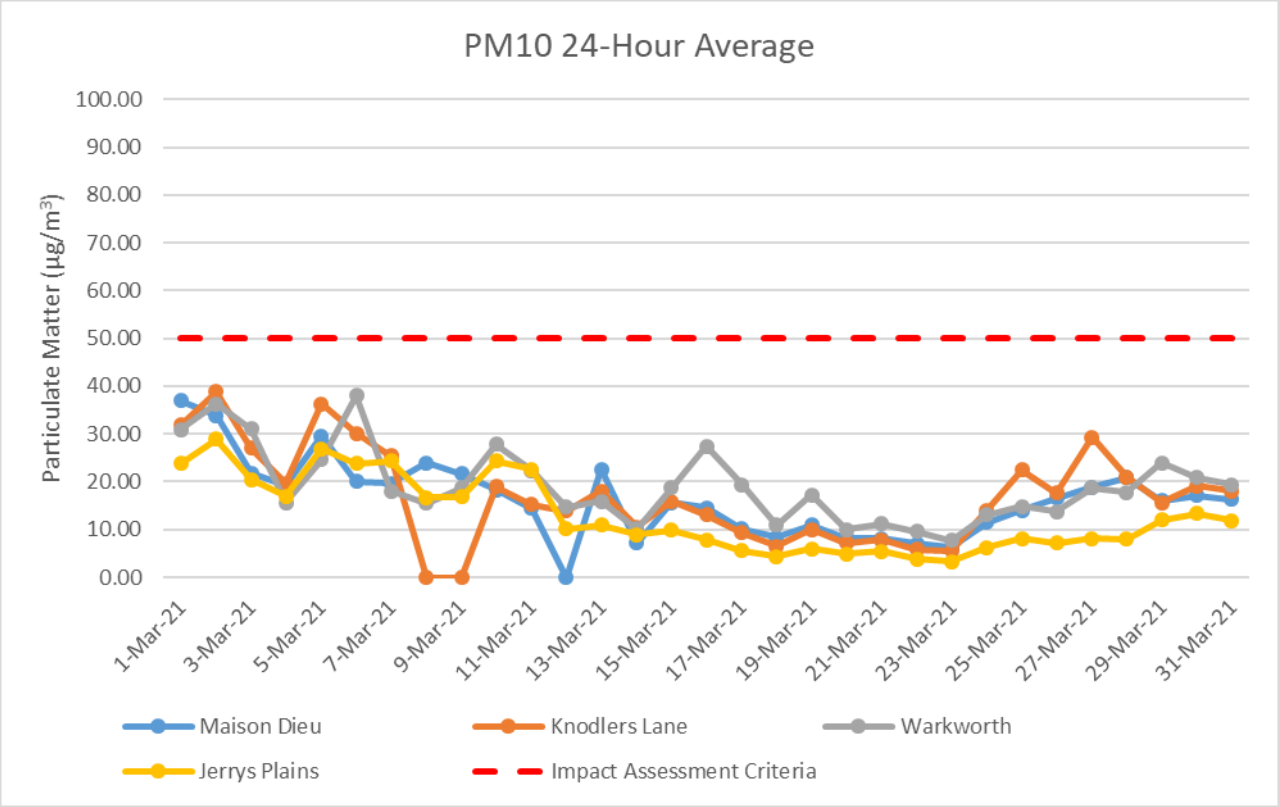


Figure 11 - Real Time PM 10 24hr average for the reporting period

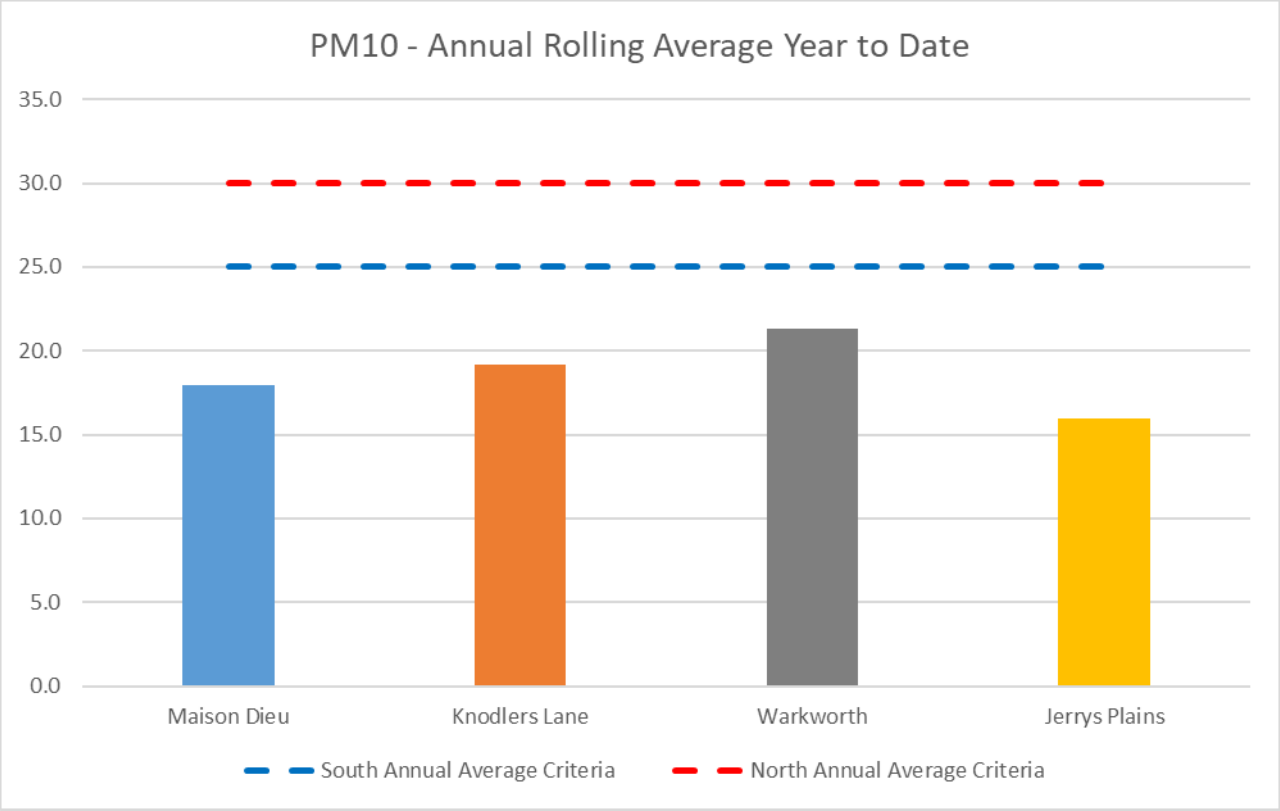


Figure 12 - Real Time PM 10 Annual Average March 2021

2.3.5 Real Time Alarms for Air Quality

The real time monitoring system generated 68 automated air quality related alarms during the reporting period. 48 alarms related to adverse weather conditions and 20 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**

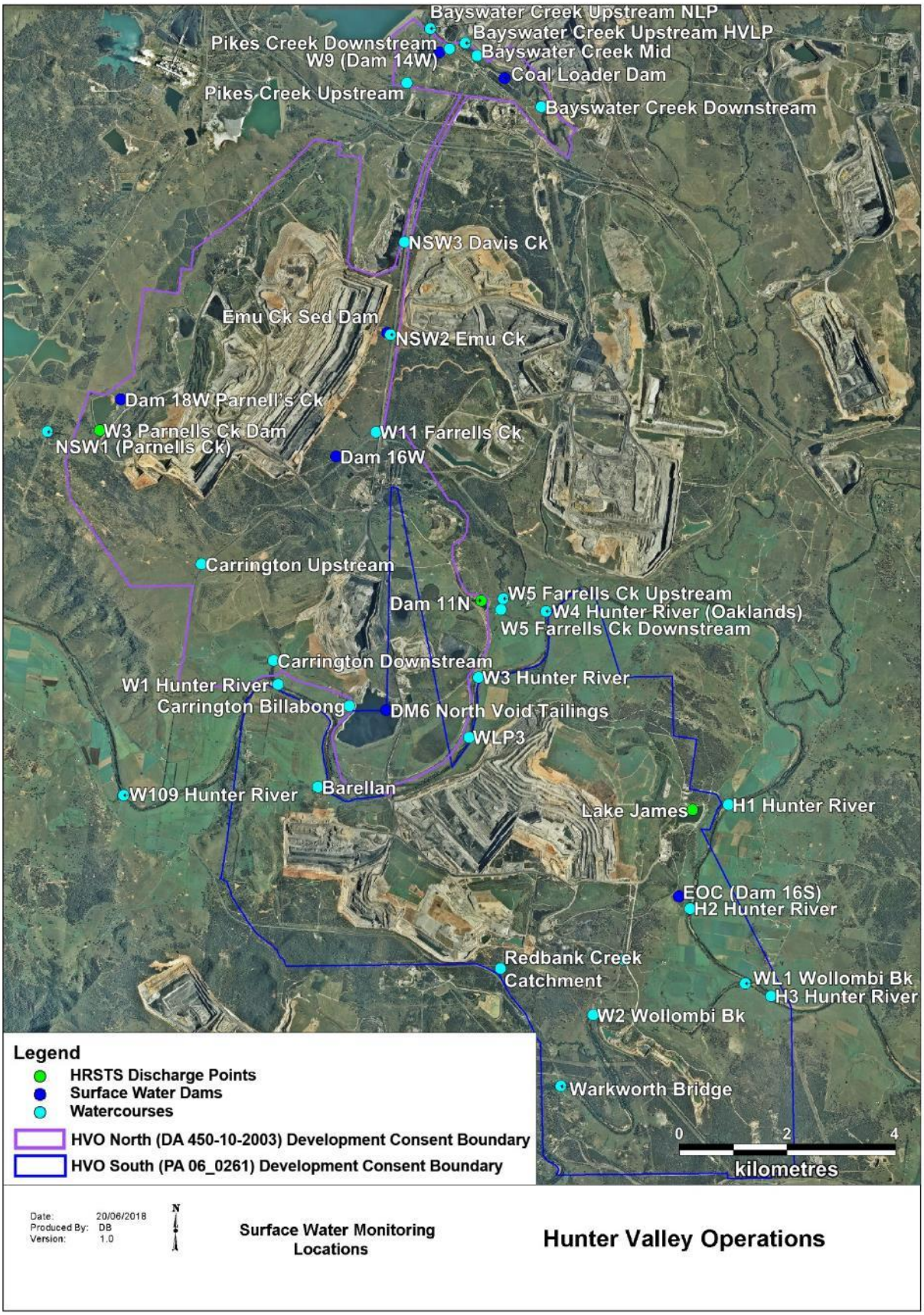


Figure 13 - HVO Surface Water Monitoring Locations

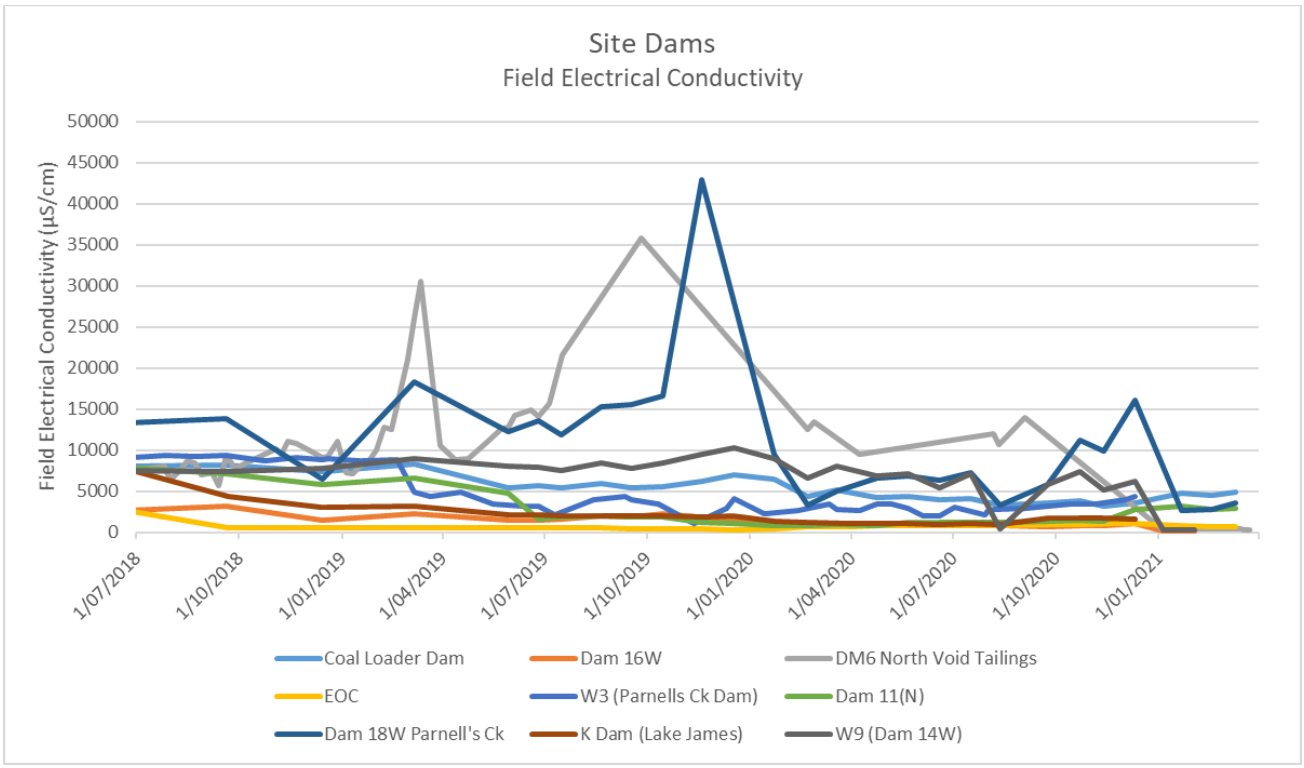


Figure 14 - Site Dams Electrical Conductivity - March 2021

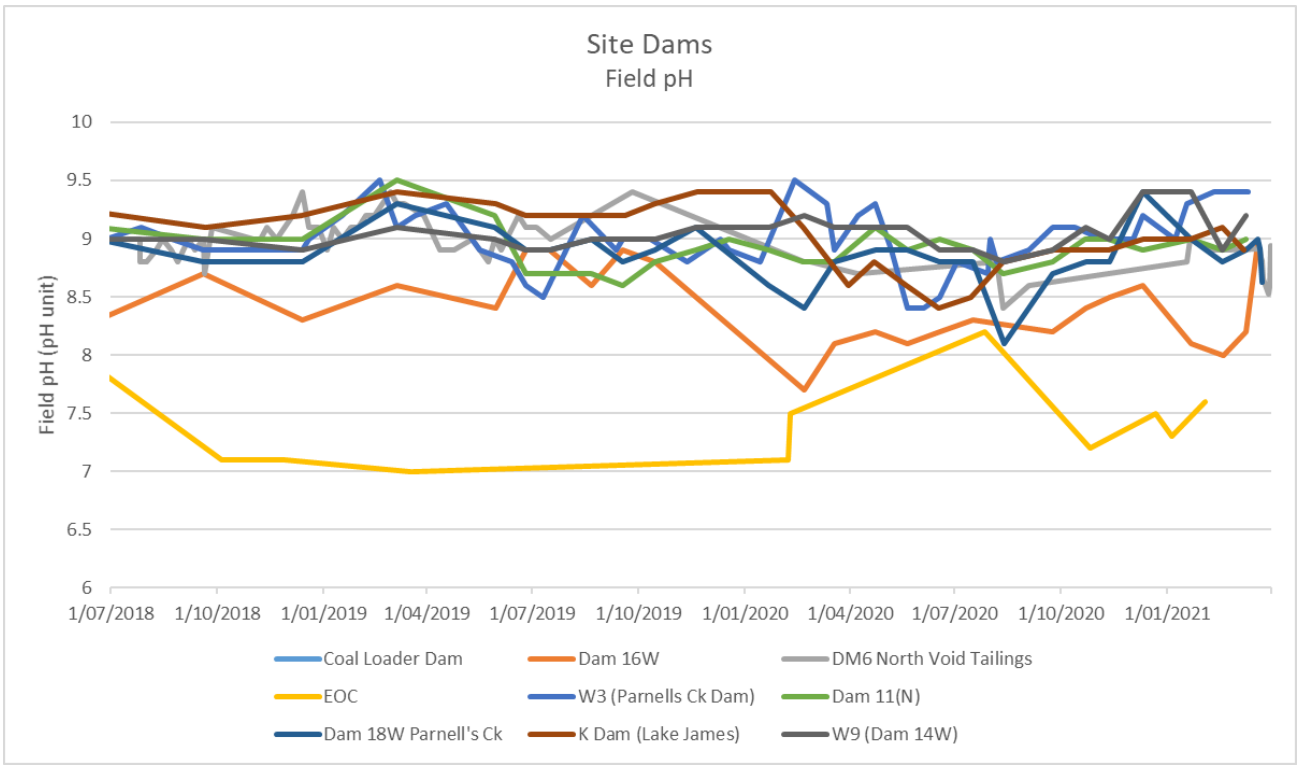


Figure 15 - Site Dams Field pH - March 2021

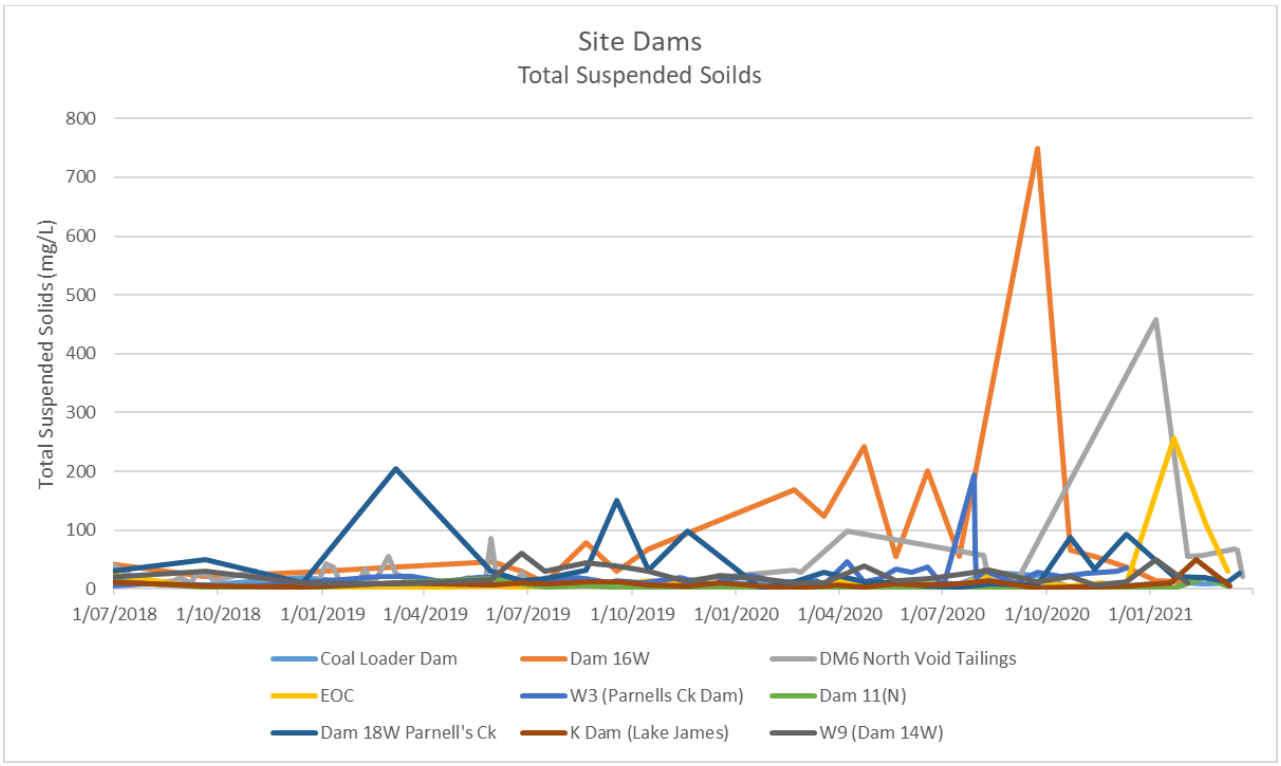


Figure 16 - Site Dams Total Suspended Solids - March 2021

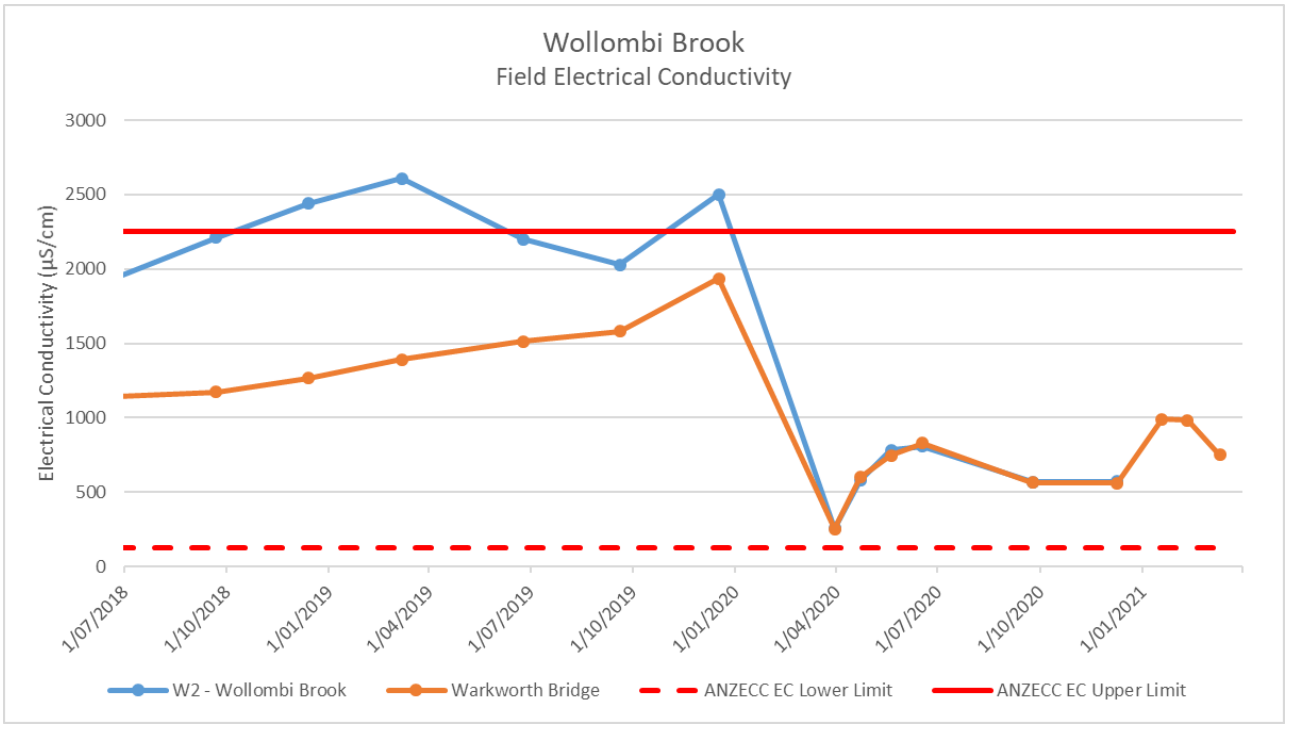


Figure 17 - Wollombi Brook Electrical Conductivity - March 2021

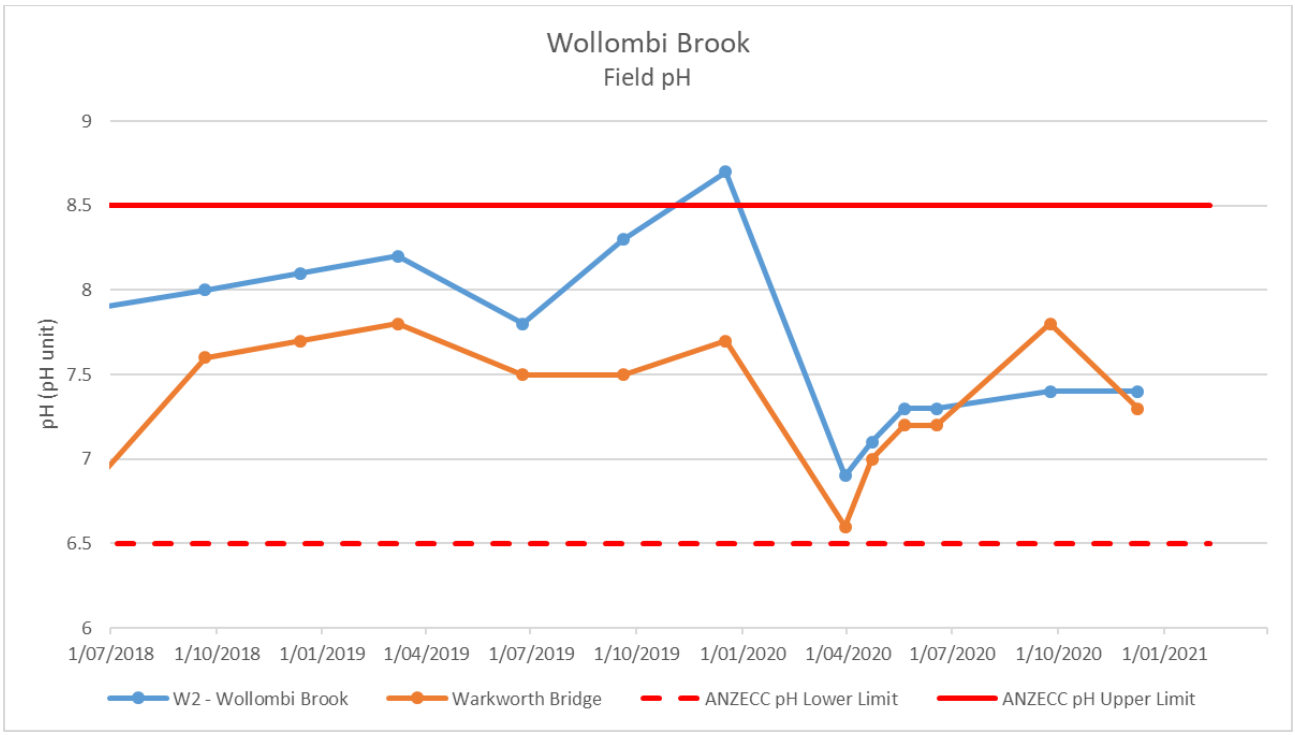


Figure 18 - Wollombi Brook Field pH - March 2021

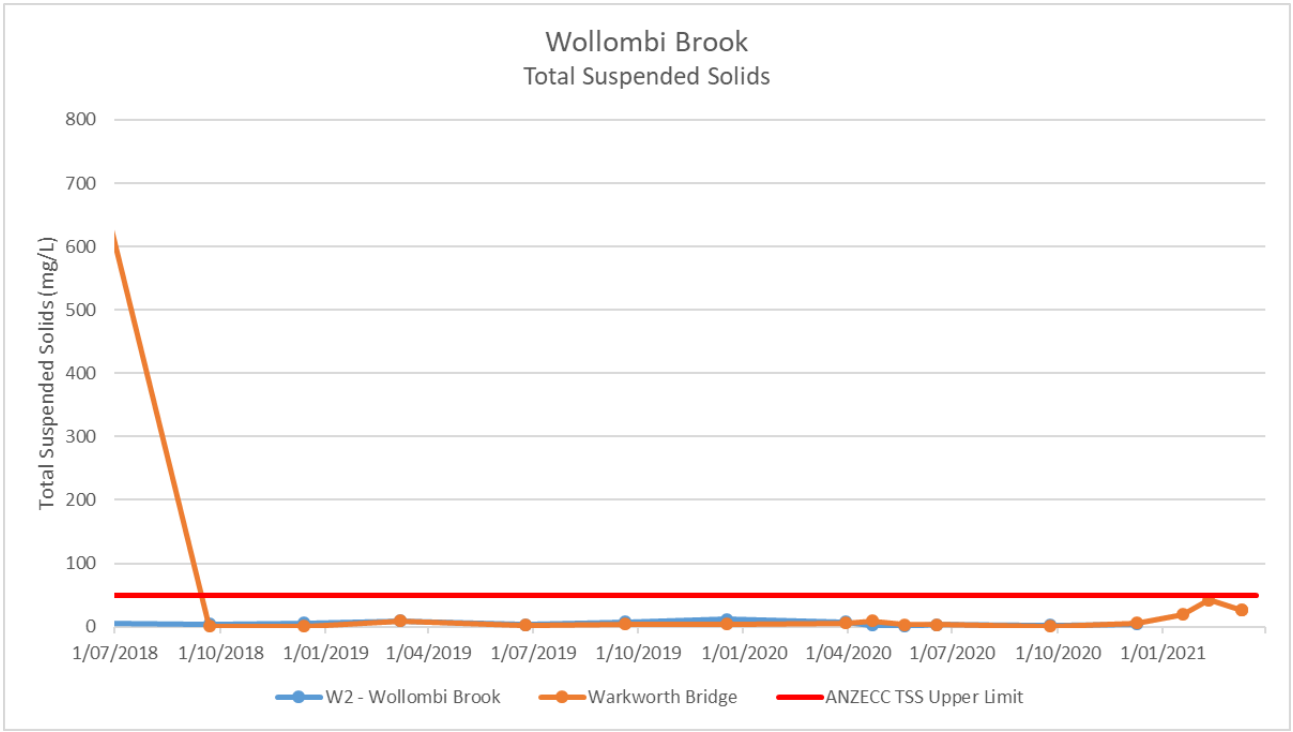


Figure 19 - Wollombi Brook Total Suspended Solids - March 2021

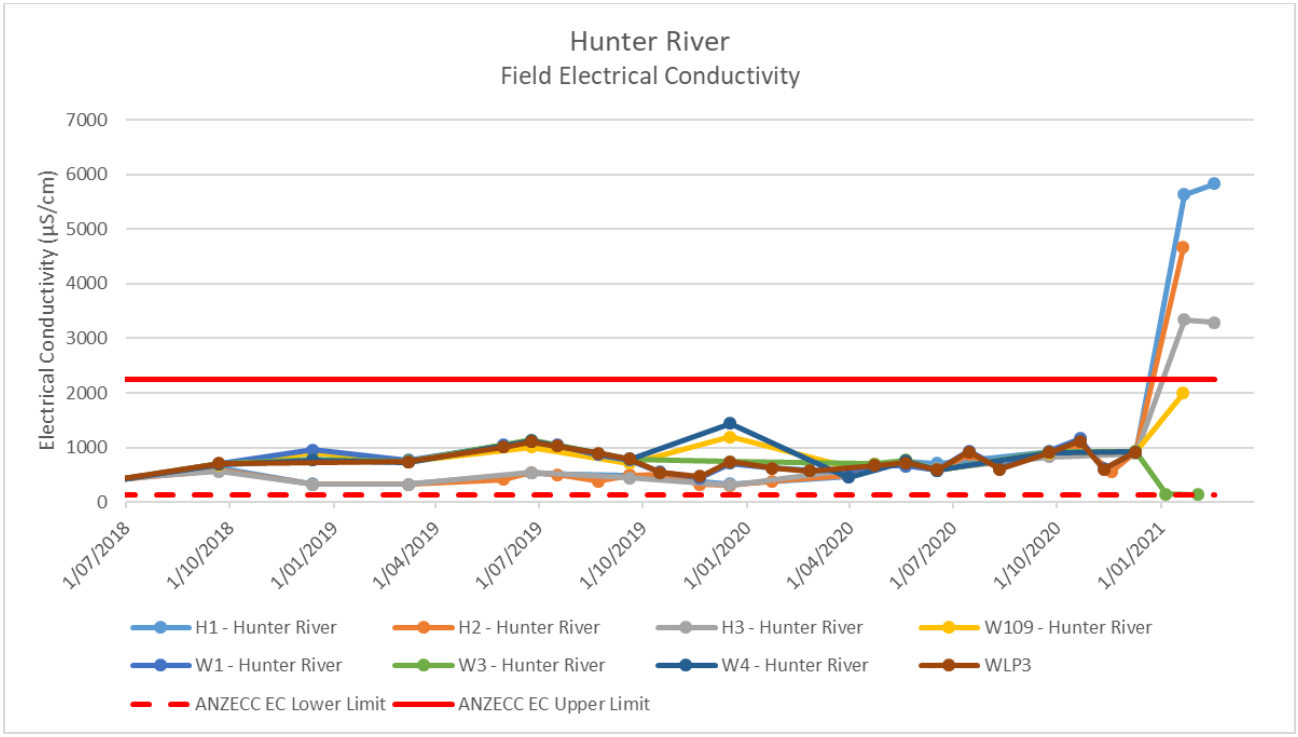


Figure 20 - Hunter River Electrical Conductivity - March 2021

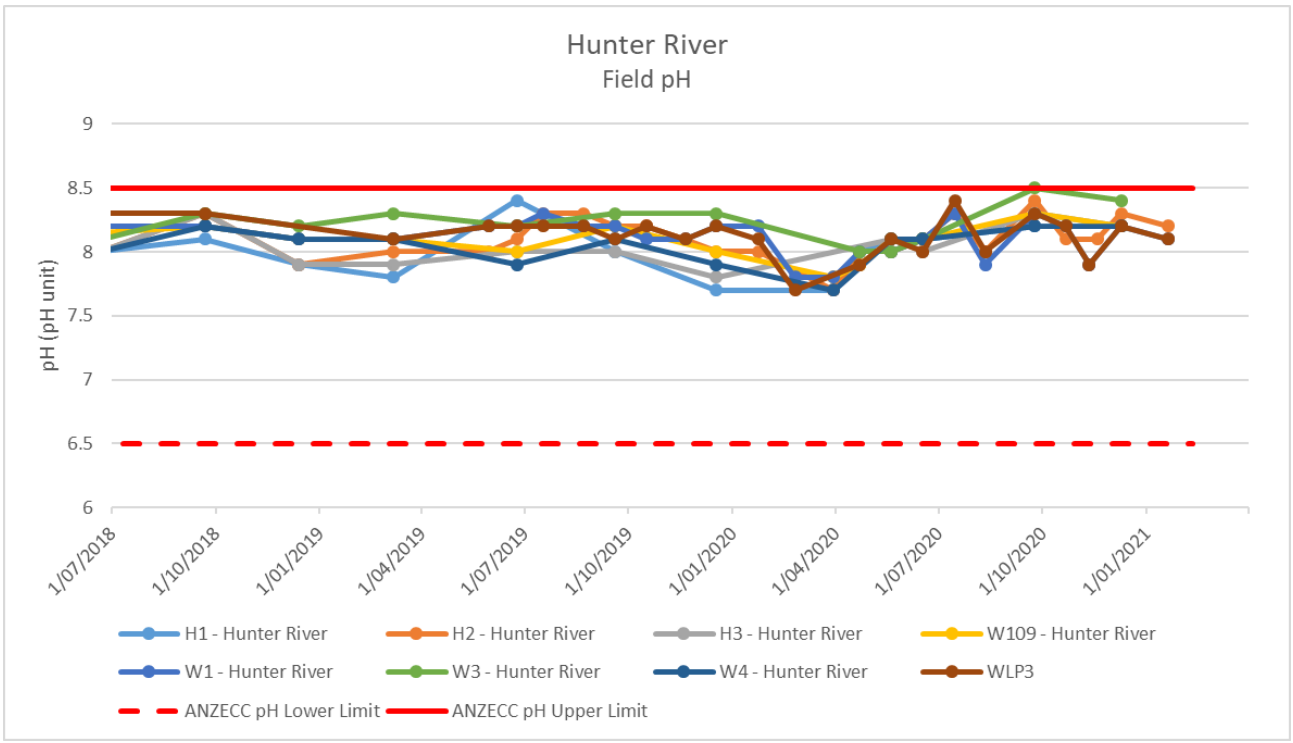


Figure 21 - Hunter River Field pH - March 2021

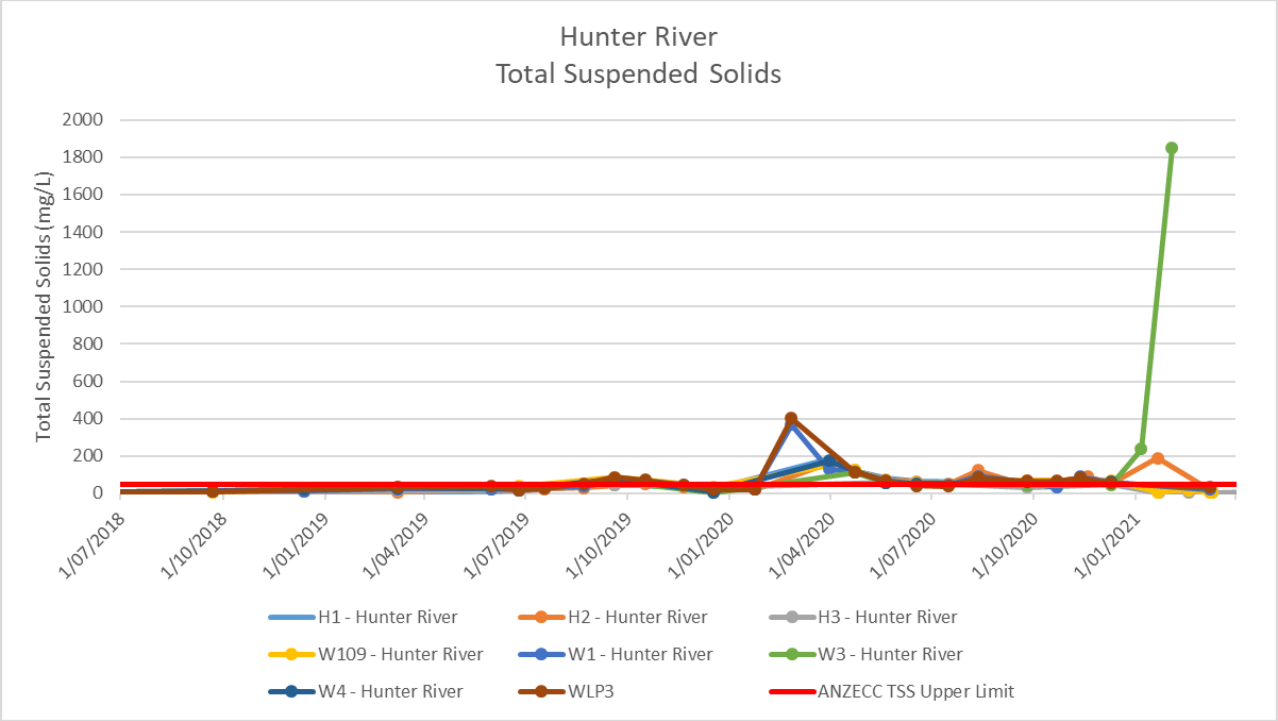


Figure 22 - Hunter River Total Suspended Solids - March 2021

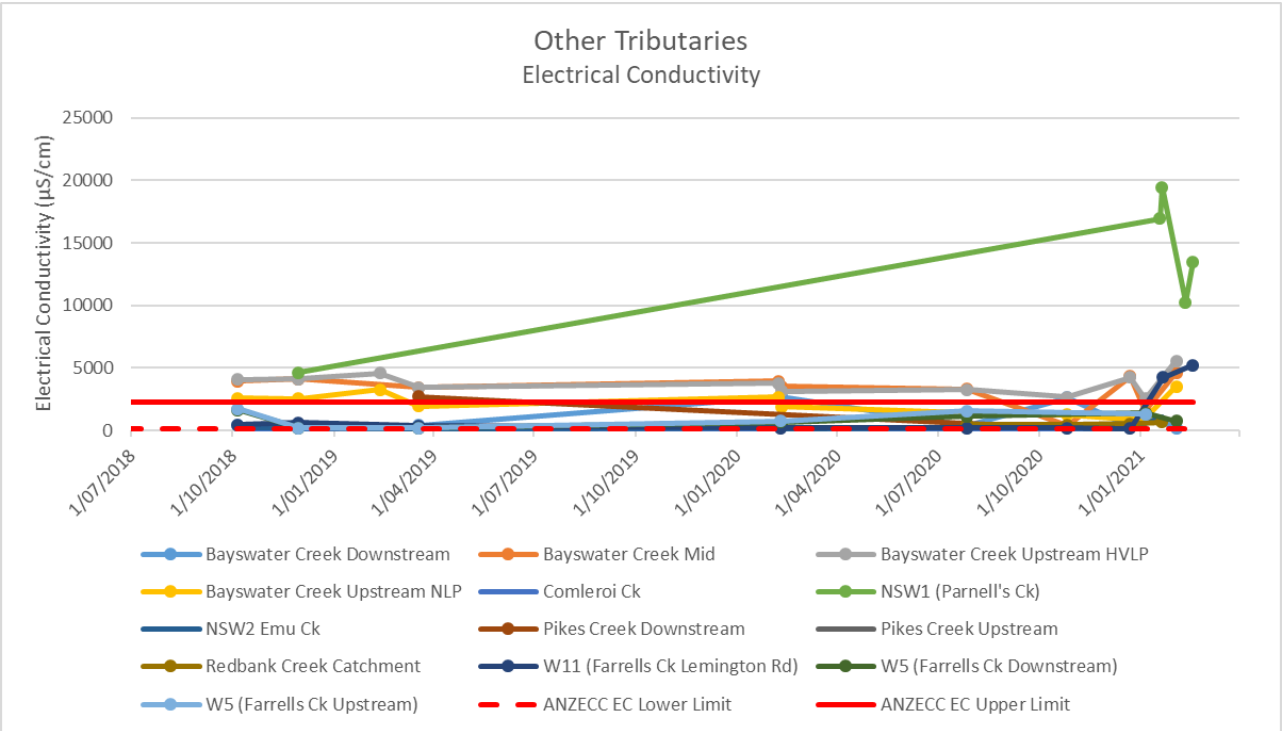


Figure 23 - Other Tributaries Electrical Conductivity - March 2021

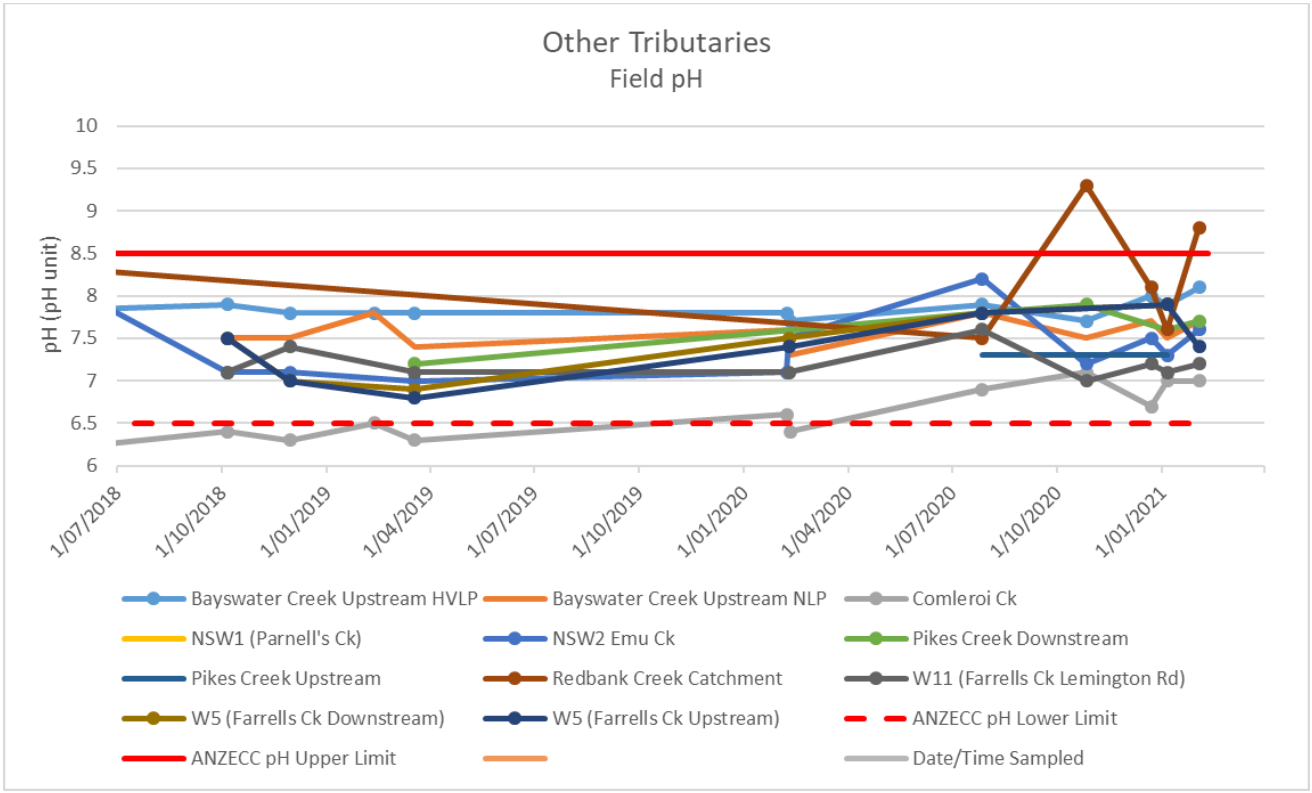


Figure 24 - Other Tributaries Field pH - March 2021

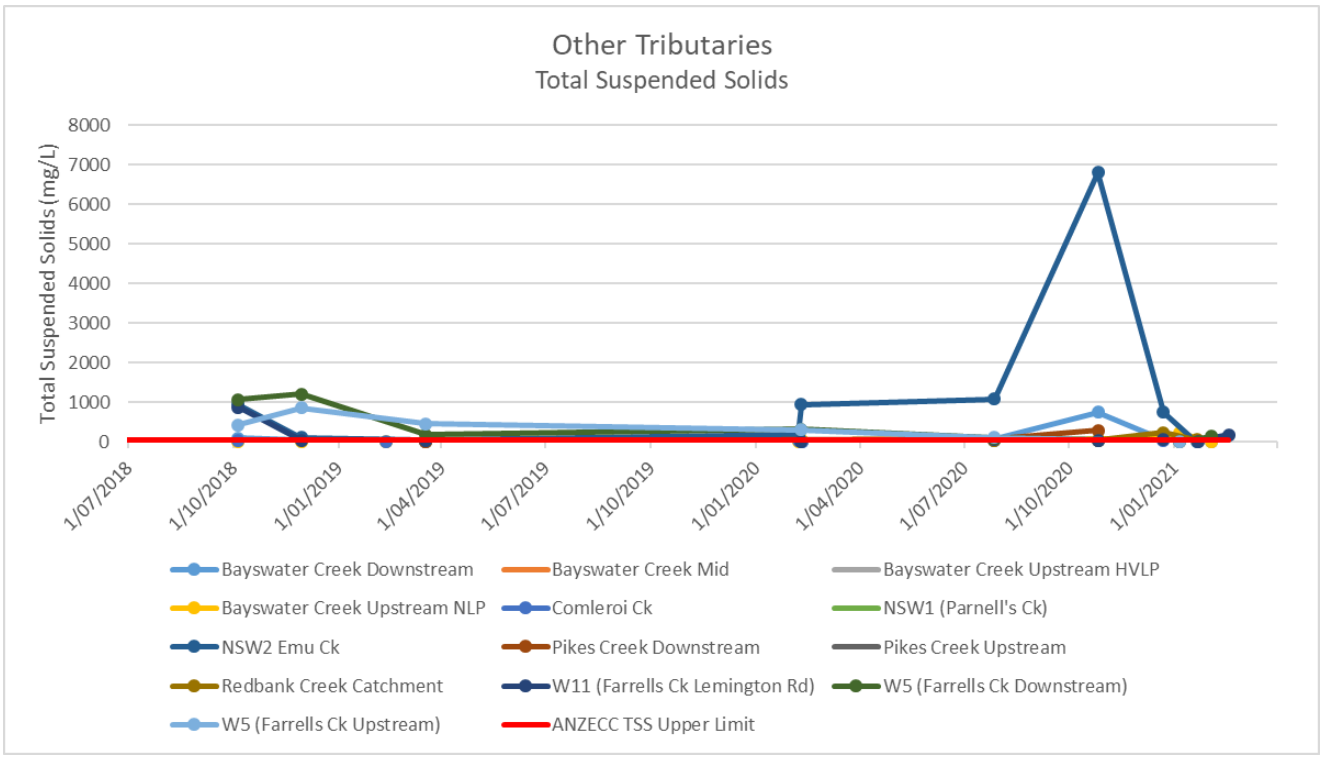


Figure 25 - Other Tributaries Total Suspended Solids - March 2021

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 - Q1 2021

Site	Date	Trigger Limit Breached	Response Action
W3 – Hunter River	05/01/2021	TSS	1st Exceedance of trigger value - Results will be investigated and provided in the 2021 annual review.
H2 – Hunter River	20/01/2021	TSS	1st Exceedance of trigger value – Results will be investigated and provided in the 2021 annual review.
H2 – Hunter River	20/01/2021	EC	1st Exceedance of trigger value
Redbank Creek Catchment	20/01/2021	TSS	1st Exceedance of trigger value – Results will be investigated and provided in the 2021 annual review.
W109 – Hunter River	20/01/2021	EC	1st Exceedance of trigger value
H1 – Hunter River	21/01/2021	EC	1st Exceedance of trigger value
H3 – Hunter River	21/01/2021	EC	2nd Exceedance of trigger value
W3 – Hunter River	02/02/2021	TSS	1st Exceedance of trigger value – Results will be investigated and provided in the 2021 annual review.
W5 – Farrells Creek Downstream	02/02/2021	TSS	1st Exceedance of trigger value – Results will be investigated and provided in the 2021 annual review.
Bayswater Creek Upstream HVLP	02/02/2021	EC	1st Exceedance of trigger value
W11 (Farrells Ck Lemington Rd)	17/02/2021	TSS	1st Exceedance of trigger value – Results will be investigated and provided in the 2021 annual review.
H1 – Hunter River	17/02/2021	EC	2nd Exceedance of trigger value
H3 – Hunter River	17/02/2021	EC	2nd Exceedance of trigger value
W109 – Hunter River	17/02/2021	EC	2nd Exceedance of trigger value

Redbank Creek Catchment	18/02/2021	TSS	1st Exceedance of trigger value – Results will be investigated and provided in the 2021 annual review.
W109 – Hunter River	08/03/2021	EC	3rd exceedance or greater of trigger value – Results will be investigated and provided in the 2021 annual review.
H1 – Hunter River	10/03/2021	EC	3rd exceedance or greater of trigger value – Results will be investigated and provided in the 2021 annual review.
H2 – Hunter River	10/03/2021	EC	1st Exceedance of trigger value
H3 – Hunter River	10/03/2021	EC	3rd exceedance or greater of trigger value – Results will be investigated and provided in the 2021 annual review.

3.2 Site Water Use

HVO is permitted to extract water from the Hunter River under water allocation licenses issued by Water NSW. During the reporting period, HVO extracted 0 ML of water from the Hunter River.

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 1002ML of 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 80**

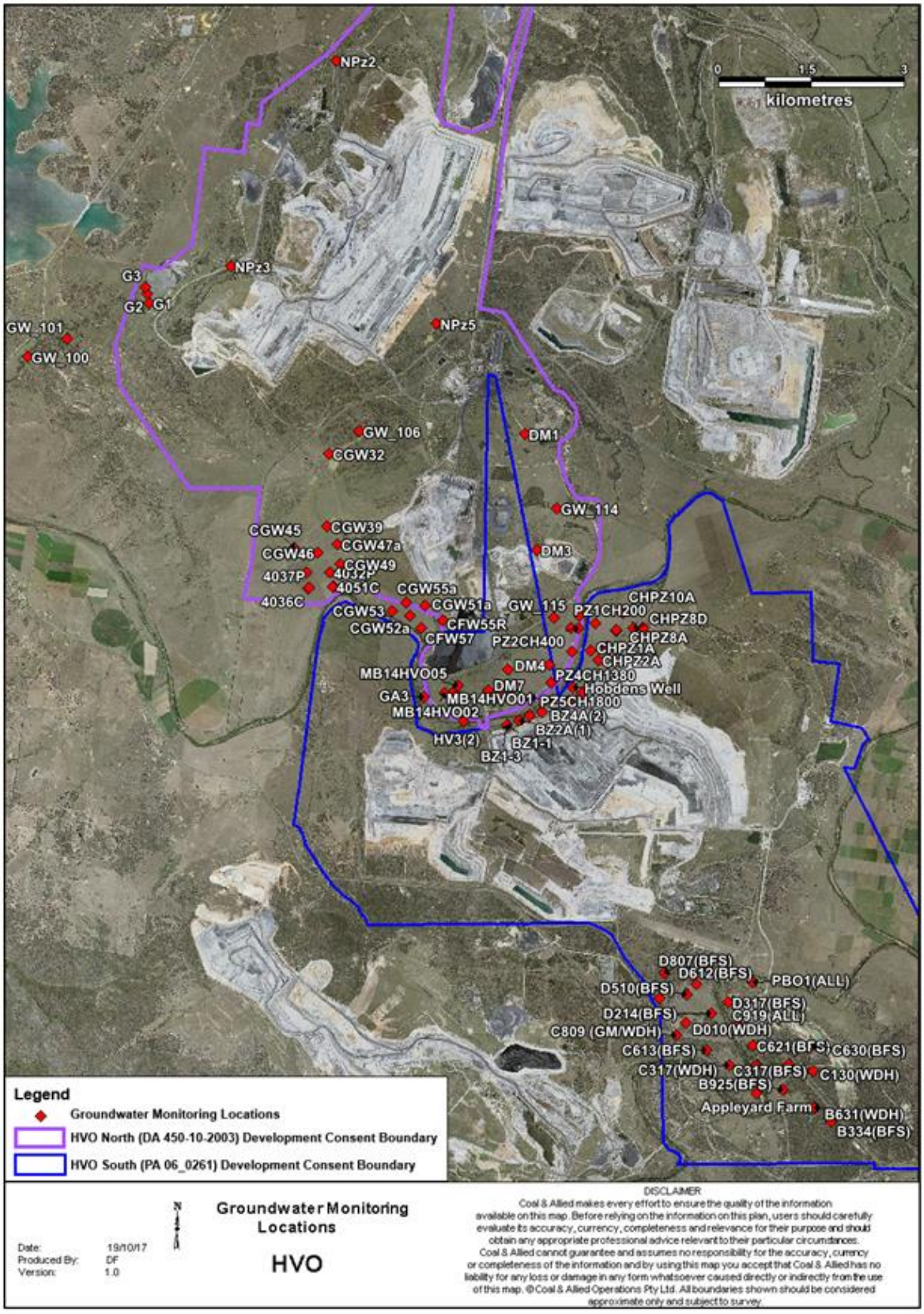


Figure 26 Groundwater monitoring Locations at HVO

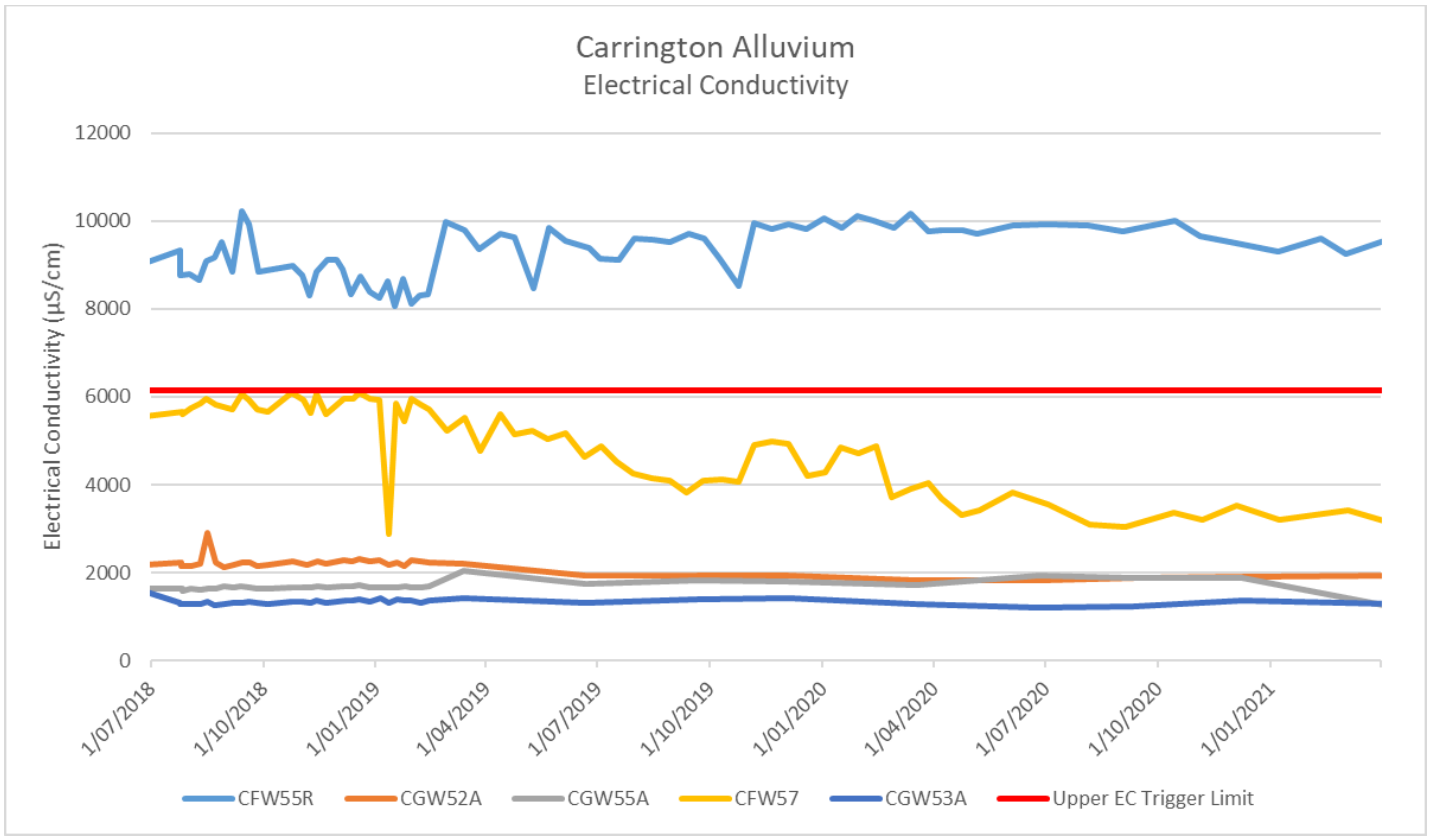


Figure 27 - Carrington Alluvium Electrical Conductivity Trend - Q1 2021

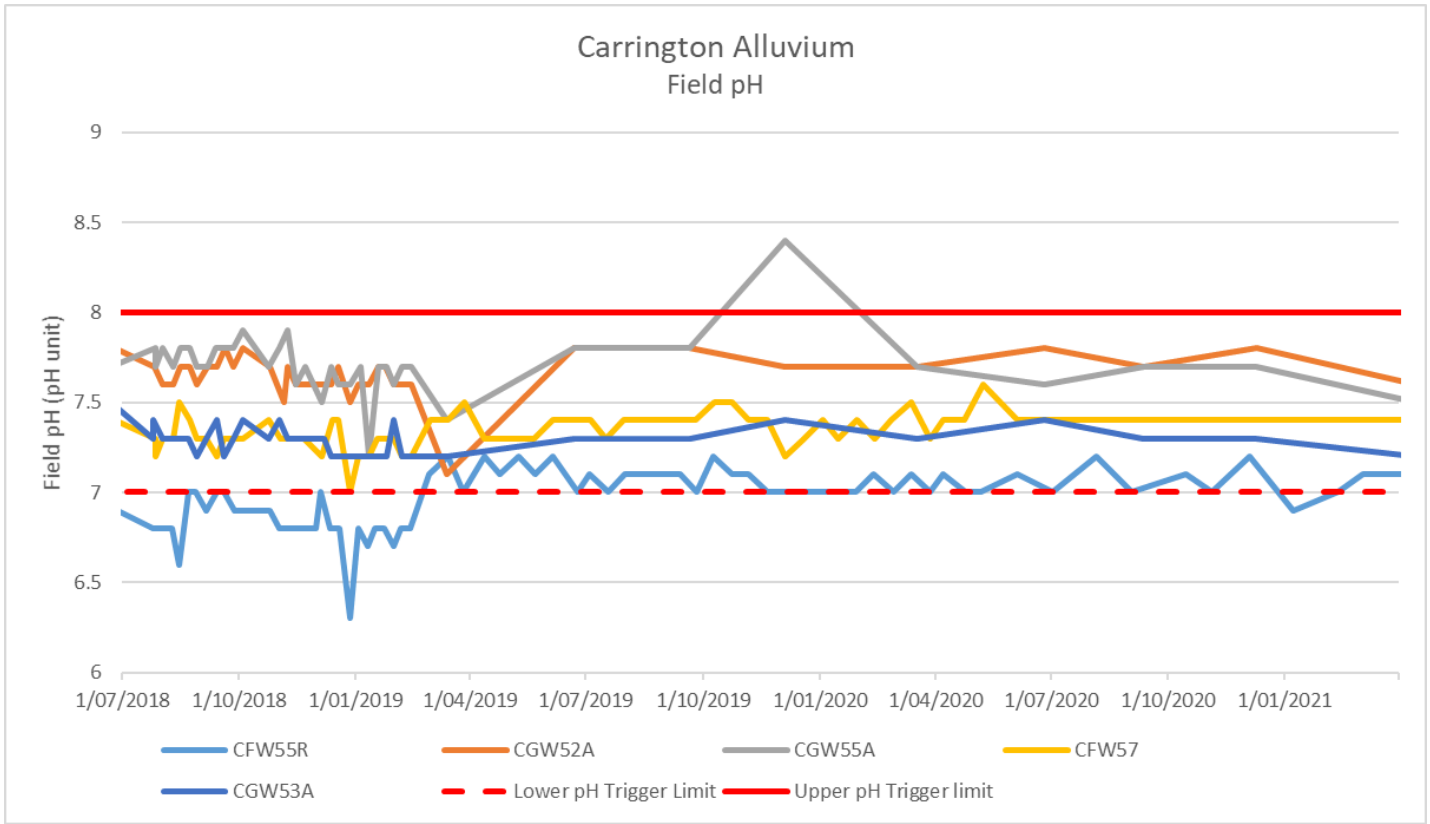


Figure 28 - Carrington Alluvium Field pH Trend - Q1 2021

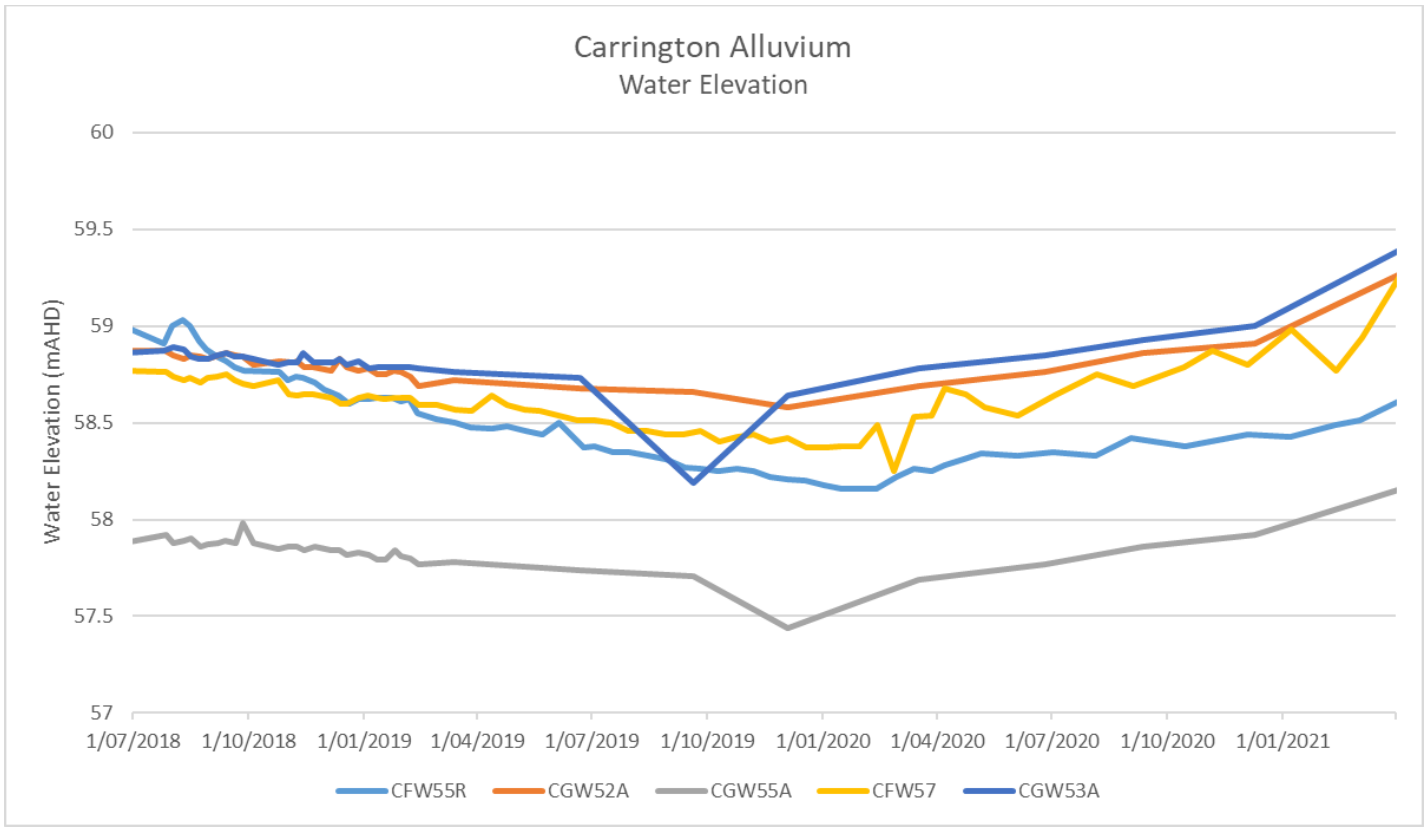


Figure 29 - Carrington Alluvium Water Elevation Trend - Q1 2021

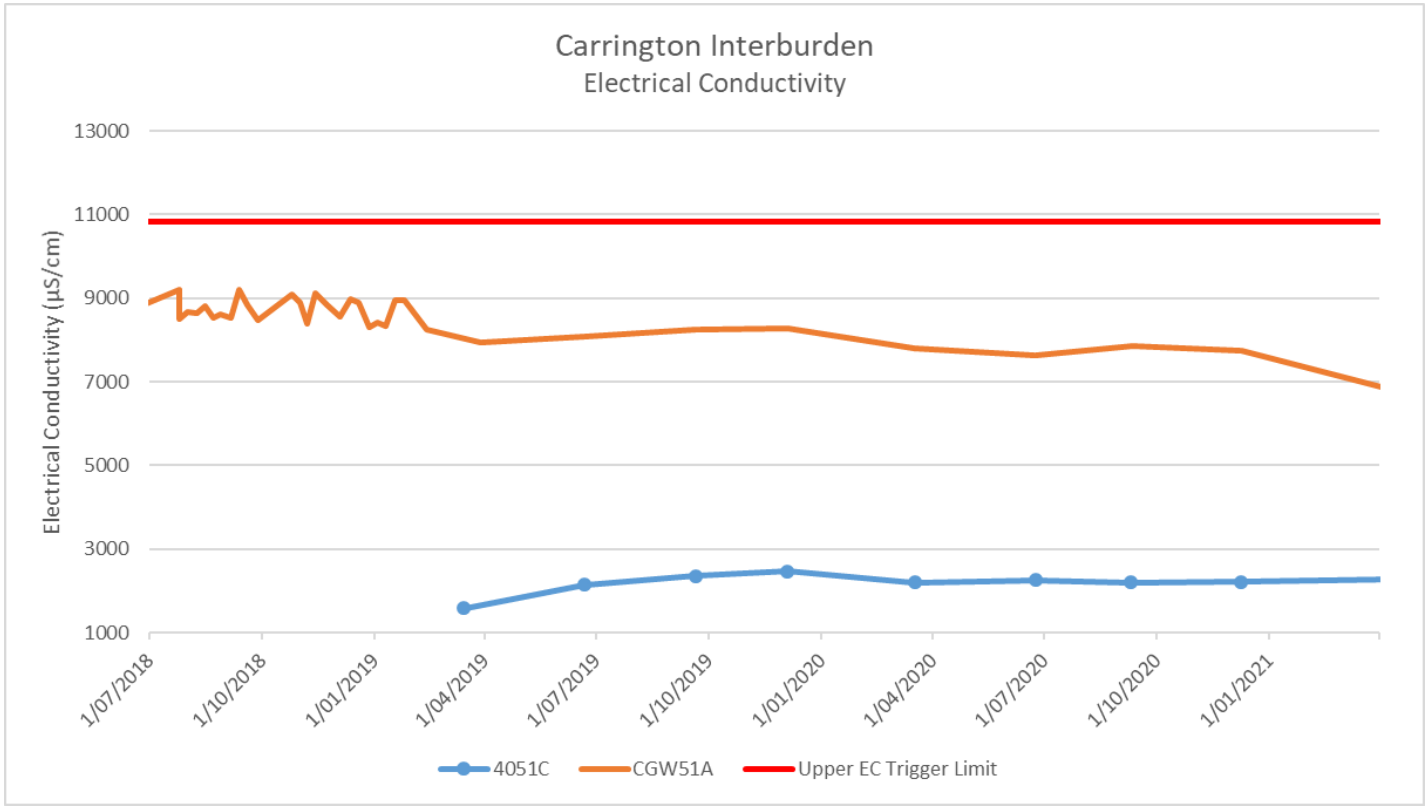


Figure 30 - Carrington Interburden Electrical Conductivity Trend - Q1 2021

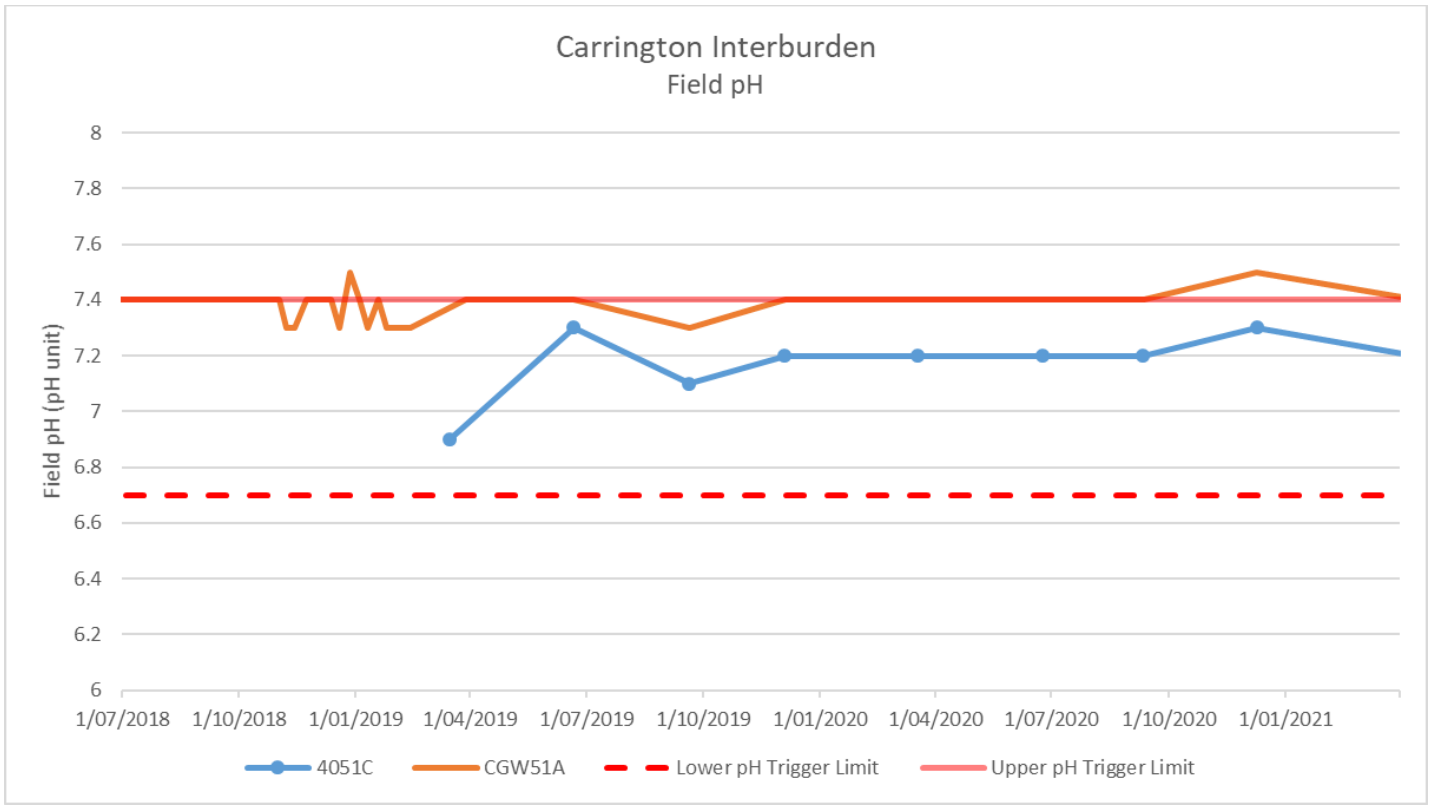
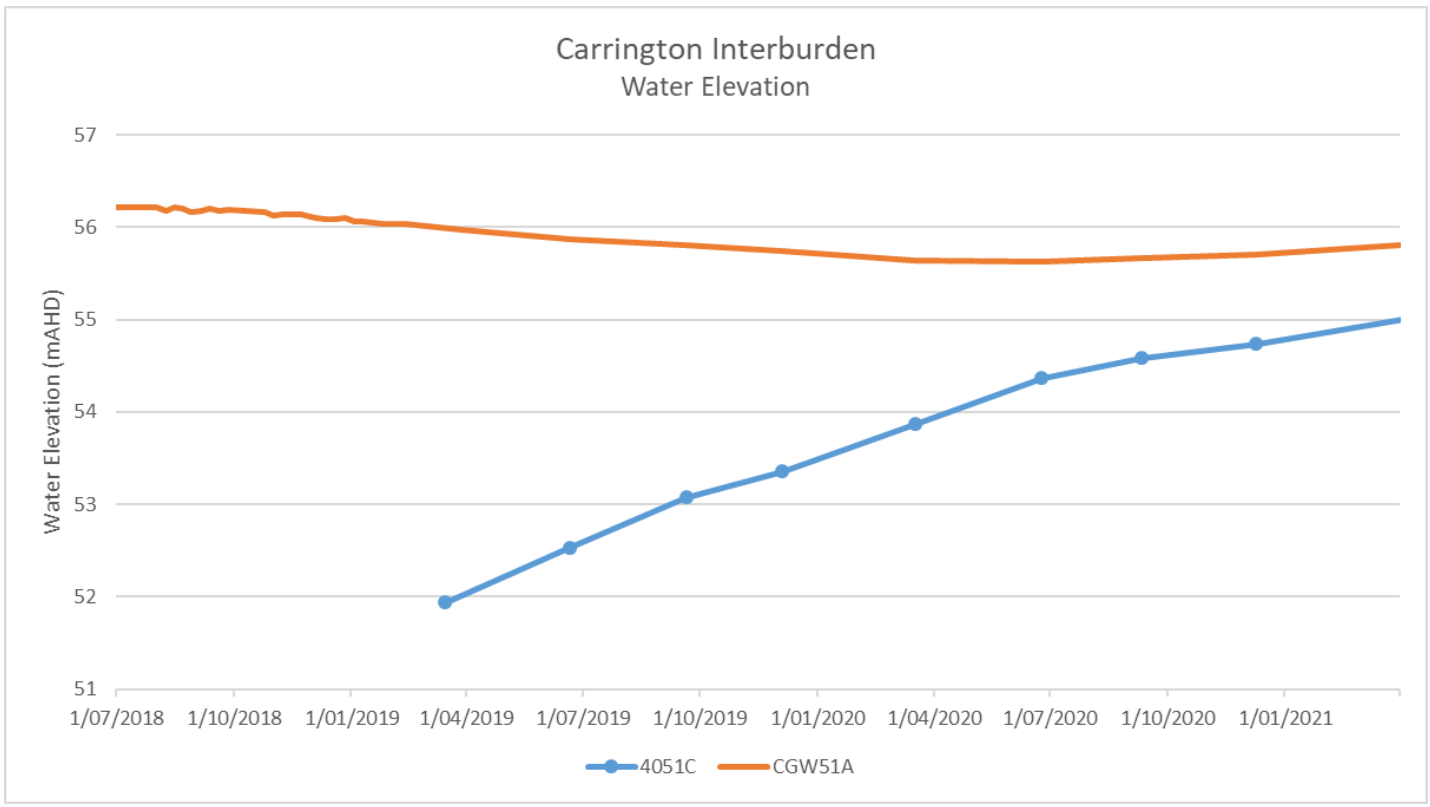


Figure 31 - Carrington Interburden Field pH Trend - Q1 2021



** 4036C had insufficient water for sampling*

Figure 32 - Carrington Interburden Water Elevation Trend - Q1 2021

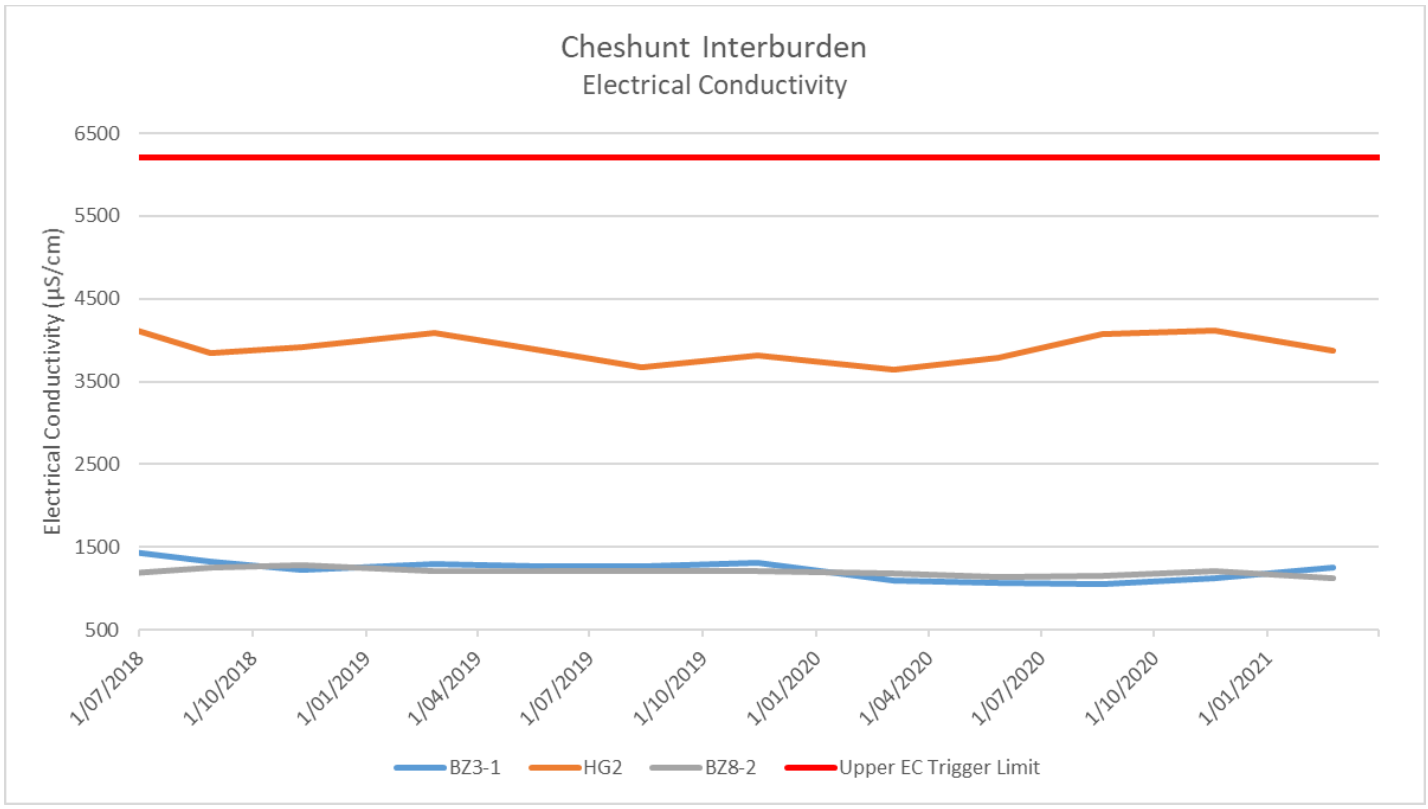


Figure 33 - Cheshunt Interburden Electrical Conductivity Trend - Q1 2021

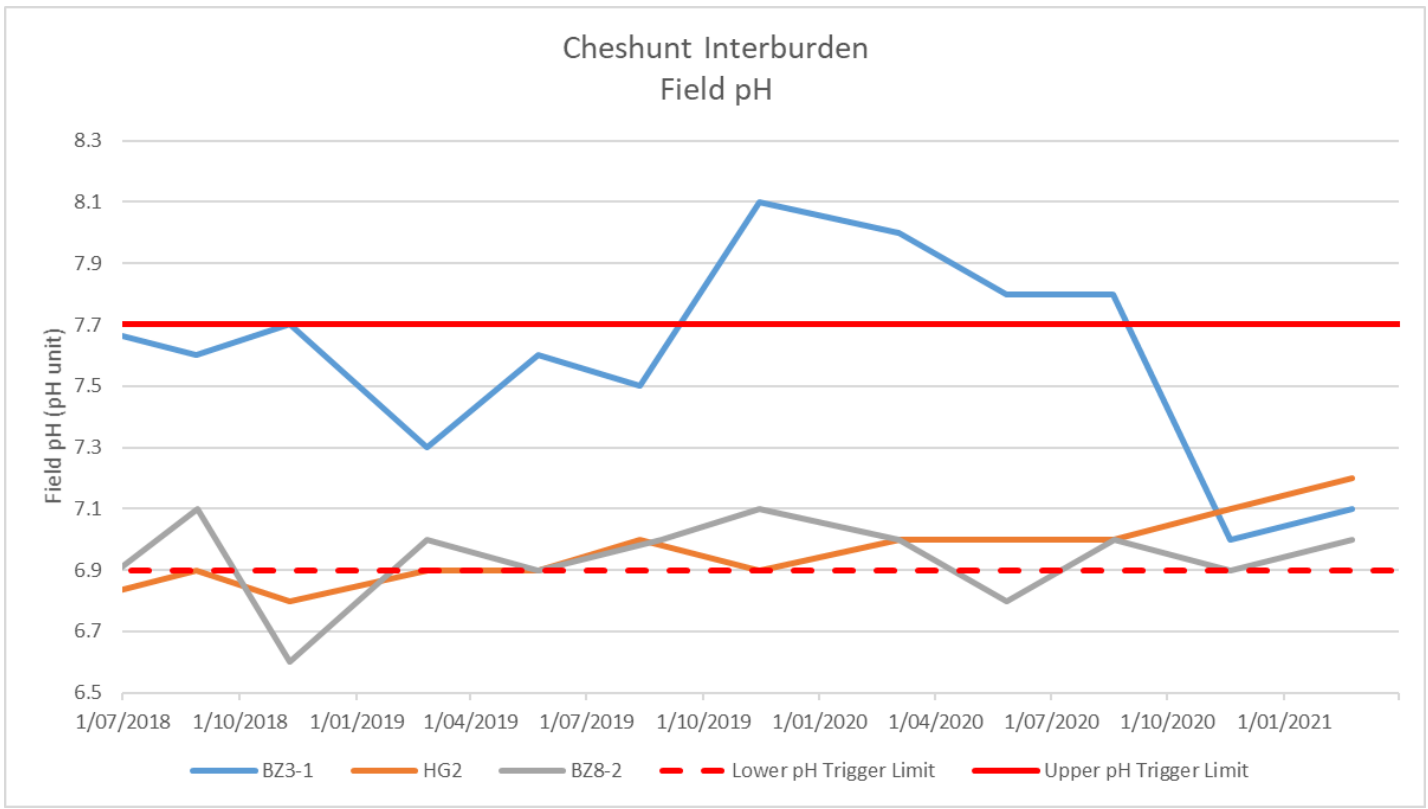


Figure 34 - Cheshunt Interburden Field pH Trend - Q1 2021

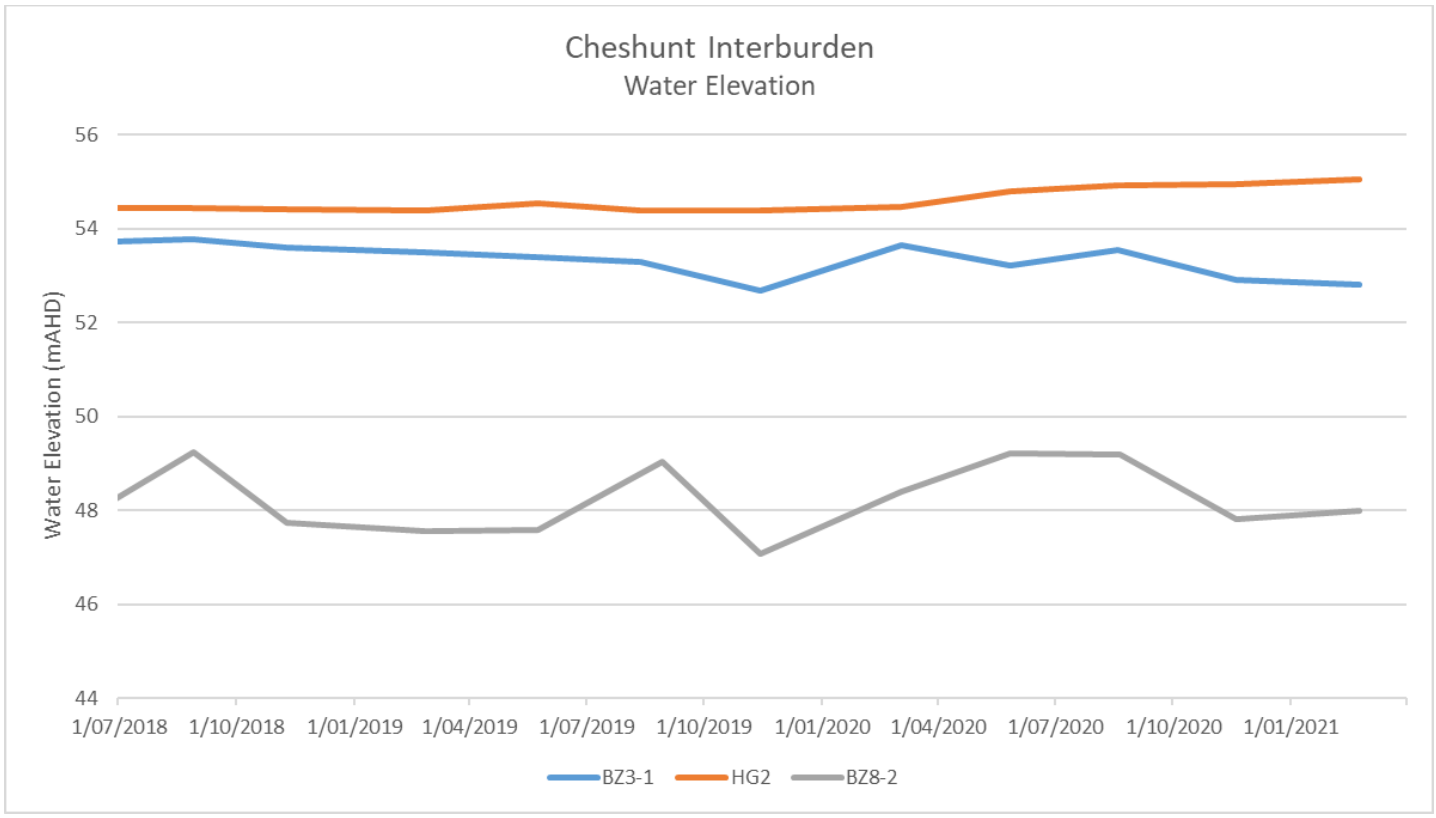
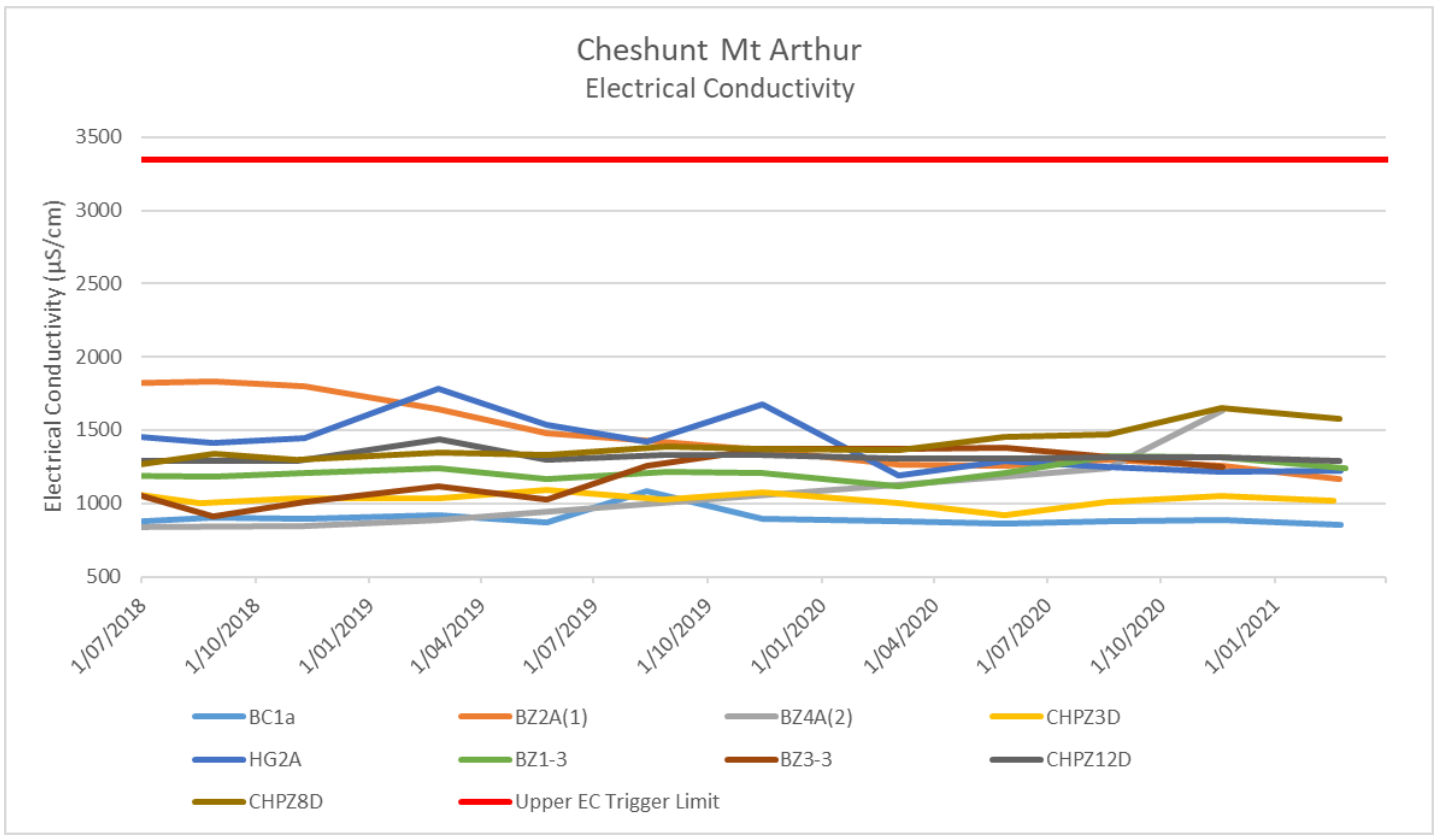
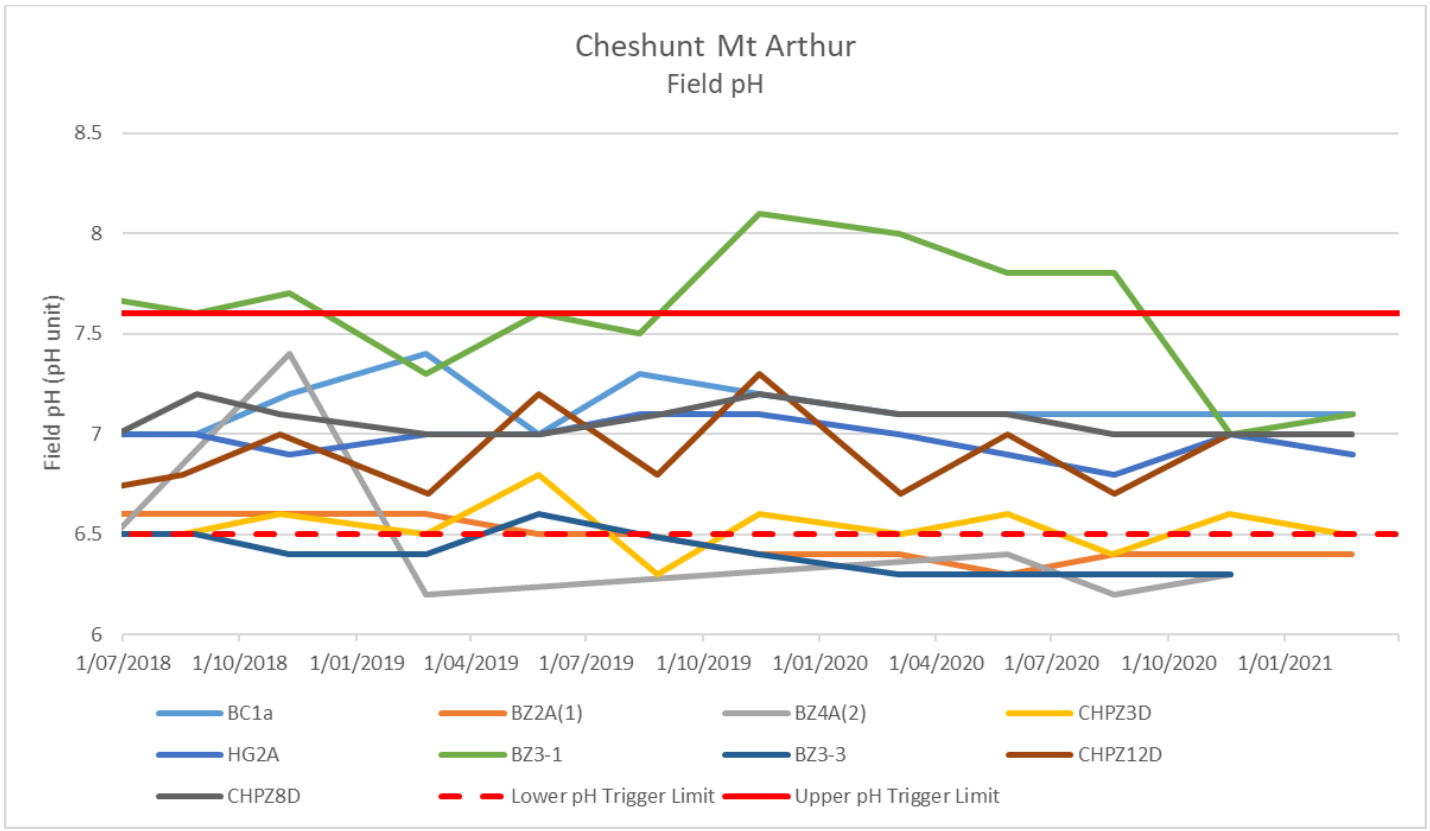


Figure 35 – Cheshunt Interburden Water Elevation Trend - Q1 2021



**BZ3-3 and BZ4A(2) had insufficient water for sampling*

Figure 36 - Cheshunt Mt Arthur Electrical Conductivity Trend - Q1 2021



*BZ3-3 and BZ4A(2) had insufficient water for sampling

Figure 37 - Cheshunt Mt Arthur Field pH Trend - Q1 2021

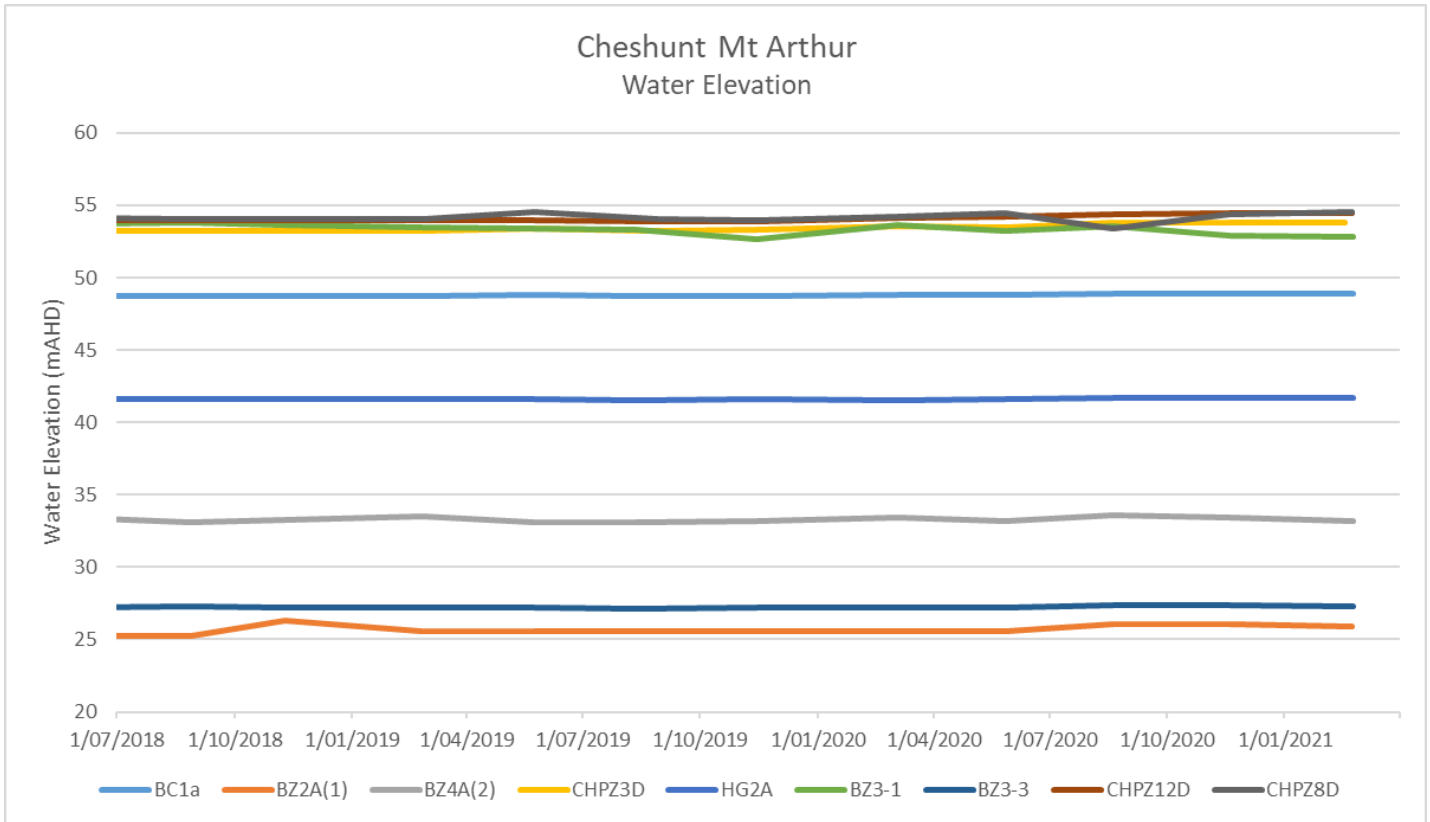


Figure 38 - Cheshunt Mt Arthur Water Elevation Trend - Q1 2021

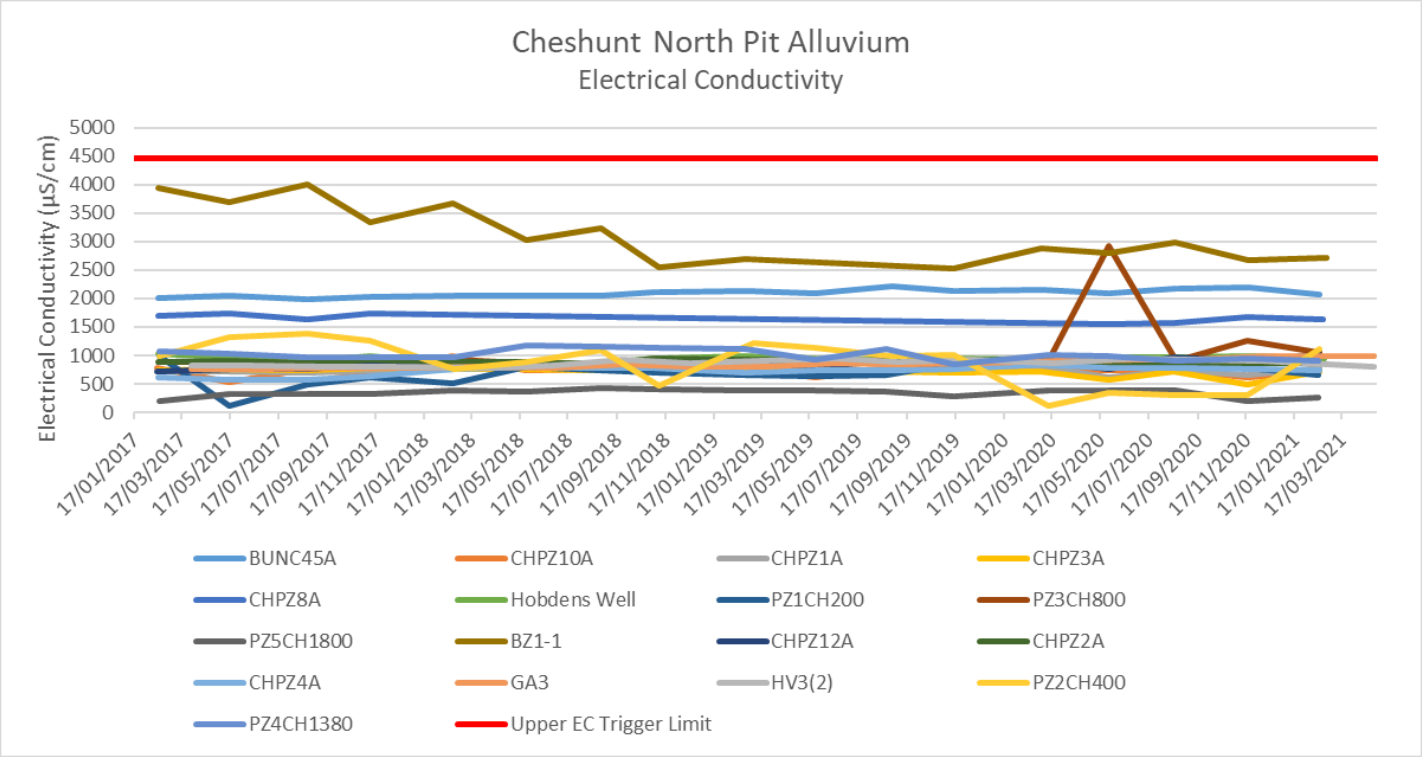


Figure 39 - Cheshunt North Pit Alluvium Electrical Conductivity Trend - Q1 2021

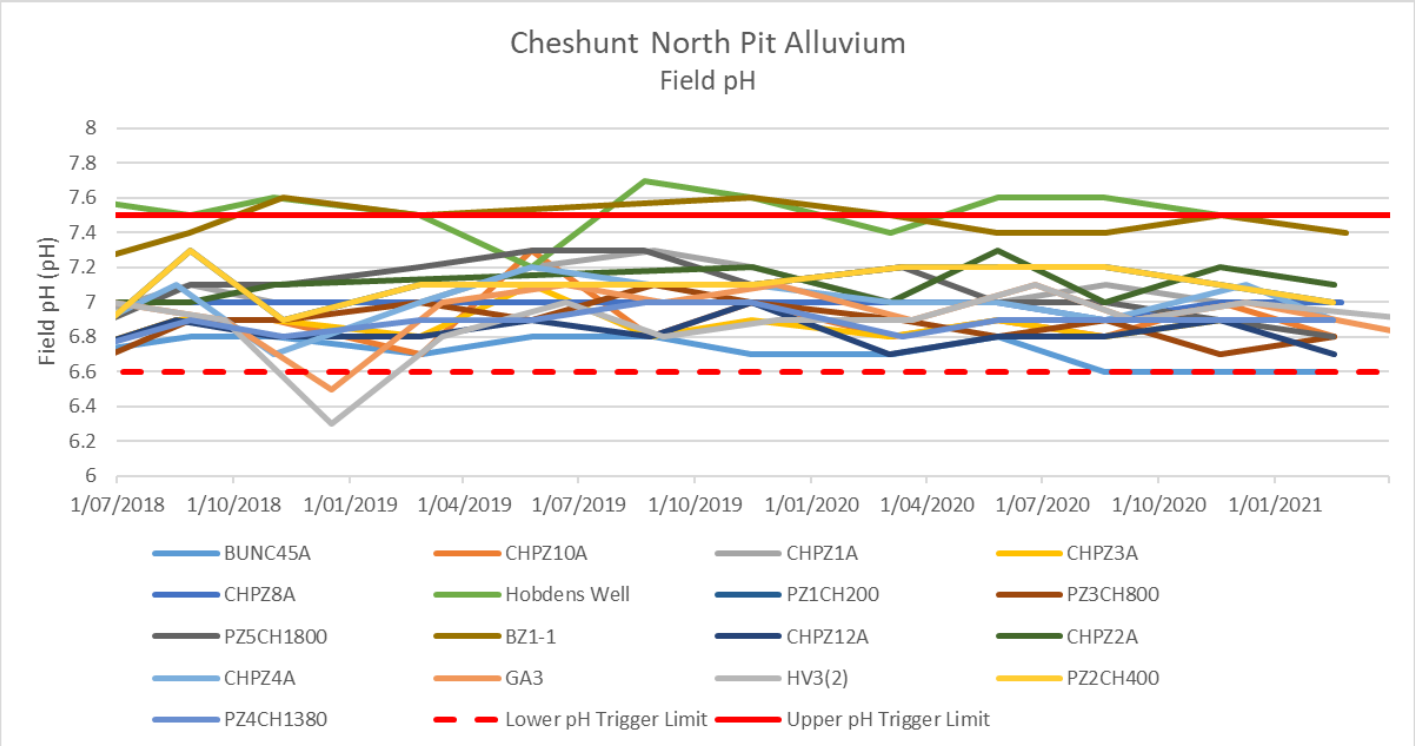


Figure 40 - Cheshunt North Pit Alluvium Field pH Trend - Q1 2021

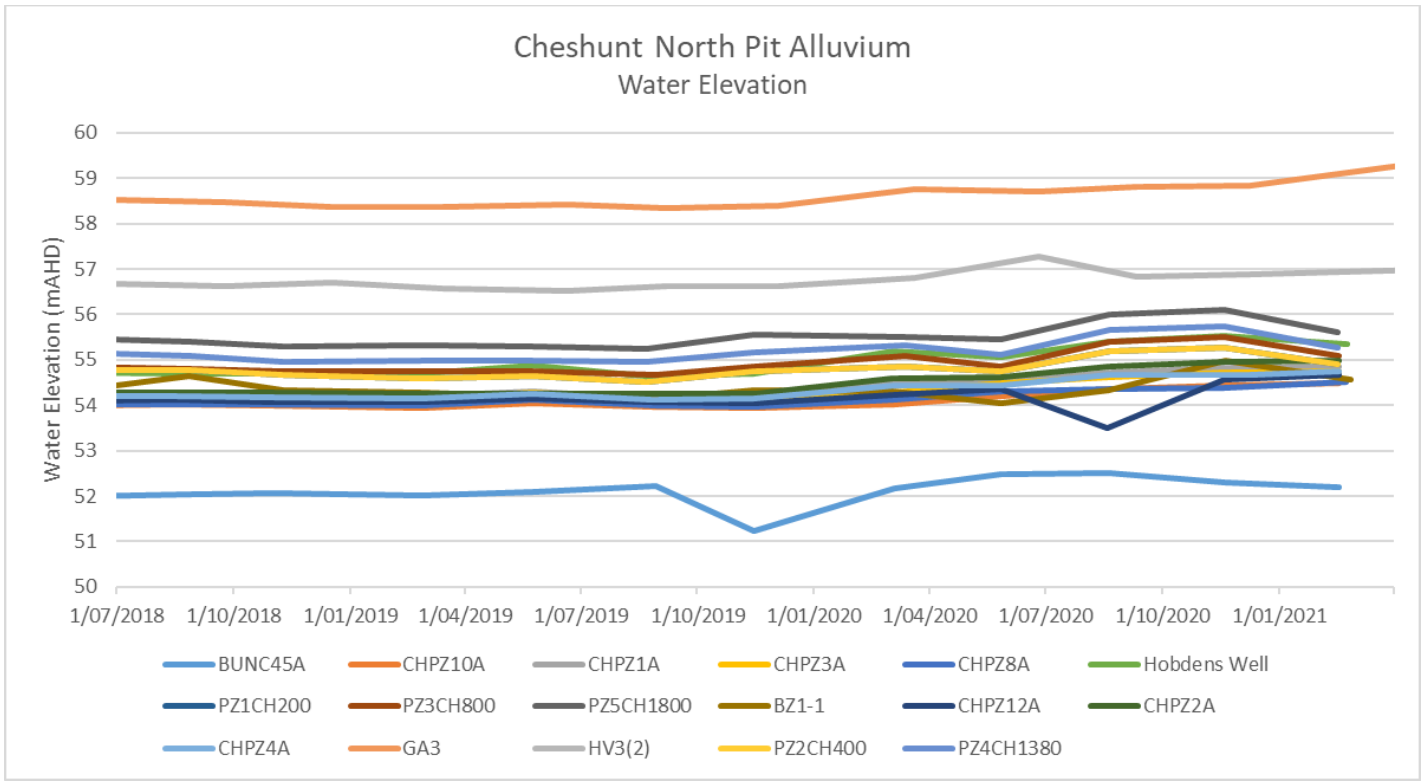


Figure 41 - Cheshunt North Pit Alluvium Water Elevation Trend - Q1 2021

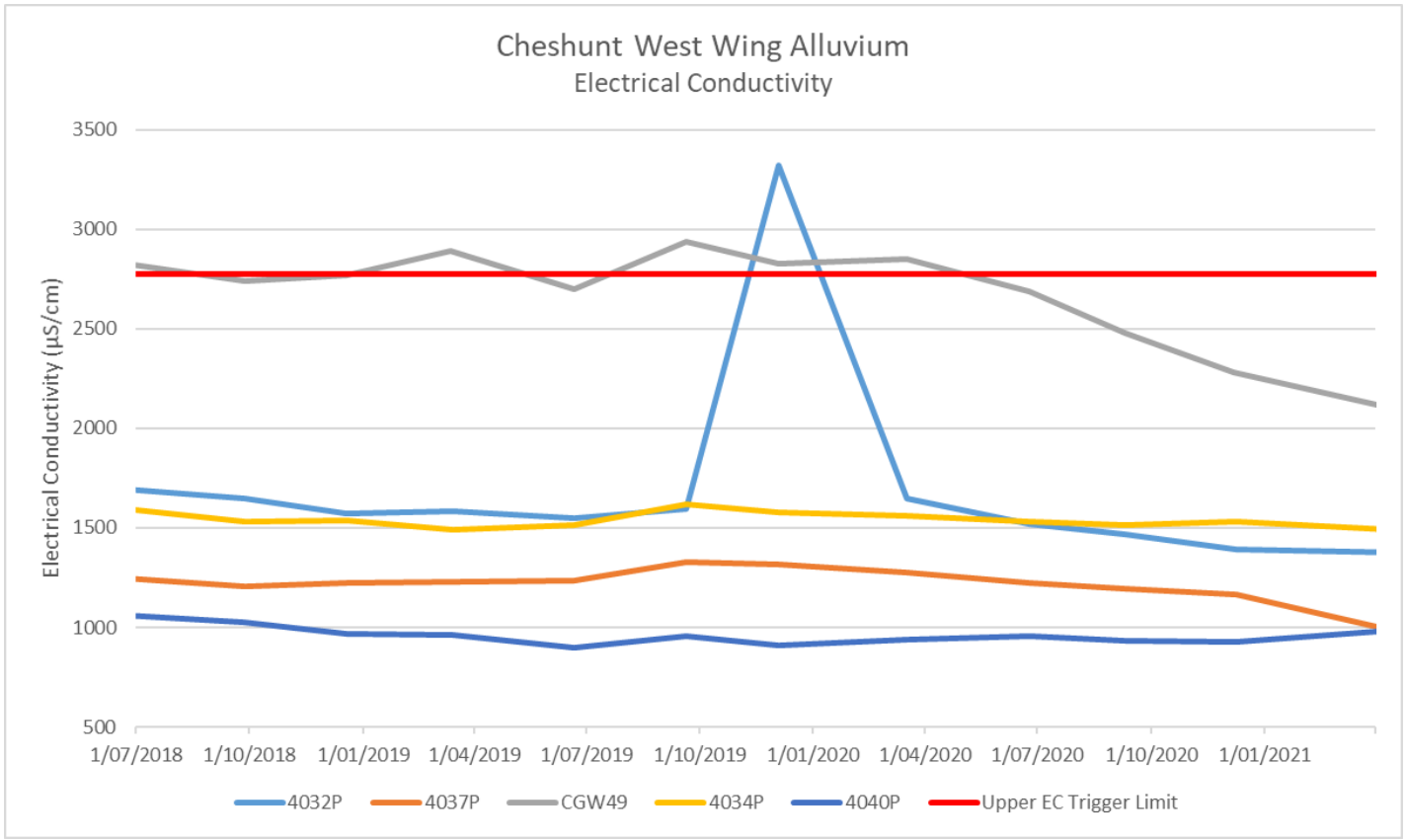


Figure 42 - Cheshunt West Wing Alluvium Electrical Conductivity Trend - Q1 2021

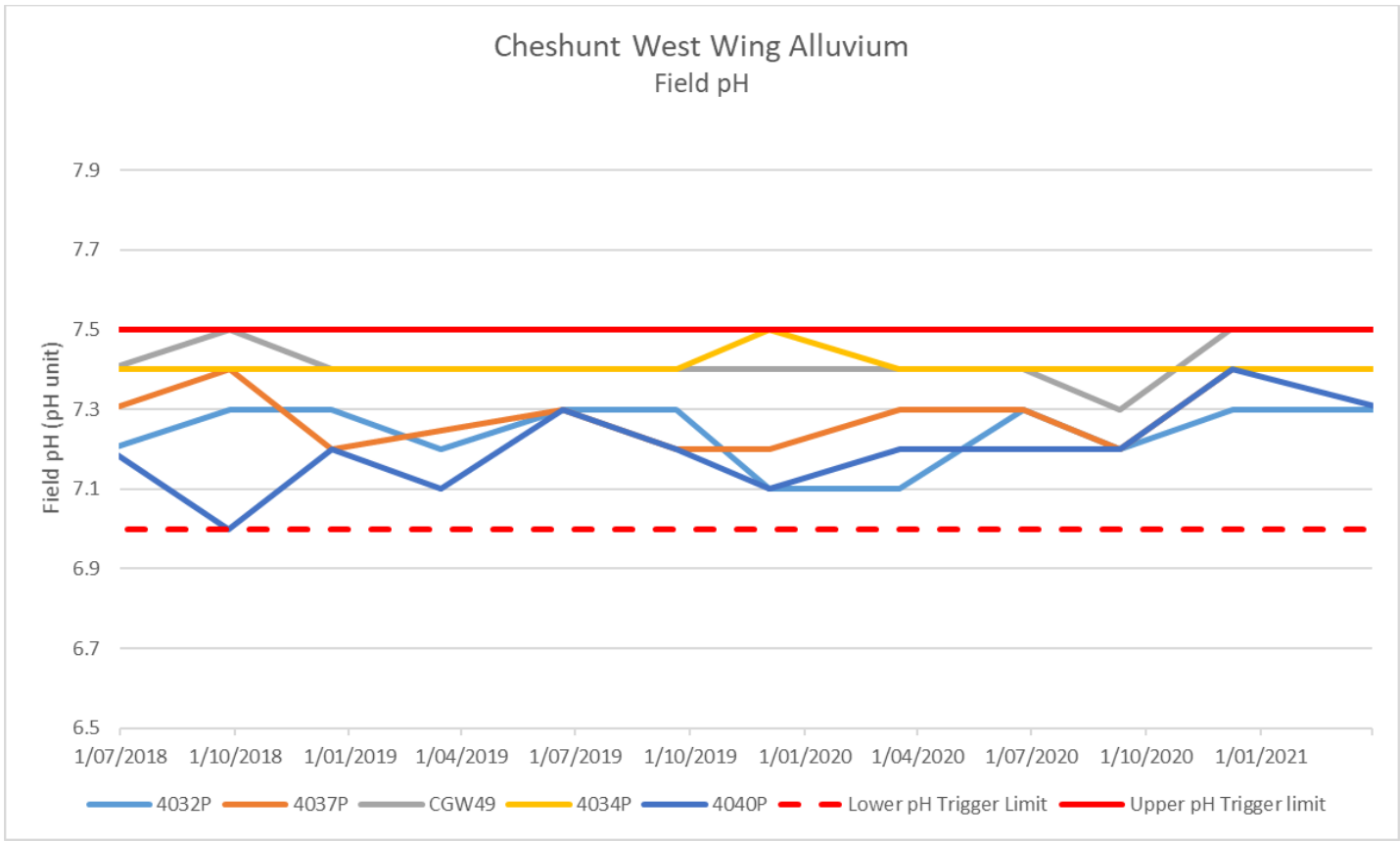


Figure 43 - Cheshunt West Wing Alluvium Field pH Trend - Q1 2021

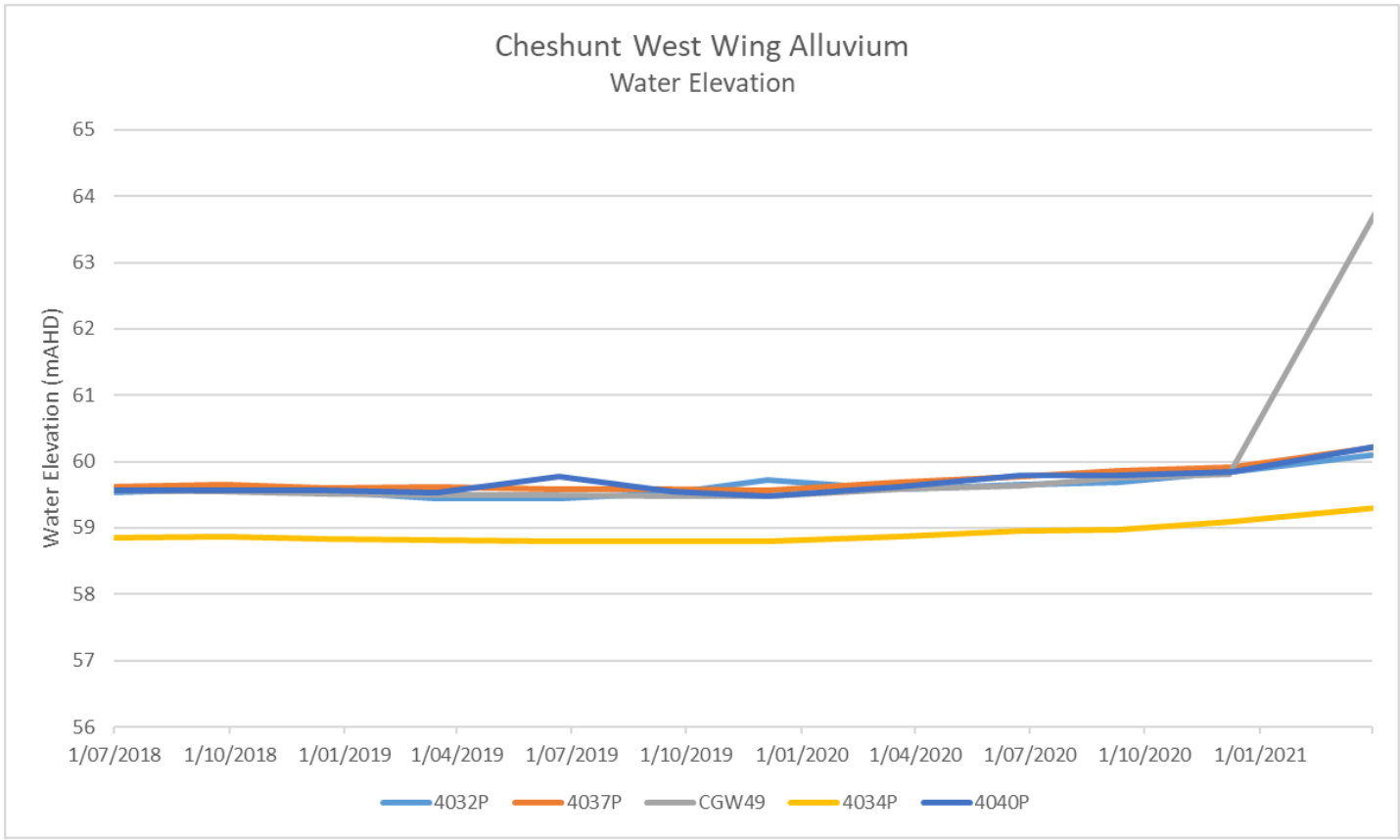


Figure 44 - Cheshunt West Wing Alluvium Water Elevation Trend - Q1 2021

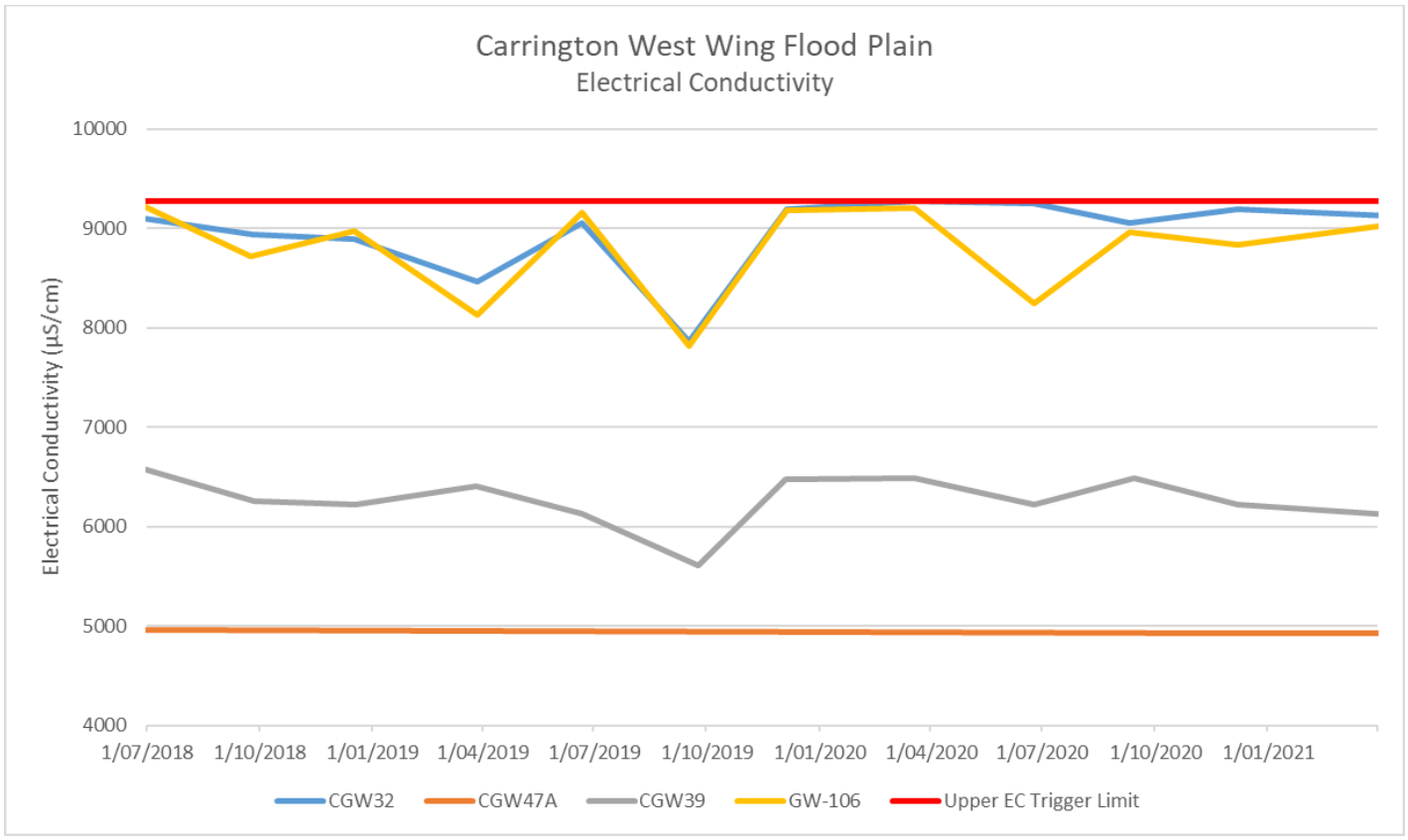


Figure 45 - Carrington West Wing Flood Plain Electrical Conductivity trend - Q1 2021

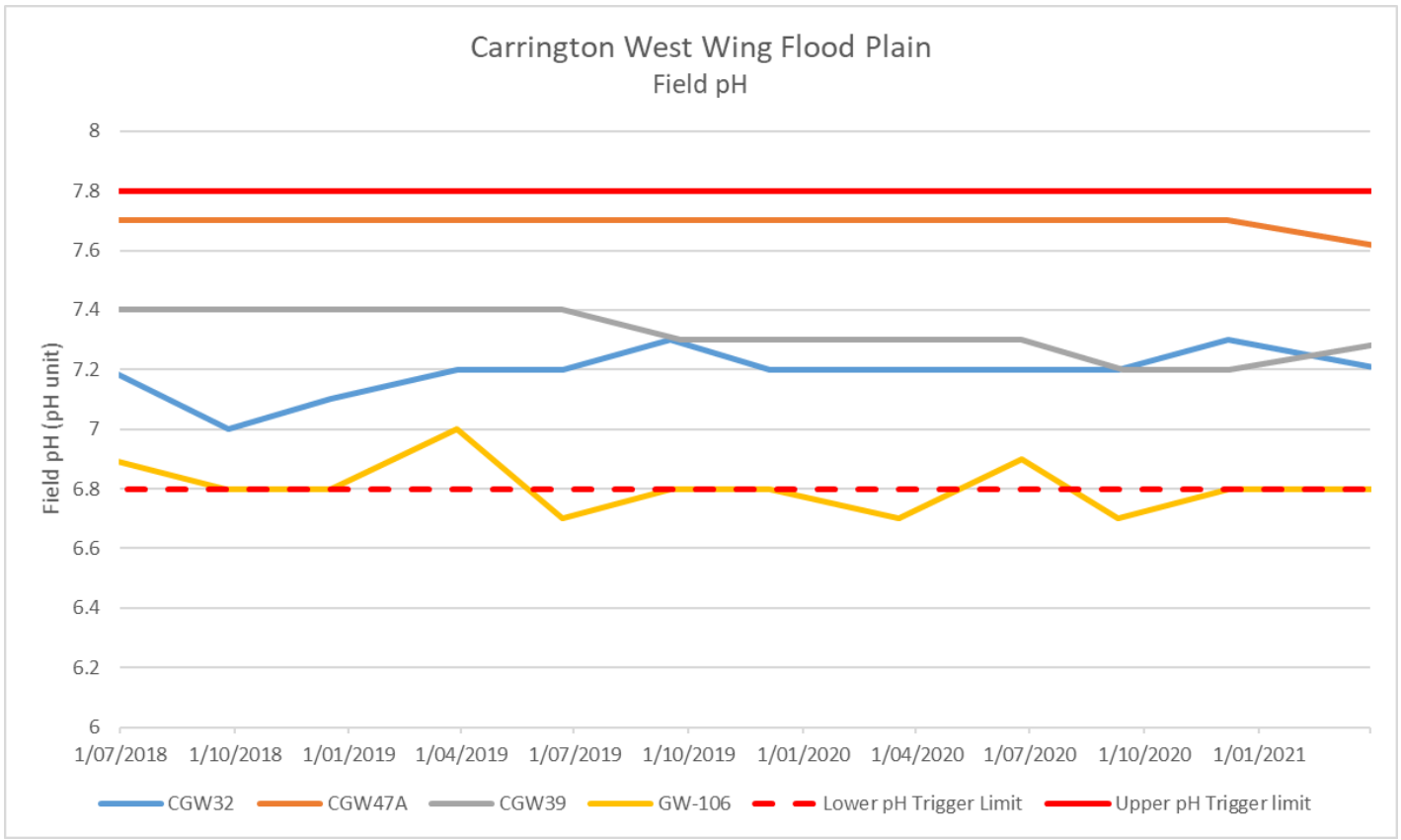


Figure 46 - Carrington West Wing Flood Plain Field pH Trend - Q1 2021

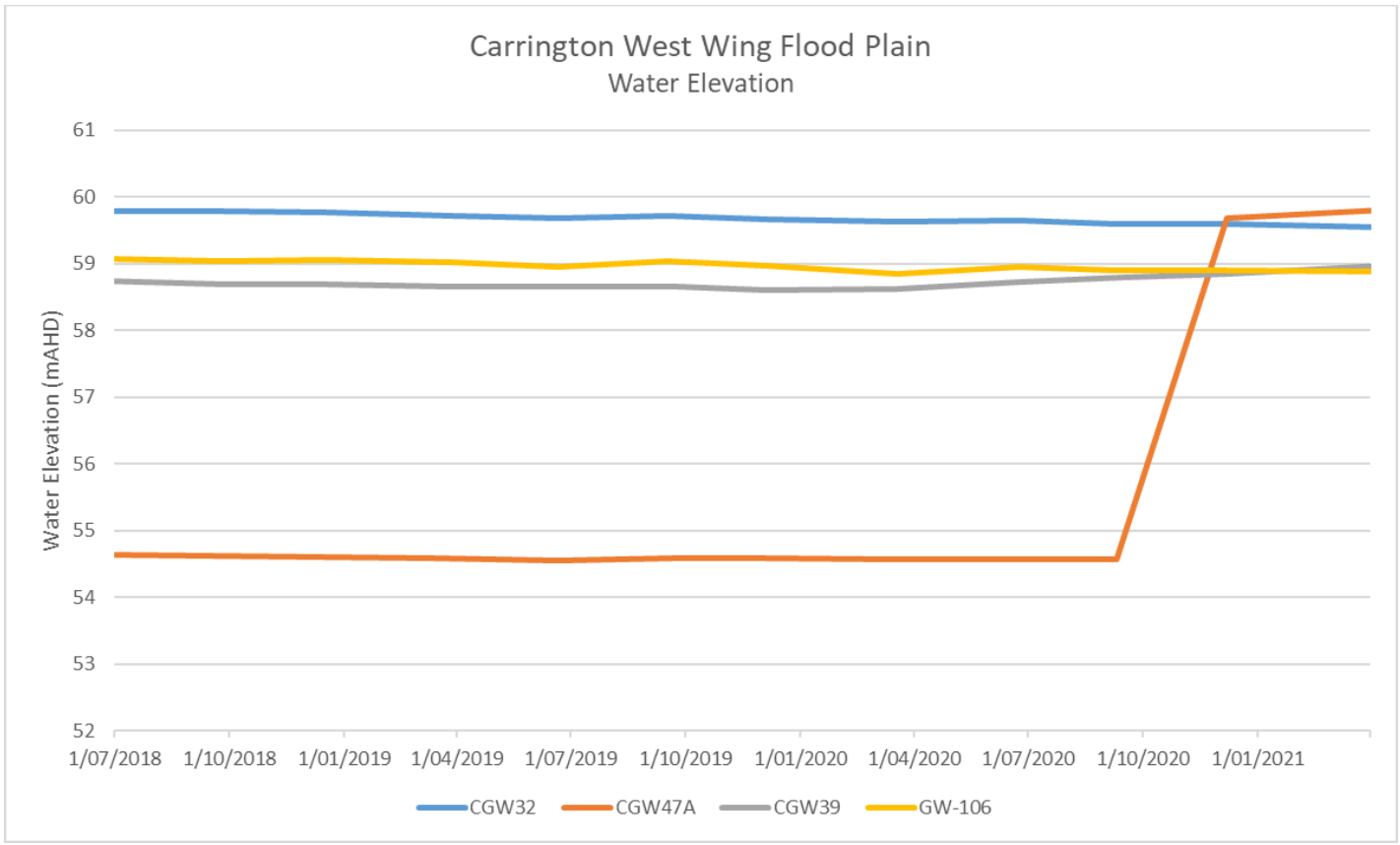


Figure 47 - Carrington West Wing Flood Plain Water Elevation Trend - Q1 2021

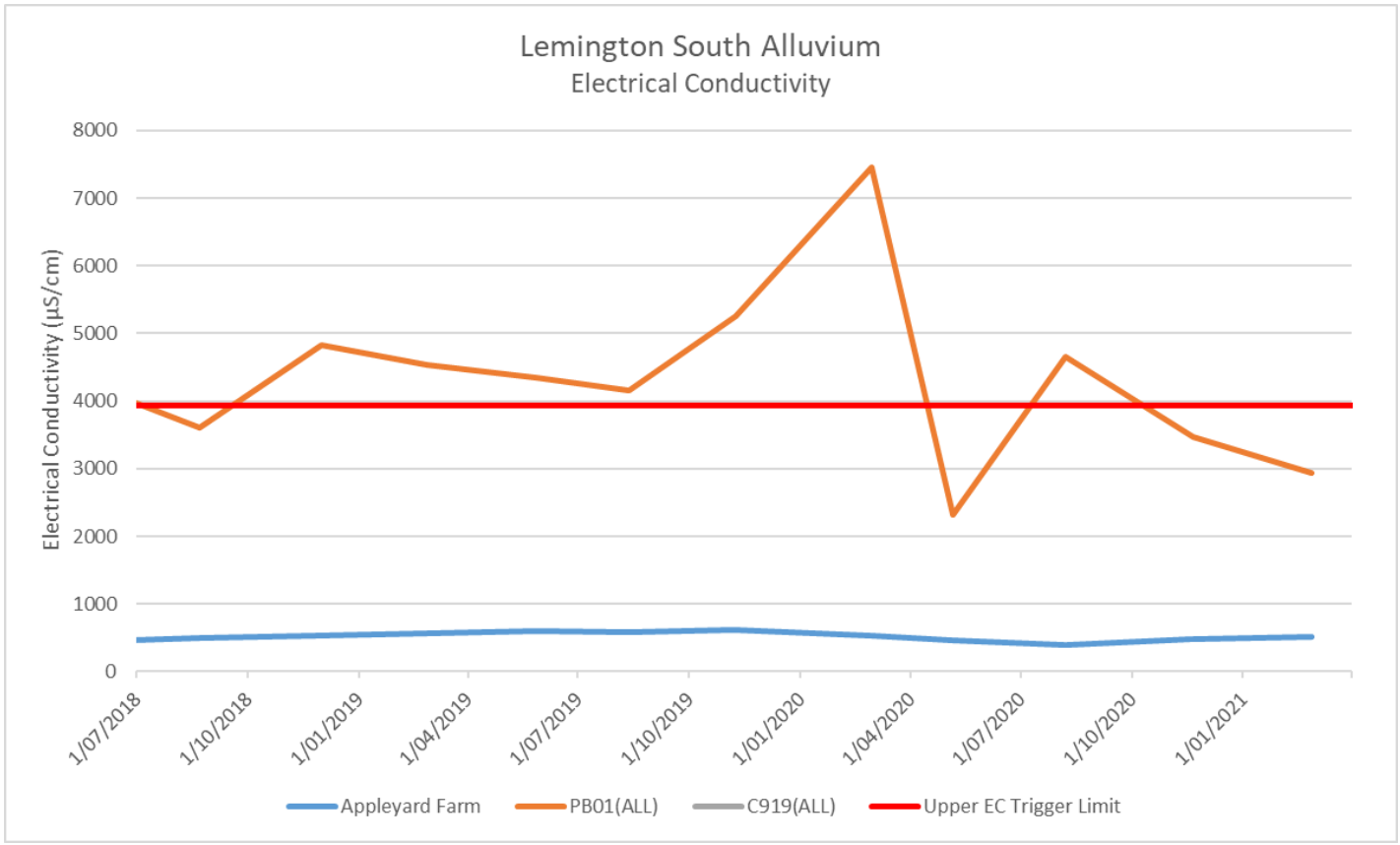


Figure 48 - Lemington South Alluvium Electrical Conductivity Trend - Q1 2021

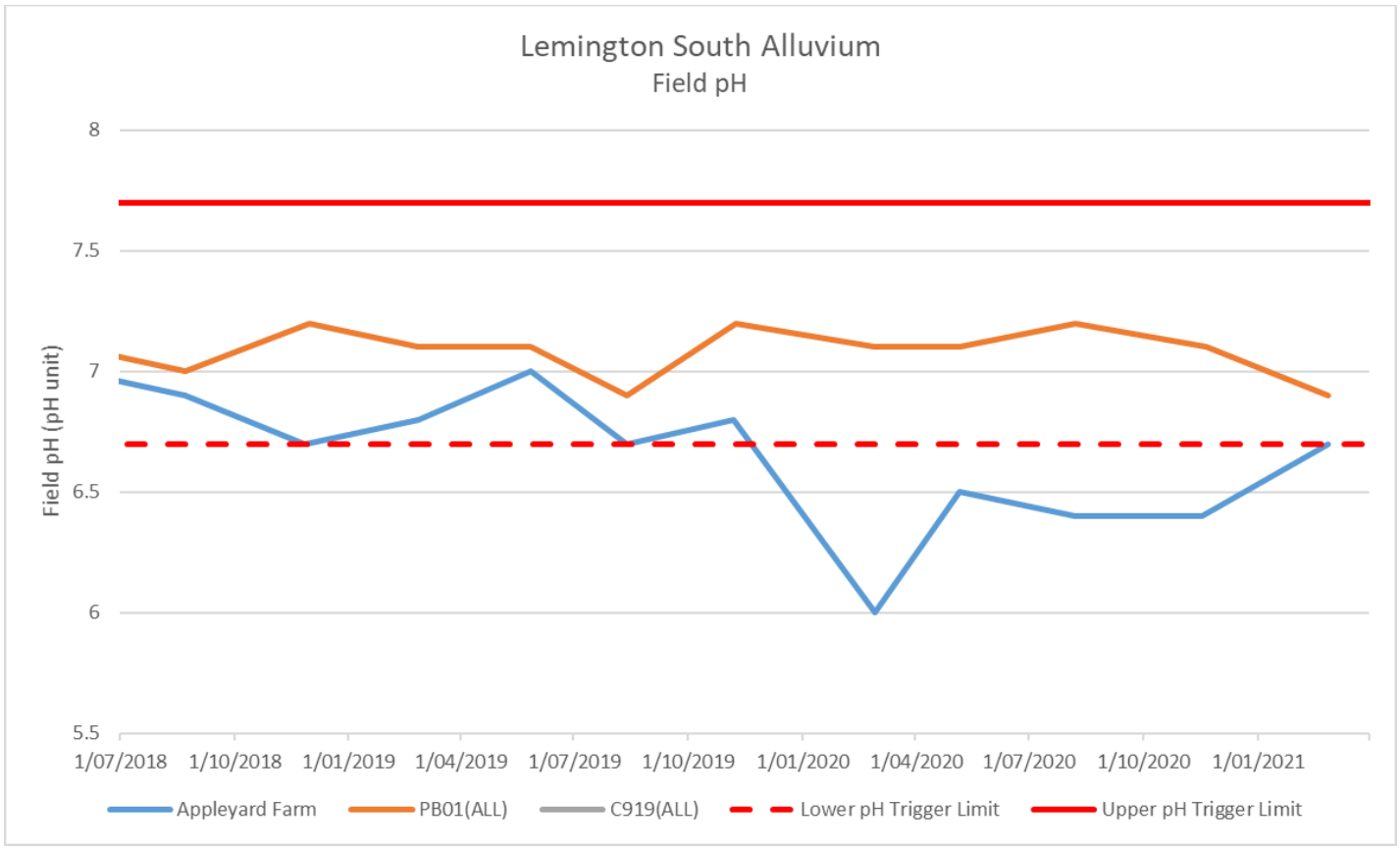


Figure 49 Lemington South Alluvium Field pH Trend - Q1 2021

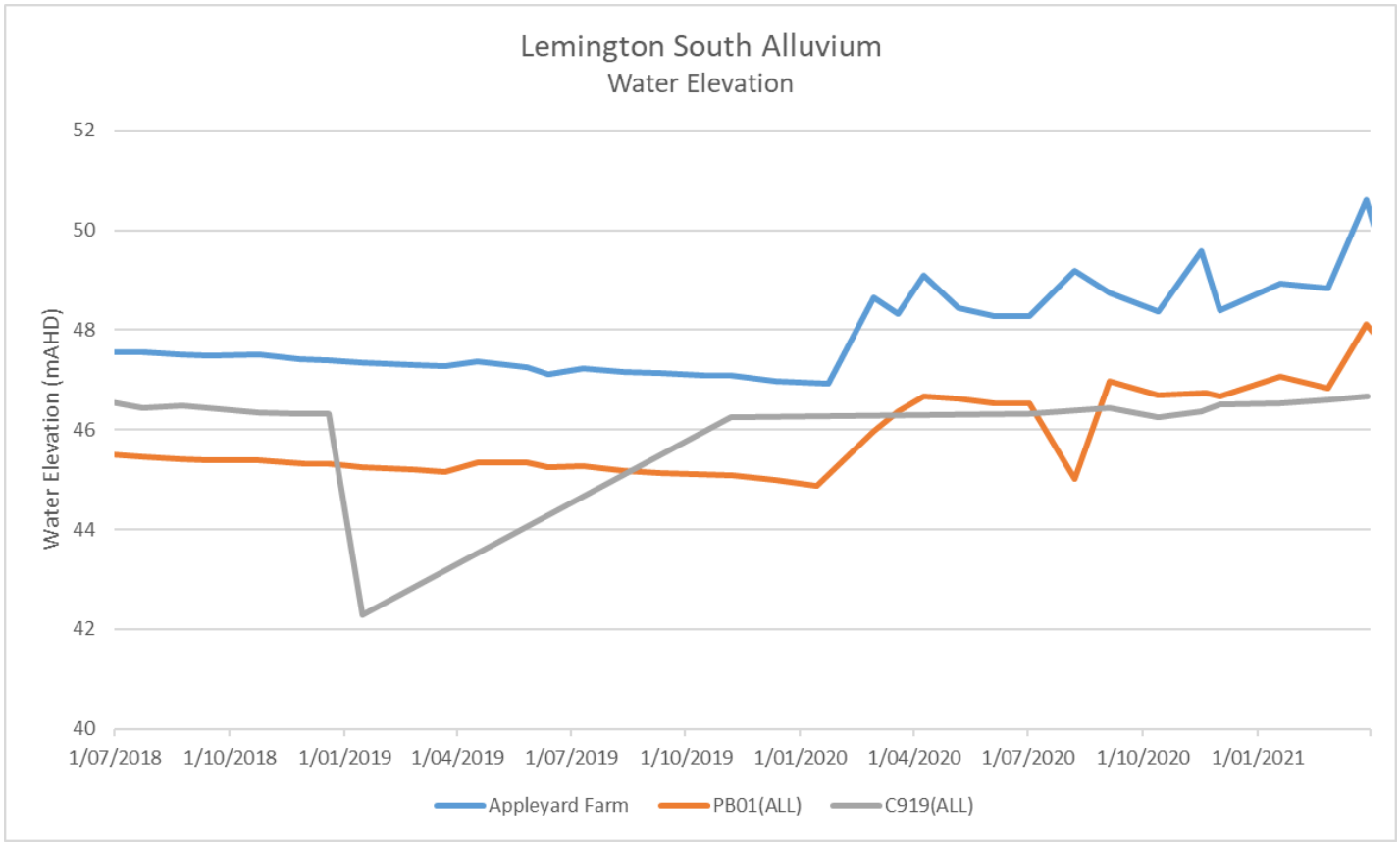


Figure 50 - Lemington South Alluvium Water Elevation Trend - Q1 2021

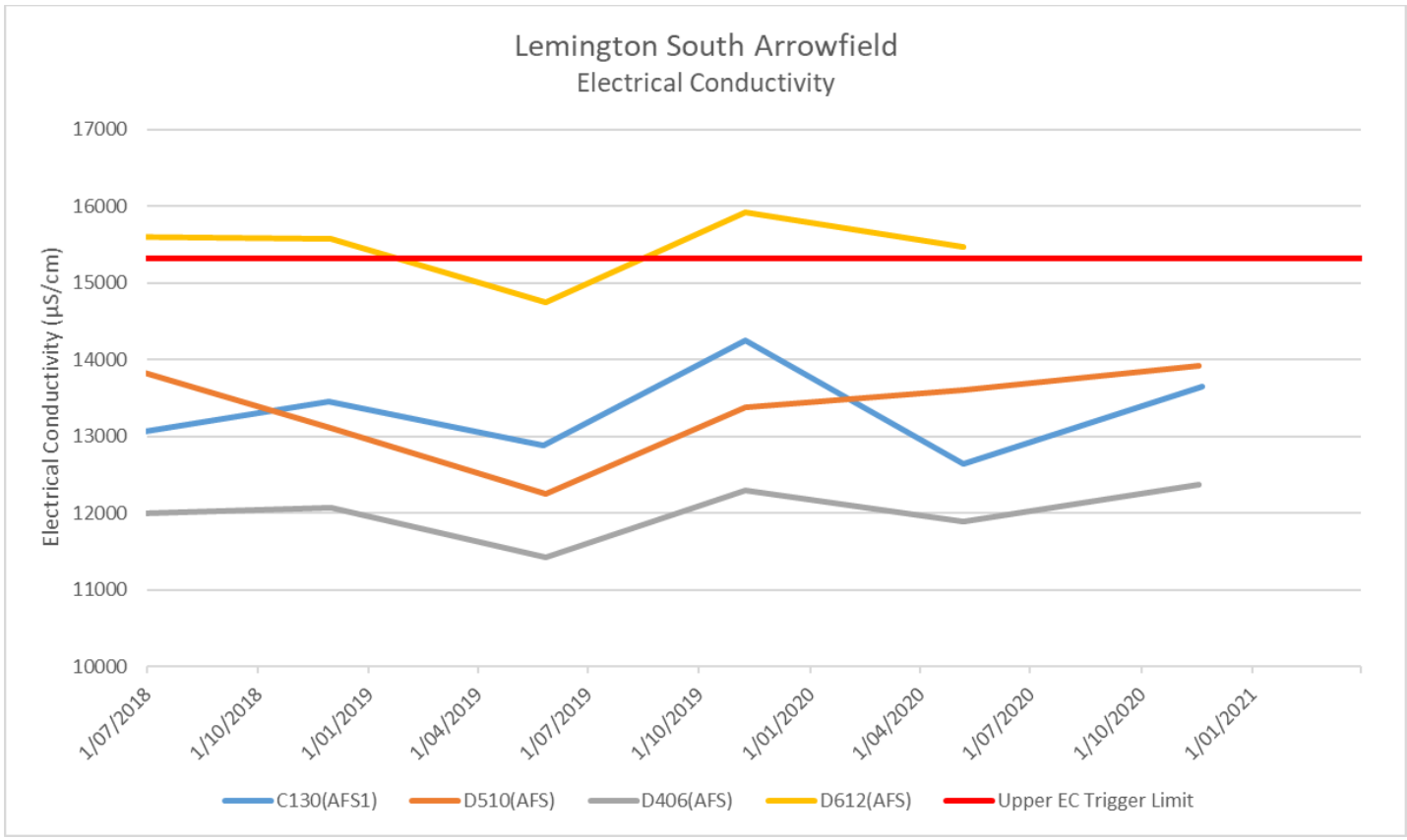


Figure 51 - Lemington South Arrowfield Electrical Conductivity Trend - Q1 2021

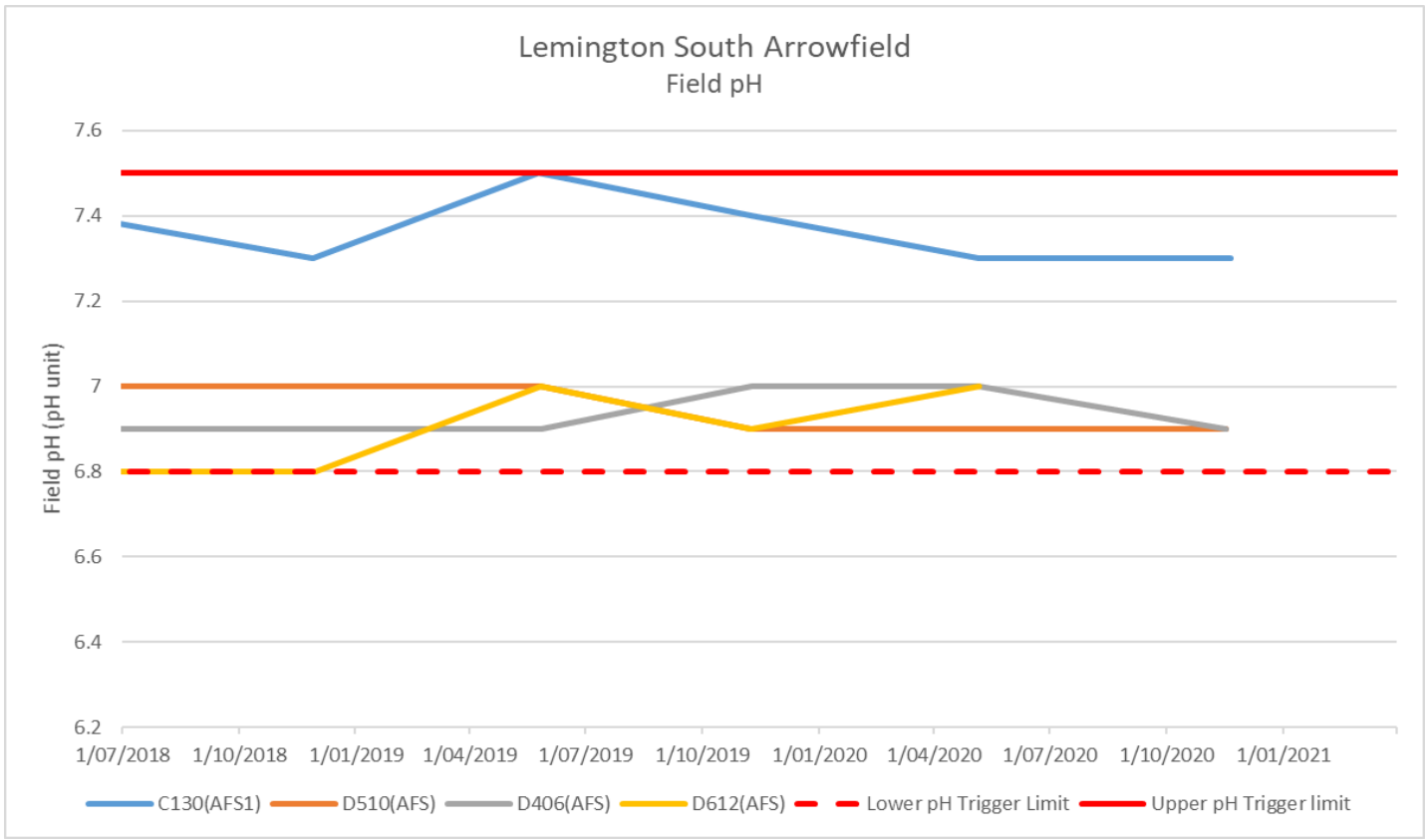


Figure 52 - Lemington South Arrowfield Field pH Trend - Q1 2021

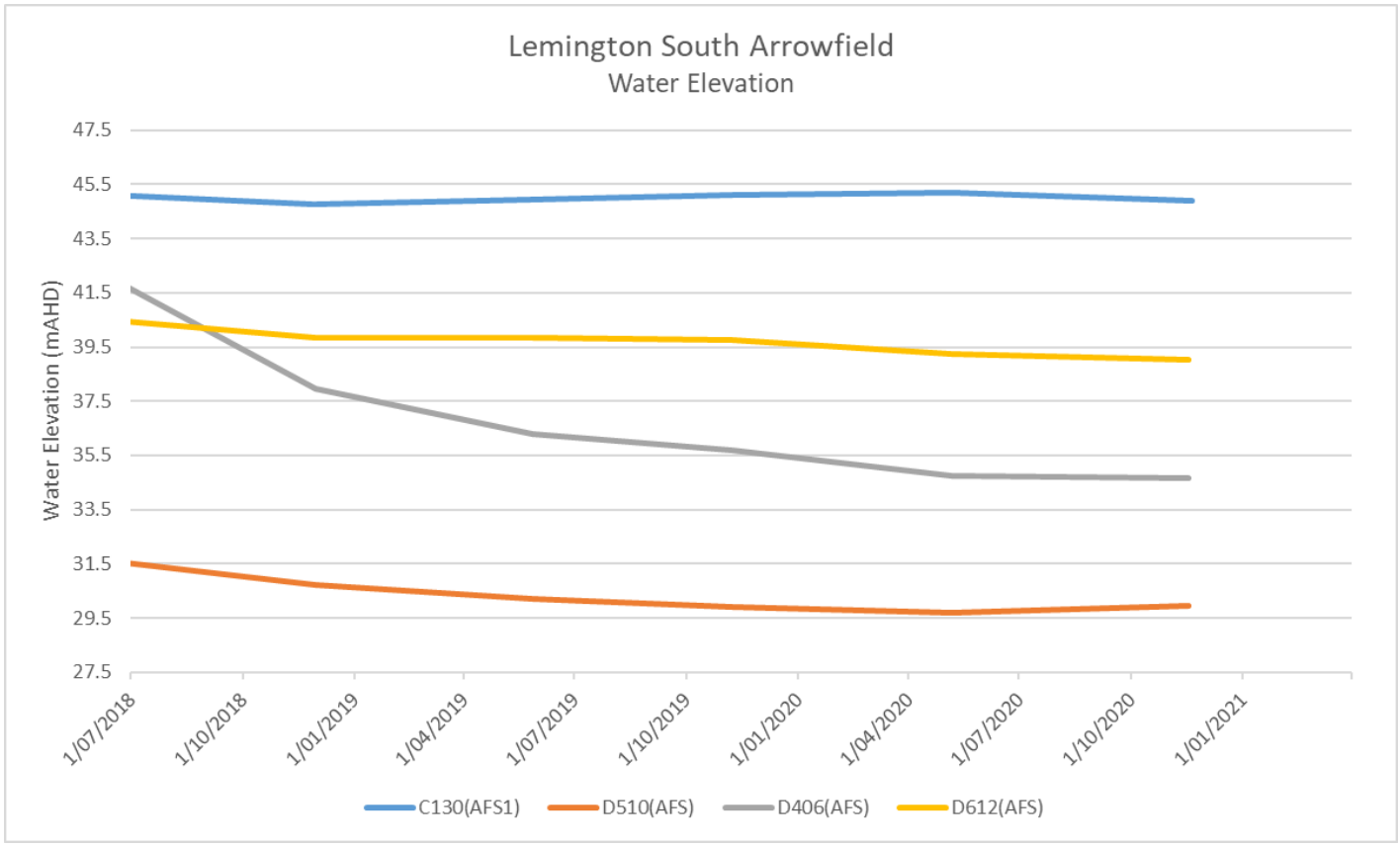


Figure 53 - Lemington South Arrowfield Water Elevation Trend - Q1 2021

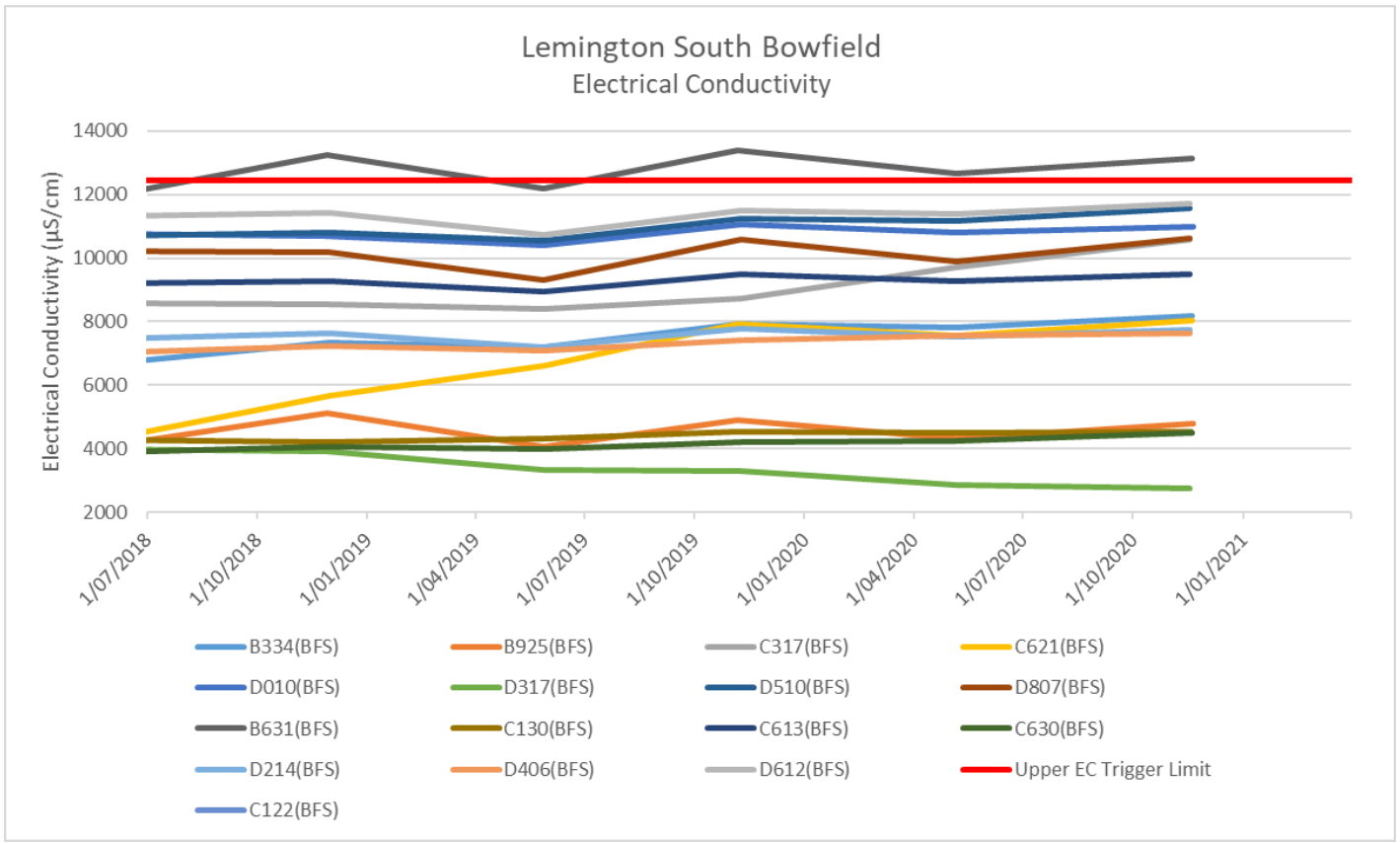


Figure 54 - Lemington South Bowfield Electrical Conductivity Trend - Q1 2021

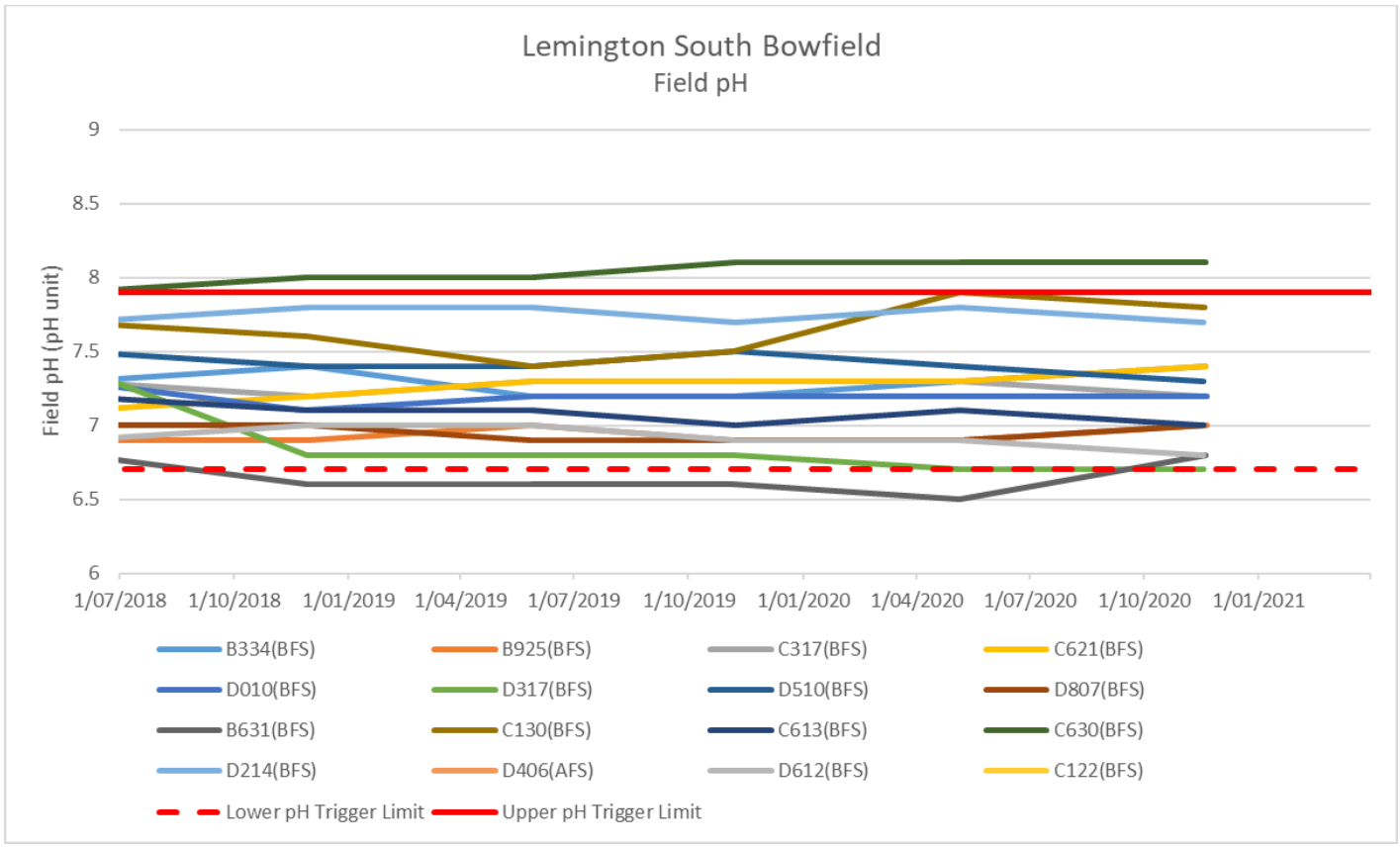


Figure 55 - Lemington South Bowfield Field pH Trend - Q1 2021

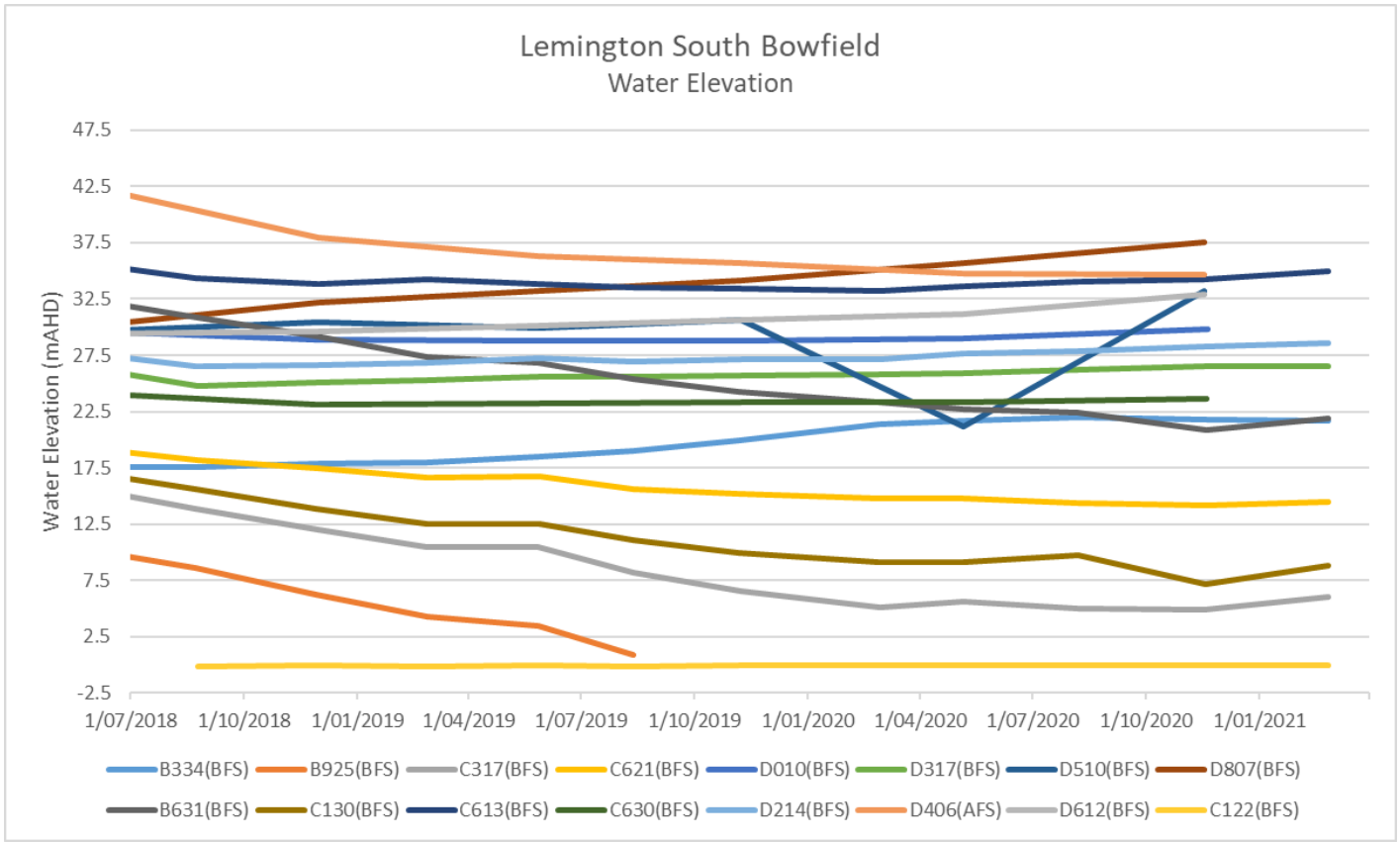


Figure 56 - Lemington South Bowfield Water Elevation Trend - Q1 2021

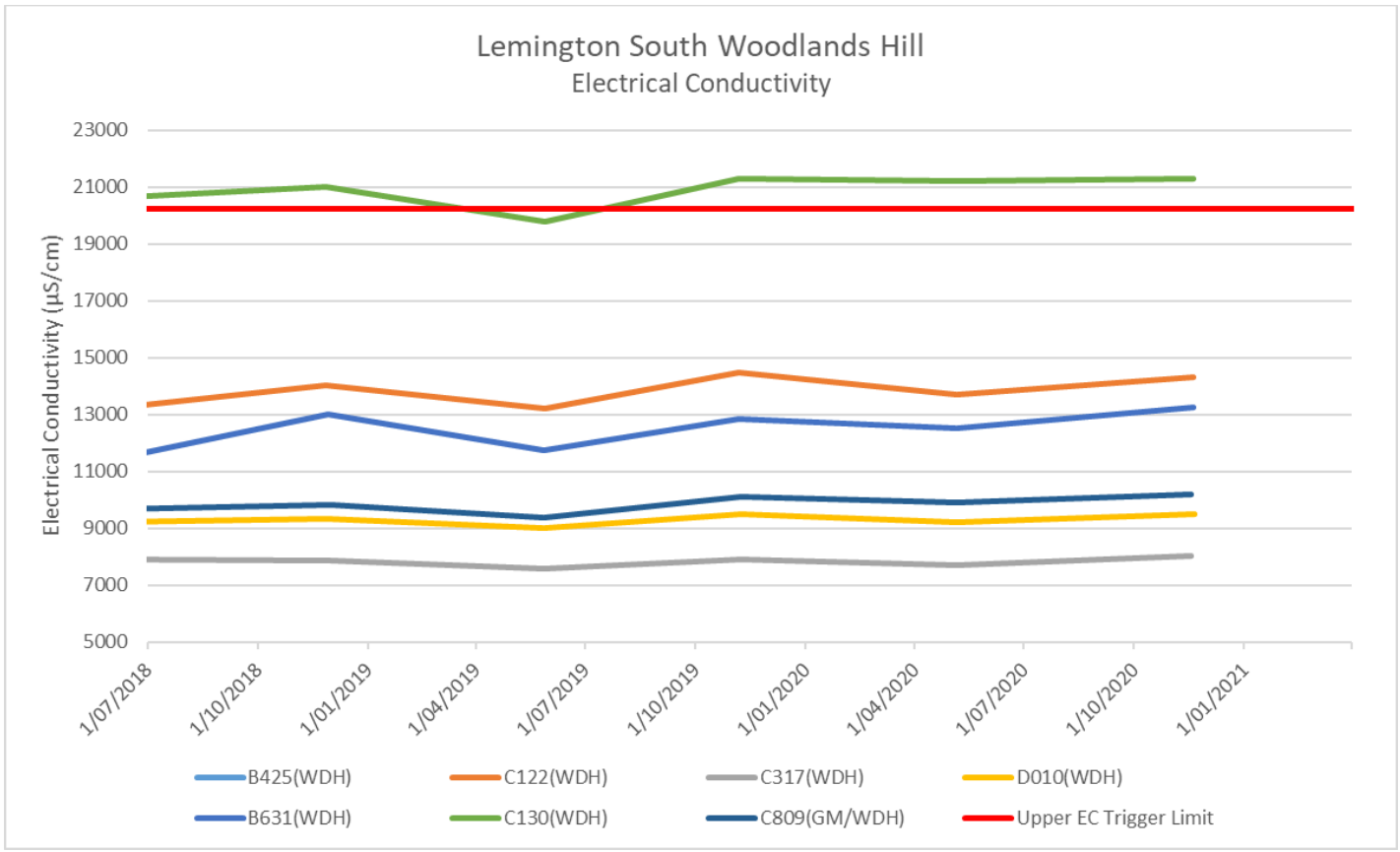


Figure 57 - Lemington South Woodlands Hill Electrical Conductivity Trend - Q1 2021

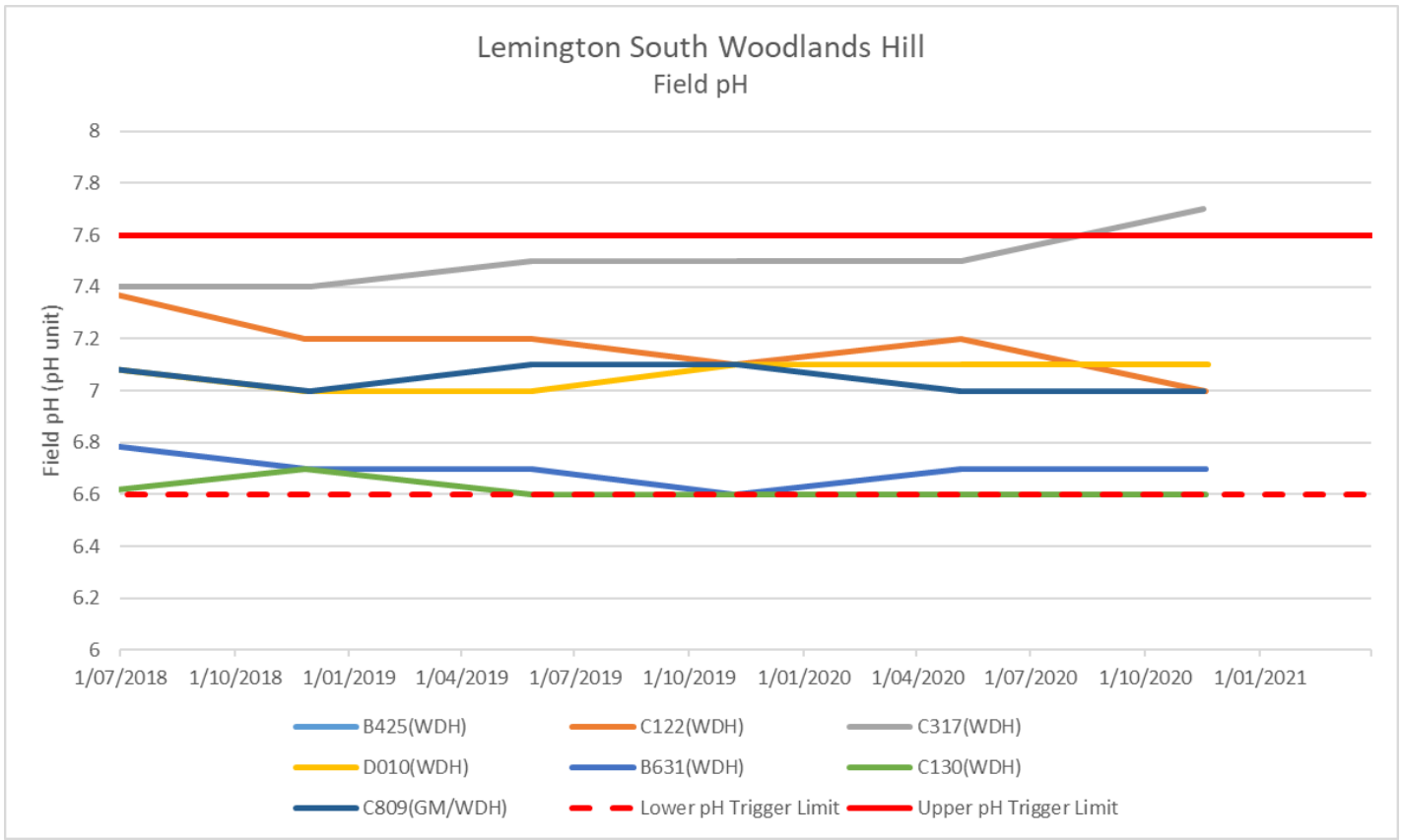


Figure 58 - Lemington South Woodlands Hill Field pH Trend - Q1 2021

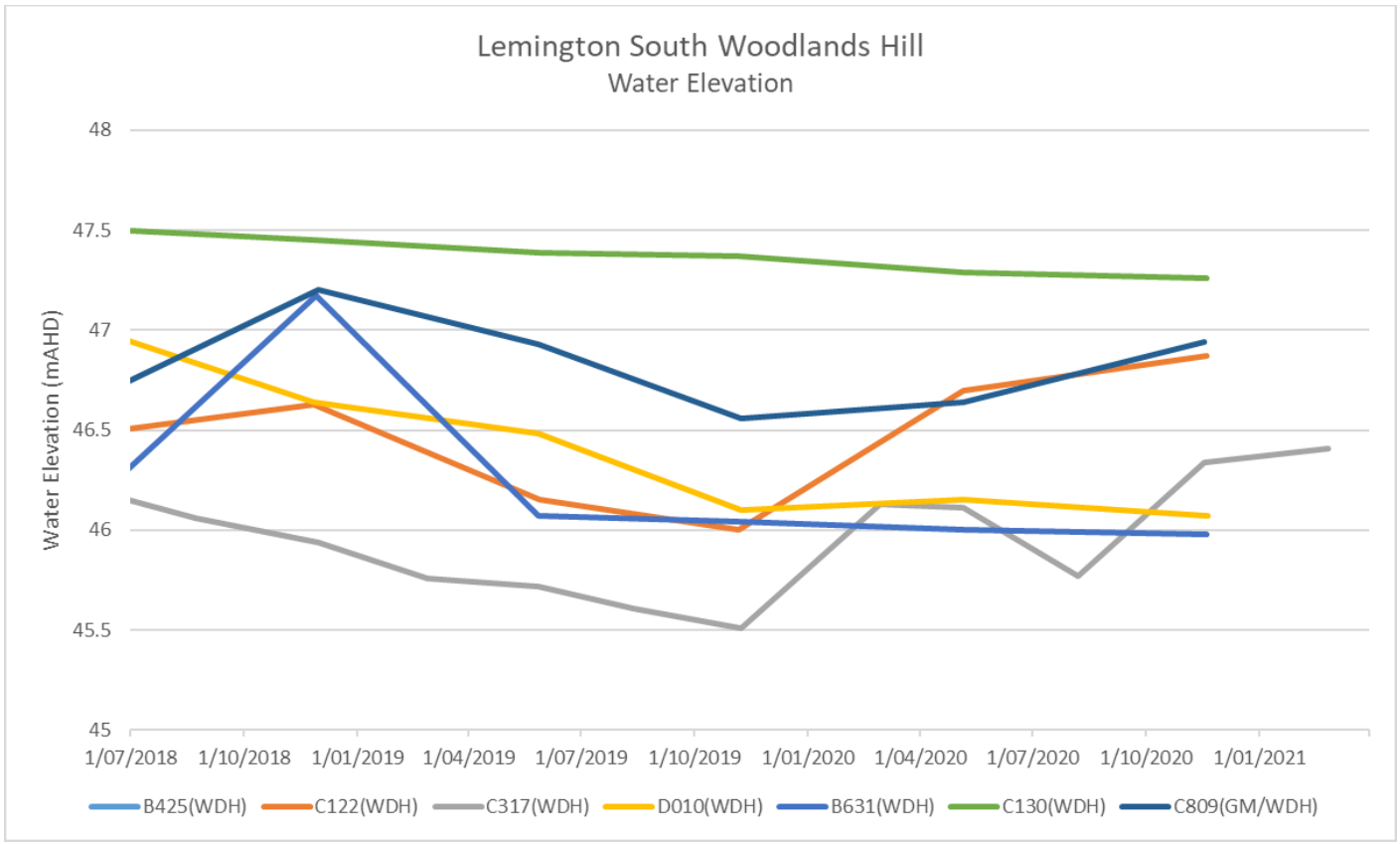


Figure 59 - Lemington South Woodlands Hill Water Elevation Trend - Q1 2021

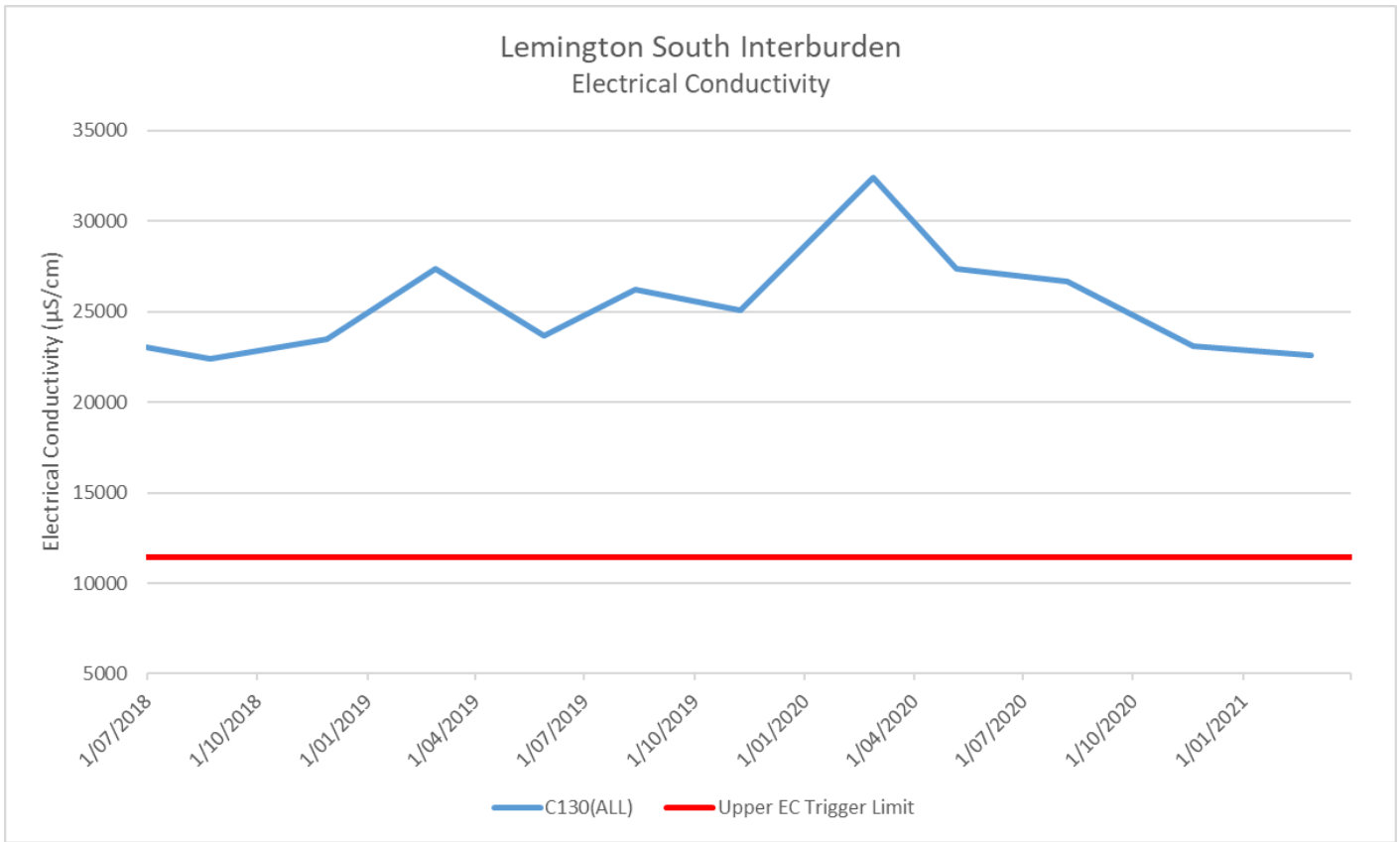


Figure 60 - Lemington South Interburden Electrical Conductivity Trend - Q1 2021

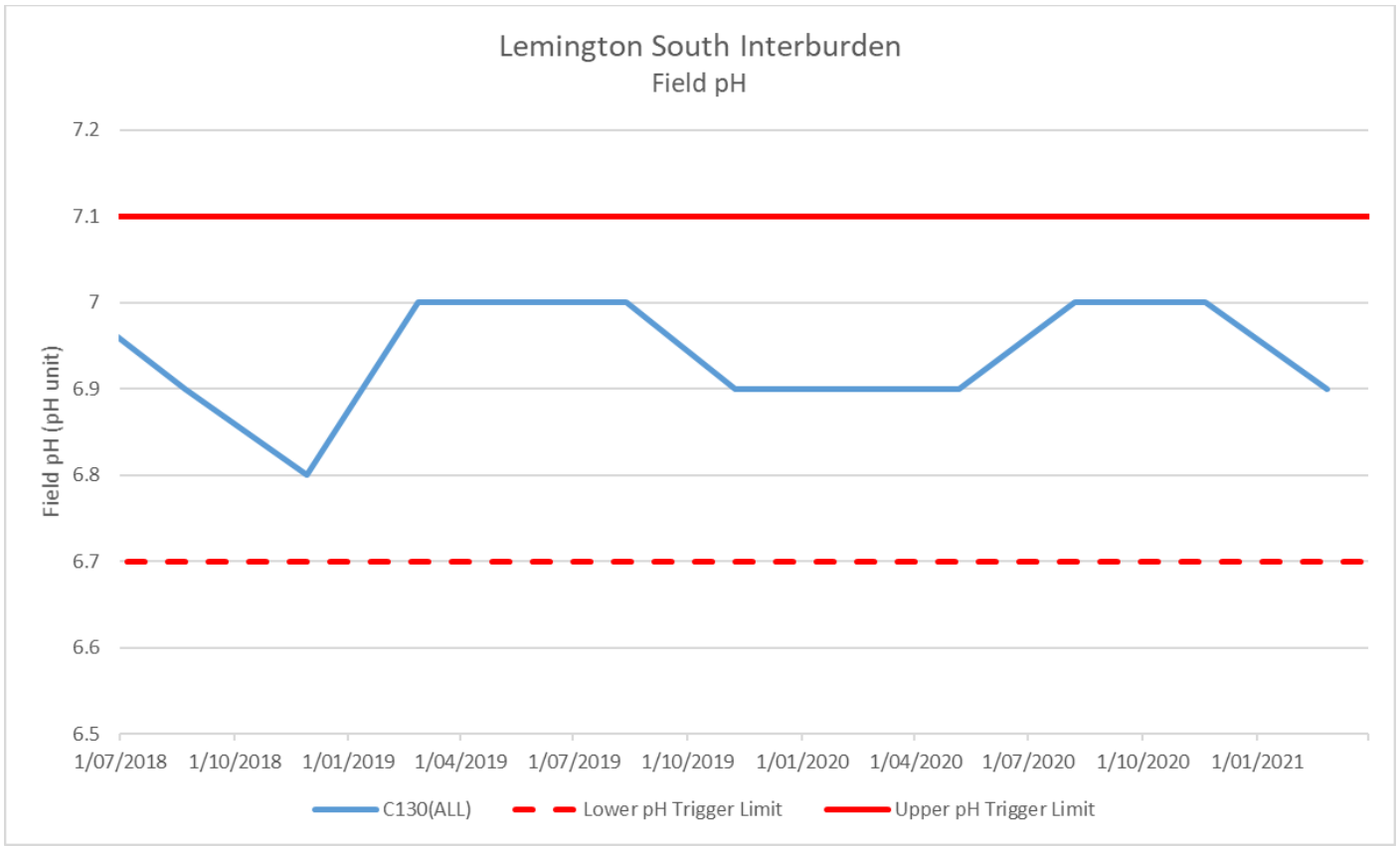


Figure 61 - Lemington South Interburden Field pH Trend - Q1 2021

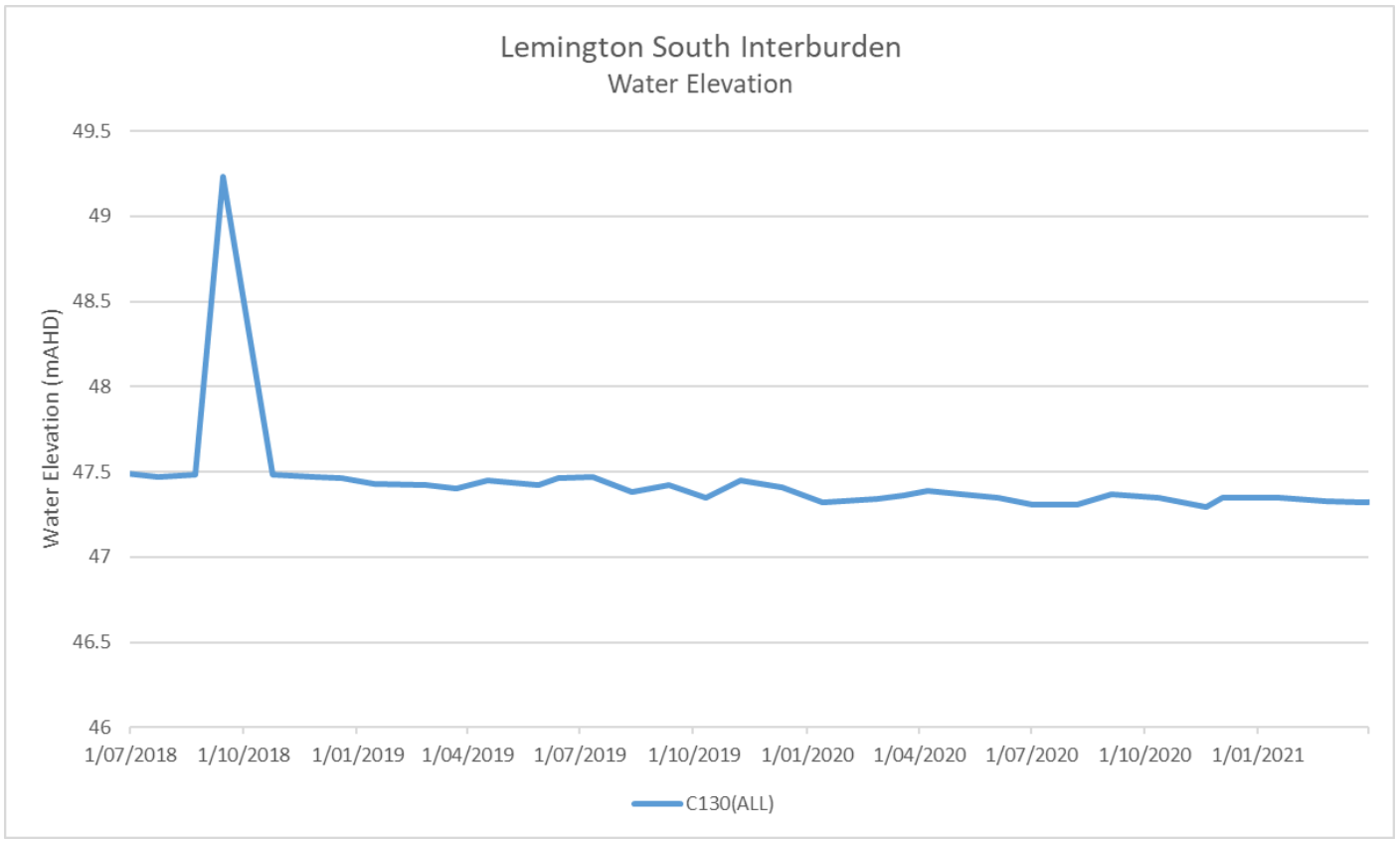


Figure 62 - Lemington South Interburden Water Elevation Trend - Q1 2021

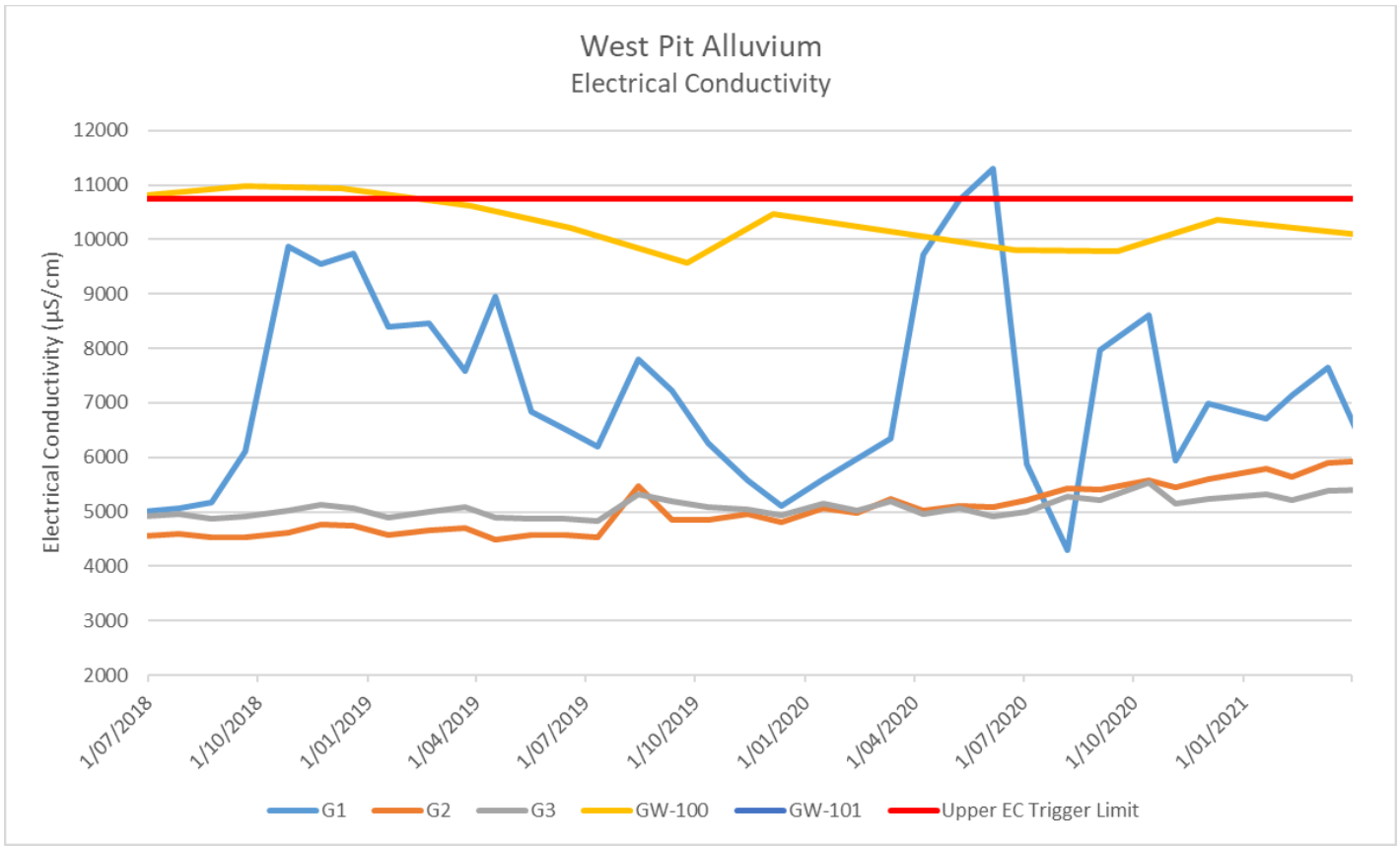


Figure 63 - West Pit Alluvium Electrical Conductivity Trend - Q1 2021

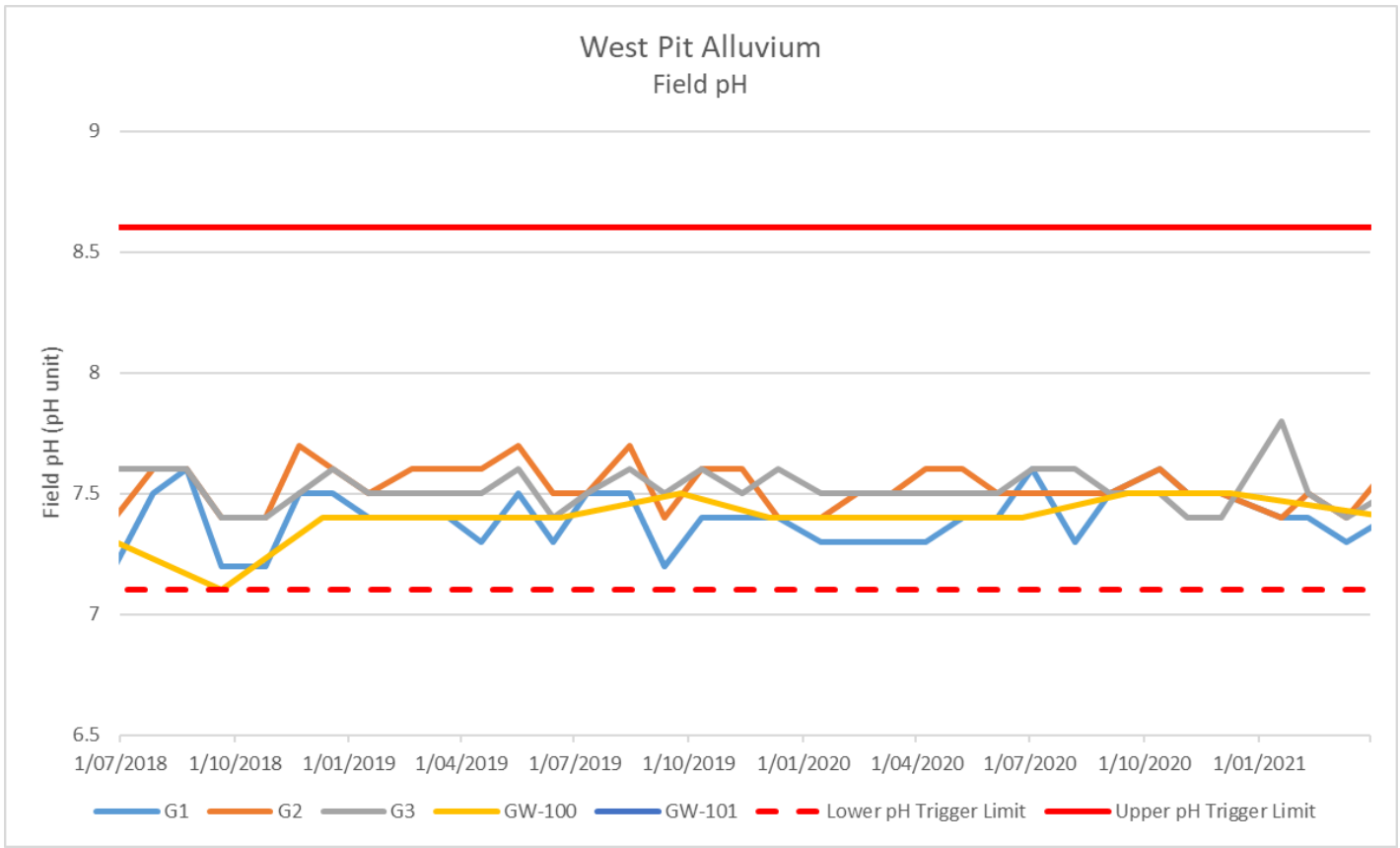
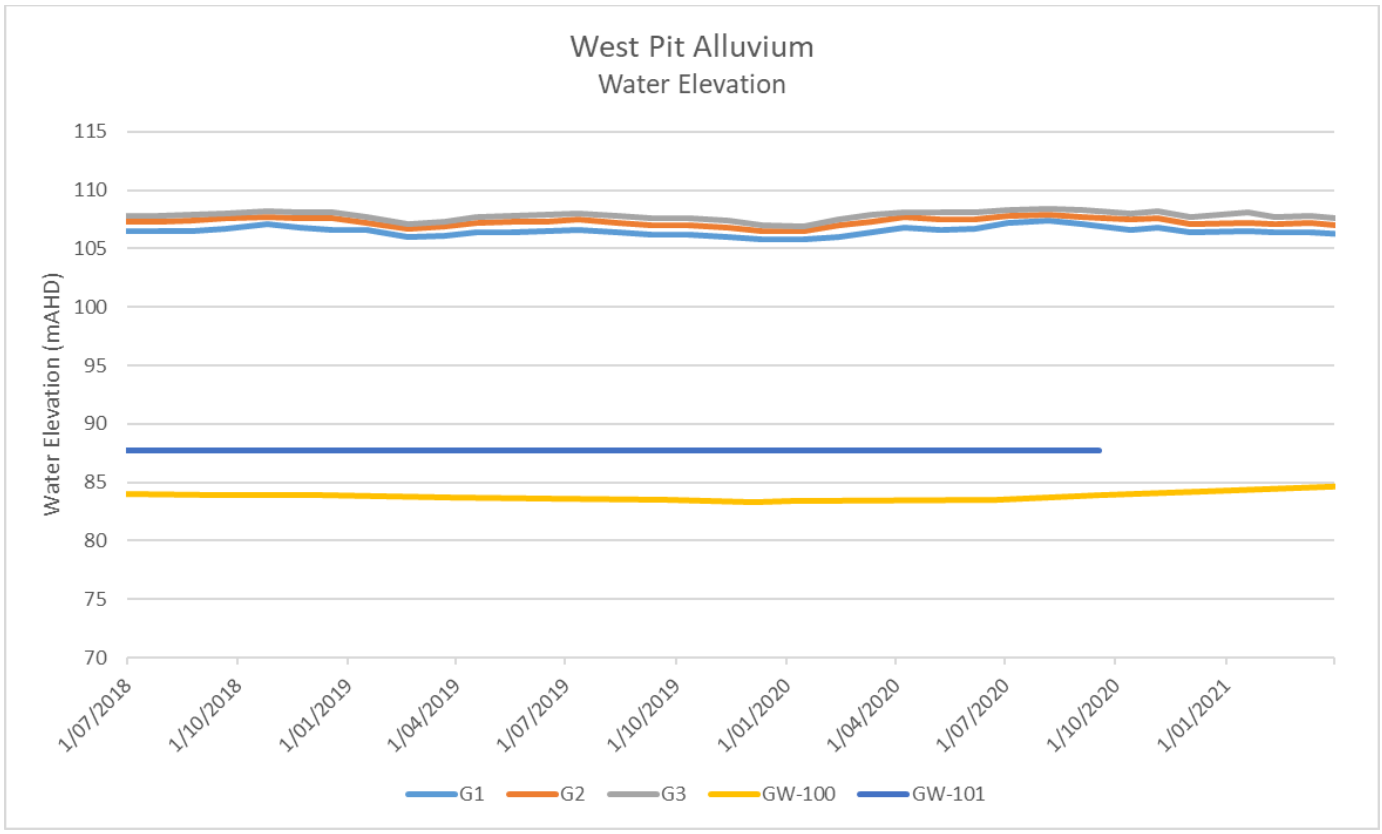


Figure 64 - West Pit Alluvium Field pH Trend - Q1 2021



** GW -101 had insufficient water for sampling*

Figure 65 - West Pit Alluvium Water Elevation Trend - Q1 2021

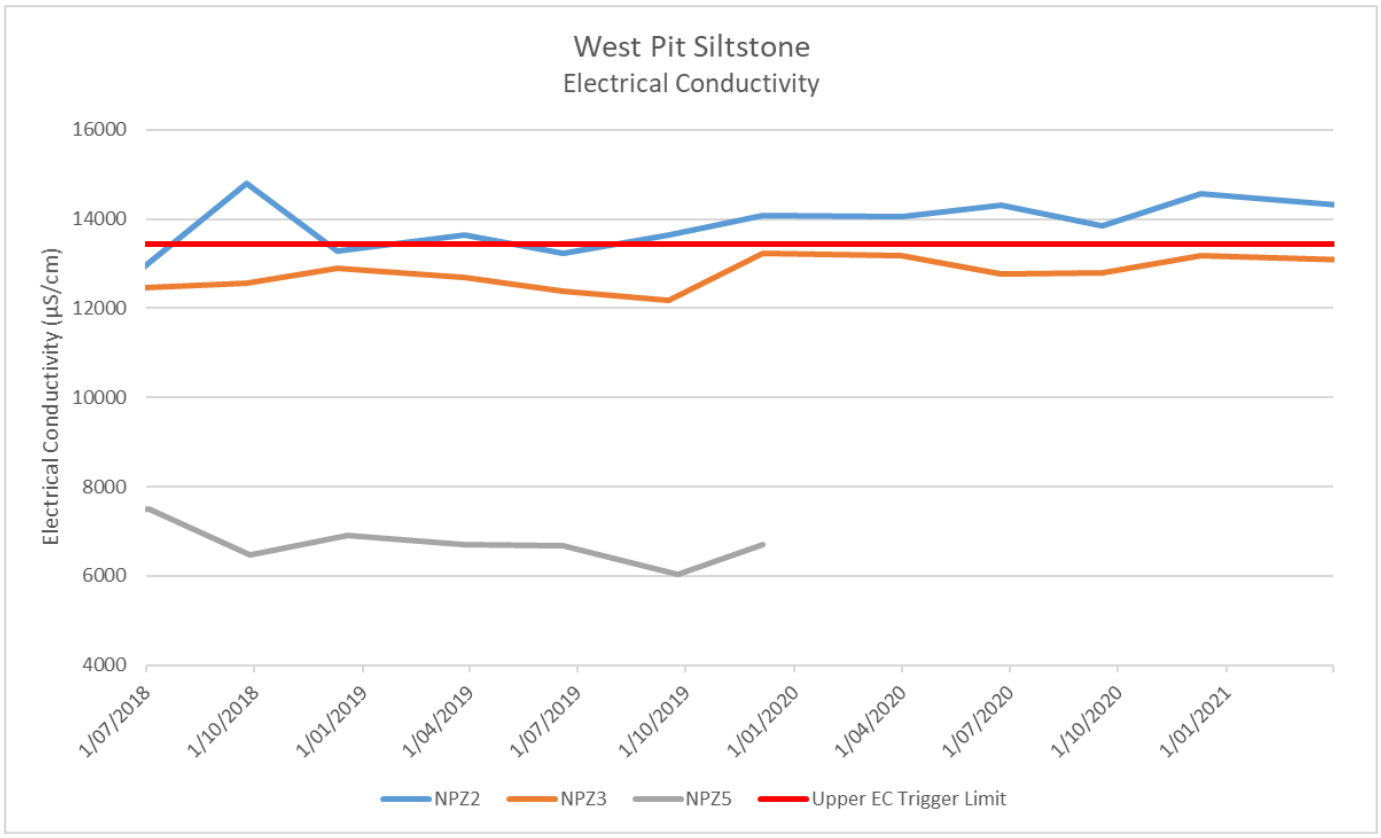


Figure 66 - West Pit Siltstone Electrical Conductivity Trend - Q1 2021

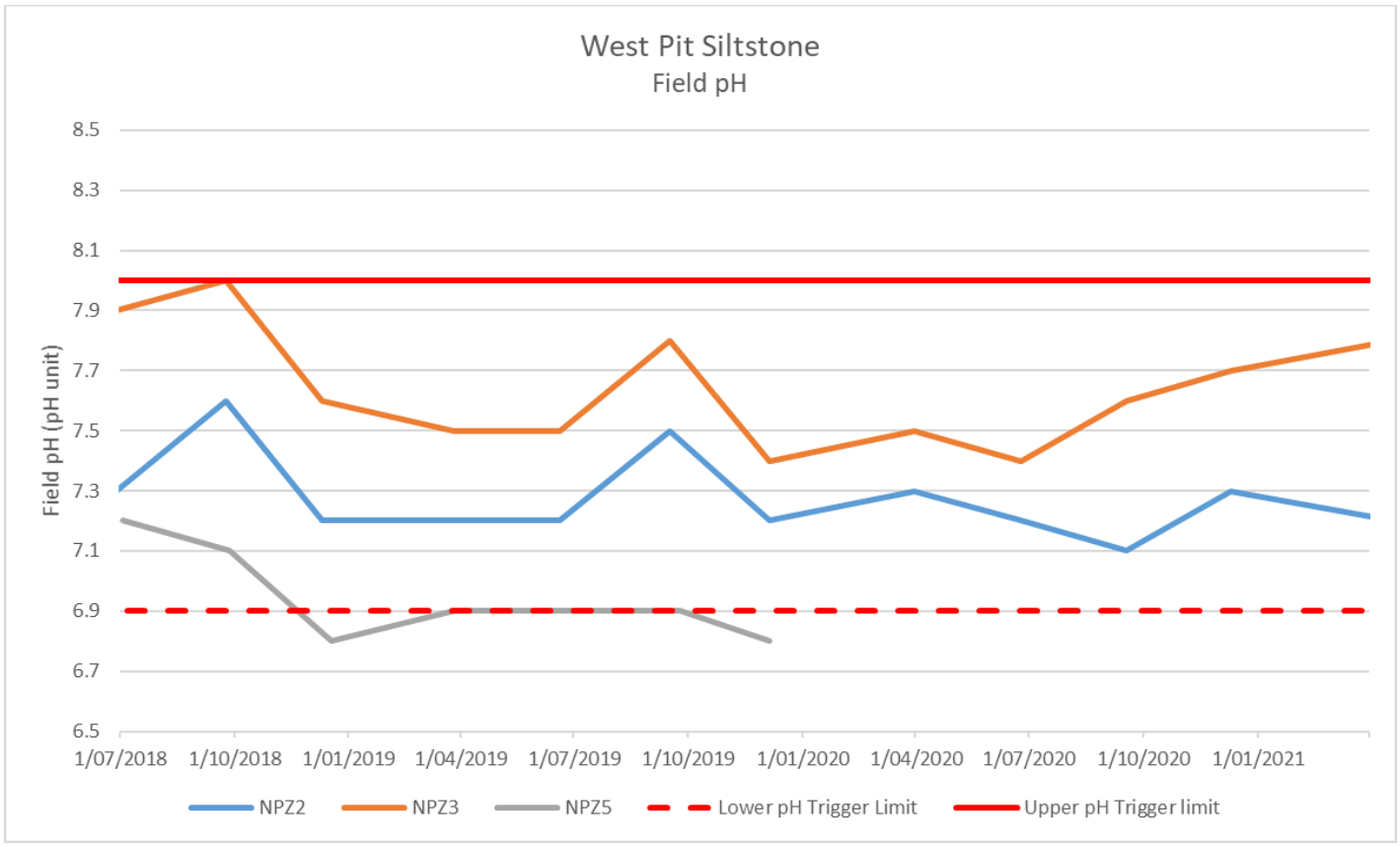


Figure 67 - West Pit Siltstone Field pH Trend - Q1 2021

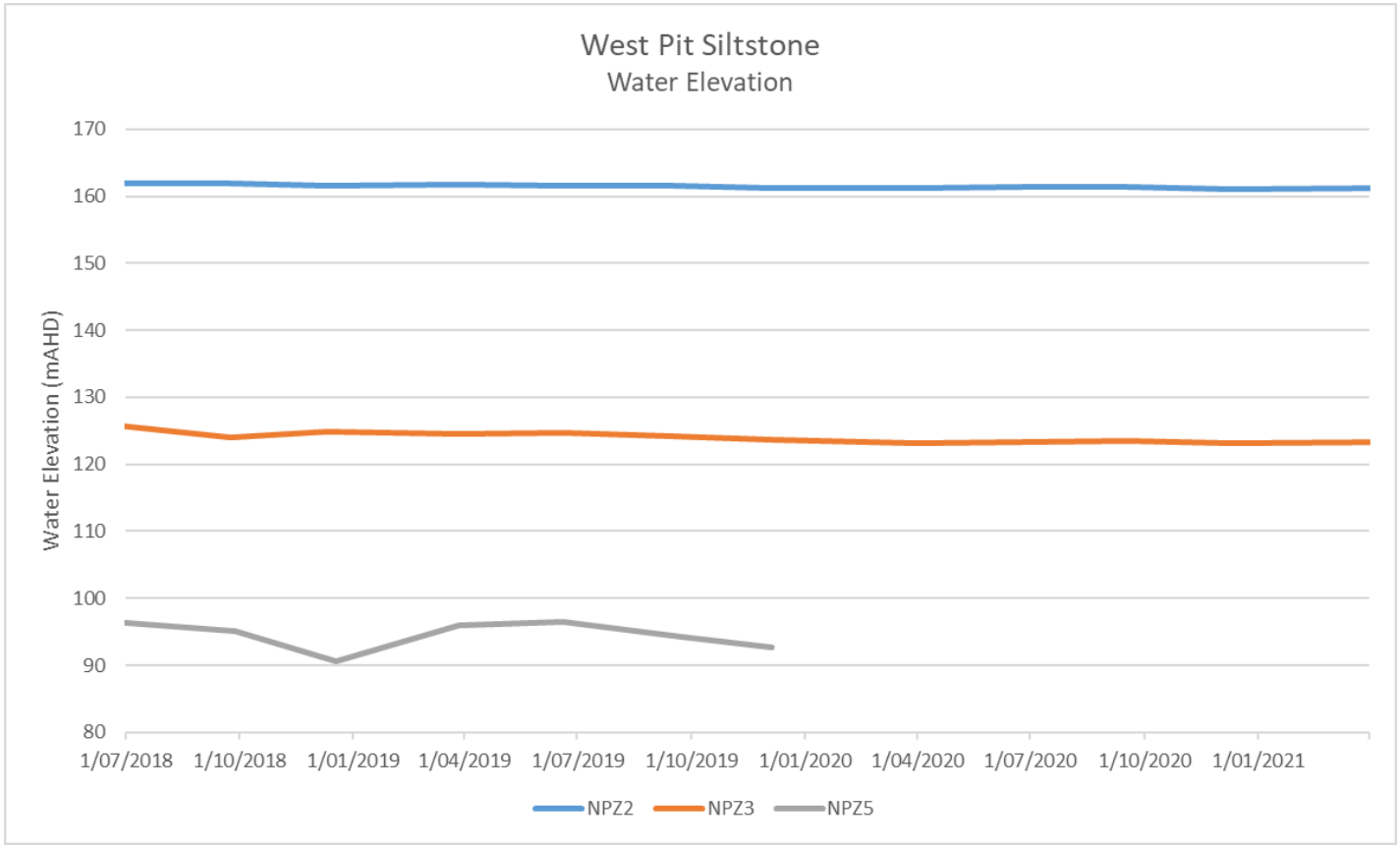


Figure 68 - West Pit Siltstone Water Elevation Trend - Q1 2021

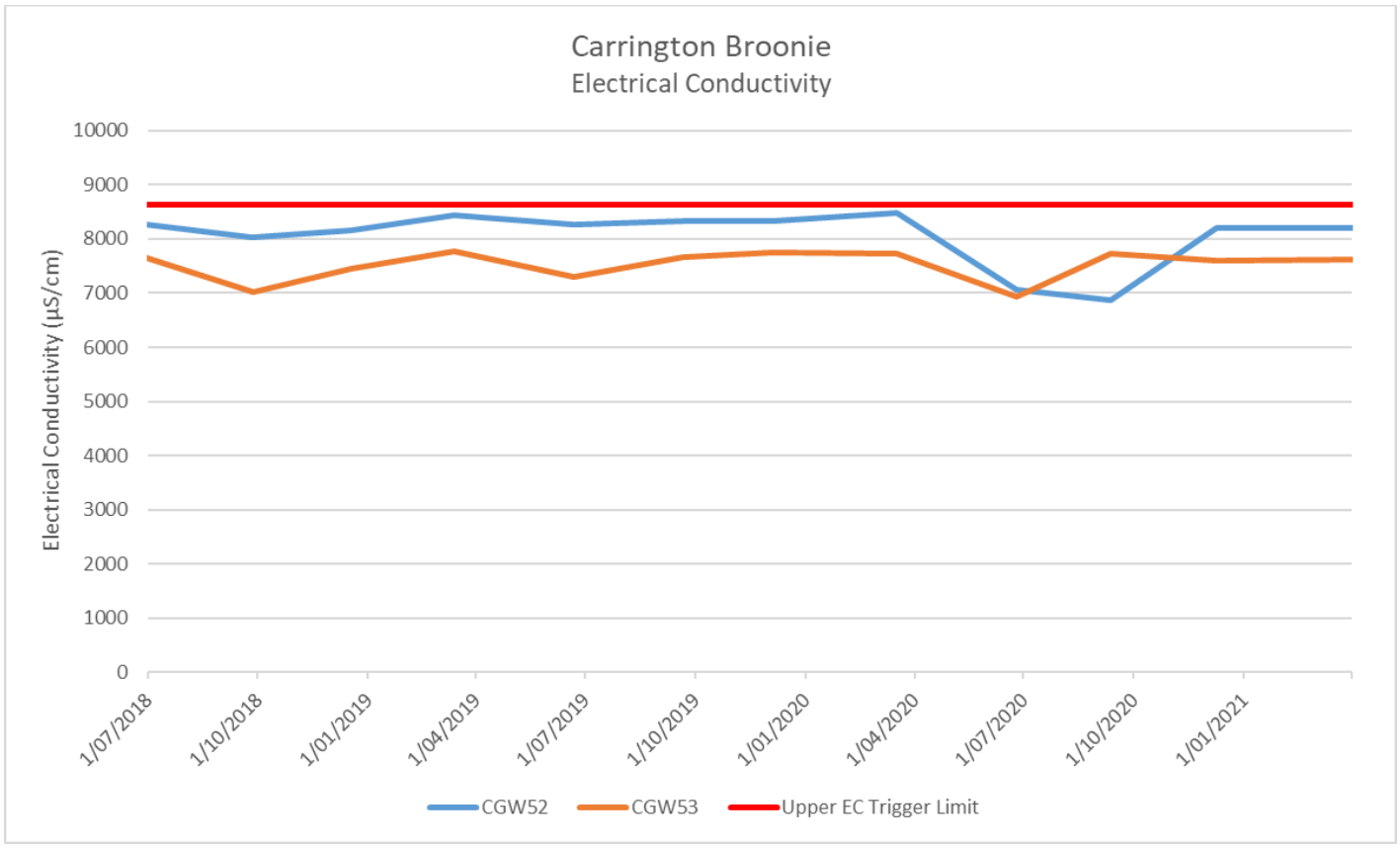


Figure 69 - Carrington Broonie Electrical Conductivity Trend - Q1 2021

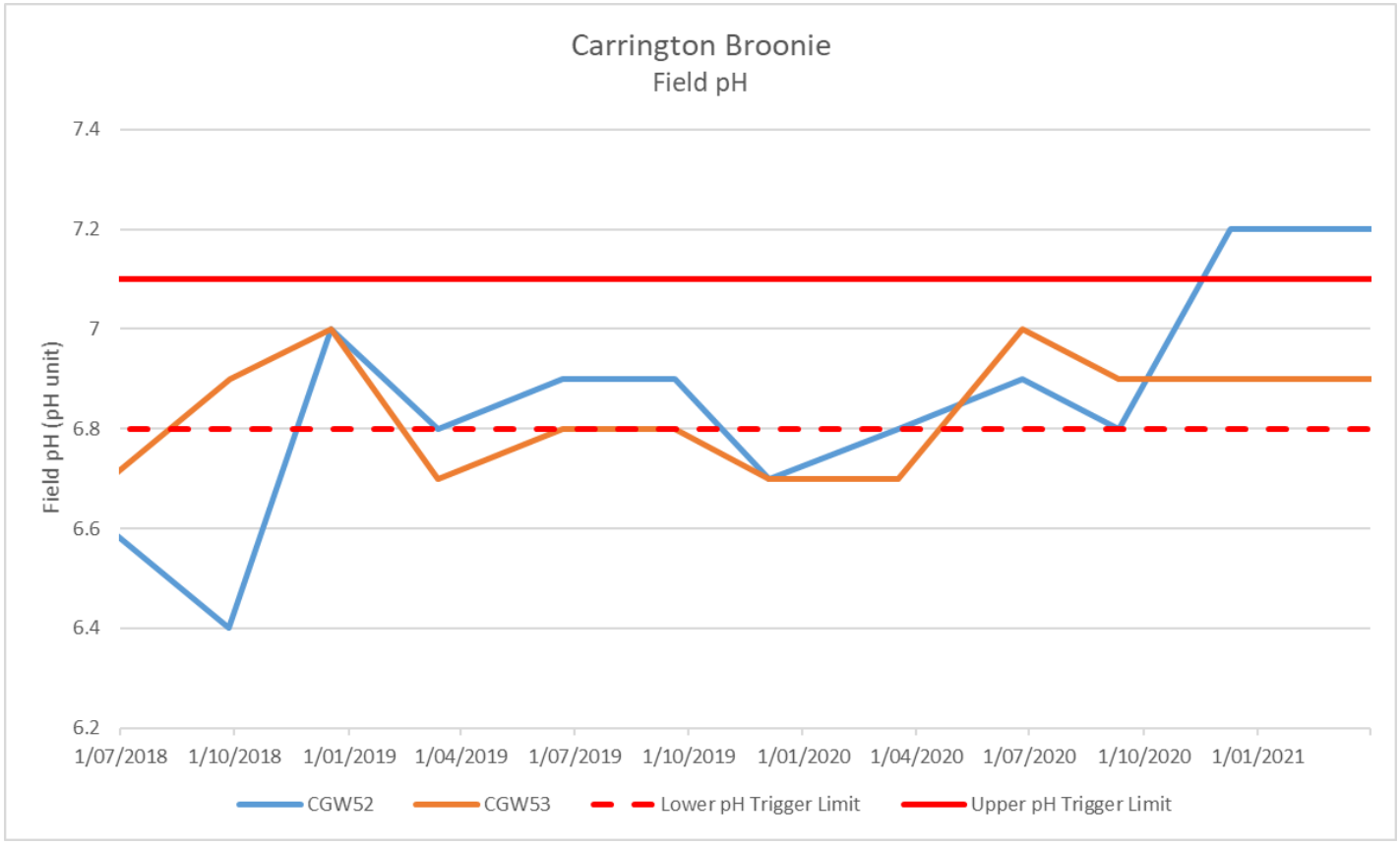


Figure 70 - Carrington Broonie Field pH Trend - Q1 2021

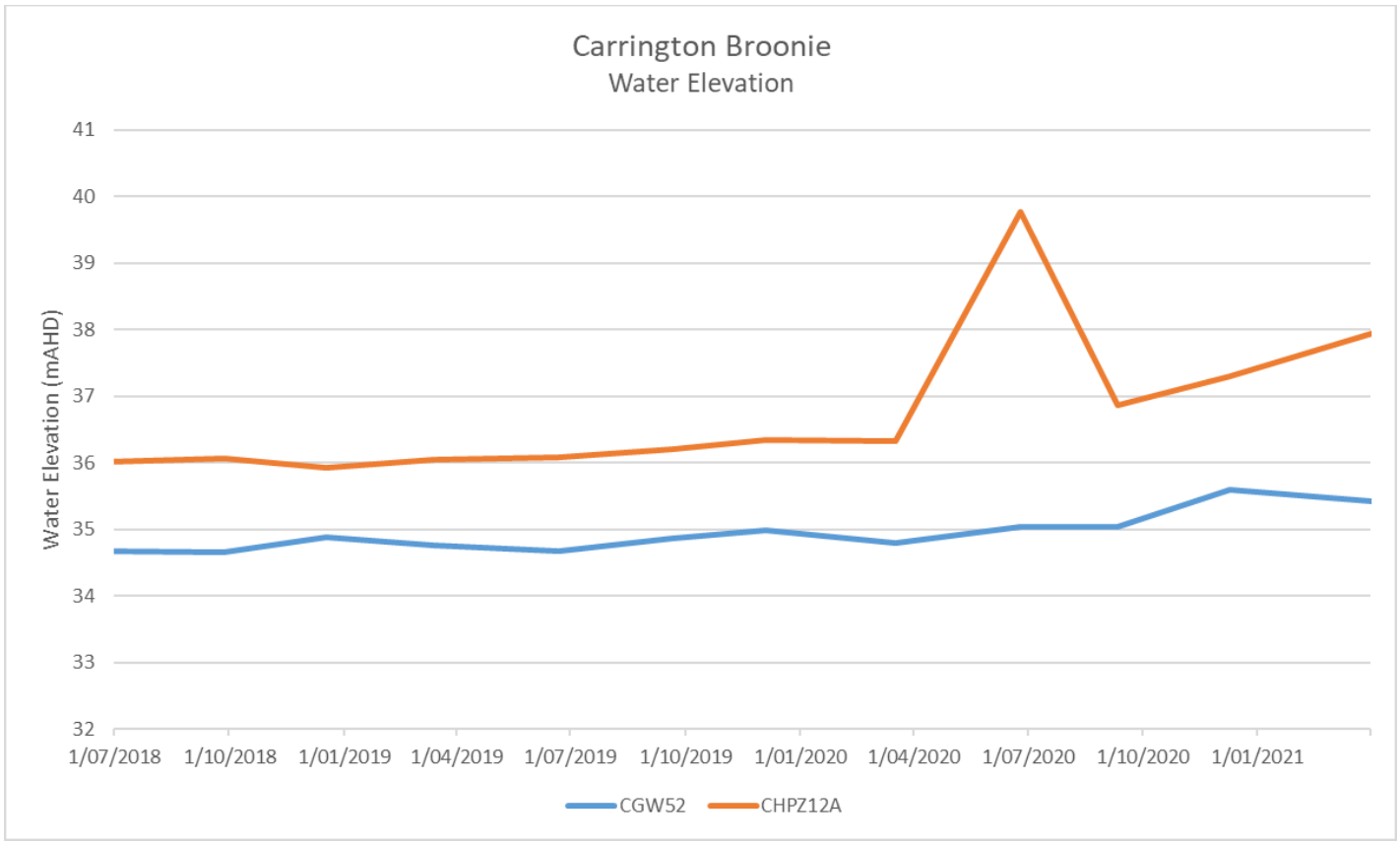


Figure 71 - Carrington Broonie Water Elevation Trend - Q1 2021

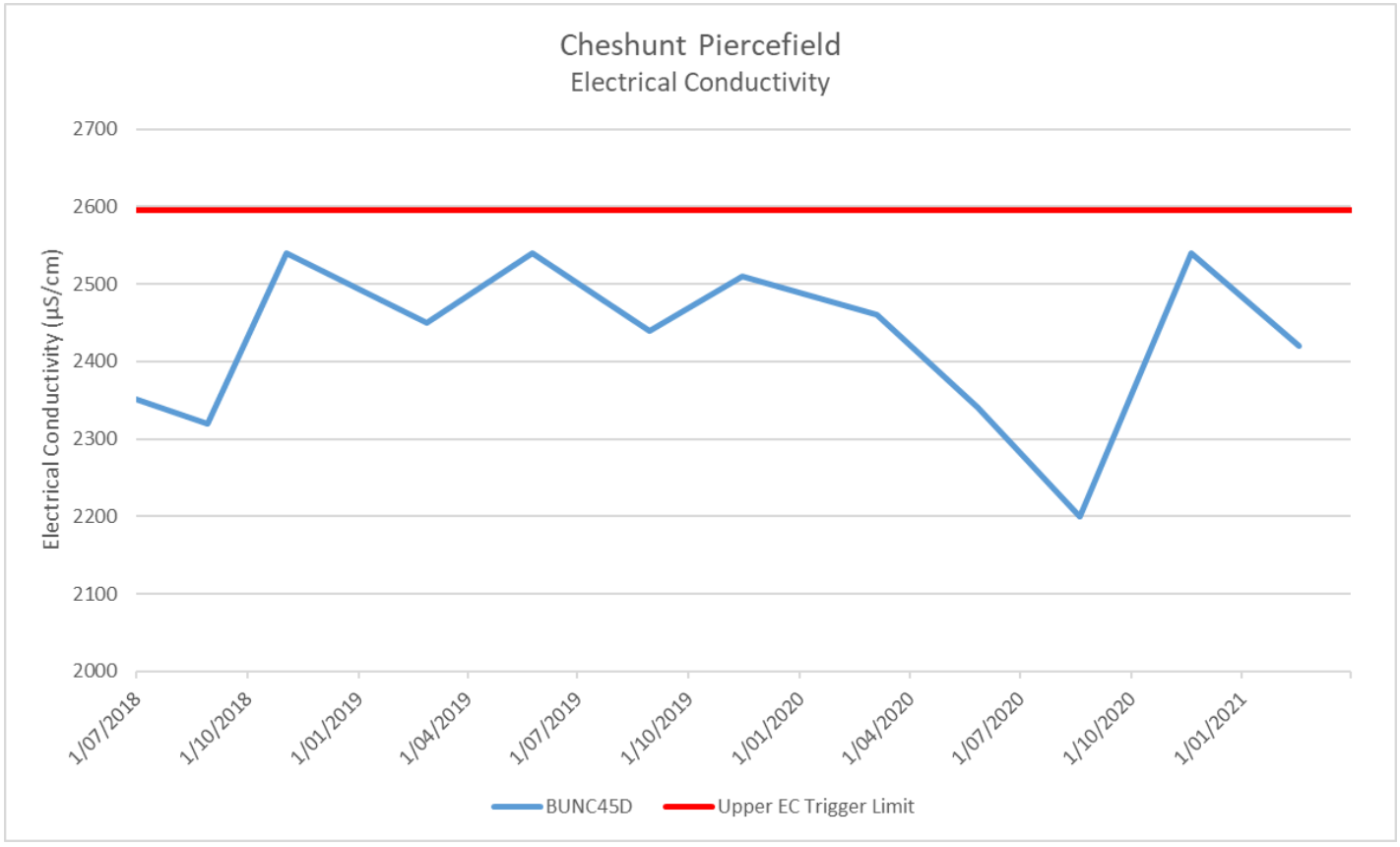


Figure 72 - Cheshunt Piercefield Electrical Conductivity Trend - Q1 2021

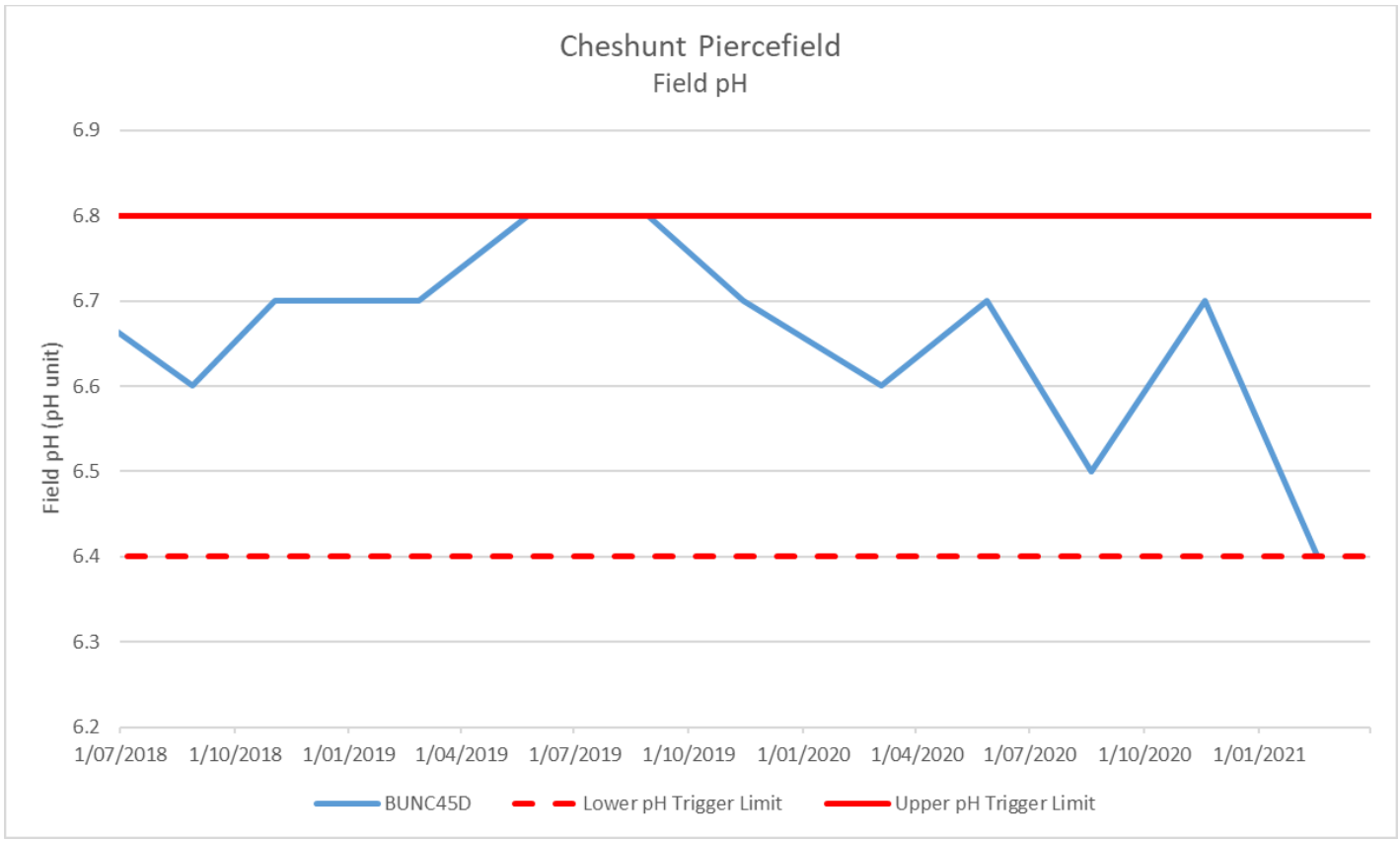


Figure 73 - Cheshunt Piercefield Field pH Trend - Q1 2021

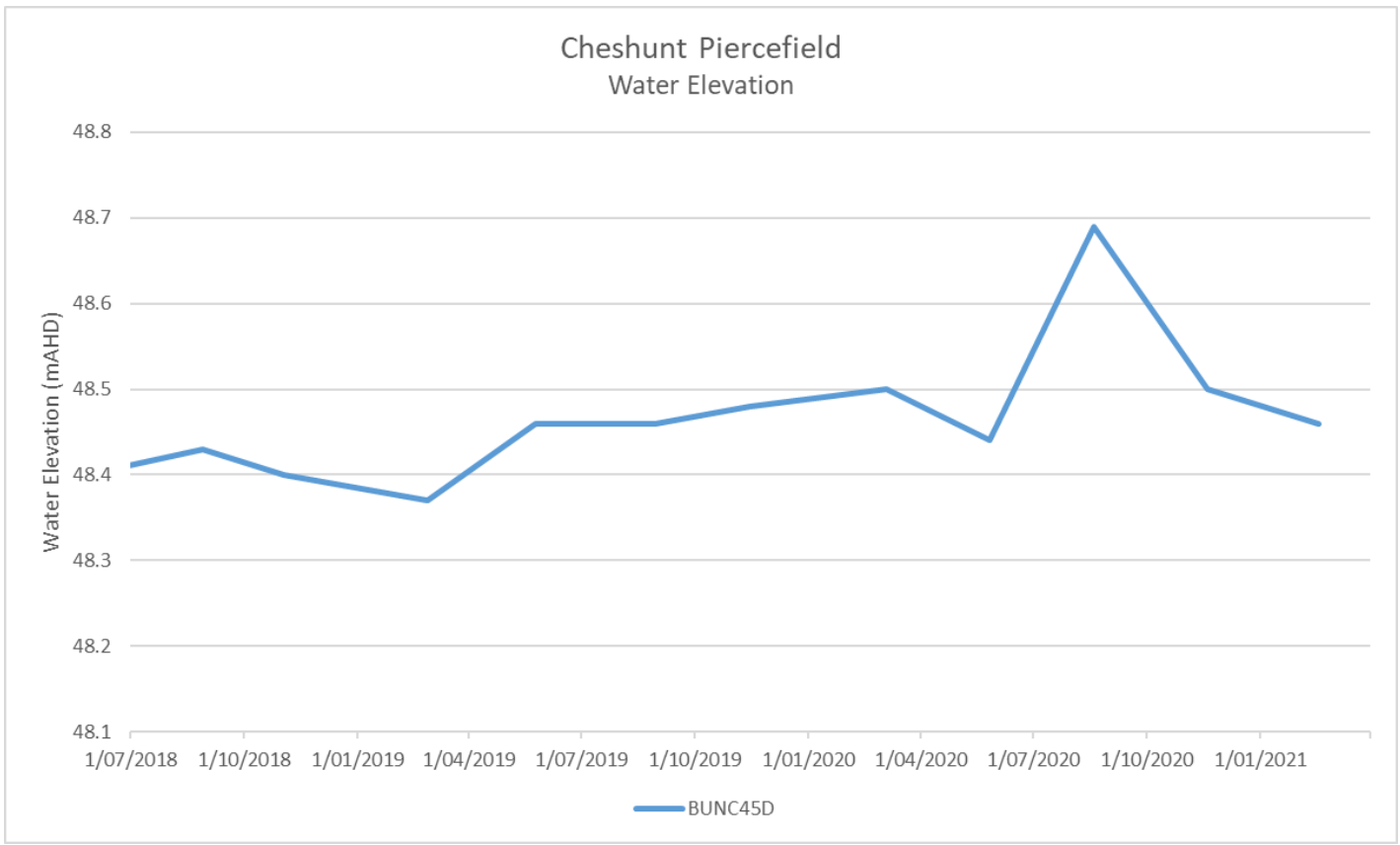


Figure 74 - Cheshunt Piercefield Water Elevation Trend - Q1 2021

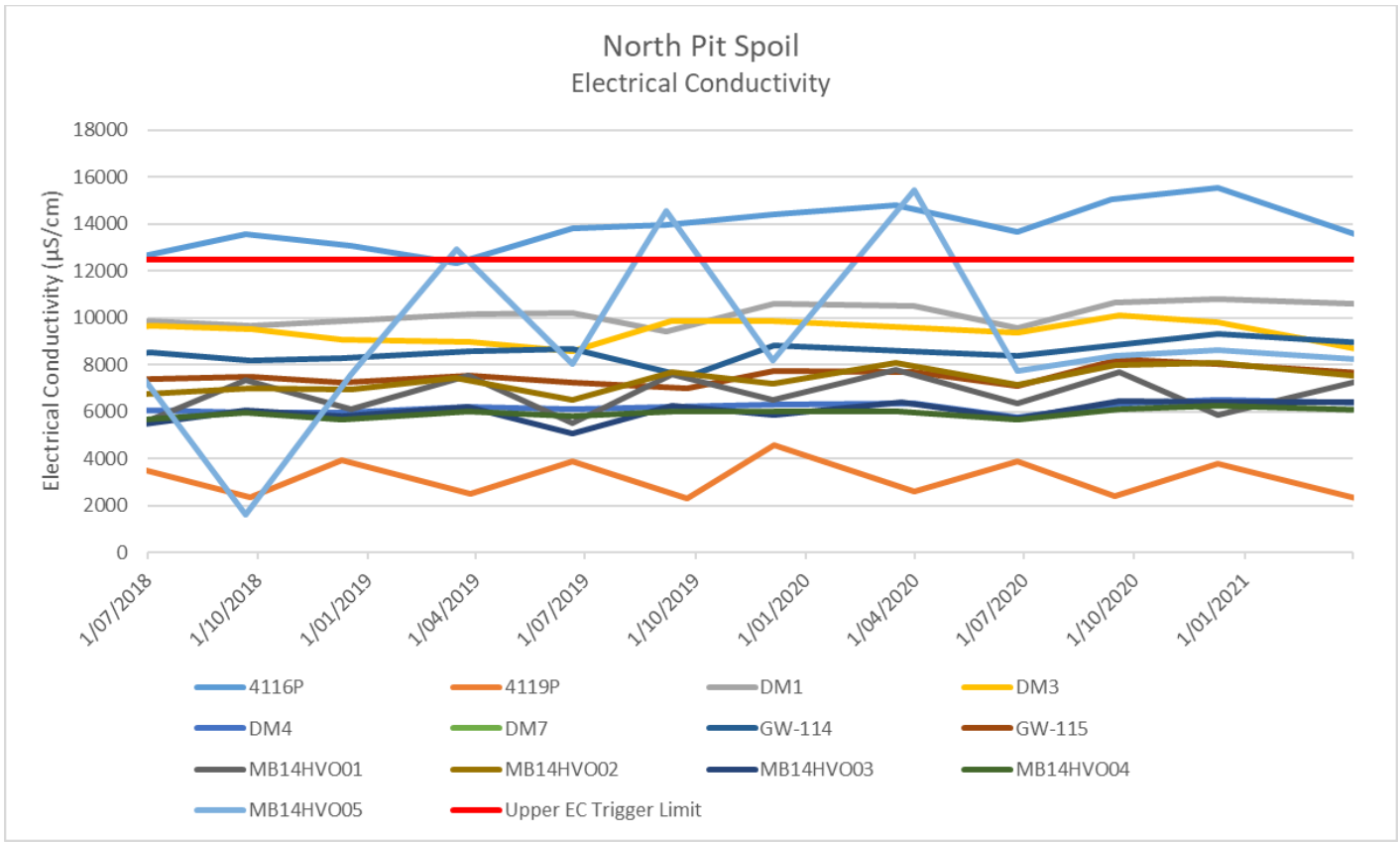


Figure 75 - North Pit Spoil Electrical Conductivity Trend - Q1 2021

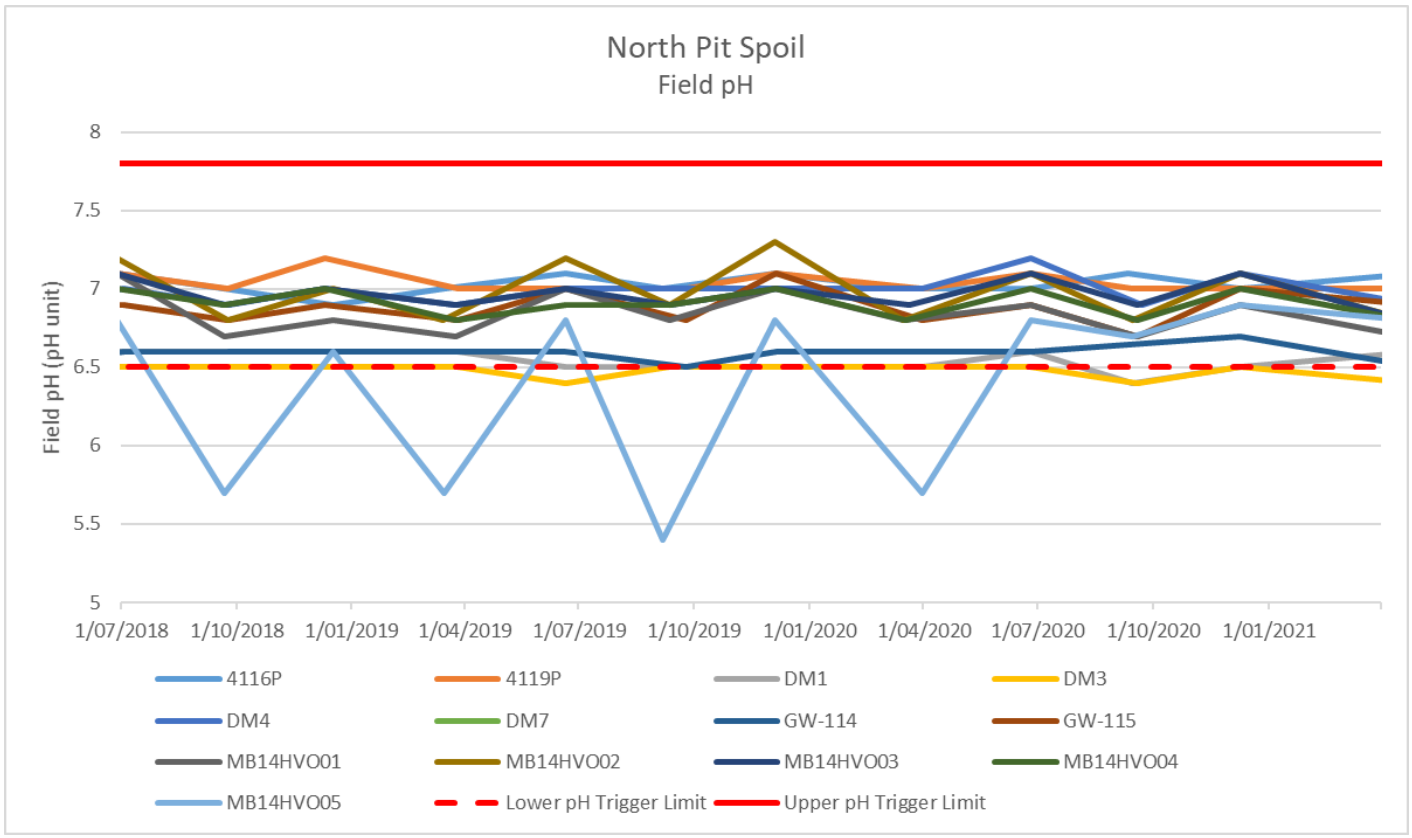


Figure 76 - North Pit Spoil Field pH Trend - Q1 2021

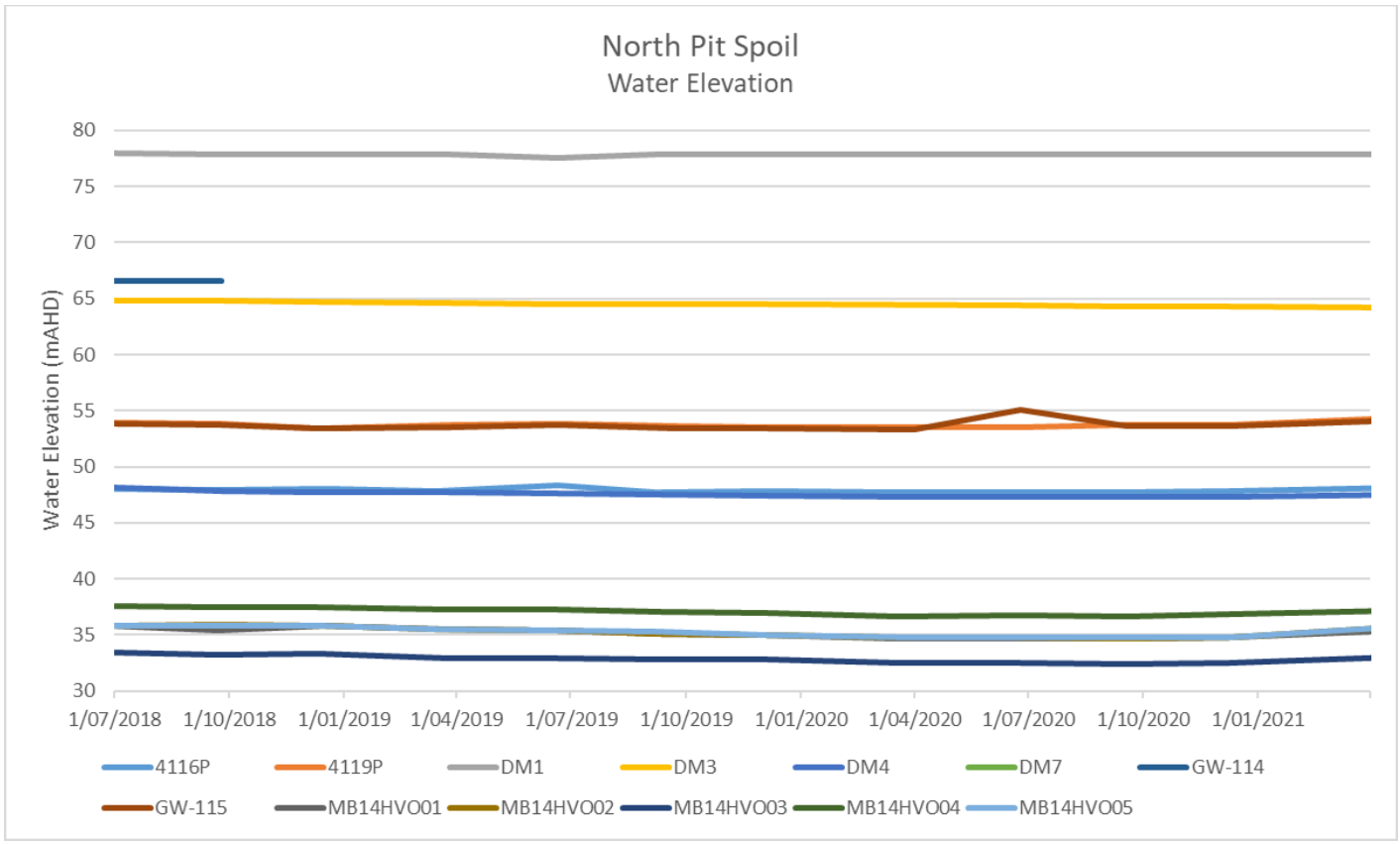


Figure 77 - North Pit Spoil Water Elevation Trend - Q1 2021

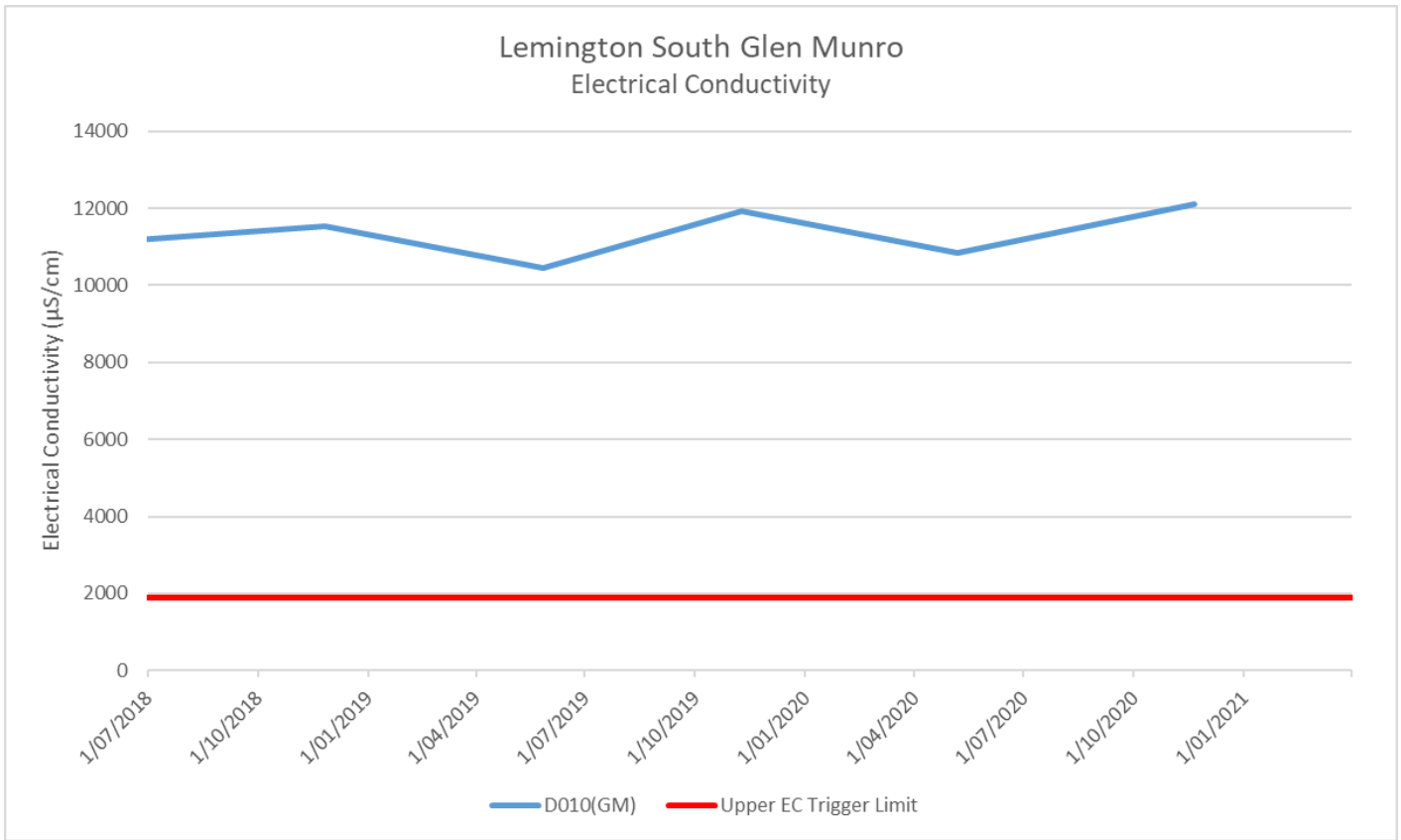


Figure 78 - Lemington South Glen Munro Electrical Conductivity Trend - Q1 2021

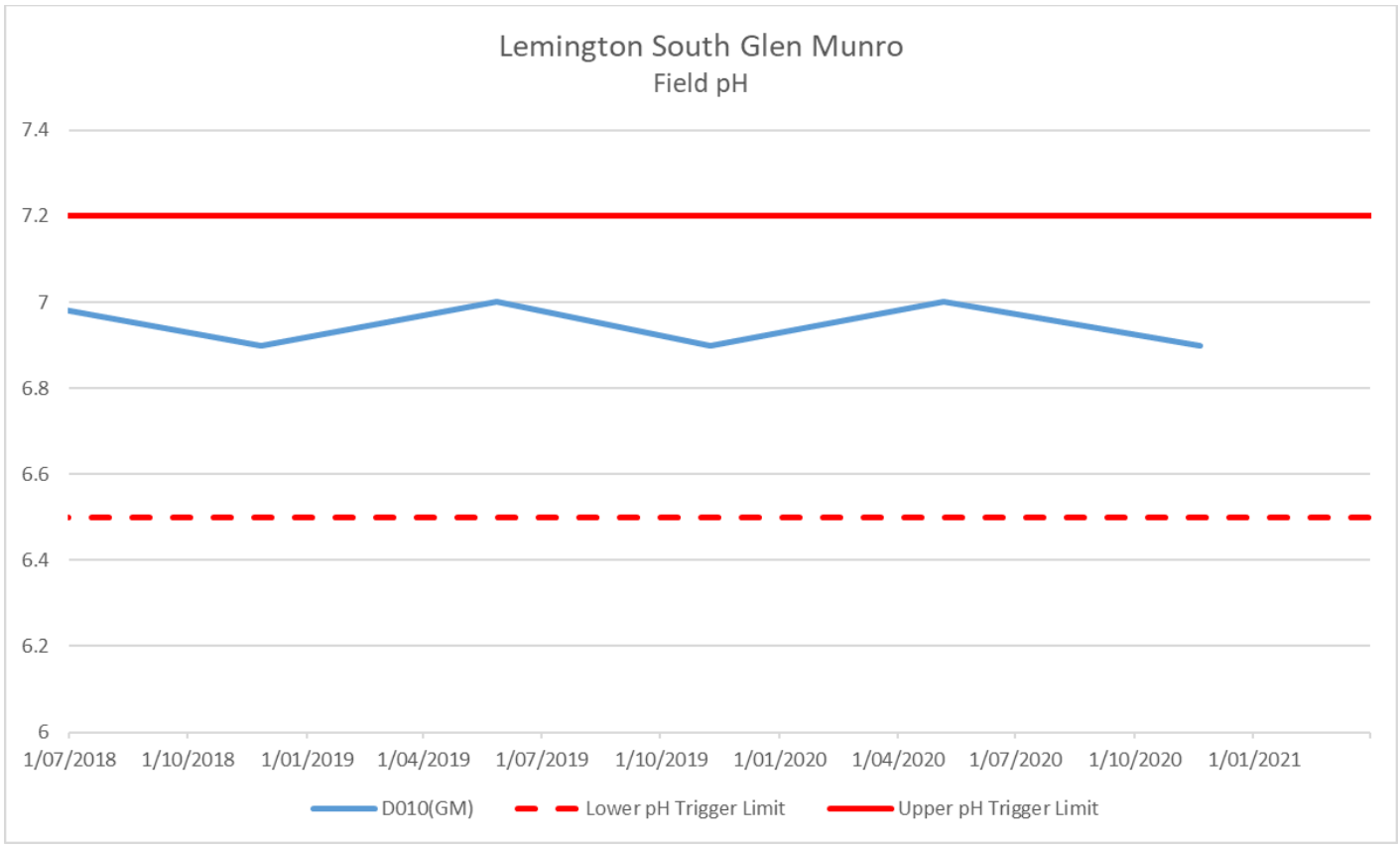


Figure 79 - Lemington South Glen Munro Field pH Trend - Q1 2021

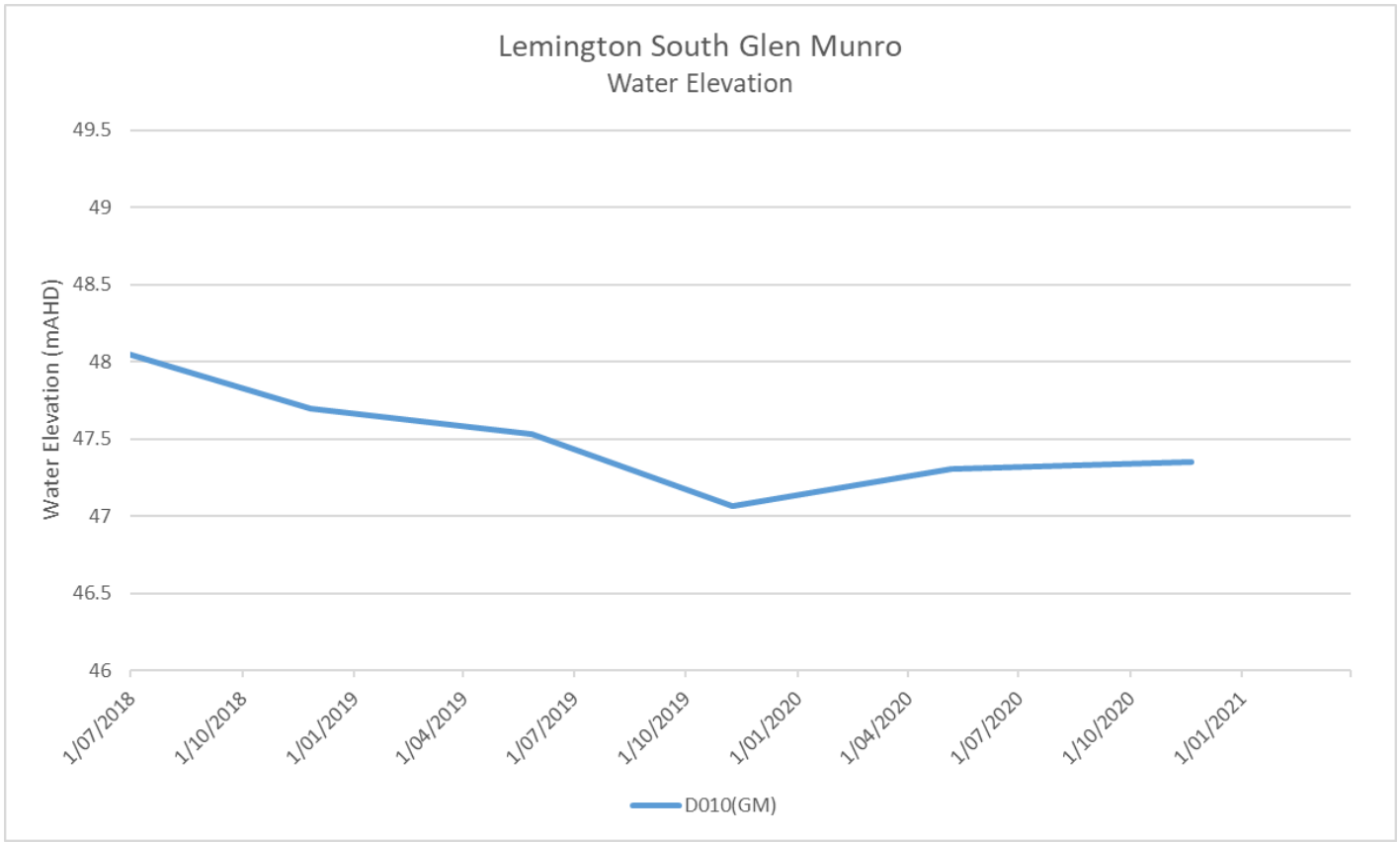


Figure 80 - Lemington South Glen Munro Water Elevation Trend - Q1 2021

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 1**Table 3.**

Table 3 - Groundwater Trigger Tracking - Q1 2021

Site	Date	Trigger Limit Breached	Response Action
CFW55R	pH	7/01/2021	1st Exceedance of trigger value
CFW55R	EC	7/01/2021	1st Exceedance of trigger value
CFW55R	EC	11/02/2021	2nd Exceedance of trigger value
BZ2A(1)	pH	22/02/2021	1st Exceedance of trigger value
C130(ALL)	EC	26/02/2021	1st Exceedance of trigger value
CFW55R	EC	3/03/2021	3rd Exceedance – Results will be investigated and provided in the 2021 annual review.
CFW57	Water Elevation	7/04/2021	1st Exceedance – Water level increase likely due to the hydraulic connection between the Hunter River and alluvium system. Increased water levels due to significant rainfalls are likely to impact the groundwater levels and hence bore CFW57 (EMM, 2021).
CGW53a	Water Elevation	14/04/2021	1st Exceedance - – Water level increase likely due to the hydraulic connection between the Hunter River and alluvium system. Increased water levels due to significant rainfalls are likely to impact the groundwater levels and hence bore CGW53a (EMM, 2021).
CGW52	pH	14/04/2021	1st Exceedance of trigger value
NPZ2	EC	19/04/2021	1st Exceedance of trigger value
4116P	EC	28/04/2021	1st Exceedance of trigger value
DM3	pH	29/04/2021	1st Exceedance of trigger value

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 81**. Blasting criteria for HVO are summarised in **Table 4**.

Table 4 - Blasting Criteria

Airblast Overpressure (dB(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

13 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)
1/03/2021 13:10	91.3	89.65	92.06	94.84	92.5
2/03/2021 14:49	88.91	85.5	98.79	85.92	99.78
5/03/2021 15:24	101.37	101.05	101.45	92.12	99.8
8/03/2021 13:18	92.06	94.21	100.97	96.66	106.05
11/03/2021 13:23	99.19	93.68	106.9	86.09	100.15
12/03/2021 13:24	89.01	86.92	84.47	88.65	88.21
13/03/2021 13:58	90.84	84.28	94.76	96.71	96.8
13/03/2021 14:02	101.7	86.6	95.51	93.92	95.8
13/03/2021 16:06	87.99	89.71	97.28	93.9	104.51
16/03/2021 13:06	98.65	100.2	89.17	80.82	78.83
22/03/2021 10:28	109.94	93.96	97.78	94.81	98.23
29/03/2021 13:34	100.18	101.45	93.59	94.27	93.95
31/03/2021 14:23	99.98	105.75	86.03	89.32	100.51

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)
1/03/2021 13:10	0.17	0.06	0.13	0.52	0.19
2/03/2021 14:49	0.16	0.09	0.42	0.13	0.38
5/03/2021 15:24	0.16	0.09	0.18	0.31	0.22
8/03/2021 13:18	0.16	0.11	0.08	0.89	0.1
11/03/2021 13:23	0.11	0.04	0.04	0.14	0.08
12/03/2021 13:24	0.18	0.14	0.11	0.24	0.09
13/03/2021 13:58	0.14	0.06	0.22	0.33	0.24
13/03/2021 14:02	0.16	0.07	0.35	0.63	0.24
13/03/2021 16:06	0.14	0.07	0.06	0.2	0.08
16/03/2021 13:06	0.12	0.07	0.06	0.09	0.08
22/03/2021 10:28	0.21	0.07	0.27	0.49	0.23
29/03/2021 13:34	0.21	0.09	0.16	0.35	0.21
31/03/2021 14:23	0.18	0.12	0.07	0.75	0.09

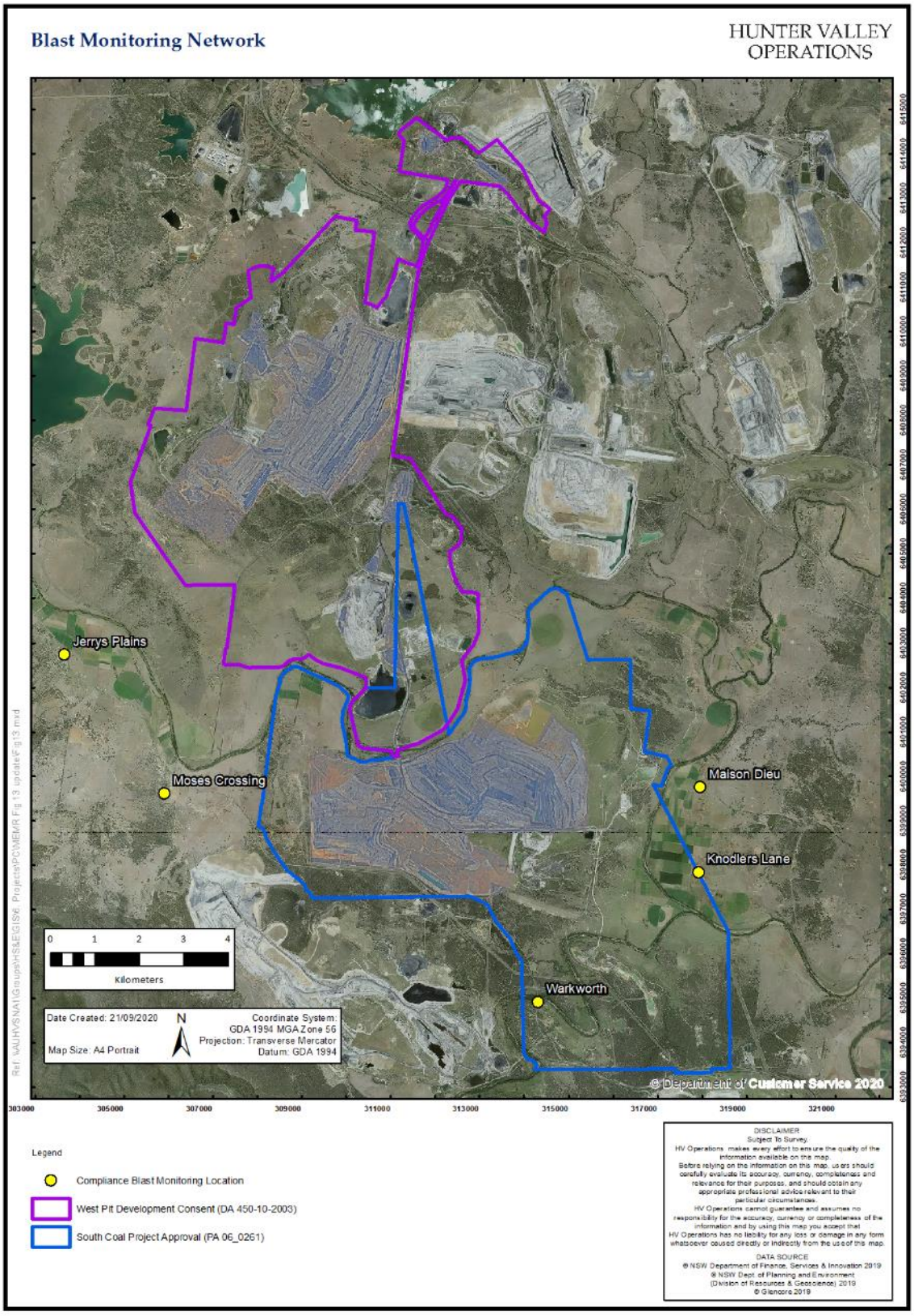


Figure 81 - Blast Monitoring Location Plan

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 82**.

5.1 Attended Noise Monitoring Results

Attended monitoring was conducted at receiver locations around HVO on the nights of the 4th and 15th of March 2021. All monitoring levels were below relevant criteria. Monitoring results are detailed in **Table 7 t**o **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 dB(A)	Criterion Applies[2]	HVO North L_{Aeq} dB[3,5,]	Exceedance[4]
Shearers Lane	*15/03/2021 22:10*	1.5	E	35	Yes	IA	Nil
Knodlers Lane	*15/03/2021 22:50*	1.8	E	35	Yes	IA	Nil
Maison Dieu	*15/03/2021 22:31*	1.5	E	35	Yes	IA	Nil
Long Point (Dights Crossing)	*15/03/2021 23:38*	1.7	E	35	Yes	IA	Nil
Kilburnie South	*15/03/2021 23:31*	1.9	E	39	Yes	<30	Nil
Jerrys Plains East	*15/03/2021 21:00*	1.6	E	39	Yes	<25	Nil
Jerrys Plains Village	*15/03/2021 21:49*	1.4	E	40	Yes	IA	Nil
Jerrys Plains West	*15/03/2021 21:27*	1.2	E	40	Yes	NM	Nil
HVGC	*16/03/2021 0:02*	1.9	E	NA	Yes	IA	Nil
Kilburnie South	*4/03/2021 21:10*	0.1	F	39	Yes	IA	Nil
Jerrys Plains East	*4/03/2021 21:36*	0.6	F	39	Yes	IA	Nil
Jerrys Plains Village	*4/03/2021 21:58*	1.7	E	40	Yes	IA	Nil

1. Atmospheric data is sourced from the HVO Cheshunt (or MTW Charlton Ridge for Long Point) 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. 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. IA means inaudible, there was no site noise at the monitoring location; and

6. NM means not measureable, noise was audible but could not be quantified.

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 dB(A)	Criterion Applies[2]	HVO North L_{Aeq} dB[3,,5,]	Exceedance[4]
Shearers Lane	*15/03/2021 22:10*	1.5	E	41	Yes	IA	Nil
Knodlers Lane	*15/03/2021 22:50*	1.8	E	41	Yes	IA	Nil
Maison Dieu	*15/03/2021 22:31*	1.5	E	41	Yes	IA	Nil
Long Point (Dights Crossing)	*15/03/2021 23:38*	1.7	E	41	Yes	IA	Nil
Kilburnie South	*15/03/2021 23:31*	1.9	E	41	Yes	<30	Nil
Jerrys Plains East	*15/03/2021 21:00*	1.6	E	41	Yes	<25	Nil
Jerrys Plains Village	*15/03/2021 21:49*	1.4	E	41	Yes	IA	Nil
Jerrys Plains West	*15/03/2021 21:27*	1.2	E	41	Yes	NM	Nil
HVGC	*16/03/2021 0:02*	1.9	E	NA	Yes	IA	Nil
Kilburnie South	*4/03/2021 21:10*	0.1	F	41	Yes	IA	Nil
Jerrys Plains East	*4/03/2021 21:36*	0.6	F	41	Yes	IA	Nil
Jerrys Plains Village	*4/03/2021 21:58*	1.7	E	41	Yes	IA	Nil

1. Atmospheric data is sourced from the HVO Cheshunt (or MTW Charlton Ridge for Long Point) 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. 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; and

5. IA means inaudible, there was no site noise at the monitoring location.

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 dB(A)	Criterion Applies[2]	HVO North L_{Aeq} dB[5]	Exceedance [4]
Shearers Lane	*15/03/2021 22:10*	1.5	E	46	Yes	IA	Nil
Knodlers Lane	*15/03/2021 22:50*	1.8	E	46	Yes	IA	Nil
Maison Dieu	*15/03/2021 22:31*	1.5	E	46	Yes	IA	Nil
Long Point (Dights Crossing)	*15/03/2021 23:38*	1.7	E	46	Yes	IA	Nil
Kilburnie South	*15/03/2021 23:31*	1.9	E	46	Yes	33	Nil
Jerrys Plains East	*15/03/2021 21:00*	1.6	E	46	Yes	33	Nil
Jerrys Plains Village	*15/03/2021 21:49*	1.4	E	46	Yes	IA	Nil
Jerrys Plains West	*15/03/2021 21:27*	1.2	E	46	Yes	NM	Nil
HVGC	*16/03/2021 0:02*	1.9	E	NA	Yes	IA	Nil
Kilburnie South	*4/03/2021 21:10*	0.1	F	46	Yes	IA	Nil
Jerrys Plains East	*4/03/2021 21:36*	0.6	F	46	Yes	IA	Nil
Jerrys Plains Village	*4/03/2021 21:58*	1.7	E	46	Yes	IA	Nil

1. Atmospheric data is sourced from the HVO Cheshunt (or MTW Charlton Ridge for Long Point) 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. 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; and

5. IA means inaudible, there was no site noise at the monitoring location;

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 dB(A)	Criterion Applies[2]	HVO South L_{Aeq} dB[4]	Exceedance[5]
Shearers Lane	*15/03/2021 22:10*	2.4	E	41	Yes	IA	Nil
Knodlers Lane	*15/03/2021 22:50*	2.7	E	40	Yes	IA	Nil
Maison Dieu	*15/03/2021 22:31*	2.8	E	39	Yes	IA	Nil
Long Point (Dights Crossing)	*15/03/2021 23:38*	3.8	E	37	No	IA	NA
Kilburnie South	*15/03/2021 23:31*	3.7	E	39	No	IA	NA
Jerrys Plains East	*15/03/2021 21:00*	2.2	D	38	Yes	32	Nil
Jerrys Plains Village	*15/03/2021 21:49*	2.8	E	35	Yes	IA	Nil
Jerrys Plains West	*15/03/2021 21:27*	2.7	E	35	Yes	IA	Nil
HVGC	*16/03/2021 0:02*	3.4	E	55	No	NM	NA

1. Atmospheric data is sourced from the HVO Cheshunt (or MTW Charlton Ridge for Long Point) 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. IA means inaudible, there was no site noise at the monitoring location; 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 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 dB(A)	Criterion Applies[2]	HVO South L_{Aeq} dB[4]	Exceedance[4]
Shearers Lane	*15/03/2021 22:10*	2.4	E	45	Yes	IA	Nil
Knodlers Lane	*15/03/2021 22:50*	2.7	E	45	Yes	IA	Nil
Maison Dieu	*15/03/2021 22:31*	2.8	E	45	Yes	IA	Nil
Long Point (Dights Crossing)	*15/03/2021 23:38*	3.8	E	45	No	IA	NA
Kilburnie South	*15/03/2021 23:31*	3.7	E	45	No	IA	NA
Jerrys Plains East	*15/03/2021 21:00*	2.2	D	45	Yes	36	Nil
Jerrys Plains Village	*15/03/2021 21:49*	2.8	E	45	Yes	IA	Nil
Jerrys Plains West	*15/03/2021 21:27*	2.7	E	45	Yes	IA	Nil
HVGC	*16/03/2021 0:02*	3.4	E	NA	No	NM	NA

1. Atmospheric data is sourced from the HVO Cheshunt (or MTW Charlton Ridge for Long Point) 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. 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; and

5. IA means inaudible, there was no site noise at the monitoring location.

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}dB[2]	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?	Frequency of Tonality[1]	Low-frequency Modifying Factor?[1]	Maximum Exceedance of NPfI Reference Spectrum[1]	Total Penalty dB
Shearers Lane	*15/03/2021 22:10*	IA	Yes	Nil	Nil	NA	Nil	NA	Nil
Knodlers Lane	*15/03/2021 22:50*	IA	Yes	Nil	Nil	NA	Nil	NA	Nil
Maison Dieu	*15/03/2021 22:31*	IA	Yes	Nil	Nil	NA	Nil	NA	Nil
Long Point (Dights Crossing)	*15/03/2021 23:38*	IA	Yes	Nil	Nil	NA	Nil	NA	Nil
Kilburnie South	*15/03/2021 23:31*	<30	Yes	Nil	Nil	NA	Nil	NA	Nil
Jerrys Plains East	*15/03/2021 21:00*	<25	Yes	Nil	Nil	NA	Nil	NA	Nil
Jerrys Plains Village	*15/03/2021 21:49*	IA	Yes	Nil	Nil	NA	Nil	NA	Nil
Jerrys Plains West	*15/03/2021 21:27*	NM	Yes	Nil	Nil	NA	Nil	NA	Nil
HVGC	*16/03/2021 0:02*	IA	Yes	Nil	Nil	NA	Nil	NA	Nil
Kilburnie South	*4/03/2021 21:10*	IA	Yes	Nil	Nil	NA	Nil	NA	Nil
Jerrys Plains East	*4/03/2021 21:36*	IA	Yes	Nil	Nil	NA	Nil	NA	Nil
Jerrys Plains Village	*4/03/2021 21:58*	IA	Yes	Nil	Nil	NA	Nil	NA	Nil

1. NA means not applicable;

2. IA means inaudible.

Table 13 - Modifying Factor Assessment HVO South for the reporting period

Location	Date and Time	Measured HVO South L_{Aeq}dB	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?	Frequency of Tonality[1]	Low-frequency Modifying Factor?[1]	Maximum Exceedance of NPfI Reference Spectrum [1]	Total Penalty dB
Shearers Lane	*15/03/2021 22:10*	IA	Yes	Nil	Nil	NA	Nil	NA	Nil
Knodlers Lane	*15/03/2021 22:50*	IA	Yes	Nil	Nil	NA	Nil	NA	Nil
Maison Dieu	*15/03/2021 22:31*	IA	Yes	Nil	Nil	NA	Nil	NA	Nil
Long Point (Dights Crossing)	*15/03/2021 23:38*	IA	No	Nil	Nil	NA	Nil	NA	Nil
Kilburnie South	*15/03/2021 23:31*	IA	No	Nil	Nil	NA	Nil	NA	Nil
Jerrys Plains East	*15/03/2021 21:00*	32	Yes	Nil	Nil	NA	Nil	NA	Nil
Jerrys Plains Village	*15/03/2021 21:49*	IA	Yes	Nil	Nil	NA	Nil	NA	Nil
Jerrys Plains West	*15/03/2021 21:27*	IA	Yes	Nil	Nil	NA	Nil	NA	Nil
HVGC	*16/03/2021 0:02*	NM	No	Nil	Nil	NA	Nil	NA	Nil

1. NA means not applicable;

2. IA means inaudible.

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 82**. 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.

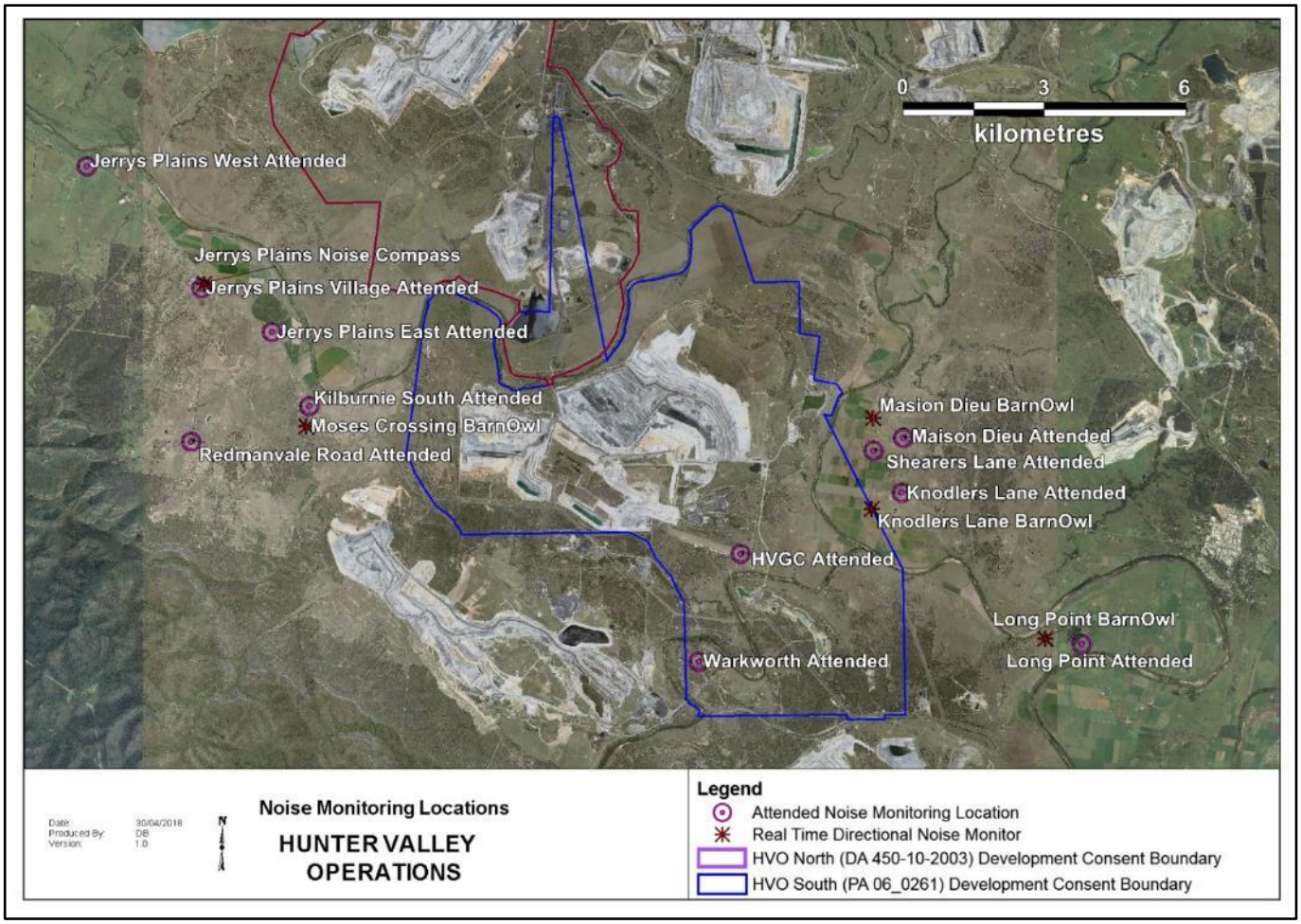


Figure 82 - Noise Monitoring Location Plan

6 Operational Downtime

A total of 47.9 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 83**. 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).

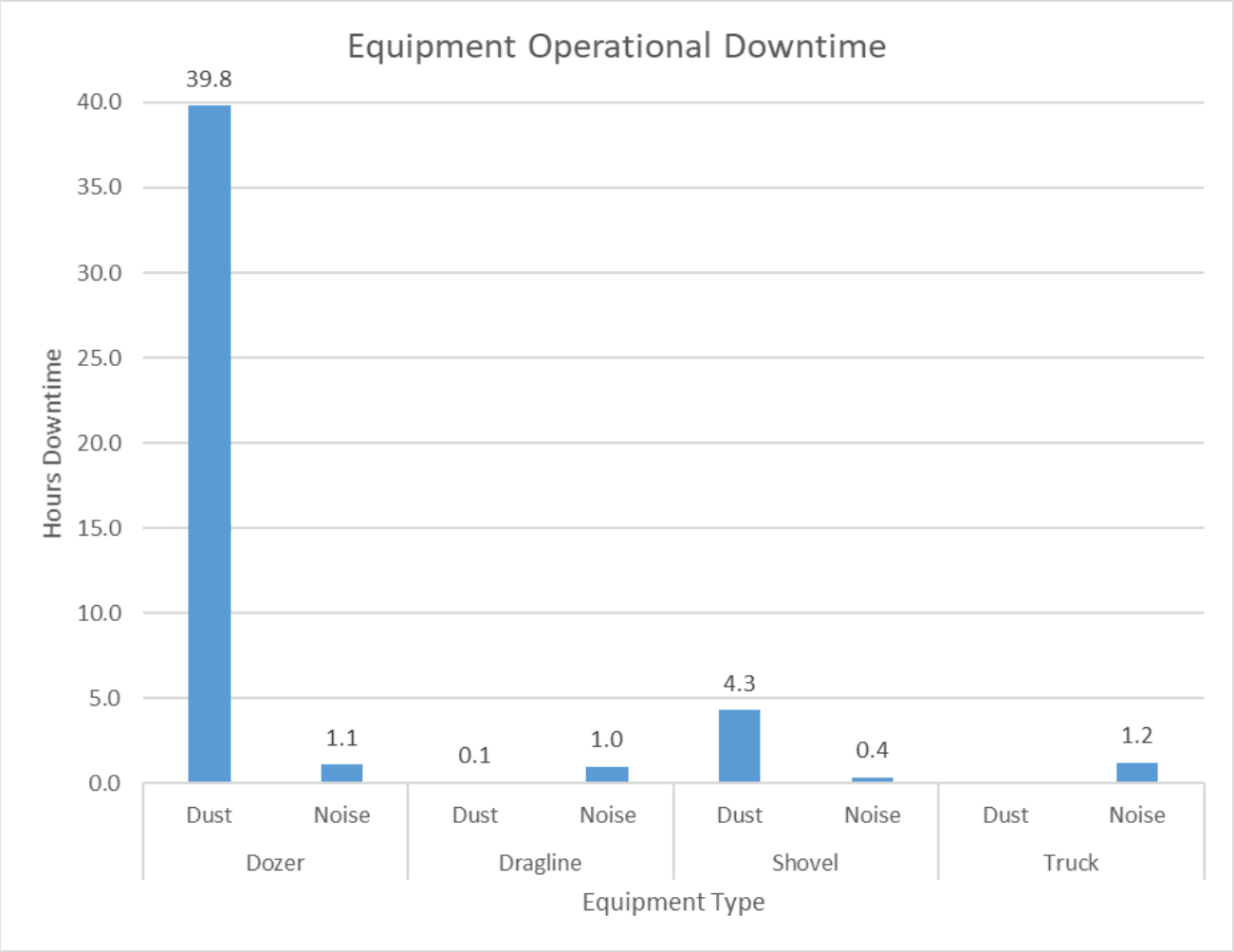


Figure 83 - Operational Downtime by Equipment Type for the reporting period

7 Rehabilitation

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

- 0.37 Ha of land was released (became available for the application of topsoil)
- 4.81 Ha of land was reshaped
- 5.66 Ha of land had topsoil applied

Year to date progress is shown in **Figure 84**.

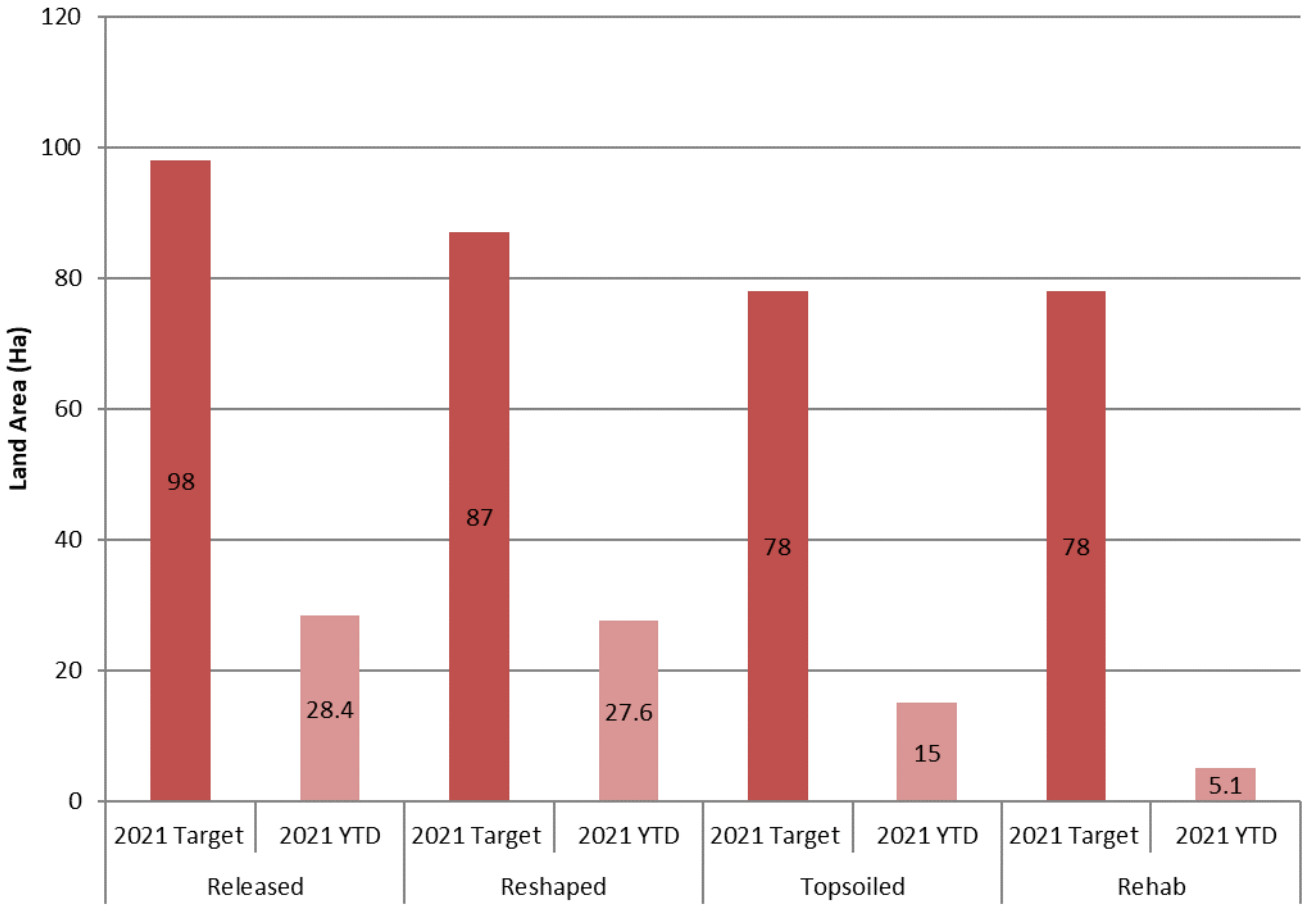


Figure 84 - Rehabilitation YTD March 2021

8 Complaints

Nil complaints were received during the reporting period. A complaints summary for 2021 is shown below in **Table 14**.

Table 14 - Complaints Summary 2021

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

9 Environmental Incidents

During March there were three reportable environmental incidents:

- **09/03/2021 – Missed Sample at Knodlers Lane TEOM**

  The TEOM air quality monitor located at Knodlers Lane recorded 58% of 24 hour data on the 09th of March due to a localised electrical storm.

- **12/03/2021 – Missed Sample at Maison Dieu TEOM**

  The TEOM air quality monitor located at Maison Dieu recorded 50% of 24 hour data on the 12th of March. The site is operated as part of the Upper Hunter Air Quality Monitoring Network.

- **23/03/2021 – Sediment Dam 2N Uncontrolled Discharge**

  During cumulative rainfall events between 19 March and 23 March 2021, Hunter Valley Operations (HVO) received 107.4mm of rainfall as recorded at the HVO Corporate MET station. At approximately 08:30 23 March during a post rainfall inspection it was identified that a sediment control dam (Dam 2N) collecting water from an old rehabilitation area was spilling to a drainage line reporting to Farrells Creek.

10 References

EMM Consulting. 2021. *Hunter Valley Operations – Quarterly Groundwater Data Review – Q1/2021.* Monitoring review, St Leonards: EMM Consulting

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)
1/03/2021	34	5.164	100.0	13.7	1038.0	204.6	1.6	0.0
2/03/2021	27.2	1.0	100.0	19.0	1145.0	136.6	2.7	0.0
3/03/2021	22.3	1.7	92.9	44.0	1262.0	121.9	3.2	0.0
4/03/2021	26.9	-2.7	108.7	16.6	1000.0	177.4	1.4	0.0
5/03/2021	27.1	0.8	83.7	19.4	990.0	186.7	3.0	0.0
6/03/2021	23.8	0.6	97.7	34.4	1296.0	113.5	3.2	0.0
7/03/2021	26.9	-2.7	100.0	30.2	1324.0	120.0	1.9	0.0
8/03/2021	29.1	-1.4	100.0	40.6	1297.0	236.1	1.9	6.6
9/03/2021	30.4	2.1	100.0	25.7	1083.0	239.4	3.4	0.0
10/03/2021	26.3	3.7	98.3	45.4	1233.0	116.0	3.3	0.0
11/03/2021	27.5	2.5	108.1	38.8	1234.0	121.1	2.6	1.8
12/03/2021	27.7	1.9	108.9	46.1	1393.0	157.7	1.1	0.0
13/03/2021	31.8	2.2	111.5	26.9	1049.0	249.3	1.8	0.2
14/03/2021	24.0	-7.1	111.1	60.5	318.3	148.2	2.1	41.8
15/03/2021	22.1	-6.8	100.0	50.3	1316.0	114.6	2.1	0.2
16/03/2021	19.9	-0.8	110.1	51.6	1085.0	117.7	2.3	0.8
17/03/2021	18.9	0.5	110.5	71.7	1129.0	119.6	3.8	4.2
18/03/2021	19.31	1.582	111.3	79.02	1168	122.3	3.992	14.8
19/03/2021	18.47	2.801	111.1	81.7	327.8	123	3.626	23
20/03/2021	21.65	2.971	111.2	82.1	901	122	4.822	30.8
21/03/2021	19.27	2.698	110.3	85.4	287.9	120.8	4.353	3.4
22/03/2021	18.27	0.991	111.7	76.58	389.2	120.9	4.082	37.8
23/03/2021	19.94	0.773	112.2	82.3	862	149.5	1.861	13.4
24/03/2021	24.35	1.349	99.8	32.43	1340	279	4.714	0.2
25/03/2021	24.99	-0.944	82.5	31.38	1323	281.8	4.566	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)
26/03/2021	24.6	-2.557	95.9	20.99	874	243.7	2.016	0
27/03/2021	25.91	-1.046	99.9	20.76	882	261.1	2.458	0
28/03/2021	25.6	-2.585	91.6	18.09	937	227.9	2.358	0
29/03/2021	25.2	0.506	100	28.12	916	125.3	1.577	0
30/03/2021	22.13	-0.869	100	38.4	1222	120.1	2.233	0
31/03/2021	22.37	-2.719	100	41.15	1237	130.8	1.508	0