HUNTER VALLEY OPERATIONS

Monthly Environmental Monitoring Report September 2020

Document Number:	HVOOC-1797567310-3555
Status:	Approved
Version:	1.0
Effective:	15/12/2020
Owner:	Environment and Community Coordinator

Table of Contents

Table of Figures

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 2020 (the 'Reporting Period').

2 Air Quality

2.1 Meteorological Monitoring

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

2.1.1 Rainfall

Rainfall for the period is summarised in **Table 1**. The 2020 trend and historical trends are shown in **Figure 1**.

Table 1 - Rainfall data - September 2020

2020	Monthly Rainfall (mm)	Cumulative Rainfall (mm)
September	51.6	564.2

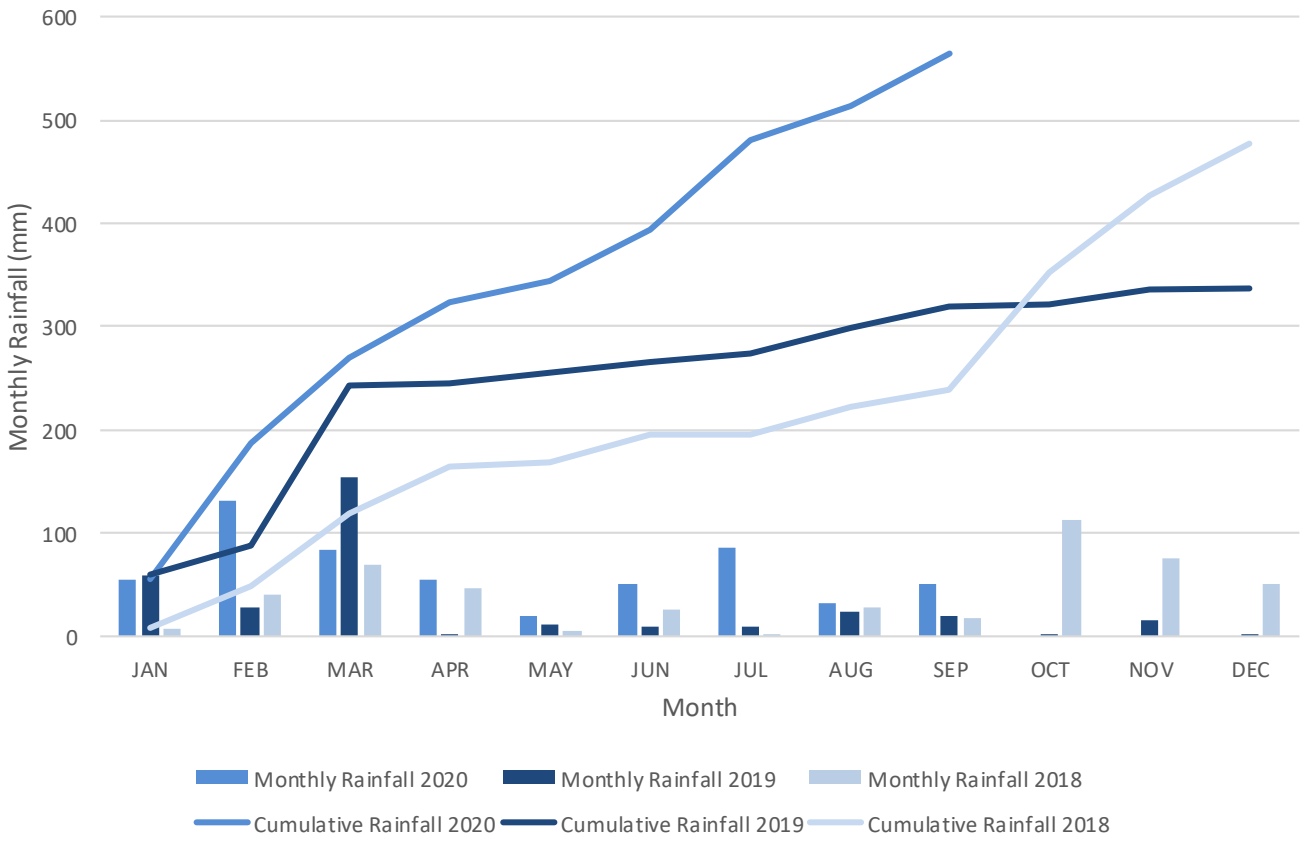


Figure 1 - Rainfalll Summary 2020

2.1.2 Wind Speed and Direction

Westerly, North Westerly and South Easterly winds were typically dominant during September, as shown in **Figure 2** (HVO Corporate) and **Figure 3** (HVO Cheshunt).

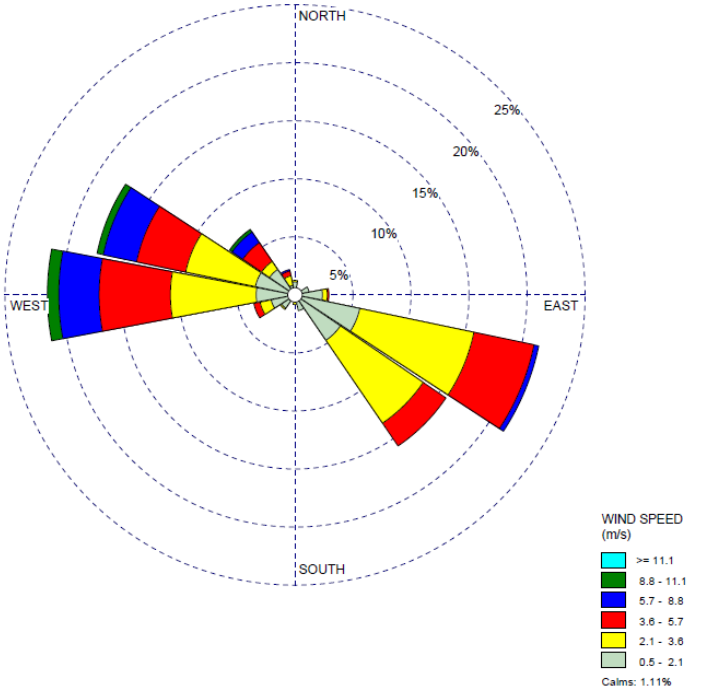


Figure 2 - HVO Corporate Wind Rose September 2020

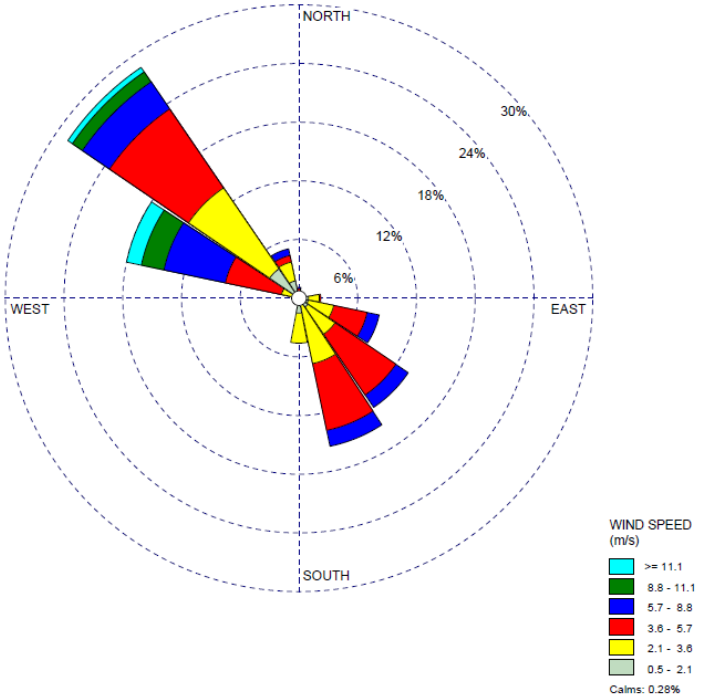


Figure 3 - HVO Cheshunt Wind Rose September 2020

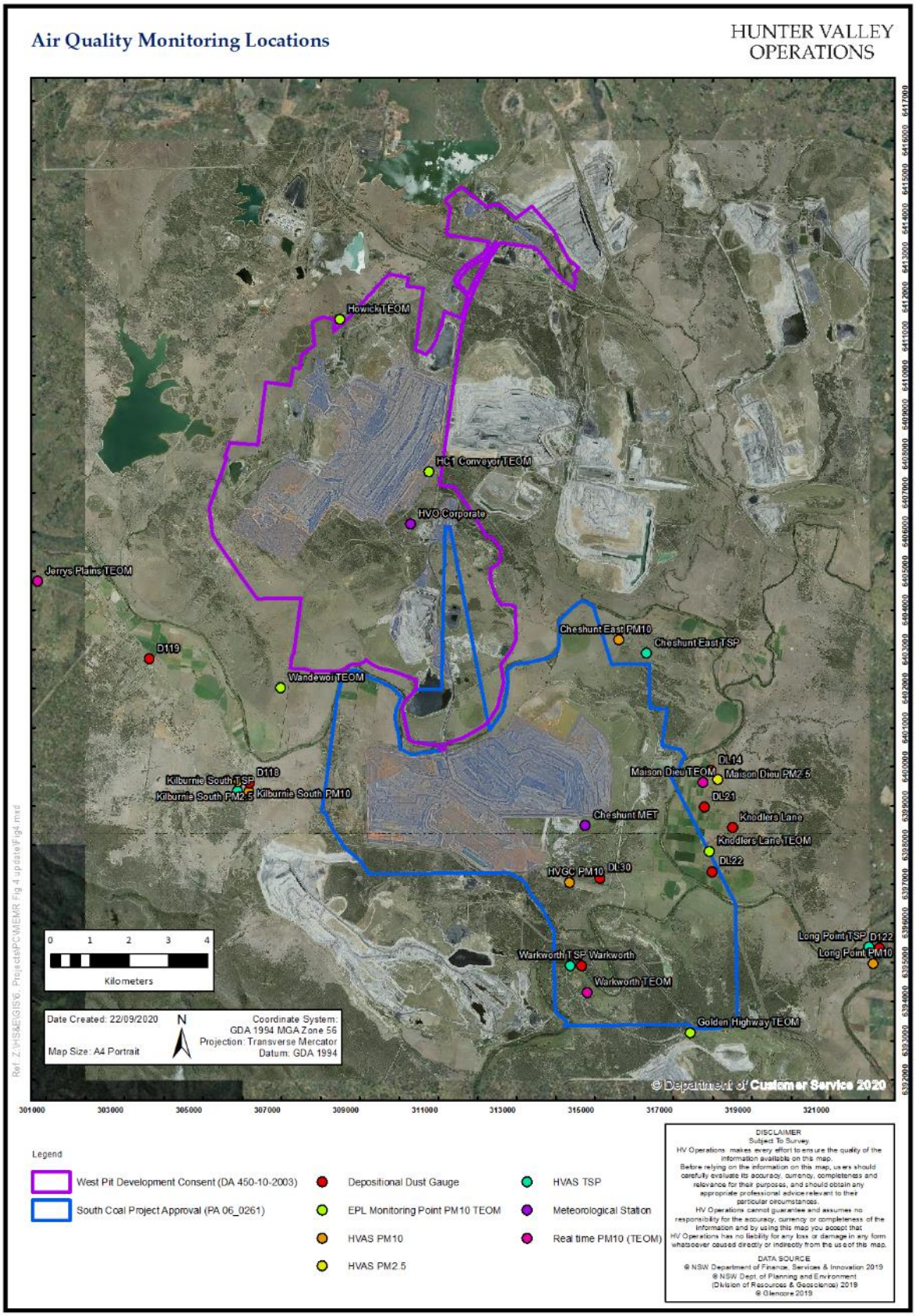


Figure 4 - Air Quality Monitoring Location Plan

2.2 Depositional Dust

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

Figure 5 displays insoluble solids results from depositional dust gauges during the reporting period compared against the annual impact assessment criteria.

During the reporting period, the DL30 and Warkworth monitors recorded a monthly result above the long-term impact assessment criteria of 4.0 g/m^2 per month.

An assessment of HVO's contribution against the long-term impact assessment criteria will be provided in the 2020 annual review.

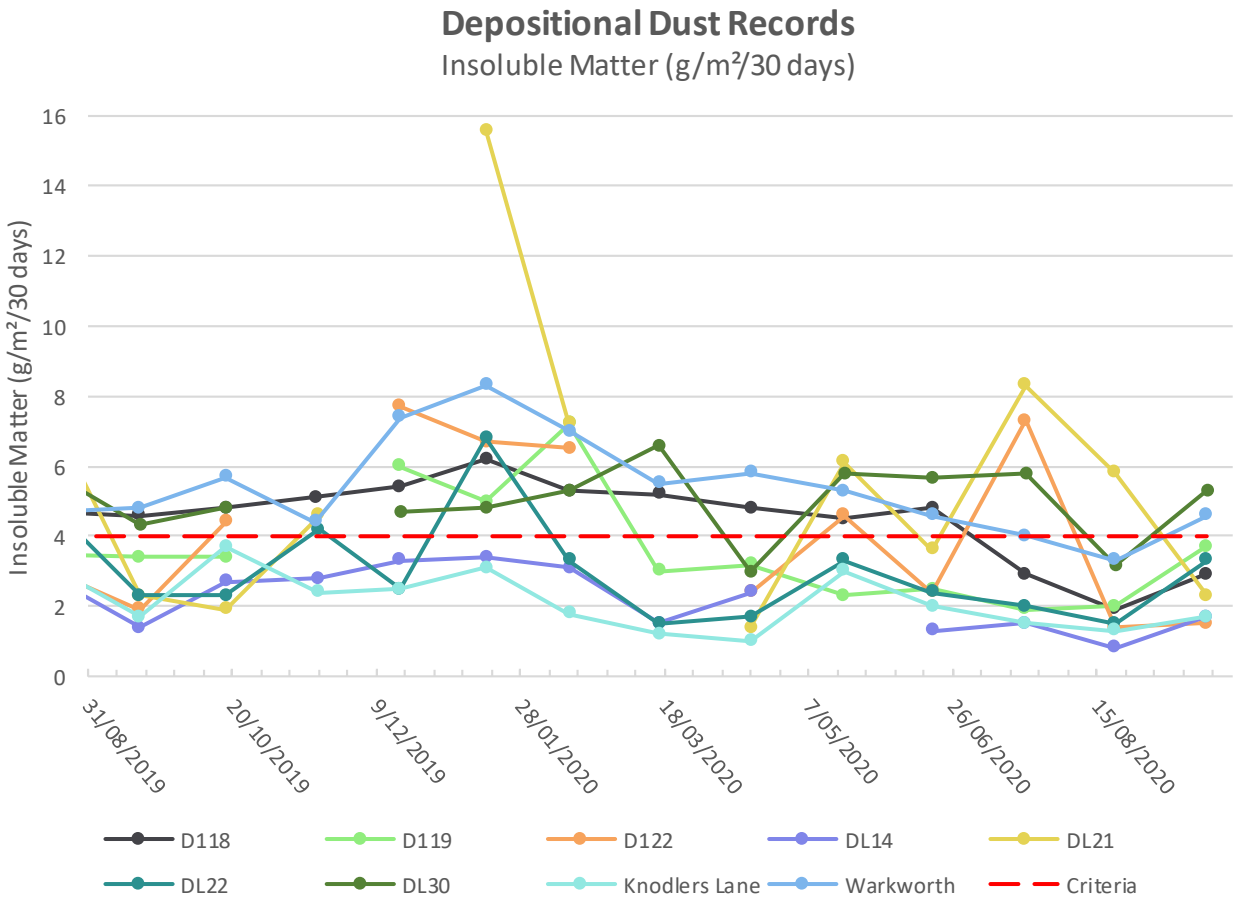


Figure 5 - Depositional Dust Results September 2020

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. During the reporting period, no monitors recorded an exceedance above the short-term impact assessment criteria of 50µg/m^3.

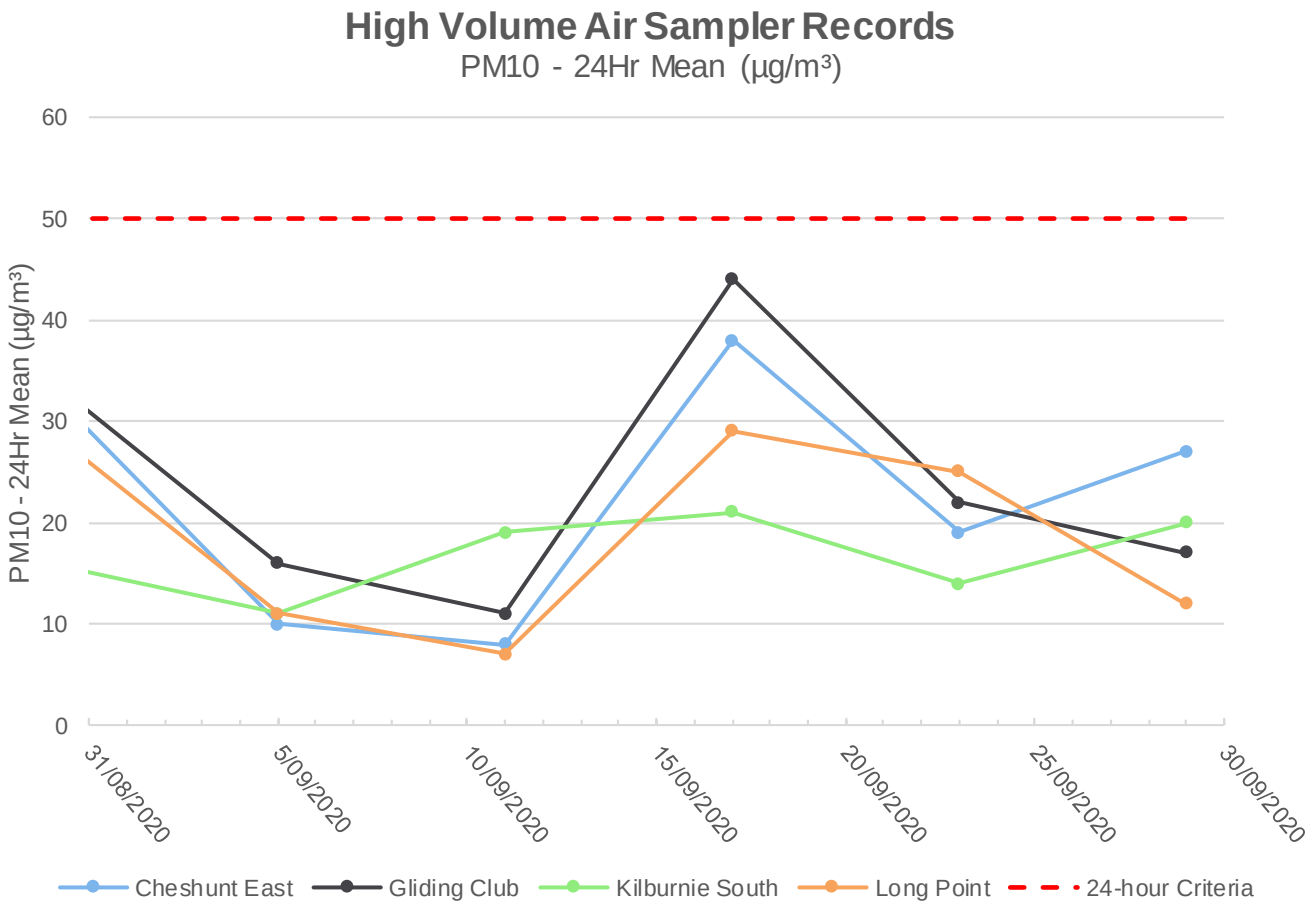


Figure 6 - Individual PM_{10} Results September 2020

2.3.1.2 Performance against long term impact assessment criteria

Figure 7 shows the year to date annual average PM_{10} results. During the reporting period, the Gliding Club monitor recorded an annual average above the PM_{10} Annual Rolling Mean criteria of 25µg/m^3 for HVO South. All monitors recorded an annual average below the 30µg/m^3 criteria for HVO North.

An assessment of HVO's contribution against the long-term impact assessment criteria will be provided in the 2020 Annual Review.

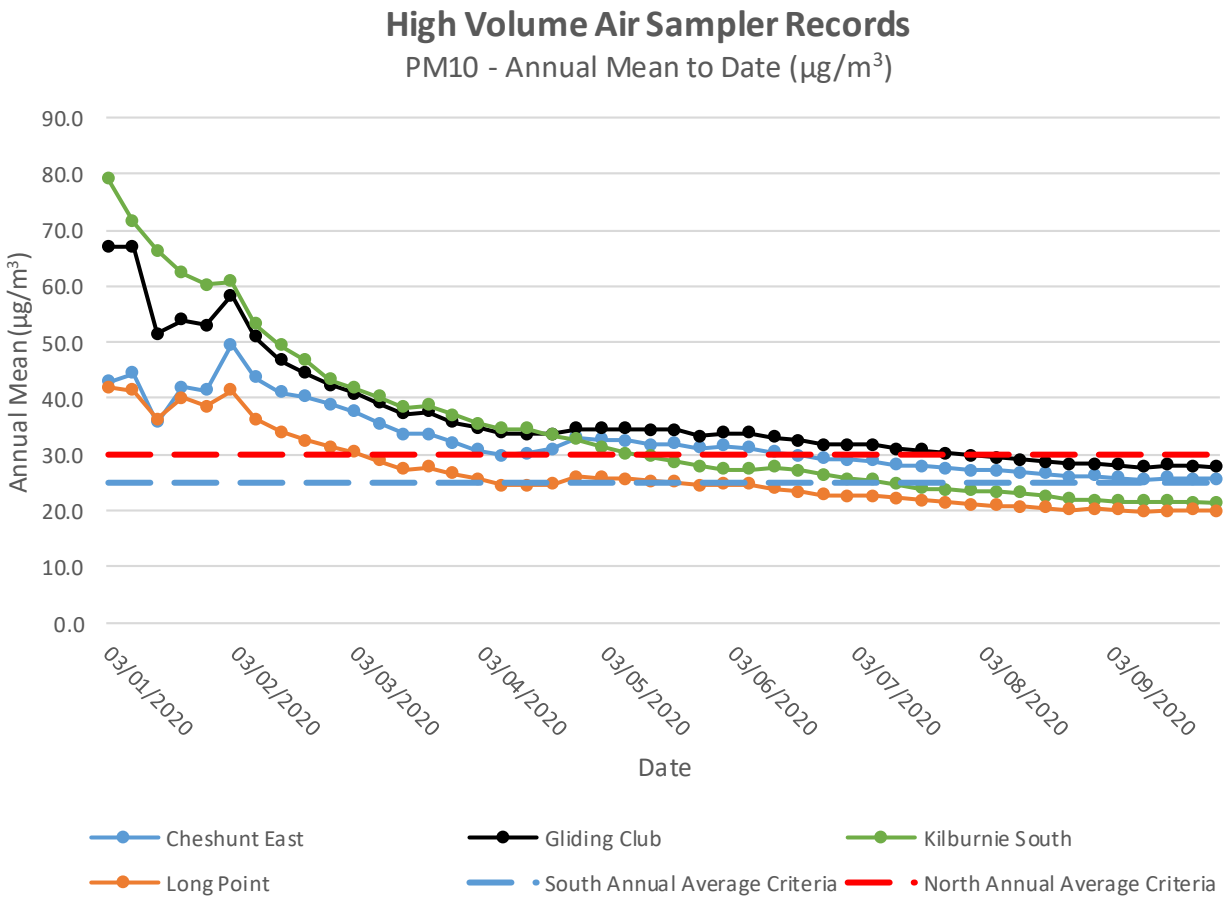


Figure 7 - Year to Date Average PM$_{10}$ as at end of September 2020

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 monitor recorded an exceedance above the short-term impact assessment criteria of 25µg/m^3 during the reporting period. The Kilburnie South monitor failed to collect a sample on the 23rd and 29th of September; an investigation commenced and these incidents were reported (refer to **Section 9**).

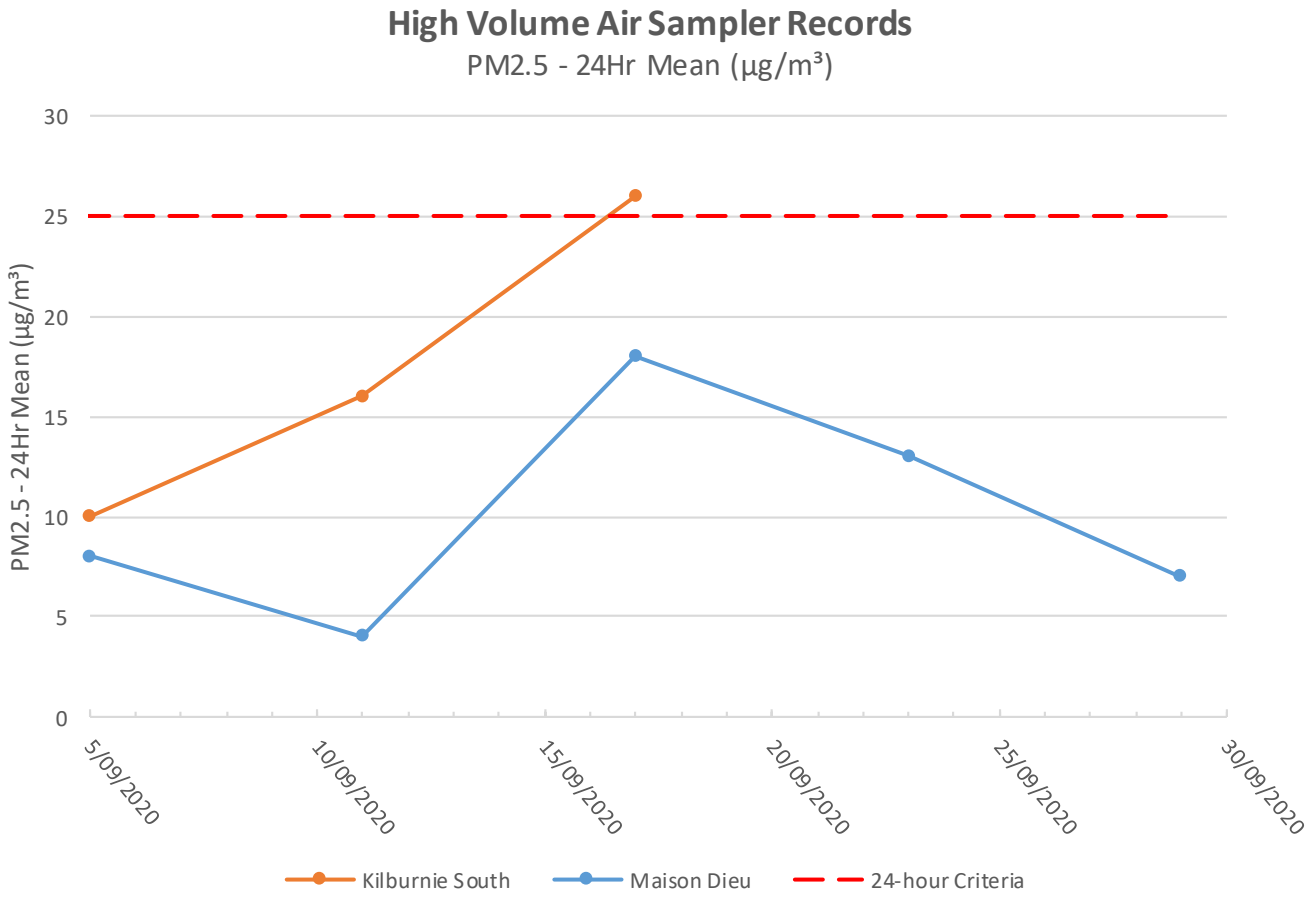


Figure 8 - Individual $PM_{2.5}$ Results September 2020

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.

This is likely due to the impact of bushfire smoke and regional air quality in the first months of the year. An assessment of HVO's contribution against the long term impact assessment criteria will be provided in the 2020 Annual Review.

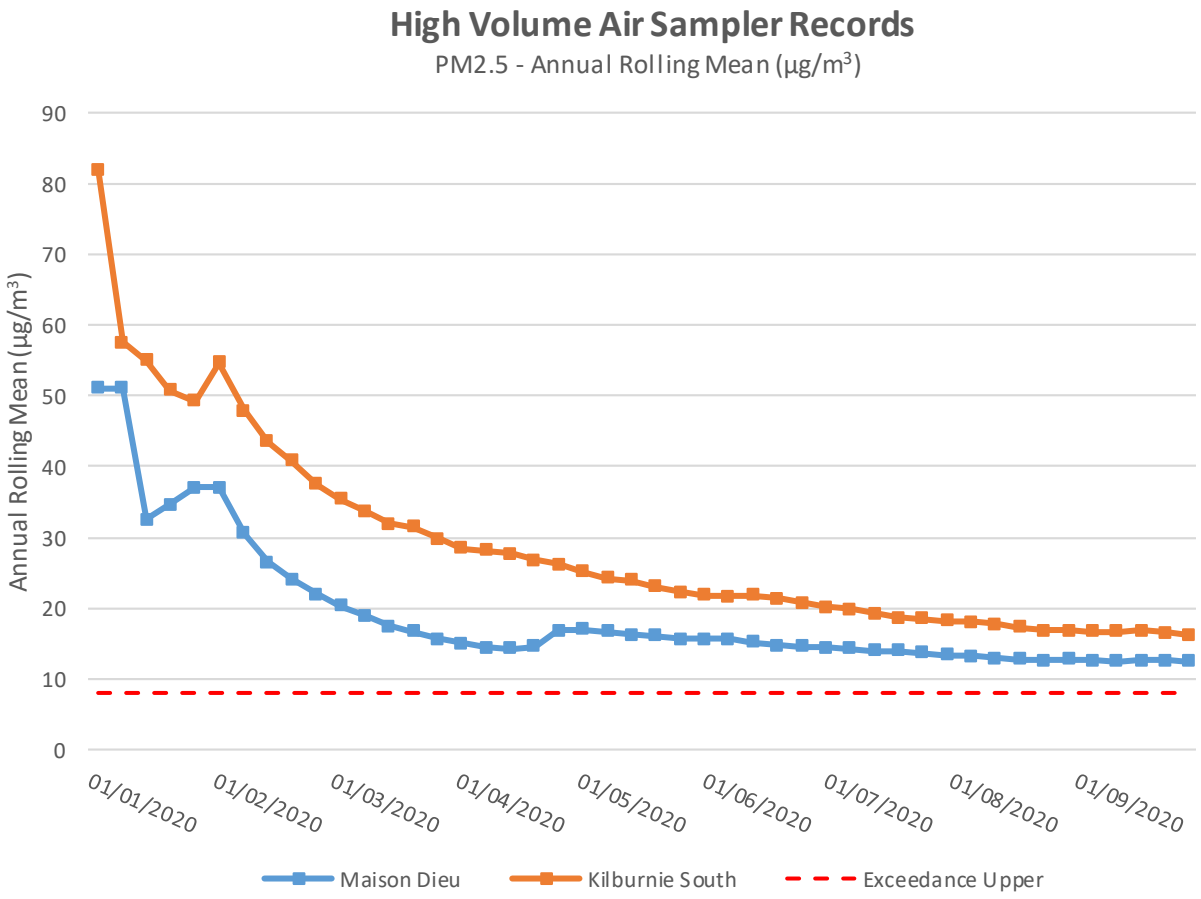


Figure 9 - Year to Date Average $PM_{2.5}$ as at end of September 2020

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.

No monitors recorded an annual average above the long-term impact assessment criteria of 90µg/m^3 during the reporting period.

An assessment of HVO's contribution against the long-term impact assessment criteria will be provided in the 2020 Annual Review.

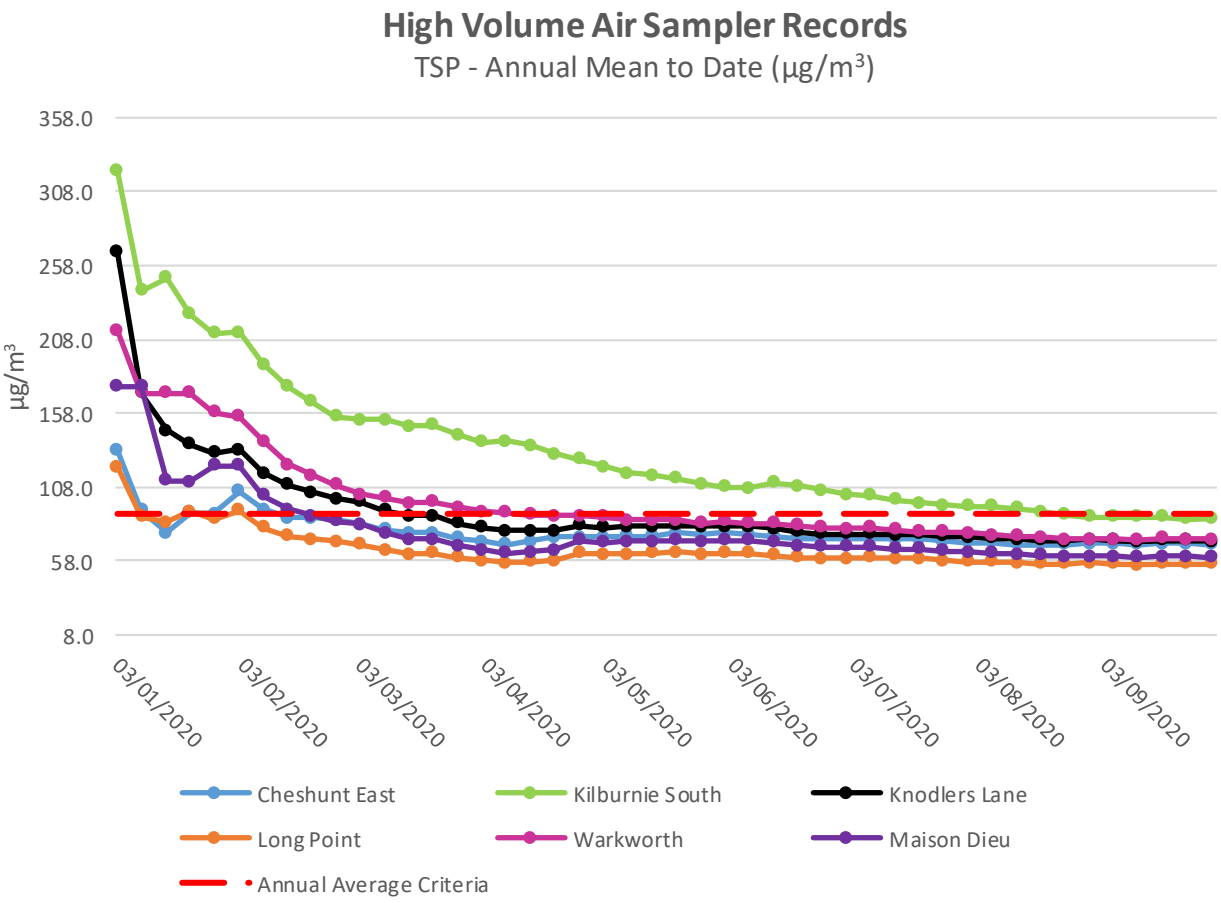


Figure 10 - Year to Date Average Total Suspended Particulatesas at end of September 2020

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 log information and transmit data to a central database, generating alarms when particulate matter levels exceed internal trigger limits. 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**.

On the 3rd September the Knodlers Lane Monitor exceeded the 24-hour average PM_{10} result limit, an investigation determined HVO's contribution to be below the criteria value.

No monitors recorded an annual average above the long-term impact criteria.

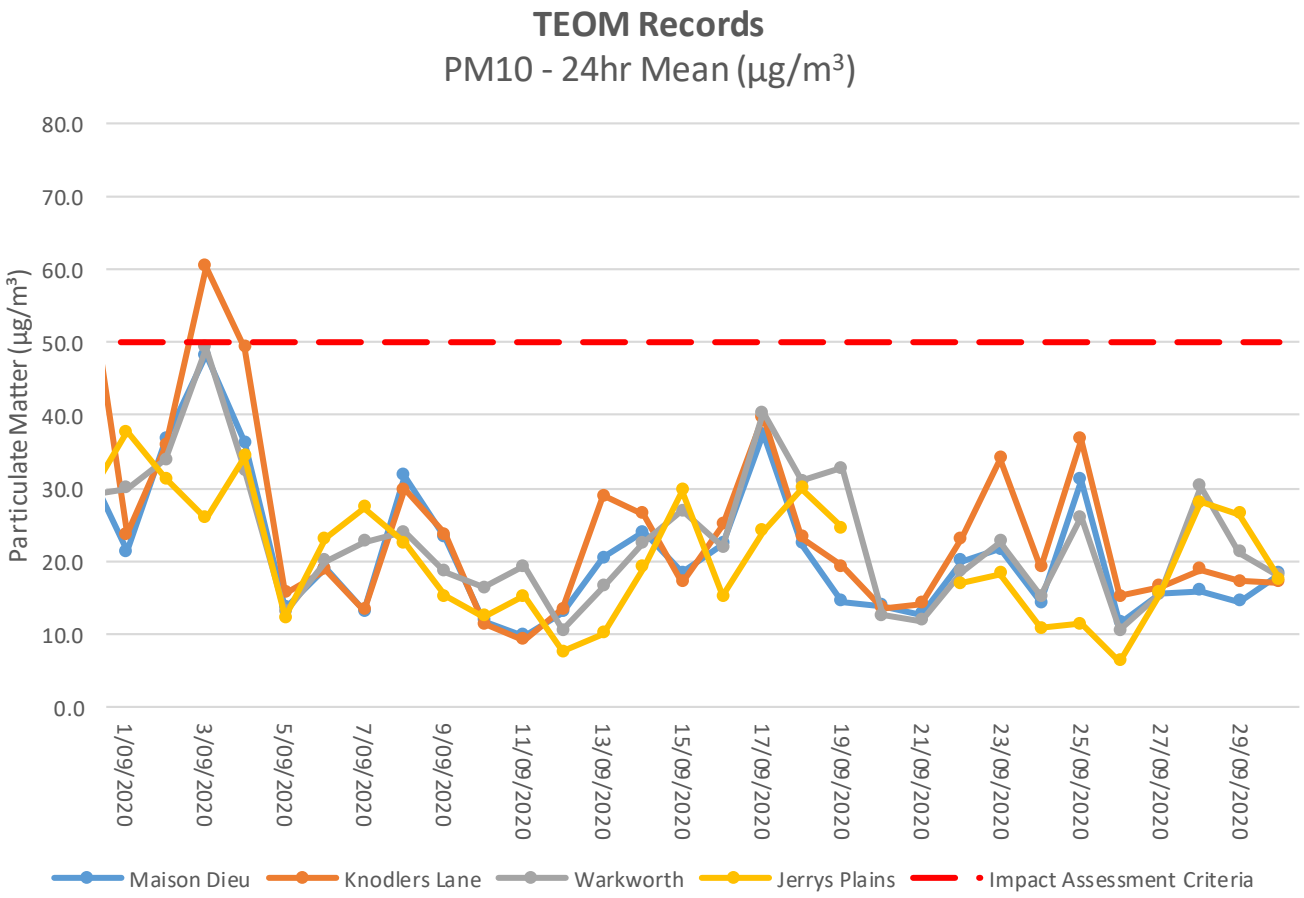


Figure 11 - Real Time PM_{10} 24hr average and YTD average September 2020

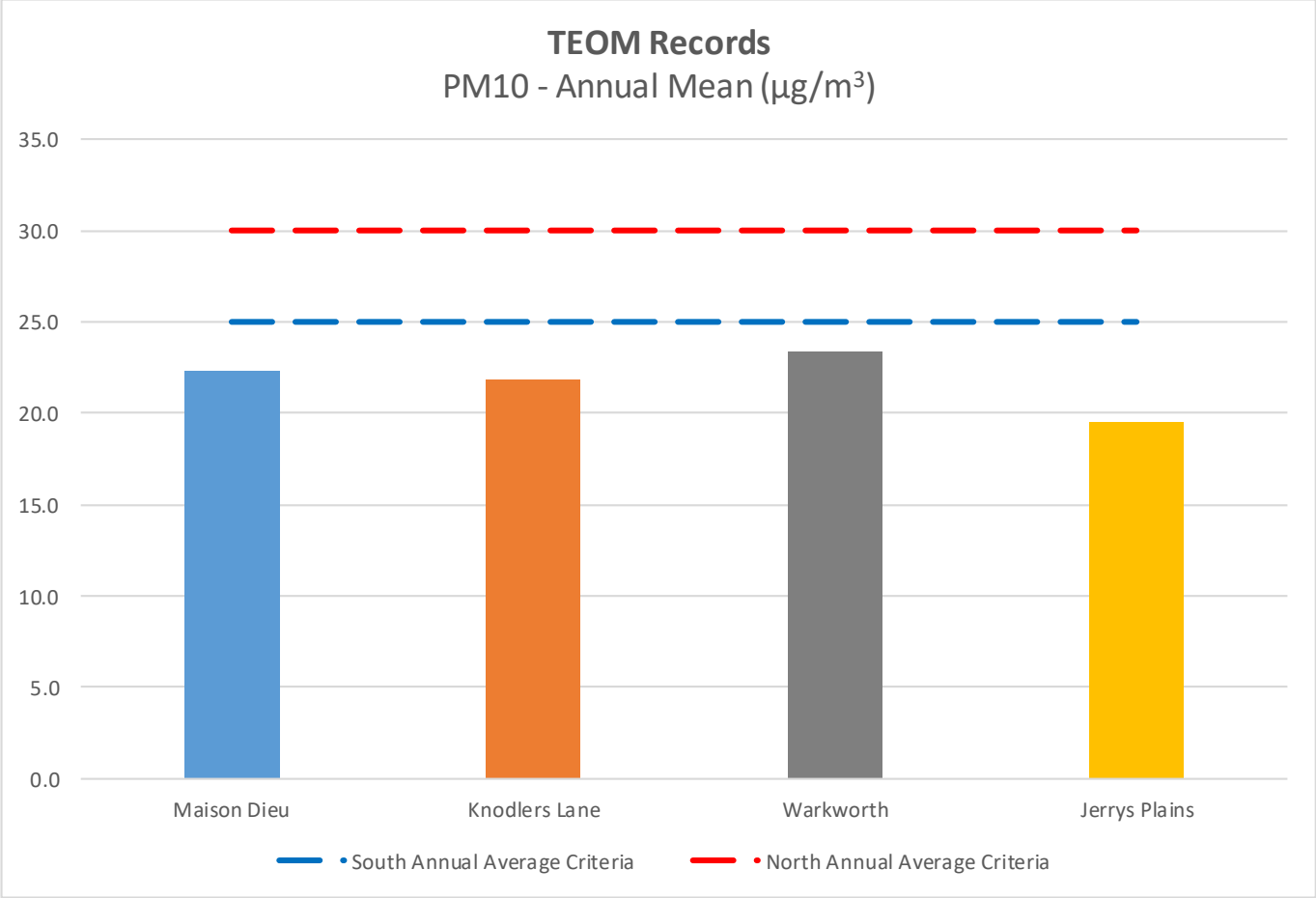


Figure 12 - Real Time PM 10- Annual Average September 2020

2.3.5 Real Time Alarms for Air Quality

During September, the real time monitoring system generated 125 automated air quality related alarms; of these alarms, 44 related to adverse weather conditions and 81 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 locations across HVO are shown in Figure 13

Figure 14 to **Figure 16** show the long-term surface water trend (2016-current) within HVO dams. **Figure 17** to **Figure 25** show the long-term surface water trend (2016-current) in surrounding watercourses.

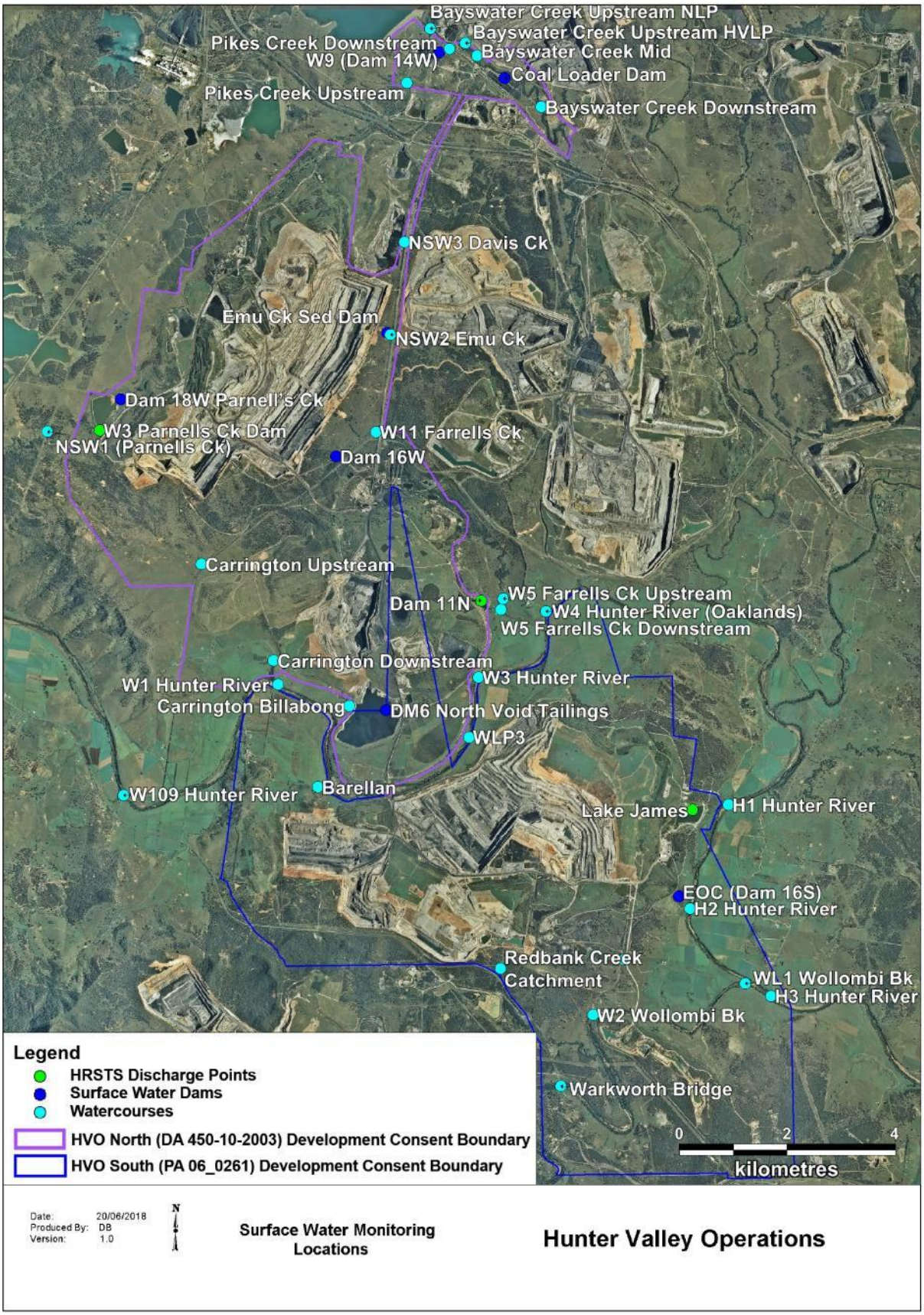


Figure 13 - HVO Surface Water Monitoring Locations

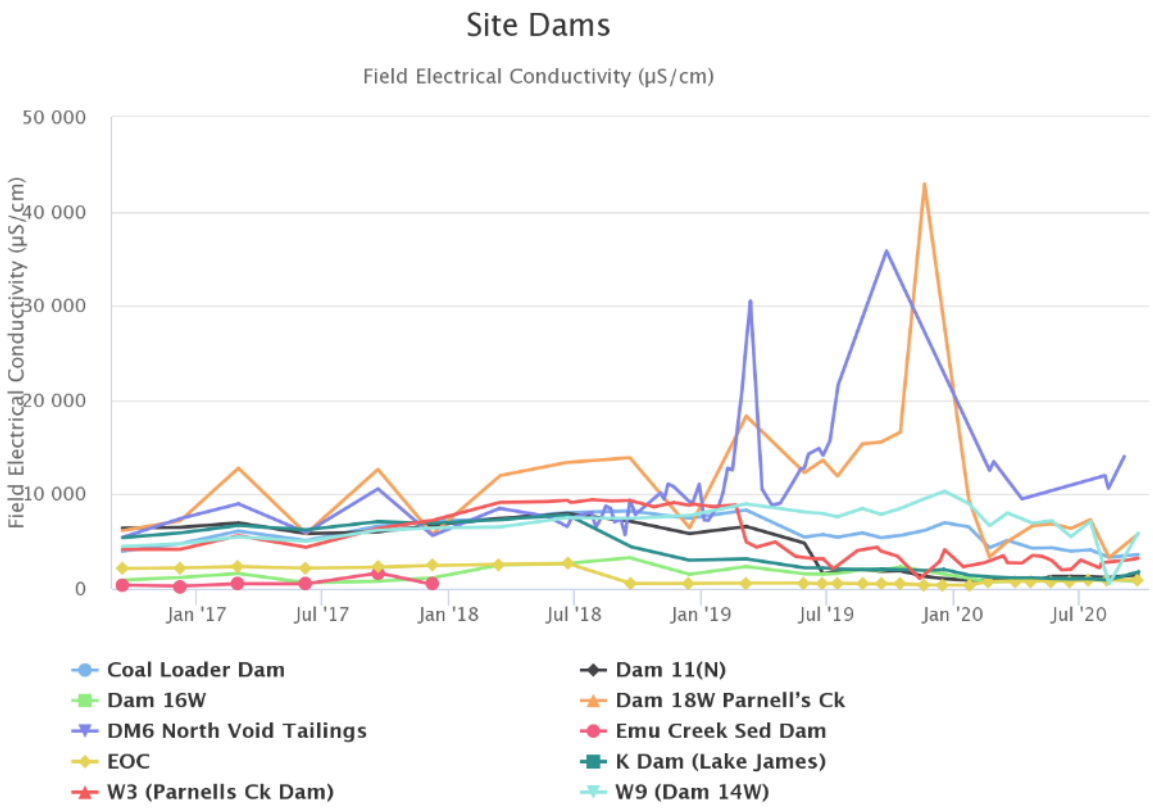


Figure 14 - Site Dams Electrical Conductivity - September 2020

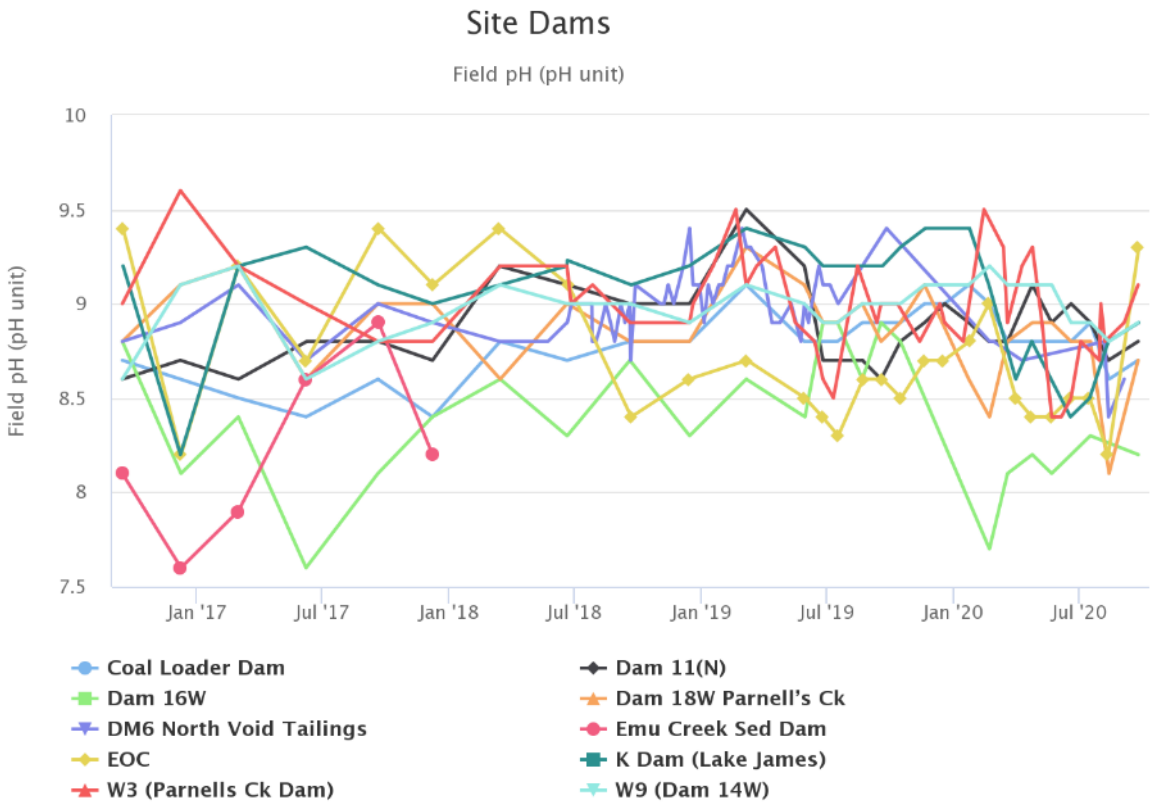


Figure 15 - Site Dams pH - September 2020

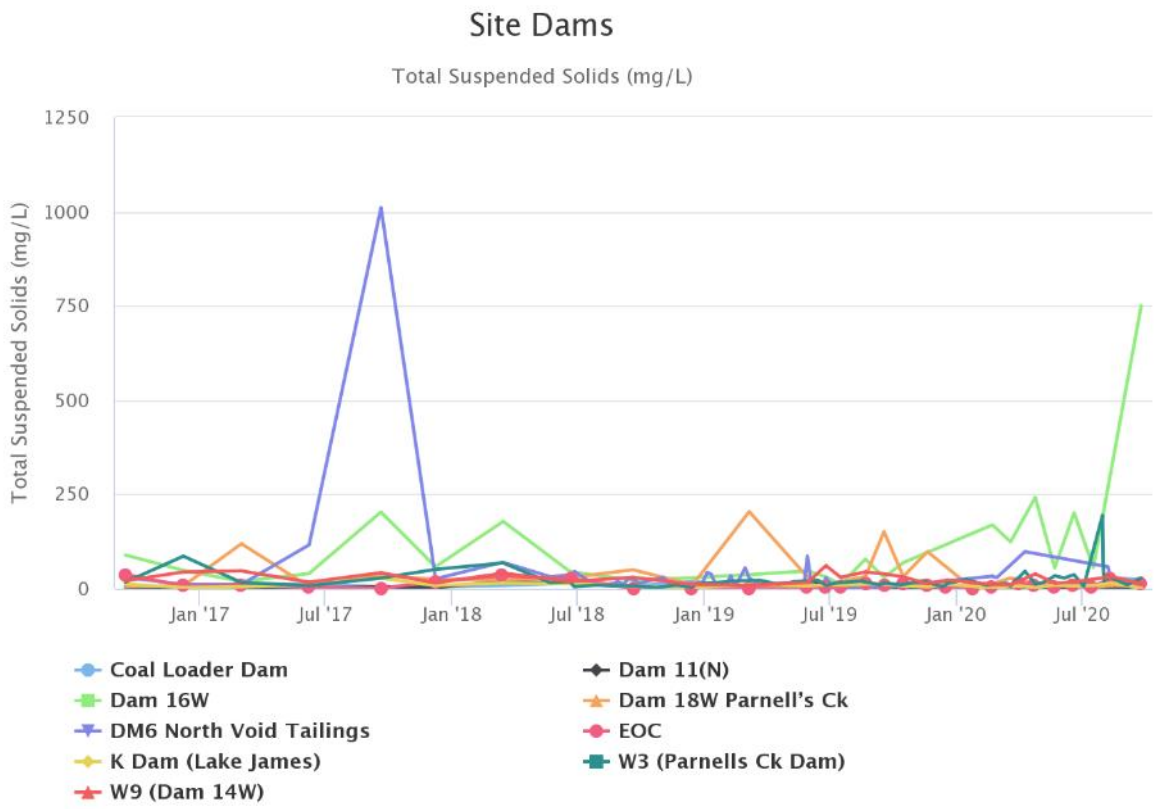


Figure 16 - Site Dams total Suspended Solids - September 2020

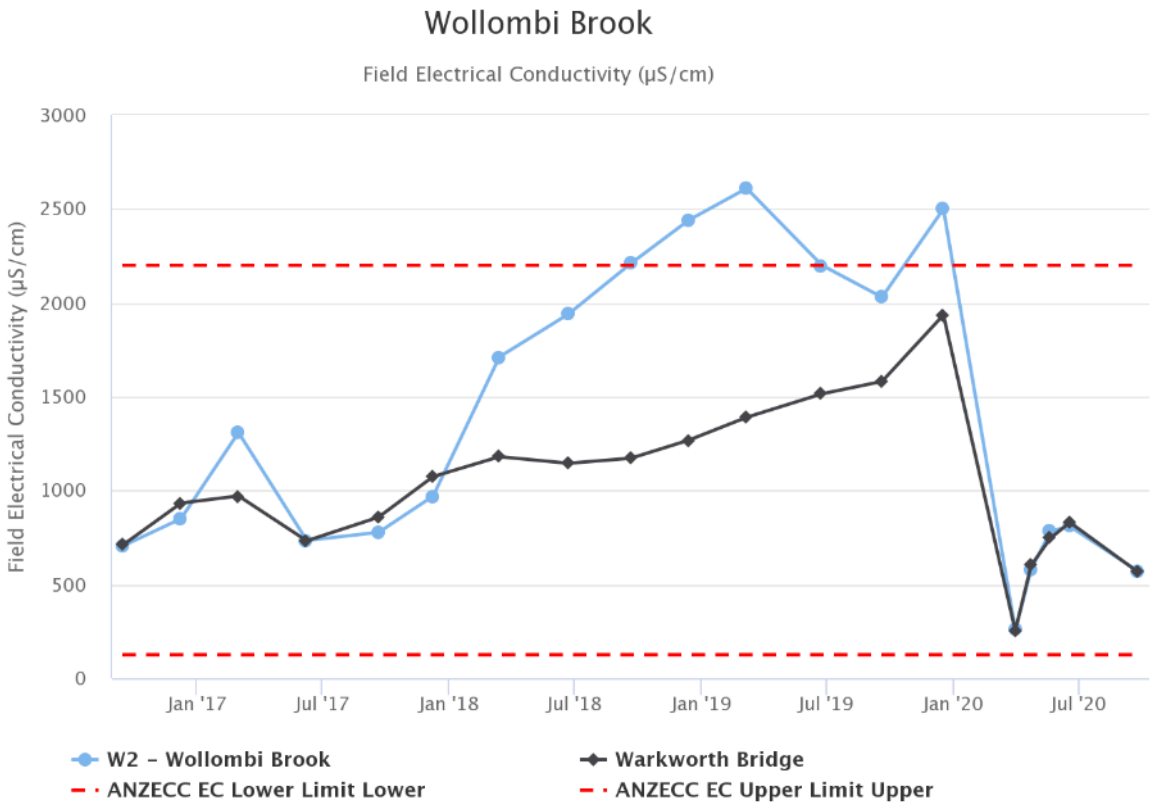


Figure 17 - Wollombi Brook Electrical Conductivity - September 2020

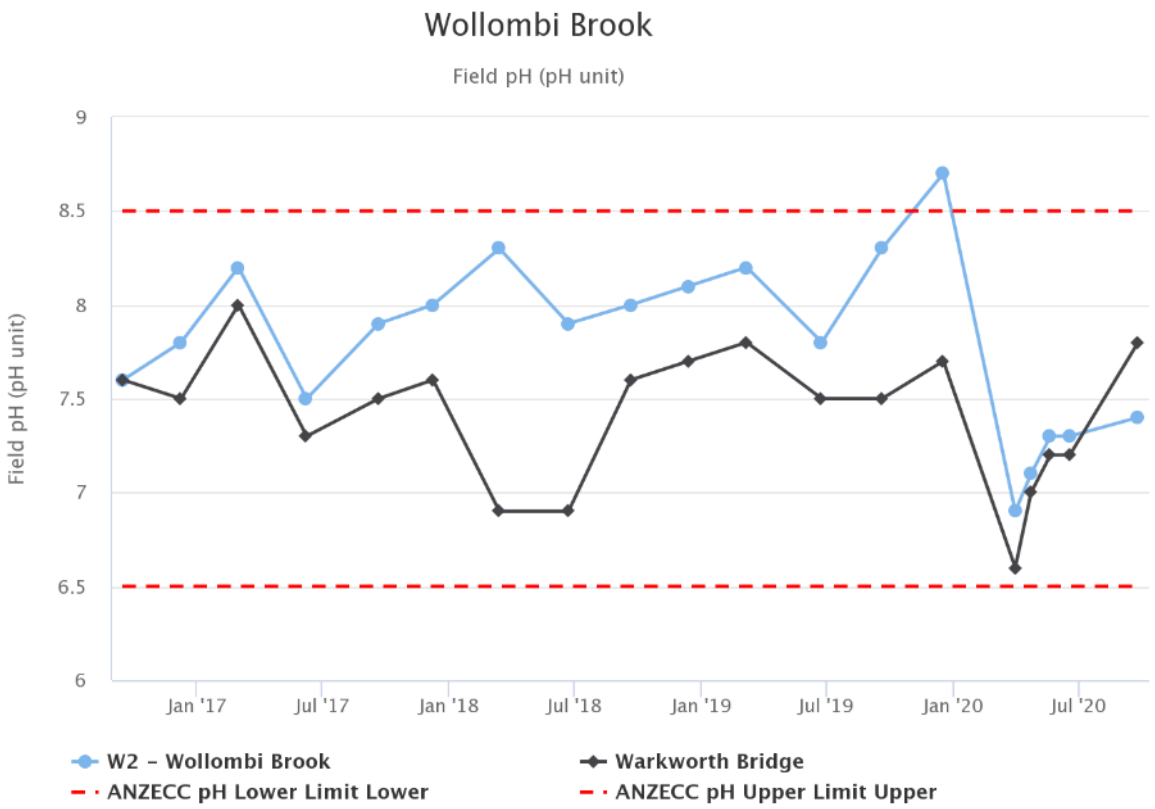


Figure 18 - Wollombi Brook pH - September 2020

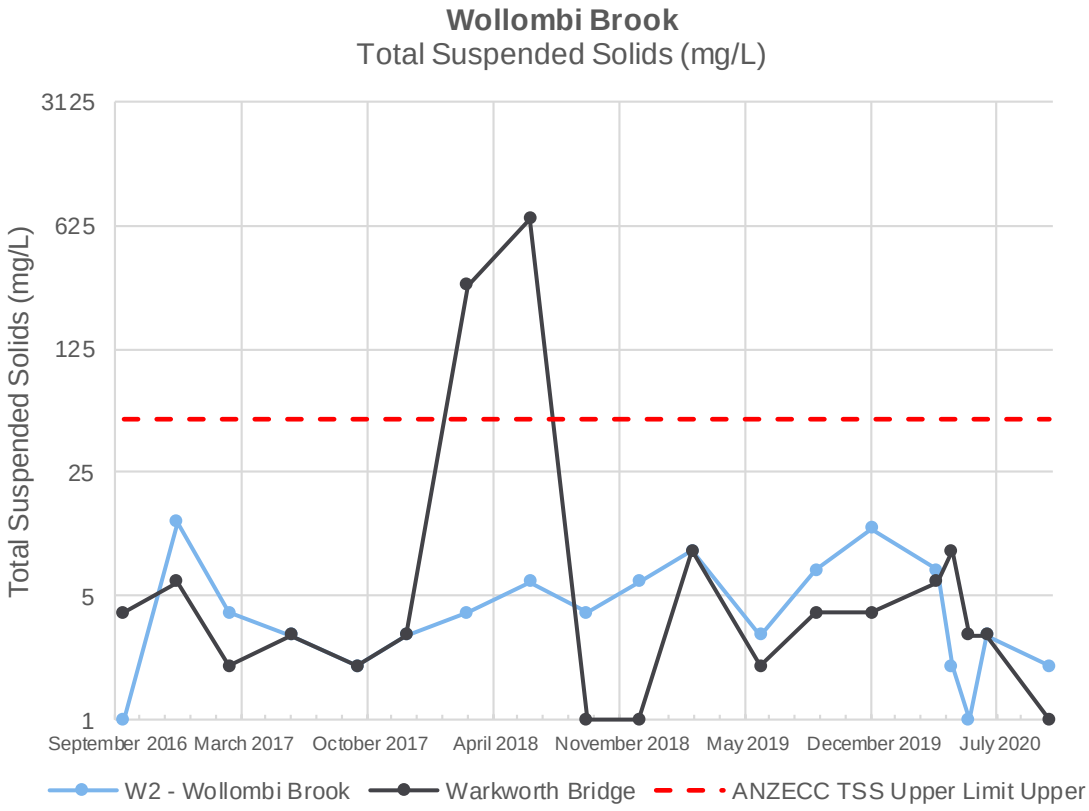


Figure 19 - Wollombi Brook total Suspended Solids - September 2020

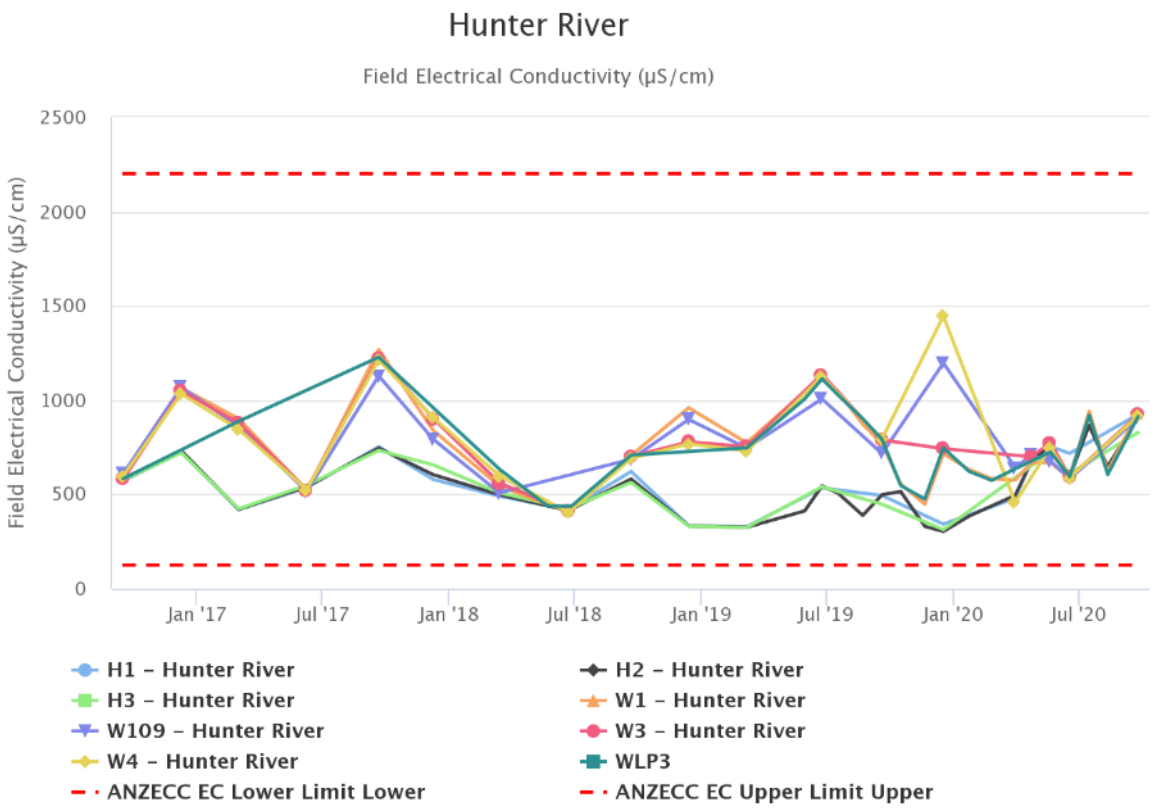


Figure 20 - Hunter River Electrical Conductivity - September 2020

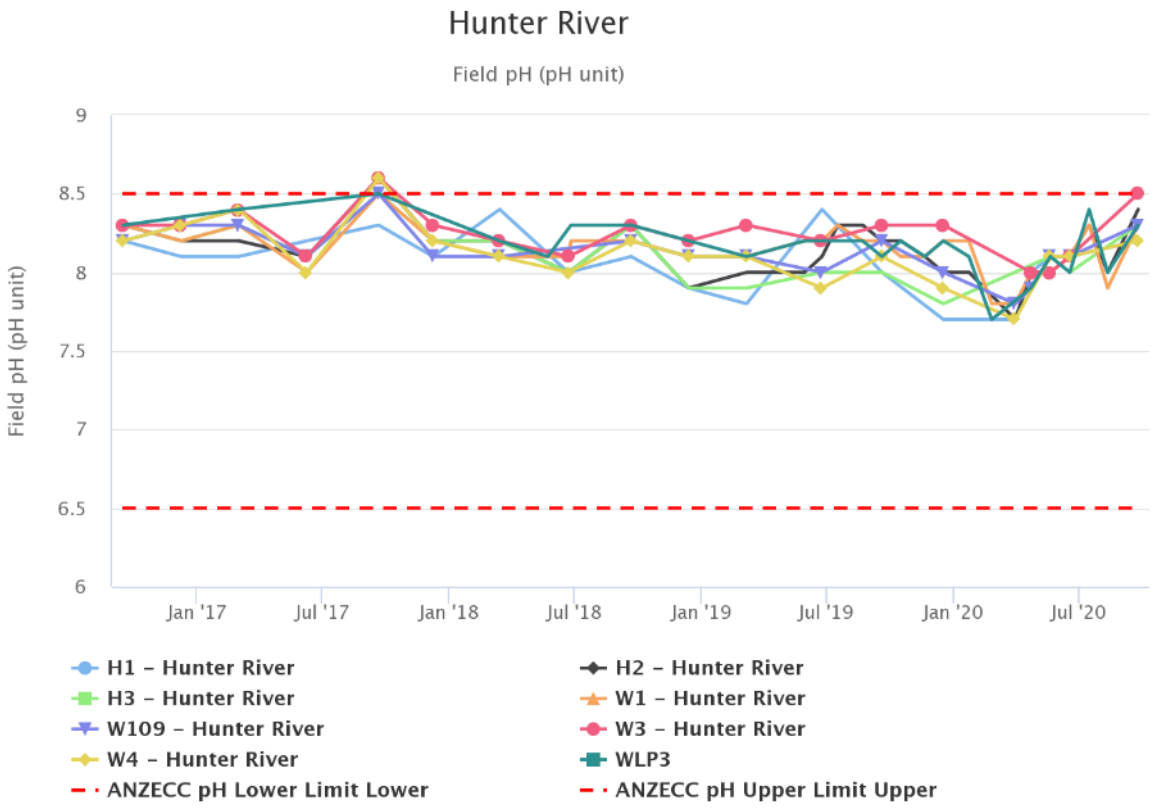


Figure 21 - Hunter River Electrical Conductivity - September 2020

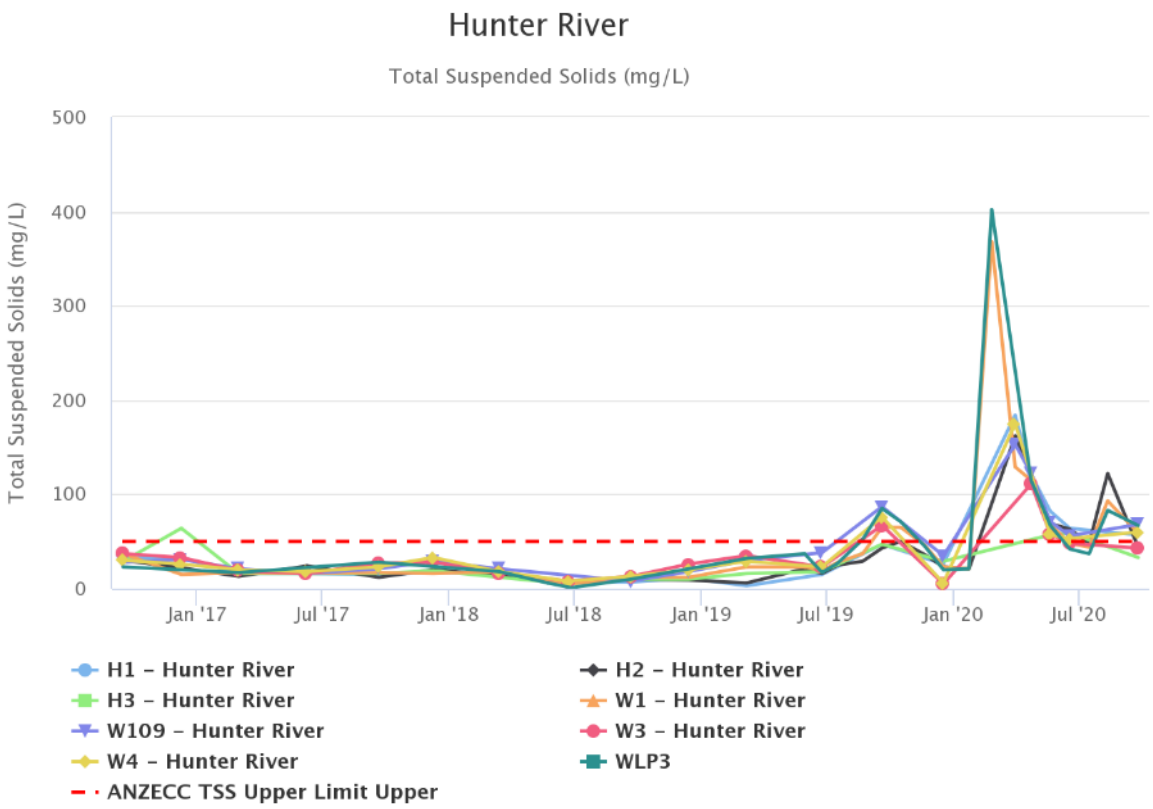


Figure 22 - Hunter River Total Suspended Solids - September 2020

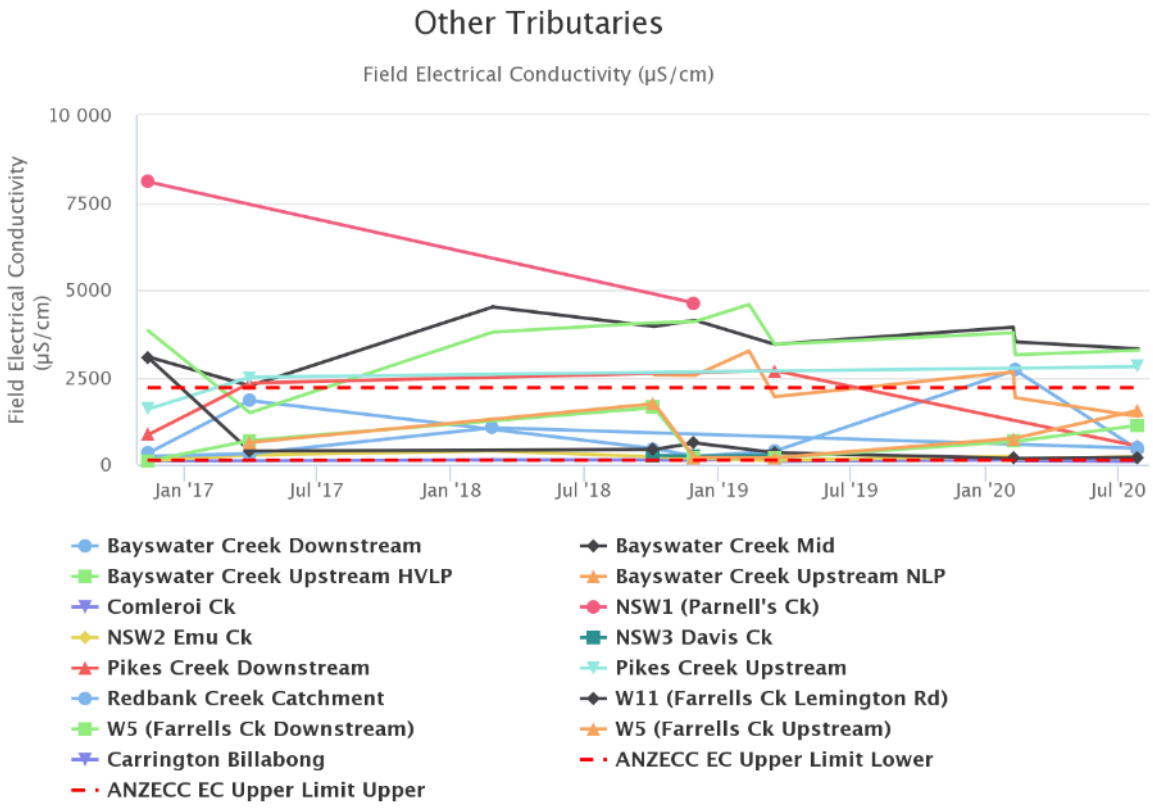


Figure 23 - Other Tributaries Electrical conductivity - September 2020

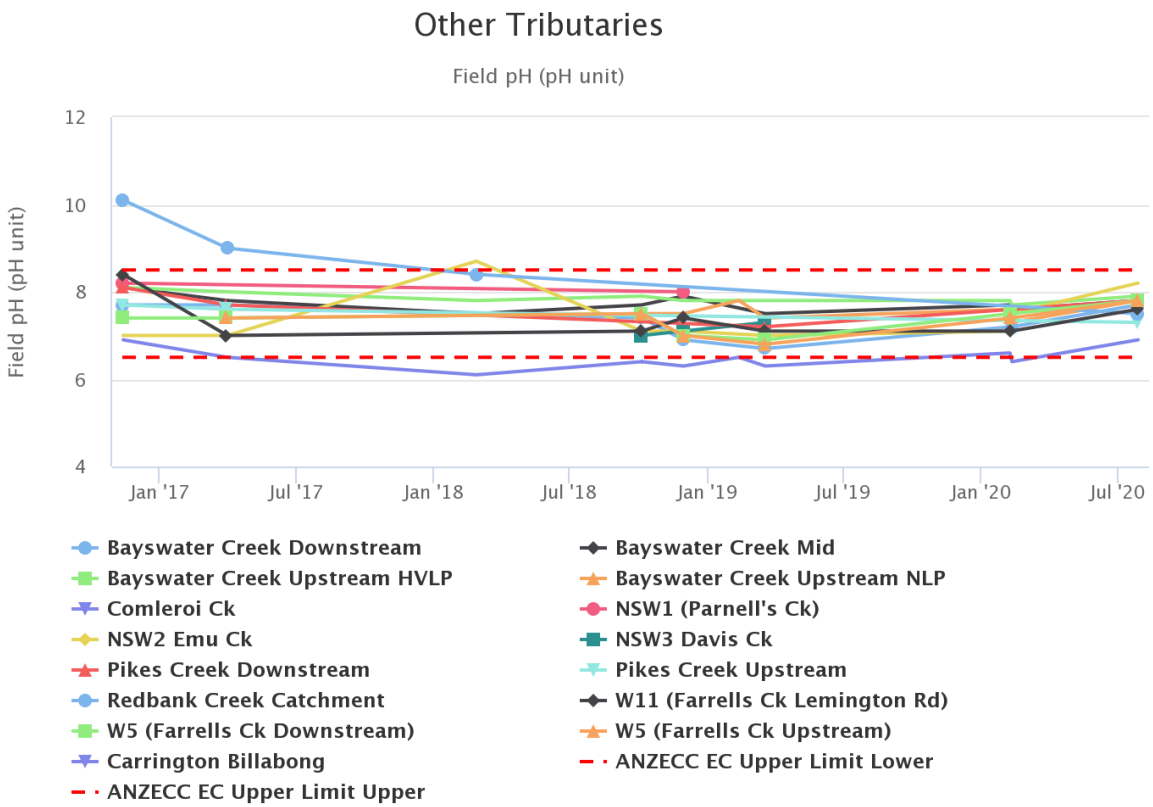


Figure 24 - Other Tributaries pH - September 2020

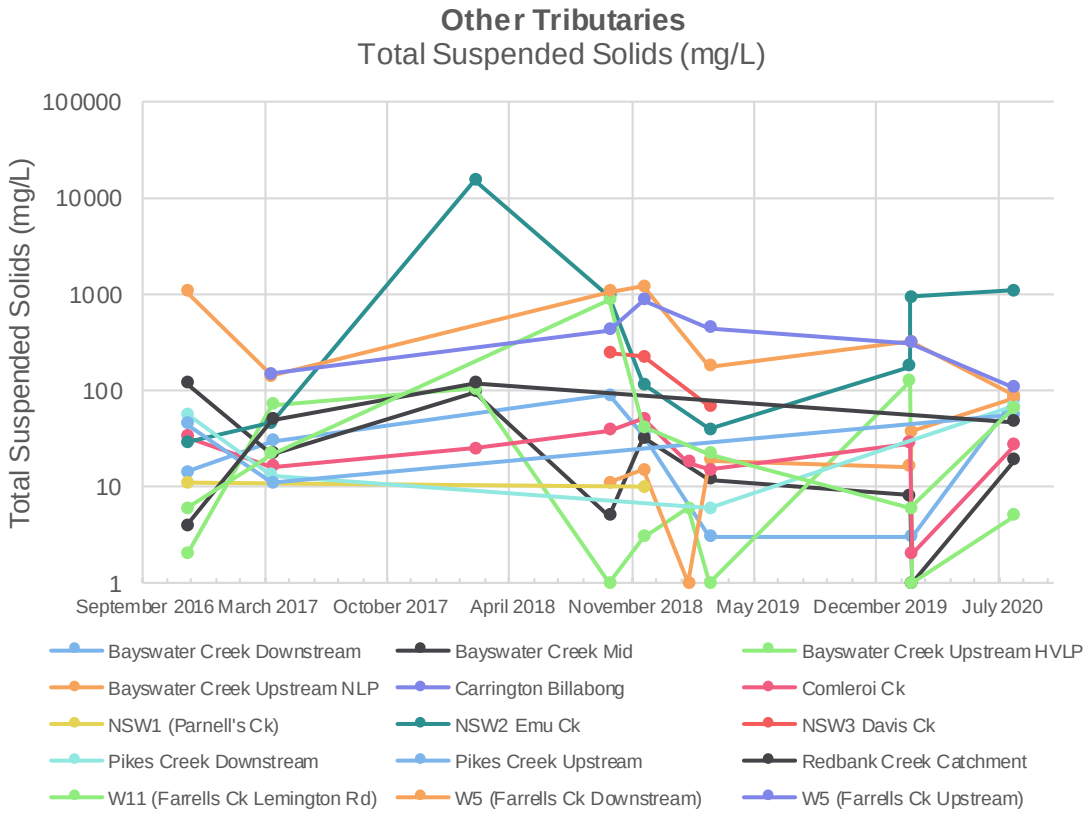


Figure 25 - Other Tributaries Total Suspended Solids - September 2020

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.

Current internal trigger limit breaches are summarised in **Table 2**.

Table 2 - Surface Water Triggers Q3 2020

Site	Date	Trigger Limit Breached	Response Action
NSW2 (Emu Ck)	27/07/2020	TSS	Second breach - Investigation into exceedance ongoing
W11 (Farrells Ck)	27/07/2020	TSS	First breach - Investigation into exceedance commenced
Pikes Creek Upstream	27/07/2020	TSS	First breach - Investigation into exceedance commenced
Pikes Creek Downstream	27/07/2020	TSS	First breach - Investigation into exceedance commenced
Bayswater Creek Downstream	27/07/2020	TSS	First breach – Investigation into exceedance commenced
H1 Hunter River	24/09/2020	TSS	Third breach - Investigation into exceedance commenced
W4 Hunter River	24/09/2020	TSS	Third breach - Investigation into exceedance ongoing
W1 Hunter River	24/09/2020	TSS	First breach - Investigation into exceedance commenced
W109 Hunter River	24/09/2020	TSS	Third breach - Investigation into exceedance ongoing

3.2 Site Water Use

Under water allocation licenses issued by Water NSW, HVO is permitted to extract water from the Hunter River. During the reporting period, HVO extracted 1.6 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.

During the reporting period, HVO discharged 0ML of water under the HRSTS.

3.4 Groundwater Monitoring Results

Groundwater monitoring is undertaken on a quarterly basis in accordance with the HVO Water Management Plan and Groundwater Monitoring Programme. Groundwater monitoring sites are shown in **Figure 26**. **Figure 27** to **Figure 83** show the long-term trends (2016-current) for groundwater bores monitored at HVO.

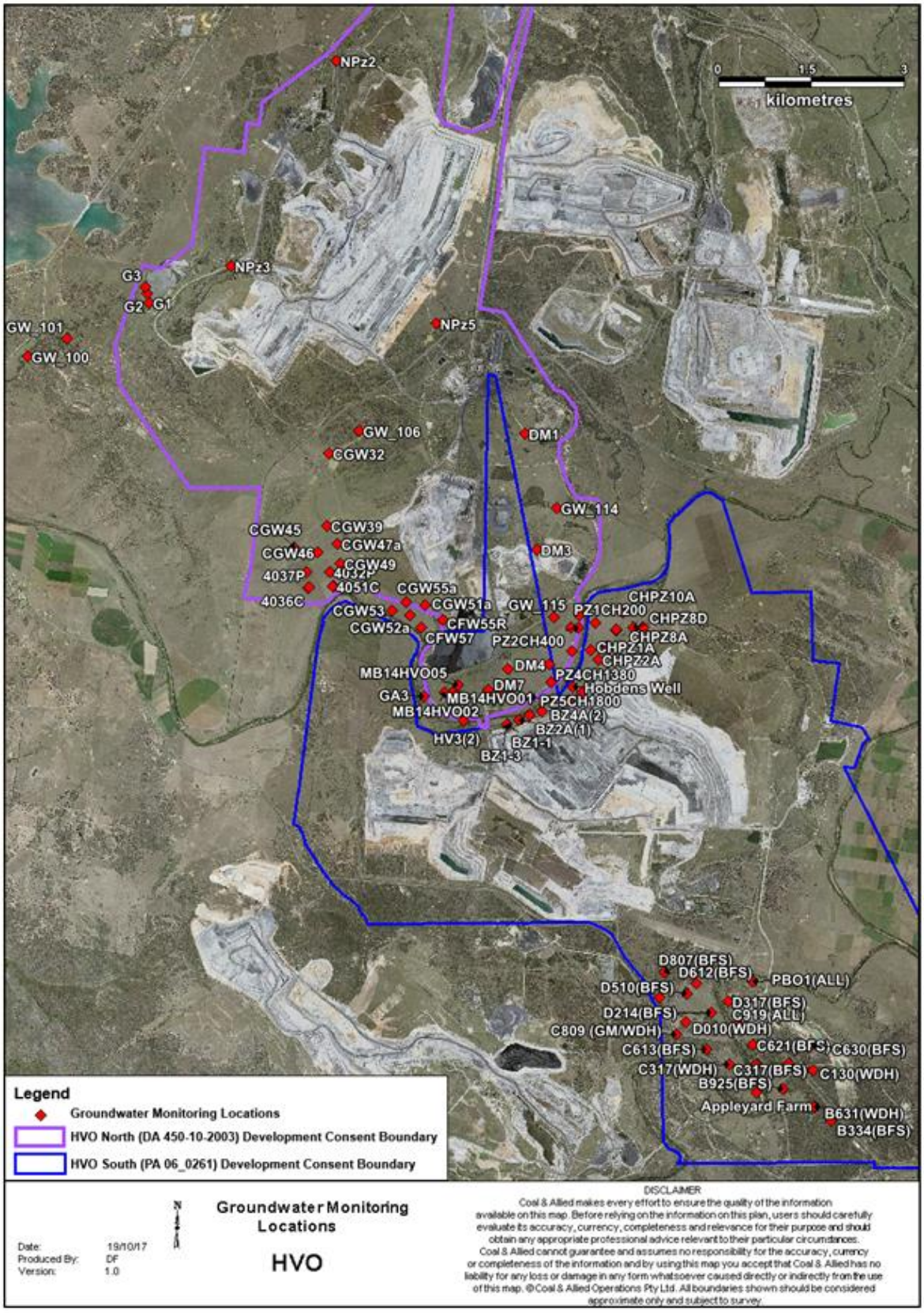


Figure 26 Groundwater monitoring Locations at HVO

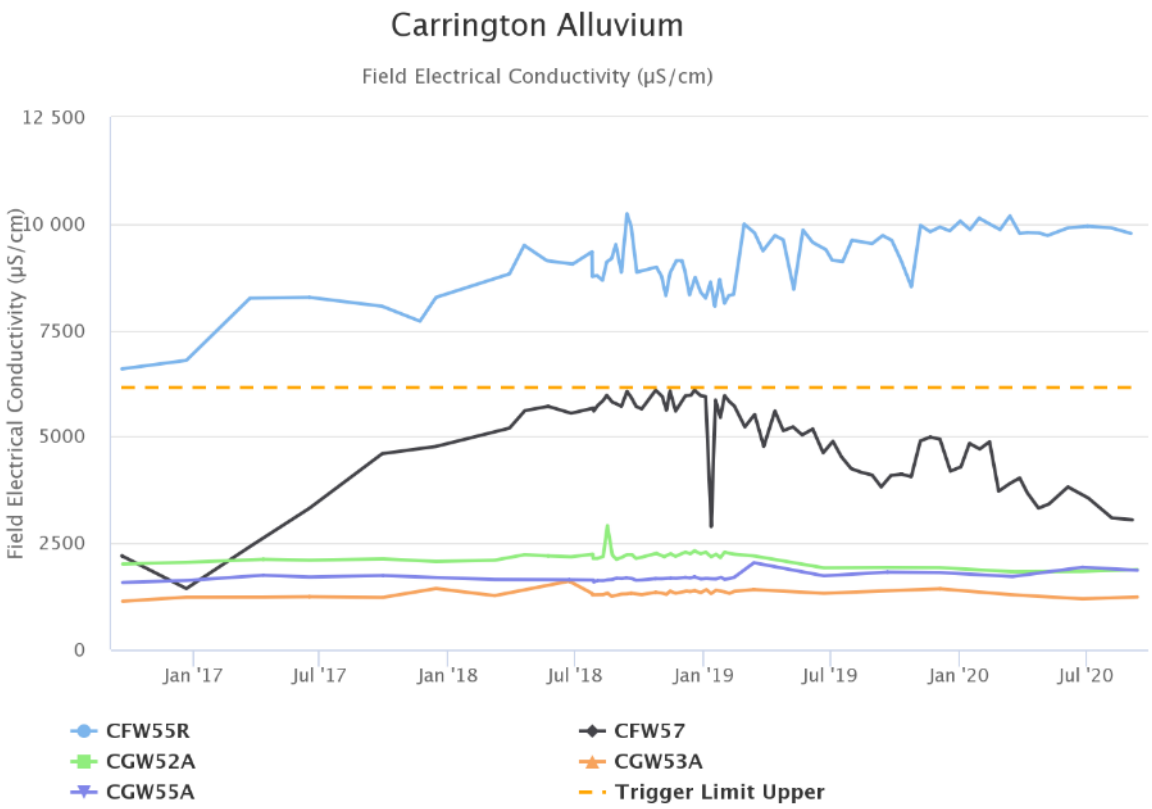


Figure 27 - Carrington Alluvium Field Electrical Conductivity Trend - September 2020

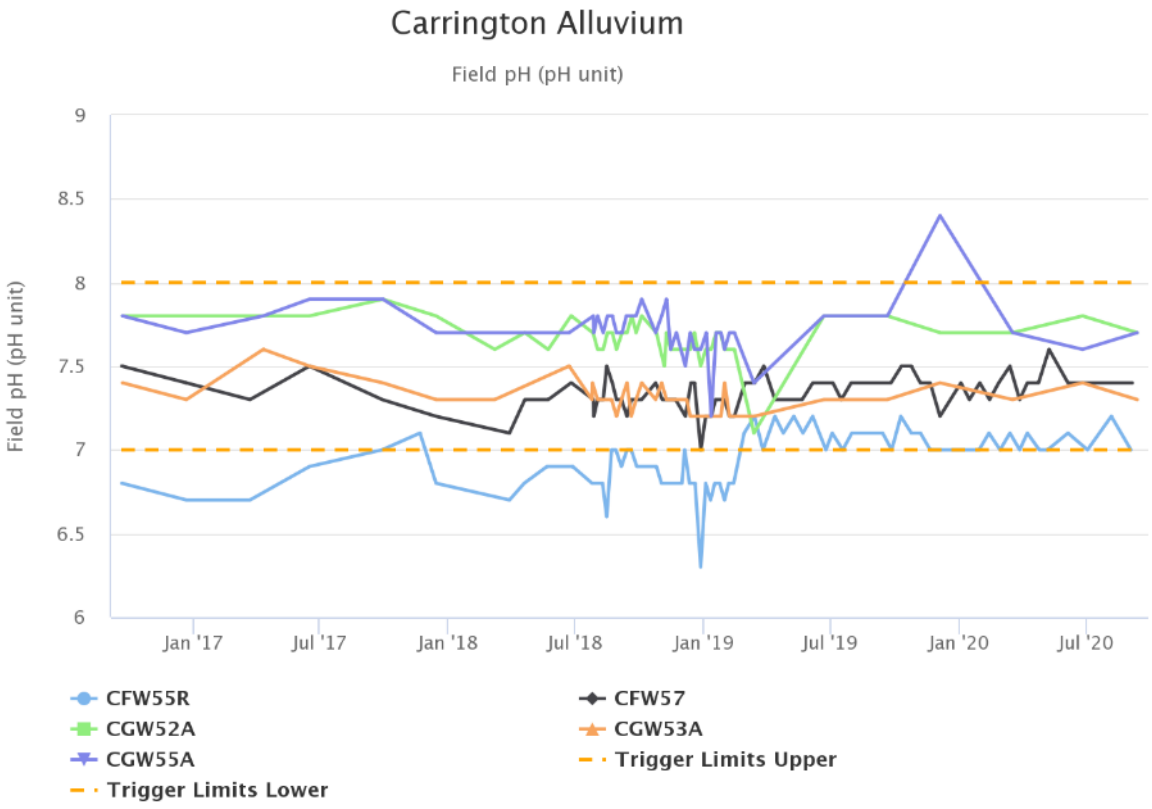


Figure 28 - Carrington Alluvium Field pH trend - September 2020

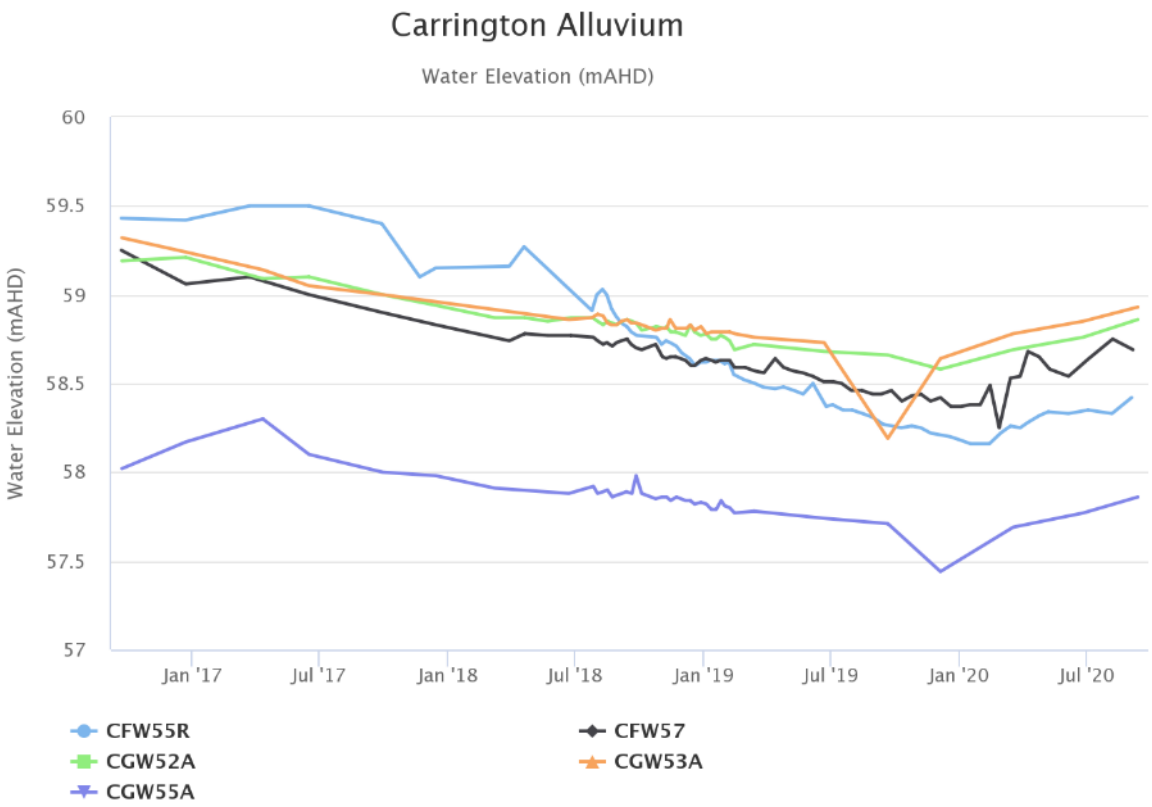
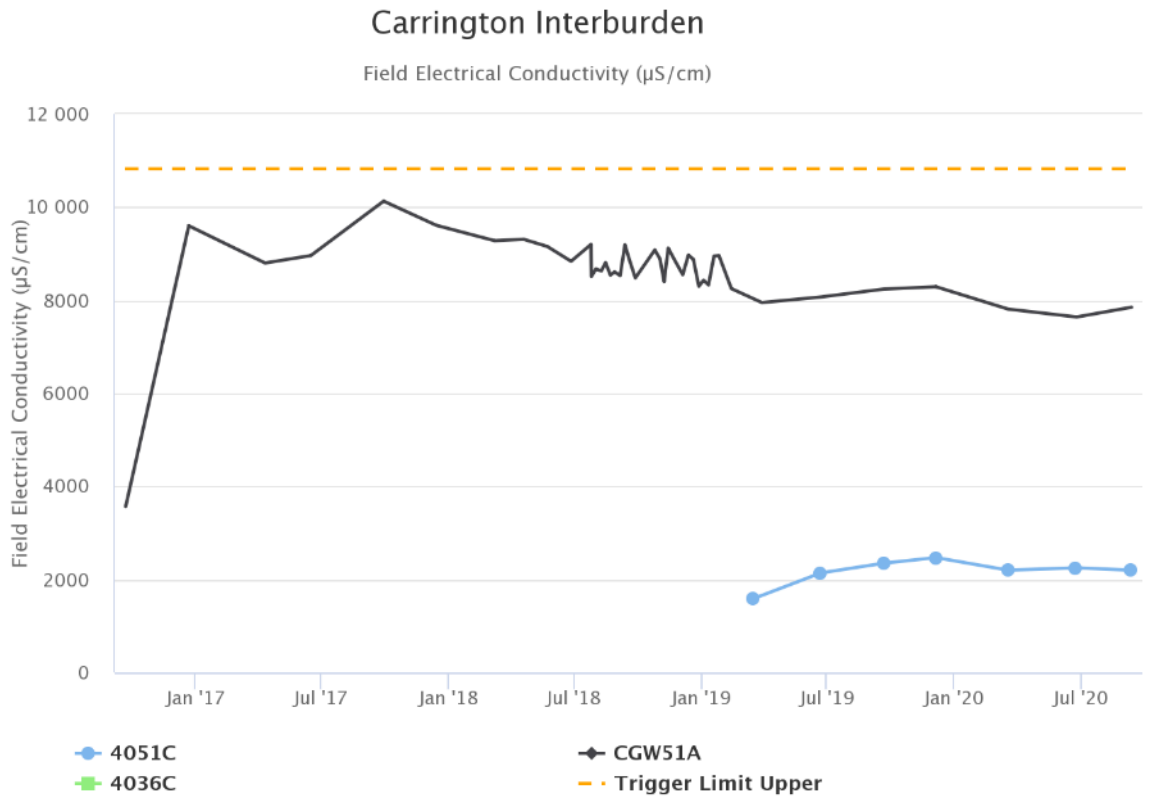


Figure 29 - Carrington Alluvium Standing Water Level - September 2020



Note: 4036C is dry or produced insufficient water for a sample.

Figure 30 - Carrington Interburden Field Electrical Conductivity Trend - September 2020

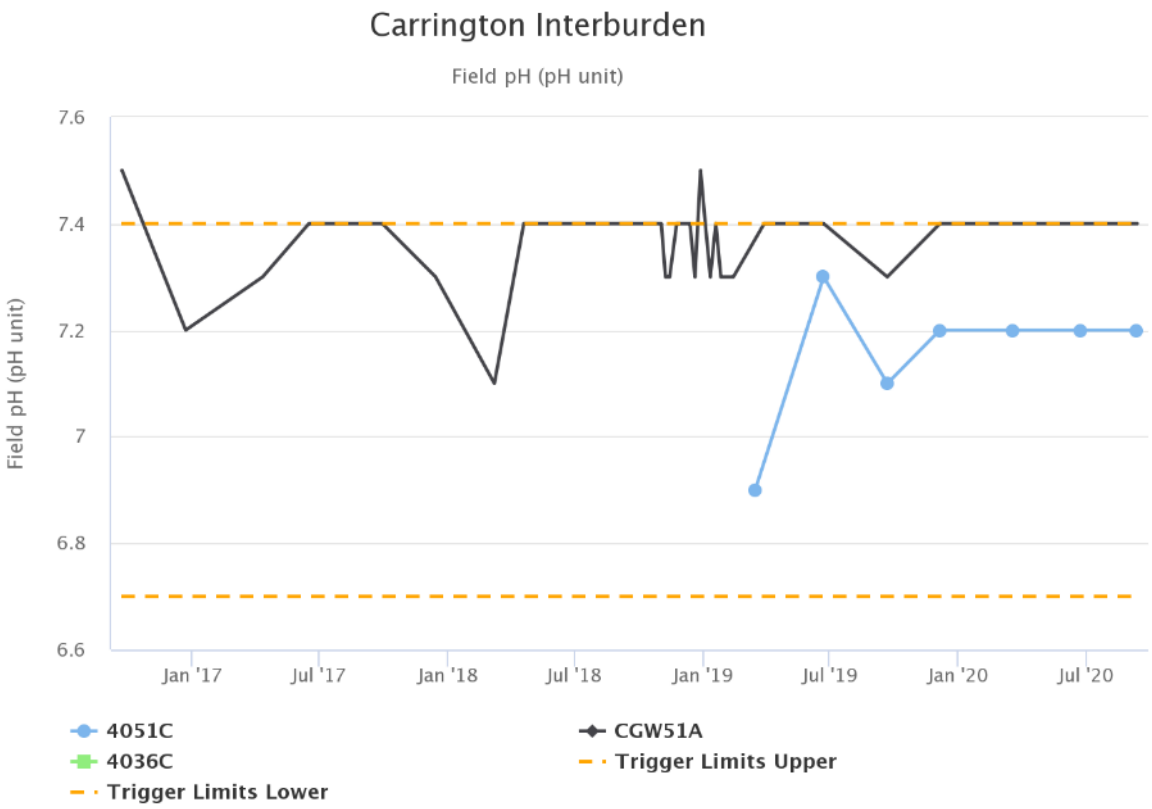


Figure 31 - Carrington Interburden Field pH Trend - September 2020

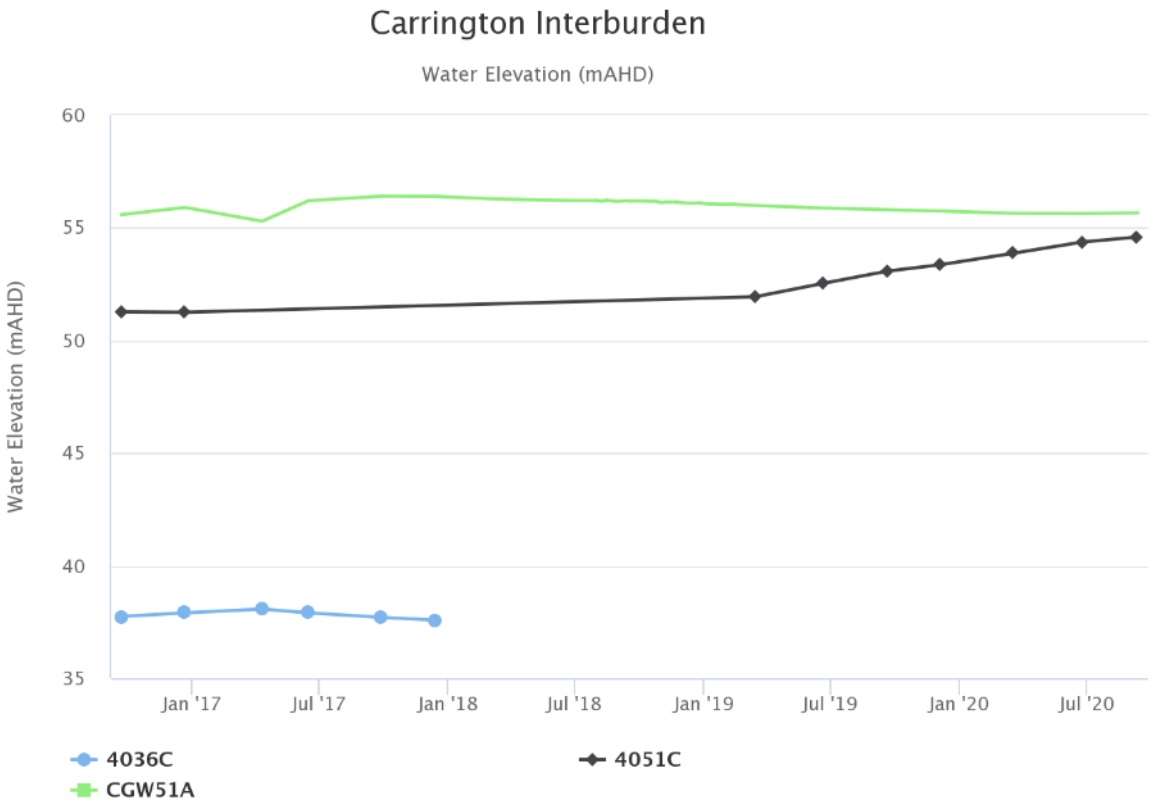


Figure 32 - Carrington Interburden Standing Water Level - September 2020

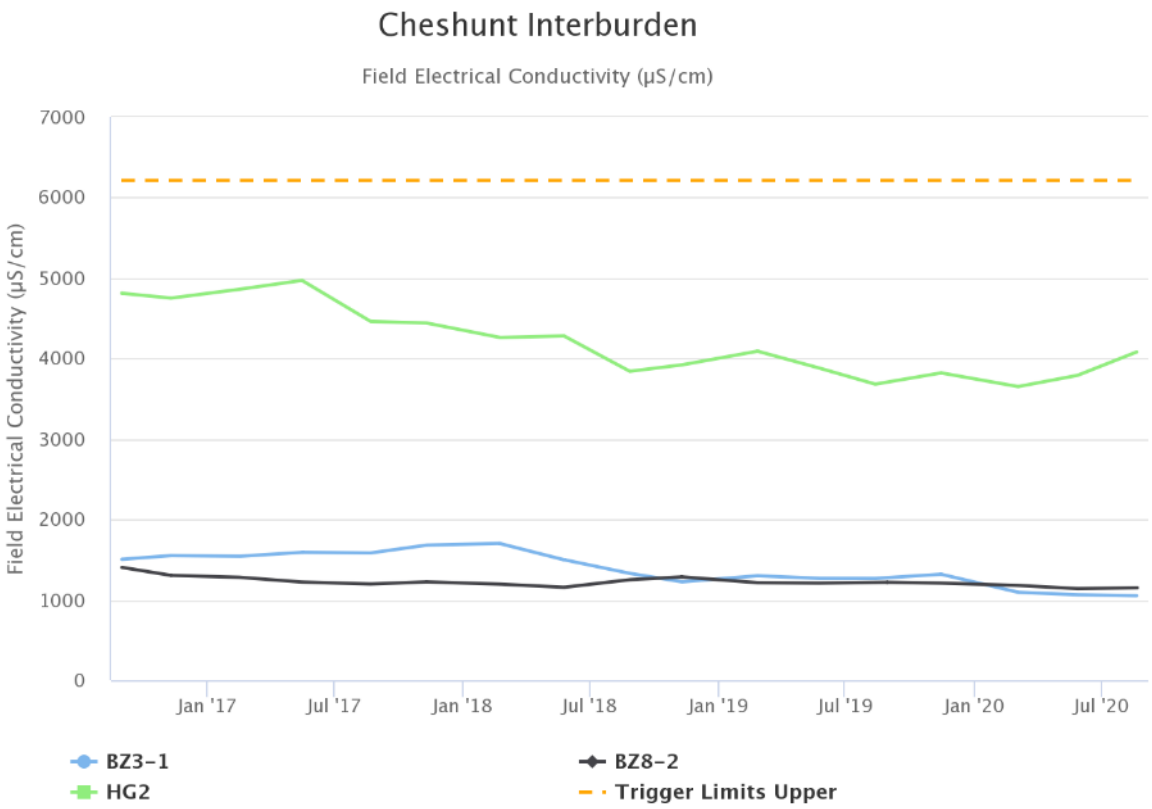


Figure 33 - Cheshunt Interburden Field Electrical Conductivity Trend - September 2020

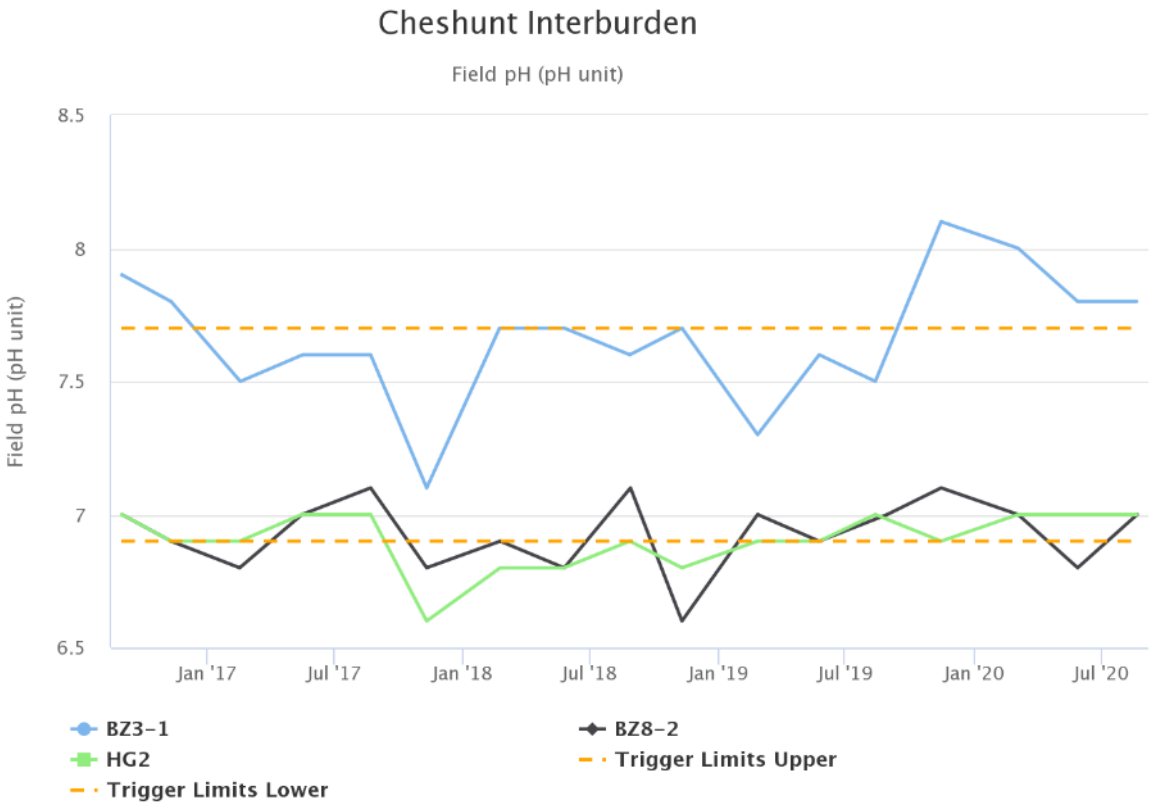


Figure 34 - Cheshunt Interburden Field pH Trend - September 2020

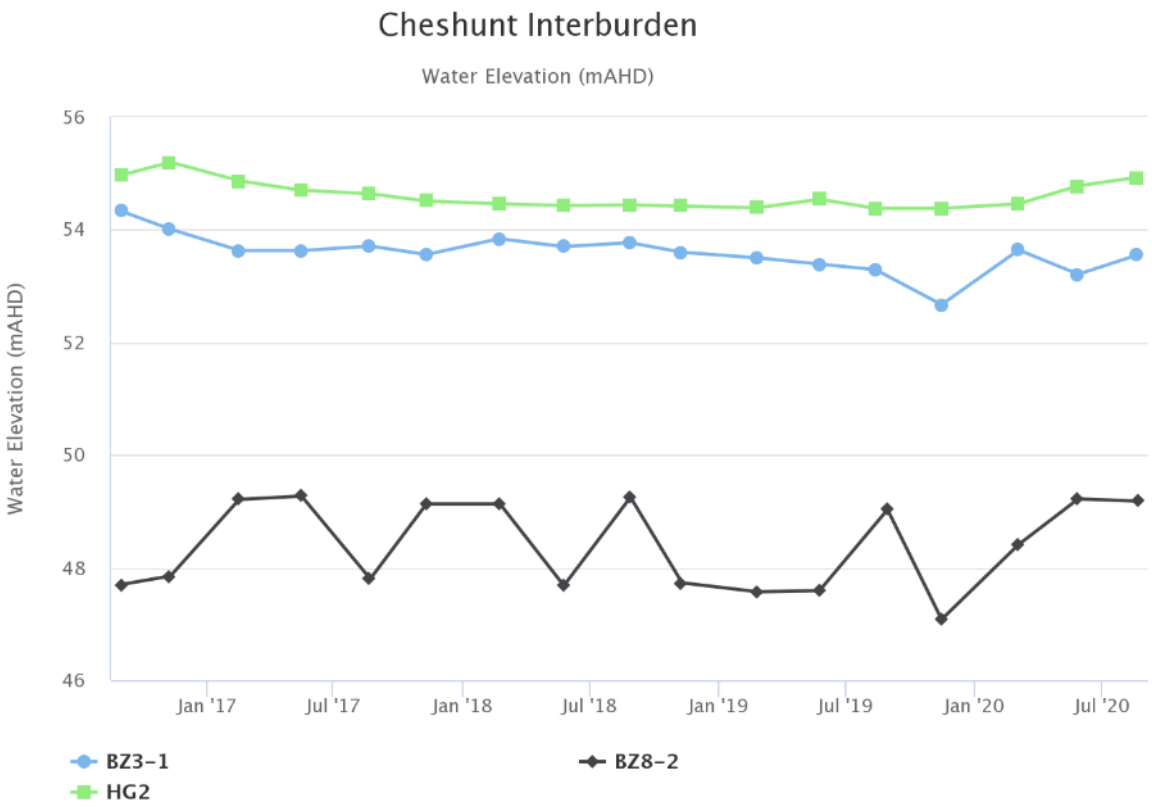


Figure 35 - Cheshunt Interburden Standing Water level - September 2020

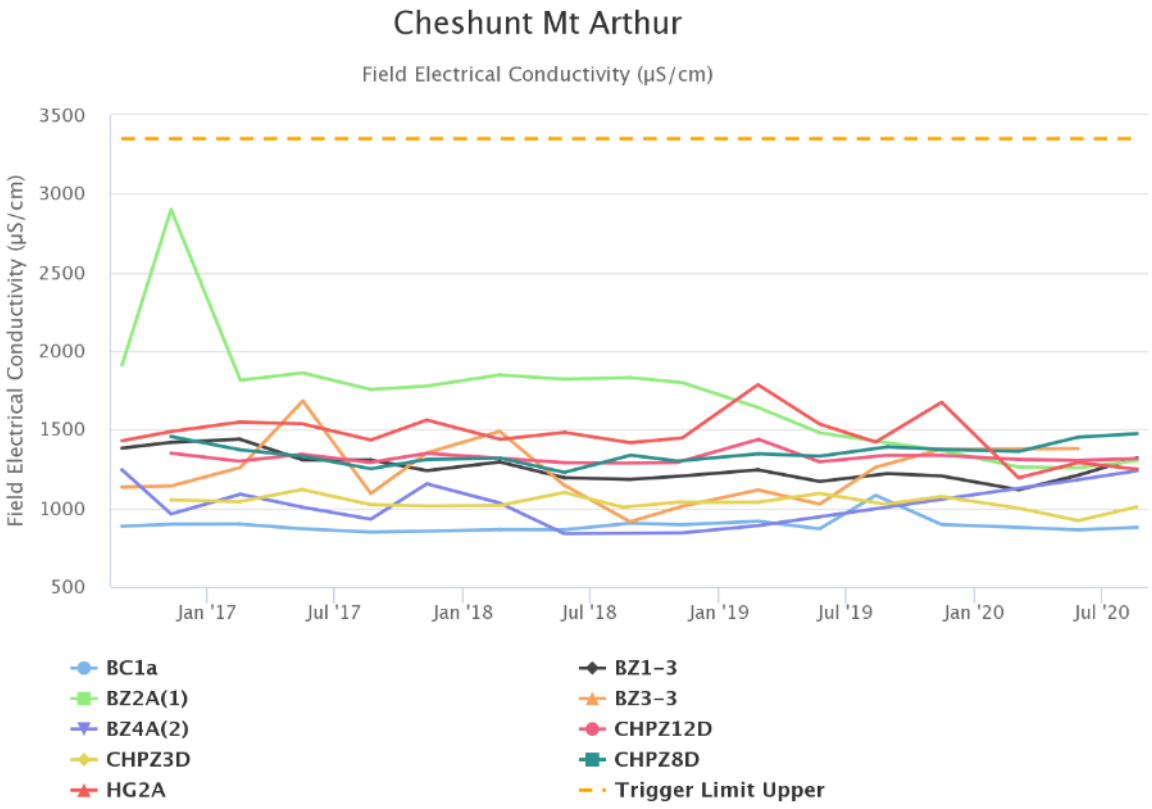


Figure 36 - Cheshunt Mt Arthur Field Electrical Conductivity Trend - September 2020

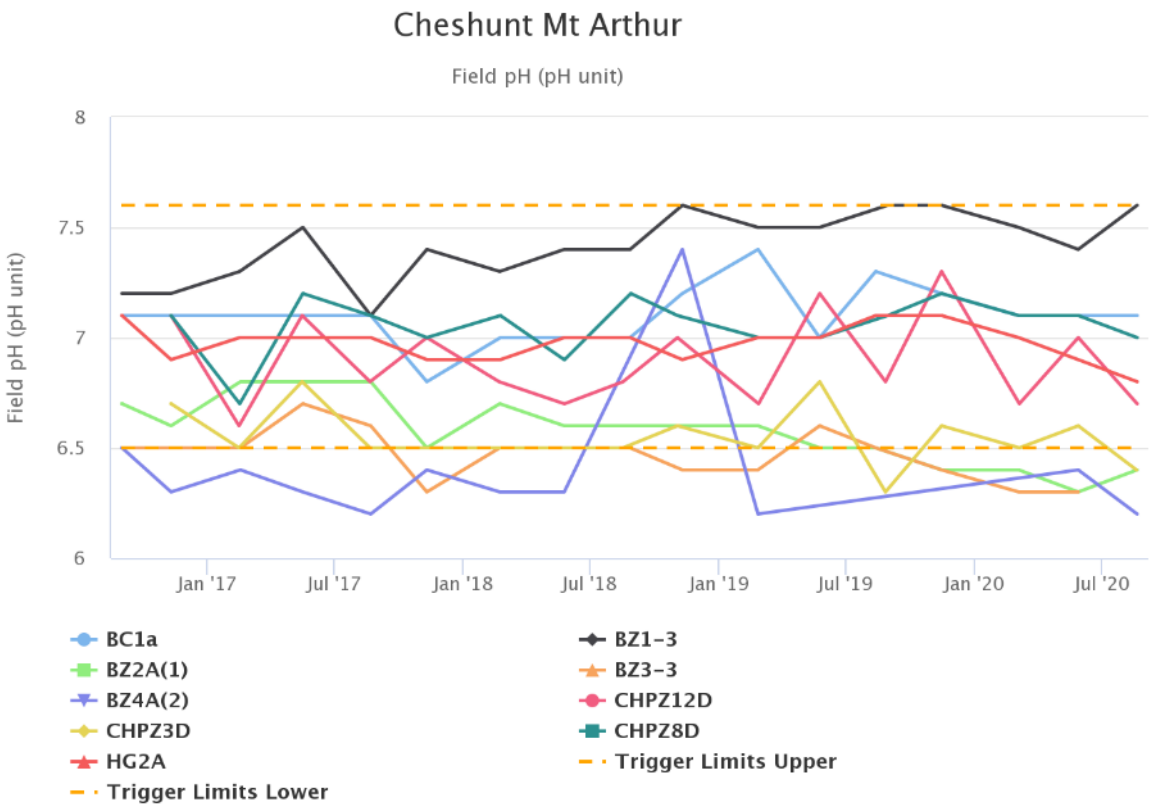


Figure 37 - Cheshunt Mt Arthur Field pH Trend - September 2020

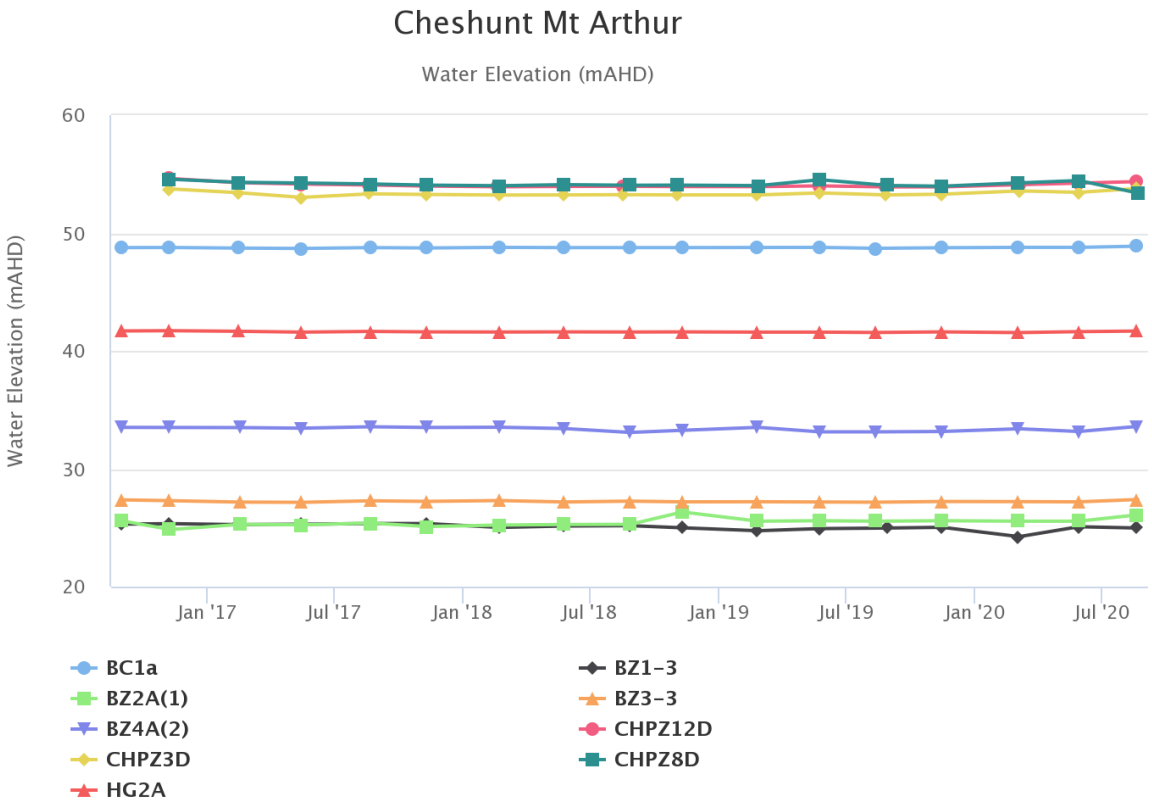


Figure 38 - Cheshunt Mt Arthur Standing Water Level - September 2020

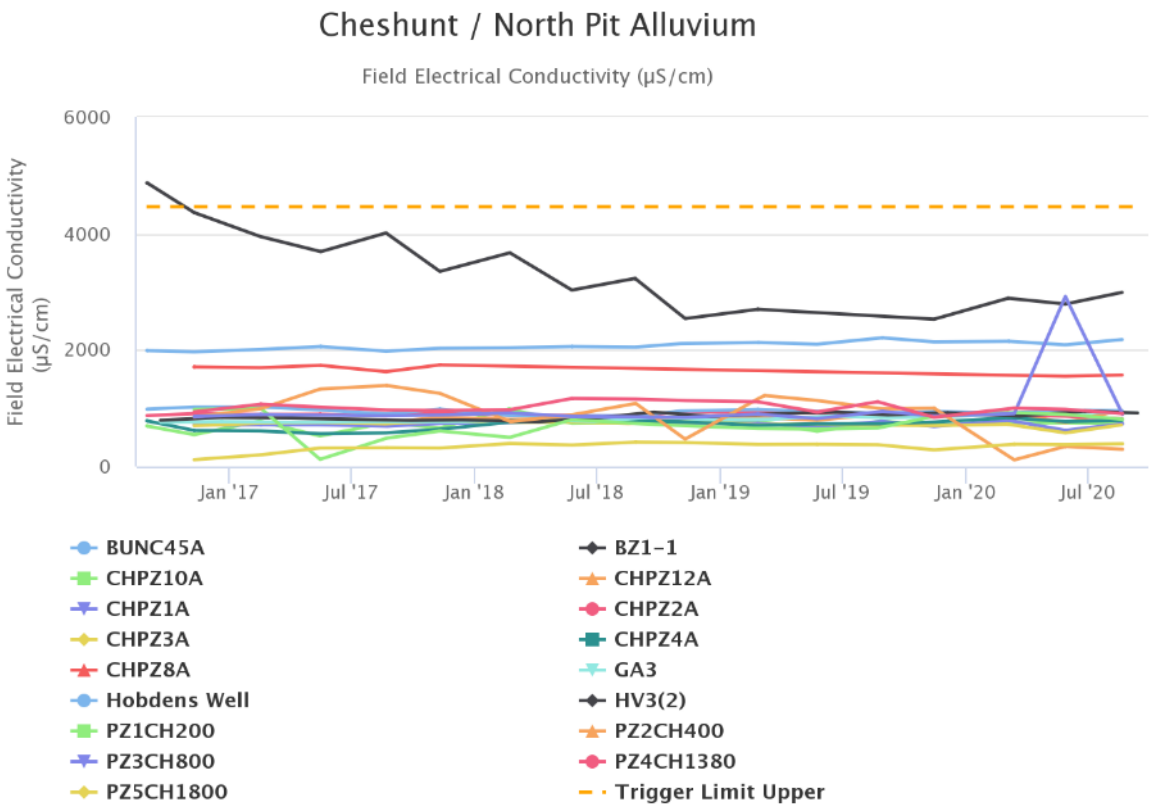


Figure 39 - Cheshunt North Pit Alluvium Field Electrical Conductivity Trend - September 2020

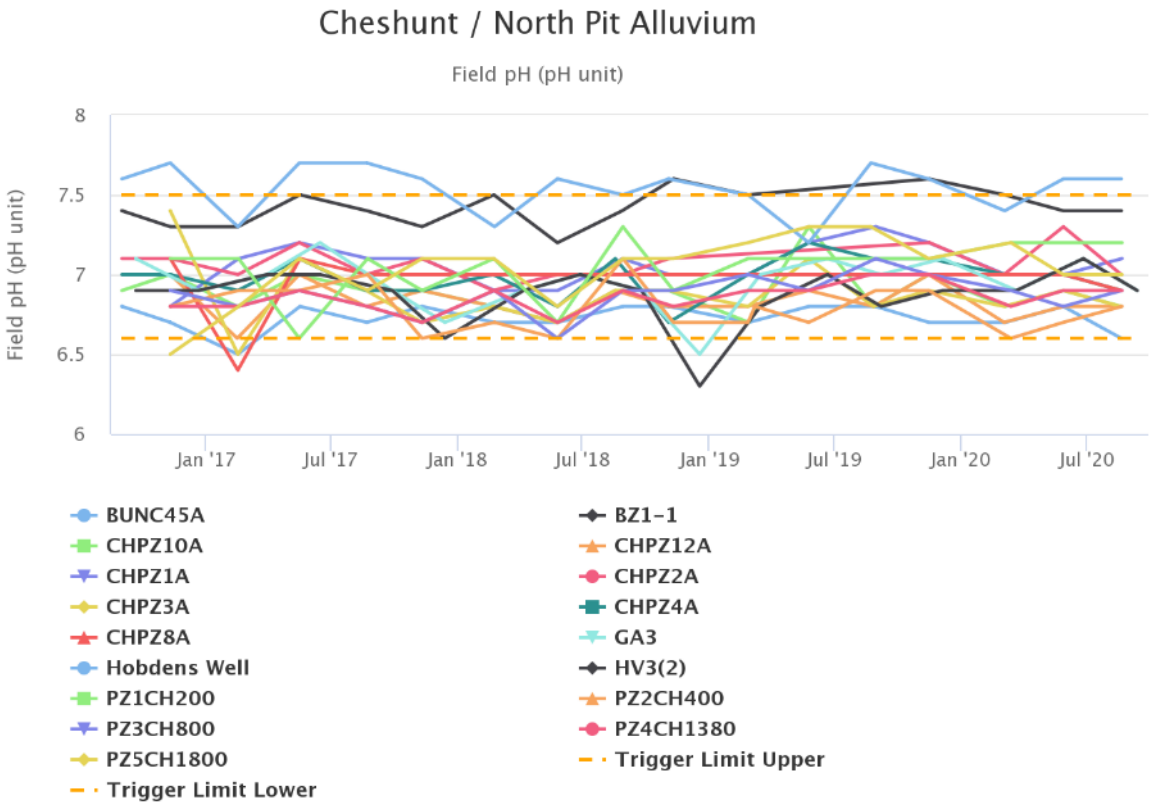


Figure 40 - Cheshunt North Pit Alluvium Field pH Trend - September 2020

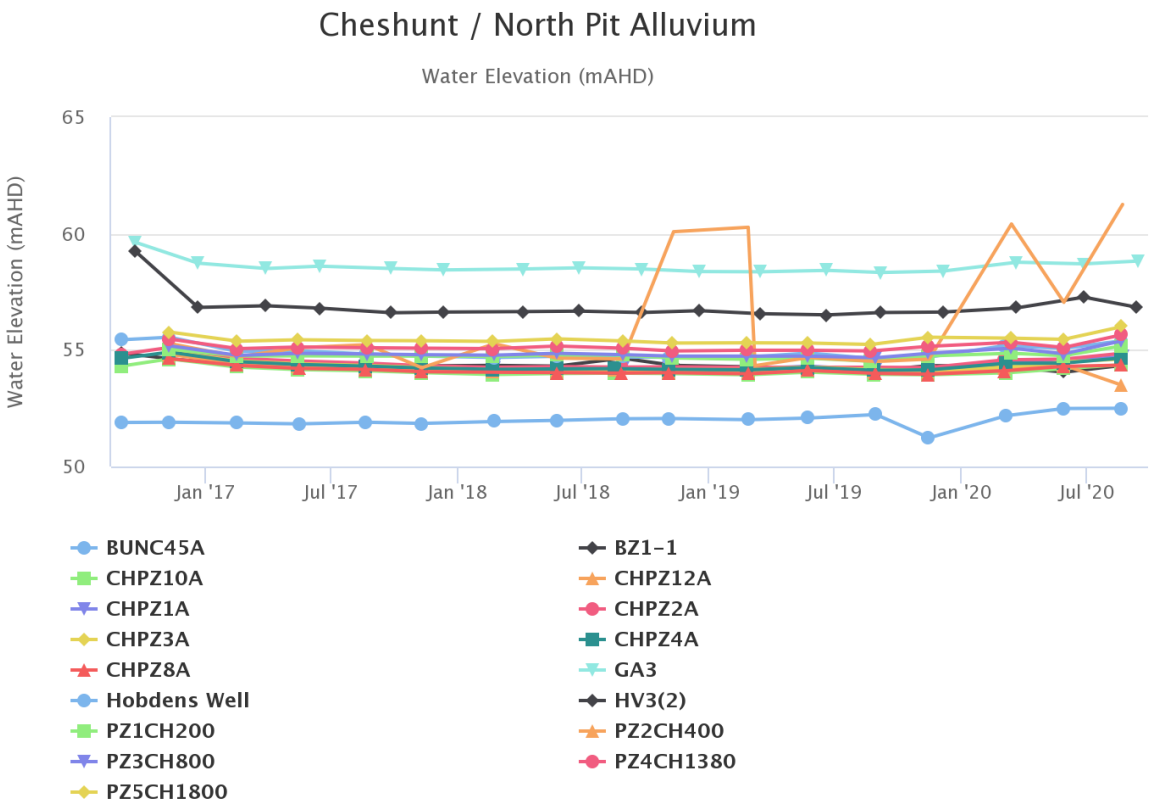


Figure 41 - Cheshunt North Pit Alluvium Standing Water Level - September 2020

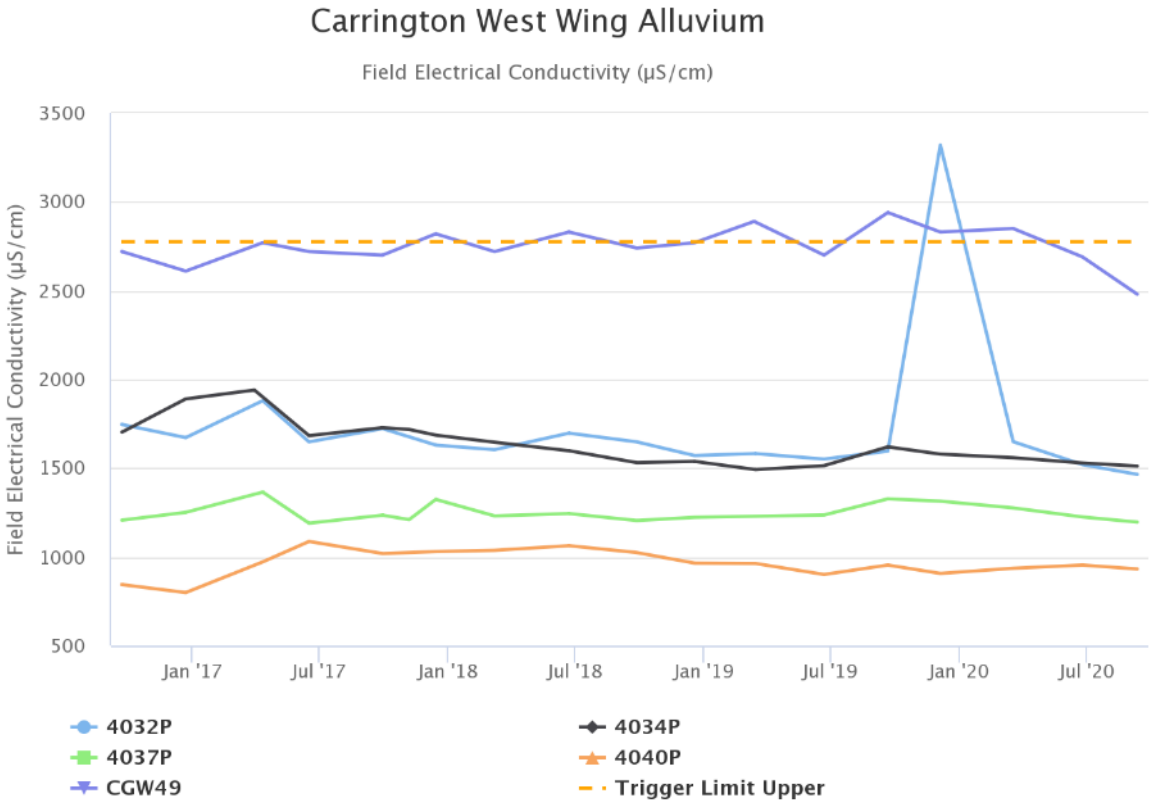


Figure 42 - Carrington West Wing Alluvium Field Electrical Conductivity Trend - September 2020

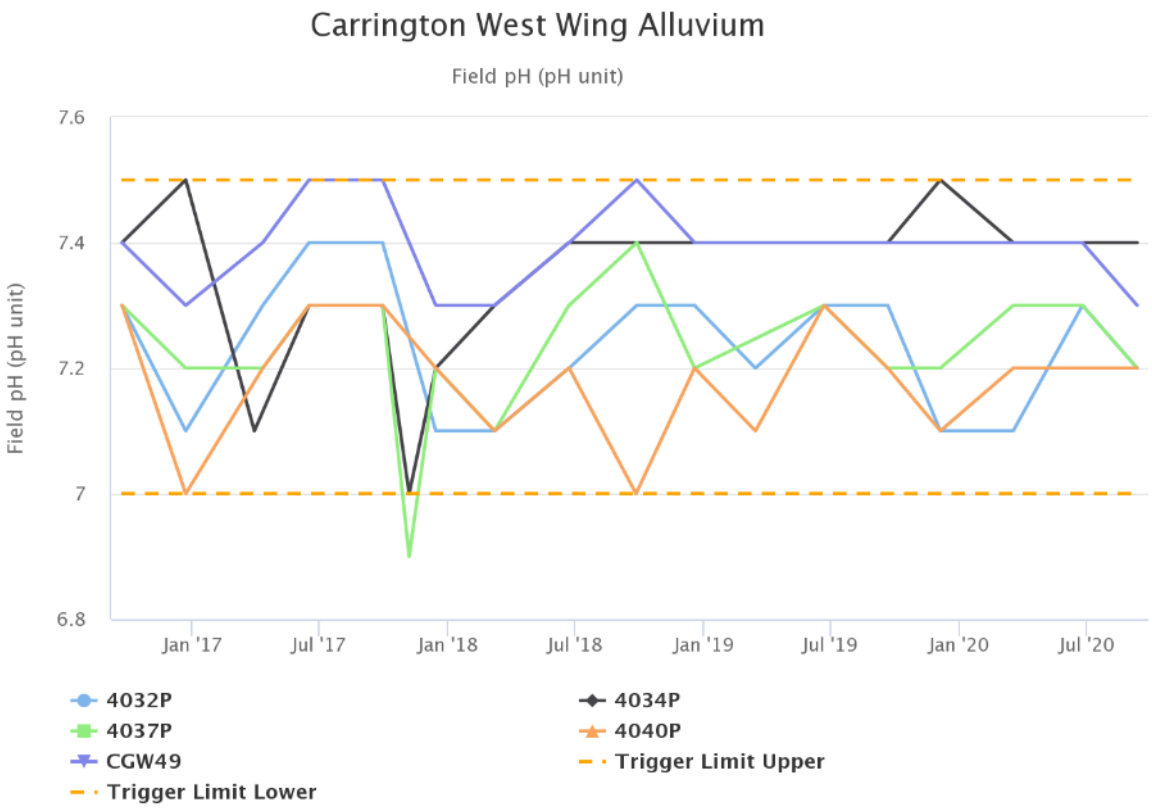


Figure 43 - Carrington West Wing Alluvium Field pH Trend - September 2020

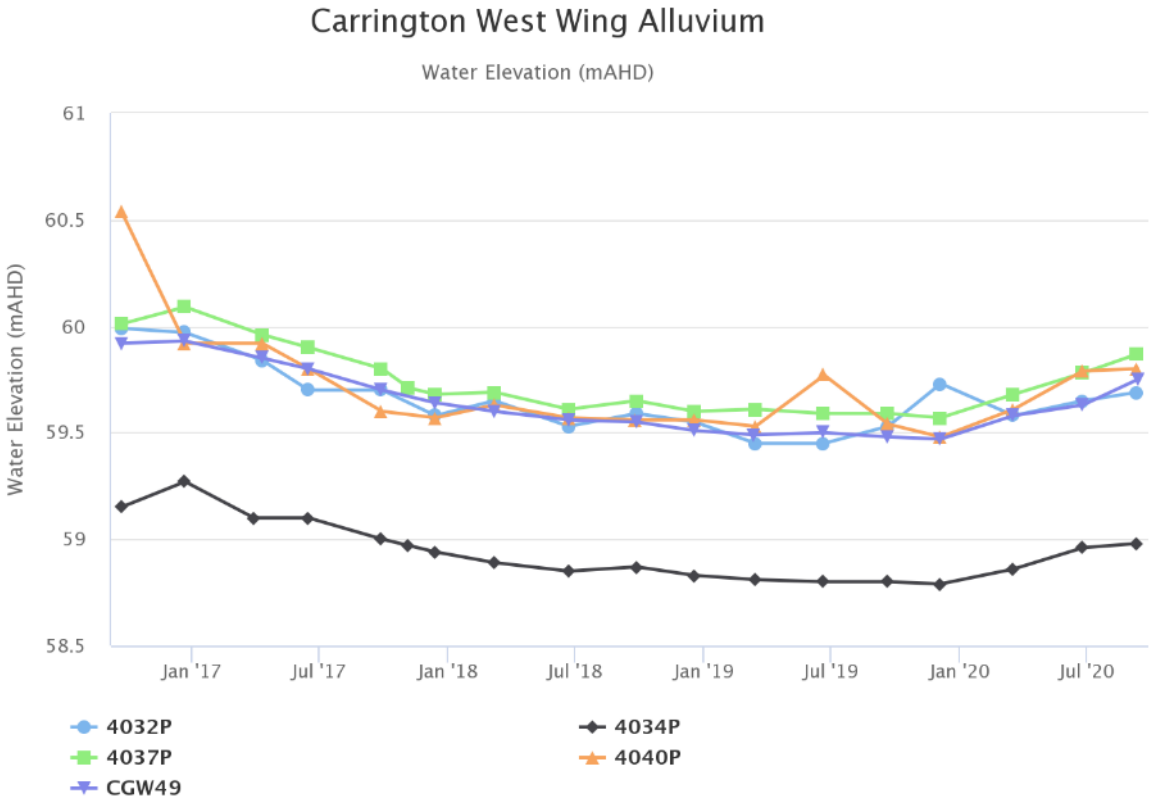


Figure 44 - Carrington West Wing Alluvium Standing Water Level - September 2020

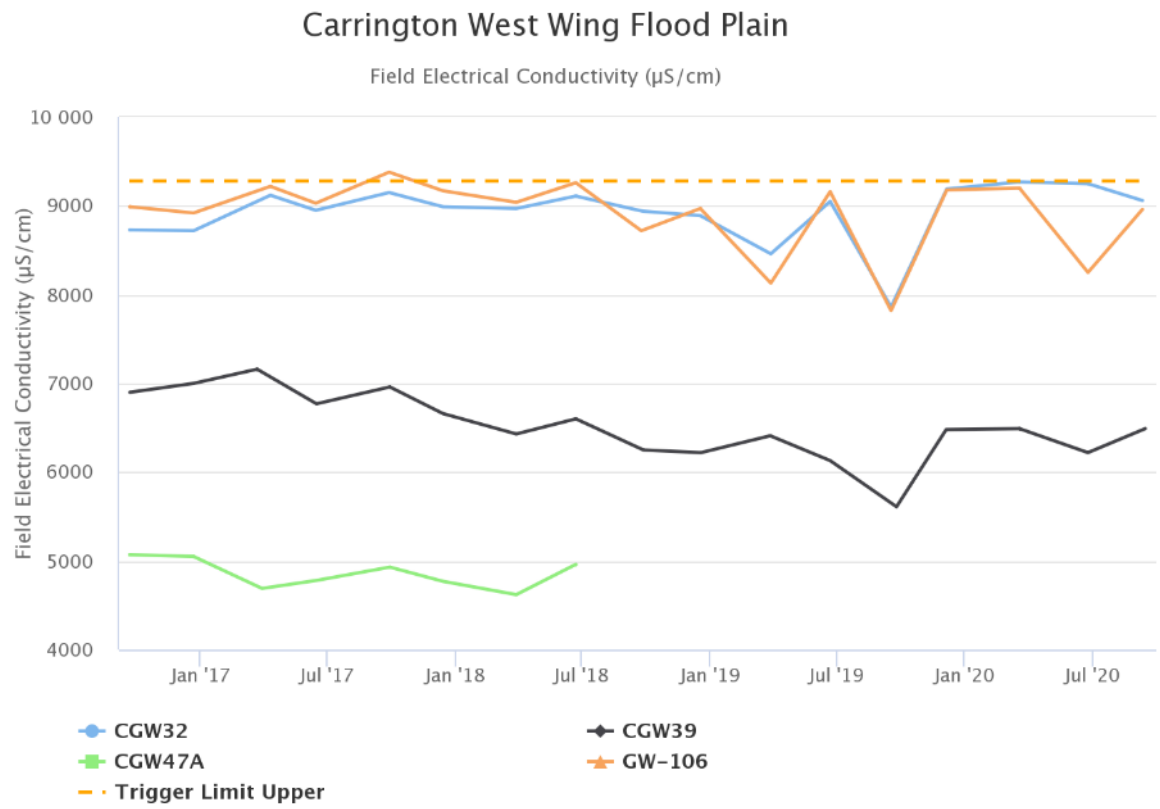


Figure 45 - Carrington West Wing Flood Plain Field Electrical Conductivity Trend - September 2020

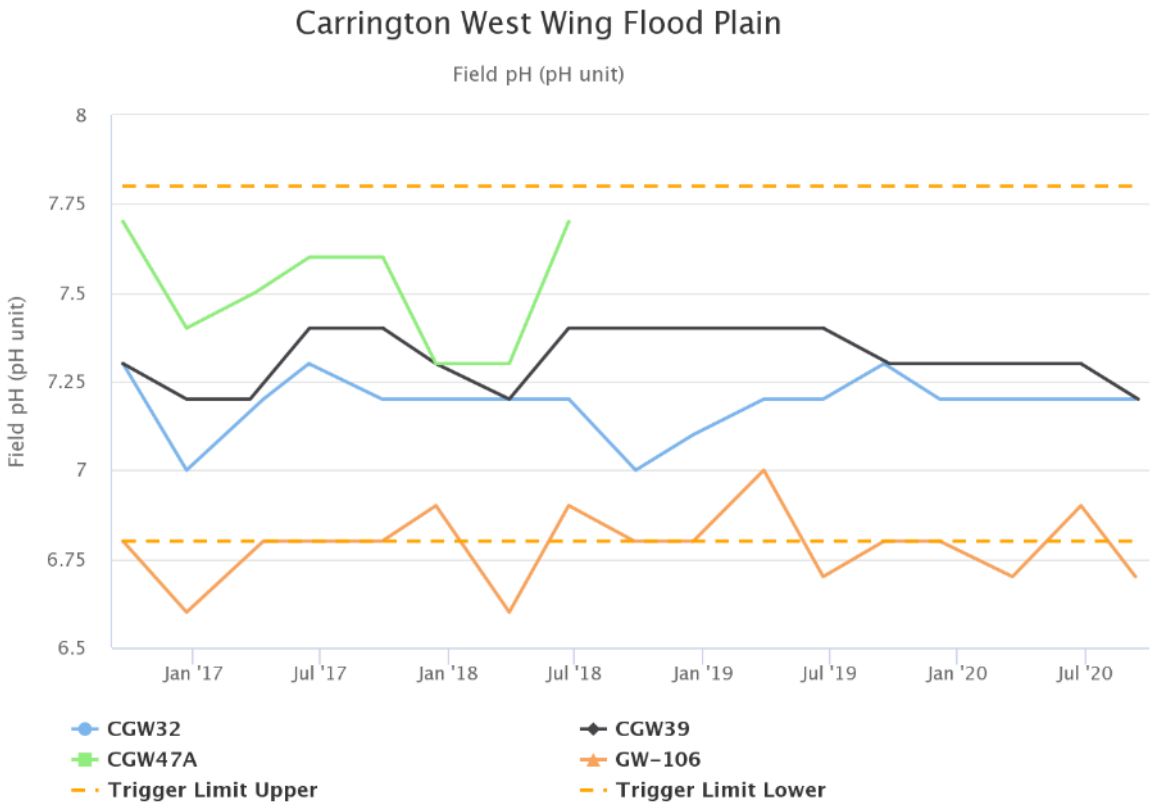


Figure 46 - Carrington West Wing Flood Plain Field pH Trend - September 2020

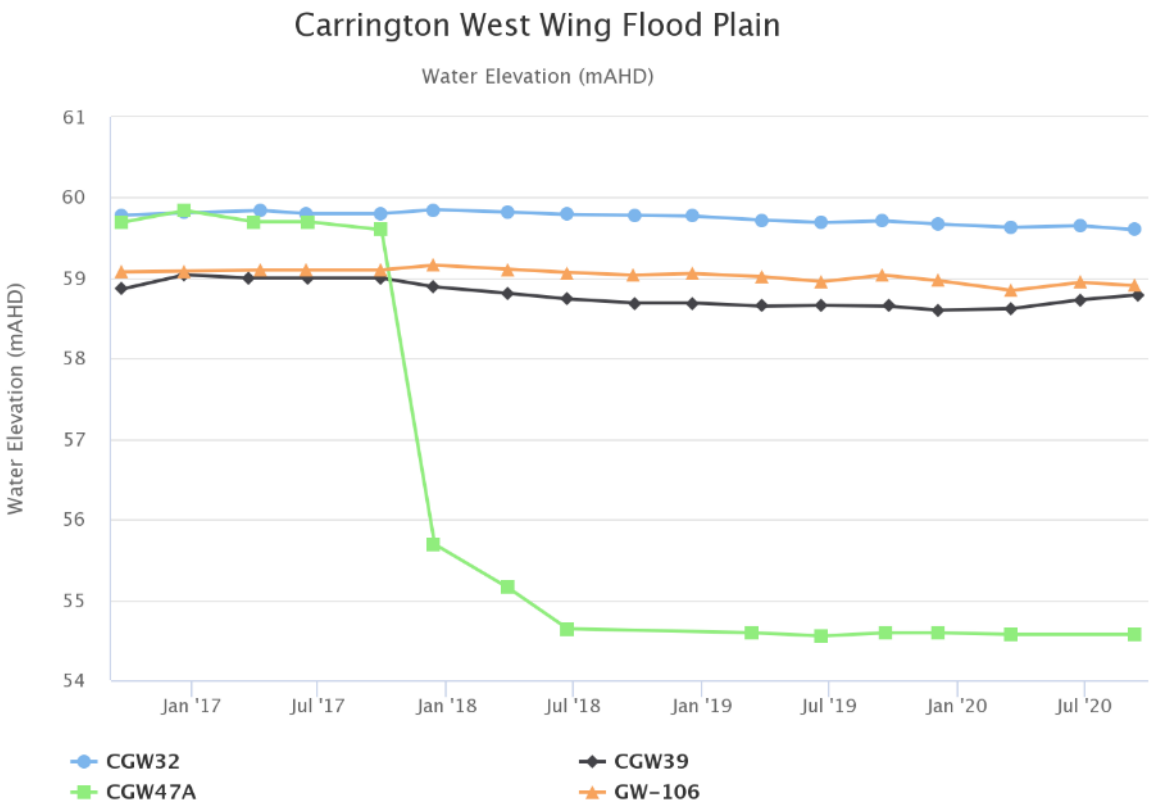
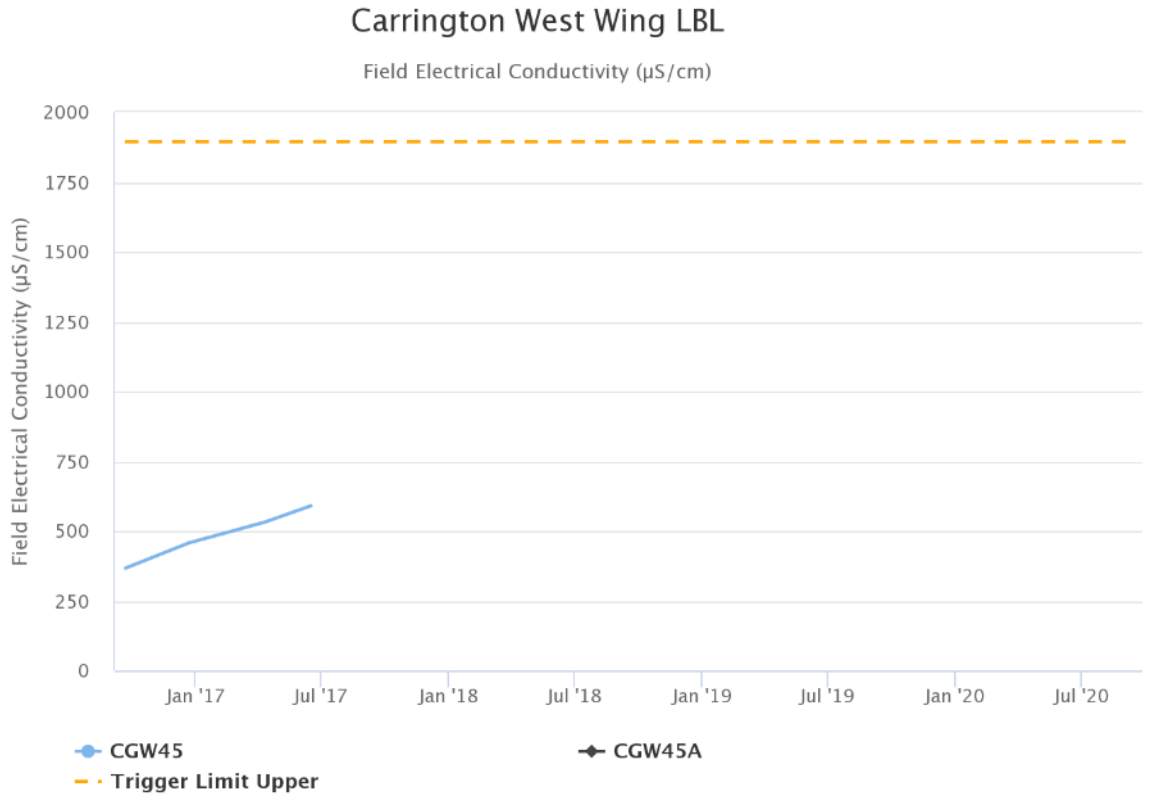


Figure 47 - Carrington West Wing Flood Plain Standing Water Level - September 2020



Note: CGW45 has been blocked since July 2017

Figure 48 - Carrington West Wing LBL Field Electrical Conductivity Trend - September 2020

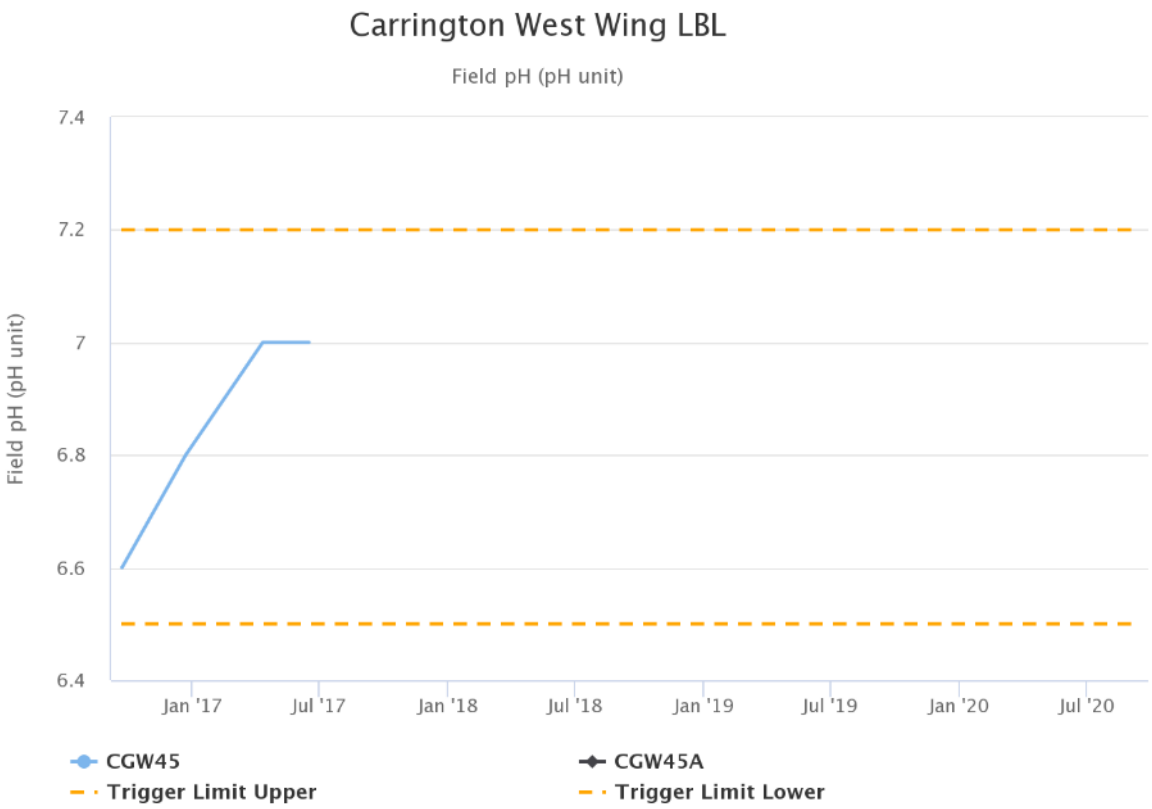


Figure 49 - Carrington West Wing LBL Field pH Trend - September 2020

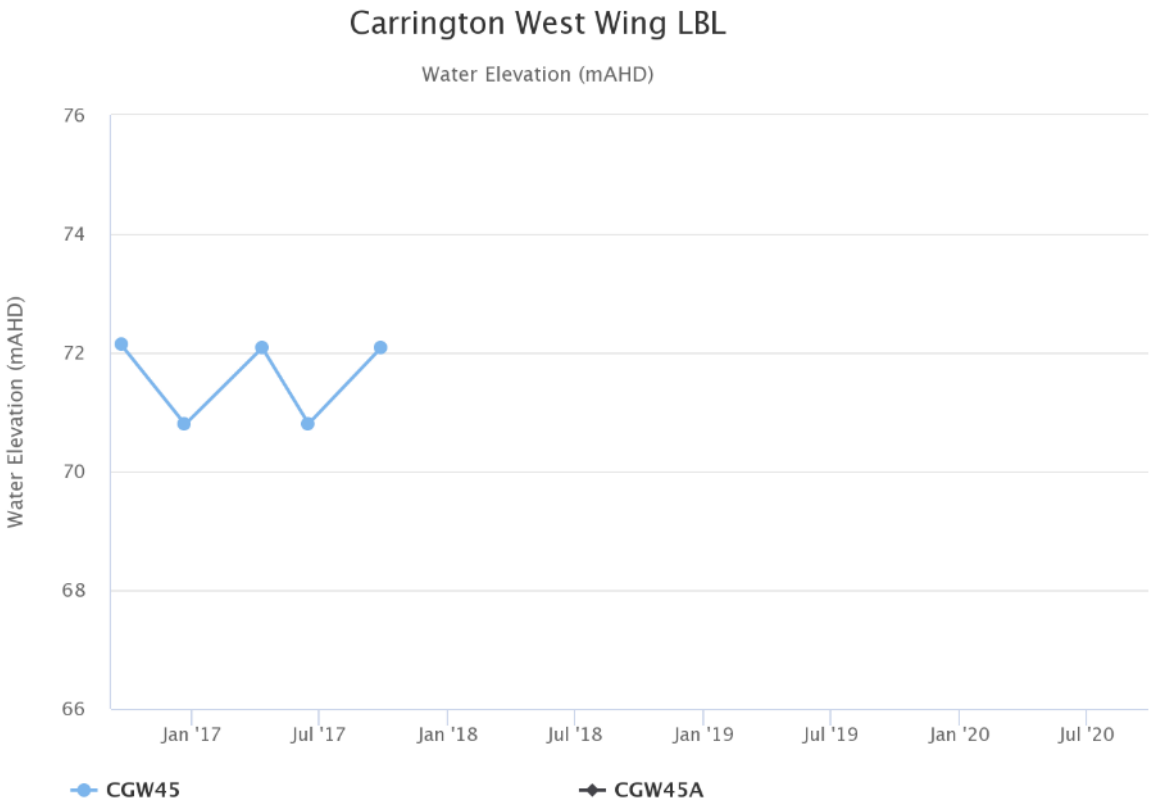
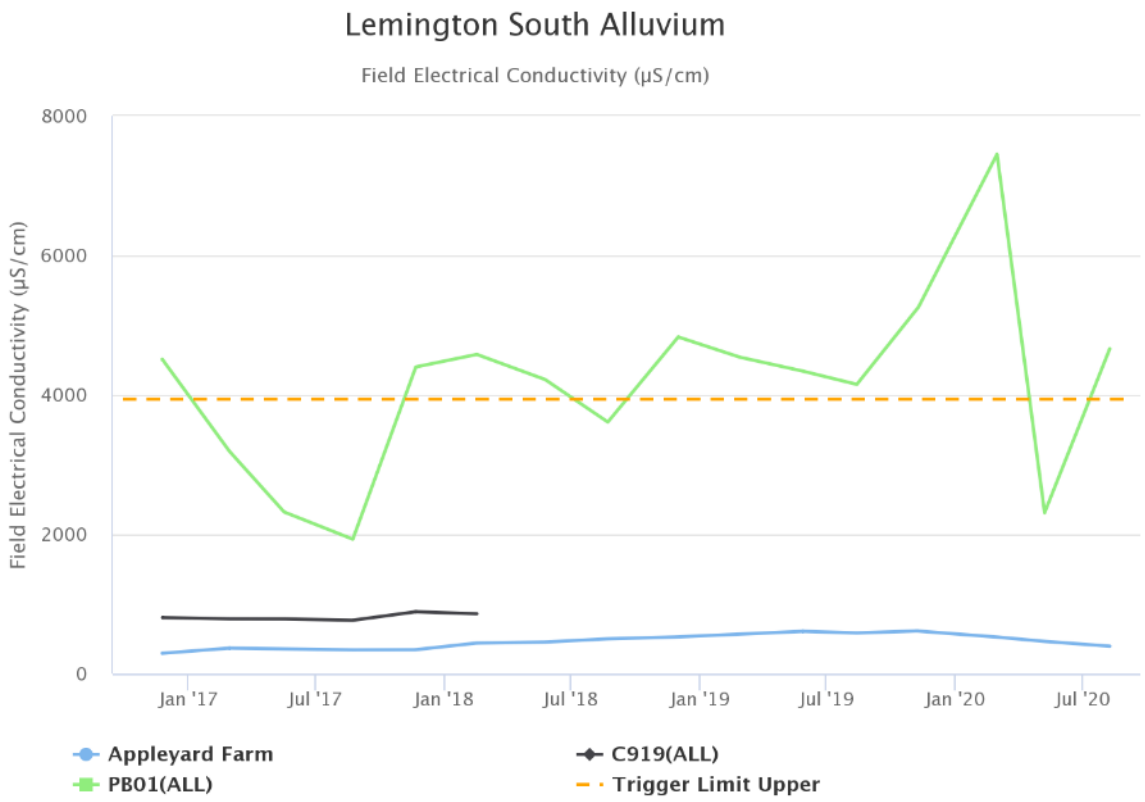


Figure 50 - Carrington West Wing LBL Standing Water Level - September 2020



Note: C919(ALL) is dry or has produced insufficient water for a sample

Figure 51 - Lemington South Alluvium Field Electrical Conductivity Trend - September 2020

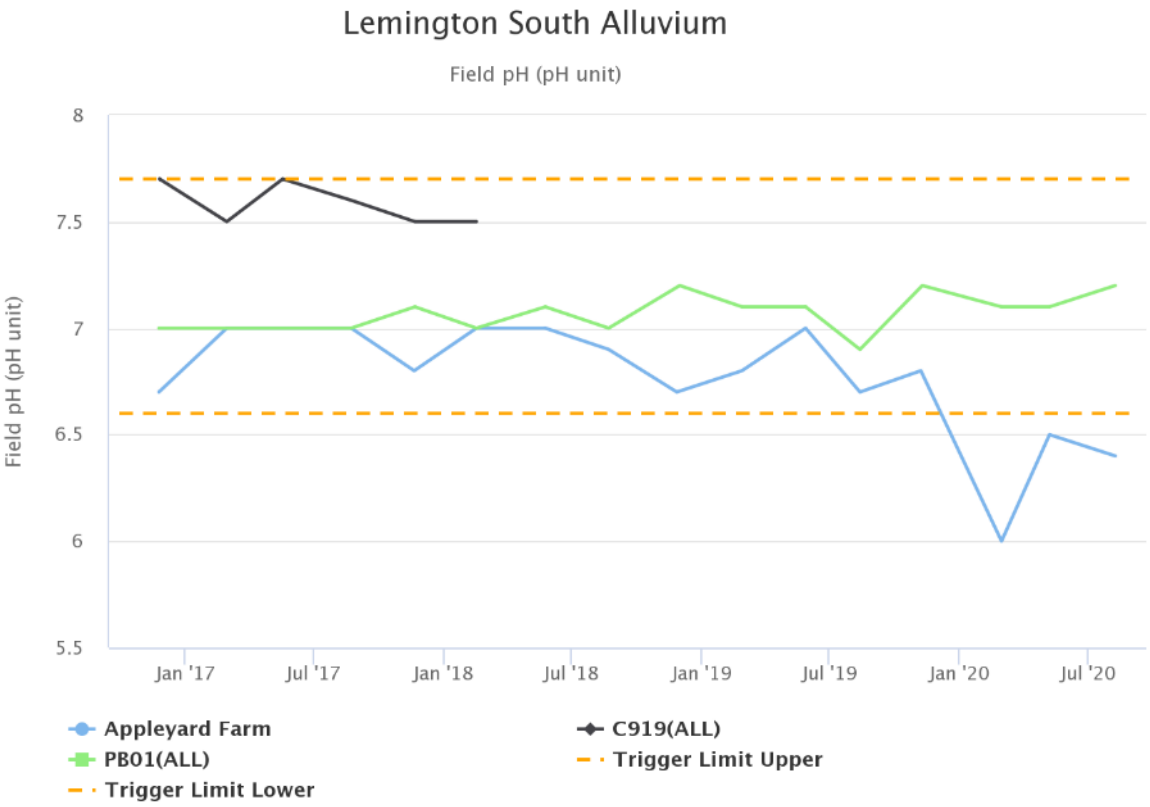


Figure 52 - Lemington South Alluvium Field pH Trend - September 2020

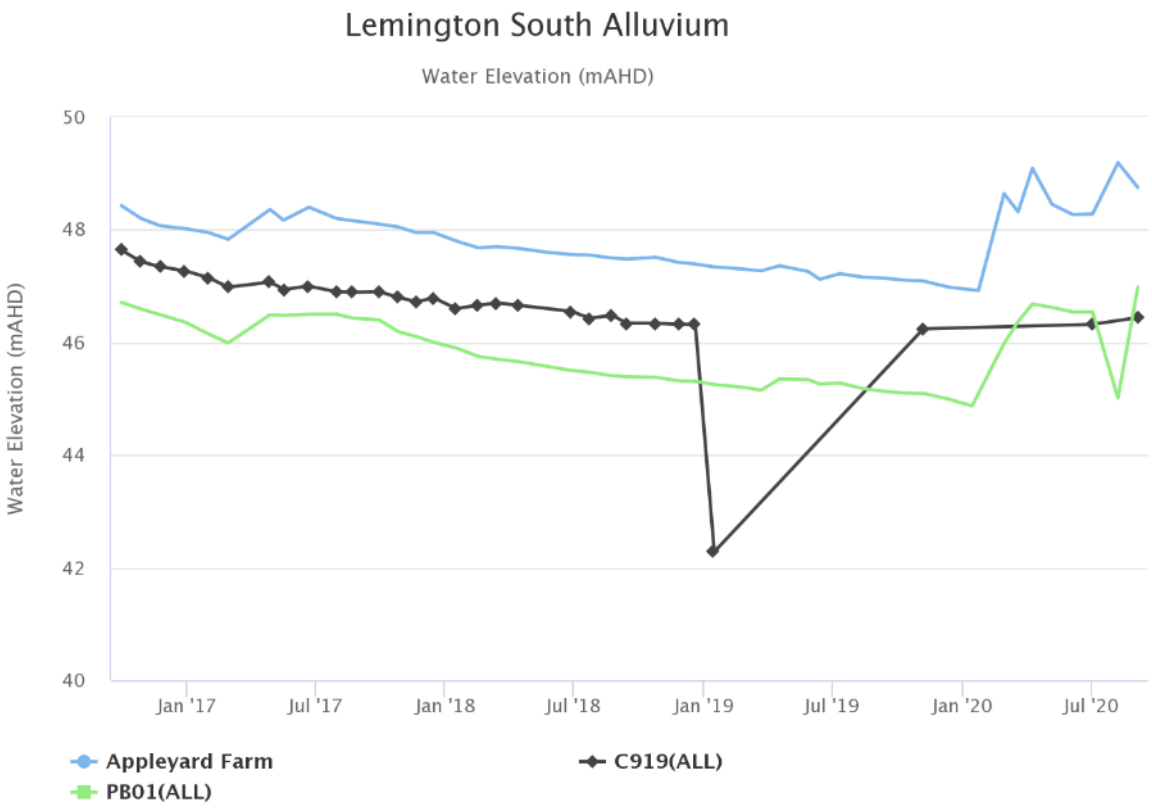


Figure 53 - Lemington South Alluvium Standing Water Level - September 2020

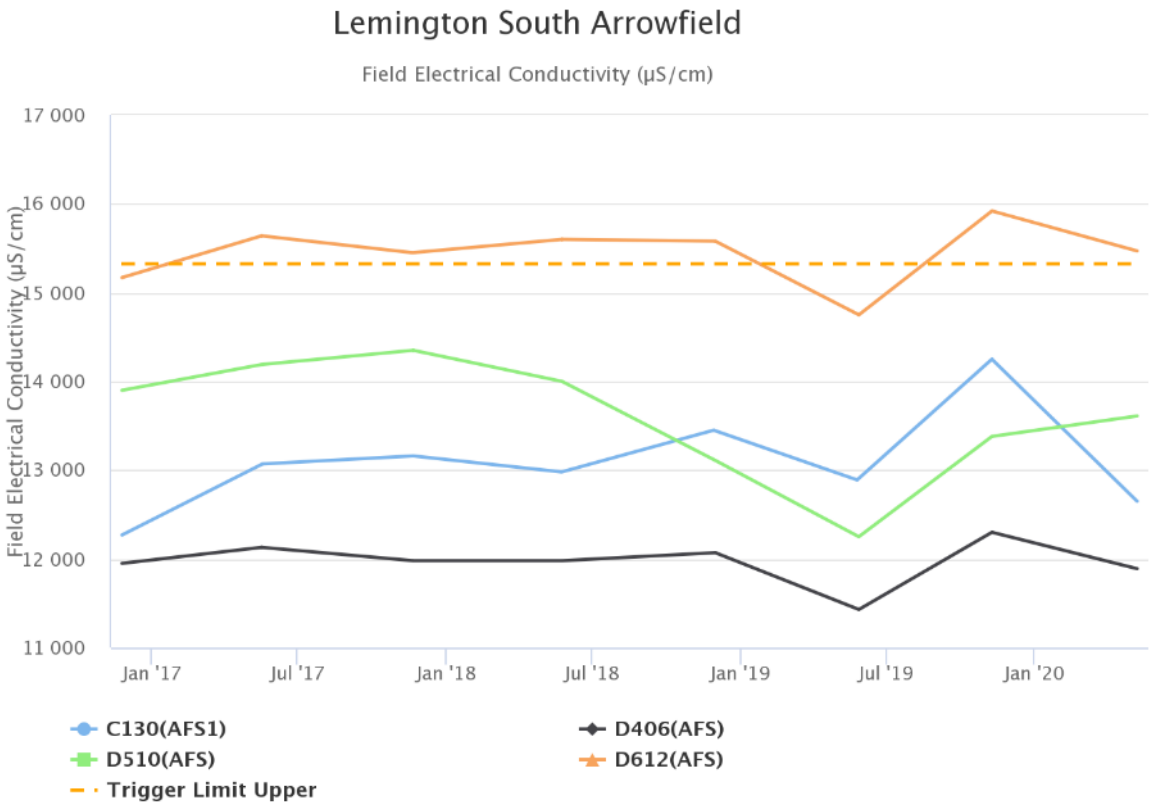


Figure 54 - Lemington South Arrowfield Field Electrical Conductivity Trend - September 2020

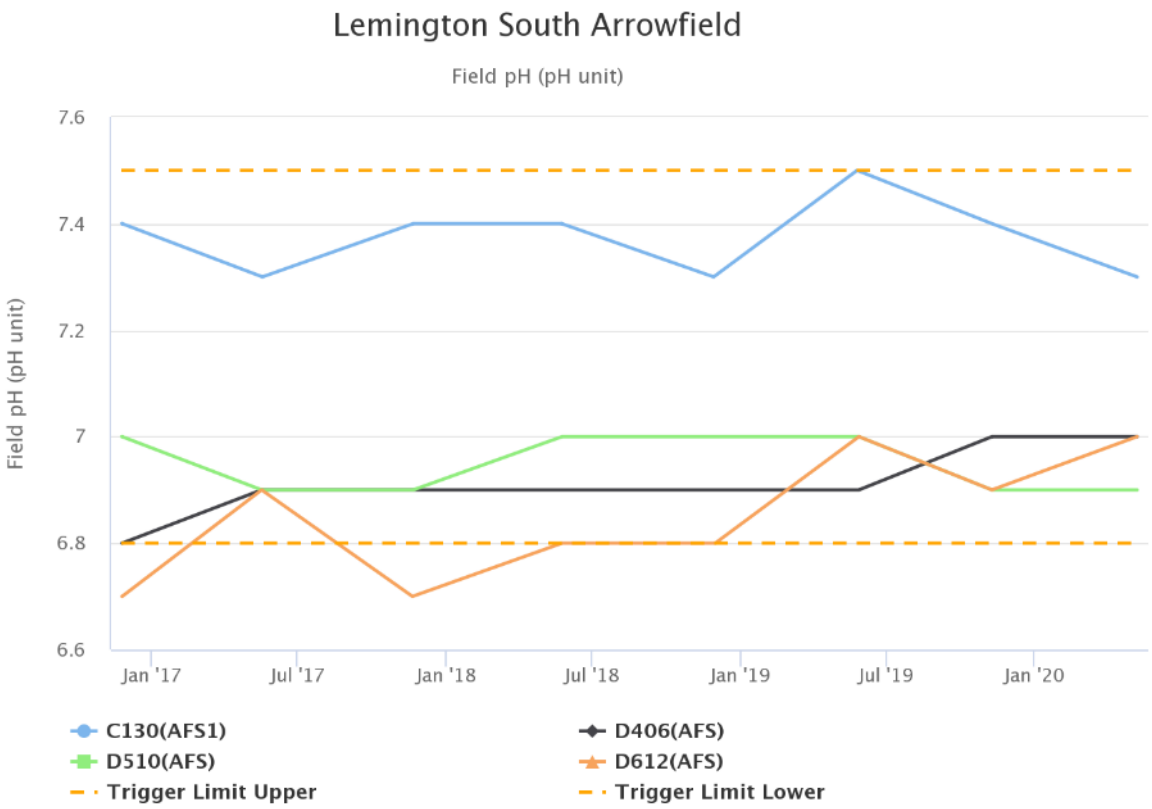


Figure 55 - Lemington South Arrowfield Field pH Trend - September 2020

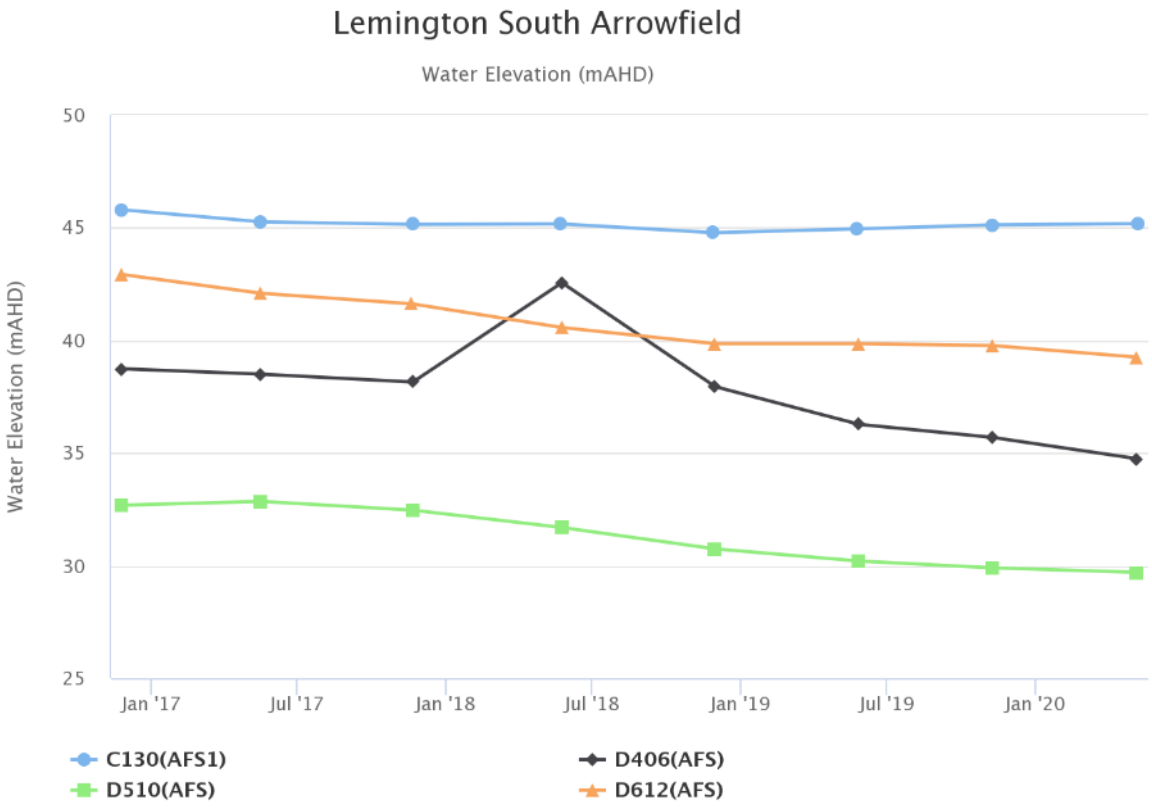


Figure 56 - Lemington South Arrowfield Standing Water Level - September 2020

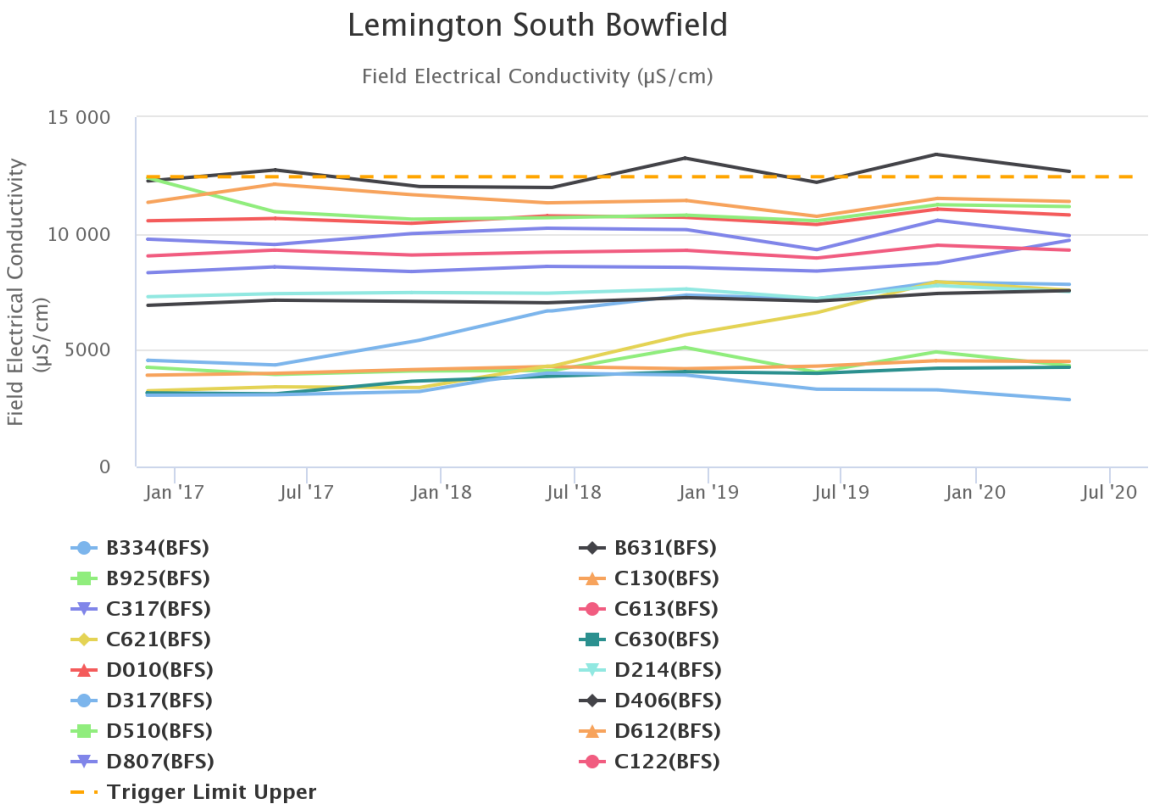


Figure 57 - Lemington South Bowfield Field Electrical Conductivity Trend - September 2020

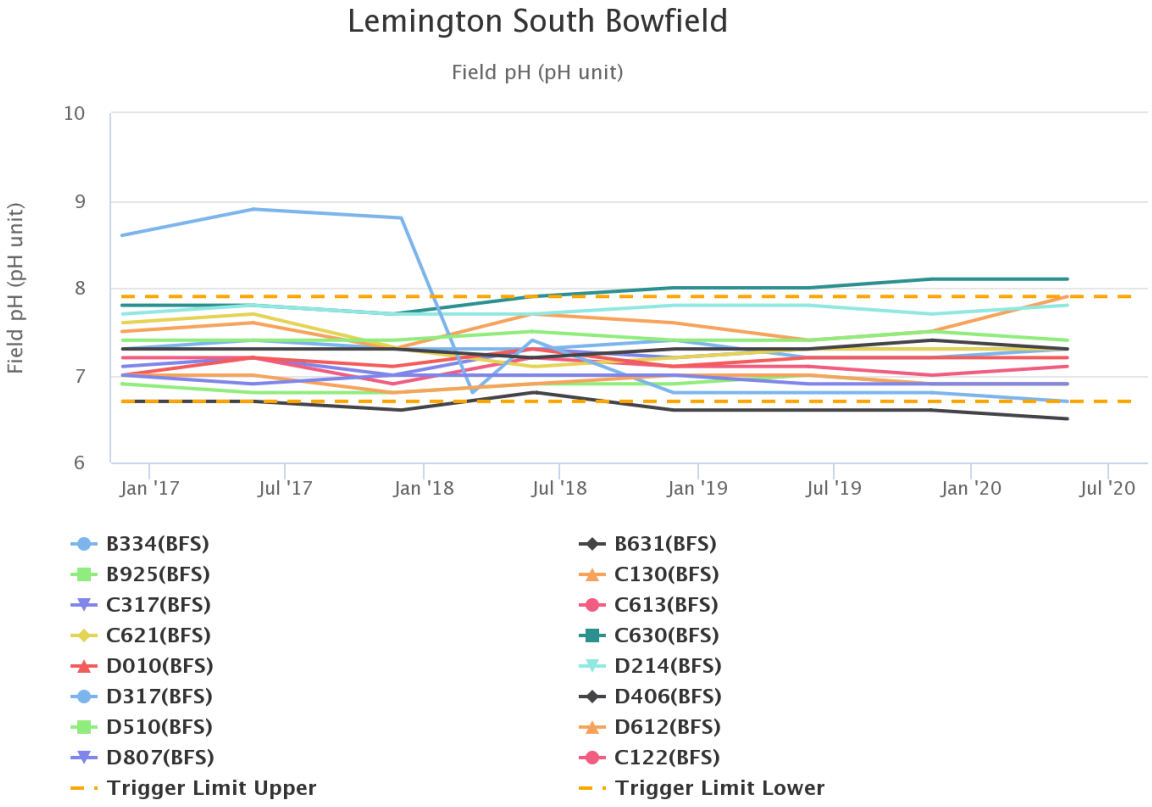


Figure 58 - Lemington South Bowfield Field pH Trend - September 2020

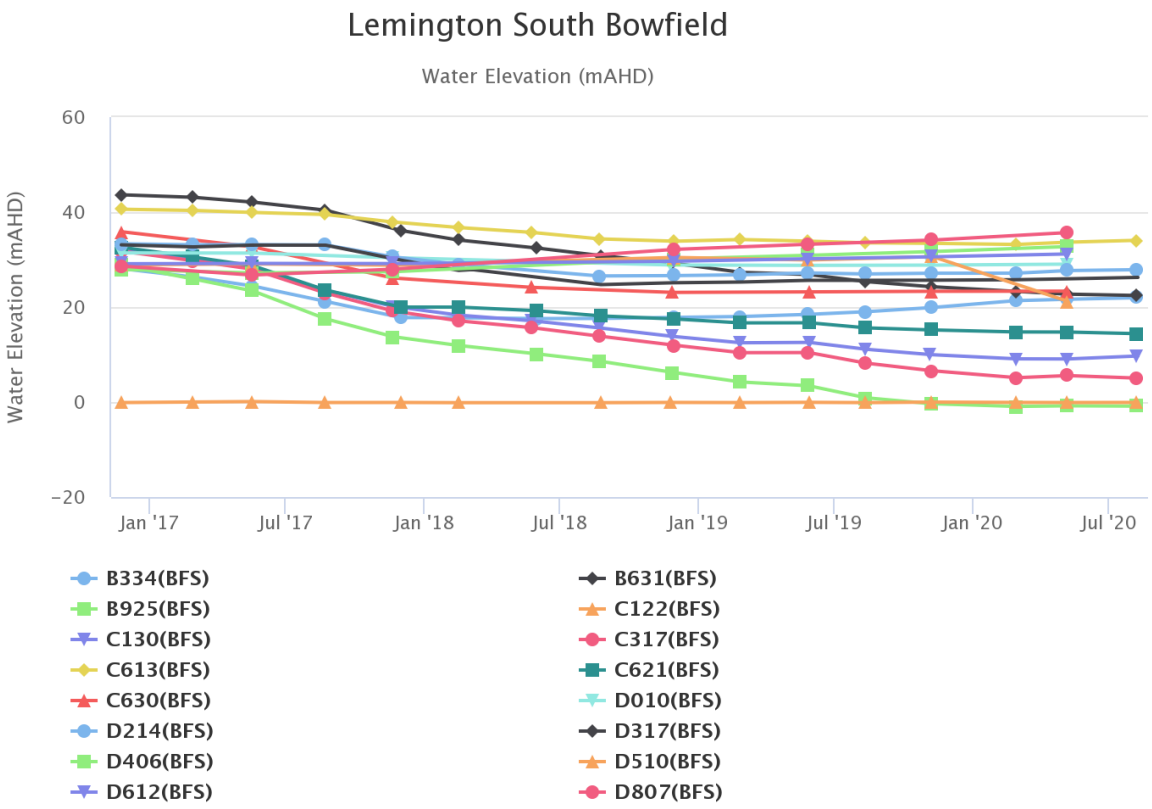


Figure 59 - Lemington South Bowfield Standing Water Level - September 2020

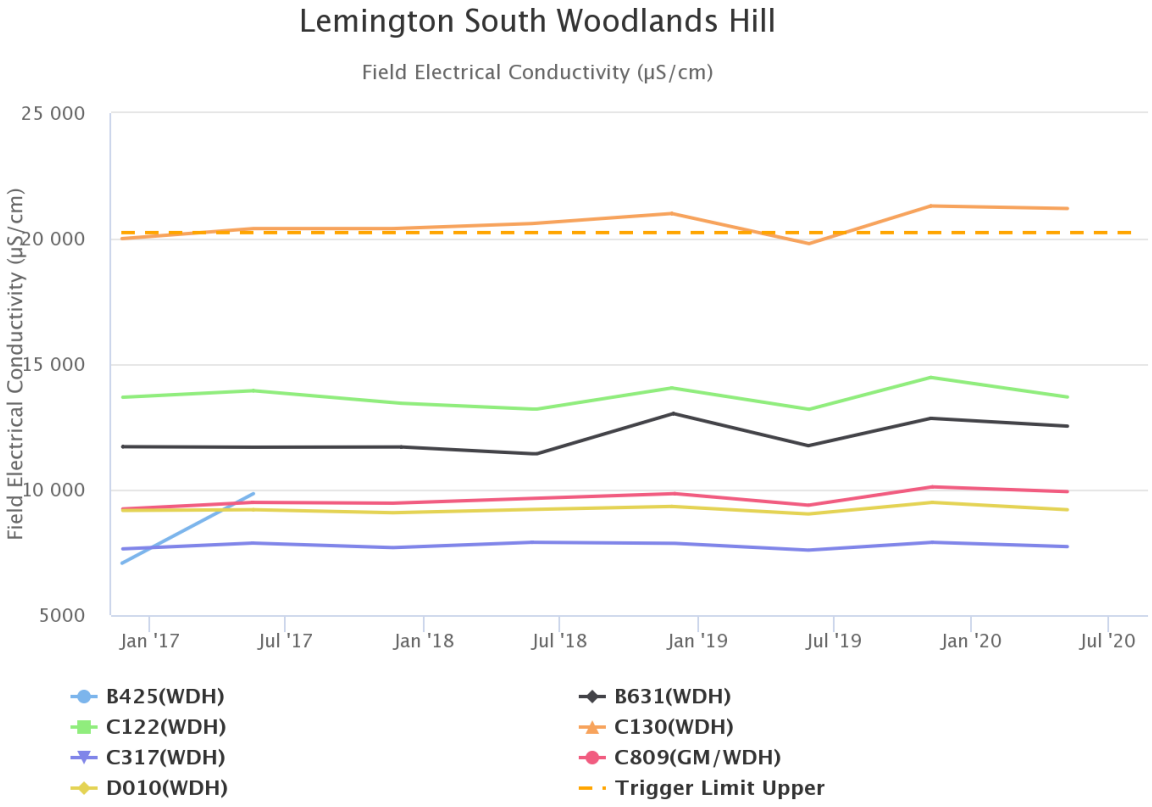


Figure 60 - Lemington South Woodlands Hill Field Electrical Conductivity Trend - September 2020

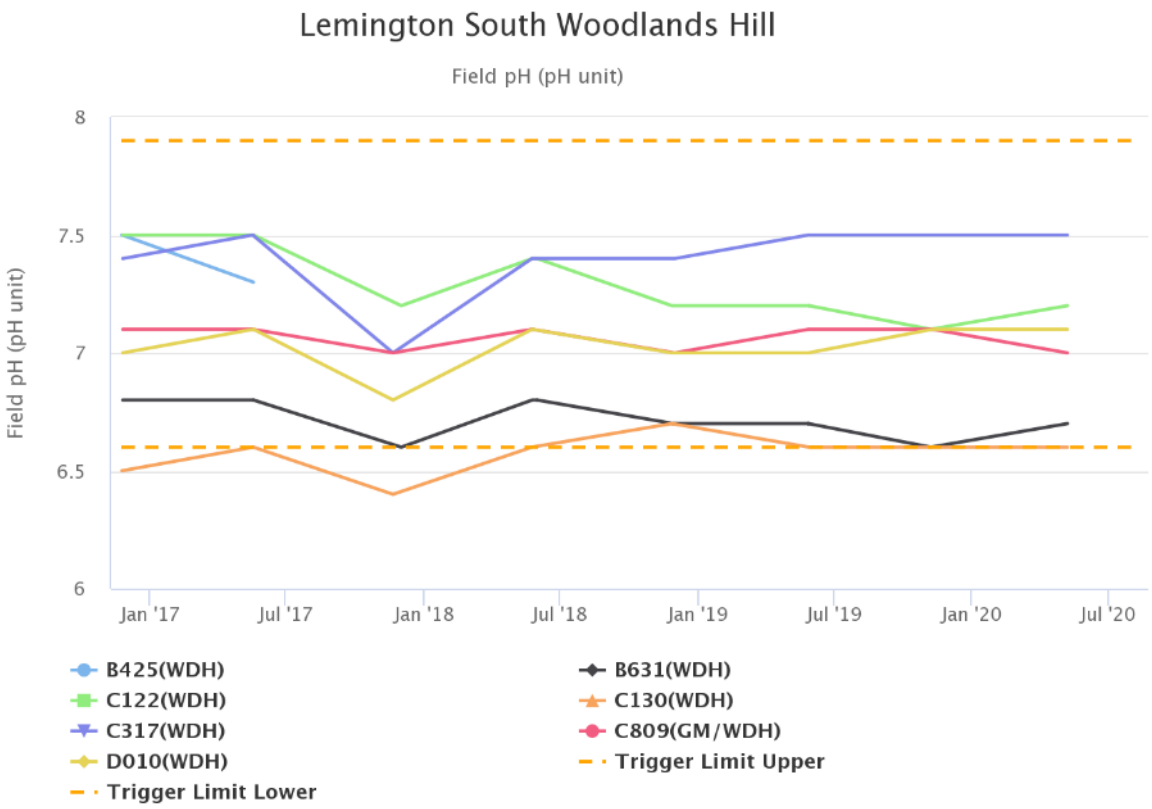


Figure 61 - Lemington South Woodlands Hill Field Electrical Conductivity Trend - September 2020

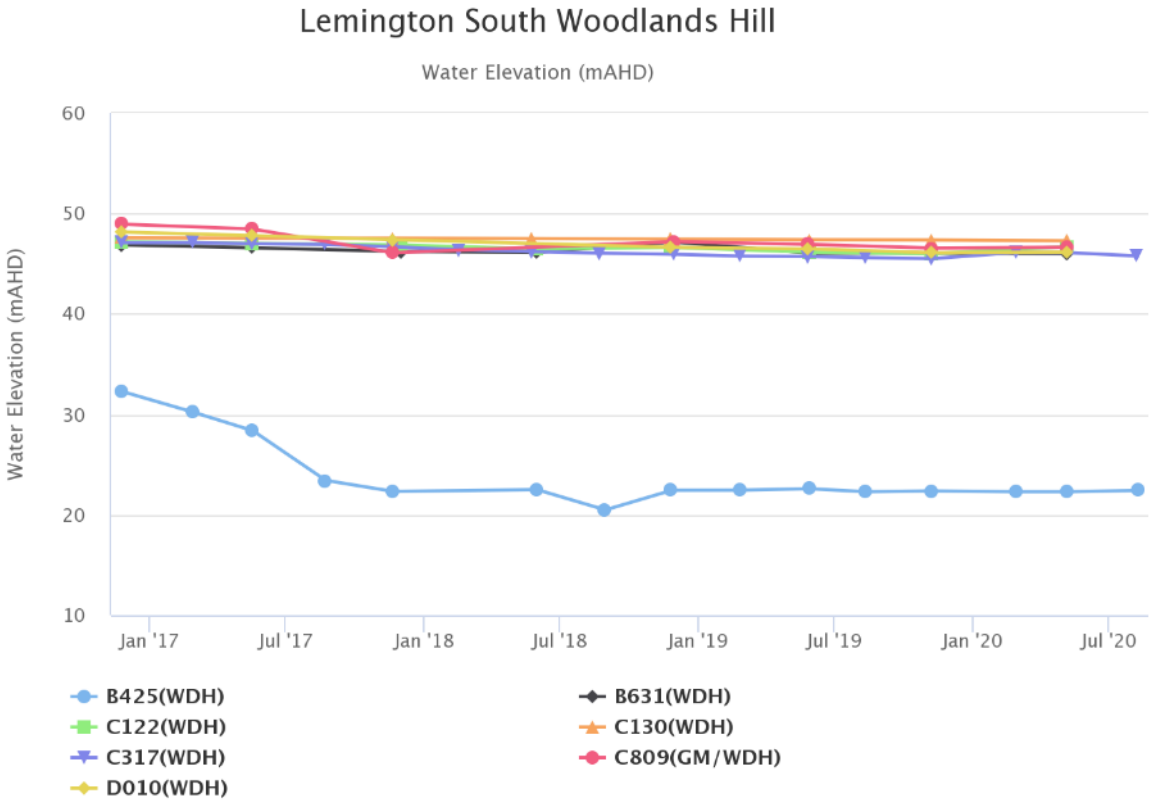


Figure 62 - Lemington South Woodlands Hill Standing Water Level - September 2020

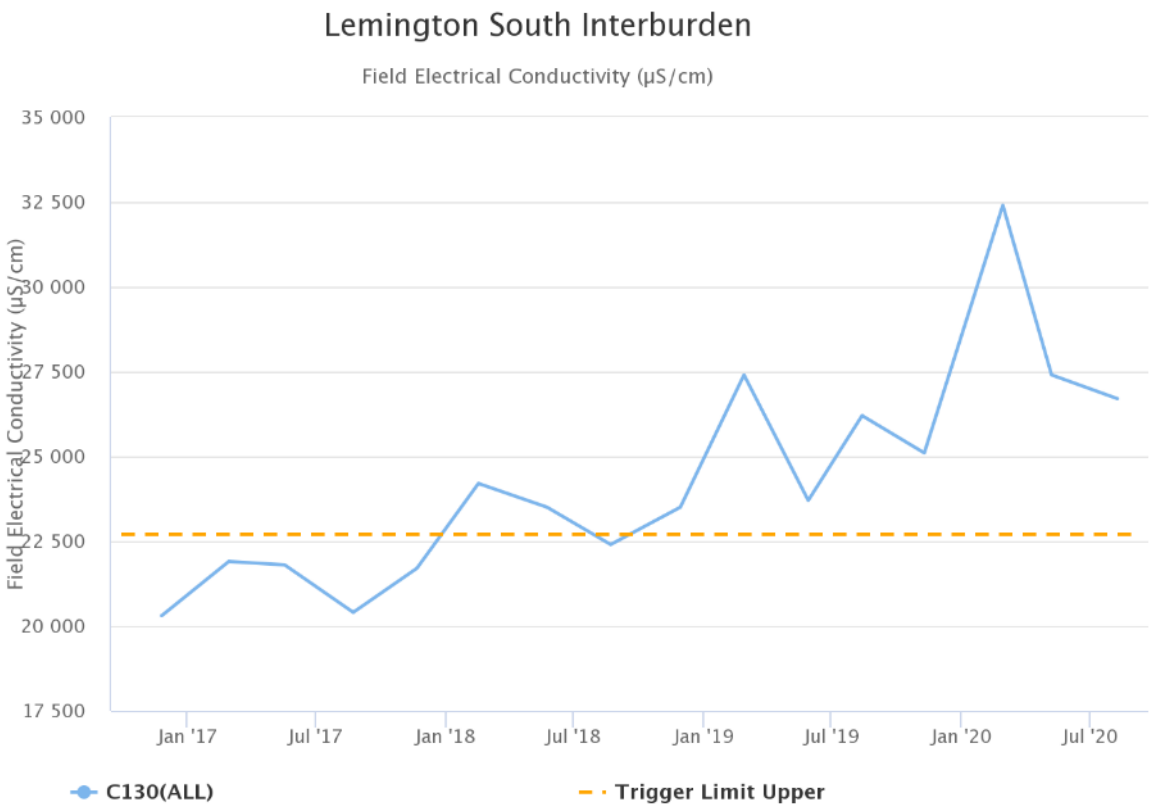


Figure 63 - Lemington South Interburden Field Electrical Conductivity Trend - September 2020

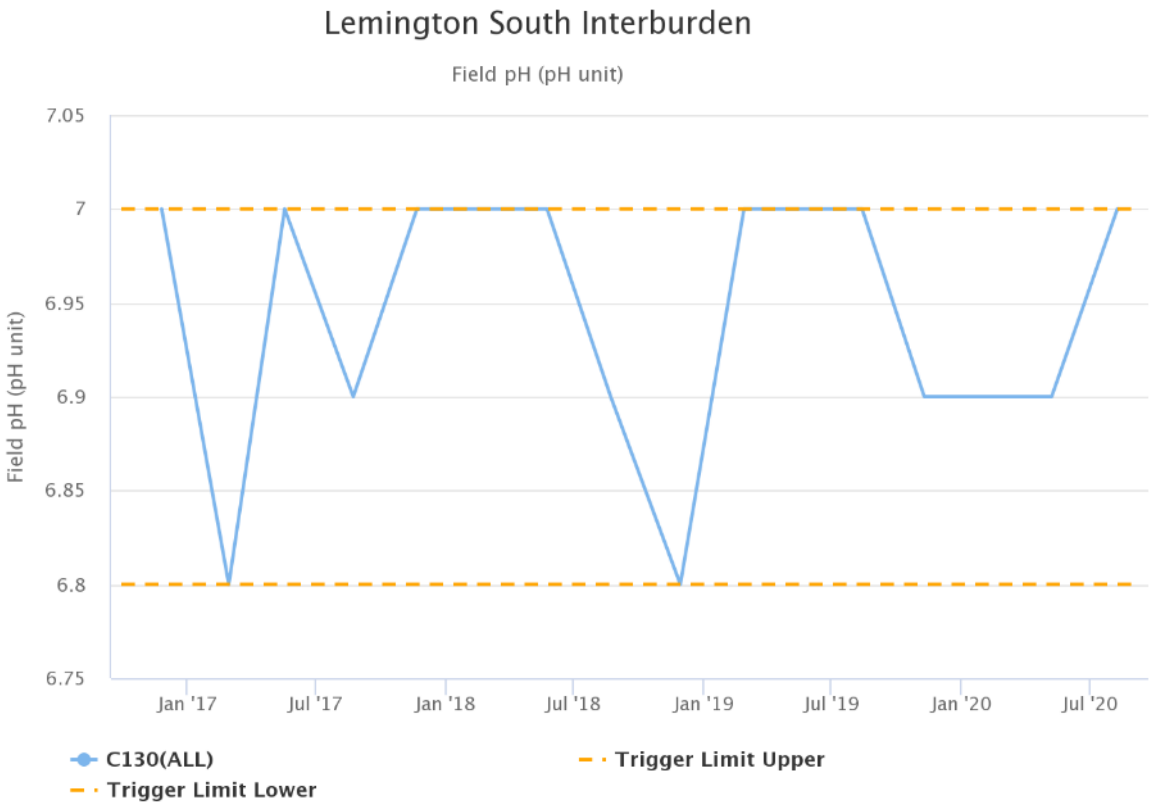


Figure 64 - Lemington South Interburden Field Electrical Conductivity Trend - September 2020

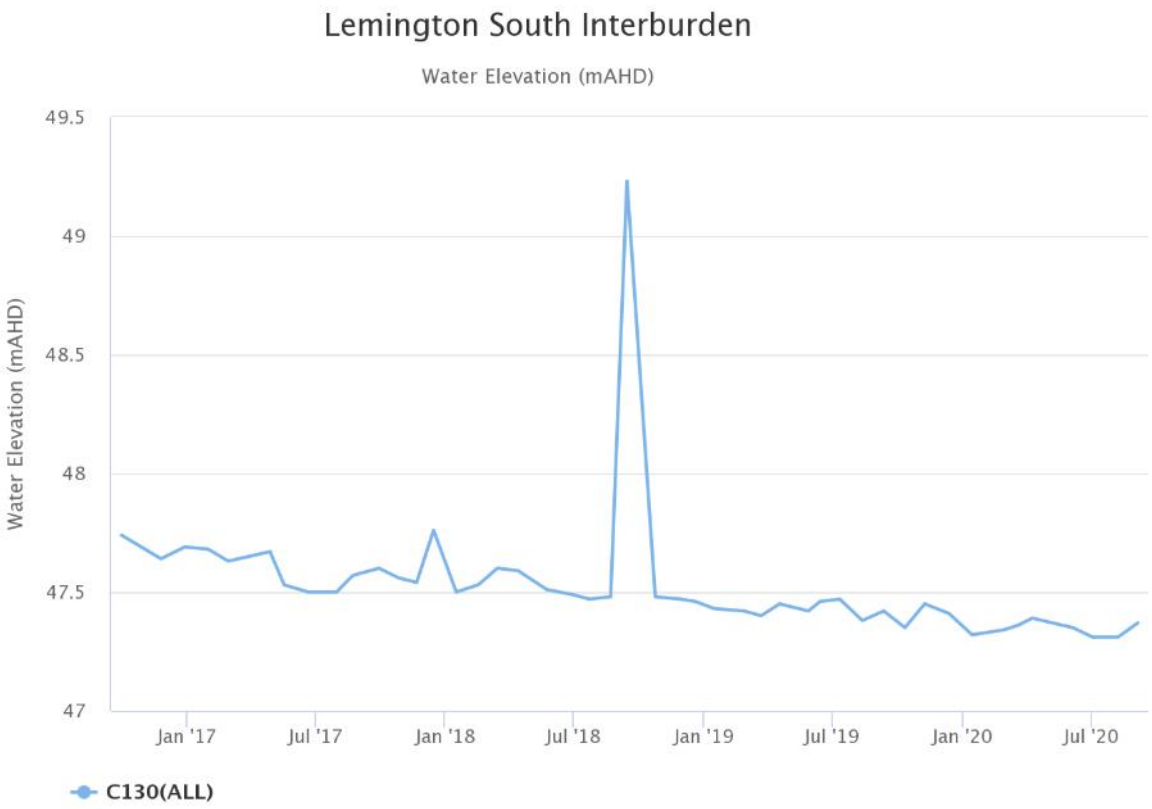


Figure 65 - Lemington south Interburden Standing Water Level - September 2020

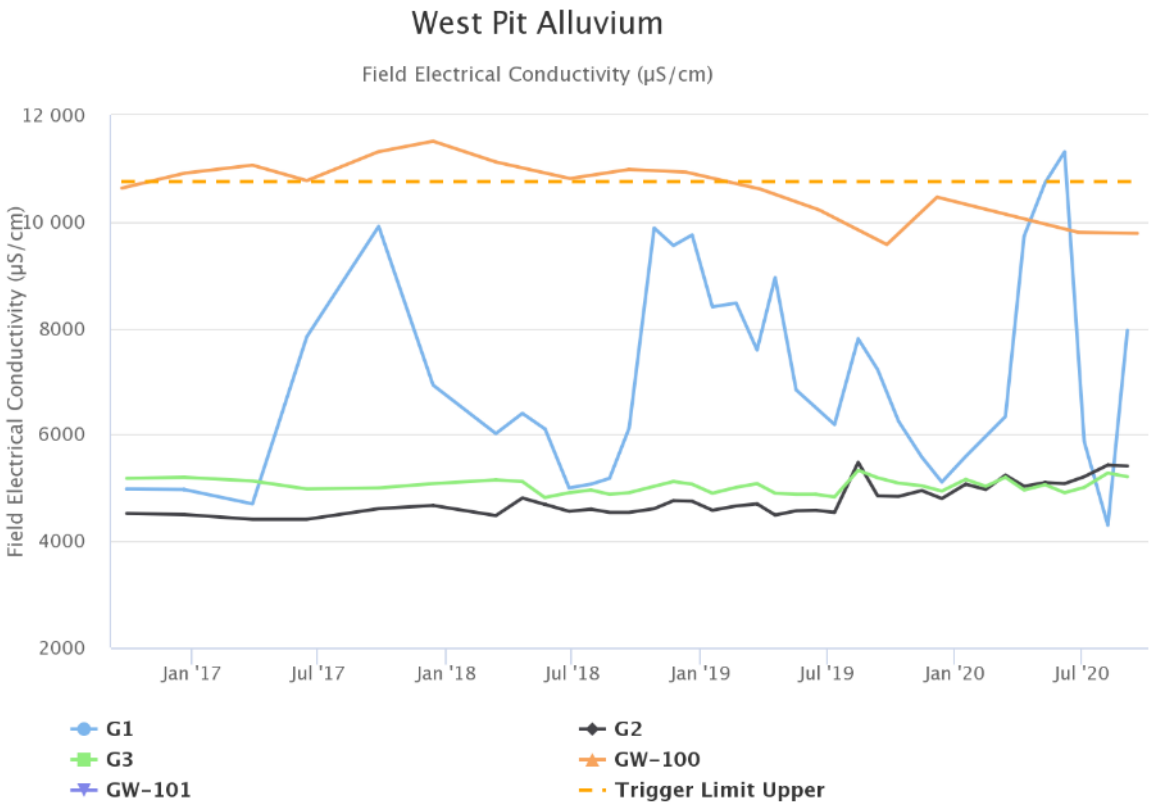


Figure 66 - West Pit Alluvium Field Electrical Conductivity Trend - September 2020

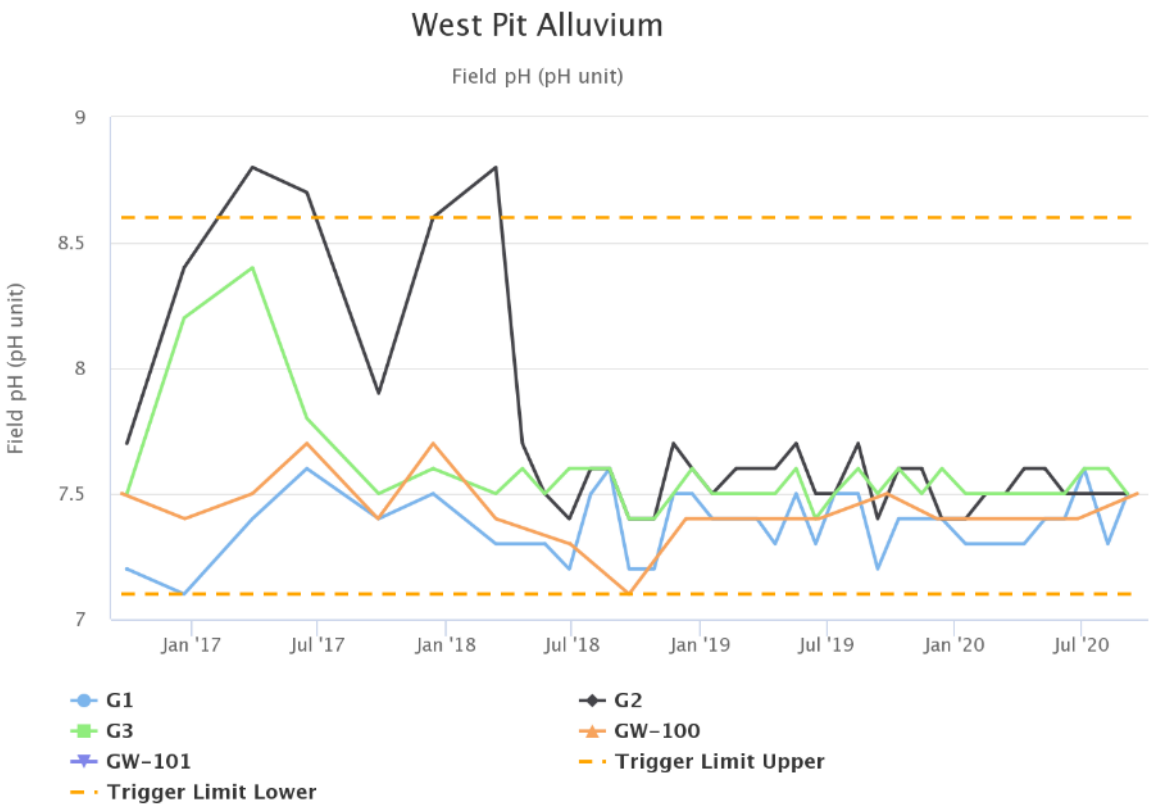
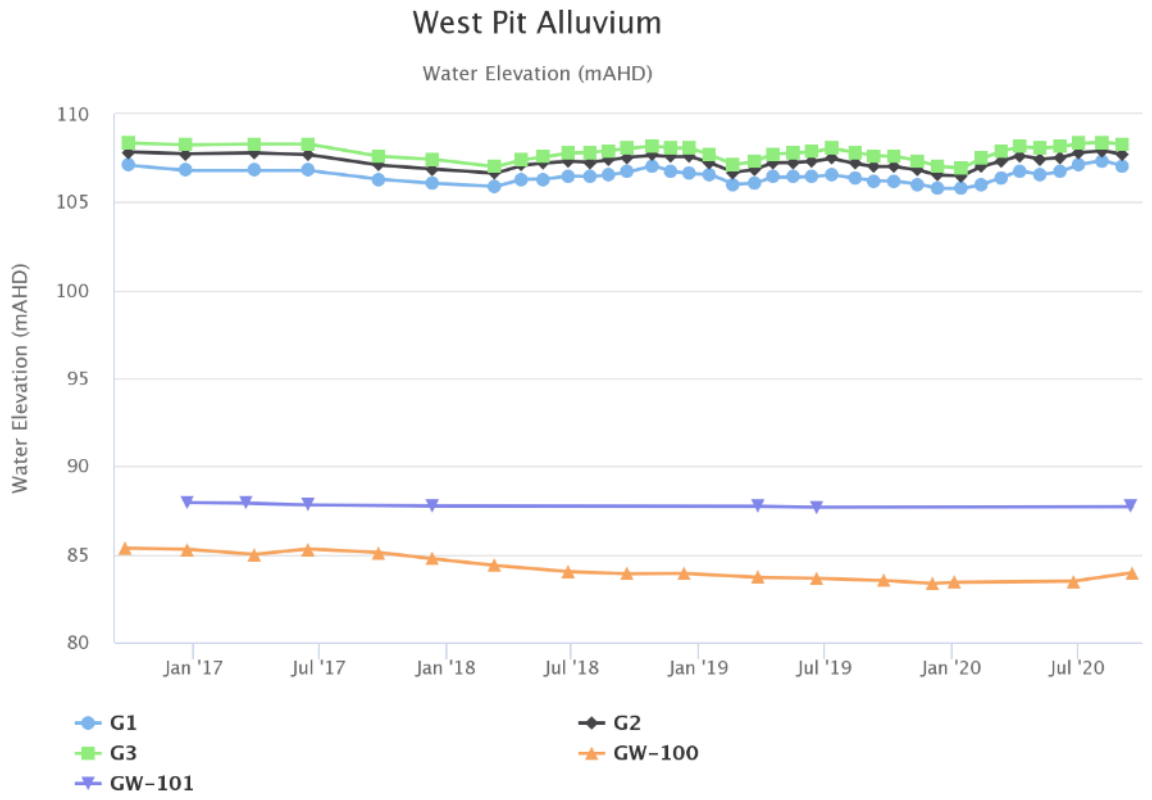
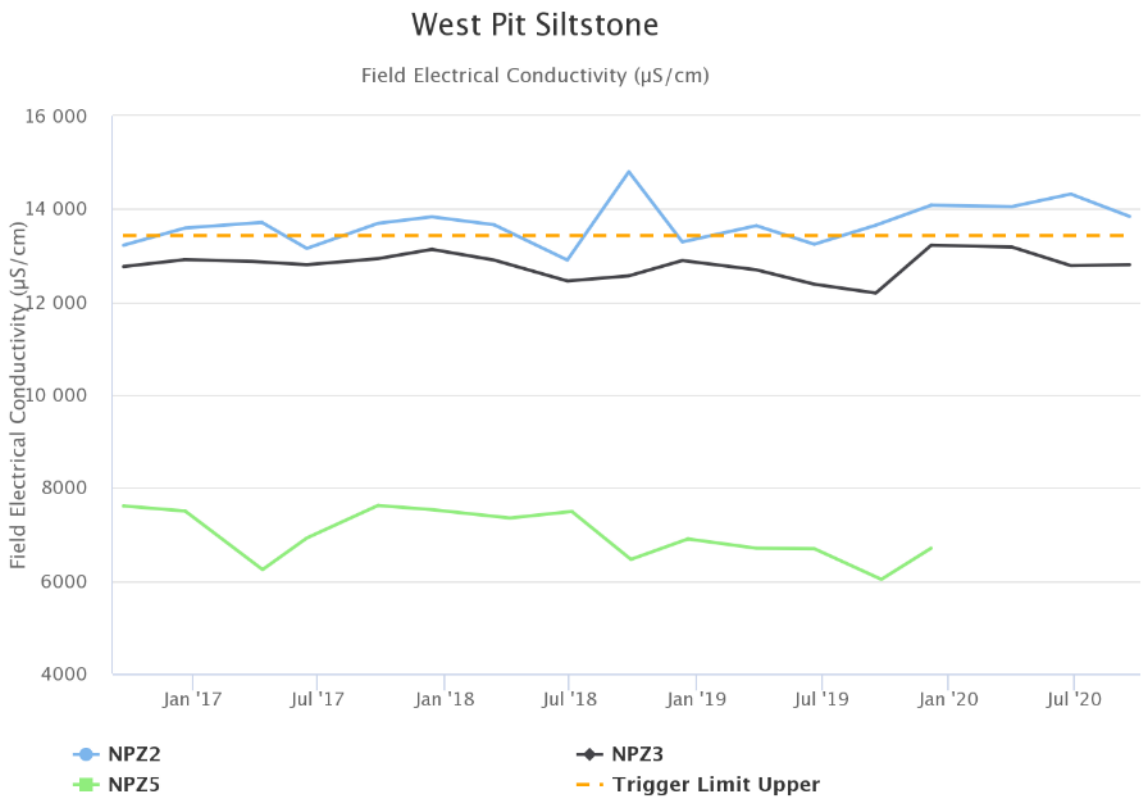


Figure 67 - West Pit Alluvium Field pH Trend - September 2020



Note: GW-101 has been dry since July 2019

Figure 68 - West Pit Alluvium Standing Water Level - September 2020



Note: NPZ5 could not be sampled due to unsafe access

Figure 69 - West Pit Siltstone Field Electrical Conductivity Trend - September 2020

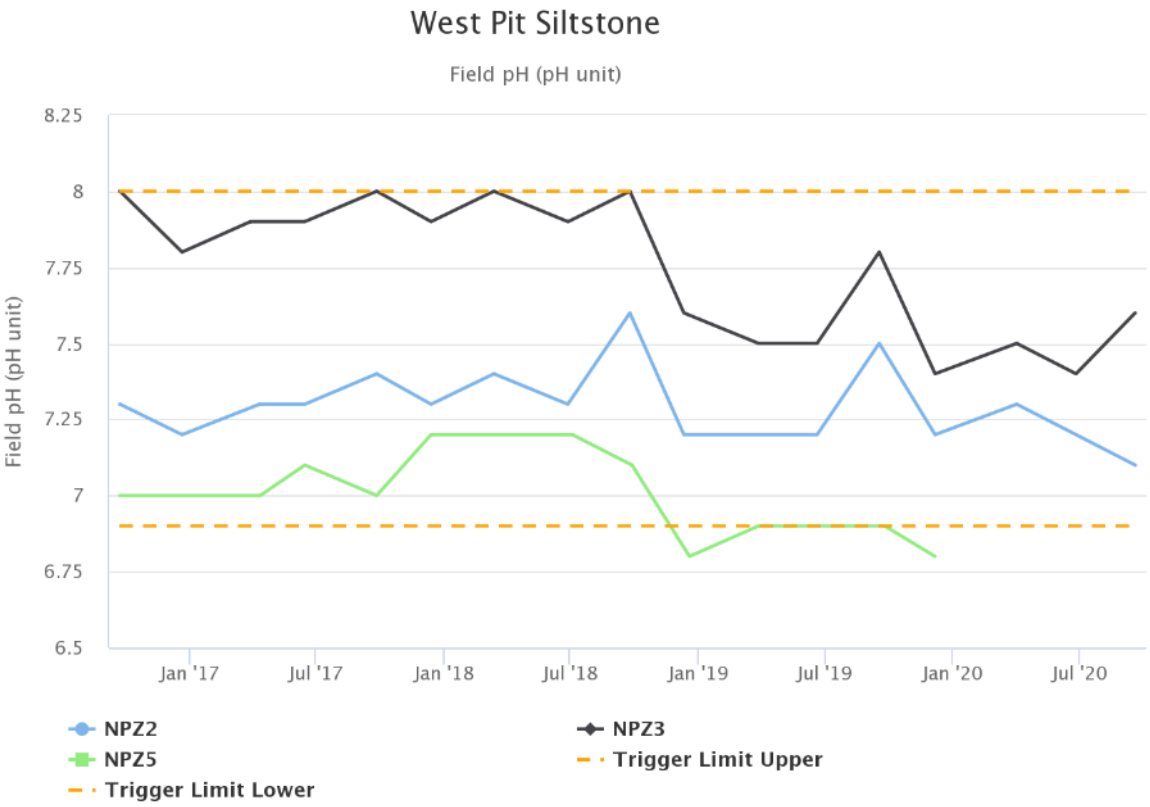


Figure - 70 West Pit Siltstone Field pH Trend - September 2020

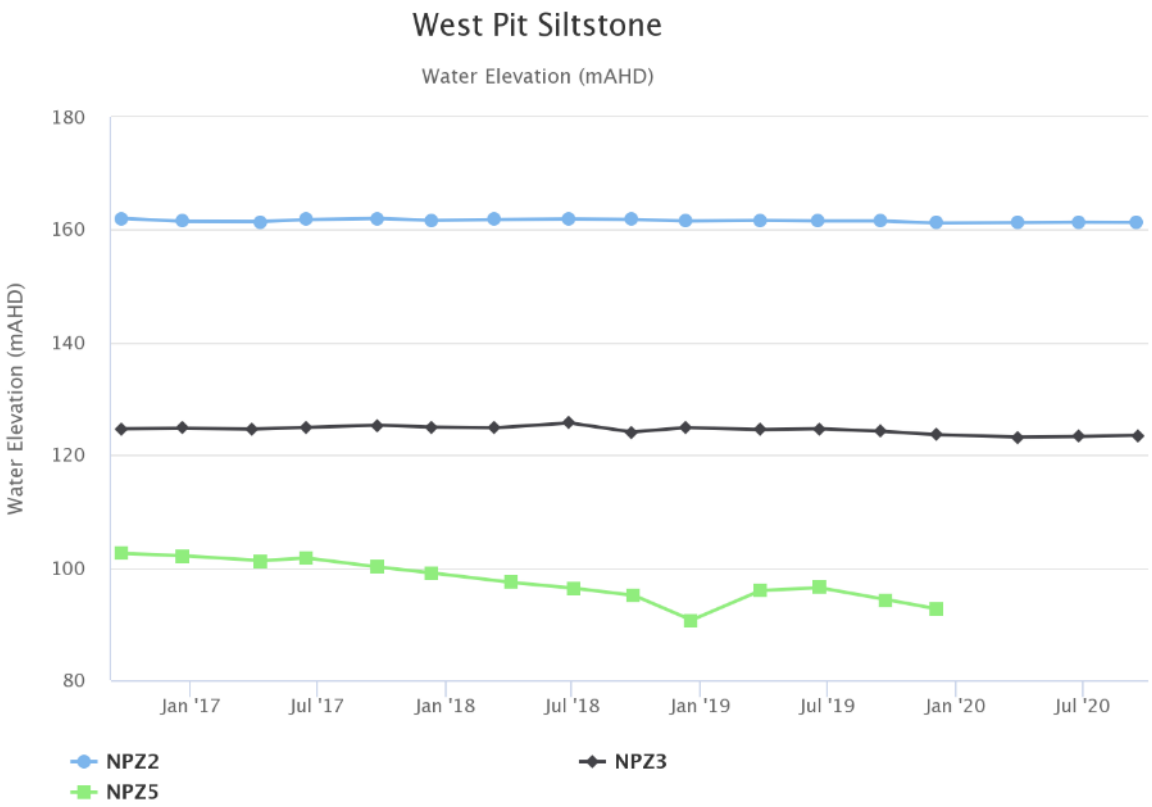


Figure 71 - West Pit Siltstone Standing Water Level - September 2020

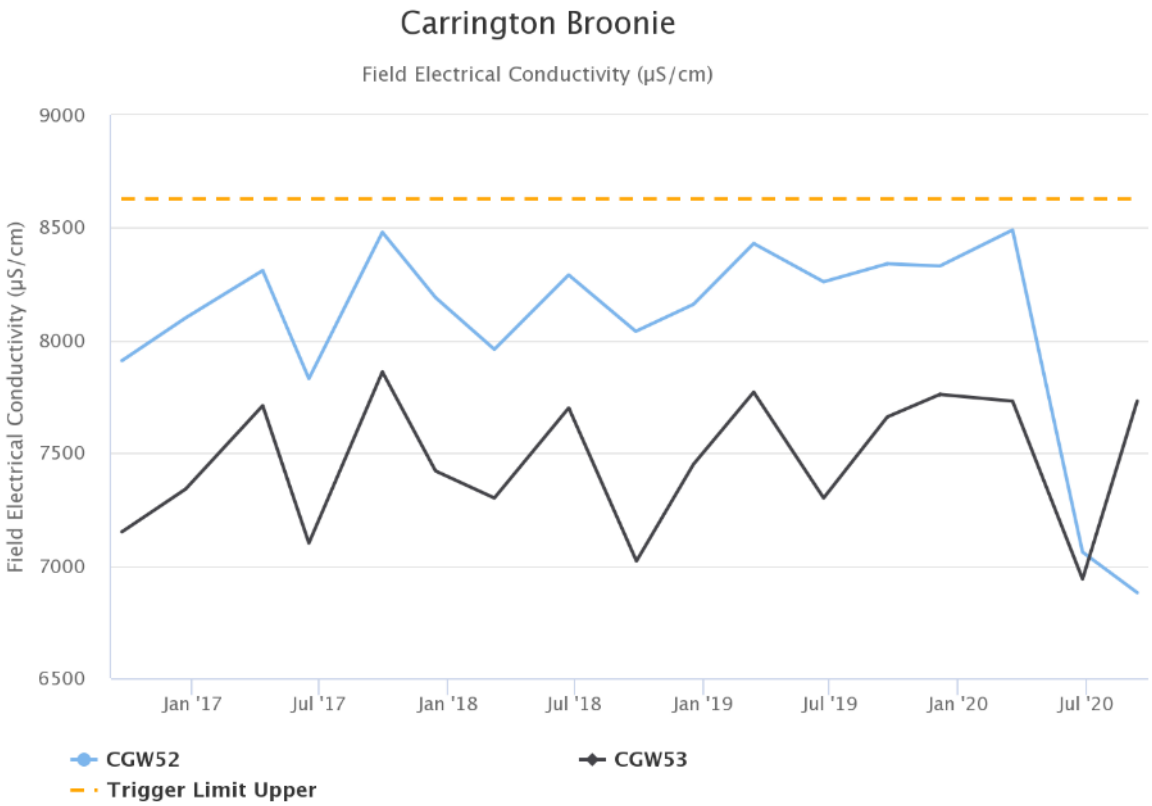


Figure 72 - Carrington Broonie Field Electrical Conductivity Trend - September 2020

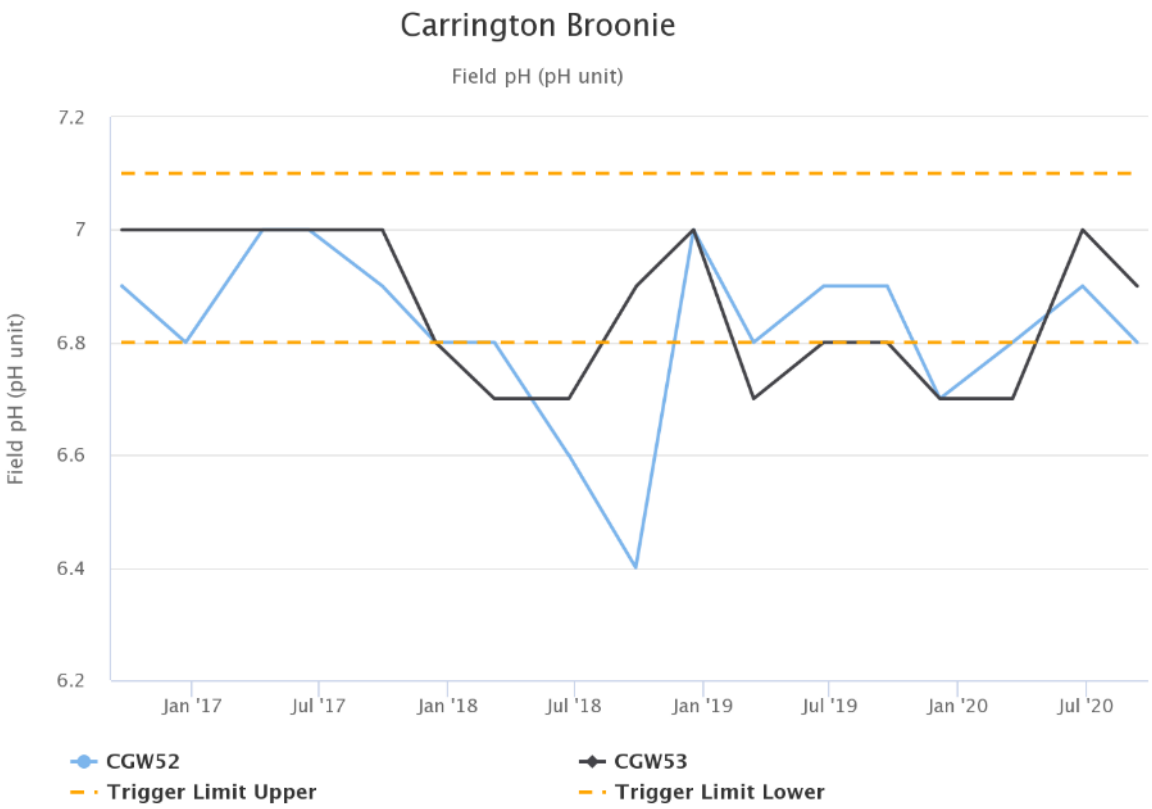


Figure 73 - Carrington Broonie Field pH trend - September 2020

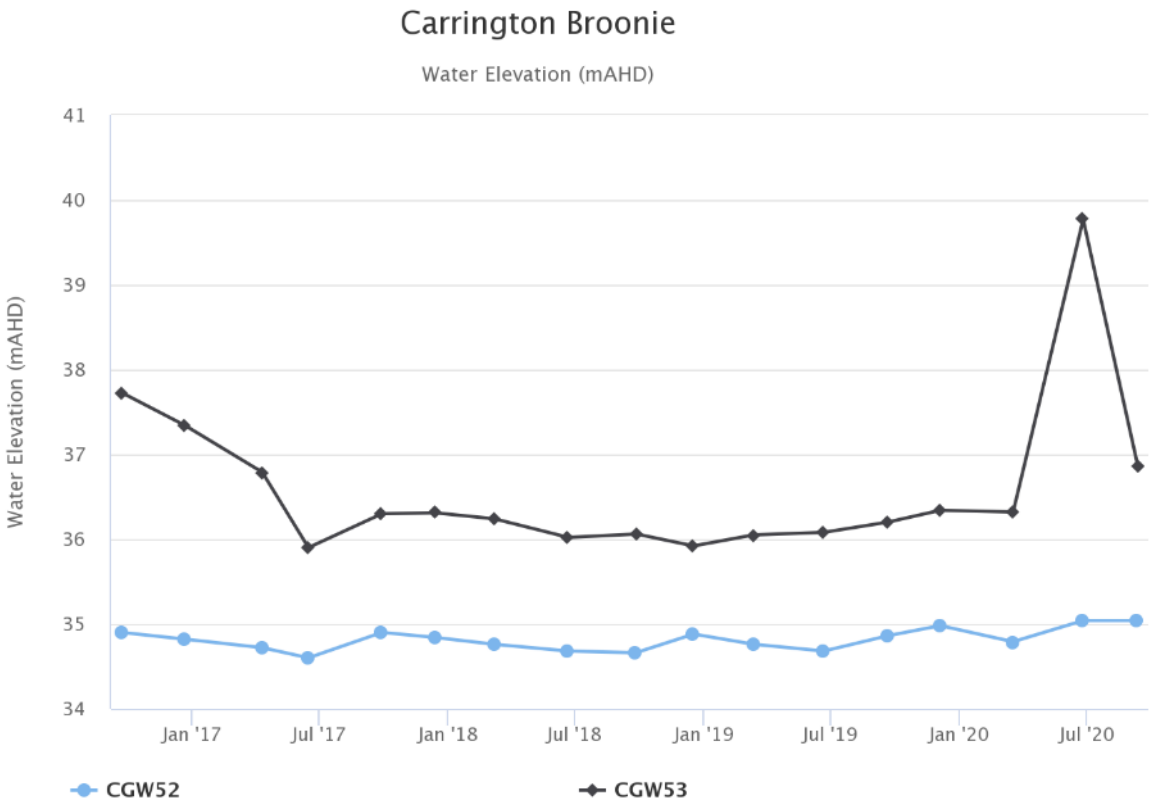


Figure 74 - Carrington Broonie Standing Water Level - September 2020

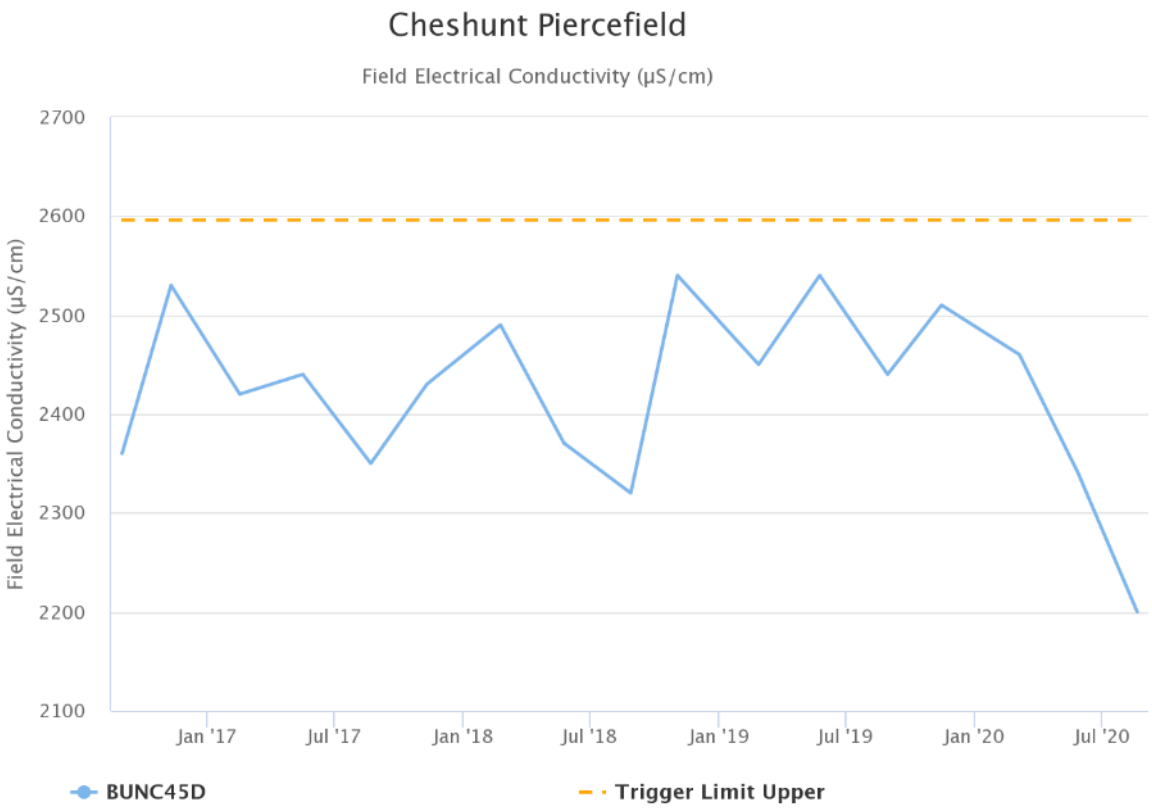


Figure 75 - Cheshunt Piercefield Field Electrical Conductivity Trend - September 2020

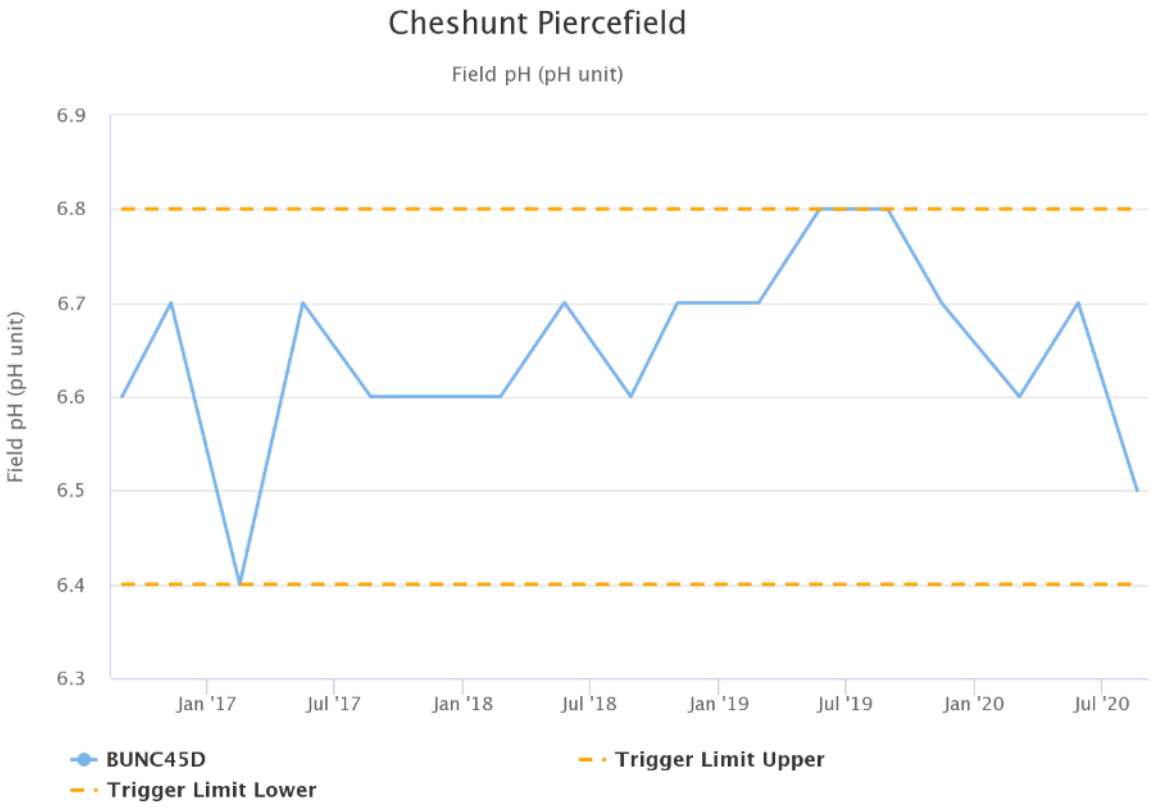


Figure 76 - Cheshunt Pierfield Field pH Trend - September 2020

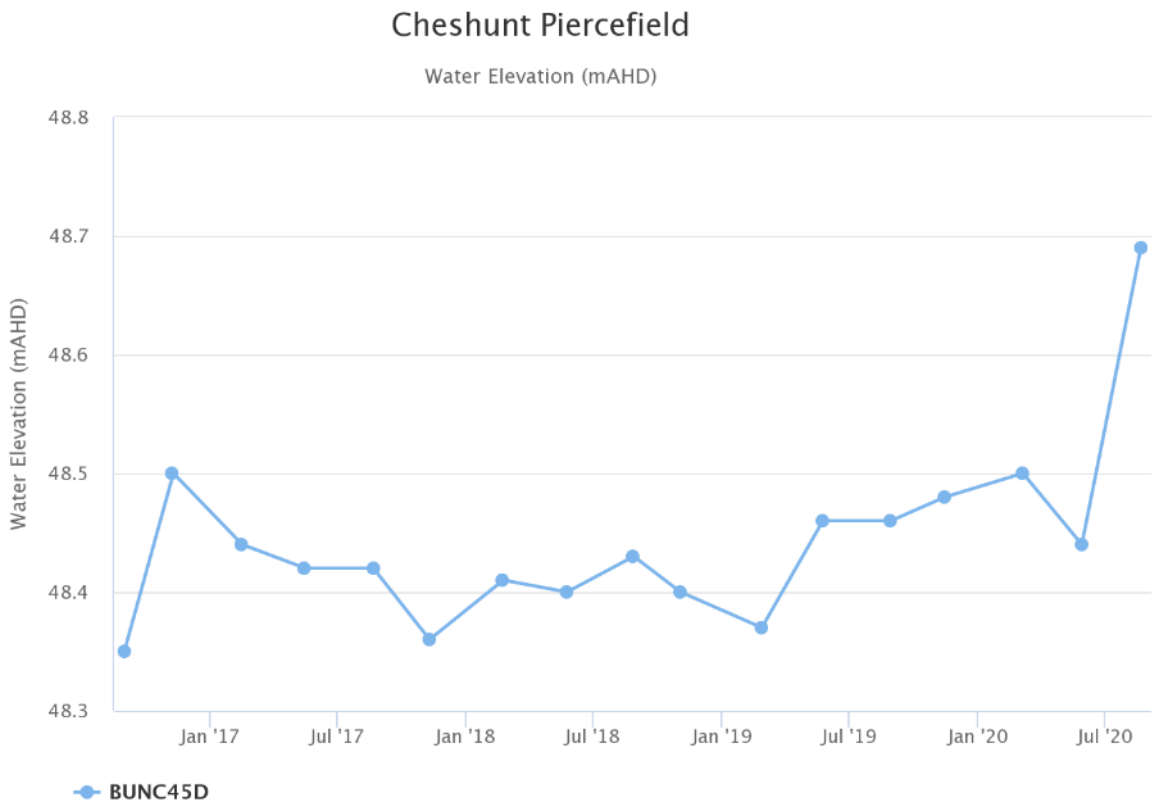


Figure 77 - Cheshunt Piercefield Standing Water Level - September 2020

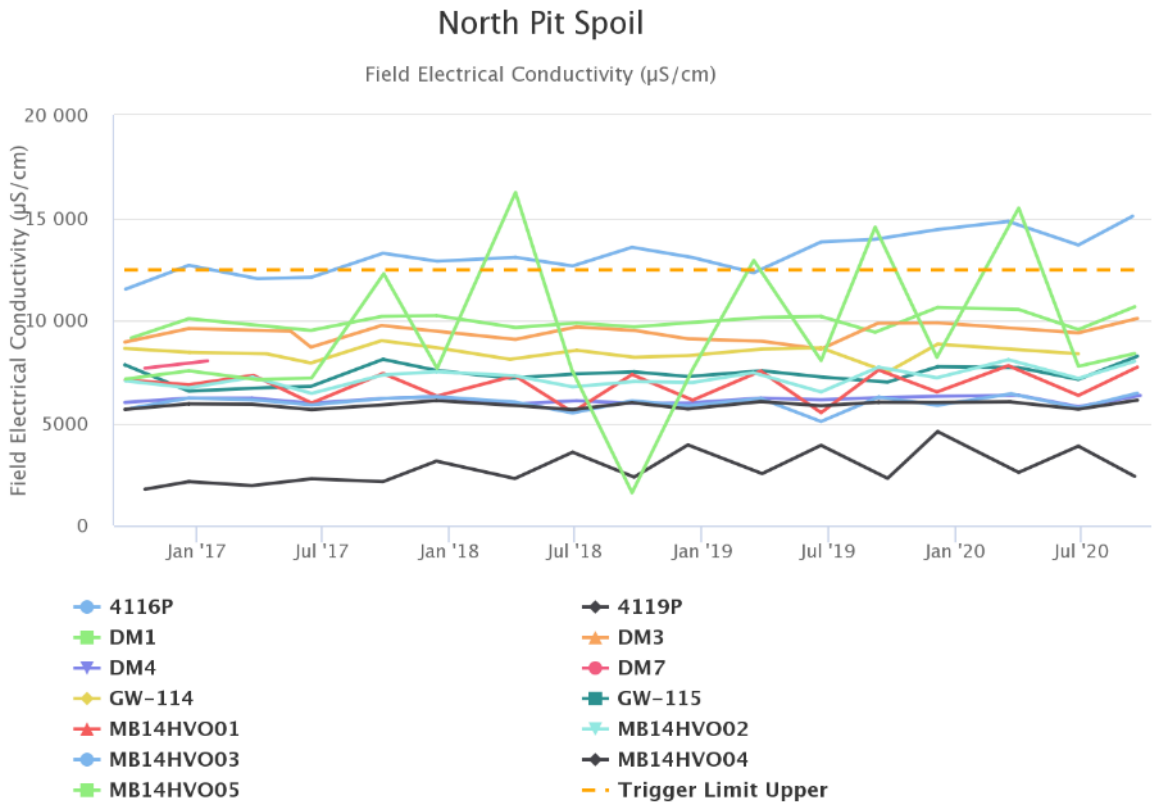


Figure 78 - North Pit Spoil Field Electrical Conductivity Trend - September 2020

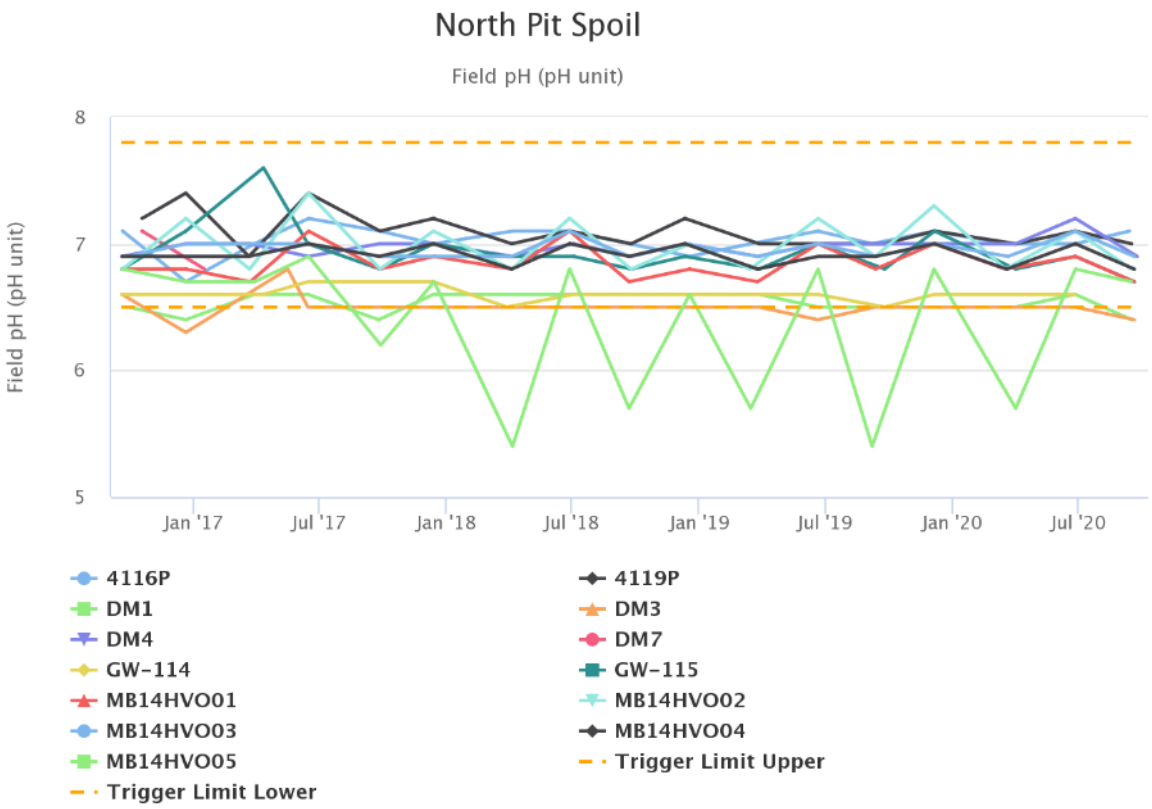


Figure 79 - North Pit Spoil Field pH Trend - September 2020

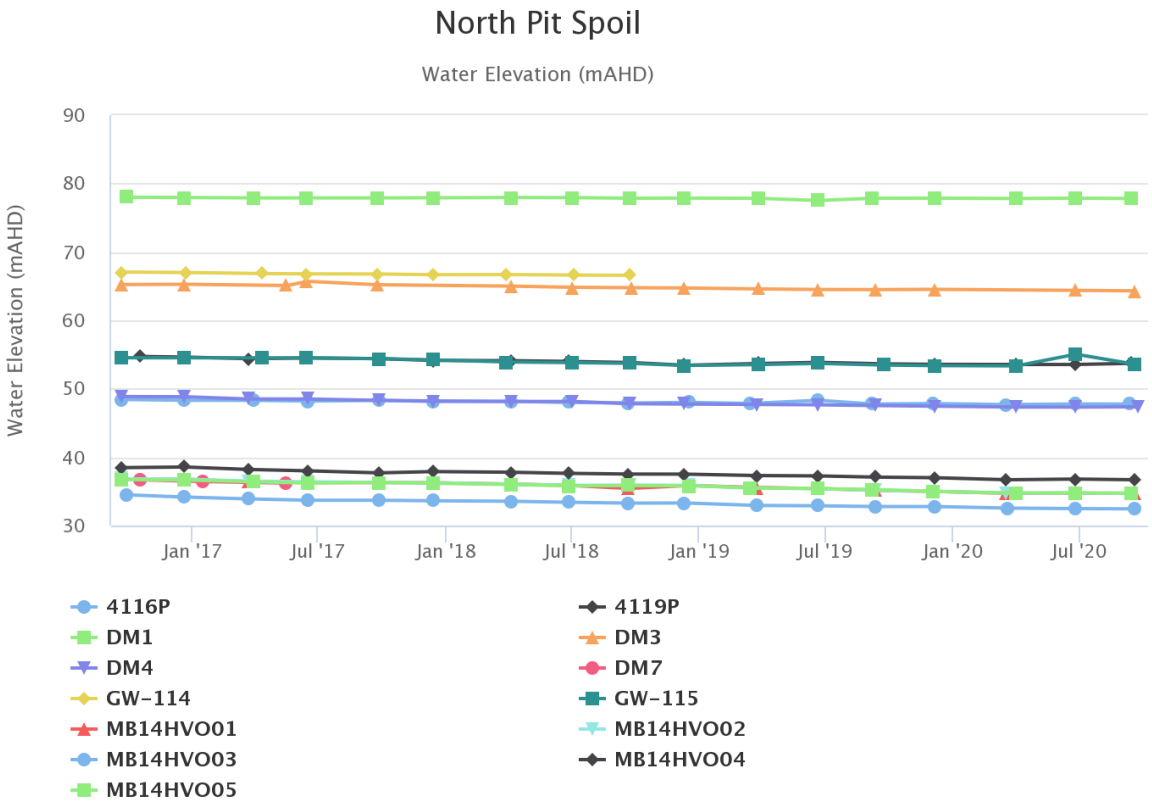


Figure 80 - North Pit Spoil Standing Water Level - September 2020

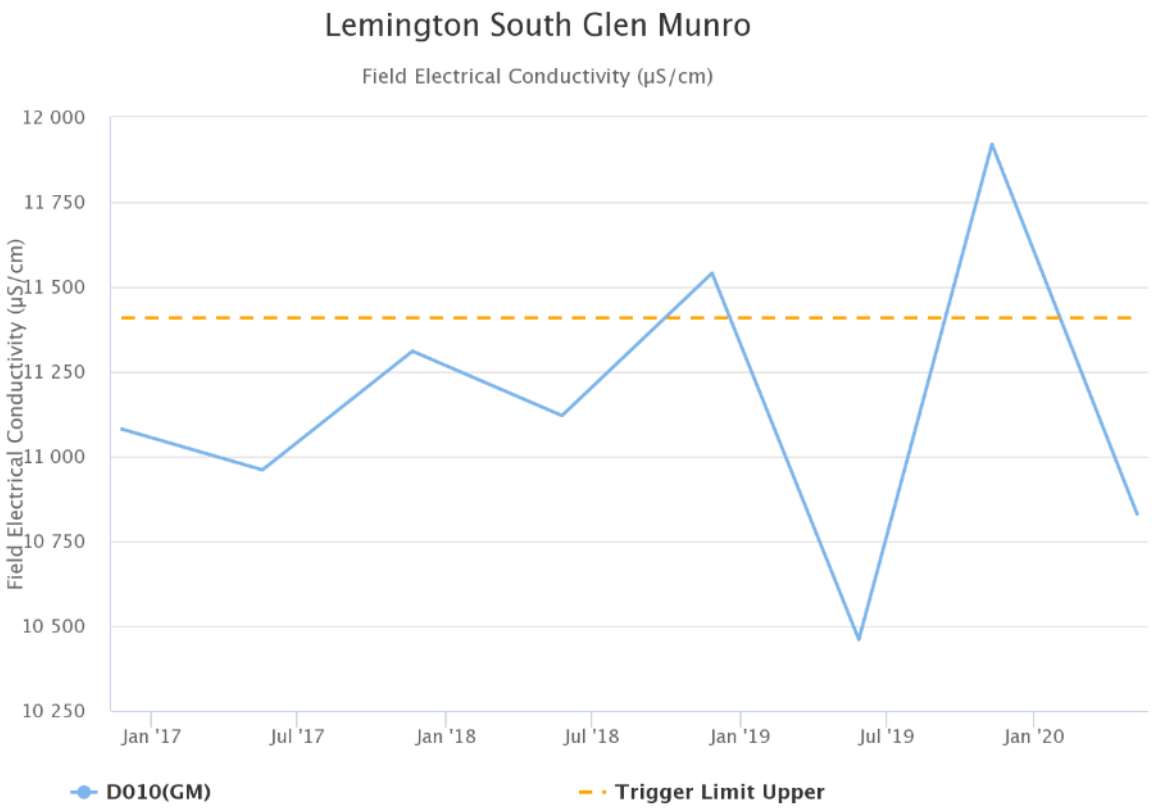


Figure 81 - Lemington South Glen Munro Field Electrical Conductivity Trend - September 2020

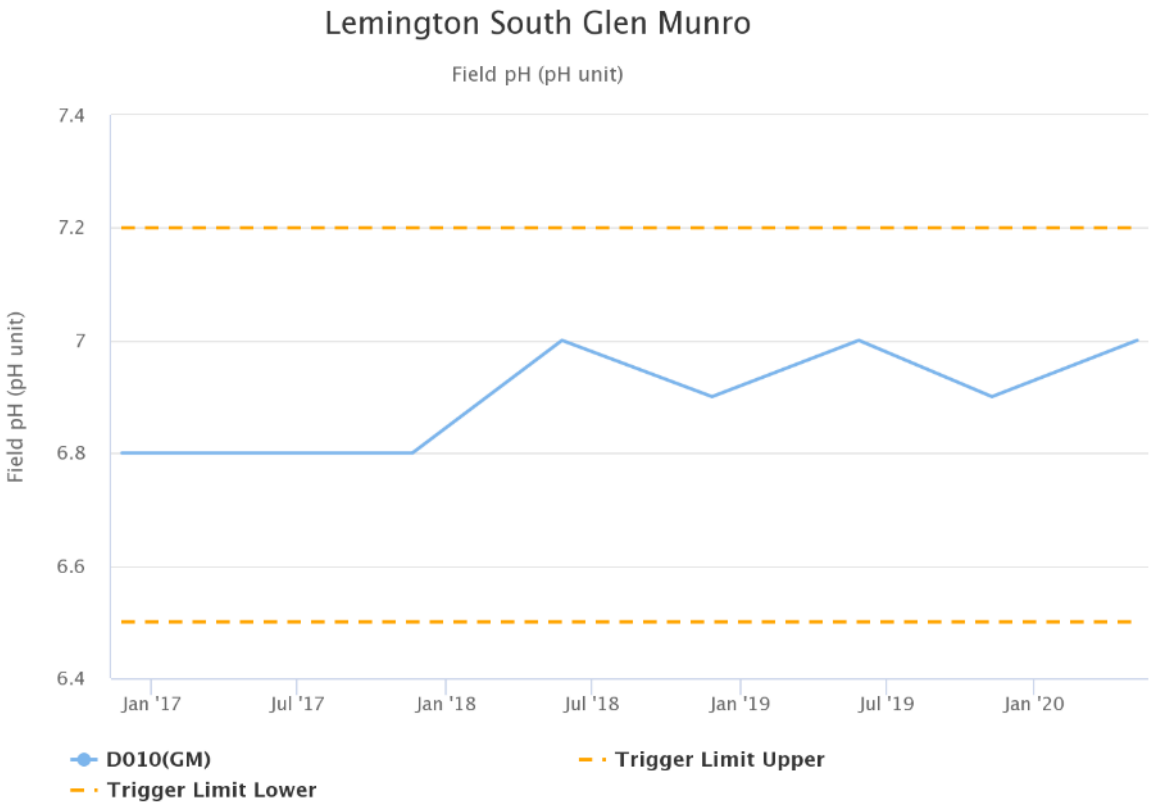


Figure 82 - Lemington South Glen Munro Field pH Trend - September 2020

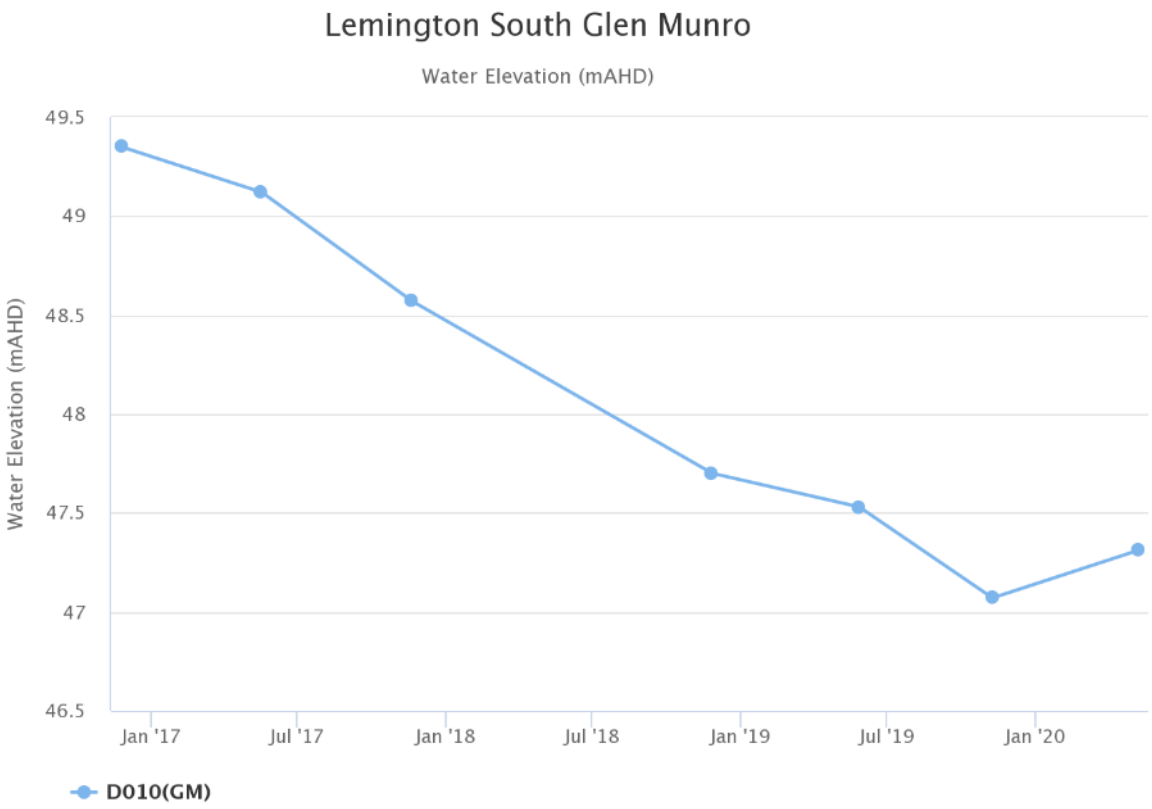


Figure 83 - Lemington South Glen Munro Standing Water Level - September 2020

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 are outlined in the HVO Water Management Plan.

Current internal trigger limit breaches are summarised in **Table 3**.

Table 3 - Groundwater Triggers Q3 2020

Site	Date	Trigger Limit Breached	Response Action
CFW55R	2/07/2020	EC	Investigation ongoing
CFW55R	5/08/2020	EC	Investigation ongoing
PB01(ALL)	7/08/2020	EC	First breach – watching brief established
Appleyard Farm	7/08/2020	pH	Third breach – investigation commenced
C130(ALL)	7/08/2020	EC	Investigation ongoing
CHPZ3D	18/08/2020	pH	First breach – watching brief established
Hobden's Well	19/08/2020	pH	Second breach – maintain watching brief
BZ4A(2)	19/08/2020	pH	Third breach – investigation commenced
BZ3-1	19/08/2020	pH	Investigation ongoing
BZ2A(1)	19/08/2020	pH	Investigation ongoing
CFW55R	2/09/2020	EC	Investigation ongoing
GW-106	10/09/2020	pH	First breach – watching brief established
4116P	11/09/2020	EC	Investigation ongoing
DM1	14/09/2020	pH	First breach – watching brief established
NPZ2	17/09/2020	EC	Investigation ongoing
DM3	18/09/2020	pH	First breach – watching brief established

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 84. 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

During September, twenty blasts were initiated at HVO. **Table 5** and **Table 6** show the blast monitoring results for the reporting period against the impact assessment criteria.

Table 5 - Overpressure Blast Monitoring Results - September 2020

Date and Time	Moses Crossing (dB)	Jerrys Plains Village (dB)	Maison Dieu (dB)	Warkworth (dB)	Knodlers Lane (dB)
01/09/2020 09:54	94.0	97.3	94.7	93.0	90.6
01/09/2020 09:56	92.4	101.6	103.3	96.9	106.1
04/09/2020 09:22	90.4	81.9	101.2	100.9	105.0
04/09/2020 09:24	106.6	99.6	103.0	98.3	108.9
05/09/2020 13:11	85.9	109.0	102.5	92.7	93.4
07/09/2020 13:05	101.1	103.9	93.8	93.6	95.2
08/09/2020 12:59	87.8	93.0	92.1	99.7	98.1
09/09/2020 13:23	96.9	98.3	101.5	92.5	96.9
09/09/2020 13:24	91.1	100.0	99.4	89.0	96.8
09/09/2020 15:11	110.2	106.9	103.2	101.7	98.4
10/09/2020 13:22	108.1	101.7	107.3	94.8	111.3
14/09/2020 13:45	98.9	93.9	93.2	96.5	96.6
14/09/2020 13:48	91.7	102.5	90.8	94.6	94.1
15/09/2020 09:41	93.3	97.5	94.1	93.5	95.3
16/09/2020 14:04	98.8	104.7	98.4	105.9	99.0
18/09/2020 12:56	99.5	99.4	95.9	95.6	95.7
19/09/2020 13:41	96.9	94.9	103.9	93.0	101.7
21/09/2020 13:41	98.2	104.3	97.3	98.7	96.6
21/09/2020 13:43	88.6	102.3	98.6	103.8	100.8
25/09/2020 09:24	93.4	100.6	101.6	102.3	104.0

Table 6 - Ground Vibration Blast Monitoring Results - September 2020

Date and Time	Moses Crossing (mm/s)	Jerrys Plains Village (mm/s)	Maison Dieu (mm/s)	Warkworth (mm/s)	Knodlers Lane (mm/s)
01/09/2020 09:54	0.25	0.09	0.25	0.47	0.13
01/09/2020 09:56	0.18	0.05	0.11	0.42	0.18
04/09/2020 09:22	0.15	0.06	0.07	0.48	0.08
04/09/2020 09:24	0.18	0.09	0.08	0.31	0.09
05/09/2020 13:11	0.11	0.04	0.14	0.17	0.15
07/09/2020 13:05	0.22	0.07	0.08	0.21	0.09
08/09/2020 12:59	0.14	0.1	0.08	0.29	0.08
09/09/2020 13:23	0.14	0.04	0.07	0.96	0.07
09/09/2020 13:24	0.11	0.04	0.06	0.15	0.07
09/09/2020 15:11	0.15	0.05	0.2	0.54	0.27
10/09/2020 13:22	0.1	0.02	0.05	0.45	0.08
14/09/2020 13:45	0.17	0.08	0.12	0.22	0.13
14/09/2020 13:48	0.21	0.21	0.16	0.25	0.12
15/09/2020 09:41	0.14	0.03	0.47	0.69	0.35
16/09/2020 14:04	0.14	0.08	0.18	0.72	0.2
18/09/2020 12:56	0.24	0.05	0.08	0.29	0.08
19/09/2020 13:41	0.13	0.07	0.09	0.12	0.08
21/09/2020 13:41	0.11	0.05	0.06	0.21	0.07
21/09/2020 13:43	0.17	0.06	0.7	0.89	0.62
25/09/2020 09:24	0.27	0.16	1.58	0.86	0.85

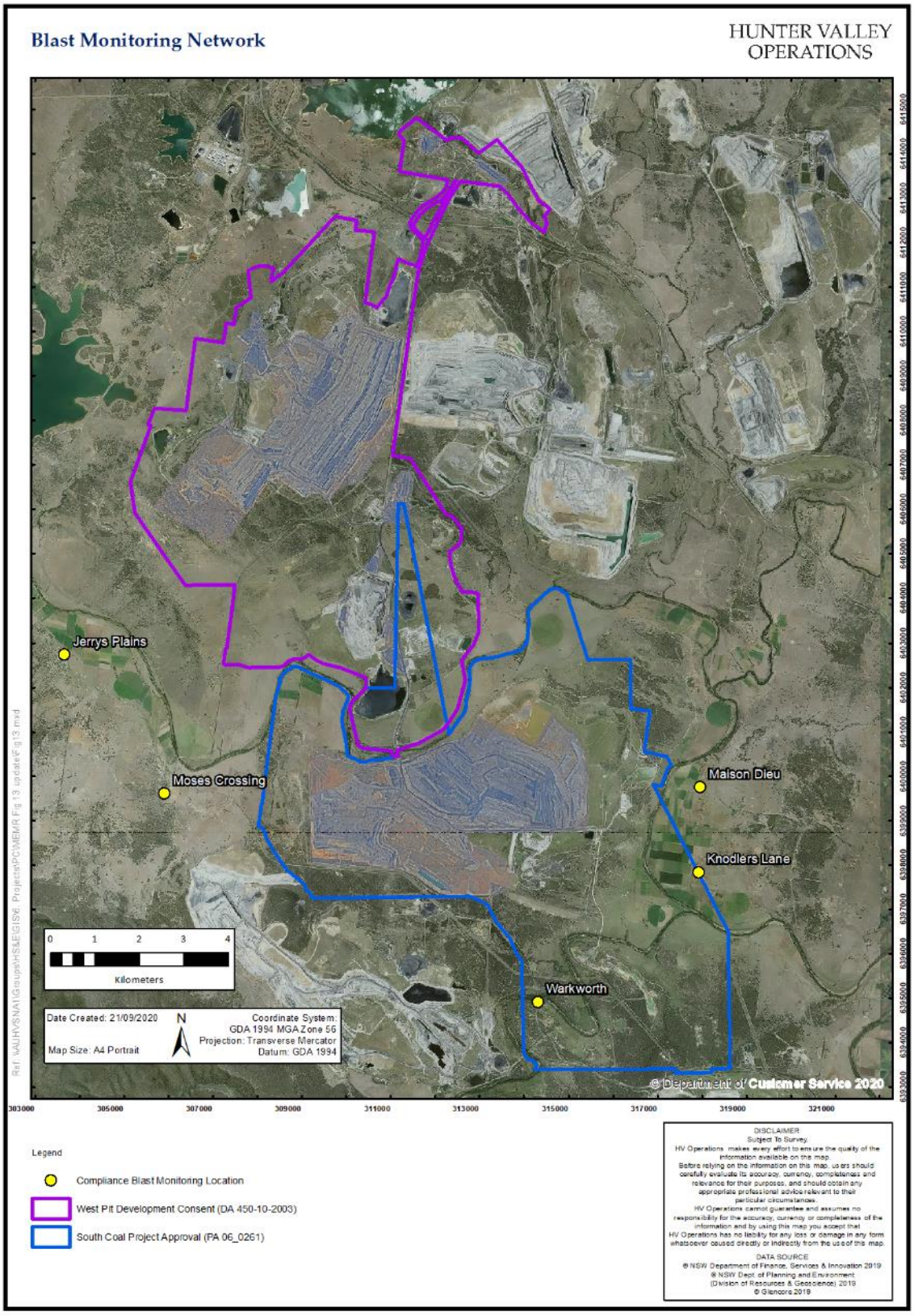


Figure 84 - Blast Monitoring Location Plan

5 Noise

Routine attended noise monitoring occurs at defined locations around HVO, as described in the HVO Noise Monitoring Programme. 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 85**.

5.1 Attended Noise Monitoring Results

Attended monitoring was conducted at receiver locations around HVO on the night of 8th September 2020 with no non-compliances recorded. Monitoring results are detailed in **Table 7** to **Table 11**.

Table 7 - LAeq,15minute HVO North Against Impact Assessment Criteria September 2020

Location	Date and Time	Wind Speed (m/s)[1]	Stability Class	Criterion dB(A)	Criterion Applies[2]	HVO North L_{Aeq} dB[3,4,5,6,7]	Exceedance[4,5]
Knodlers Lane	08/09/2020 21:45	0.7	F	35	Yes	IA	Nil
Maison Dieu	08/09/2020 21:24	0.8	D	35	Yes	IA	Nil
Shearers Lane	08/09/2020 21:03	1.1	D	35	Yes	IA	Nil
Kilburnie South	08/09/2020 23:37	2.4	D	39	Yes	IA	Nil
Jerrys Plains Village	08/09/2020 21:20	0.6	D	36	Yes	<25	Nil
Jerrys Plains East	08/09/2020 21:00	1.1	D	39	Yes	<25	Nil
Long Point Road	08/09/2020 21:02	1.4	D	35	Yes	IA	Nil
HVGC	08/09/2020 00:06	1.8	E	NA	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 attrivuted to HVO South Pit Area, including modifying factors if applicable;

4. Bold results in red indicated exceedance of relevant 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;

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

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

Table 8 - LAeq,15minute HVO North Against Land Acquisition Criteria September 2020

Location	Date and Time	Wind Speed (m/s)[1]	Stability Class	Criterion dB(A)	Criterion Applies[2]	HVO North L_{Aeq} dB[3,4,6,7]	Exceedance[4,5]
Knodlers Lane	08/09/2020 21:45	0.7	F	41	Yes	IA	Nil
Maison Dieu	08/09/2020 21:24	0.8	D	41	Yes	IA	Nil
Shearers Lane	08/09/2020 21:03	1.1	D	41	Yes	IA	Nil
Kilburnie South	08/09/2020 23:37	2.4	D	41	Yes	IA	Nil
Jerrys Plains Village	08/09/2020 21:20	0.6	D	41	Yes	<25	Nil
Jerrys Plains East	08/09/2020 21:00	1.1	D	41	Yes	<25	Nil
Long Point Road	08/09/2020 21:02	1.4	D	41	Yes	IA	Nil
HVGC	08/09/2020 00:06	1.8	E	NA	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 attrivuted to HVO South Pit Area, including modifying factors if applicable;

4. Bold results in red indicated exceedance of relevant 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;

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

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

Table 9 - LA1,1minute HVO North Against Impact Assessment Criteria September 2020

Location	Date and Time	Wind Speed (m/s)[1]	Stability Class	Criterion dB(A)	Criterion Applies[2]	HVO North L_{Aeq} dB[3,4,6,7]	Exceedance[4,5]
Knodlers Lane	08/09/2020 21:45	0.7	F	46	Yes	IA	Nil
Maison Dieu	08/09/2020 21:24	0.8	D	46	Yes	IA	Nil
Shearers Lane	08/09/2020 21:03	1.1	D	46	Yes	IA	Nil
Kilburnie South	08/09/2020 23:37	2.4	D	46	Yes	IA	Nil
Jerrys Plains Village	08/09/2020 21:20	0.6	D	46	Yes	30	Nil
Jerrys Plains East	08/09/2020 21:00	1.1	D	46	Yes	<25	Nil
Long Point Road	08/09/2020 21:02	1.4	D	46	Yes	IA	Nil
HVGC	08/09/2020 00:06	1.8	E	NA	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 attrivuted to HVO South Pit Area, including modifying factors if applicable;

4. Bold results in red indicated exceedance of relevant 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;

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

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

Table 10 - LAeq,15minute HVO South Against Impact Assessment Criteria September 2020

Location	Date and Time	Wind Speed (m/s)[1]	Stability Class	Criterion dB(A)	Criterion Applies[2]	HVO South L_{Aeq} dB[3,4,6,7]	Exceedance[4,5]
Knodlers Lane	08/09/2020 21:45	2.2	D	39	Yes	34	Nil
Maison Dieu	08/09/2020 21:24	1.8	D	39	Yes	<30	Nil
Shearers Lane	08/09/2020 21:03	1.1	E	41	Yes	<25	Nil
Kilburnie South	08/09/2020 23:37	2	D	39	Yes	<20	Nil
Jerrys Plains Village	08/09/2020 21:20	1.2	D	35	Yes	IA	Nil
Jerrys Plains East	08/09/2020 21:00	1.1	E	35	Yes	IA	Nil
Long Point Road	08/09/2020 21:02	1.4	D	35	Yes	IA	Nil
HVGC	08/09/2020 00:06	2.5	D	55	Yes	40	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 attrivuted to HVO South Pit Area, including modifying factors if applicable;

4. Bold results in red indicated exceedance of relevant 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;

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

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

Table 11 - LA1,1minute HVO South Against Impact Assessment Criteria September 2020

Location	Date and Time	Wind Speed (m/s)[1]	Stability Class	Criterion dB(A)	Criterion Applies[2]	HVO South L_{Aeq} dB[3,4,6,7]	Exceedance[4,5]
Knodlers Lane	08/09/2020 21:45	2.2	D	45	Yes	37	Nil
Maison Dieu	08/09/2020 21:24	1.8	D	45	Yes	<30	Nil
Shearers Lane	08/09/2020 21:03	1.1	E	45	Yes	28	Nil
Kilburnie South	08/09/2020 23:37	2	D	45	Yes	25	Nil
Jerrys Plains Village	08/09/2020 21:20	1.2	D	45	Yes	IA	Nil
Jerrys Plains East	08/09/2020 21:00	1.1	E	45	Yes	IA	Nil
Long Point Road	08/09/2020 21:02	1.4	D	45	Yes	IA	Nil
HVGC	08/09/2020 00:06	2.5	D	NA	Yes	46	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 attrivuted to HVO South Pit Area, including modifying factors if applicable;

4. Bold results in red indicated exceedance of relevant 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;

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

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

5.2 NPfI 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. During September 2020 no penalties were applied. The assessments for the low frequency noise are shown in **Table 12** and **Table 13**.

Table 12 - Modifying Factor Assessment HVO North September 2020

Location	Date and Time	Measured HVO North L_{Aeq} dB	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 dB[2]
Knodlers Lane	08/09/2020 21:45	IA	Yes	No	No	NA	No	NA	Nil
Maison Dieu	08/09/2020 21:24	IA	Yes	No	No	NA	No	NA	Nil
Shearers Lane	08/09/2020 21:03	IA	Yes	No	No	NA	No	NA	Nil
Kilburnie South	08/09/2020 23:37	IA	Yes	No	No	NA	No	NA	Nil
Jerrys Plains Village	08/09/2020 21:20	<25	Yes	No	No	NA	No	NA	Nil
Jerrys Plains East	08/09/2020 21:00	<25	Yes	No	No	NA	No	NA	Nil
Long Point Road	08/09/2020 21:02	IA	Yes	No	No	NA	No	NA	Nil
HVGC	08/09/2020 00:06	IA	Yes	No	No	NA	No	NA	Nil

1. NA means not applicable;

2. Bold results indicate that NPfI low-frequency modifying factor has been triggered and application of correction is required.

Table 13 - Modifying Factor Assessment HVO South September 2020

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?	Maximum Exceedance of NPfI Reference Spectrum [1,2]	Total Penalty dB[2]
Knodlers Lane	08/09/2020 21:45	34	Yes	No	No	NA	No	NA	Nil
Maison Dieu	08/09/2020 21:24	<30	Yes	No	No	NA	No	NA	Nil
Shearers Lane	08/09/2020 21:03	<25	Yes	No	No	NA	No	NA	Nil
Kilburnie South	08/09/2020 23:37	<20	Yes	No	No	NA	No	NA	Nil
Jerrys Plains Village	08/09/2020 21:20	IA	Yes	No	No	NA	No	NA	Nil
Jerrys Plains East	08/09/2020 21:00	IA	Yes	No	No	NA	No	NA	Nil
Long Point Road	08/09/2020 21:02	IA	Yes	No	No	NA	No	NA	Nil
HVGC	08/09/2020 00:06	40	Yes	No	No	NA	No	NA	Nil

1. NA means not applicable;

2. Bold results indicate that NPfI low-frequency modifying factor has been triggered and application of correction 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 85**. 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 likely to be attributable to HVO.

HVO investigates and responds to noise alarms with appropriate modification to operations. Changes in response to a noise alarm can include replacing equipment with quieter (noise attenuated) 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.

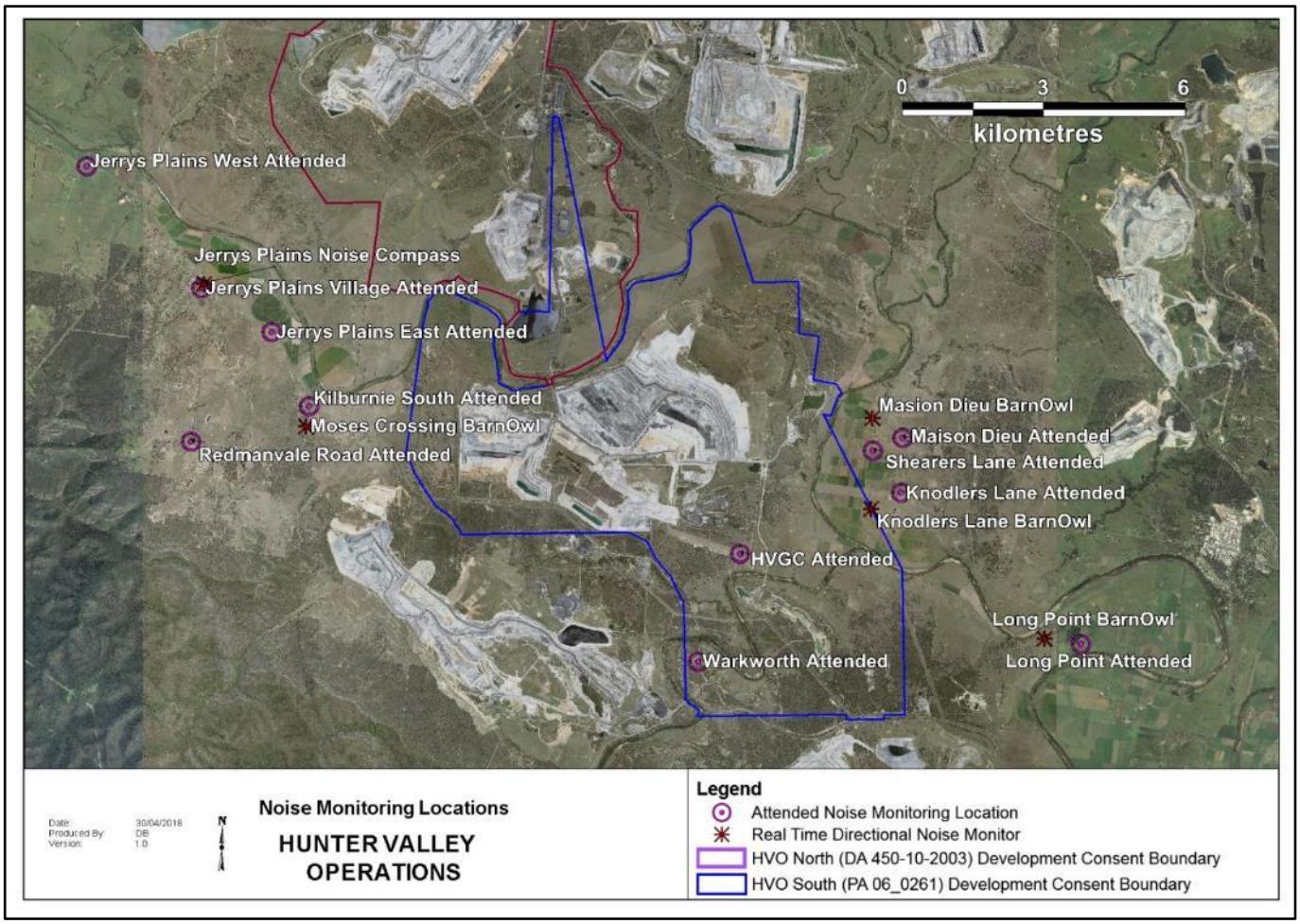


Figure 85 - Noise monitoring location plan

6 Operational Downtime

During September a total of 68 hours of equipment downtime were logged in response to real time monitoring and inspections for environmental factors such as noise and dust. Operational downtime by equipment type is show in **Figure 86**. 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).

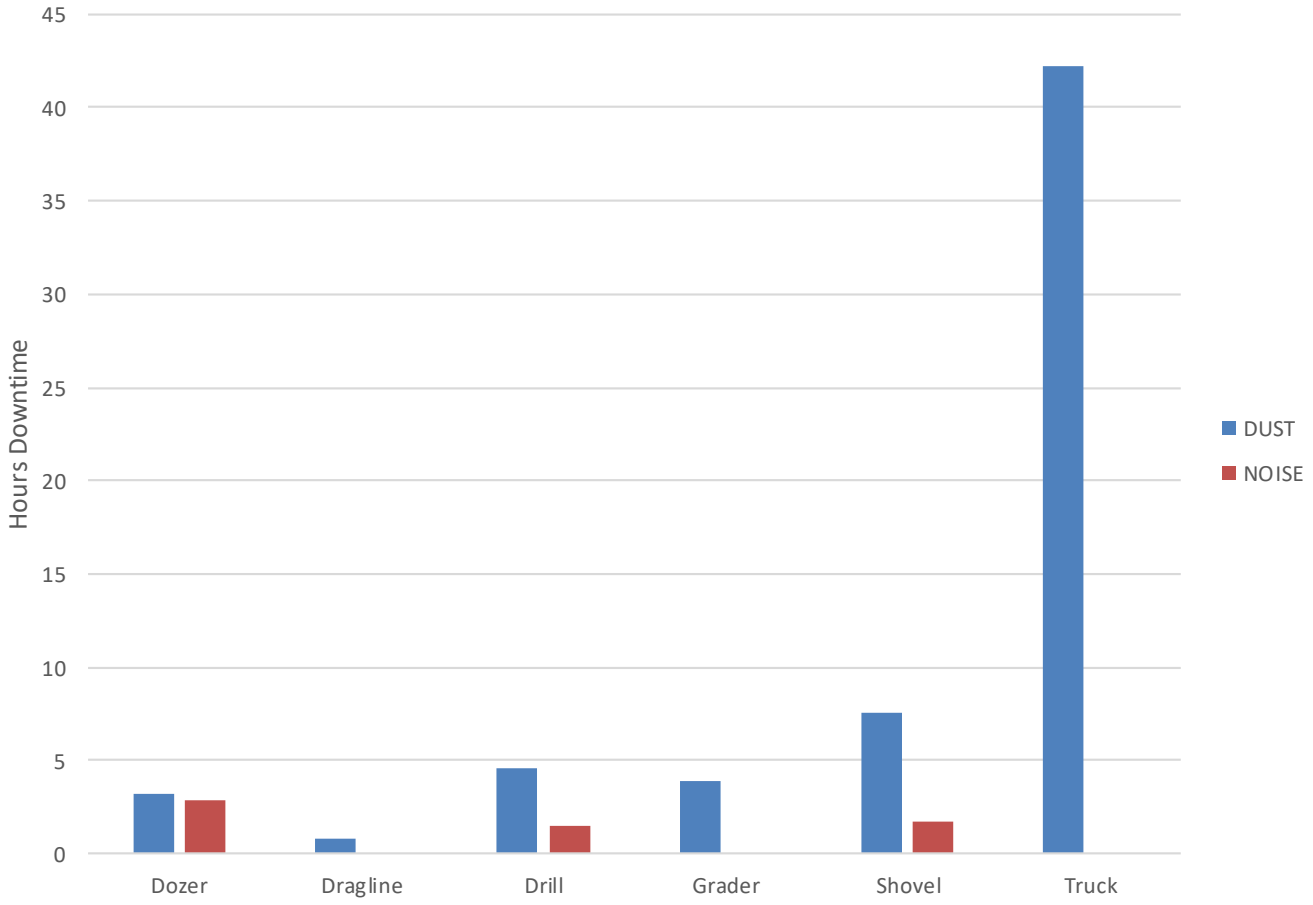


Figure 86 - Operational Downtime by Equipment Type

7 Rehabilitation

During September, 24.1 Ha of land was bulk shaped, 14.5 Ha of land was released, 19.2 Ha of land was topsoiled, and 15.5 Ha was rehabilitated. Year to date progress can be viewed in **Figure 87**.

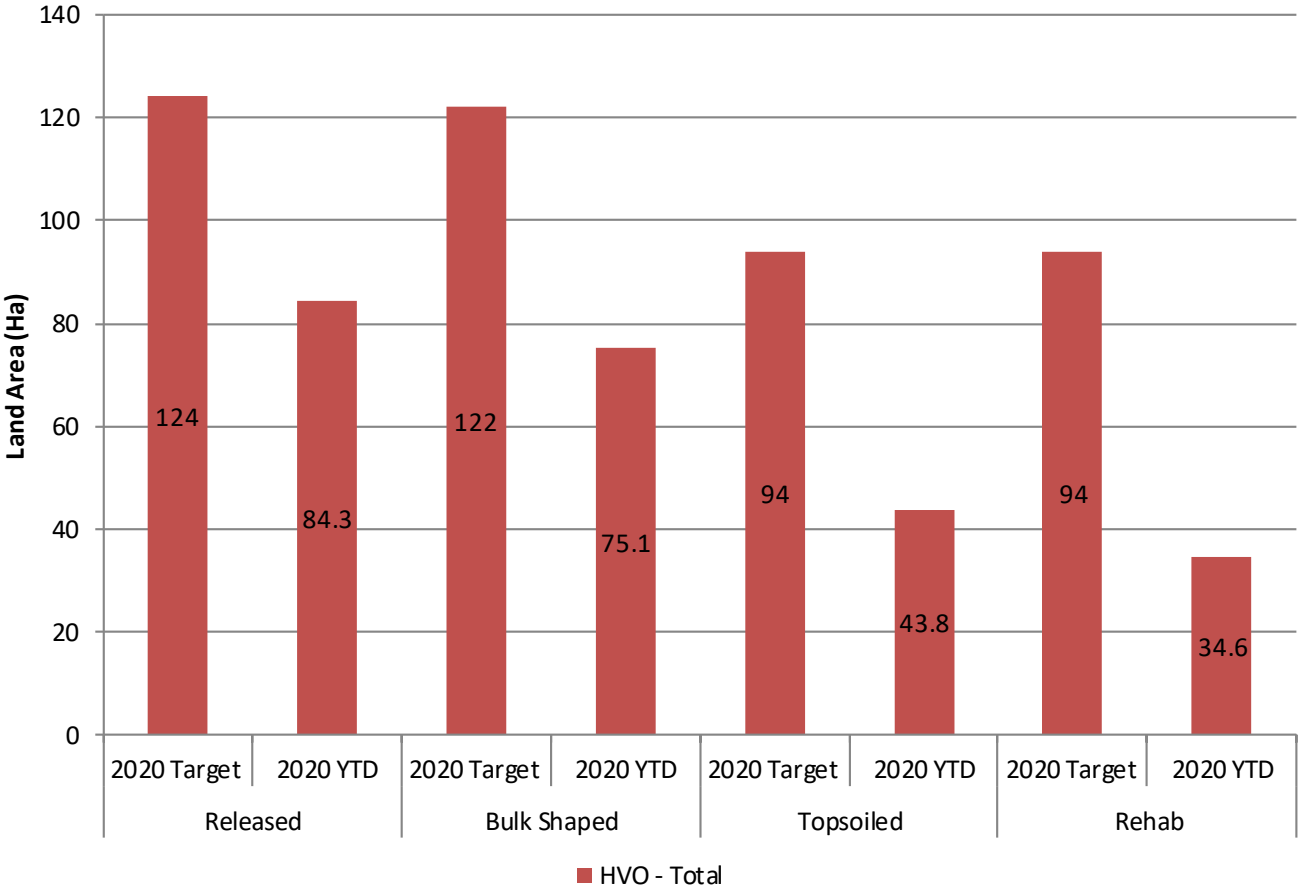


Figure 87 - Rehabilitation YTD September 2020

8 Complaints

Five complaints were received during September 2020. Eleven complaints have been received in 2020. Details of complaints received are shown in **Table 14**.

Table 14 - Complaints Summary 2020

Month	Noise	Dust	Blast	Lighting	Other	Total
January	-	-	-	-	-	-
February	-	-	-	-	-	-
March	-	-	-	-	-	-
April	-	-	-	-	-	-
May	3	-	-	-	-	3
June	2	-	-	-	-	2
July	-	-	-	-	-	-
August	-	-	1	-	-	1
September	-	-	1	3	1	5
October						
November						
December						
Total	5	0	2	3	1	**11**

9 Environmental Incidents

During September there were 4 reportable environmental incidents:

- 03/09/2020 – Delayed reporting of Warkworth TEOM miscapture
  The Warkworth TEOM failed to capture sufficient air quality data on the 10th and 11th August, this was noted for inclusion in the EPL Annual Return, however the failure to monitor was not immediately reported to the Department of Planning, Industry and Environment (DPIE).
  Environmental Consequence: Cat 1 Negligible
- 20/09/2020 – Missed Sample at Jerrys Plains TEOM
  The data logger on the Jerrys Plain TEOM failed, resulting in missed samples on the 20th and 21st September.
  Environmental Consequence: Cat 1 Negligible
- 23/09/2020 – Failure to run at Kilburnie South $PM_{2.5}$ HVAS
  The Kilburnie South $PM_{2.5}$ HVAS failed to run on the 23rd September due to a power supply failure. A temporary replacement monitor was put into place.
  Environmental Consequence: Cat 1 Negligible
- 29/09/2020 – Failure to run at Kilburnie South $PM_{2.5}$ HVAS
  The temporary replacement Kilburnie South $PM_{2.5}$ HVAS failed to run on the 29th September. The original unit was repaired and reinstated for the next run.

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)
01/09/2020	18.31	8.46	87.9	40.9	957	121	2.7	0.0
02/09/2020	23.01	6.03	100	29.92	897	269	2.7	0.0
03/09/2020	25.89	13.73	76.45	32.39	739	284	4.8	0.0
04/09/2020	26.53	14.22	100	29.02	1041	283	4.5	2.0
05/09/2020	21.93	11.50	100	22.82	786	250	3.0	1.4
06/09/2020	19.78	8.64	100	52.15	1027	113	3.3	0.0
07/09/2020	21.84	8.95	100	36.97	785	121	2.2	0.0
08/09/2020	24.8	7.43	100	26.42	788	220	1.4	0.0
09/09/2020	16.42	9.94	111.5	59.26	219	163	2.4	16.0
10/09/2020	16.04	9.55	110.5	56.1	1039	126	3.5	2.4
11/09/2020	17.69	8.93	108.2	56.61	1199	118	3.0	0.0
12/09/2020	21.42	6.83	111.7	31.04	822	243	1.5	0.0
13/09/2020	23.48	8.83	98.4	33.21	1009	270	2.6	0.0
14/09/2020	25.89	11.18	98.8	28.87	936	224	2.9	0.0
15/09/2020	22.94	12.78	108.3	46.73	1091	110	1.9	0.0
16/09/2020	25.83	10.64	110.6	35.37	840	253	2.3	0.0
17/09/2020	27.28	13.96	82.9	26.77	813	250	3.1	0.0
18/09/2020	17.5	12.83	100	66.42	730	118	3.5	0.0
19/09/2020	24.41	13.38	111.7	31.65	968	127	2.5	0.0
20/09/2020	18.29	13.21	111.8	70.2	1150	163	1.1	20.4
21/09/2020	27.59	10.70	112.7	44.27	1338	223	2.3	8.4
22/09/2020	23.58	14.47	100	18.76	896	277	4.7	0.0
23/09/2020	20.2	10.70	74.31	20.59	884	279	4.9	0.0
24/09/2020	18.46	7.83	83	19	1262	273	3.7	0.0
25/09/2020	22.45	6.03	93.7	12.56	1084	281	5.5	0.8

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)
26/09/2020	14.52	4.82	86.1	26.89	1155	285	7.0	0.2
27/09/2020	18.54	5.49	82.5	28.45	1229	212	3.2	0.0
28/09/2020	18.94	6.58	96.8	20.73	1174	121	1.7	0.0
29/09/2020	19.82	5.35	97.9	28.72	994	116	2.2	0.0
30/09/2020	18.51	7.57	100	44.54	758	245	1.9	0.0