

# HUNTER VALLEY OPERATIONS



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## Monthly Environmental Monitoring Report December 2020

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## Table of Contents

<b>1</b>	<b>Introduction .....</b>	<b>5</b>
<b>2</b>	<b>Air Quality .....</b>	<b>5</b>
2.1	Meteorological Monitoring .....	5
2.1.1	Rainfall.....	5
2.1.2	Wind Speed and Direction .....	6
2.2	Depositional Dust.....	8
2.3	Suspended Particles .....	9
2.3.1	HVAS PM <sub>10</sub> Results .....	9
2.3.2	HVAS PM <sub>2.5</sub> Results.....	11
2.3.3	TSP Results.....	13
2.3.4	Real Time PM <sub>10</sub> Results .....	14
2.3.5	Real Time Alarms for Air Quality.....	15
<b>3</b>	<b>Water Quality .....</b>	<b>16</b>
3.1	Surface Water.....	16
3.1.1	Surface Water Trigger Tracking.....	24
3.2	Site Water Use.....	25
3.3	HRSTS Discharge.....	25
3.4	Groundwater Monitoring Results .....	25
3.4.1	Groundwater Trigger Tracking.....	56
<b>4</b>	<b>Blasting .....</b>	<b>57</b>
4.1	Blast Monitoring Results .....	58
<b>5</b>	<b>Noise .....</b>	<b>61</b>
5.1	Attended Noise Monitoring Results .....	61
5.2	NPfl Low Frequency Assessment.....	67
5.3	Real Time Noise Monitoring.....	69
<b>6</b>	<b>Operational Downtime .....</b>	<b>70</b>
<b>7</b>	<b>Rehabilitation .....</b>	<b>71</b>
<b>8</b>	<b>Complaints.....</b>	<b>72</b>
<b>9</b>	<b>Environmental Incidents.....</b>	<b>73</b>

## Table of Figures

Figure 1 - Rainfall Summary 2020.....	5
Figure 2 - HVO Corporate Wind Rose December 2020 .....	6
Figure 3 - HVO Cheshunt Wind Rose December 2020.....	6
Figure 4 - Air Quality Monitoring Location Plan .....	7
Figure 5 - Depositional Dust Results December 2020 .....	8
Figure 6 - Individual PM <sub>10</sub> Results December 2020.....	9
Figure 7 - Year to Date Average PM <sub>10</sub> as at end of December 2020.....	10
Figure 8 - Individual PM <sub>2.5</sub> Results December 2020.....	11
Figure 9 - Year to Date Average PM <sub>2.5</sub> as at end of December 2020 .....	12
Figure 10 - Year to Date Average Total Suspended Particulates as at end of December 2020 .....	13
Figure 11 - Real Time PM <sub>10</sub> 24hr average and YTD average December 2020.....	14
Figure 12 - Real Time PM <sub>10</sub> Annual Average December 2020 .....	15
Figure 13 - HVO Surface Water Monitoring Locations .....	17
Figure 14 - Site Dams Electrical Conductivity - December 2020.....	18
Figure 15 - Site Dams pH - December 2020.....	18
Figure 16 Site Dams TSS - December 2020.....	19
Figure 17 - Wollombi Brook Electrical Conductivity - December 2020.....	19
Figure 18 - Wollombi Brook pH - December 2020.....	20
Figure 19 - Wollombi Brook TSS - December 2020.....	20
Figure 20 - Hunter River Electrical Conductivity - December 2020 .....	21
Figure 21 - Hunter River pH - December 2020.....	21
Figure 22 - Hunter River TSS - December 2020.....	22
Figure 23 - Other Tributaries Electrical Conductivity - December 2020.....	22
Figure 24 - Other Tributaries pH - December 2020 .....	23
Figure 25 - Other Tributaries TSS - December 2020.....	23
Figure 26 Groundwater monitoring Locations at HVO .....	26
Figure 27 - Carrington Alluvium Field Electrical Conductivity Trend - December 2020.....	27
Figure 28 - Carrington Alluvium Field pH Trend - December 2020.....	27
Figure 29 - Carrington Alluvium Standing Water Level - December 2020 .....	28
Figure 30 - Carrington Interburden Field Electrical conductivity Trend - December 2020.....	28
Figure 31 - Carrington Interburden Field pH - December 2020 .....	29
Figure 32 - Carrington Interburden Standing Water Level - December 2020.....	29
Figure 33 - Cheshunt Interburden Field Electrical Conductivity Trend - December 2020 .....	30
Figure 34 - Cheshunt Interburden Field pH Trend - December 2020.....	30
Figure 35 - Cheshunt Interburden Standing Water Level - December 2020.....	31
Figure 36 - Cheshunt Mt Arthur Field Electrical Conductivity Trend - December 2020.....	31
Figure 37 - Cheshunt Mt Arthur Field pH Trend - December 2020.....	32
Figure 38 - Cheshunt Mt Arthur Standing Water Level - December 2020.....	32
Figure 39 - Cheshunt North Pit Alluvium Field Electrical Conductivity Trend - December 2020.....	33
Figure 40 - Cheshunt North Pit Alluvium Field pH Trend - December 2020.....	33
Figure 41 - Cheshunt North Pit Alluvium Standing Water Level - December 2020.....	34
Figure 42 - Carrington West Wing Alluvium Field Electrical Conductivity Trend - December 2020.....	34
Figure 43 - Carrington West Wing Alluvium Field pH Trend - December 2020.....	35
Figure 44 - Carrington West Wing Alluvium Standing Water Level - December 2020 .....	35
Figure 45 - Carrington West Wing Flood Plain Field Electrical Conductivity Trend - December 2020.....	36
Figure 46 - Carrington West Wing Flood Plain Field pH Trend - December 2020.....	36
Figure 47 - Carrington West Wing Flood Plain Standing Water Level - December 2020.....	37
Figure 48 - Carrington West Wing LBL Field Electrical Conductivity Trend - December 2020 .....	37
Figure 49 - Carrington West Wing LBL Field Electrical Conductivity Trend - December 2020 .....	38
Figure 50 - Carrington West Wing LBL Standing Water Level - December 2020.....	38
Figure 51 - Lemington South Alluvium Field Electrical Conductivity Trend - December 2020.....	39
Figure 52 - Lemington South Alluvium Field pH Trend - December 2020.....	39
Figure 53 - Lemington South Alluvium Standing Water Level - December 2020 .....	40
Figure 54 - Lemington South Arrowfield Field Electrical Conductivity Trend - December 2020.....	40
Figure 55 - Lemington South Arrowfield Field pH Trend - December 2020 .....	41
Figure 56 Lemington South Arrowfield Standing Water Level - December 2020.....	41

Figure 57 - Lemington South Bowfield Field Electrical Conductivity Trend - December 2020.....42  
 Figure 58 - Lemington South Bowfield Field pH - December 2020.....42  
 Figure 59 - Lemington South Bowfield Standing Water Level - December 2020 .....43  
 Figure 60 - Lemington South Woodlands Hill Field Electrical Conductivity Trend - December 2020.....43  
 Figure 61 - Lemington South Woodlands Hill Field pH Trend - December 2020.....44  
 Figure 62 - Lemington South Woodlands Hill Standing Water Level - December 2020 .....44  
 Figure 63 - Lemington South Interburden Field Electrical Conductivity Trend - December 2020.....45  
 Figure 64 - Lemington South Interburden Field pH Trend - December 2020 .....45  
 Figure 65 - Lemington South Interburden Standing Water Level - December 2020 .....46  
 Figure 66 - West Pit Alluvium Field Electrical Conductivity Trend - December 2020.....46  
 Figure 67 - West Pit Alluvium Field pH - December 2020.....47  
 Figure 68 - West Pit Alluvium Standing Water Level - December 2020 .....47  
 Figure 69 - West Pit Siltstone Field Electrical Conductivity Trend - December 2020.....48  
 Figure 70 - West Pit Siltstone Field pH Trend - December 2020 .....48  
 Figure 71 - West Pit Siltstone Standing Water level - December 2020.....49  
 Figure 72 - Carrington Broonie Field Electrical Conductivity Trend - December 2020.....49  
 Figure 73 - Carrington Broonie Field pH Trend - December 2020.....50  
 Figure 74 - Carrington Broonie Standing Water Level - December 2020 .....50  
 Figure 75 - Cheshunt Piercefield Field Electrical Conductivity Trend - December 2020 .....51  
 Figure 76 - Cheshunt Piercefield Field pH Trend - December 2020.....51  
 Figure 77 - Cheshunt Piercefield Standing Water Level - December 2020.....52  
 Figure 78 - North Pit Spoil Field Electrical Conductivity Trend - December 2020 .....52  
 Figure 79 - North Pit Spoil Field pH Trend - December 2020.....53  
 Figure 80 - North Pit Spoil Standing Water Level - December 2020.....53  
 Figure 81 - Lemington South Glen Munro Field Electrical Conductivity Trend - December 2020 .....54  
 Figure 82 - Lemington South Glen Munro Field pH Trend - December 2020.....54  
 Figure 83 - Lemington South Glen Munro Standing Water Level - December 2020.....55  
 Figure 84 - Blast Monitoring Location Plan .....60  
 Figure 85 - Noise Monitoring Location Plan .....69  
 Figure 86 - Operational Downtime by Equipment Type December 2020.....70  
 Figure 87 - Rehabilitation YTD December 2020.....71

Table 1 - Rainfall data - December 2020 5  
 Table 2 Surface Water Triggers Q4 2020 24  
 Table 3 - Groundwater Triggers Q4 2020 56  
 Table 4 - Blasting Criteria 57  
 Table 5 - Overpressure Blast Monitoring Results December 2020 58  
 Table 6 - Ground Vibration Blast Monitoring Results December 2020 59  
 Table 7 - LAeq,15minute HVO North Against Impact Assessment Criteria December 2020 62  
 Table 8 - LAeq,15minute HVO North Against Land Acquisition Criteria December 2020 63  
 Table 9 - LA1,1minute HVO North Against Impact Assessment Criteria December 2020 64  
 Table 10 - LAeq,15minute HVO South Against Impact Assessment Criteria December 2020 65  
 Table 11 - LA1,1minute HVO South Against Impact Assessment Criteria December 2020 66  
 Table 12 - Modifying Factor Assessment HVO North December 2020 67  
 Table 13 - Modifying Factor Assessment HVO South December 2020 68  
 Table 14 - Complaints Summary 2020 72

# 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 1<sup>st</sup> to 31<sup>st</sup> December 2020 (the 'Reporting Period').

## 2 Air Quality

### 2.1 Meteorological Monitoring

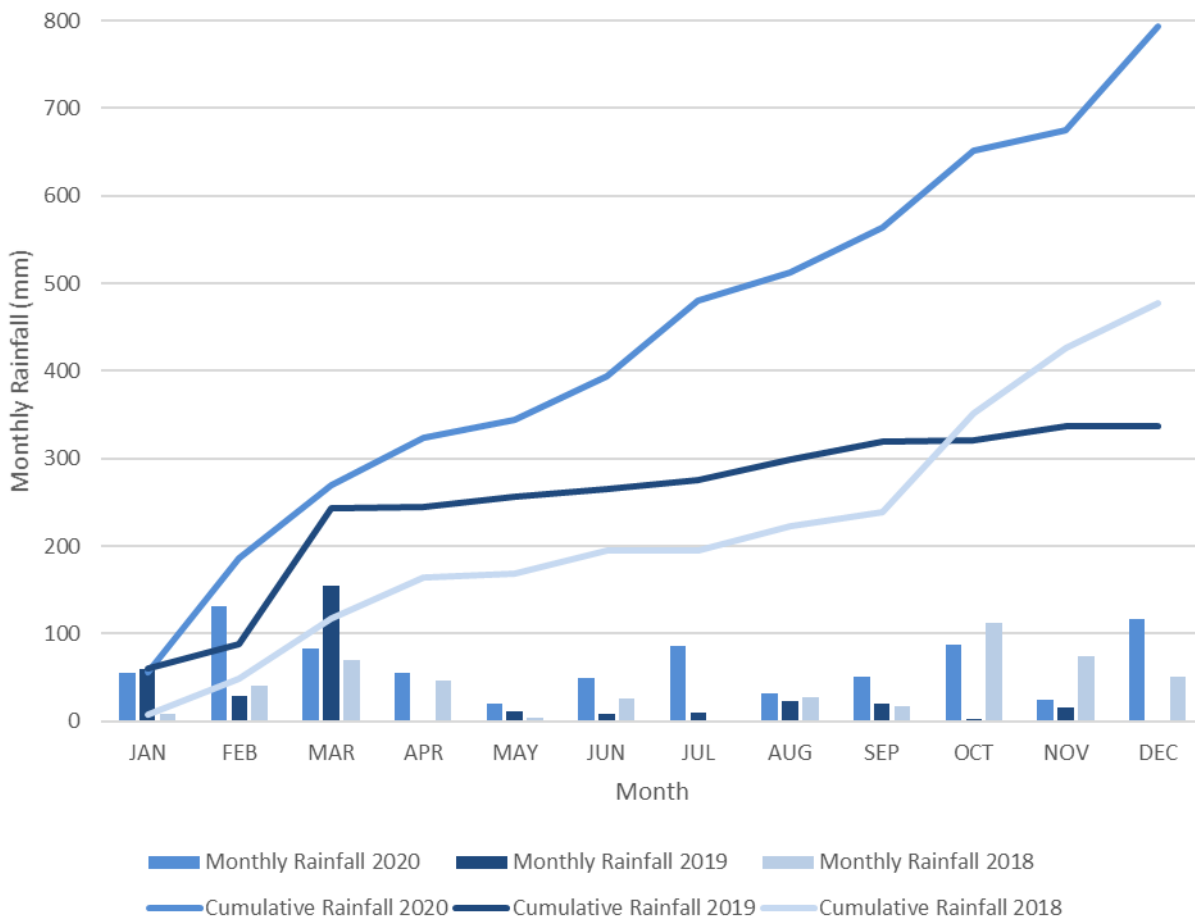
HVO maintains two meteorological stations: 'HVO Corporate' and 'Cheshunt' (refer to **Figure 4**)

#### 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 - December 2020**

2020	Monthly Rainfall (mm)	Cumulative Rainfall (mm)
December	117.4	793



**Figure 1 - Rainfall Summary 2020**

## 2.1.2 Wind Speed and Direction

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

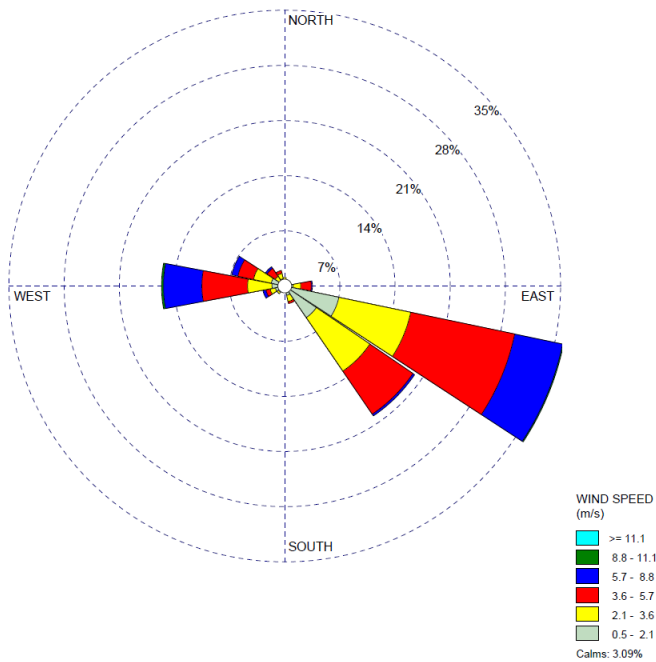


Figure 2 - HVO Corporate Wind Rose December 2020

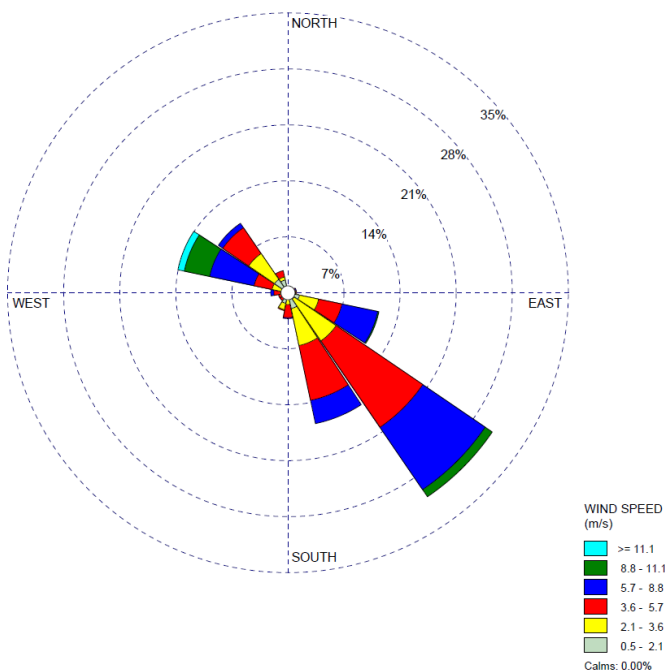


Figure 3 - HVO Cheshunt Wind Rose December 2020

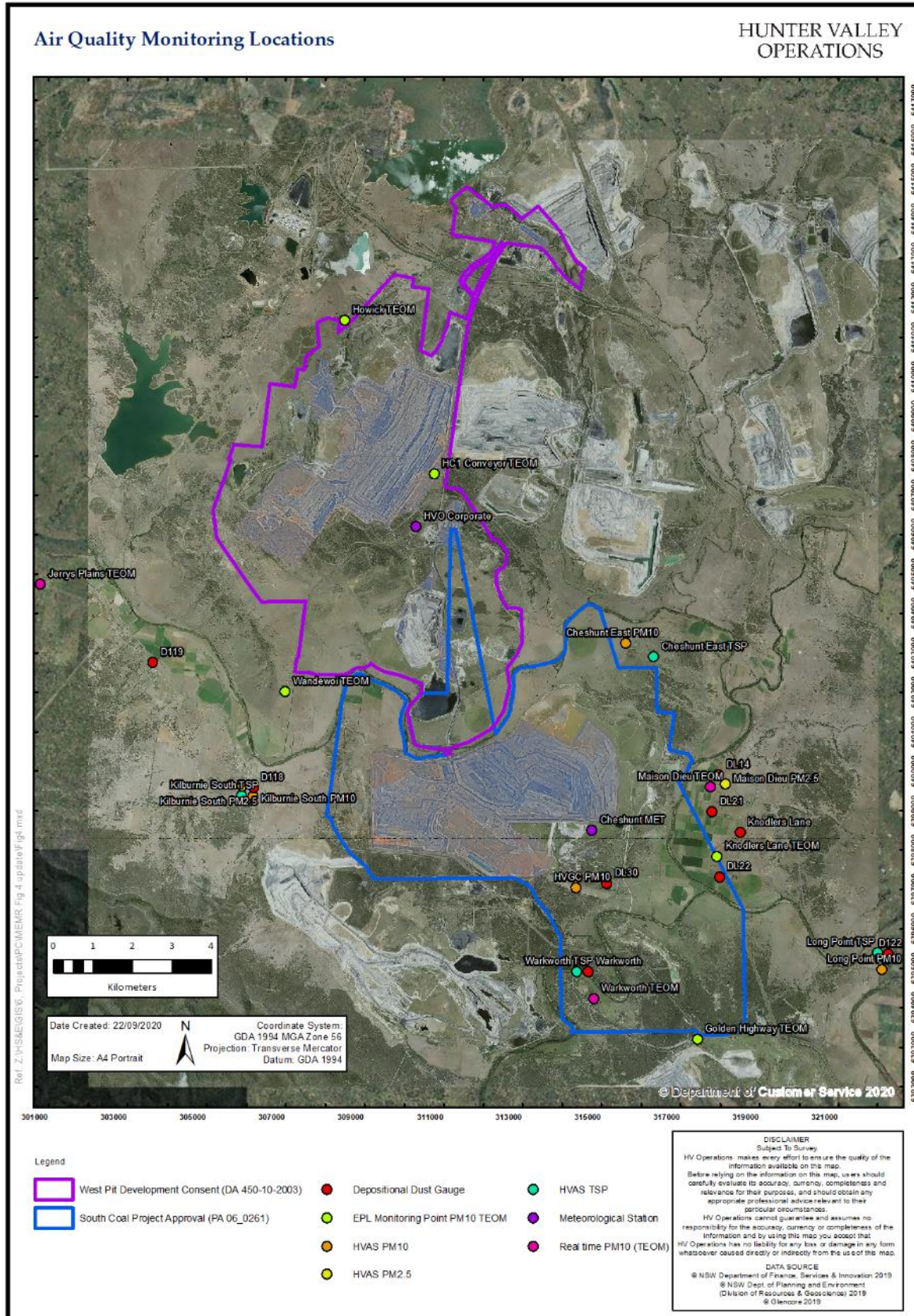


Figure 4 - Air Quality Monitoring Location Plan

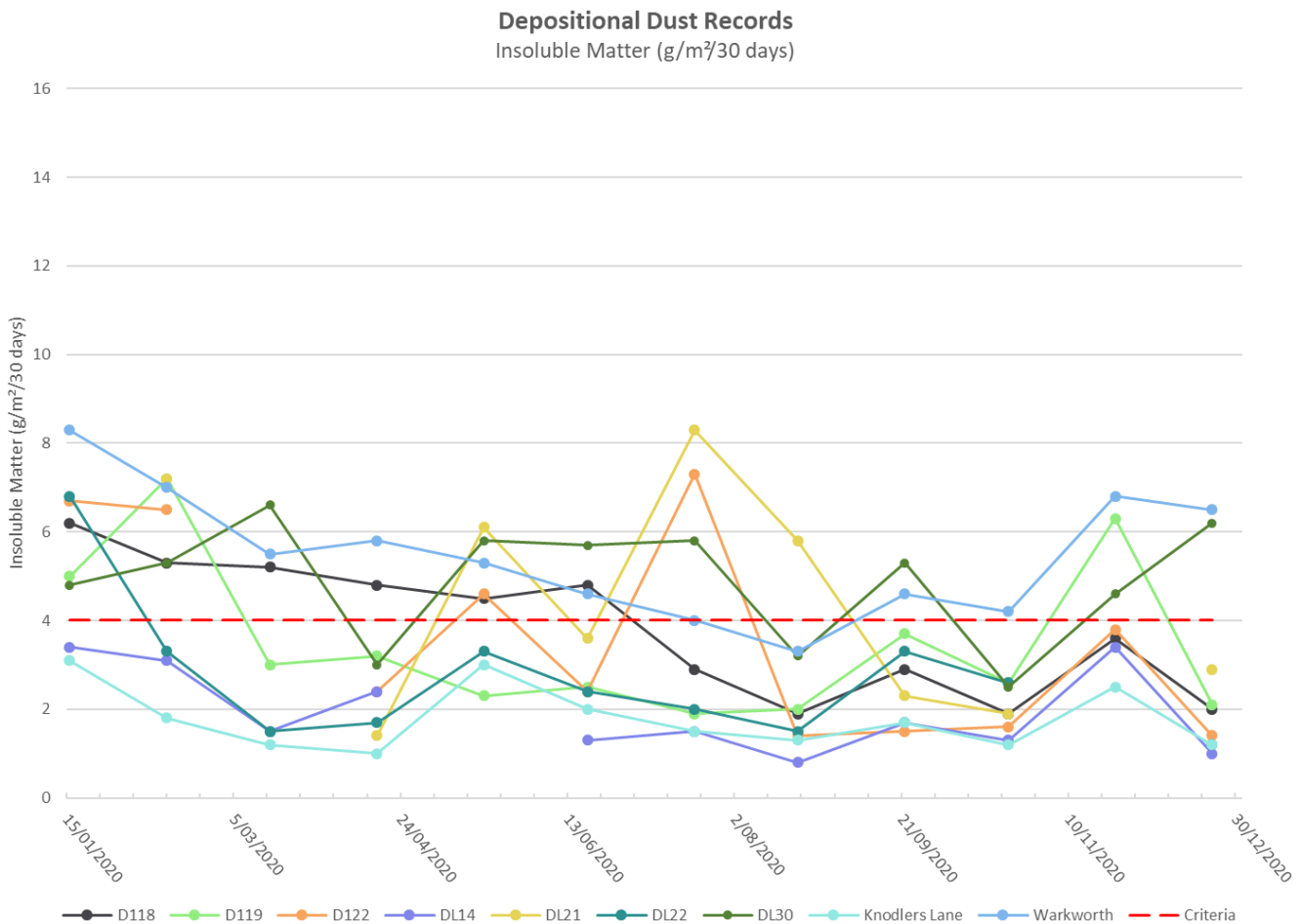
## 2.2 Depositional Dust

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. Any monthly results deemed to be contaminated (due to presence of bird droppings, insects, etc.) are not displayed. During December, no results were deemed contaminated.

During the reporting period, the Warkworth and DL30 monitors recorded a monthly result above the long-term impact assessment criteria of 4.0 g/m<sup>2</sup> 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 December 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<sub>10</sub>). The Kilburnie South and Maison Dieu HVAS also monitor Particulate Matter <2.5µm (PM<sub>2.5</sub>). 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<sub>10</sub> Results

#### 2.3.1.1 Performance against short term impact assessment criteria

Figure 6 shows individual PM<sub>10</sub> results at each monitoring station against the short-term impact assessment criteria of 50µg/m<sup>3</sup>. During the reporting period, no monitors recorded an exceedance above the short-term impact assessment criteria of 50µg/m<sup>3</sup>.

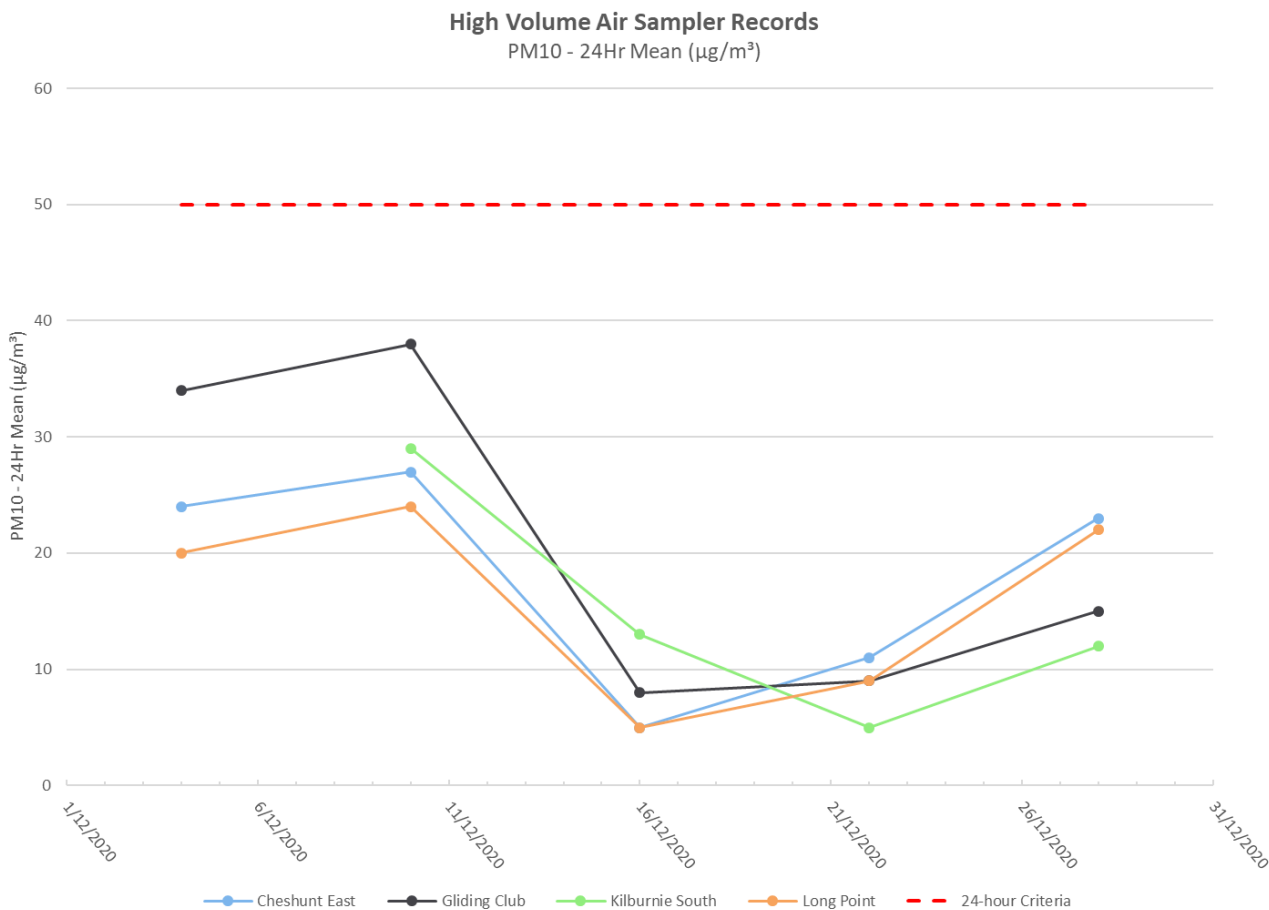


Figure 6 - Individual PM<sub>10</sub> Results December 2020

### 2.3.1.2 Performance against long term impact assessment criteria

Figure 7 shows the year to date annual average PM<sub>10</sub> results. During the reporting period, the Gliding Club monitor recorded an annual average above the PM<sub>10</sub> Annual Rolling Mean criteria of 25µg/m<sup>3</sup> for HVO South. All monitors recorded an annual average below the 30µg/m<sup>3</sup> 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.

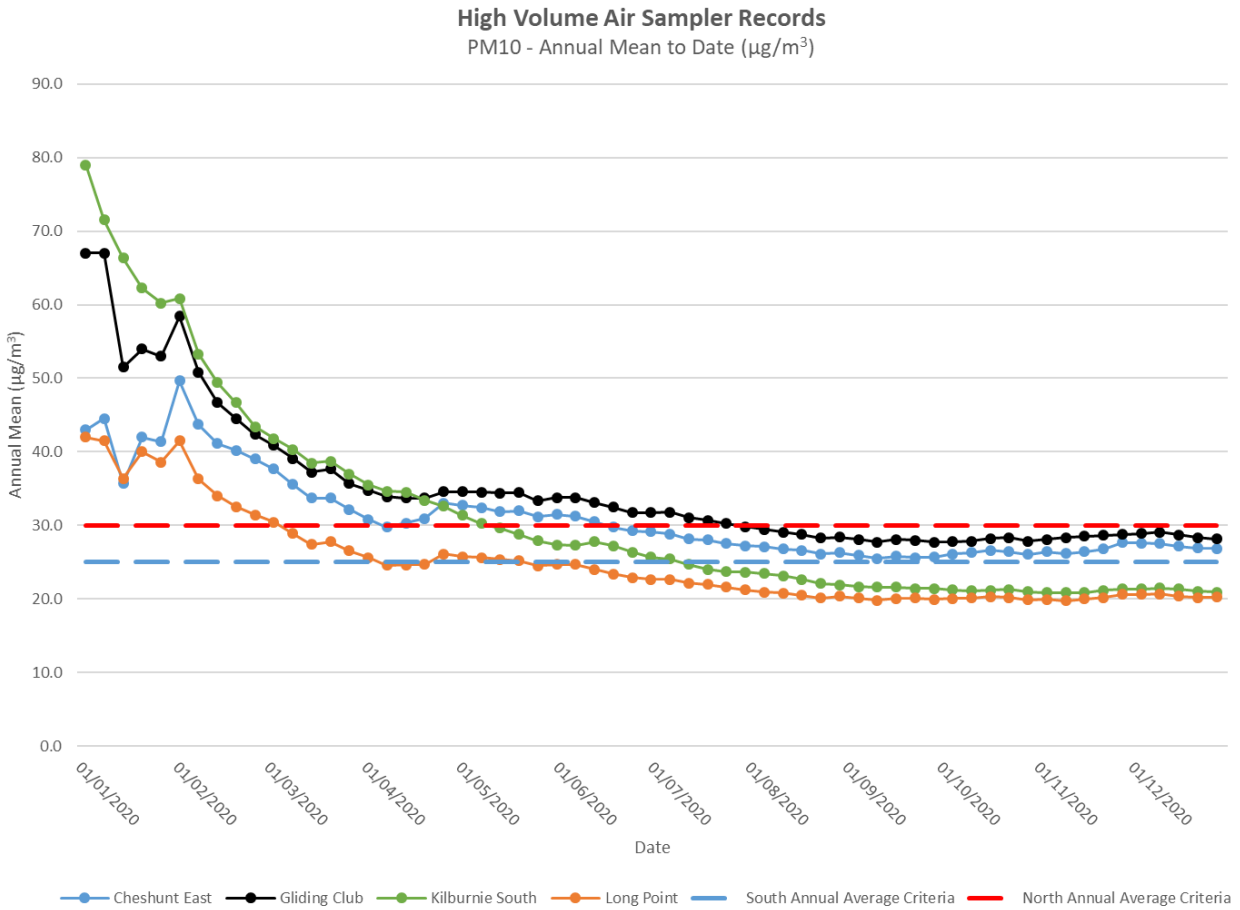


Figure 7 - Year to Date Average PM<sub>10</sub> as at end of December 2020

## 2.3.2 HVAS PM<sub>2.5</sub> Results

HVO monitors PM<sub>2.5</sub> 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<sub>2.5</sub> results at each monitoring station against the HVO South short-term impact assessment criteria of 25µg/m<sup>3</sup>.

During the reporting period neither monitor recorded an exceedance of the short-term impact assessment criteria of 25µg/m<sup>3</sup>

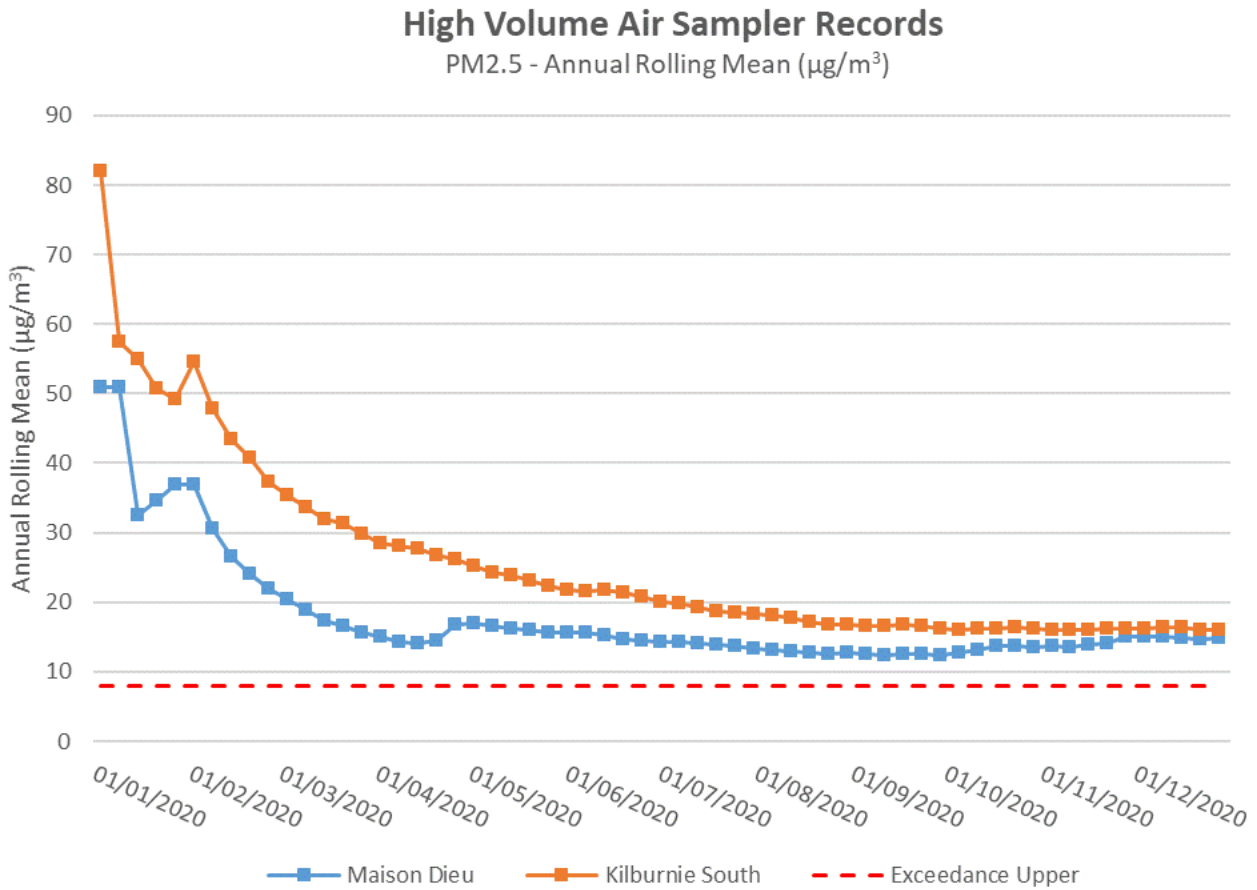


Figure 8 - Individual PM<sub>2.5</sub> Results December 2020

### 2.3.2.2 Performance against long term impact assessment criteria

**Figure 9** shows the year to date annual average PM<sub>2.5</sub> results. During the reporting period, both monitors recorded an annual average above the PM<sub>2.5</sub> Annual Rolling Mean criteria of 8µg/m<sup>3</sup>.

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<sub>2.5</sub> as at end of December 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<sup>3</sup>.

No monitors recorded an annual average above the long-term impact assessment criteria of 90µg/m<sup>3</sup> 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.

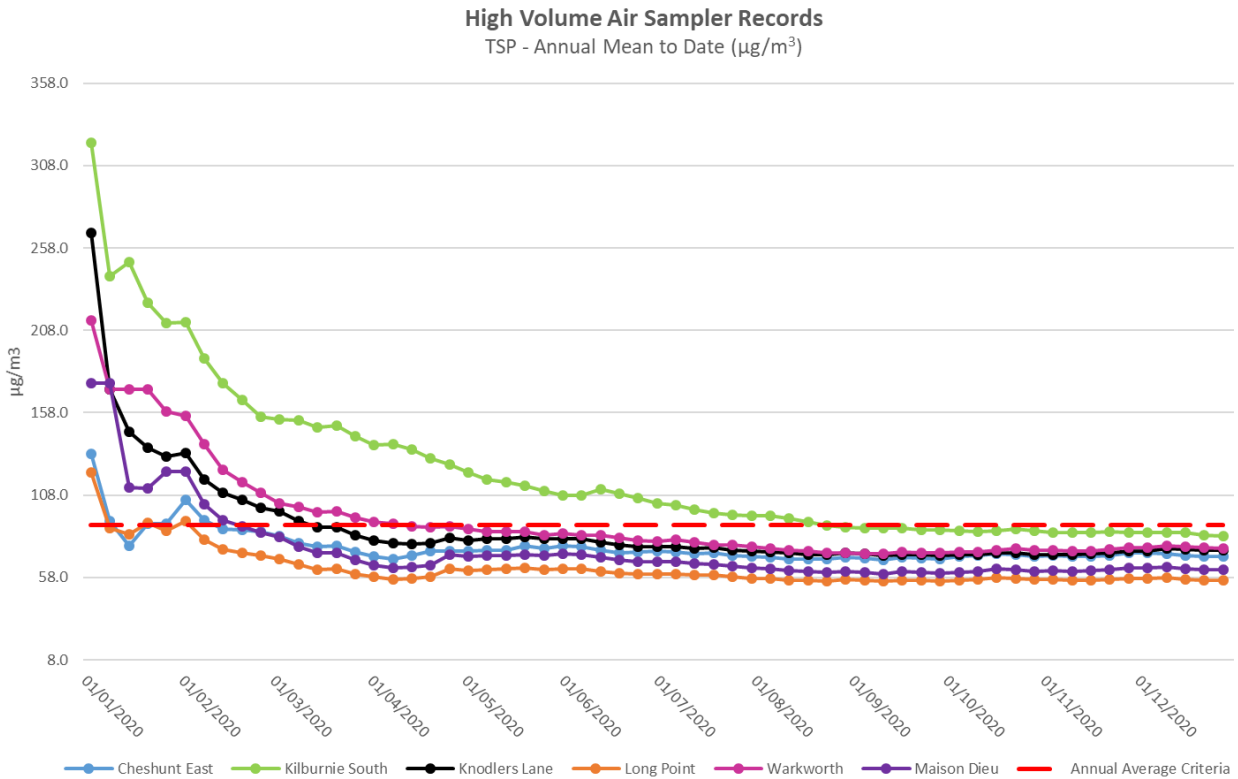


Figure 10 - Year to Date Average Total Suspended Particulates at end of December 2020

## 2.3.4 Real Time PM<sub>10</sub> Results

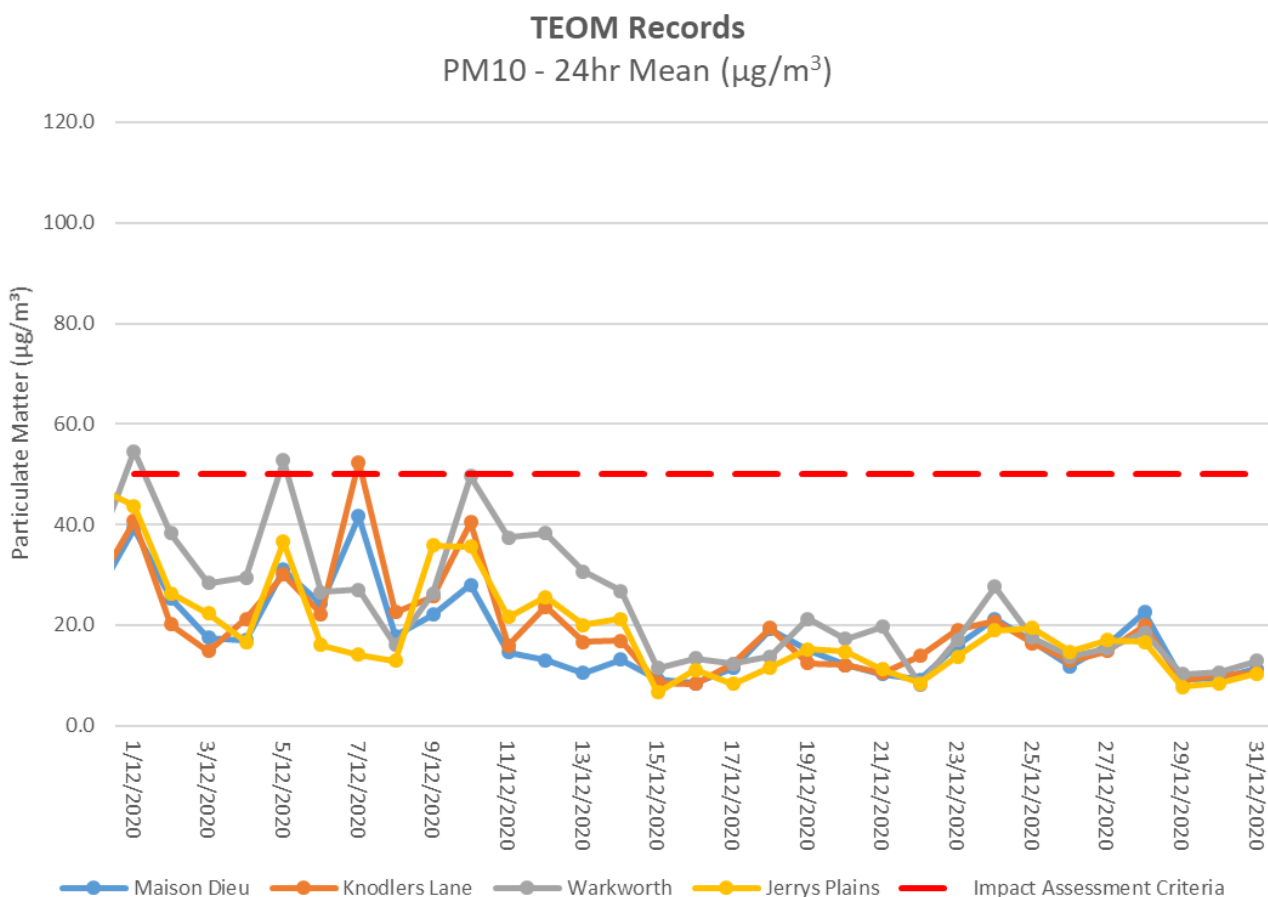
HVO maintains a network of real time PM<sub>10</sub> monitors. The real time air quality monitoring stations continuously log information and transmit data to a central database, generating alarms when particulate matter levels exceed internal trigger limits. Results from real time PM<sub>10</sub> monitoring 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<sub>10</sub> result from the real time monitoring sites. The year to date annual averages for each monitoring site are shown in **Figure 12**.

On the 1<sup>st</sup> and 5<sup>th</sup> December the Warkworth monitor exceeded the 24-hour average PM<sub>10</sub> result limit, investigations determined HVO's contributions to be below the criteria value on each day.

On the 7<sup>th</sup> December the Knodlers Lane monitor exceeded the 24-hour average PM<sub>10</sub> 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<sub>10</sub> 24hr average and YTD average December 2020**

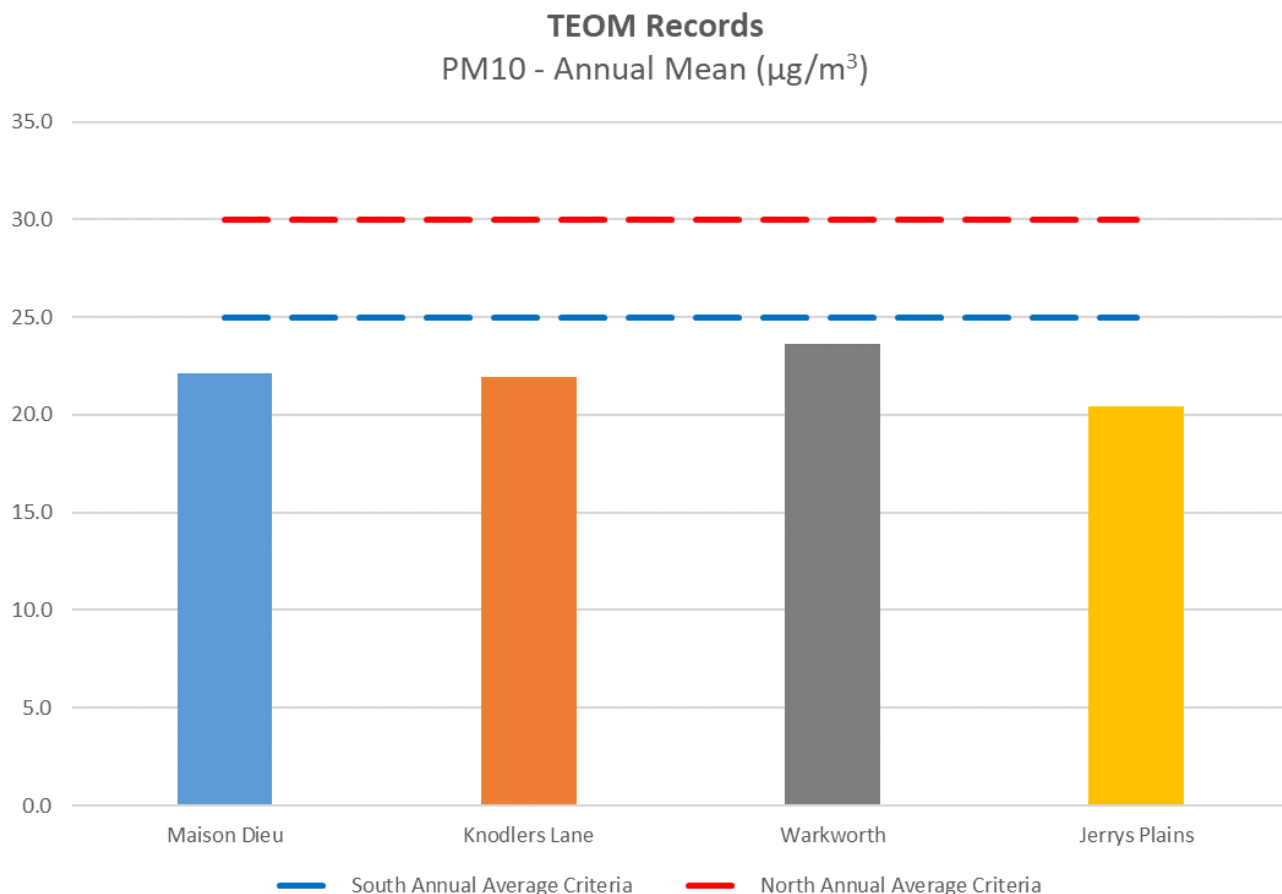


Figure 12 - Real Time PM<sub>10</sub> Annual Average December 2020

## 2.3.5 Real Time Alarms for Air Quality

During December, the real time monitoring system generated 178 automated air quality related alarms; of these alarms, 131 related to adverse weather conditions and 47 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**

**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.



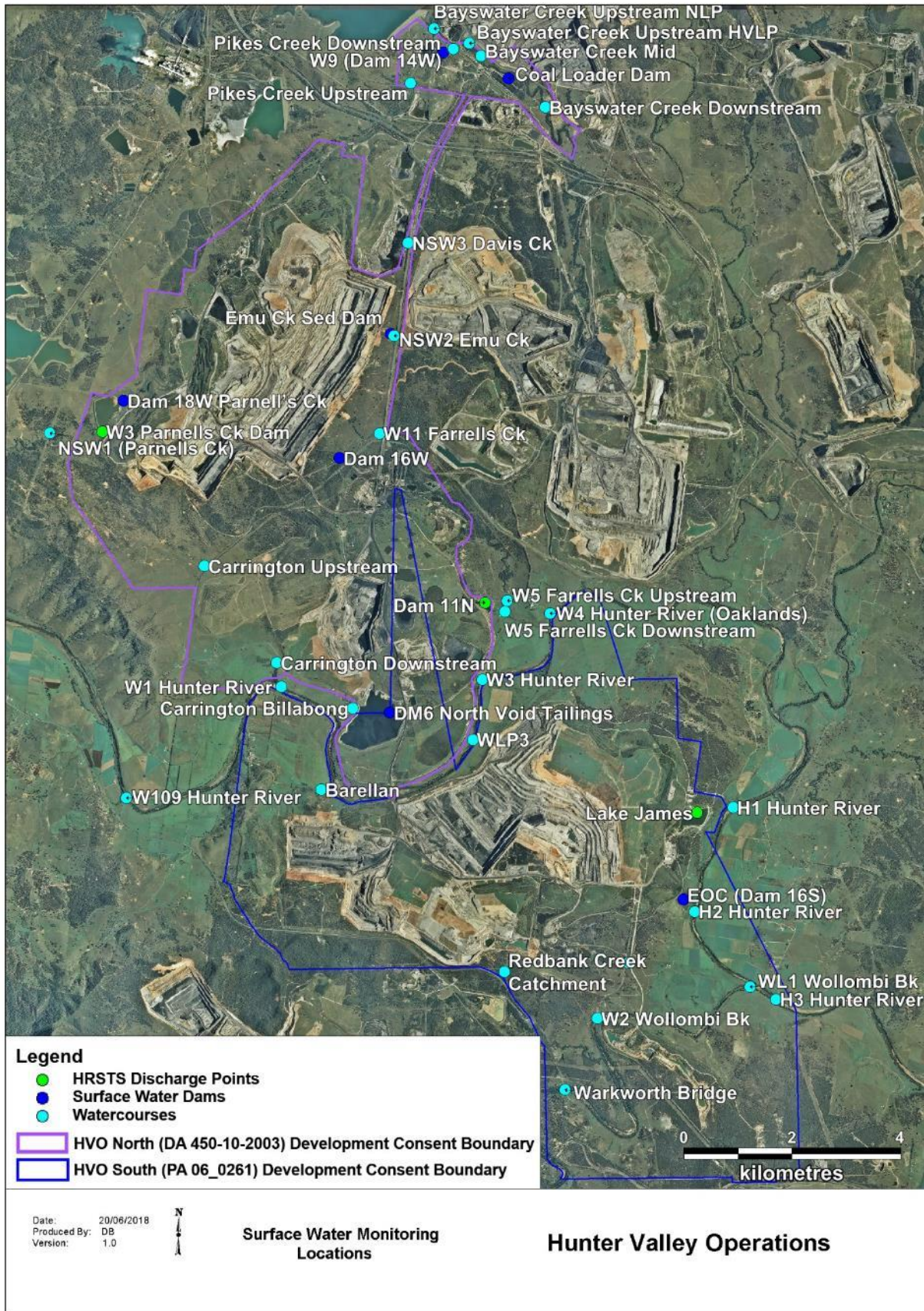
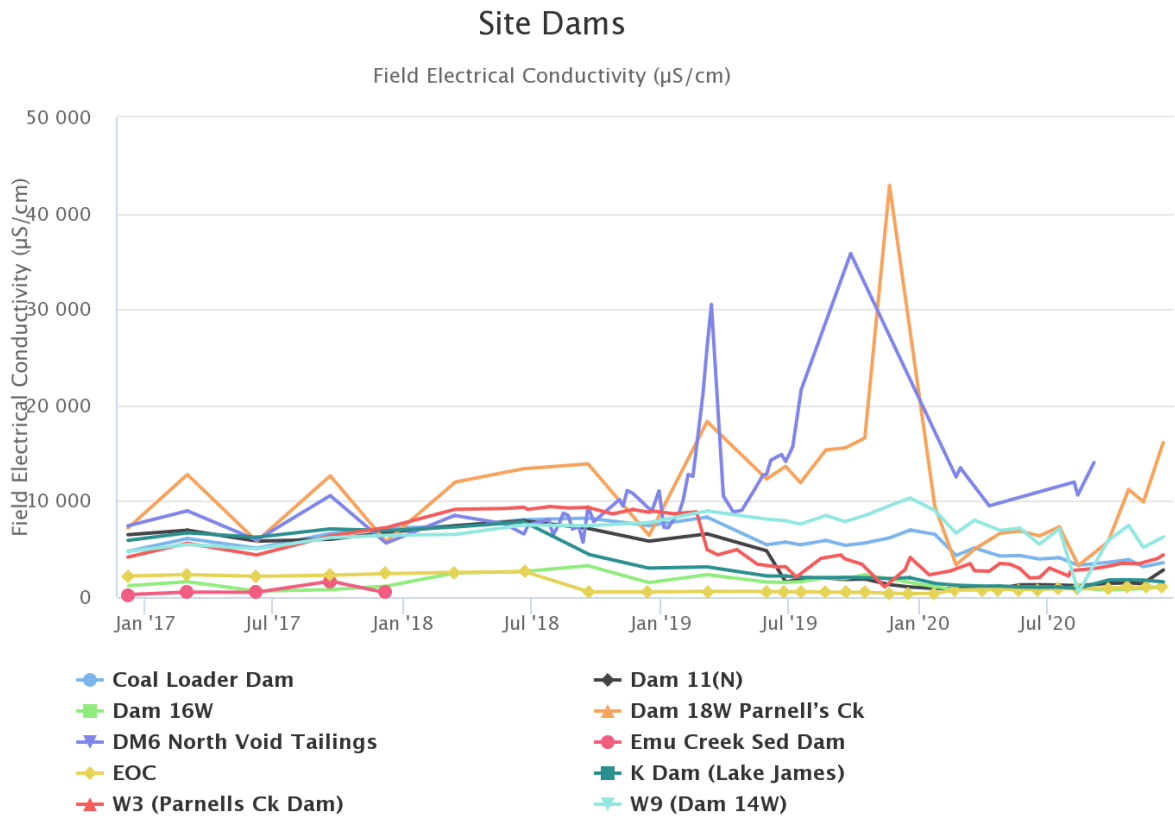
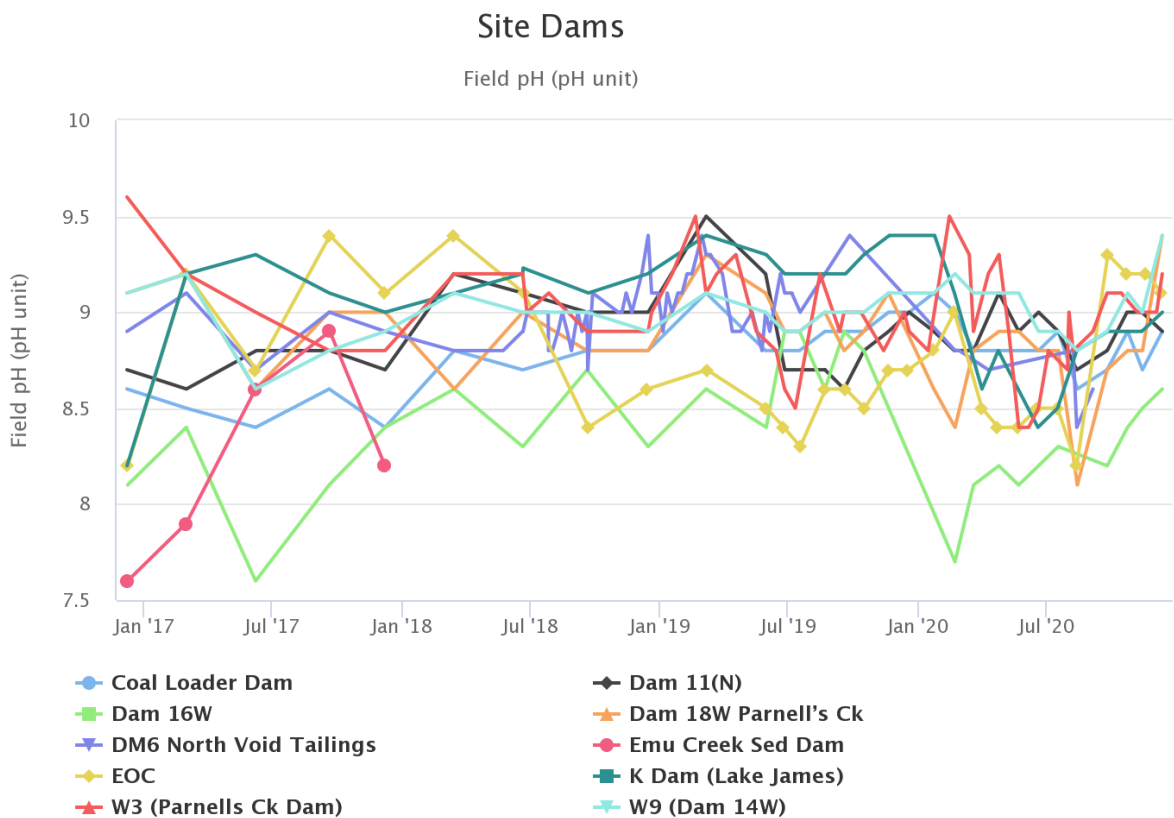


Figure 13 - HVO Surface Water Monitoring Locations



**Figure 14 - Site Dams Electrical Conductivity - December 2020**



**Figure 15 - Site Dams pH - December 2020**

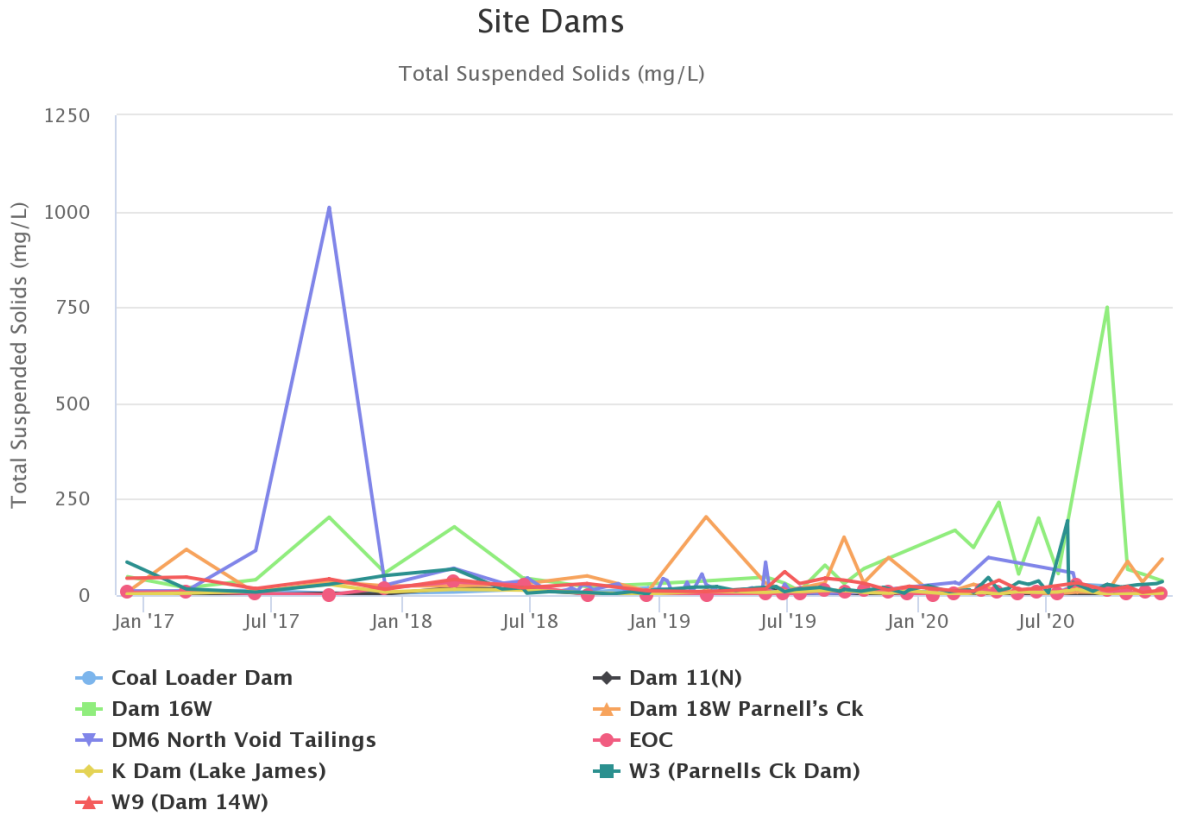


Figure 16 Site Dams TSS - December 2020

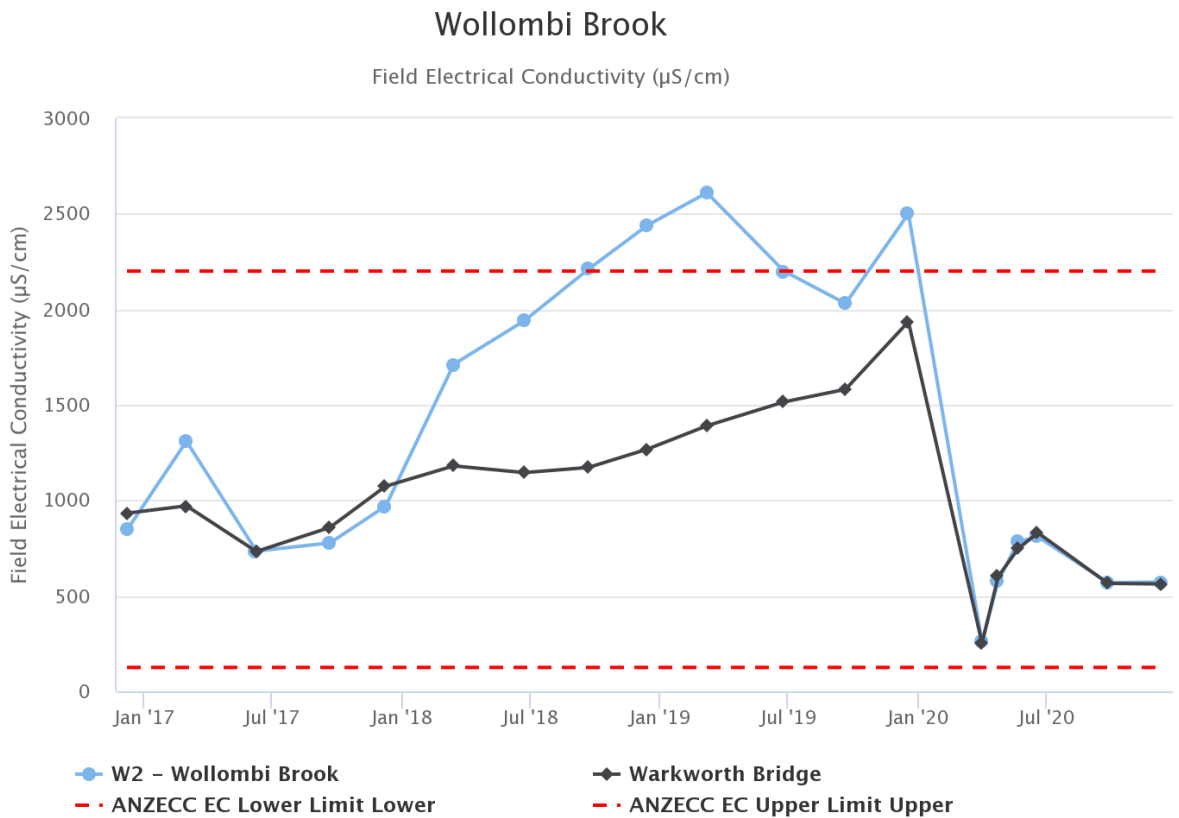
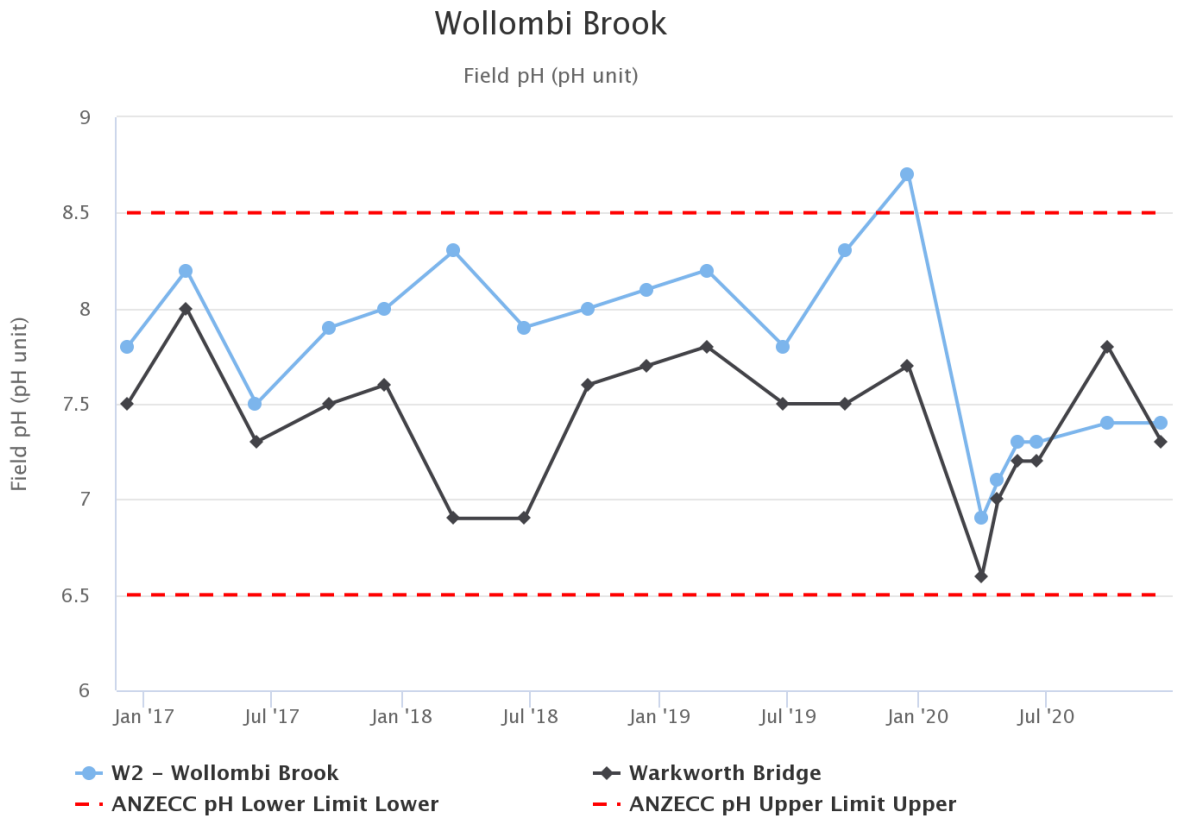
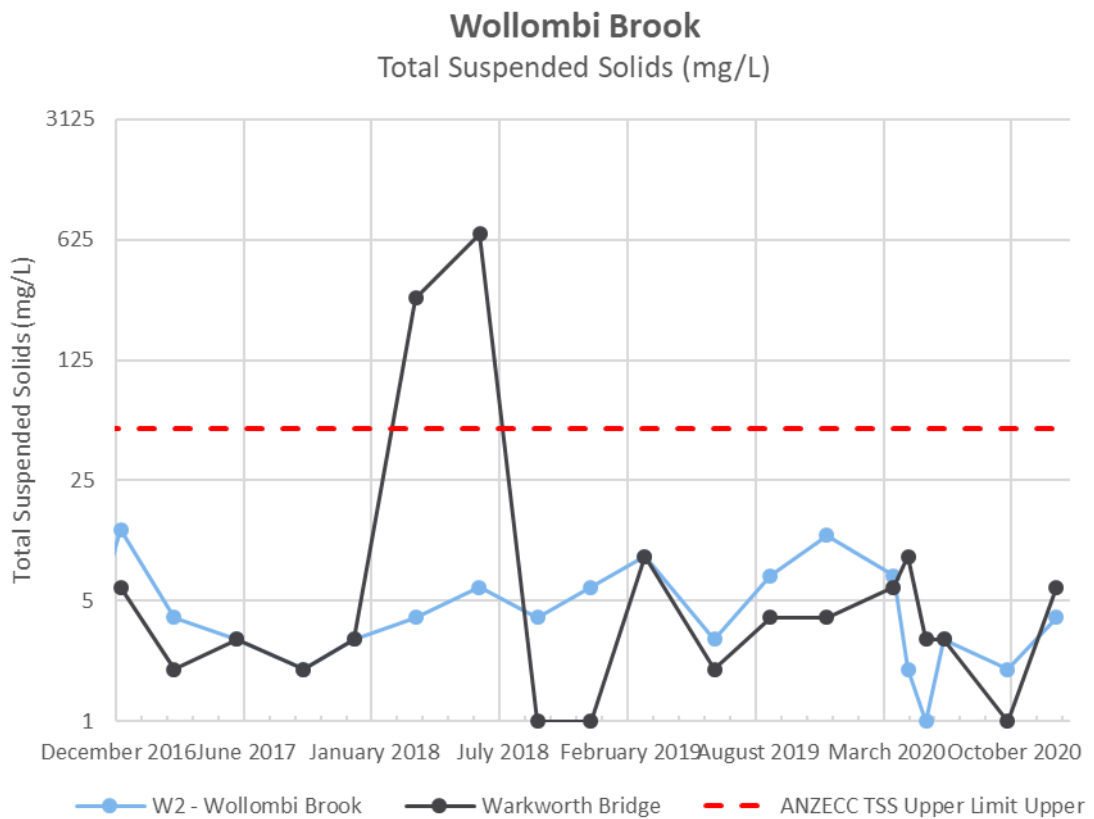


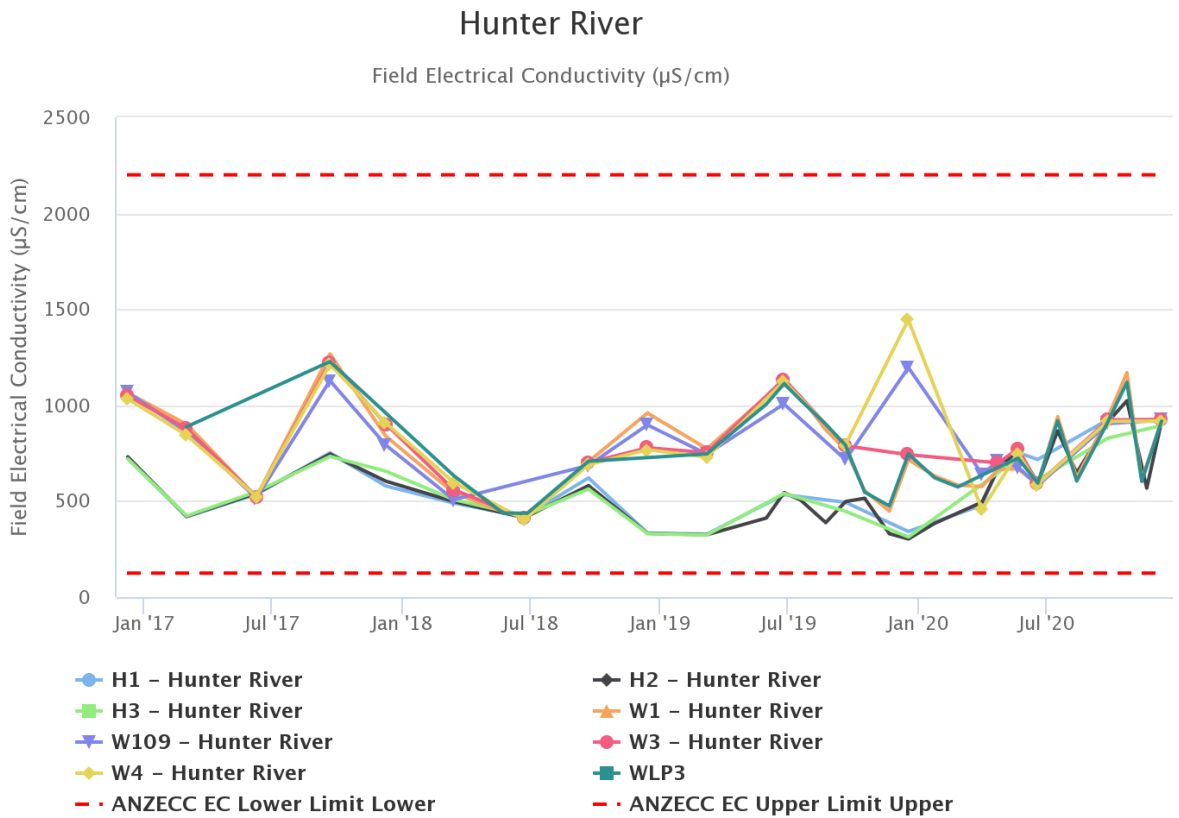
Figure 17 - Wollombi Brook Electrical Conductivity - December 2020



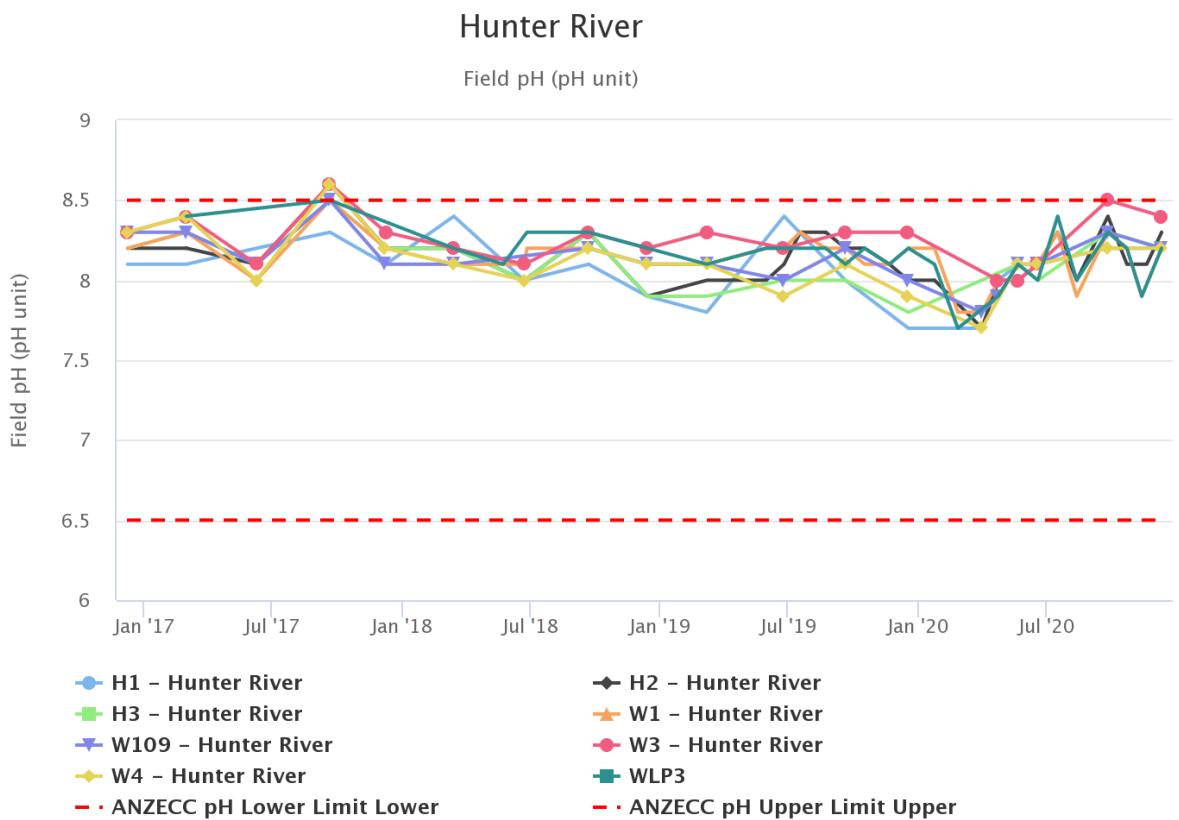
**Figure 18 - Wollombi Brook pH - December 2020**



**Figure 19 - Wollombi Brook TSS - December 2020**



**Figure 20 - Hunter River Electrical Conductivity - December 2020**



**Figure 21 - Hunter River pH - December 2020**

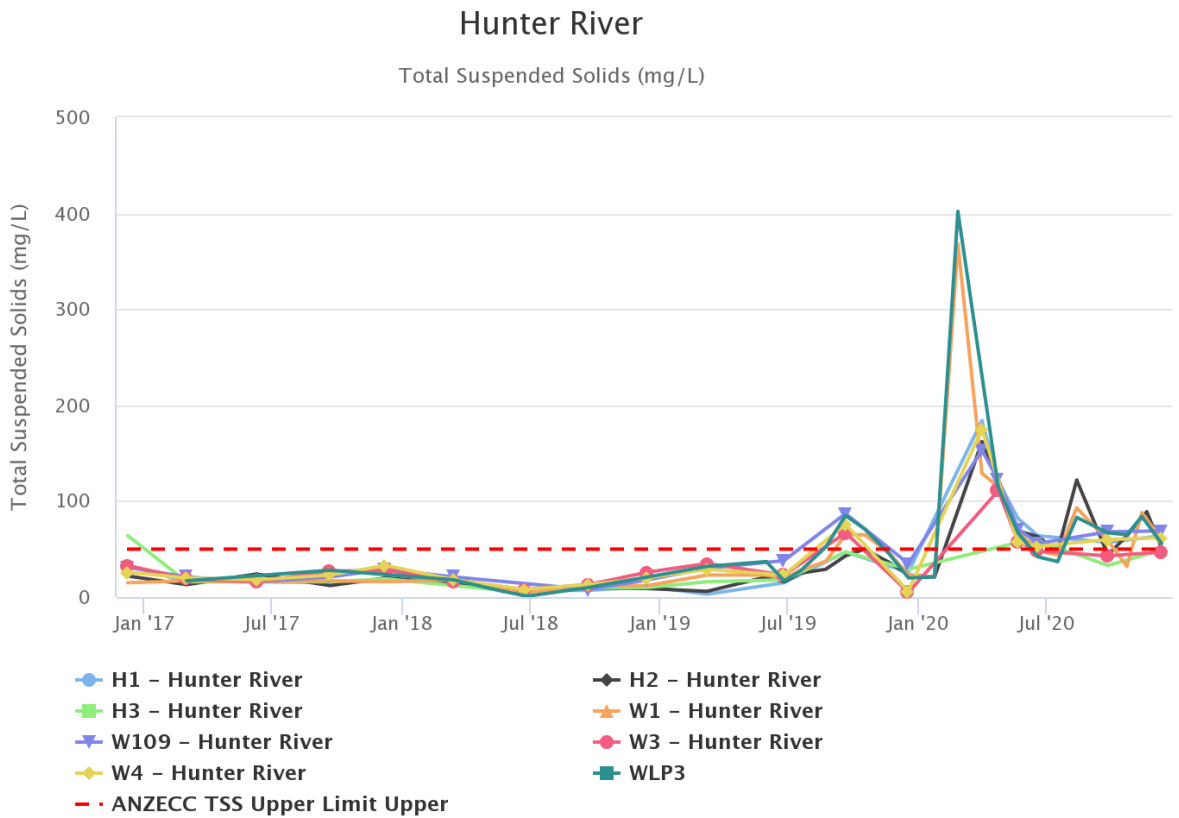


Figure 22 - Hunter River TSS - December 2020

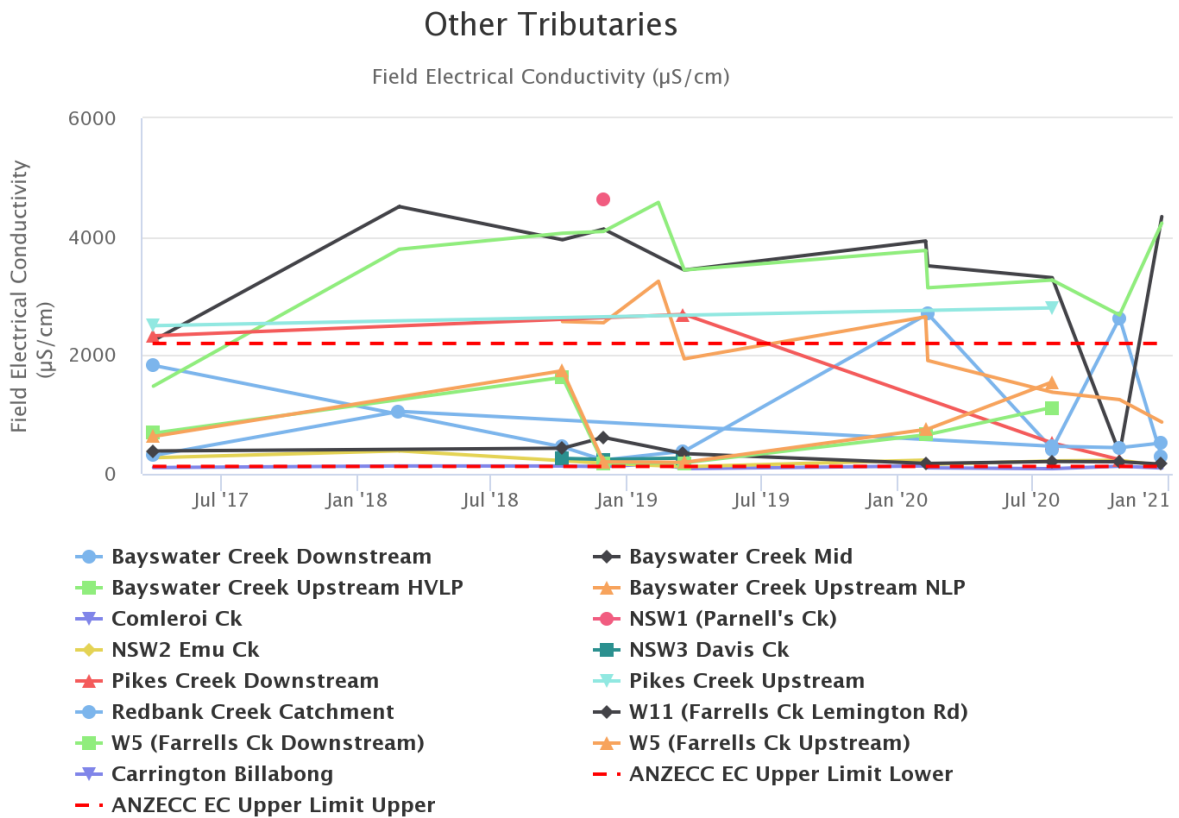


Figure 23 - Other Tributaries Electrical Conductivity - December 2020

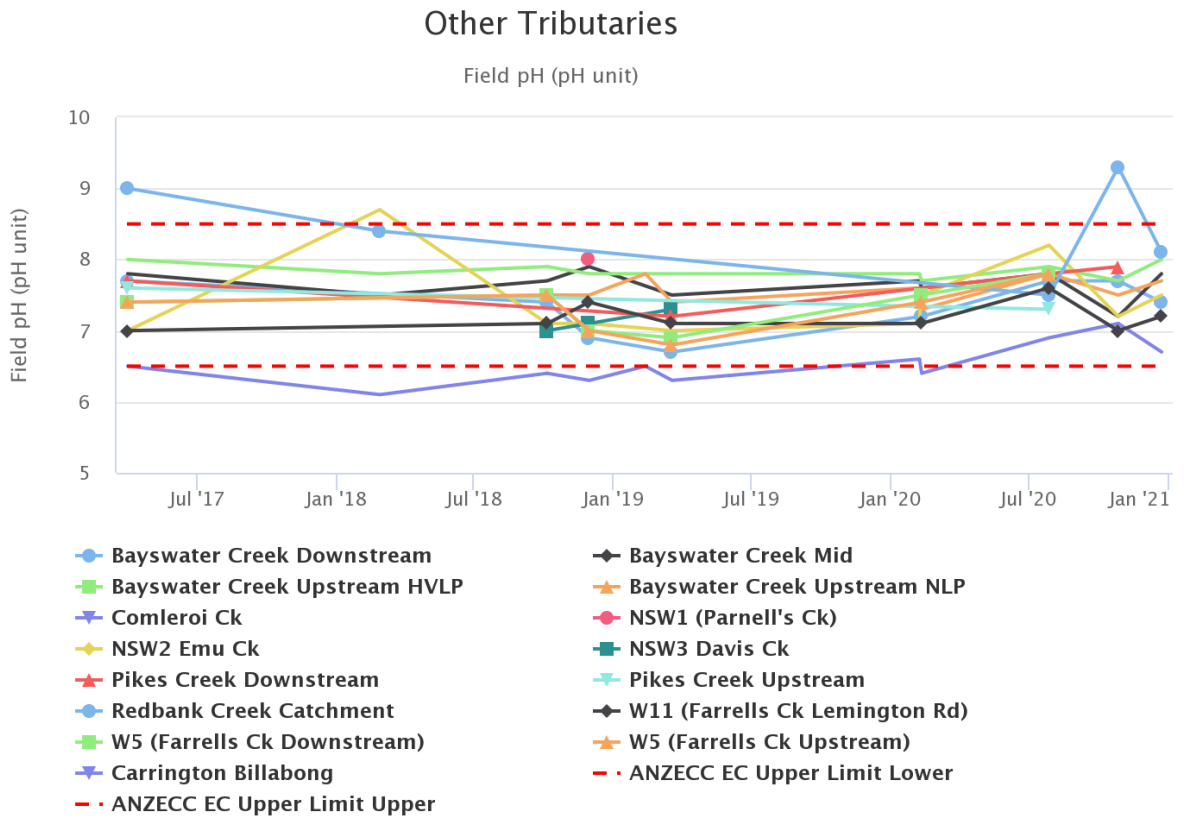


Figure 24 - Other Tributaries pH - December 2020

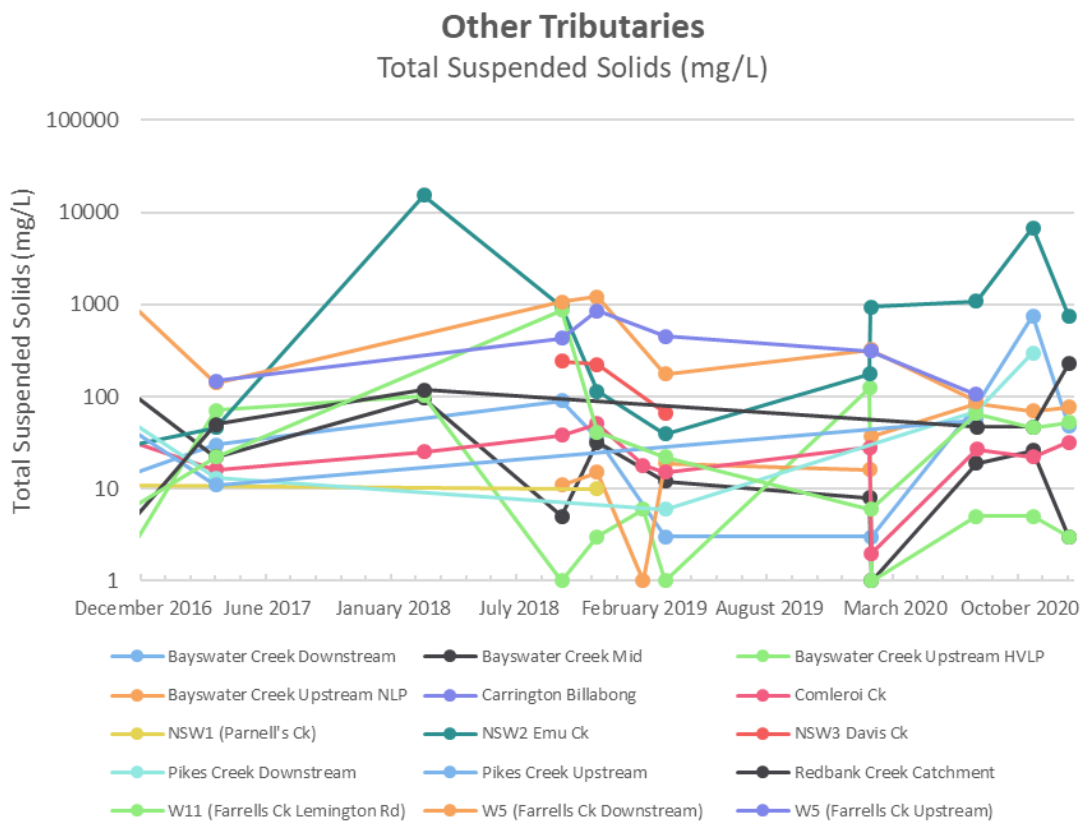


Figure 25 - Other Tributaries TSS - December 2020

### 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 4**Table 2**.

**Table 2 Surface Water Triggers Q4 2020**

Site	Date	Trigger Limit Breached	Response Action
W11 (Farrells Ck)	26/10/2020	pH	First breach – Establish watching brief
NSW2 (Emu Ck)	26/10/2020	TSS	Third breach – Investigation into exceedance ongoing
Pikes Creek Downstream	26/10/2020	TSS	Second breach – Investigation into exceedance ongoing
Bayswater Creek Mid	26/10/2020	pH	First breach – Establish watching brief
Bayswater Creek Downstream	26/10/2020	TSS	Second breach – Investigation into exceedance ongoing
H1 Hunter River	9/12/2020	TSS	Fourth breach – Investigation into exceedance ongoing
W4 Hunter River	9/12/2020	TSS	Fourth breach - Investigation into exceedance ongoing
W1 Hunter River	9/12/2020	TSS	Second breach - Investigation into exceedance ongoing
W109 Hunter River	9/12/2020	TSS	Fourth breach - Investigation into exceedance ongoing
H3 Hunter River	9/12/2020	EC	First breach – Establish watching brief
H2 Hunter River	9/12/2020	TSS	First breach – Investigation into exceedance commenced
W11 (Farrells Ck)	22/12/2020	pH	Second breach – Maintaining watching brief
NSW2 (Emu Ck)	22/12/2020	TSS	Fourth breach – Investigation 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 238.4 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. The location of groundwater monitoring points across HVO are show in **Figure 26**

**Figure 27** to **Figure 83** show the long-term trends (2016-current) for groundwater bores monitored at HVO.

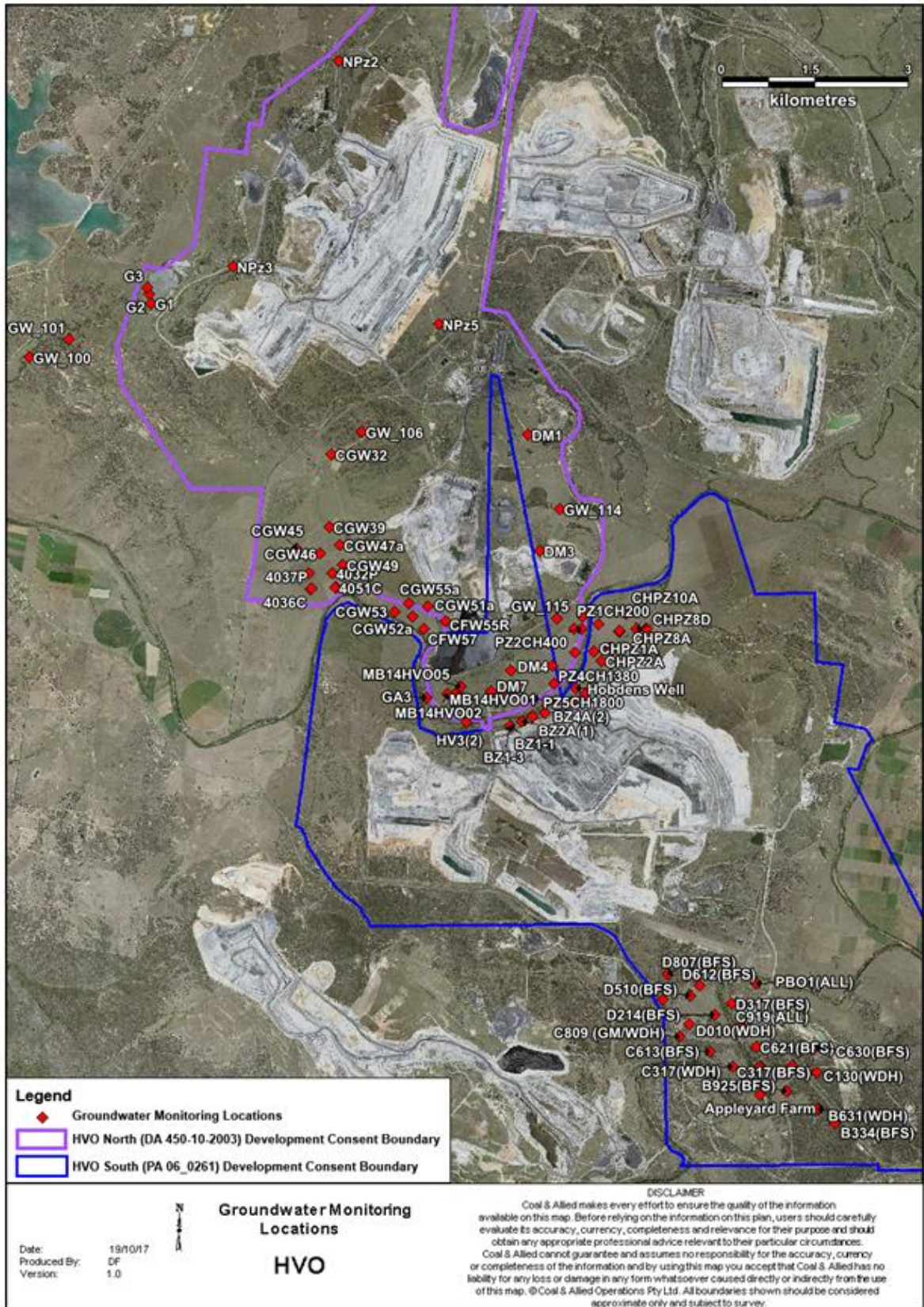
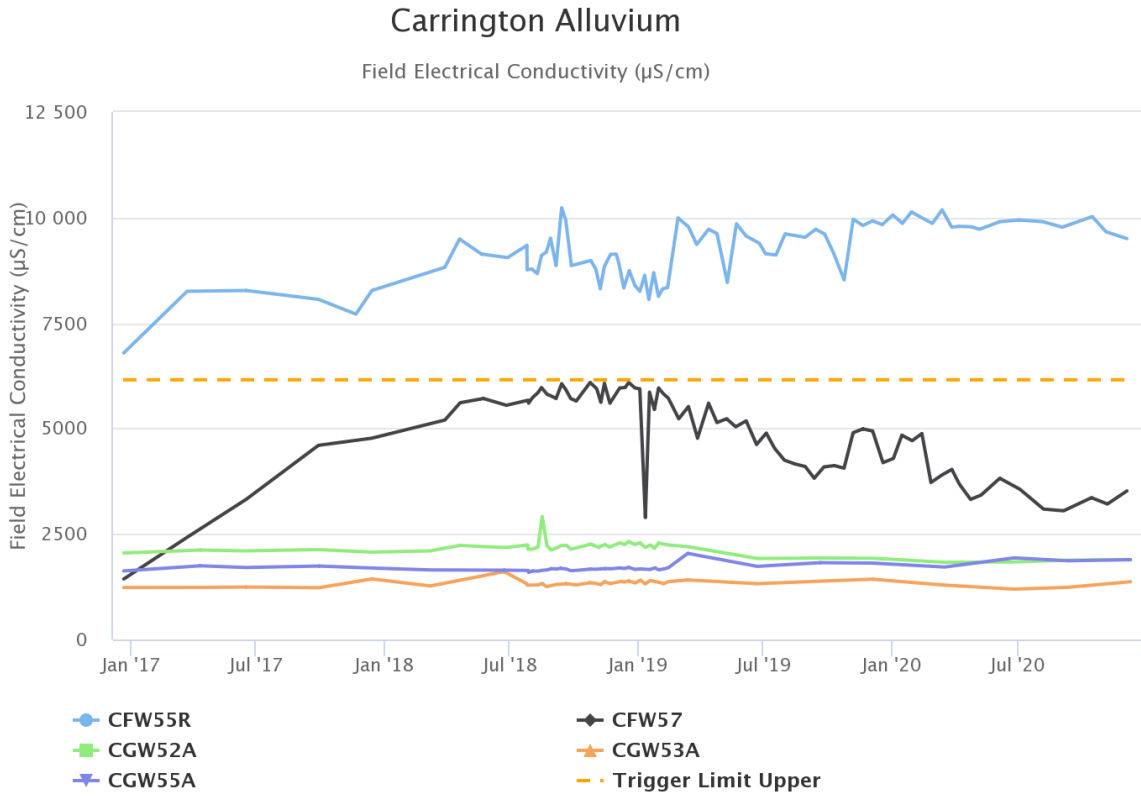
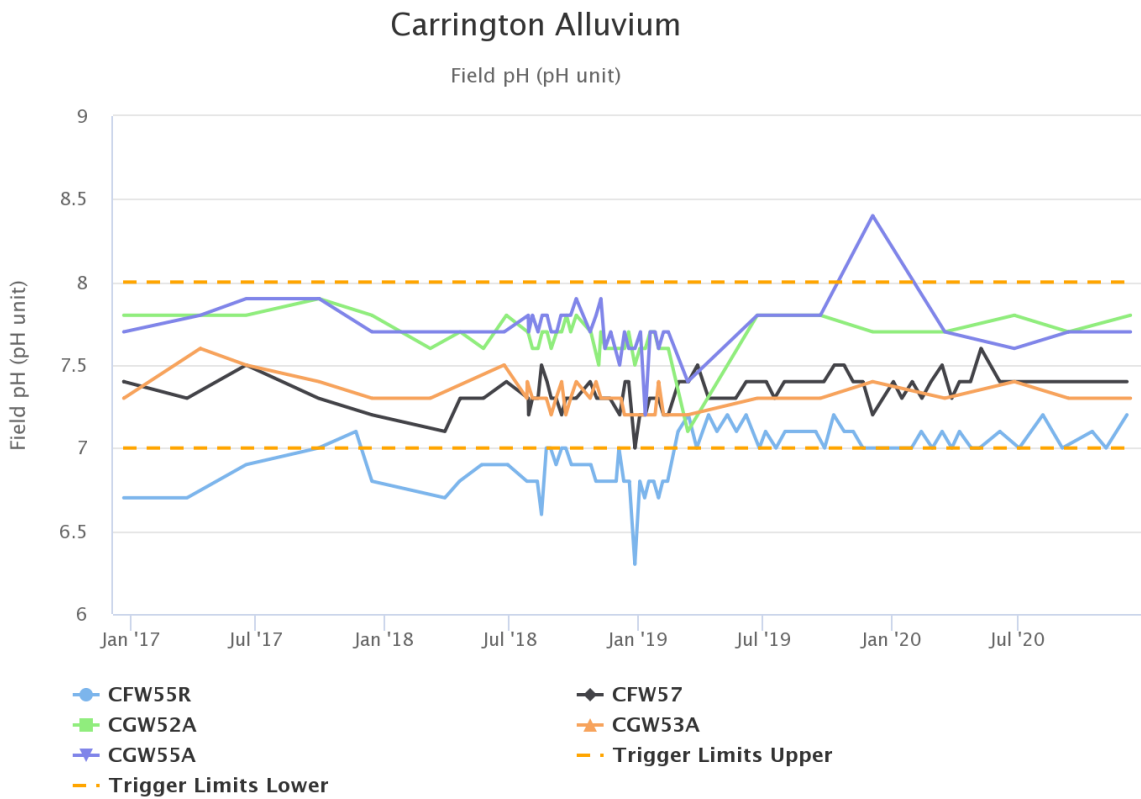


Figure 26 Groundwater monitoring Locations at HVO



**Figure 27 - Carrington Alluvium Field Electrical Conductivity Trend - December 2020**



**Figure 28 - Carrington Alluvium Field pH Trend - December 2020**

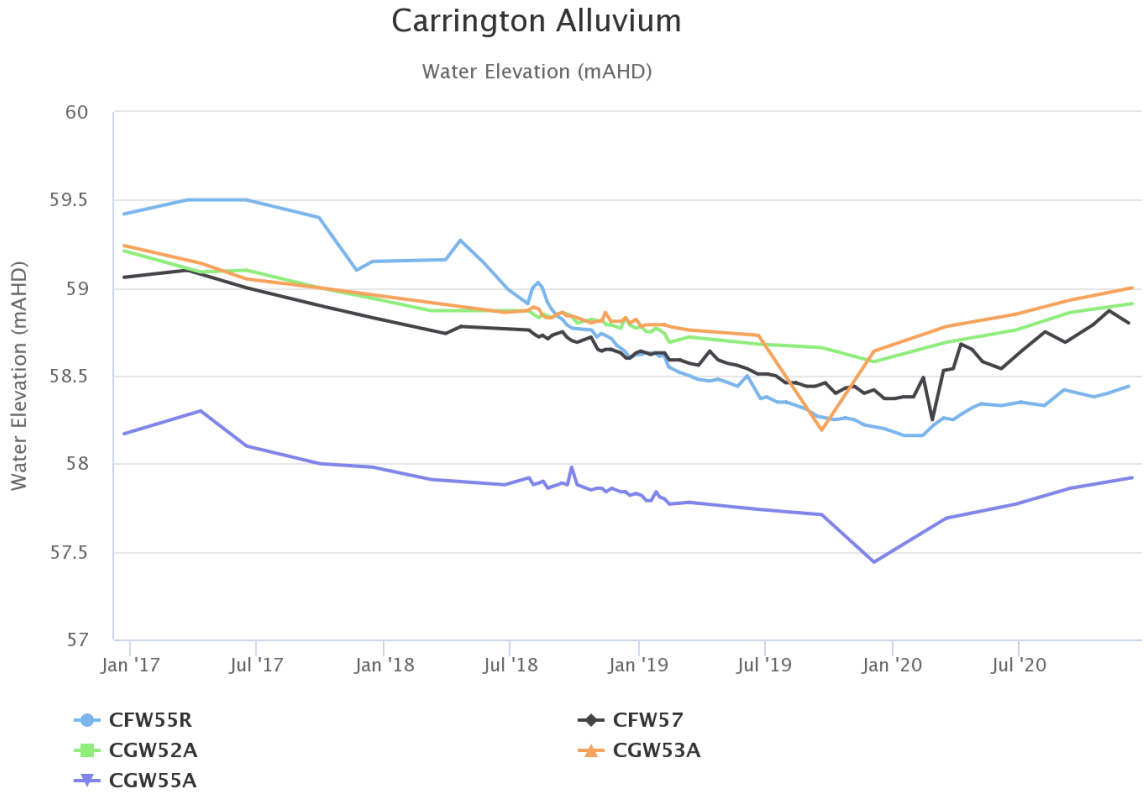
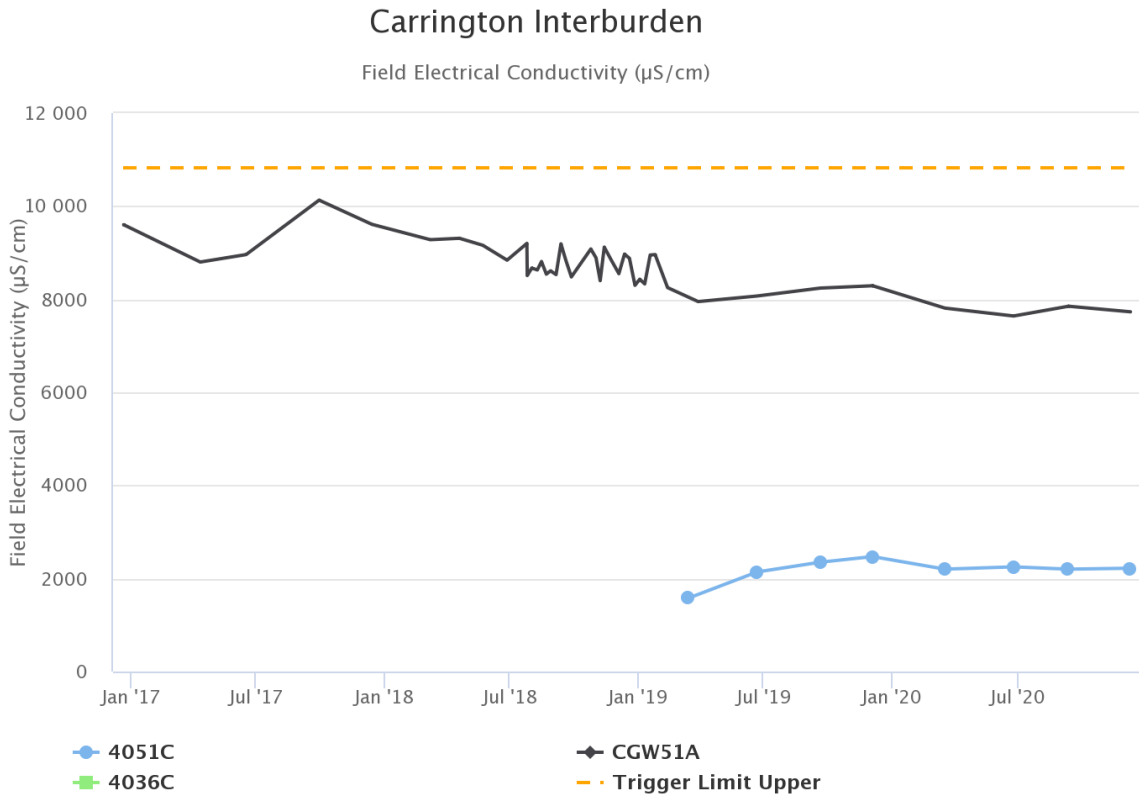
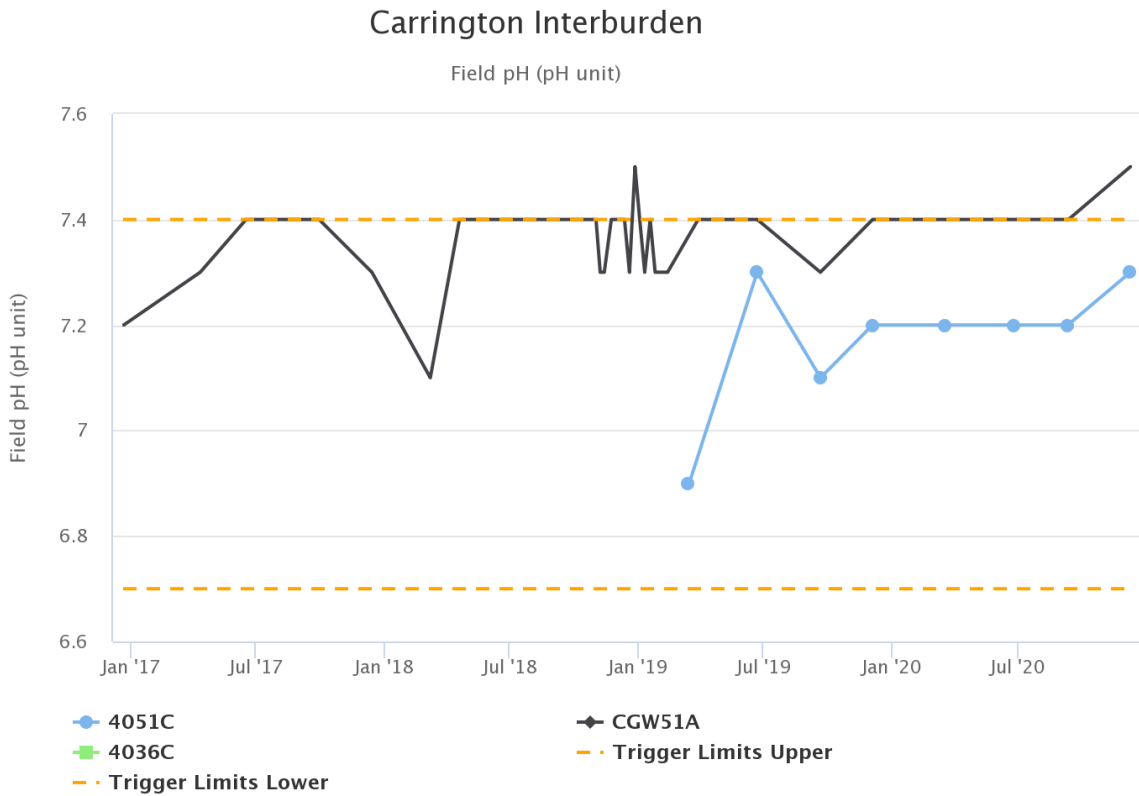


Figure 29 - Carrington Alluvium Standing Water Level - December 2020

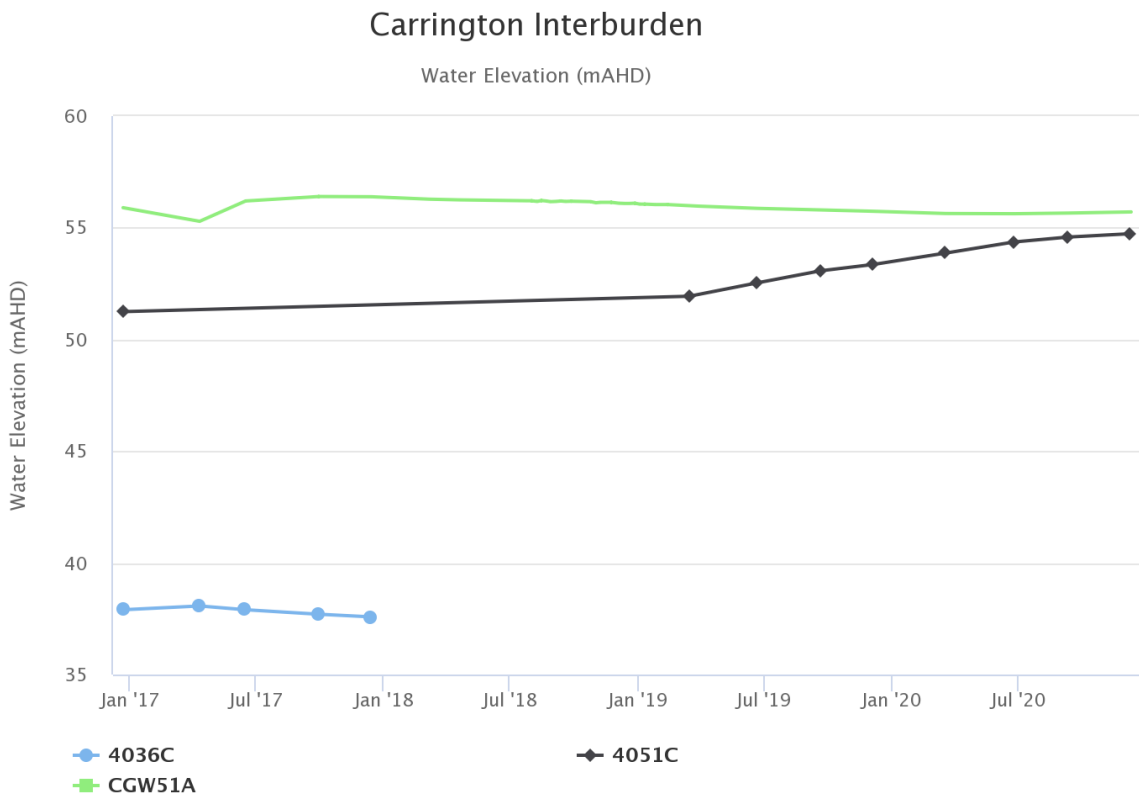


Note: 4036C produced insufficient water for a sample

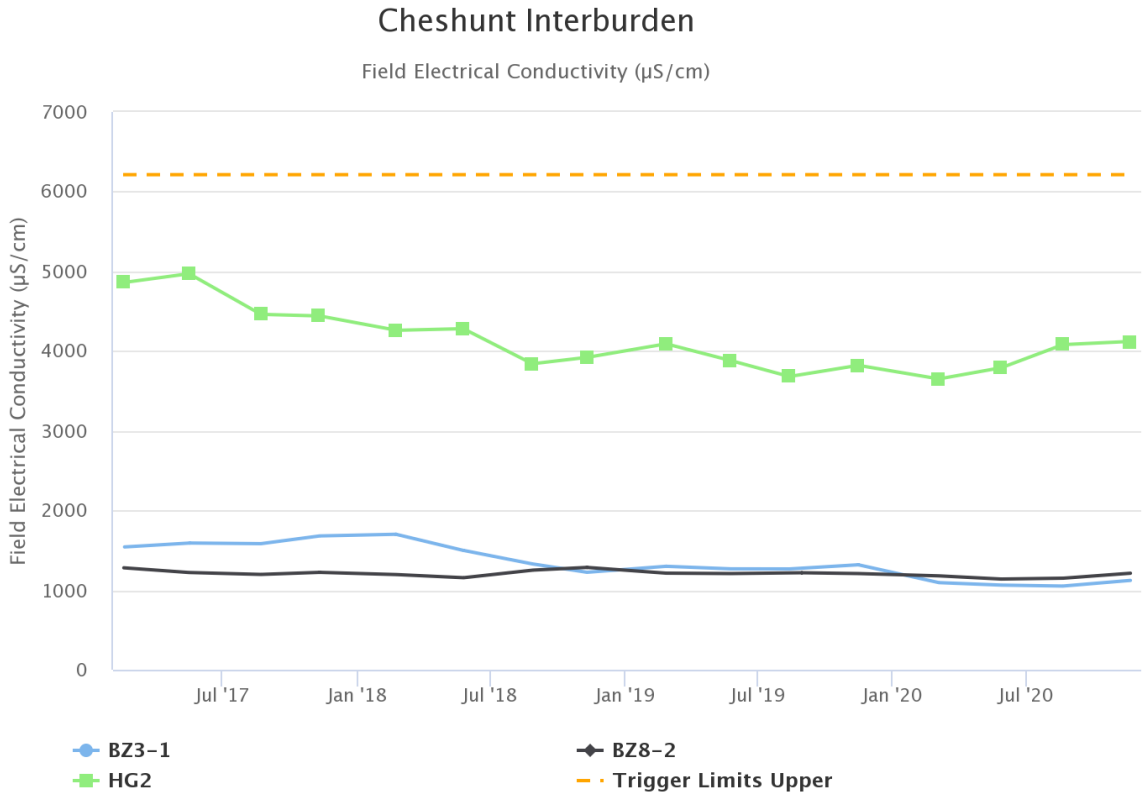
Figure 30 - Carrington Interburden Field Electrical conductivity Trend - December 2020



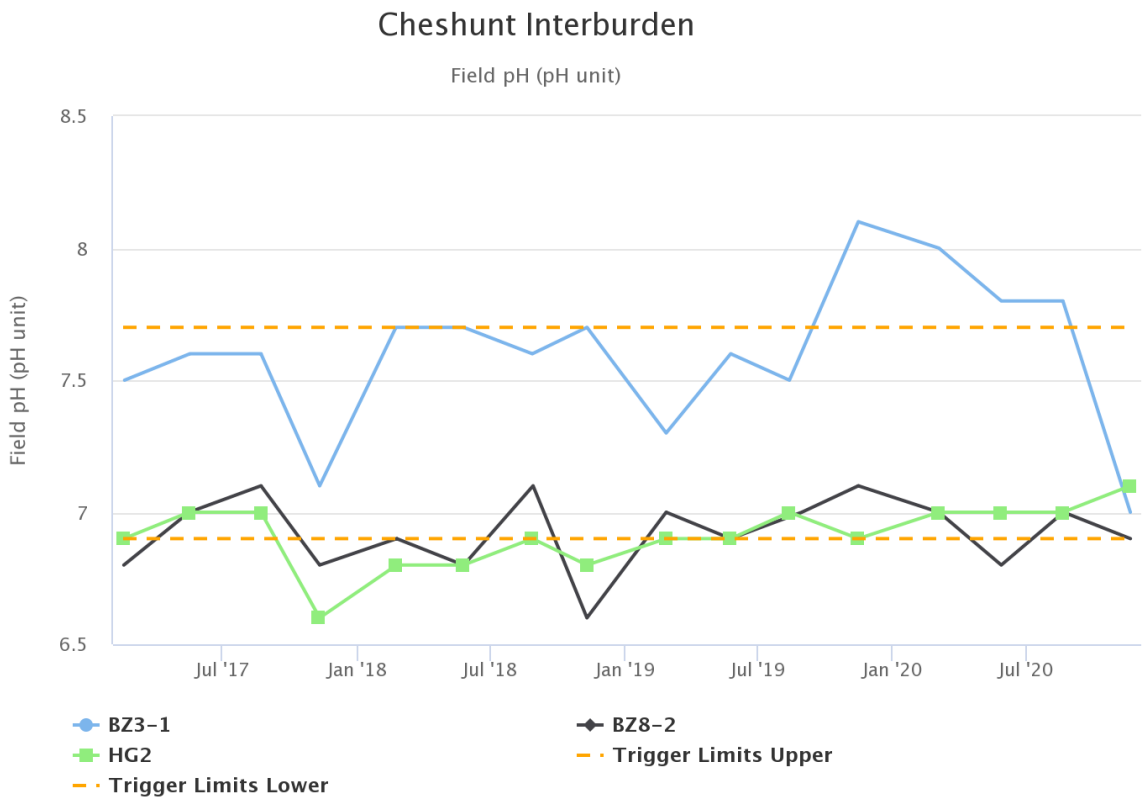
**Figure 31 - Carrington Interburden Field pH - December 2020**



**Figure 32 - Carrington Interburden Standing Water Level - December 2020**



**Figure 33 - Cheshunt Interburden Field Electrical Conductivity Trend - December 2020**



**Figure 34 - Cheshunt Interburden Field pH Trend - December 2020**

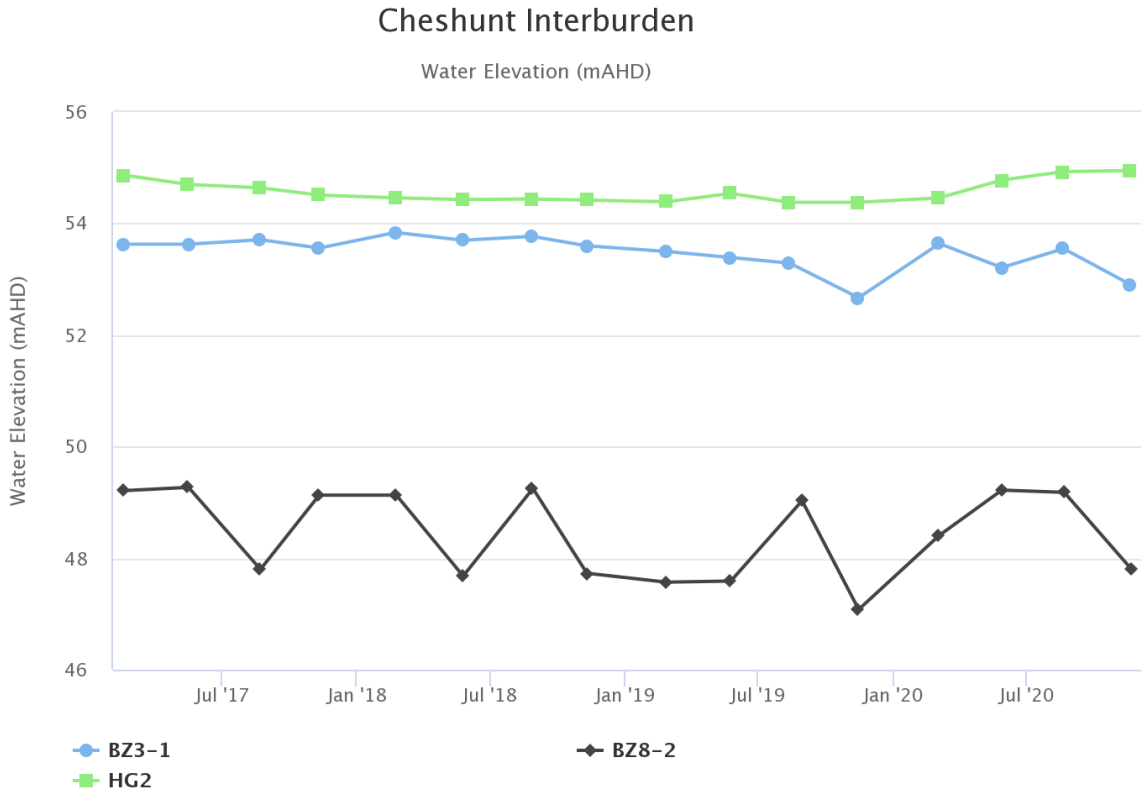


Figure 35 - Cheshunt Interburden Standing Water Level - December 2020

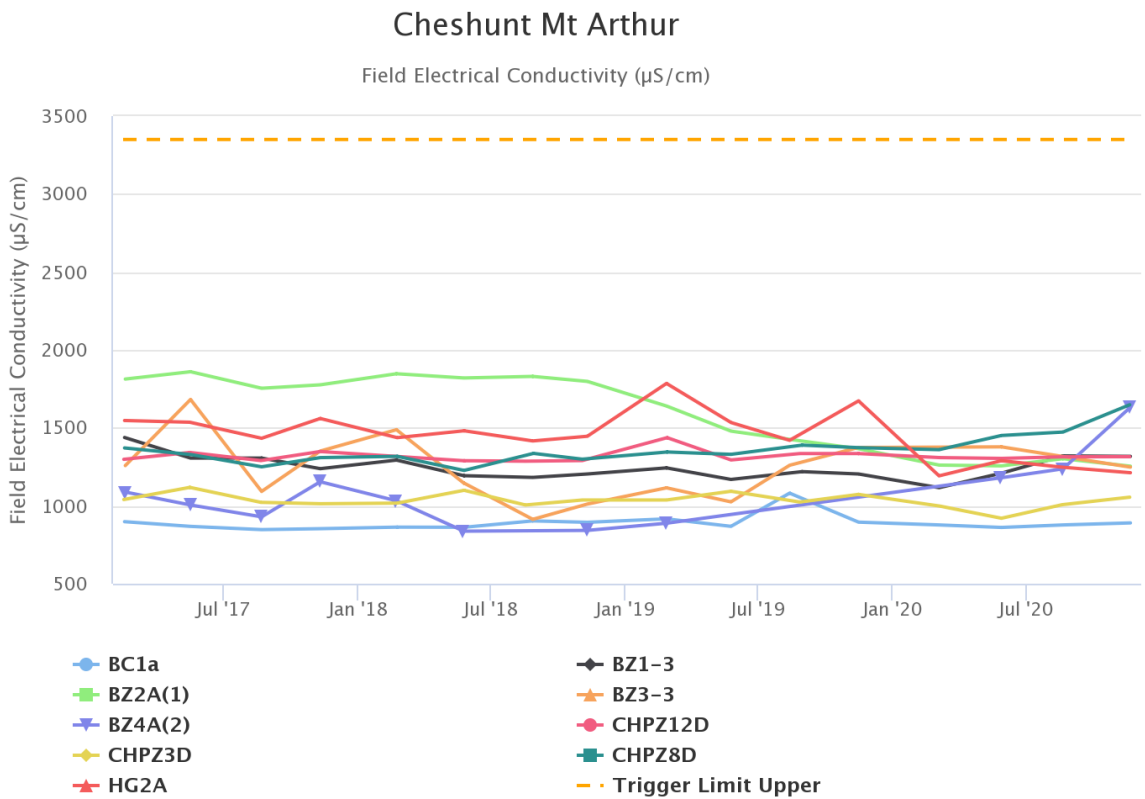


Figure 36 - Cheshunt Mt Arthur Field Electrical Conductivity Trend - December 2020

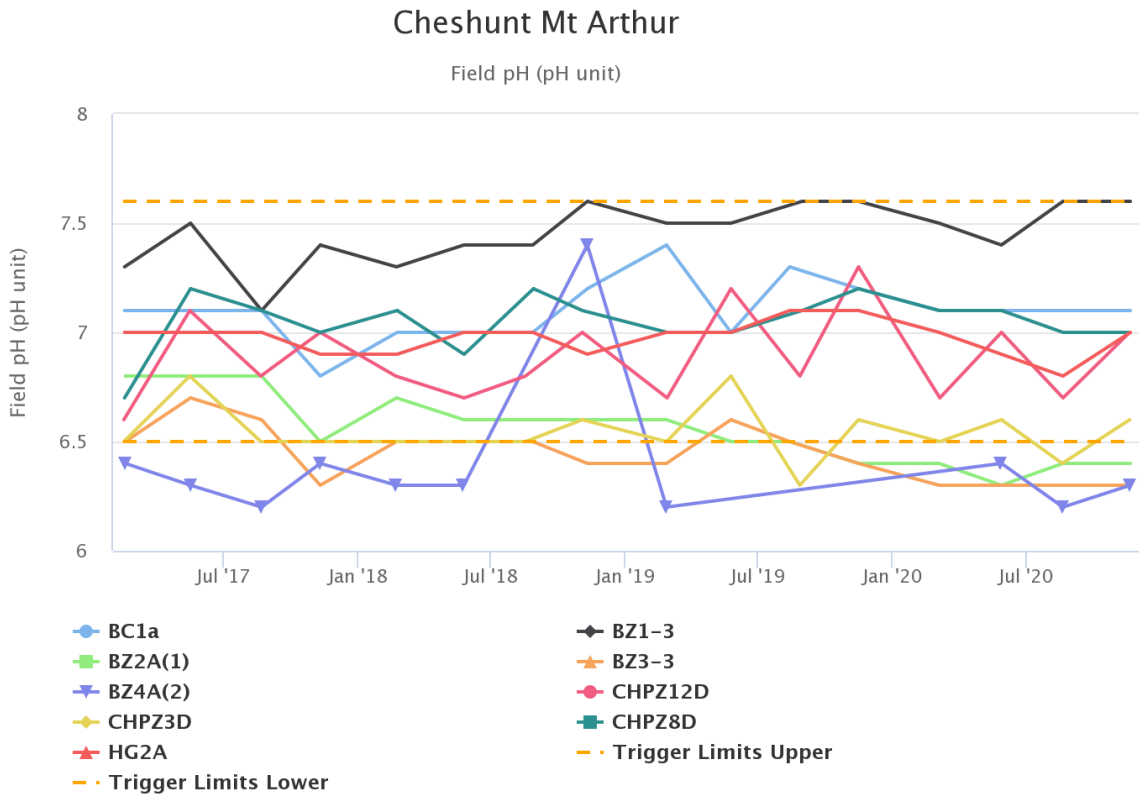


Figure 37 - Cheshunt Mt Arthur Field pH Trend - December 2020

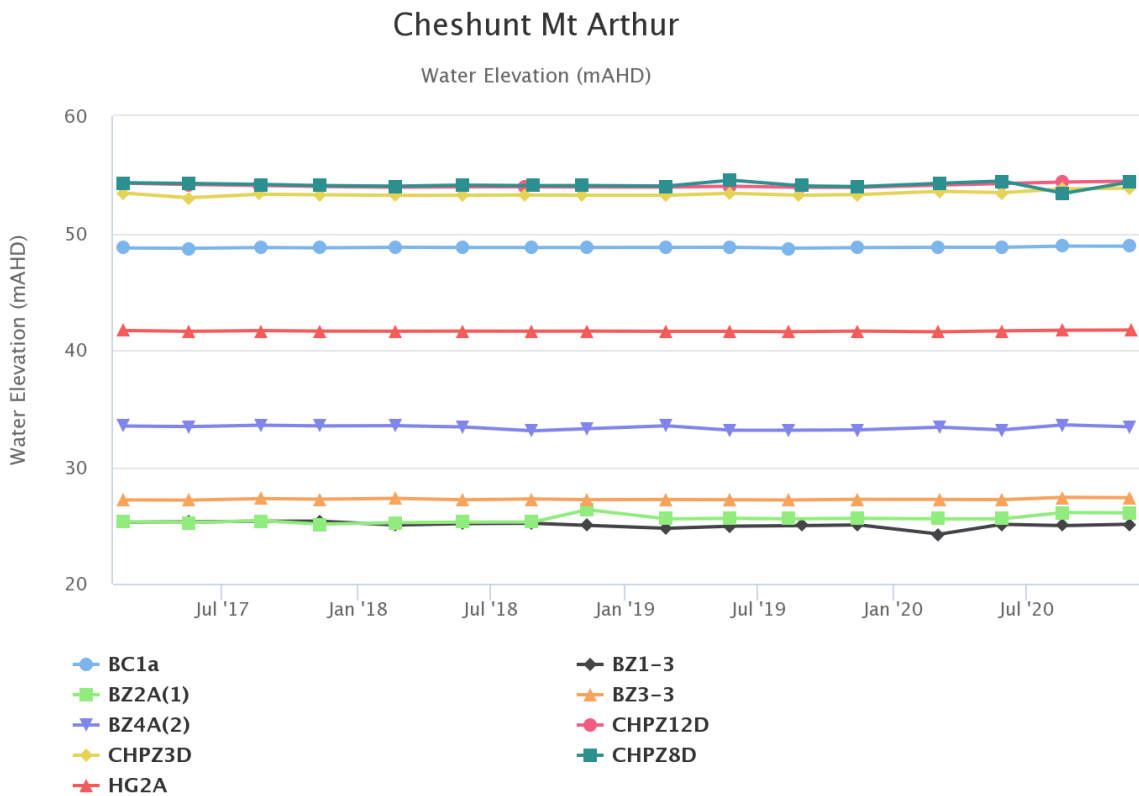


Figure 38 - Cheshunt Mt Arthur Standing Water Level - December 2020



Cheshunt / North Pit Alluvium

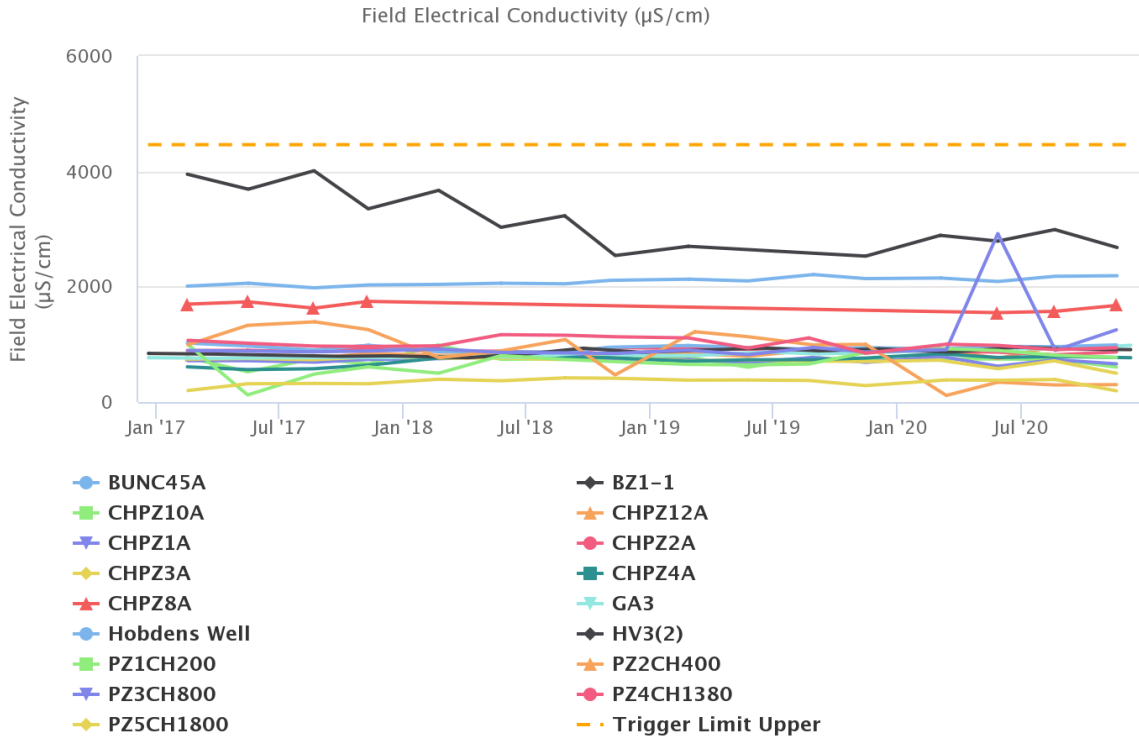


Figure 39 - Cheshunt North Pit Alluvium Field Electrical Conductivity Trend - December 2020

Cheshunt / North Pit Alluvium

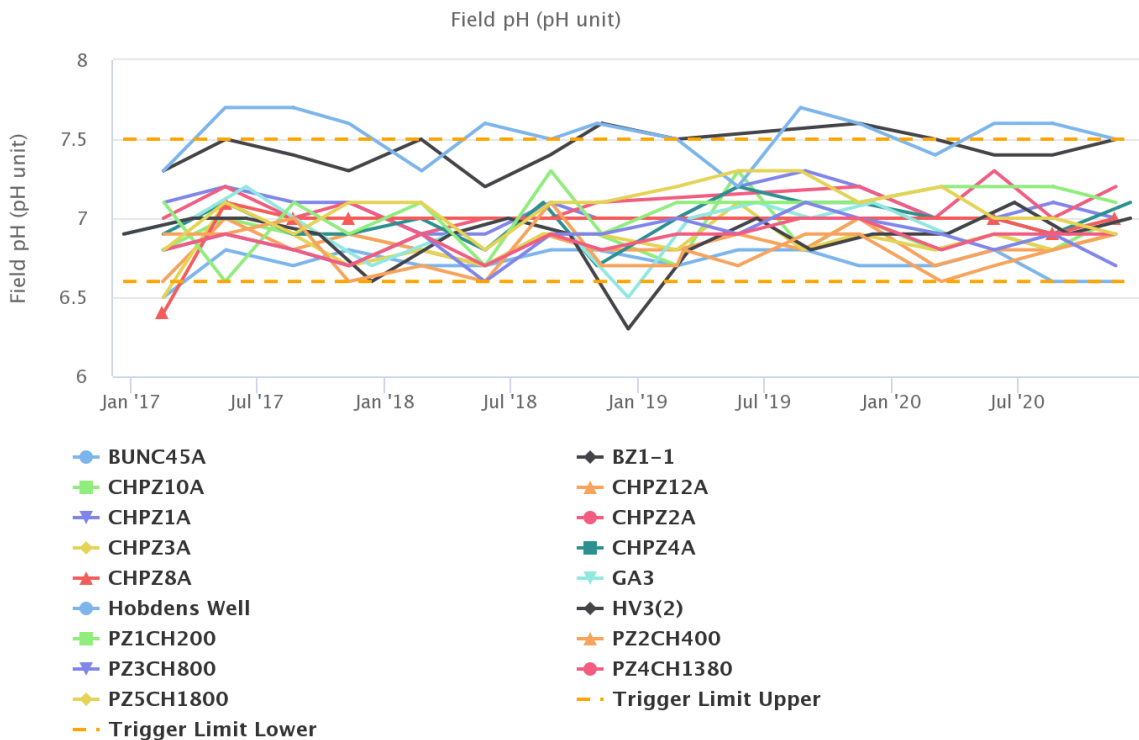
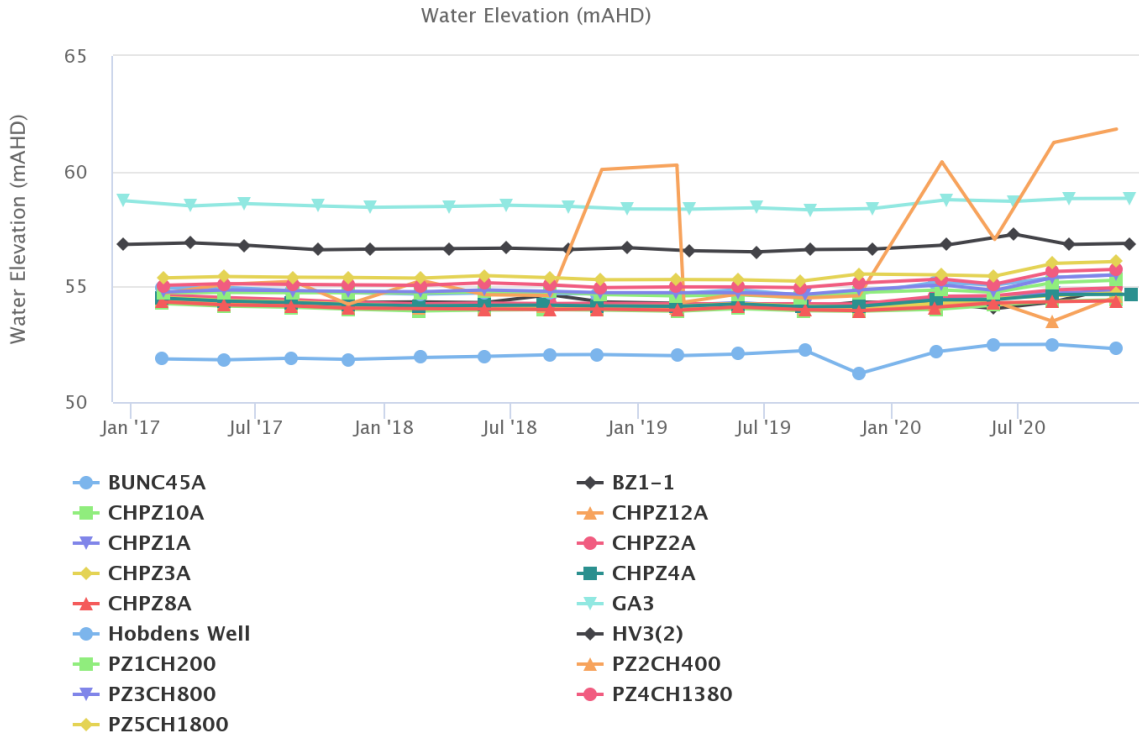


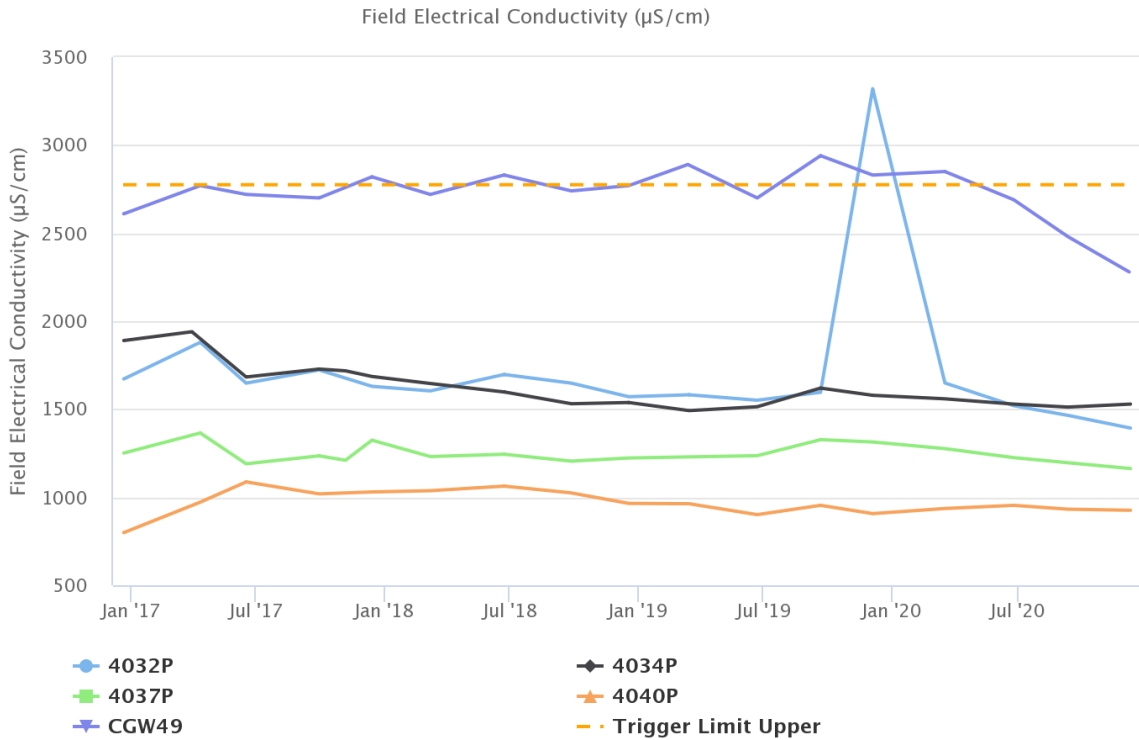
Figure 40 - Cheshunt North Pit Alluvium Field pH Trend - December 2020

**Cheshunt / North Pit Alluvium**

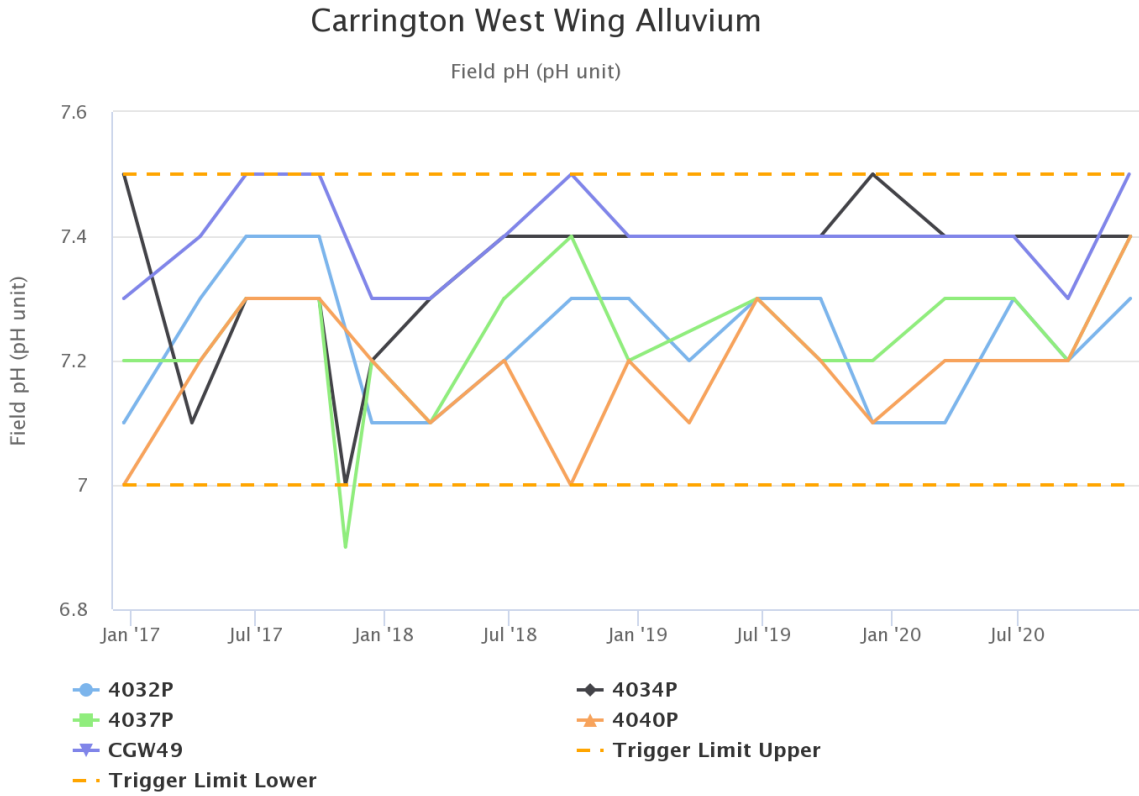


**Figure 41 - Cheshunt North Pit Alluvium Standing Water Level - December 2020**

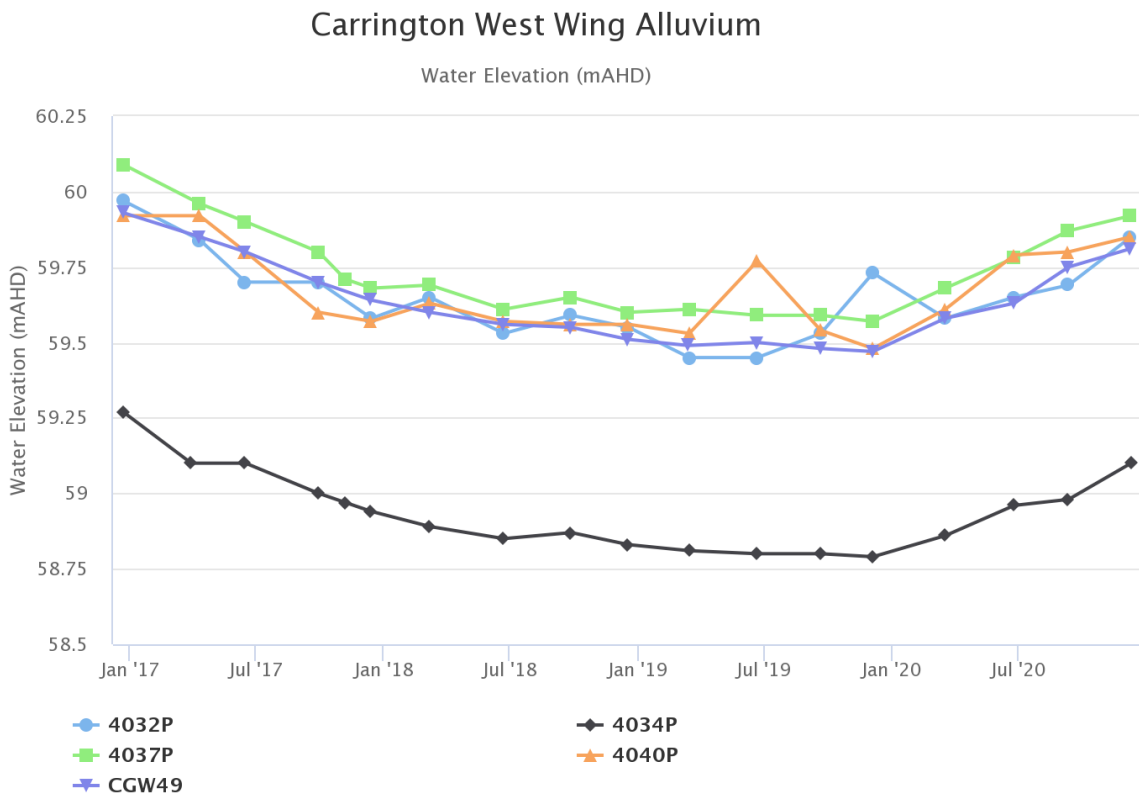
**Carrington West Wing Alluvium**



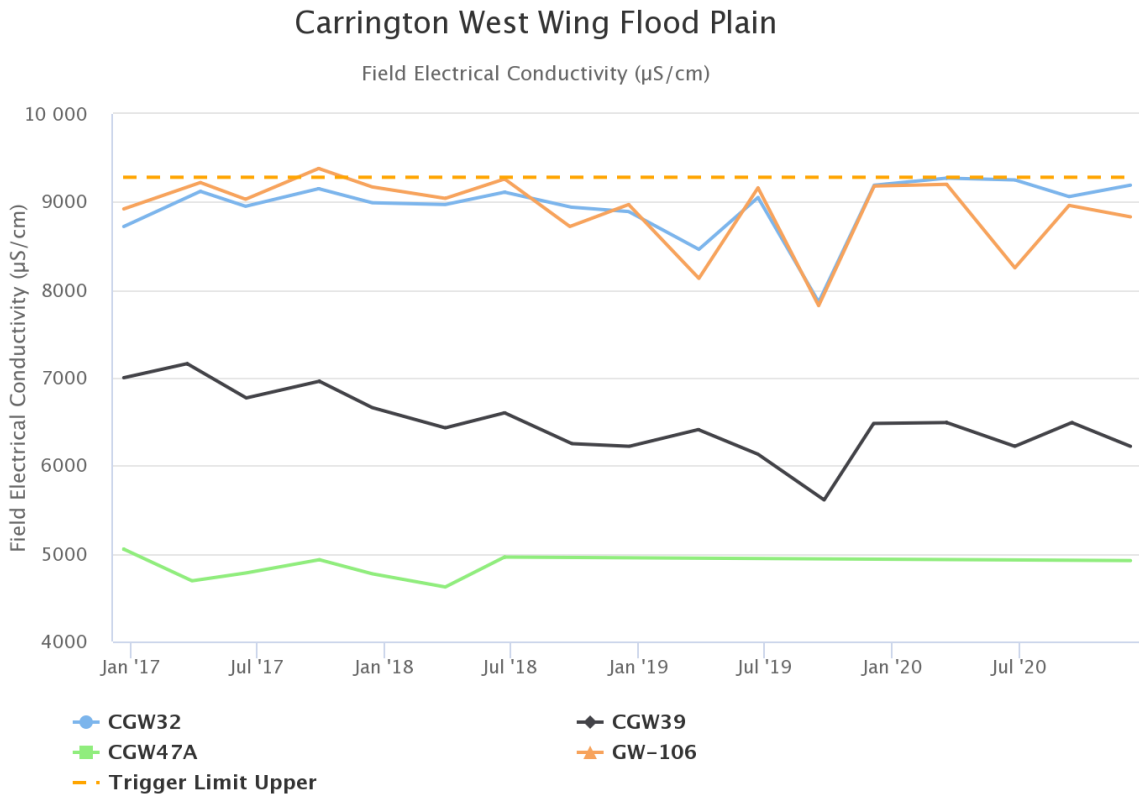
**Figure 42 - Carrington West Wing Alluvium Field Electrical Conductivity Trend - December 2020**



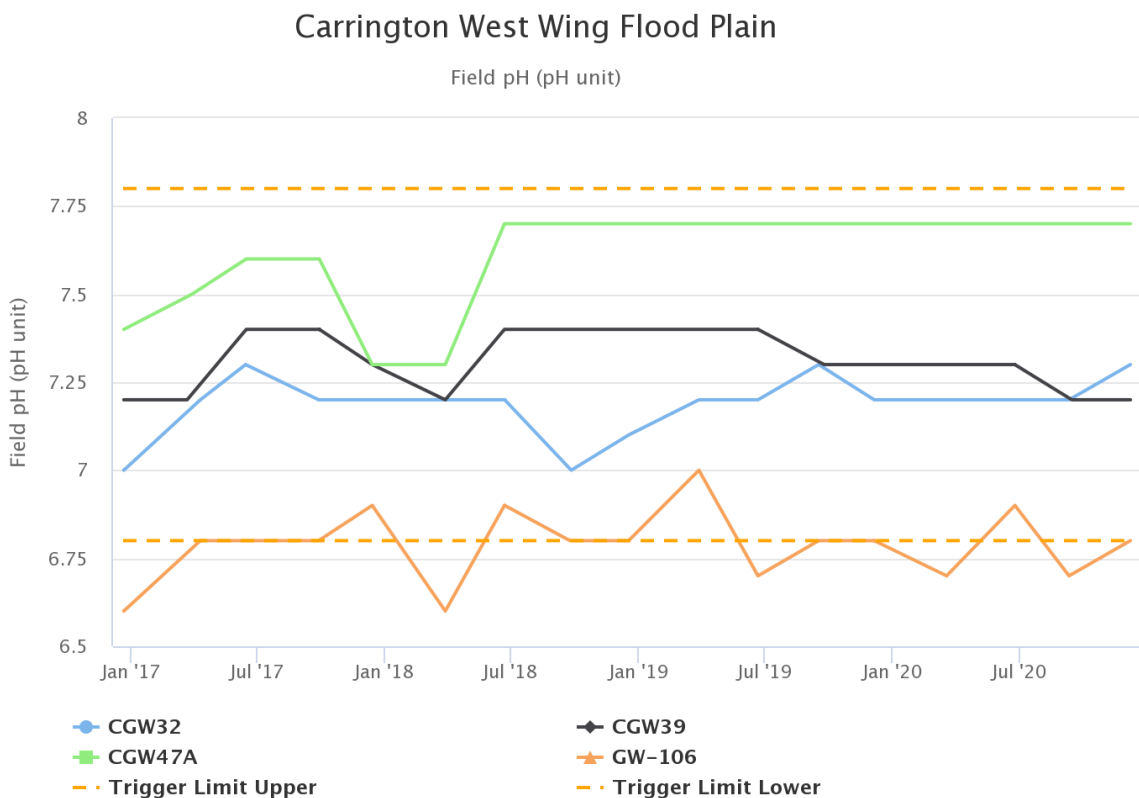
**Figure 43 - Carrington West Wing Alluvium Field pH Trend - December 2020**



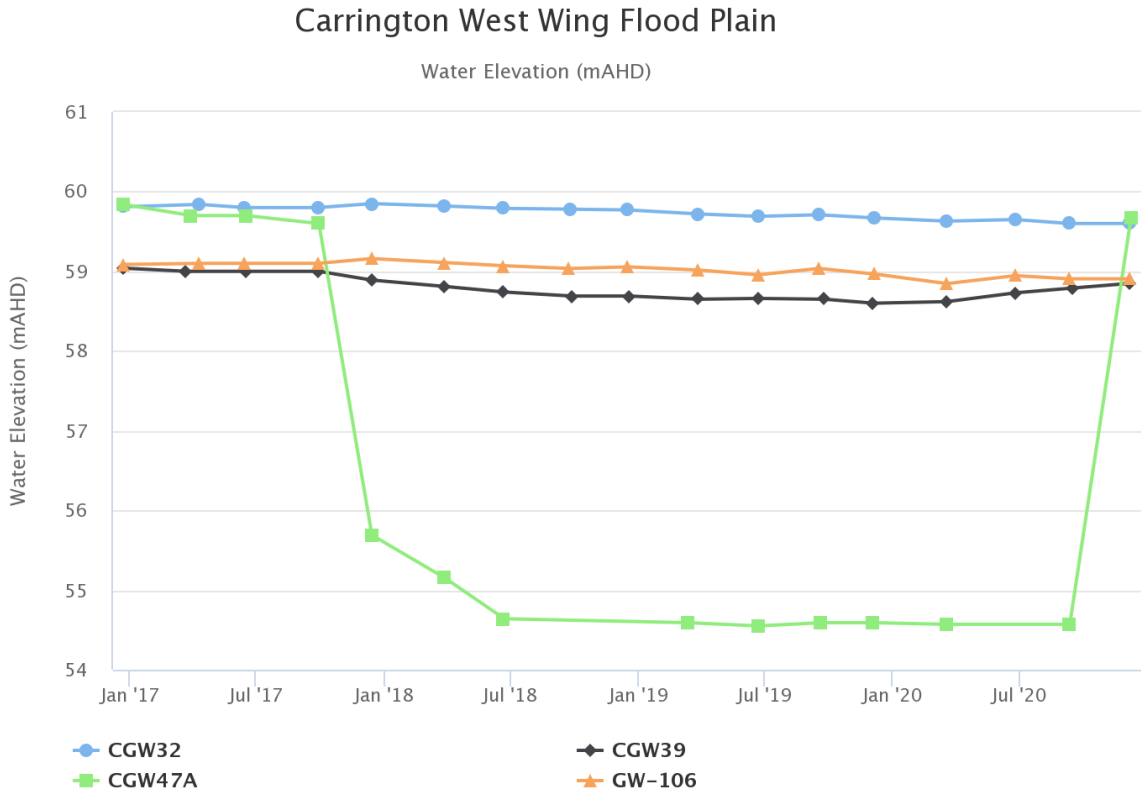
**Figure 44 - Carrington West Wing Alluvium Standing Water Level - December 2020**



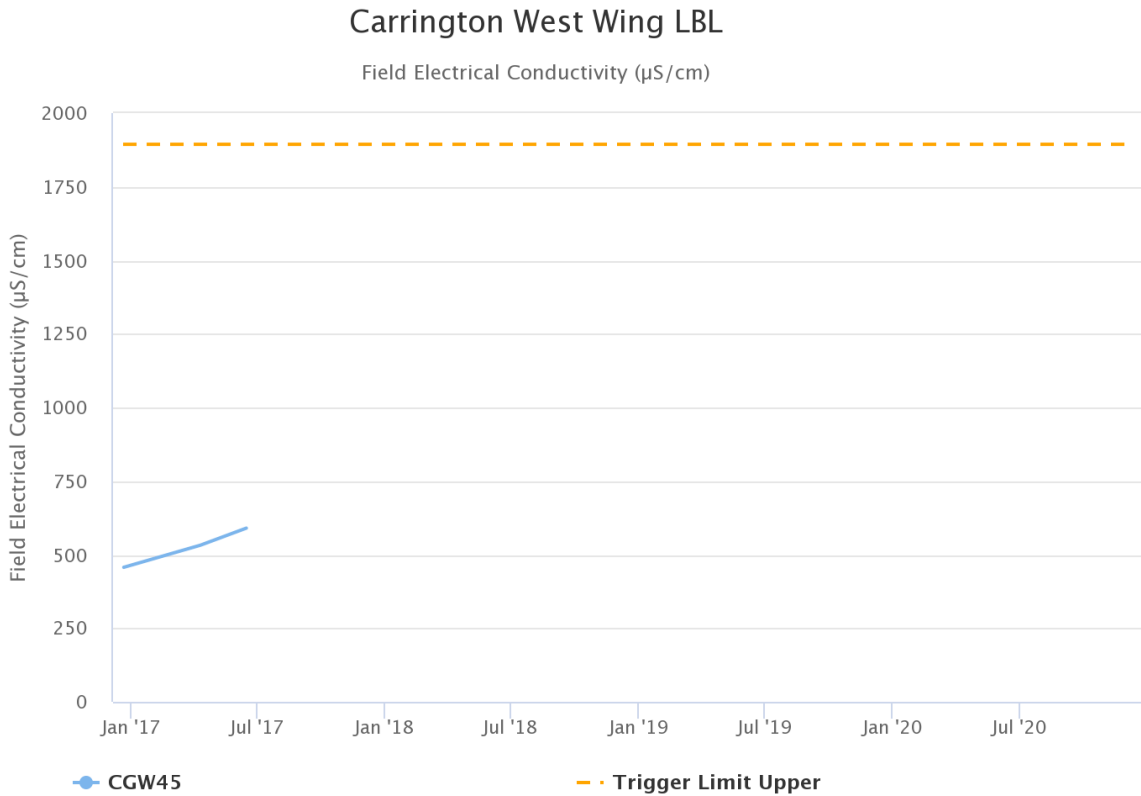
**Figure 45 - Carrington West Wing Flood Plain Field Electrical Conductivity Trend - December 2020**



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

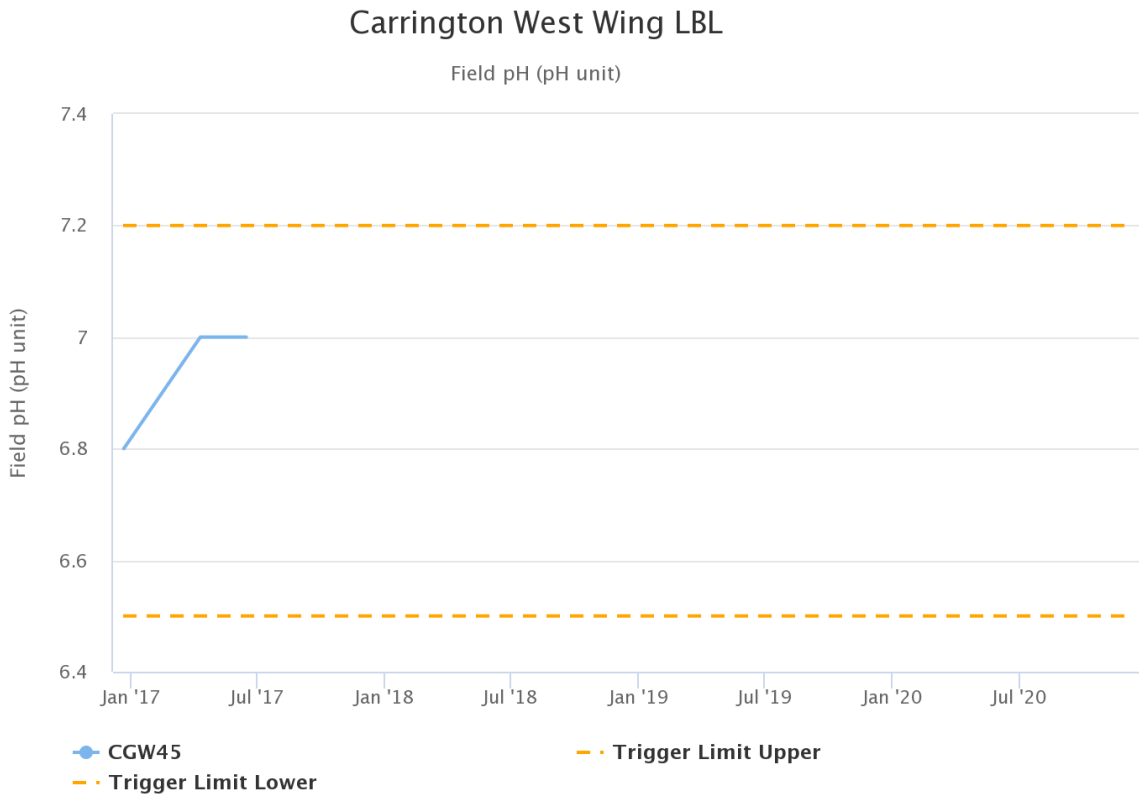


**Figure 47 - Carrington West Wing Flood Plain Standing Water Level - December 2020**

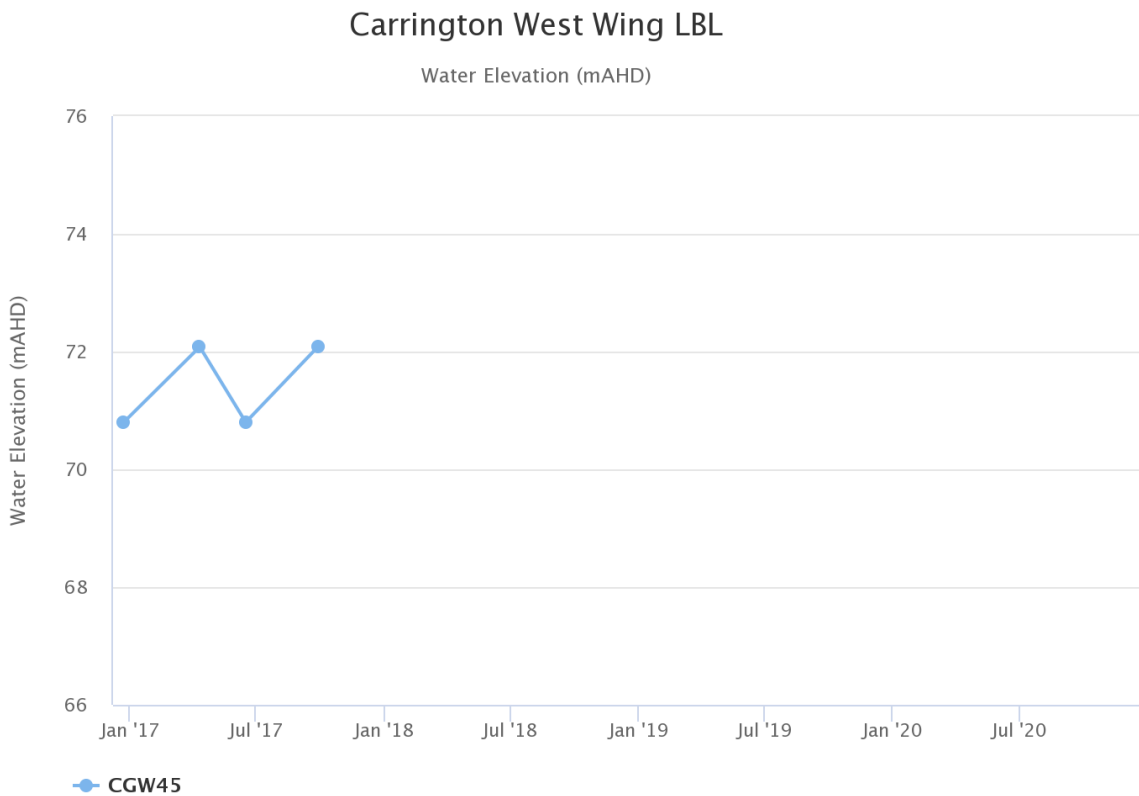


Note: CGW45 has been blocked since July 2017

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

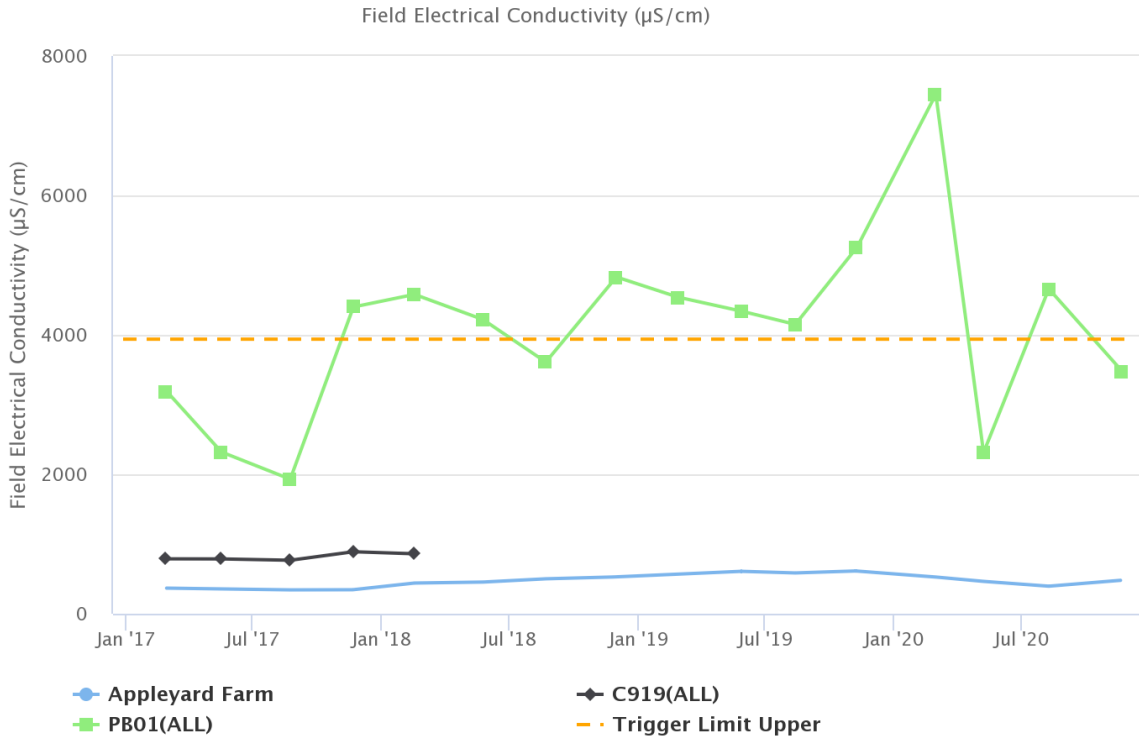


**Figure 49 - Carrington West Wing LBL Field Electrical Conductivity Trend - December 2020**



**Figure 50 - Carrington West Wing LBL Standing Water Level - December 2020**

Lemington South Alluvium



Note: C919(ALL) produced insufficient water for a sample

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

Lemington South Alluvium

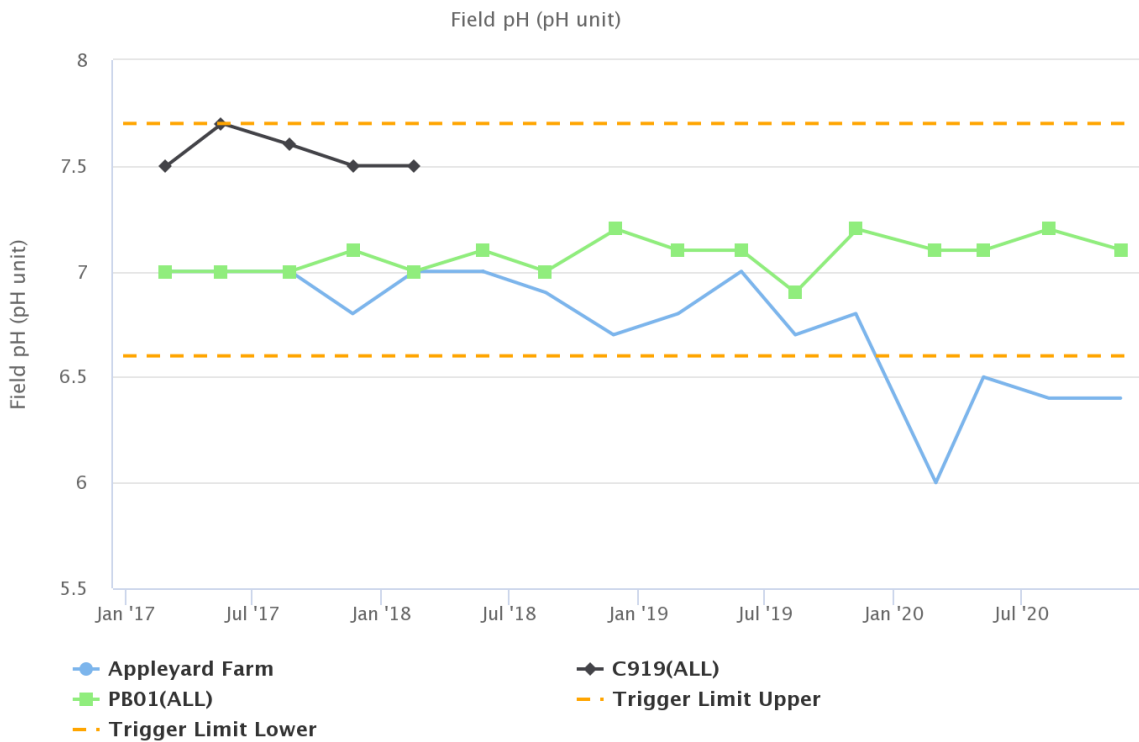
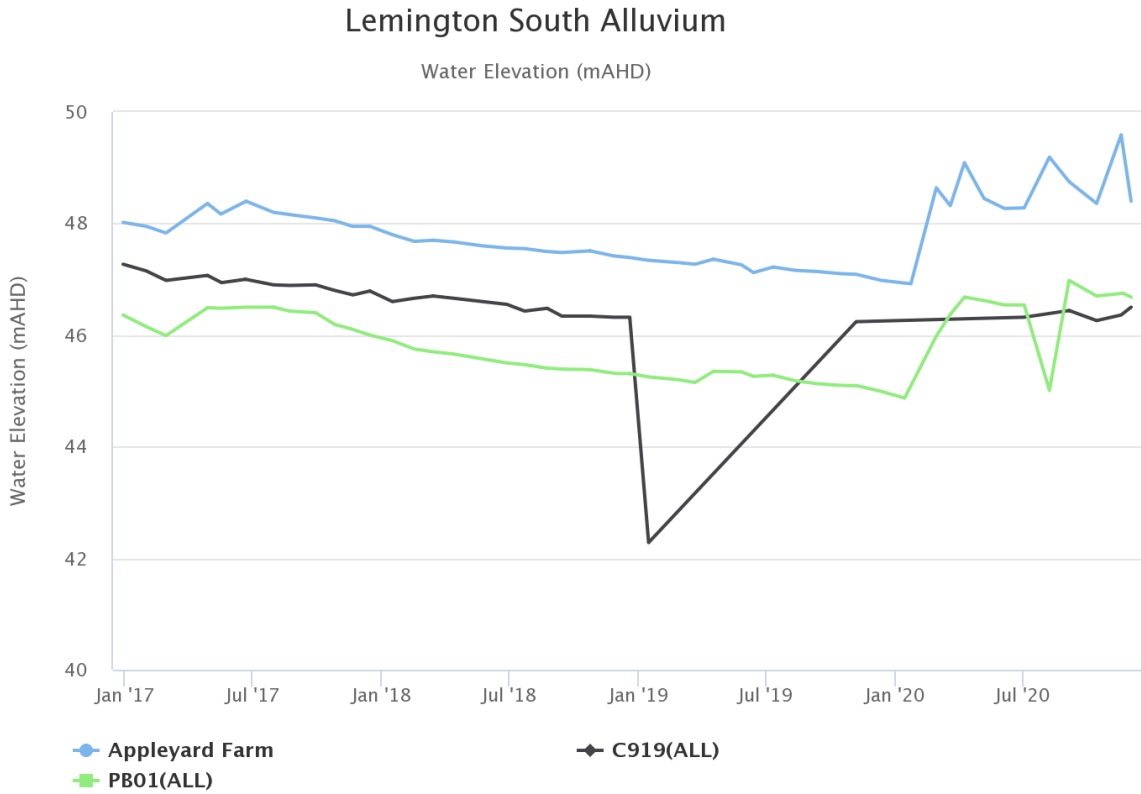
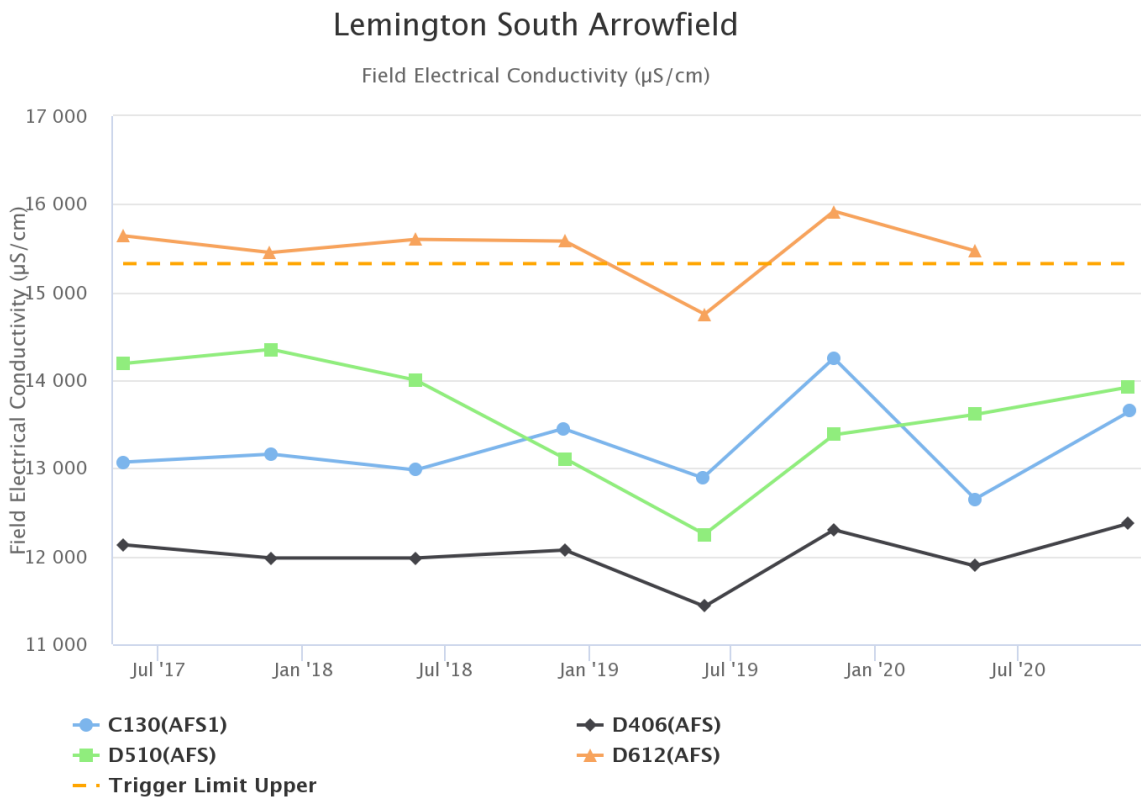


Figure 52 - Lemington South Alluvium Field pH Trend - December 2020



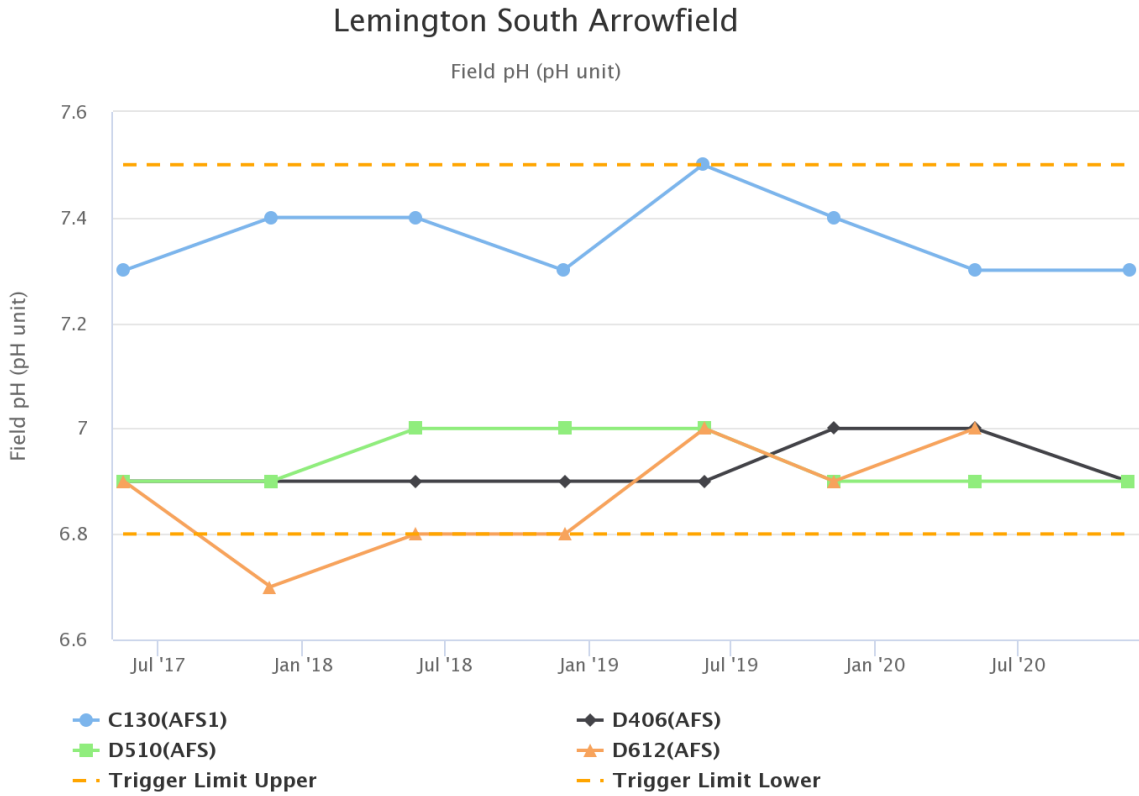
**Figure 53 - Lemington South Alluvium Standing Water Level - December 2020**



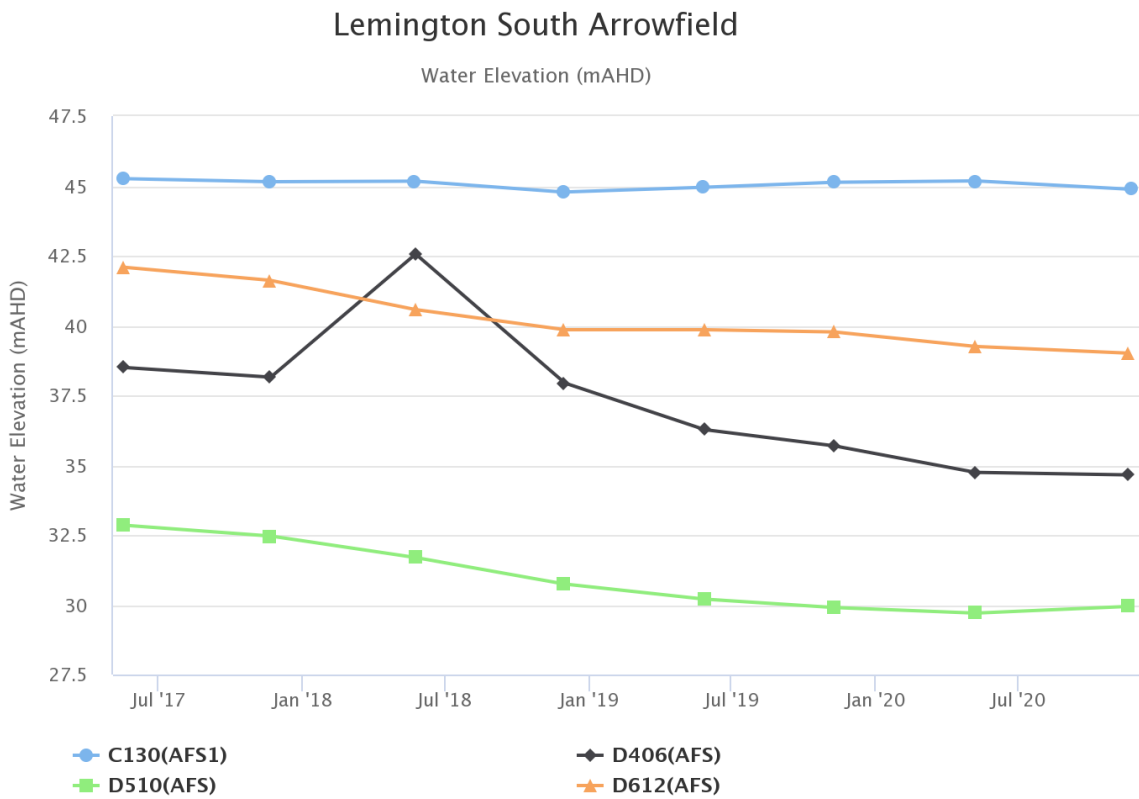
Note: D612(AFS) produced insufficient water for a sample.

**Figure 54 - Lemington South Arrowfield Field Electrical Conductivity Trend - December 2020**

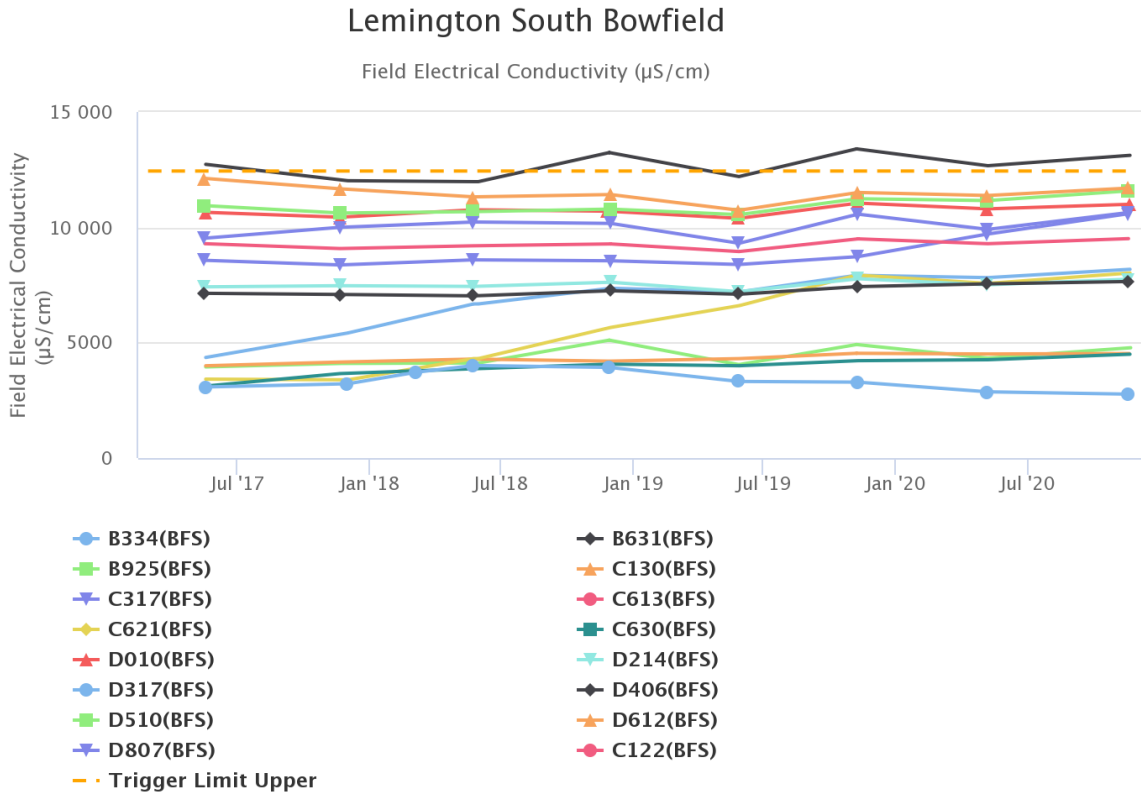




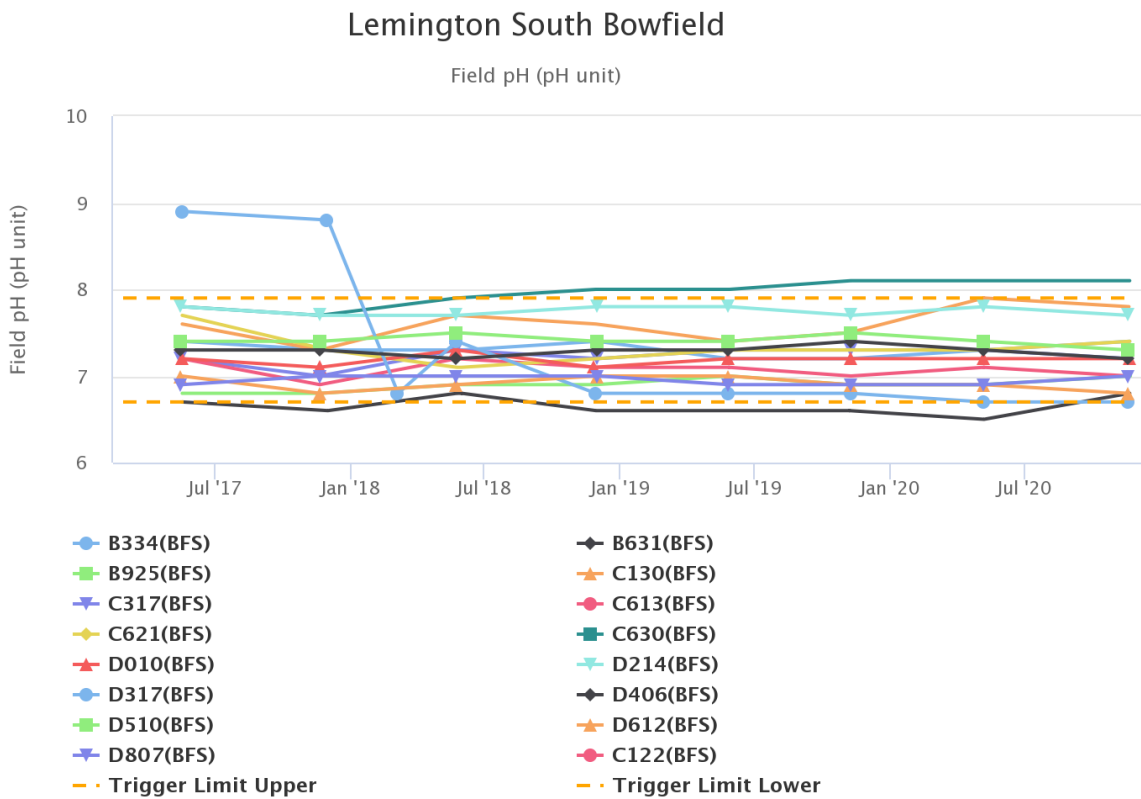
**Figure 55 - Lemington South Arrowfield Field pH Trend - December 2020**



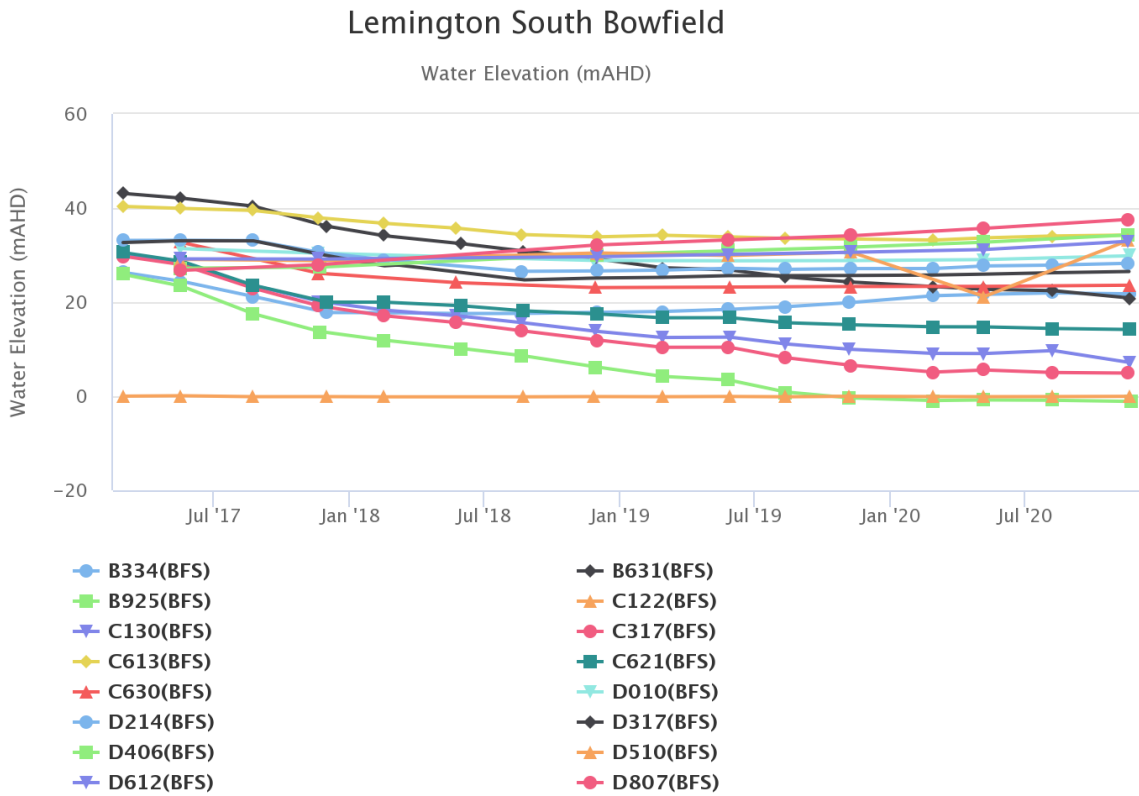
**Figure 56 Lemington South Arrowfield Standing Water Level - December 2020**



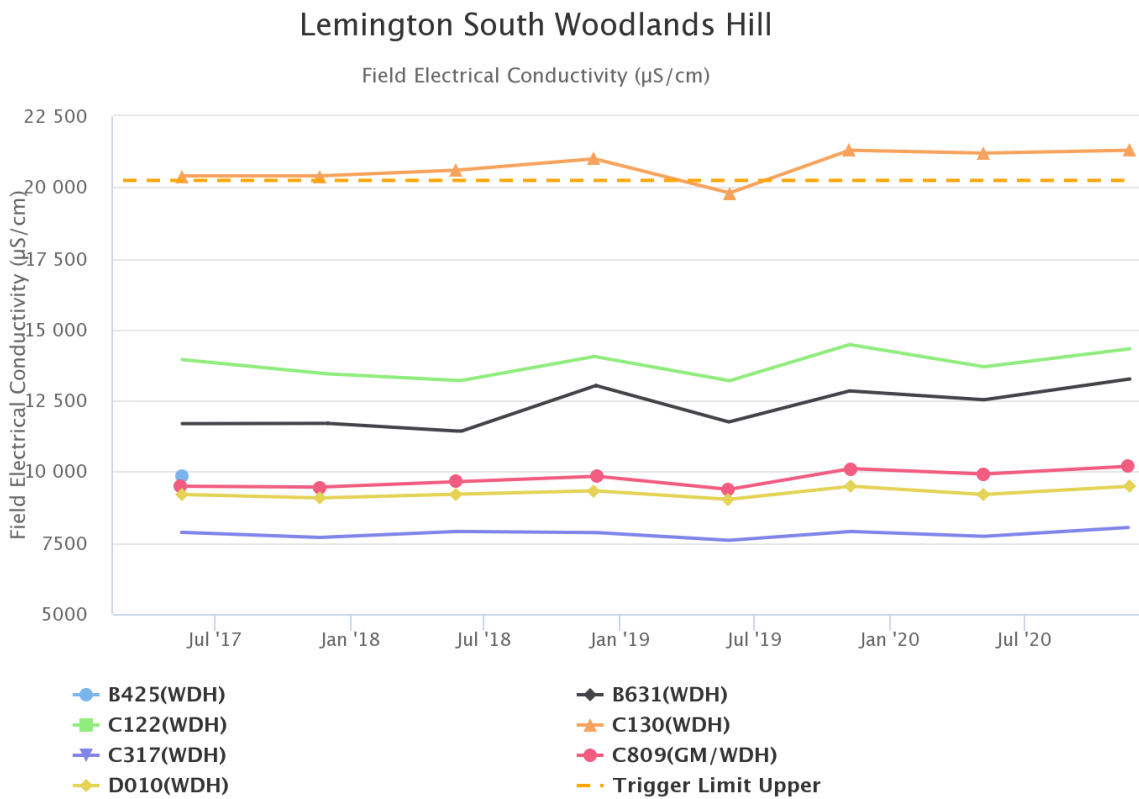
**Figure 57 - Lemington South Bowfield Field Electrical Conductivity Trend - December 2020**



**Figure 58 - Lemington South Bowfield Field pH - December 2020**



**Figure 59 - Lemington South Bowfield Standing Water Level - December 2020**



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

Lemington South Woodlands Hill

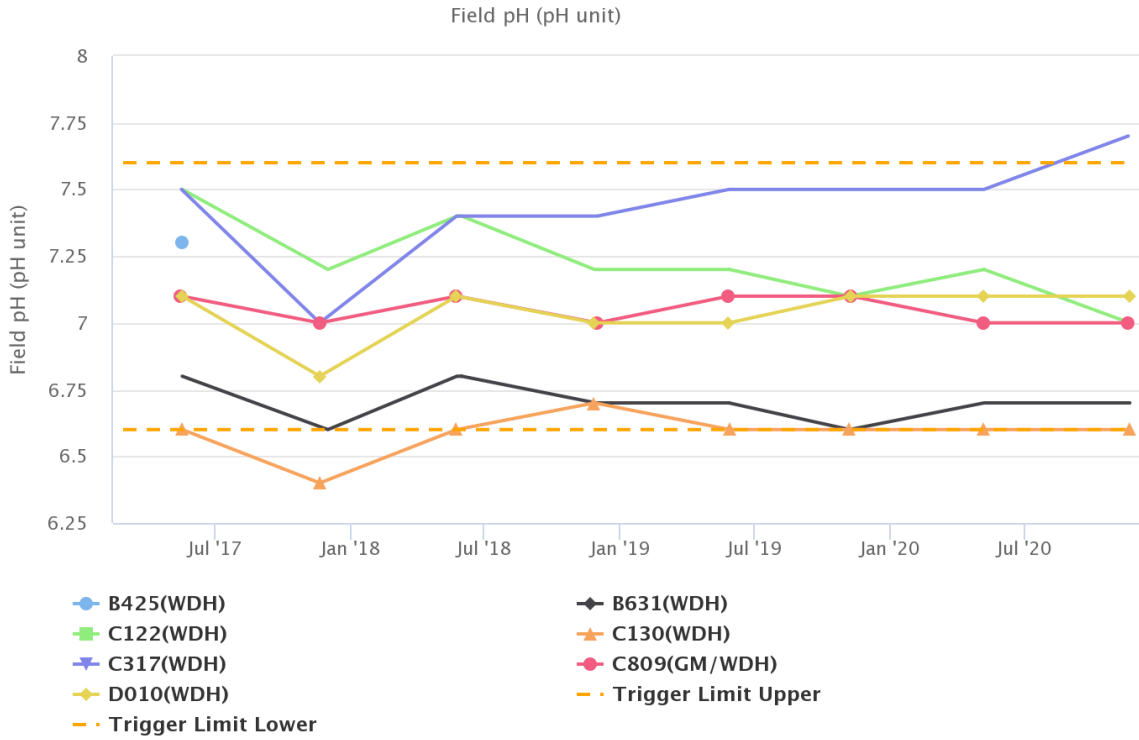


Figure 61 - Lemington South Woodlands Hill Field pH Trend - December 2020

Lemington South Woodlands Hill

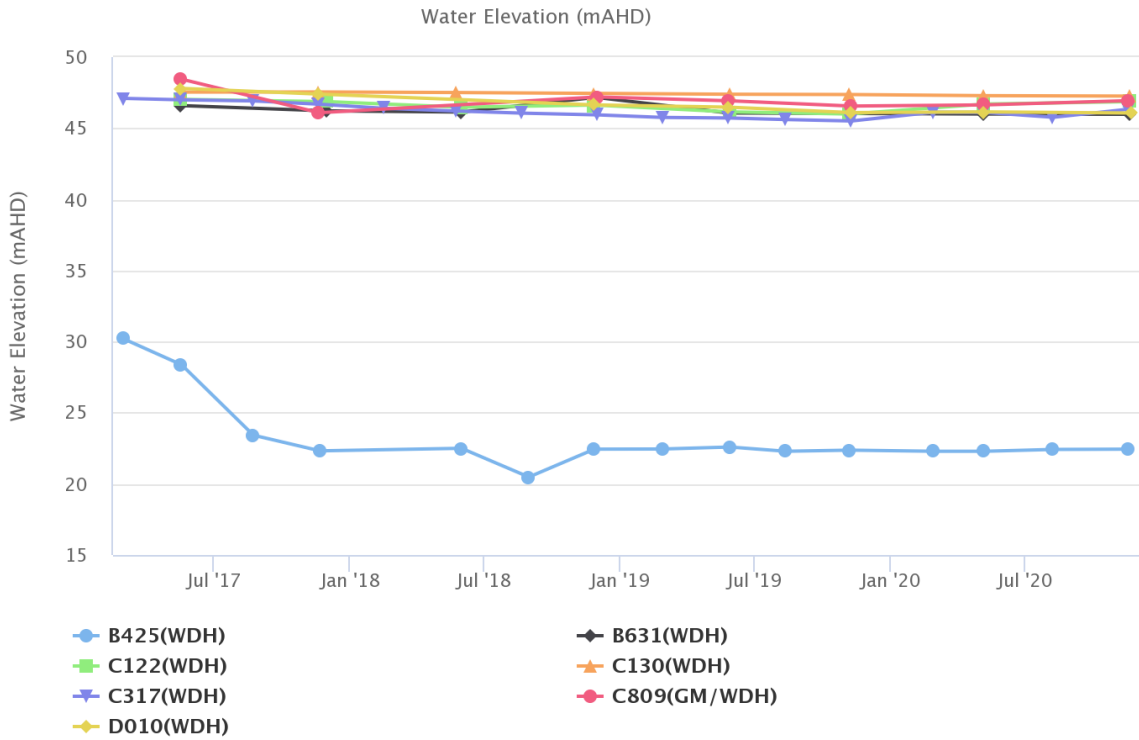


Figure 62 - Lemington South Woodlands Hill Standing Water Level - December 2020

### Lemington South Interburden

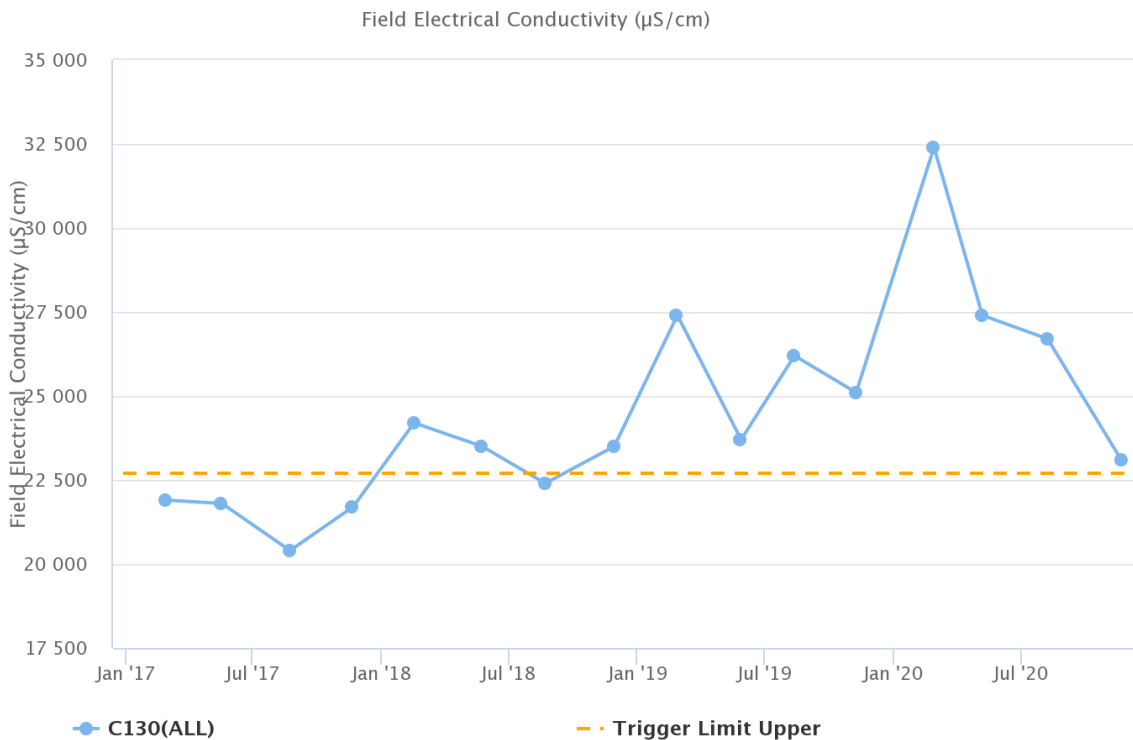


Figure 63 - Lemington South Interburden Field Electrical Conductivity Trend - December 2020

### Lemington South Interburden

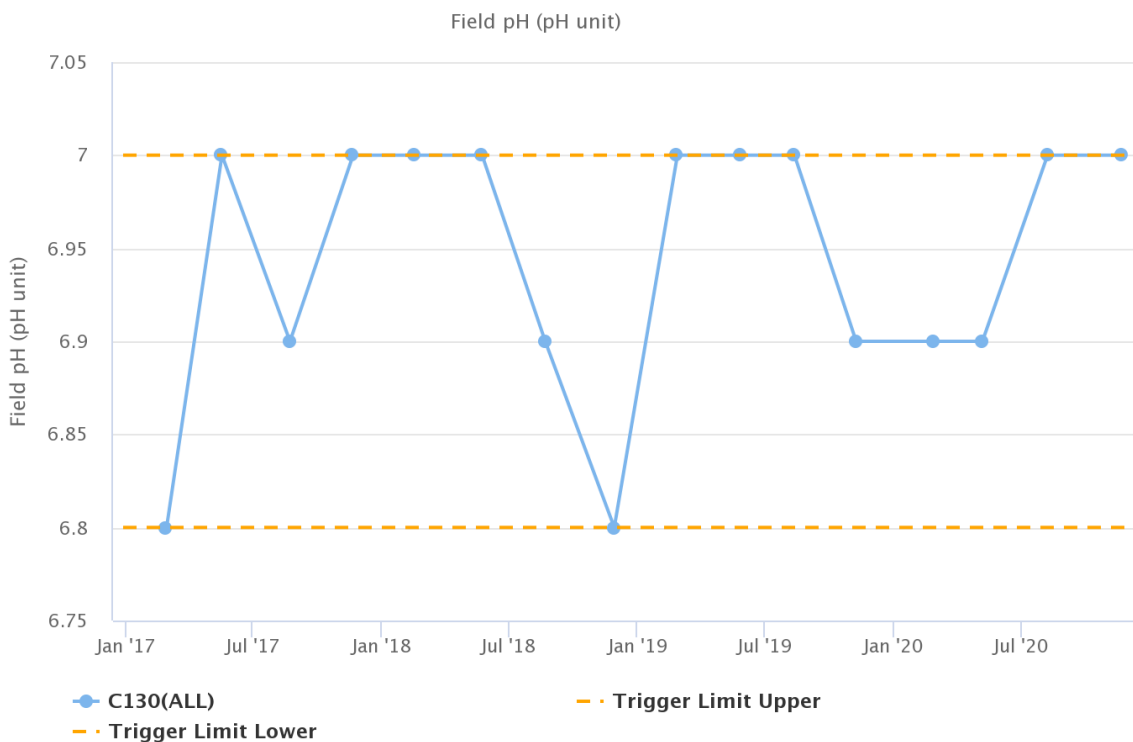


Figure 64 - Lemington South Interburden Field pH Trend - December 2020

Lemington South Interburden

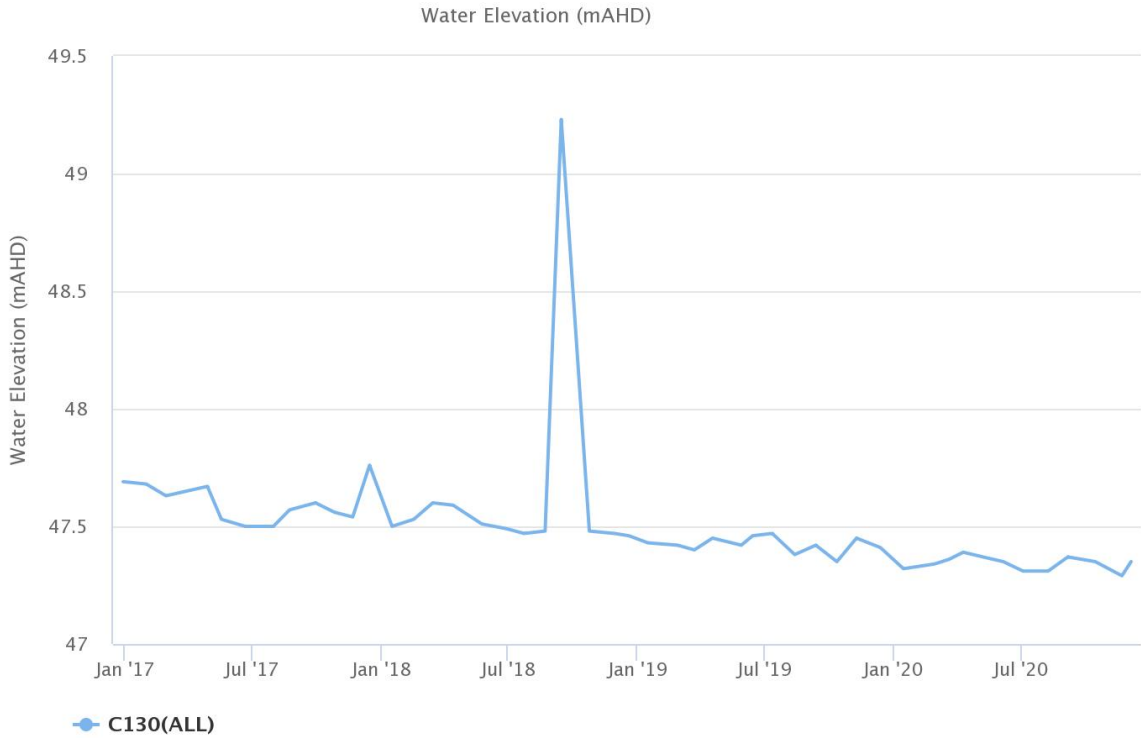
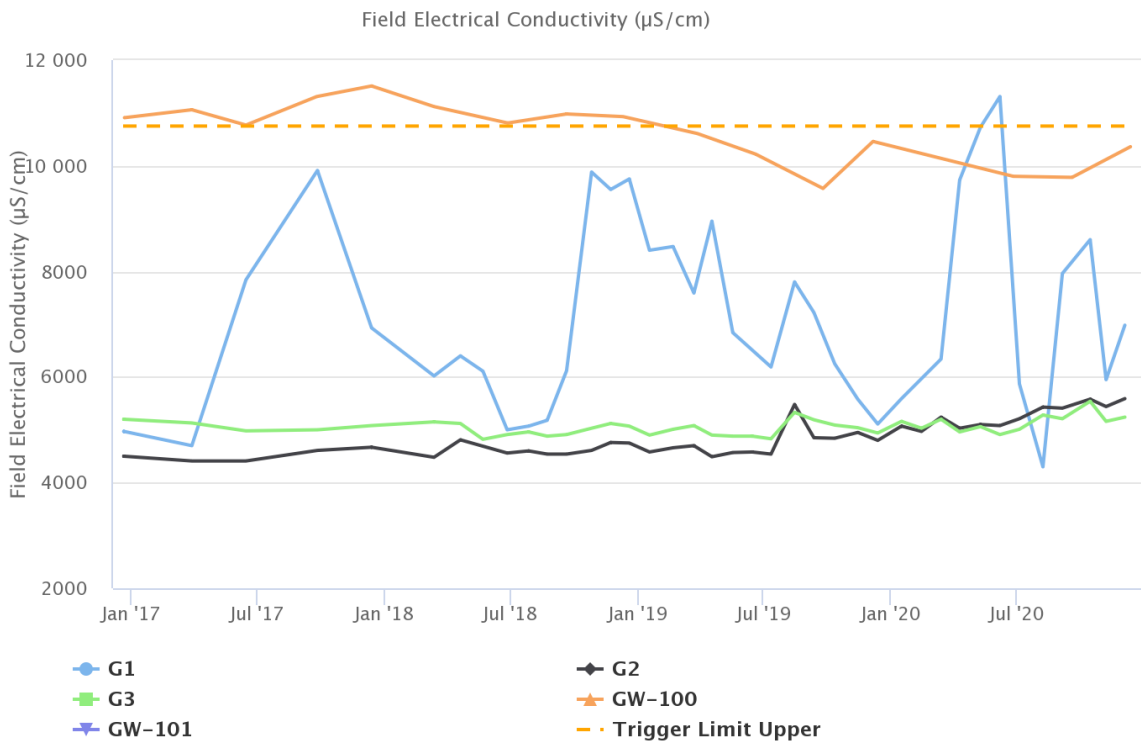


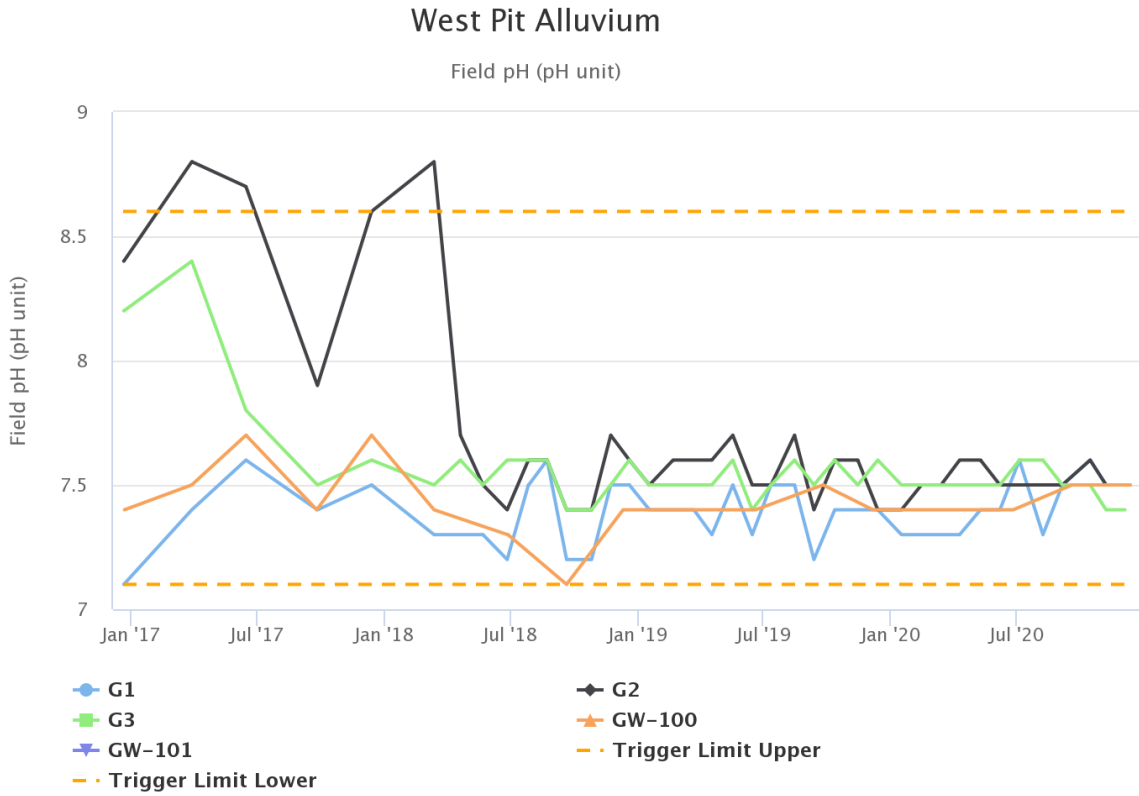
Figure 65 - Lemington South Interburden Standing Water Level - December 2020

West Pit Alluvium

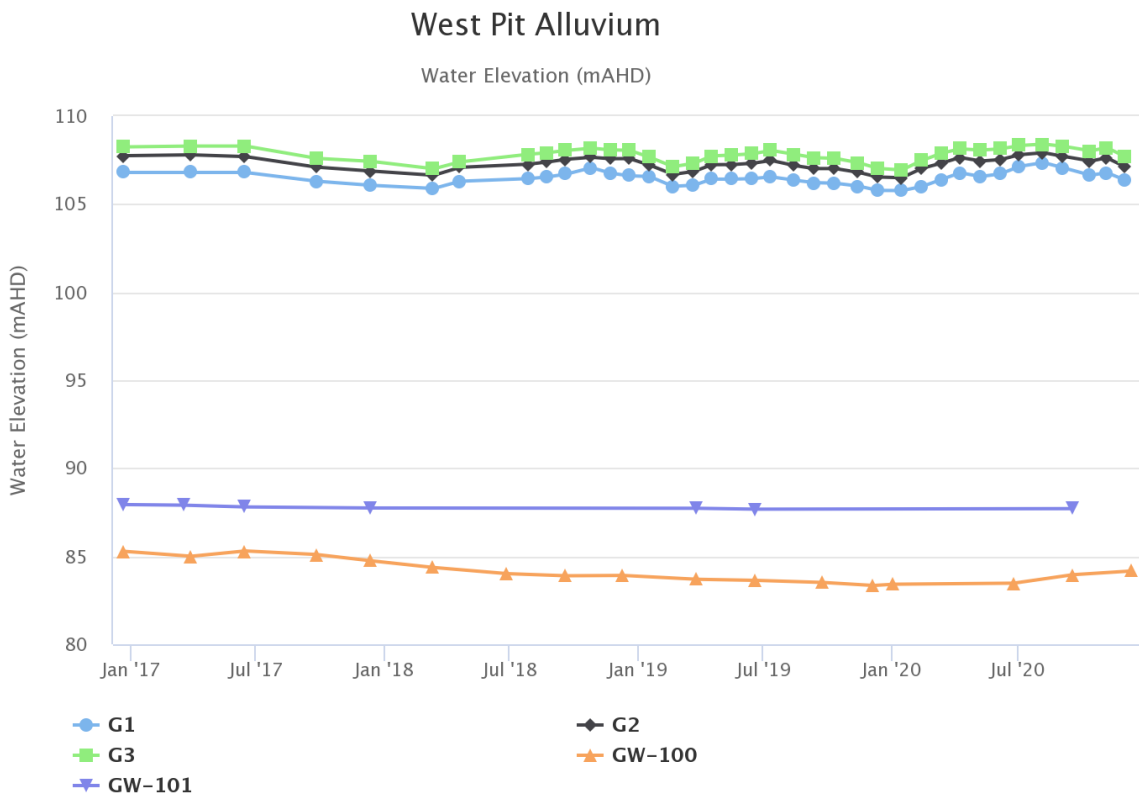


Note: GW-101 produced insufficient water for a sample.

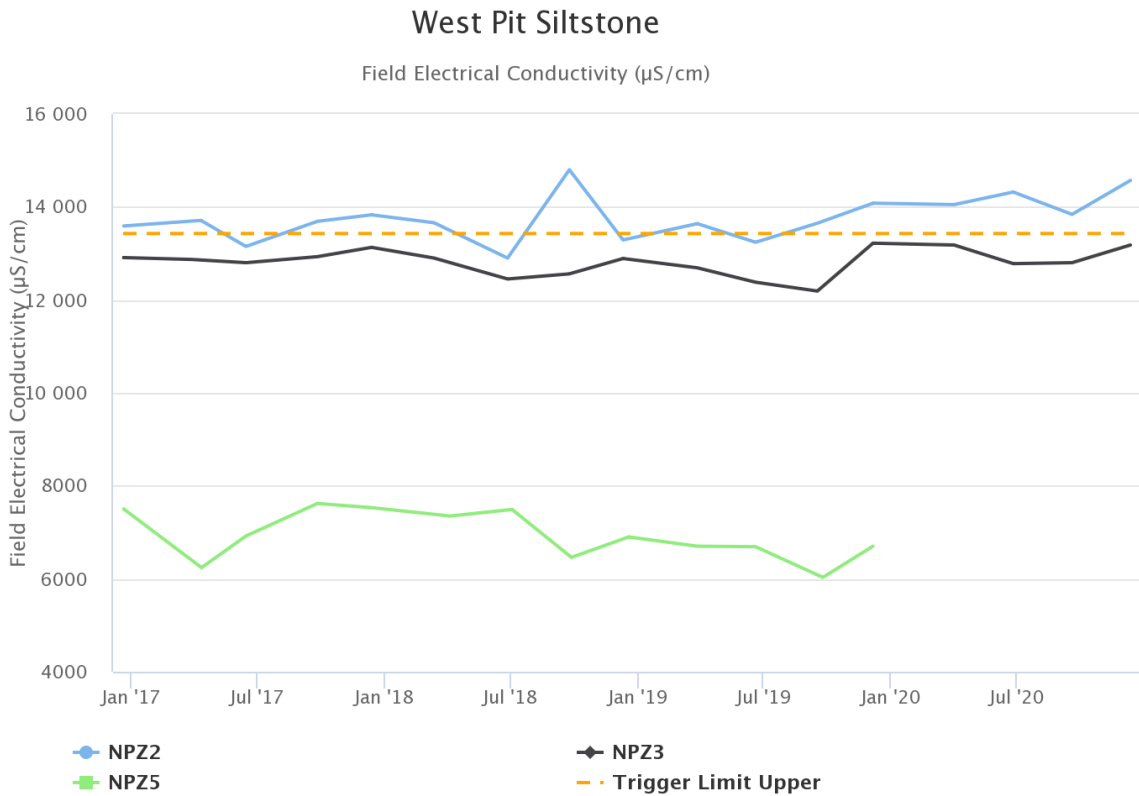
Figure 66 - West Pit Alluvium Field Electrical Conductivity Trend - December 2020



**Figure 67 - West Pit Alluvium Field pH - December 2020**

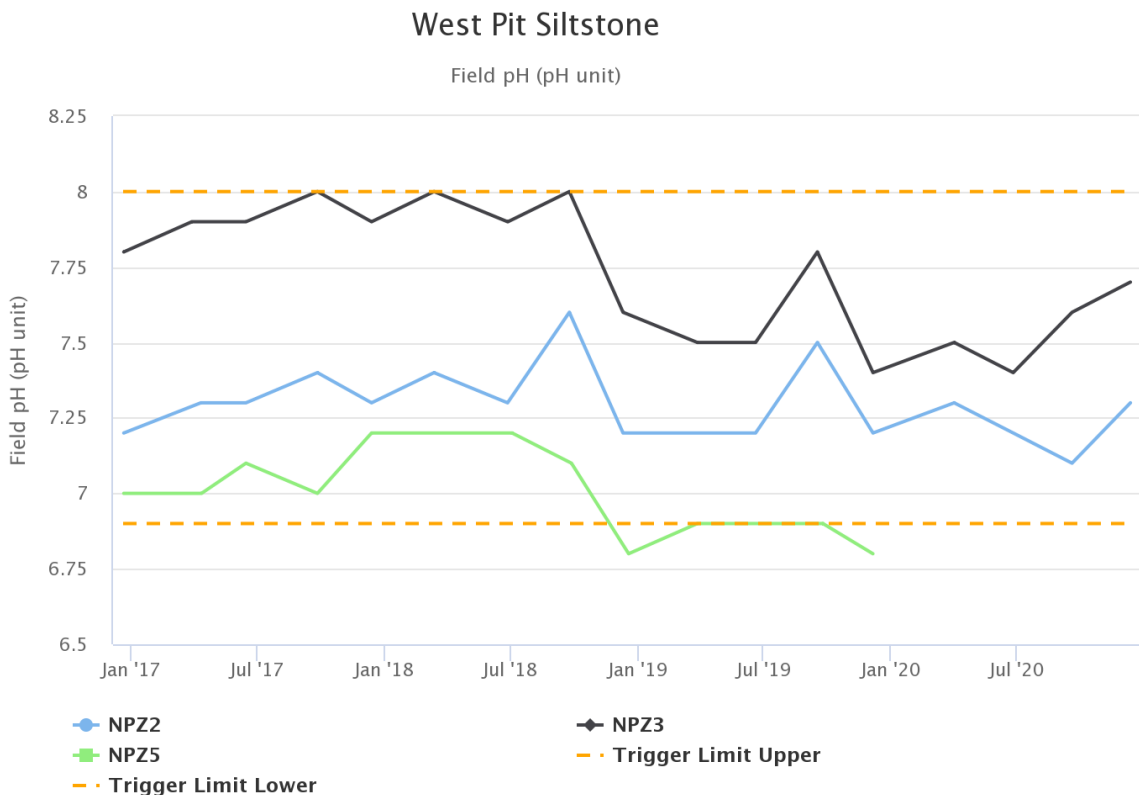


**Figure 68 - West Pit Alluvium Standing Water Level - December 2020**



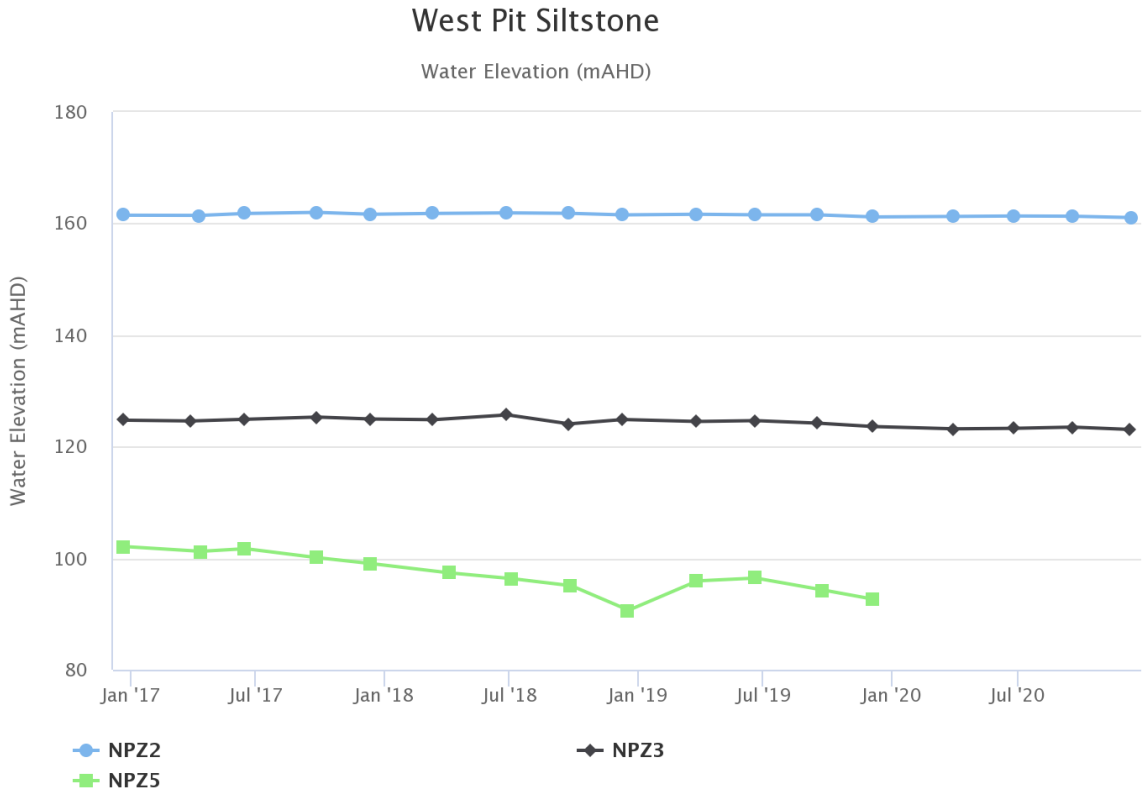
Note: NPZ5 could not be sampled due to unsafe access.

**Figure 69 - West Pit Siltstone Field Electrical Conductivity Trend - December 2020**

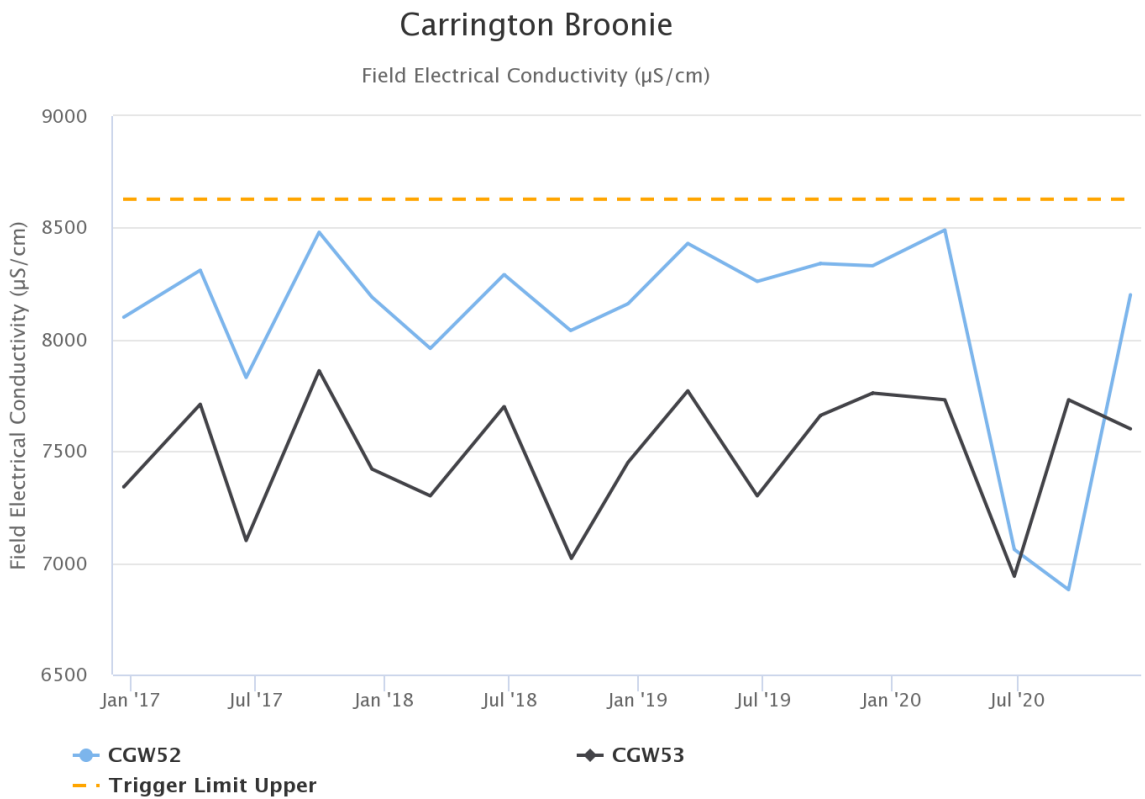


**Figure 70 - West Pit Siltstone Field pH Trend - December 2020**

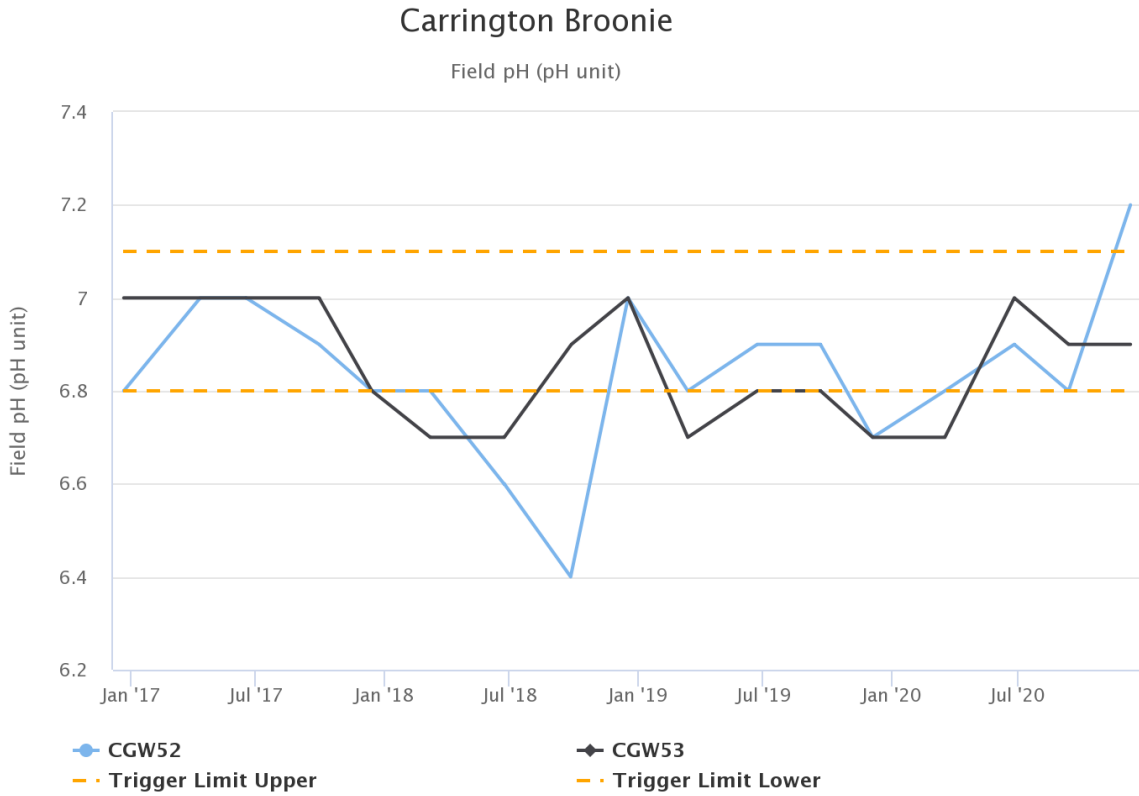




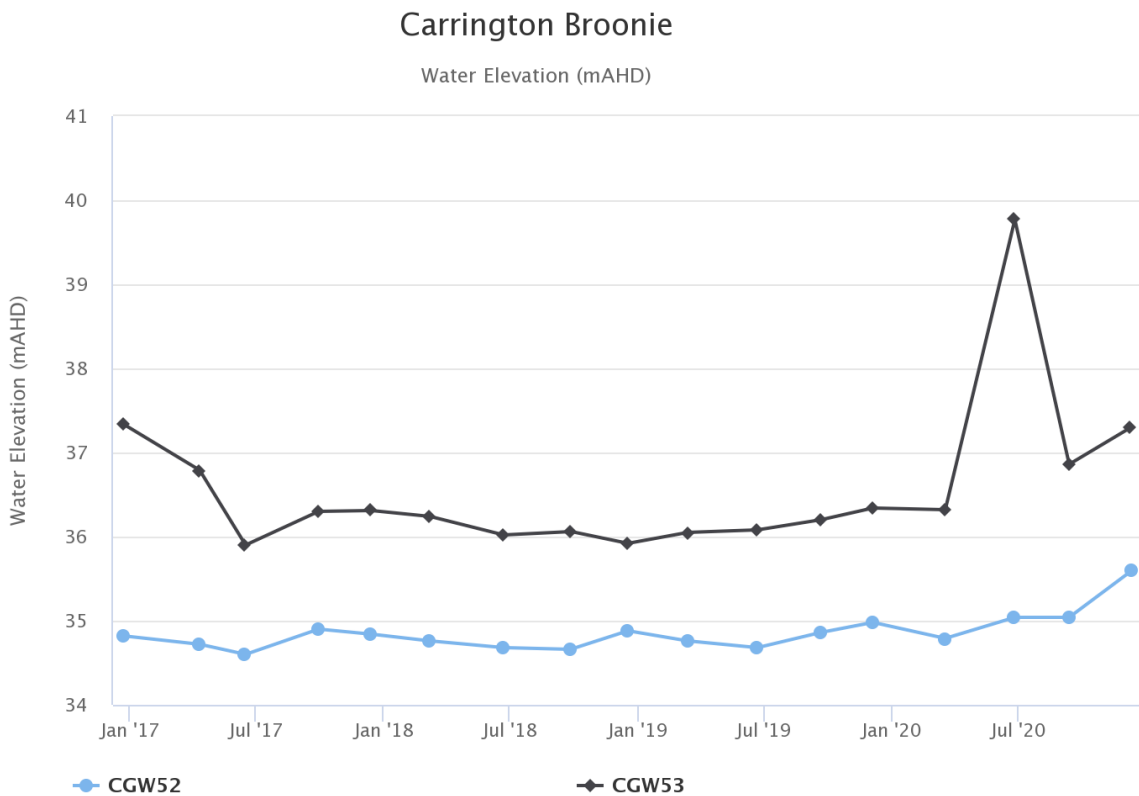
**Figure 71 - West Pit Siltstone Standing Water level - December 2020**



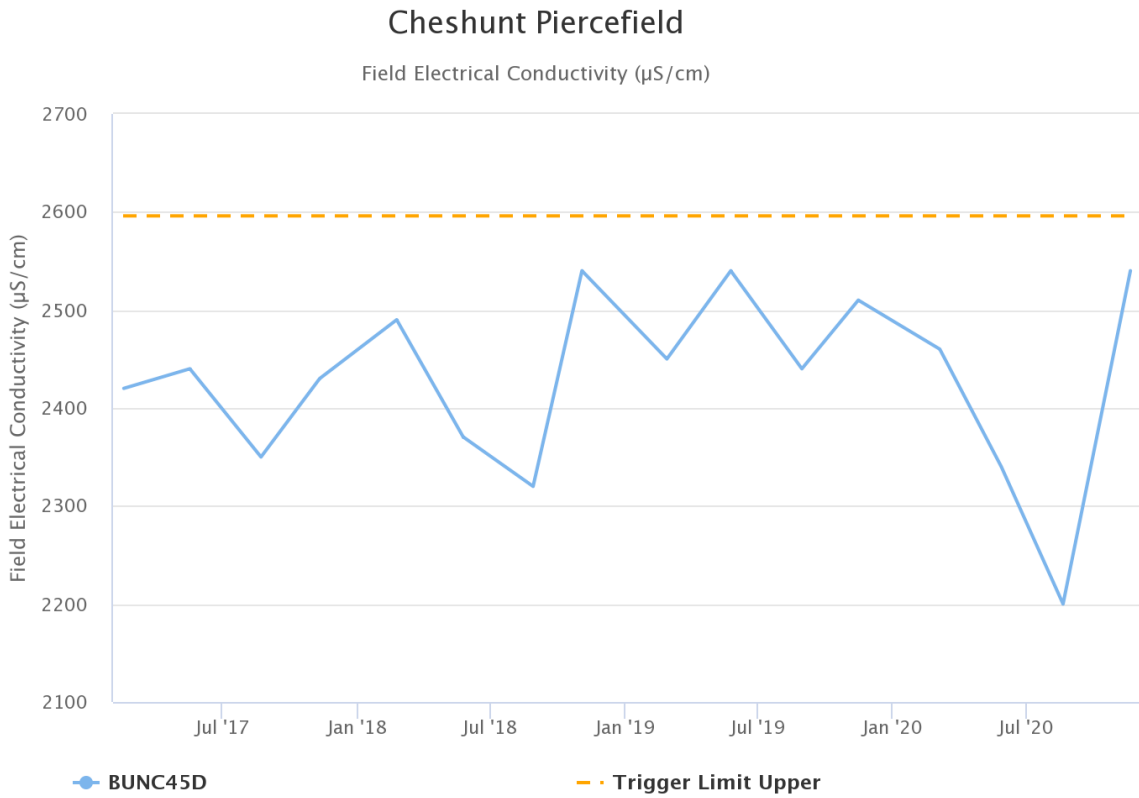
**Figure 72 - Carrington Broonie Field Electrical Conductivity Trend - December 2020**



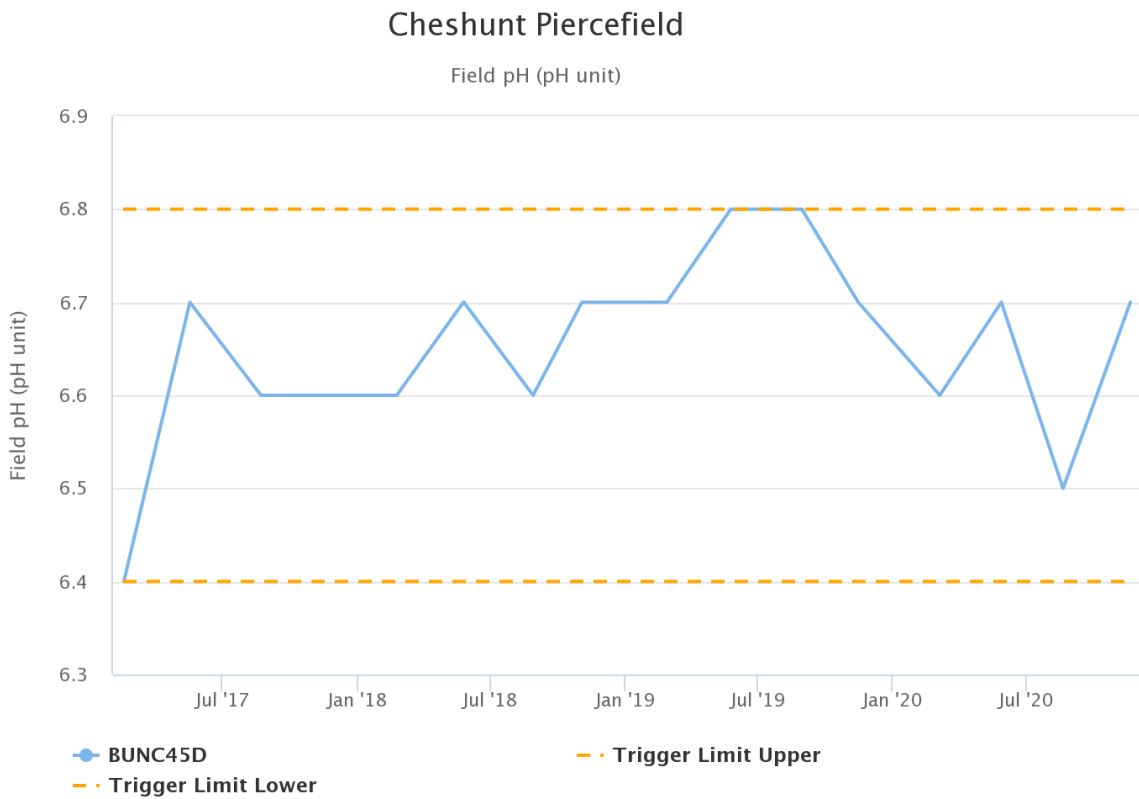
**Figure 73 - Carrington Broonie Field pH Trend - December 2020**



**Figure 74 - Carrington Broonie Standing Water Level - December 2020**



**Figure 75 - Cheshunt Piercefield Field Electrical Conductivity Trend - December 2020**



**Figure 76 - Cheshunt Piercefield Field pH Trend - December 2020**

### Cheshunt Piercefield

Water Elevation (mAHD)

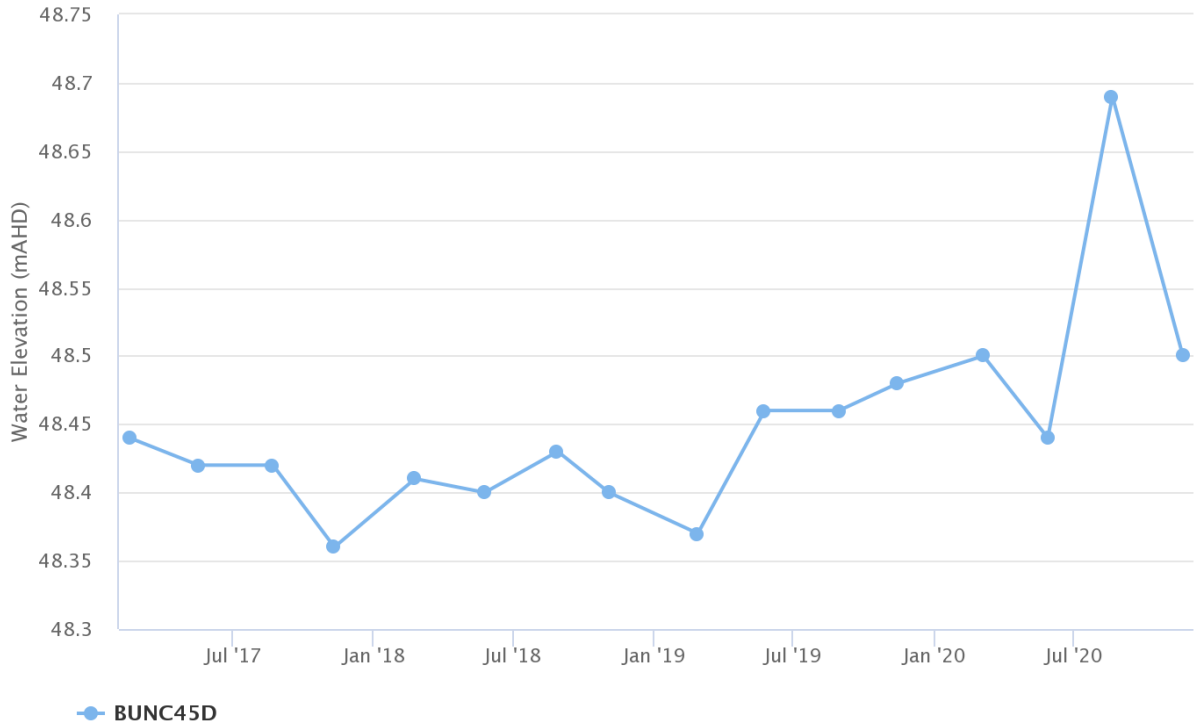


Figure 77 - Cheshunt Piercefield Standing Water Level - December 2020

### North Pit Spoil

Field Electrical Conductivity (µS/cm)

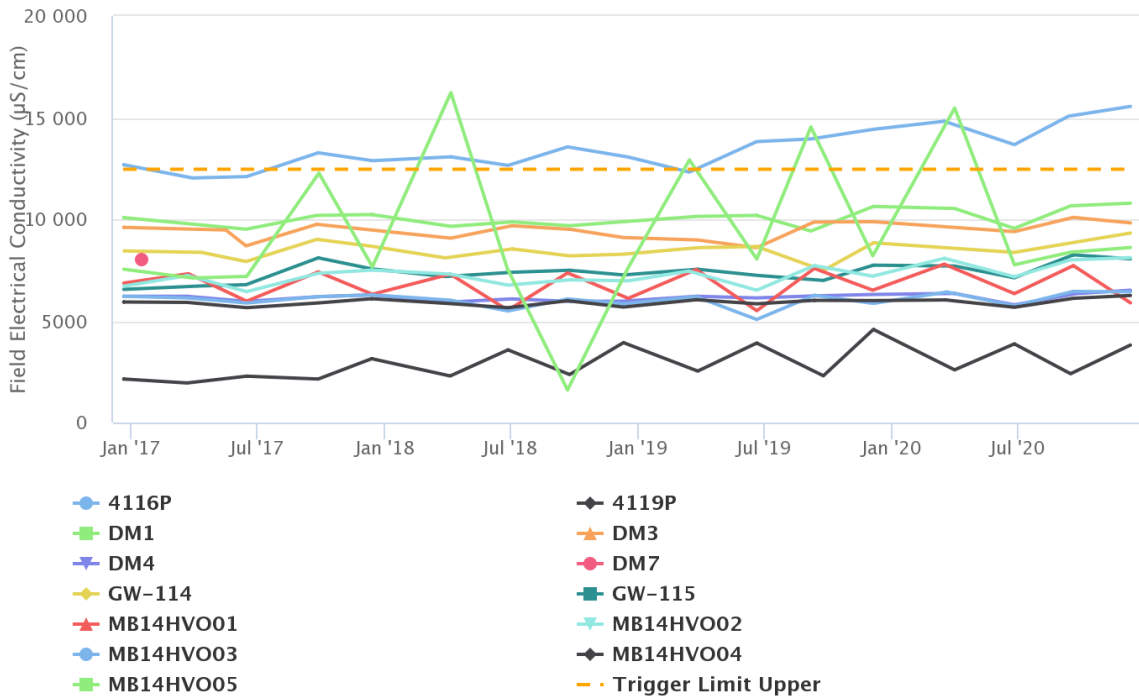


Figure 78 - North Pit Spoil Field Electrical Conductivity Trend - December 2020

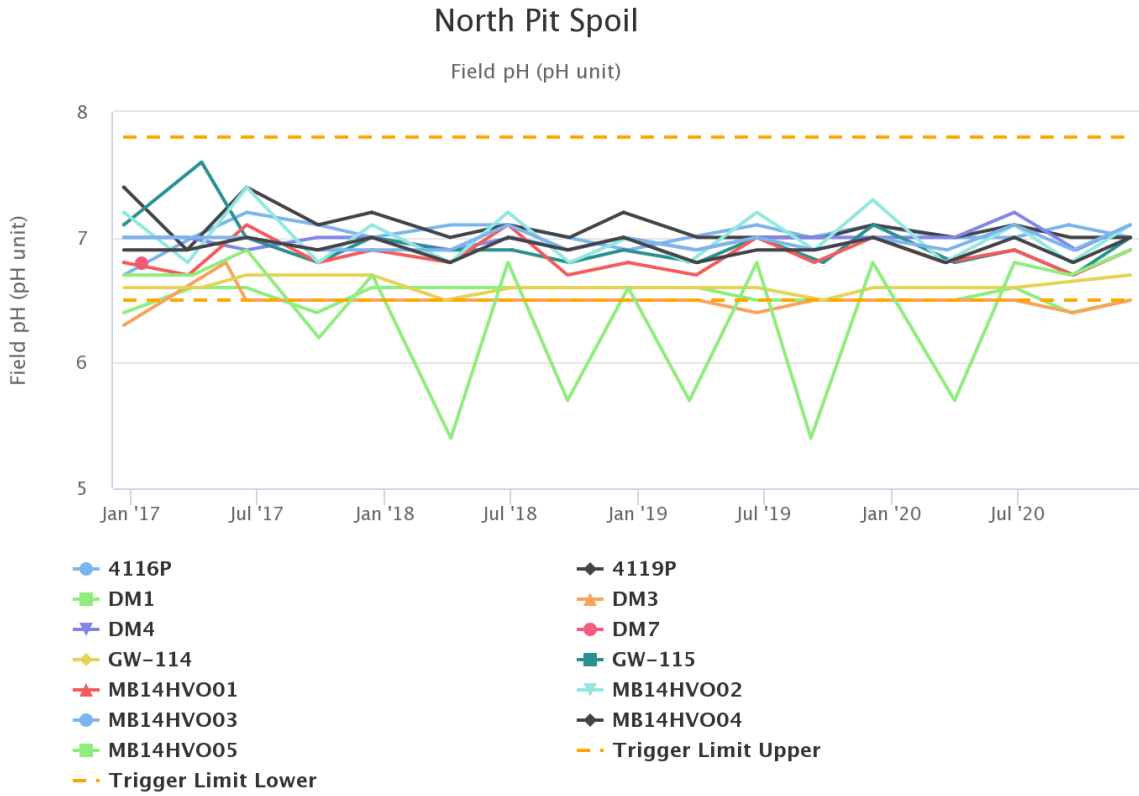


Figure 79 - North Pit Spoil Field pH Trend - December 2020

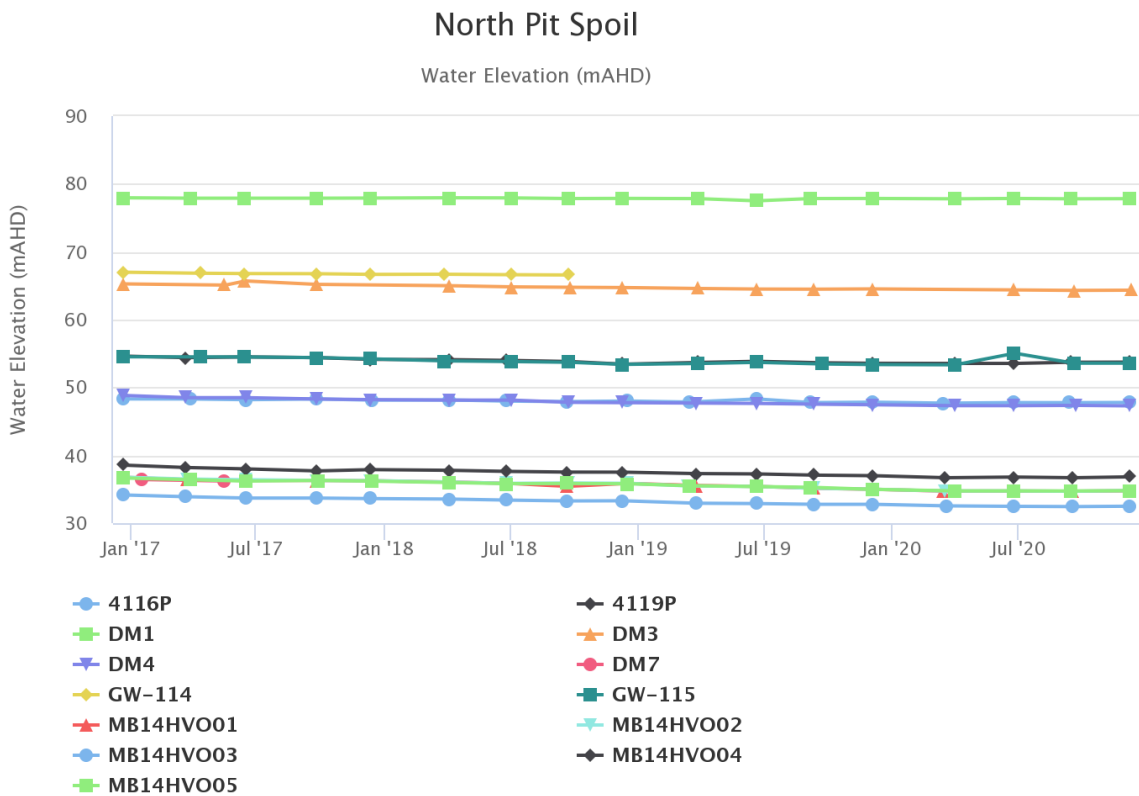
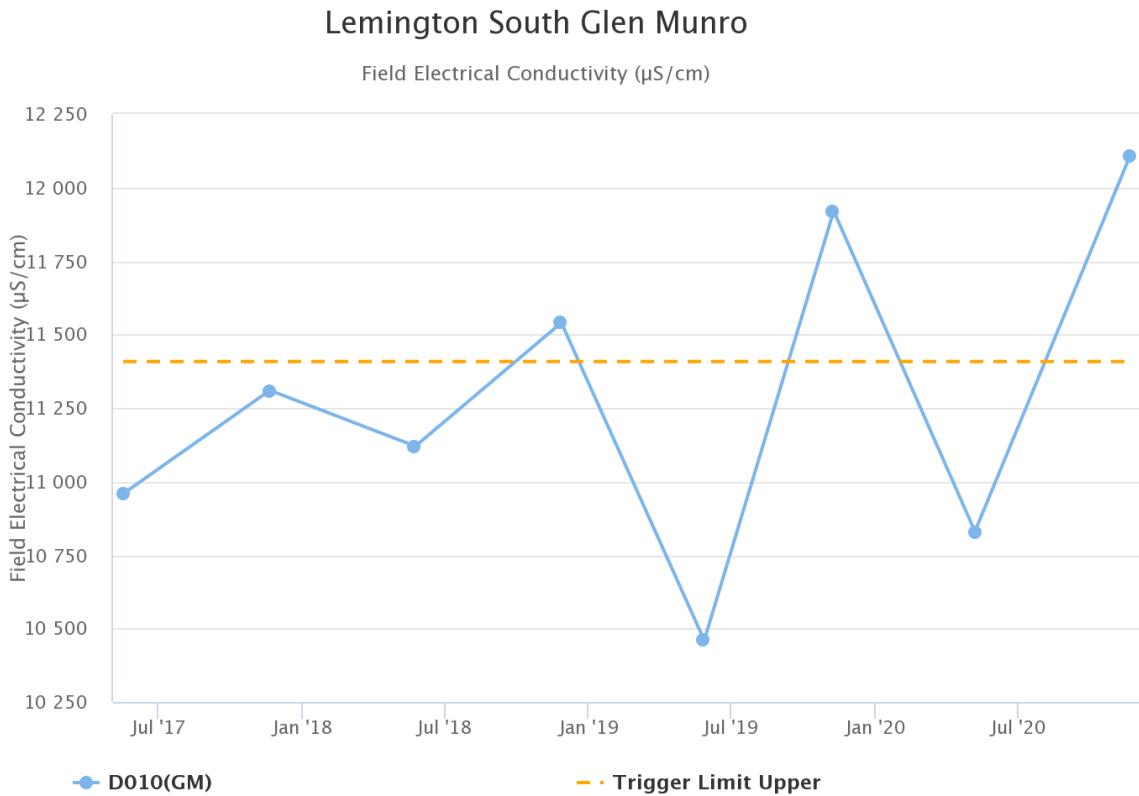
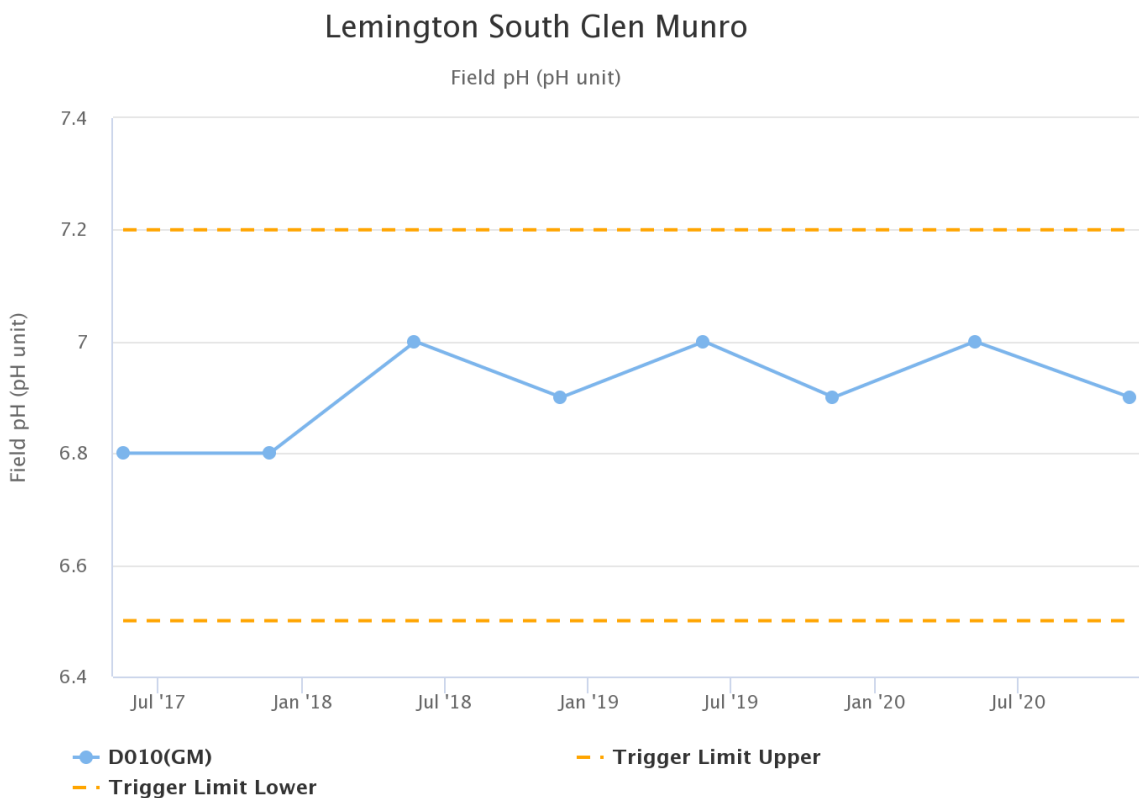


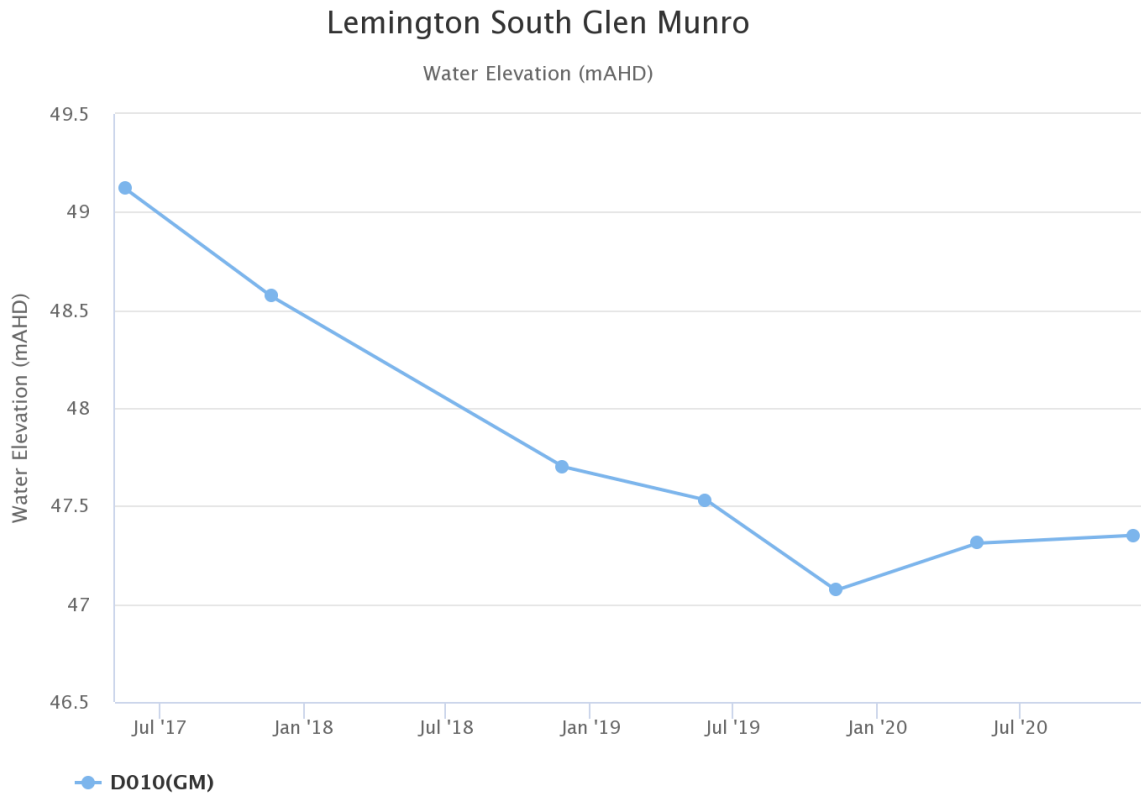
Figure 80 - North Pit Spoil Standing Water Level - December 2020



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



**Figure 82 - Lemington South Glen Munro Field pH Trend - December 2020**



**Figure 83 - Lemington South Glen Munro Standing Water Level - December 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 Q4 2020**

Site	Date	Trigger Limit Breached	Response Action
CFW55R	4/11/2020	EC	Investigation ongoing
Appleyard Farm	17/11/2020	pH 5 <sup>th</sup> Percentile	Investigation ongoing
C317(WDH)	17/11/2020	pH 95 <sup>th</sup> Percentile	First breach, watching brief established
BZ4A(2)	19/11/2020	pH 5 <sup>th</sup> Percentile	Investigation ongoing
BZ3-3	19/11/2020	pH 5 <sup>th</sup> Percentile	Investigation ongoing
BZ2A(1)	19/11/2020	pH 5 <sup>th</sup> Percentile	Investigation ongoing
C630(BFS)	19/11/2020	pH 95 <sup>th</sup> Percentile	Third breach, investigation commenced
C130(WDH)	19/11/2020	EC	Third breach, investigation commenced
B631(BFS)	19/11/2020	EC	Third breach, investigation commenced
D010(GM)	20/11/2020	EC	Investigation ongoing
C130(ALL)	20/11/2020	EC	Investigation ongoing
CFW55R	04/12/2020	EC	Investigation ongoing
CGW52	09/12/2020	pH 95 <sup>th</sup> Percentile	First breach, established watching brief
CGW51A	09/12/2020	pH 95 <sup>th</sup> Percentile	First breach, watching brief established
4116P	09/12/2020	EC	Investigation ongoing
NPZ2	10/12/2020	EC	Investigation ongoing



# 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 December, fifteen blasts were initiated at HVO. **Table 5** and

Table 6 show the blast monitoring results for the reporting period.

**Table 5 - Overpressure Blast Monitoring Results December 2020**

Date and Time	Moses Crossing (dB)	Jerrys Plains Village (dB)	Maison Dieu (dB)	Warkworth (dB)	Knodlers Lane (dB)
2/12/2020 13:10	99.7	103.7	103.1	98.2	101.1
2/12/2020 13:12	98.4	104.8	101.4	88.1	105.5
3/12/2020 13:19	89.5	87.1	86.5	91.8	85.5
4/12/2020 13:19	90.6	102.4	104.8	112.0	111.4
4/12/2020 13:06	88.7	103.4	103.6	98.5	108.9
5/12/2020 12:14	92.0	101.1	91.3	95.3	91.7
7/12/2020 09:23	92.5	93.8	94.6	101.3	99.5
8/12/2020 13:02	101.6	96.7	96.2	97.3	97.7
11/12/2020 13:31	112.0	107.5	101.7	90.5	88.2
12/12/2020 17:14	112.1	104.9	86.4	86.9	97.6
14/12/2020 13:08	101.8	96.4	103.2	94.7	90.5
15/12/2020 13:03	93.6	96.2	86.4	90.1	92.0
17/12/2020 13:02	97.5	102.1	99.9	101.3	103.4
21/12/2020 13:19	88.9	92.8	81.6	94.4	82.4
24/12/2020 12:59	87.7	91.6	83.8	87.5	89.3

**Table 6 - Ground Vibration Blast Monitoring Results December 2020**

Date and Time	Moses Crossing (mm/s)	Jerrys Plains Village (mm/s)	Maison Dieu (mm/s)	Warkworth (mm/s)	Knodlers Lane (mm/s)
2/12/2020 13:10	0.13	0.04	0.09	0.82	0.08
2/12/2020 13:12	0.1	0.02	0.03	0.35	0.08
3/12/2020 13:19	0.1	0.06	0.04	0.5	0.07
4/12/2020 13:19	0.18	0.11	0.11	0.44	0.1
4/12/2020 13:06	0.11	0.06	0.06	0.58	0.08
5/12/2020 12:14	0.12	0.06	0.1	0.17	0.09
7/12/2020 09:23	0.19	0.15	0.15	0.19	0.1
8/12/2020 13:02	0.14	0.08	0.1	0.15	0.1
11/12/2020 13:31	0.12	0.04	0.34	0.29	0.3
12/12/2020 17:14	0.1	0.03	0.03	0.16	0.07
14/12/2020 13:08	0.14	0.05	0.12	0.32	0.09
15/12/2020 13:03	0.14	0.12	0.2	0.13	0.09
17/12/2020 13:02	0.1	0.04	0.05	0.43	0.08
21/12/2020 13:19	0.13	0.11	0.07	0.23	0.09
24/12/2020 12:59	0.23	0.19	0.18	0.23	0.09

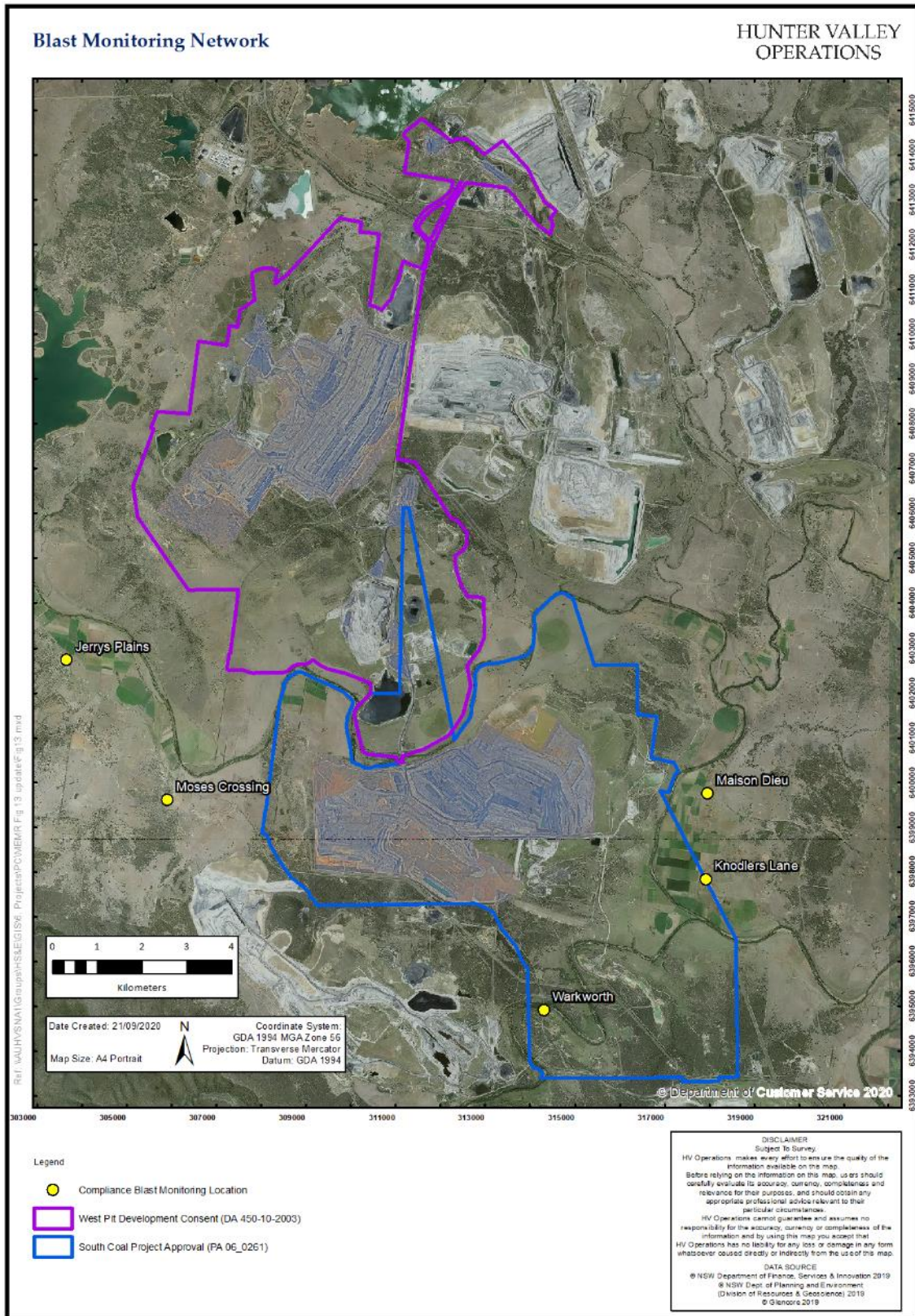


Figure 84 - Blast Monitoring Location Plan

## 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 the 3<sup>rd</sup> December 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 December 2020**

Location	Date and Time	Wind Speed (m/s) <sup>1</sup>	Stability Class	Criterion dB(A)	Criterion Applies <sup>2</sup>	HVO North LAeq dB <sup>3,4,5,6,7</sup>	Exceedance <sup>4,5</sup>
Shearers Lane	03/12/2020 21:00	2.1	E	35	Yes	IA	Nil
Knodlers Lane	03/12/2020 21:45	1.5	D	35	Yes	IA	Nil
Maison Dieu	03/12/2020 21:23	1.8	E	35	Yes	IA	Nil
Long Point	03/12/2020 22:41	1.2	F	35	Yes	IA	Nil
Kilburnie South	03/12/2020 23:19	1.4	F	39	Yes	IA	Nil
Jerrys Plains East	03/12/2020 21:52	1.5	D	39	Yes	NM	Nil
Jerrys Plains Village	03/12/2020 21:26	1.8	E	40	Yes	30	Nil
Jerrys Plains West	03/12/2020 21:00	2.1	E	40	Yes	32	Nil
HVGC	03/12/2020 23:50	1.2	F	NA	NA	IA	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 LAeq 15 minute attributed 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 December 2020**

Location	Date and Time	Wind Speed (m/s) <sup>1</sup>	Stability Class	Criterion dB(A)	Criterion Applies <sup>2</sup>	HVO North LAeq dB <sup>3,4,6,7</sup>	Exceedance <sup>4,5</sup>
Shearers Lane	03/12/2020 21:00	2.1	E	41	Yes	IA	Nil
Knodlers Lane	03/12/2020 21:45	1.5	D	41	Yes	IA	Nil
Maison Dieu	03/12/2020 21:23	1.8	E	41	Yes	IA	Nil
Long Point	03/12/2020 22:41	1.2	F	41	Yes	IA	Nil
Kilburnie South	03/12/2020 23:19	1.4	F	41	Yes	IA	Nil
Jerrys Plains East	03/12/2020 21:52	1.5	D	41	Yes	NM	Nil
Jerrys Plains Village	03/12/2020 21:26	1.8	E	41	Yes	30	Nil
Jerrys Plains West	03/12/2020 21:00	2.1	E	41	Yes	32	Nil
HVGC	03/12/2020 23:50	1.2	F	NA	NA	IA	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 LAeq 15 minute attributed 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 December 2020**

Location	Date and Time	Wind Speed (m/s) <sup>1</sup>	Stability Class	Criterion dB(A)	Criterion Applies <sup>2</sup>	HVO North L <sub>Aeq</sub> dB <sup>3,4,6,7</sup>	Exceedance <sup>4,5</sup>
Shearers Lane	03/12/2020 21:00	2.1	E	46	Yes	IA	Nil
Knodlers Lane	03/12/2020 21:45	1.5	D	46	Yes	IA	Nil
Maison Dieu	03/12/2020 21:23	1.8	E	46	Yes	IA	Nil
Long Point	03/12/2020 22:41	1.2	F	46	Yes	IA	Nil
Kilburnie South	03/12/2020 23:19	1.4	F	46	Yes	IA	Nil
Jerrys Plains East	03/12/2020 21:52	1.5	D	46	Yes	NM	Nil
Jerrys Plains Village	03/12/2020 21:26	1.8	E	46	Yes	32	Nil
Jerrys Plains West	03/12/2020 21:00	2.1	E	46	Yes	39	Nil
HVGC	03/12/2020 23:50	1.2	F	NA	NA	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<sub>Aeq</sub> 15 minute attributed 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 December 2020**

Location	Date and Time	Wind Speed (m/s) <sup>1</sup>	Stability Class	Criterion dB(A)	Criterion Applies <sup>2</sup>	HVO South L <sub>Aeq</sub> dB <sup>3,4,6,7</sup>	Exceedance <sup>4,5</sup>
Shearers Lane	03/12/2020 21:00	3.4	D	41	No	NM	NA
Knodlers Lane	03/12/2020 21:45	2.8	E	40	Yes	IA	Nil
Maison Dieu	03/12/2020 21:23	2.9	E	39	Yes	IA	Nil
Long Point	03/12/2020 22:41	2.1	E	37	Yes	31	Nil
Kilburnie South	03/12/2020 23:19	1.9	E	39	Yes	IA	Nil
Jerrys Plains East	03/12/2020 21:52	2.8	E	38	Yes	IA	Nil
Jerrys Plains Village	03/12/2020 21:26	2.9	E	35	Yes	IA	Nil
Jerrys Plains West	03/12/2020 21:00	3.4	D	35	No	IA	NA
HVGC	03/12/2020 23:50	2.2	D	35	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<sub>Aeq</sub> 15 minute attributed 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 December 2020**

Location	Date and Time	Wind Speed (m/s) <sup>1</sup>	Stability Class	Criterion dB(A)	Criterion Applies <sup>2</sup>	HVO South L <sub>Aeq</sub> dB <sup>3,4,6,7</sup>	Exceedance <sup>4,5</sup>
Shearers Lane	03/12/2020 21:00	3.4	D	45	No	NM	NA
Knodlers Lane	03/12/2020 21:45	2.8	E	45	Yes	IA	Nil
Maison Dieu	03/12/2020 21:23	2.9	E	45	Yes	IA	Nil
Long Point	03/12/2020 22:41	2.1	E	45	Yes	39	Nil
Kilburnie South	03/12/2020 23:19	1.9	E	45	Yes	IA	Nil
Jerrys Plains East	03/12/2020 21:52	2.8	E	45	Yes	IA	Nil
Jerrys Plains Village	03/12/2020 21:26	2.9	E	45	Yes	IA	Nil
Jerrys Plains West	03/12/2020 21:00	3.4	D	45	No	IA	NA
HVGC	03/12/2020 23:50	2.2	D	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<sub>Aeq</sub> 15 minute attributed 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 NPfl Low Frequency Assessment

In accordance with the requirements of the EPA's Noise Policy for Industry (NPfl), the applicability of the low frequency modification penalty has been assessed. During December 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 December 2020**

Location	Date and Time	Measured HVO North $L_{Aeq}dB$	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?	Frequency of Tonality <sup>1</sup>	Low-frequency Modifying Factor?	Maximum Exceedance of NPfl Reference Spectrum <sup>1,2</sup>	Total Penalty $dB^2$
Shearers Lane	03/12/2020 21:00	IA	Yes	No	No	NA	No	NA	Nil
Knodlers Lane	03/12/2020 21:45	IA	Yes	No	No	NA	No	NA	Nil
Maison Dieu	03/12/2020 21:23	IA	Yes	No	No	NA	No	NA	Nil
Long Point	03/12/2020 22:41	IA	Yes	No	No	NA	No	NA	Nil
Kilburnie South	03/12/2020 23:19	IA	Yes	No	No	NA	No	NA	Nil
Jerrys Plains East	03/12/2020 21:52	NM	Yes	No	No	NA	No	NA	Nil
Jerrys Plains Village	03/12/2020 21:26	30	Yes	No	No	NA	No	NA	Nil
Jerrys Plains West	03/12/2020 21:00	32	Yes	No	No	NA	No	NA	Nil
HVGC	03/12/2020 23:50	IA	NA	No	No	NA	No	NA	Nil

1. NA means not applicable;

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

**Table 13 - Modifying Factor Assessment HVO South December 2020**

Location	Date and Time	Measured HVO South $L_{Aeq}dB$	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?	Frequency of Tonality <sup>1</sup>	Low-frequency Modifying Factor?	Maximum Exceedance of NPfI Reference Spectrum <sup>1,2</sup>	Total Penalty dB <sup>2</sup>
Shearers Lane	03/12/2020 21:00	NM	No	No	No	NA	No	NA	Nil
Knodlers Lane	03/12/2020 21:45	IA	Yes	No	No	NA	No	NA	Nil
Maison Dieu	03/12/2020 21:23	IA	Yes	No	No	NA	No	NA	Nil
Long Point	03/12/2020 22:41	31	Yes	No	No	NA	No	NA	Nil
Kilburnie South	03/12/2020 23:19	IA	Yes	No	No	NA	No	NA	Nil
Jerrys Plains East	03/12/2020 21:52	IA	Yes	No	No	NA	No	NA	Nil
Jerrys Plains Village	03/12/2020 21:26	IA	Yes	No	No	NA	No	NA	Nil
Jerrys Plains West	03/12/2020 21:00	IA	No	No	No	NA	No	NA	Nil
HVGC	03/12/2020 23:50	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.

### 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.

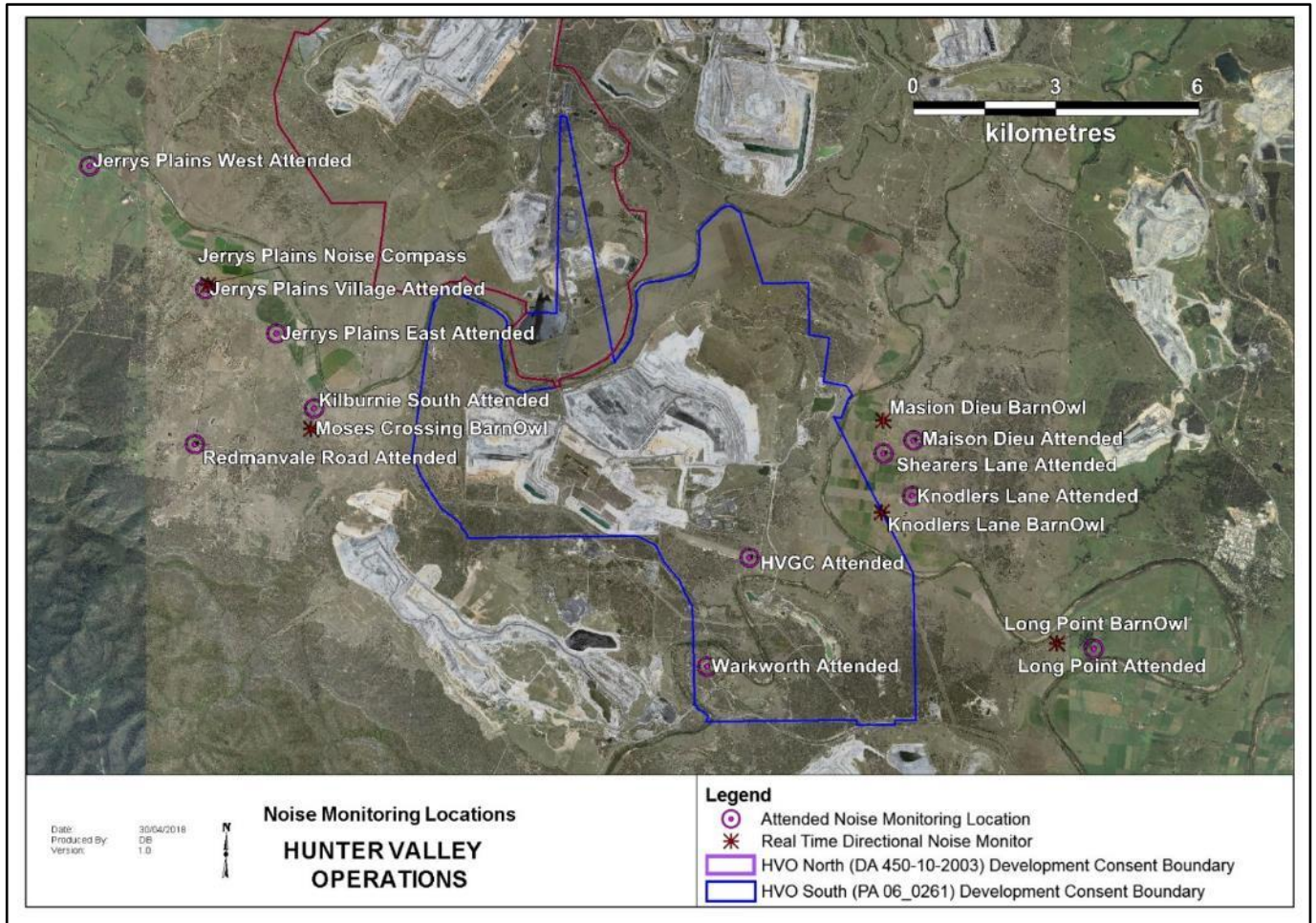
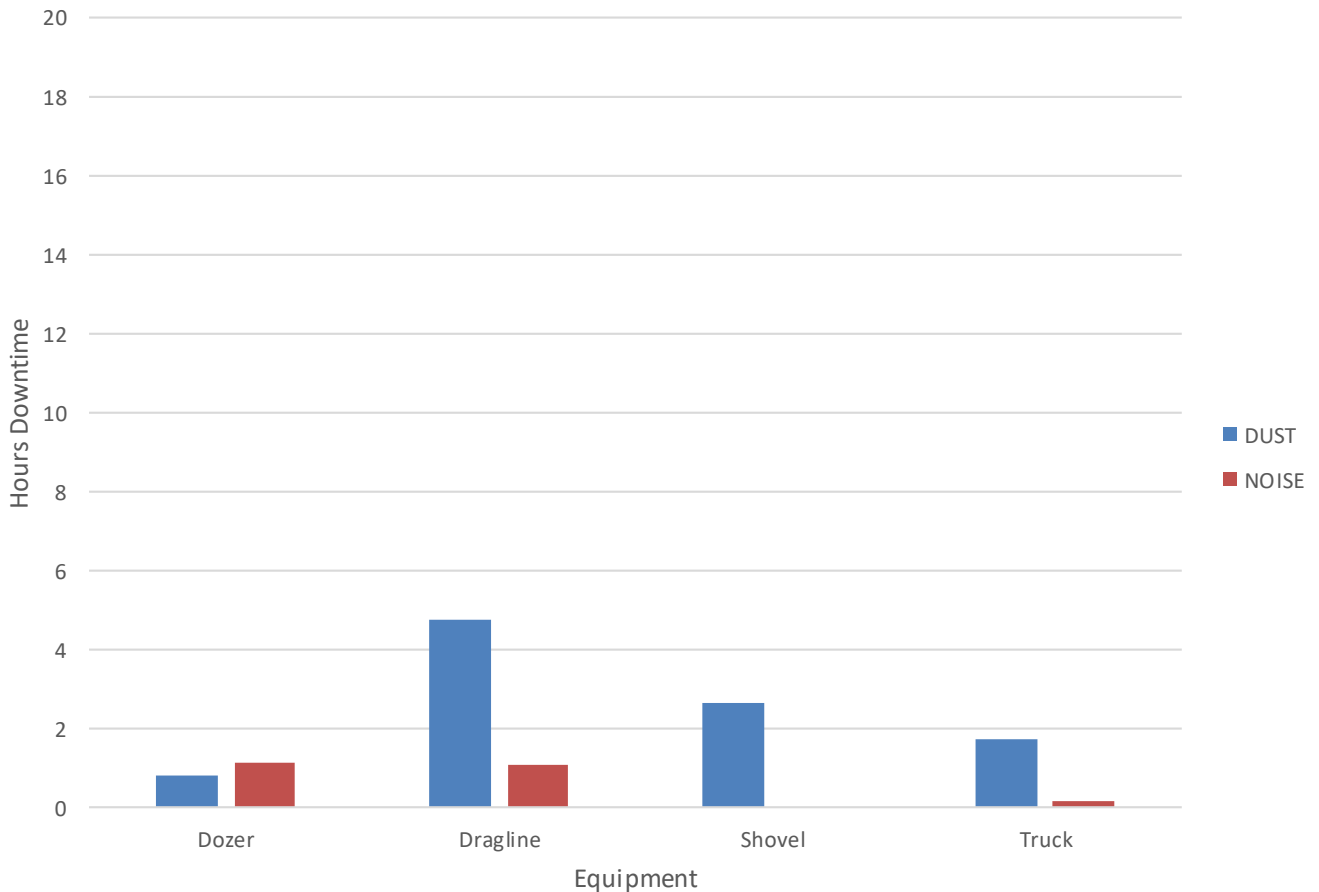


Figure 85 - Noise Monitoring Location Plan

## 6 Operational Downtime

During December a total of 12 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 December 2020**

# 7 Rehabilitation

During December, 0.03 Ha of land was bulk shaped, 0.03 Ha of land was released, 5.49 Ha of land was topsoiled, and 7.68 Ha was rehabilitated. Year to date progress can be viewed in **Figure 87**.



**Figure 87 - Rehabilitation YTD December 2020**



# 8 Complaints

No complaints were received during December 2020. Sixteen 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	-	1	-	1	1	3
November	1	-	-	-	-	1
December	-	-	-	-	-	-
<b>Total</b>	<b>6</b>	<b>1</b>	<b>2</b>	<b>4</b>	<b>2</b>	<b>16</b>

## 9 Environmental Incidents

During December there were three reportable environmental incidents.

- **02/12/2020 – Failure to Monitor at Warkworth TEOM**

The Warkworth TEOM failed to record data following an electrical storm on the evening of 1 December 2020, subsequently the unit recorded 38.9% data capture for 2/12/2020, below the 75% required to calculate a 24-hour average.

Environmental consequence: Cat 1

- **02/12/2020 – Failure to Monitor at Knodlers Lane TEOM**

The Knodlers Lane TEOM failed to recorded data following an electrical storm on the evening of 1 December 2020, subsequently the unit recorded 45.8% data capture for 2/12/2020, below the 75% required to calculate a 24-hour average.

Environmental consequence: Cat 1

- **04/12/2020 – Failure to Monitor at Kilburnie South and Warkworth HVAS**

The PM10 and TSP HVAS units at the Kilburnie South monitoring location recorded 62% data capture on the 4<sup>th</sup> December 2020, below the 75% required. The Warkworth TSP also failed to monitor on the 4<sup>th</sup> December, running for only 2 minutes of the 24-hour period.

Environmental consequence: Cat 1

## 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)
1/12/2020	39.6	1.7	100.0	9.3	1029	181.6	2.5	4.6
2/12/2020	22.1	3.2	109.7	63.1	573	127.4	3.9	0
3/12/2020	23.5	2.9	100.0	60.2	1456	119	3.2	0
4/12/2020	34.7	4.7	100.0	13.4	1342	223.6	3.7	0
5/12/2020	25.3	2.6	109.3	27.5	1163	174.9	2.7	12
6/12/2020	29.2	7.0	100.0	7.8	1111	274.1	6.3	0.8
7/12/2020	28.4	4.1	57.4	7.2	1455	273.3	4.7	0
8/12/2020	25.4	1.0	78.4	4.4	1223	215.9	3.9	0
9/12/2020	28.0	-2.0	94.0	9.3	1094	143.8	2.1	0
10/12/2020	31.0	0.3	95.3	7.4	1306	176.1	3.4	0
11/12/2020	18.9	0.0	100.0	44.8	532	120.1	4.6	0.2
12/12/2020	22.5	0.3	97.0	27.5	1549	112.9	4.9	0
13/12/2020	24.3	0.9	100.0	41.0	1651	113.6	4.7	0
14/12/2020	21.6	2.9	100.0	58.1	1036	114.4	4.7	1
15/12/2020	21.8	2.1	111.4	85.5	786	124.4	4.1	16.8
16/12/2020	30.6	6.0	111.1	39.1	1505	118.2	1.7	2.8
17/12/2020	30.6	6.4	108.2	41.4	1383	242.6	1.9	0.8
18/12/2020	27.7	7.0	110.8	55.4	1202	242.4	2.5	11.6
19/12/2020	20.8	3.4	111.1	73.5	1229	113.5	4.0	0.2
20/12/2020	20.9	3.9	108.6	74.5	530	121	1.8	0.6
21/12/2020	19.6	3.1	111.9	77.2	316	145.9	1.5	24.8
22/12/2020	25.3	2.9	112.0	27.3	1641	273	5.6	6
23/12/2020	25.8	0.1	94.4	27.4	1365	194.3	3.2	0
24/12/2020	27.4	1.4	100.0	27.6	1824	188.2	1.6	0
25/12/2020	24.8	3.1	96.2	44.8	1491	128.4	3.9	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)
26/12/2020	27.2	2.0	100.0	39.3	1575	121.2	2.8	0.2
27/12/2020	30.7	2.3	109.1	33.3	1226	259.6	2.8	0.2
28/12/2020	31.1	2.6	111.4	24.7	1363	249.5	4.5	27.4
29/12/2020	23.1	2.7	111.4	64.9	1673	133.1	2.4	5.2
30/12/2020	24.9	3.5	110.4	53.1	1491	123.6	3.3	2.2
31/12/2020	21.2	1.2	110.0	73.4	1316	132.1	3.6	1

Note: '-' means data unavailable.