HUNTER VALLEY OPERATIONS

Monthly Environmental Monitoring Report

Hunter Valley Operations

December 2018

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Revision History

Version No.	Person Responsible	Document Status	Date
1.0	**Environment & Community Officer**	**Draft**	**25/01/2019**
1.1	**Environment & Community Coordinator**	**Final**	**30/01/2019**

1.0 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 December to 31st December 2018.

2.0 AIR QUALITY

2.1 Meteorological Monitoring

HVO maintains two meteorological stations; 'Corporate' and 'Cheshunt' (Refer to Figure 4: Air Quality Monitoring Location Plan).

2.1.1 Rainfall

Rainfall for the period is summarised in Table **1**, the 2018 trend and historical trend are shown in Figure 1.

Table 1: Monthly Rainfall HVO

2018	Monthly Rainfall (mm)	Cumulative Rainfall (mm)
December	50.6	477

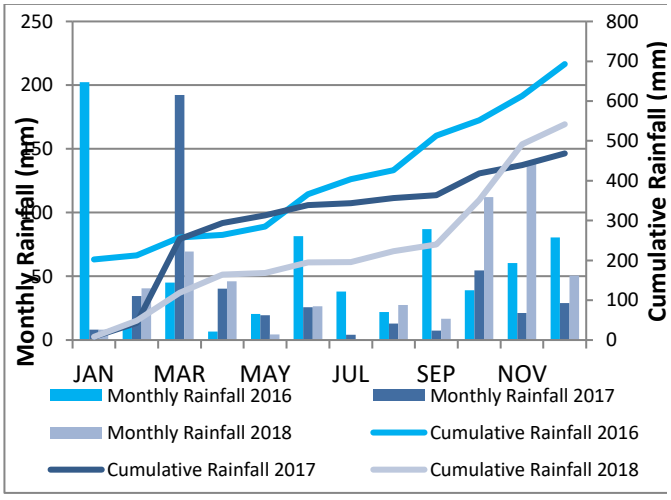

Figure 1: Rainfall Summary 2018

2.1.2 Wind Speed and Direction

South - Easterly winds were dominant during December as shown in Figure 2 (HVO Corporate) and Figure 3 (HVO Cheshunt).

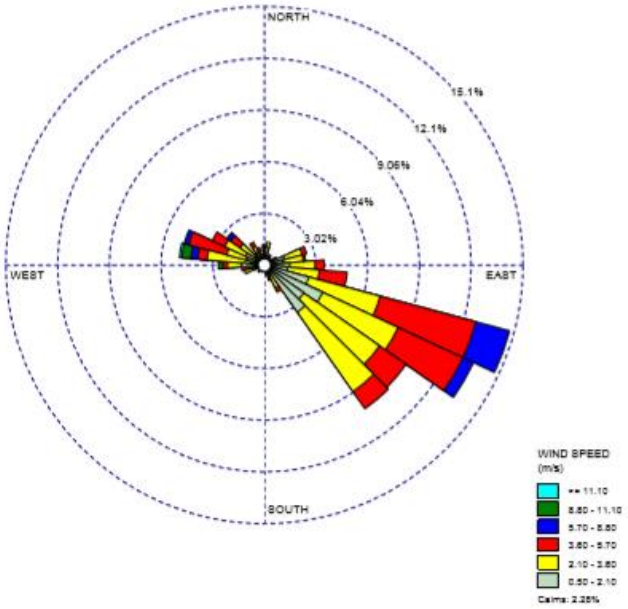

Figure 2: HVO Corporate Wind Rose – December 2018

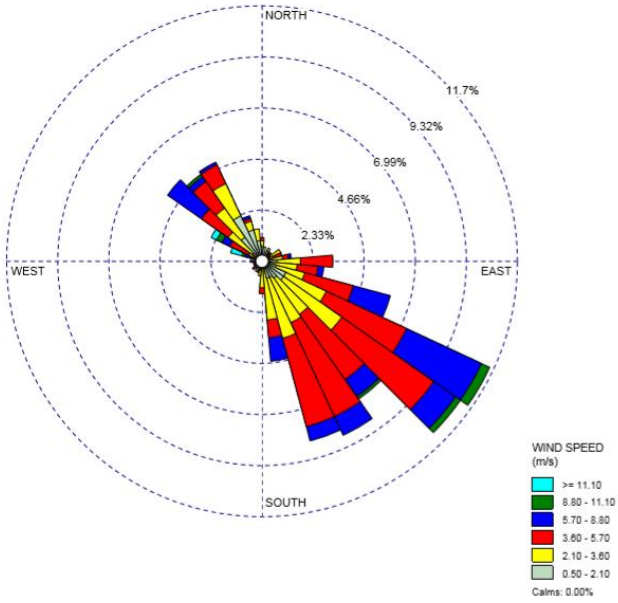

Figure 3: HVO Cheshunt Wind Rose – December 2018

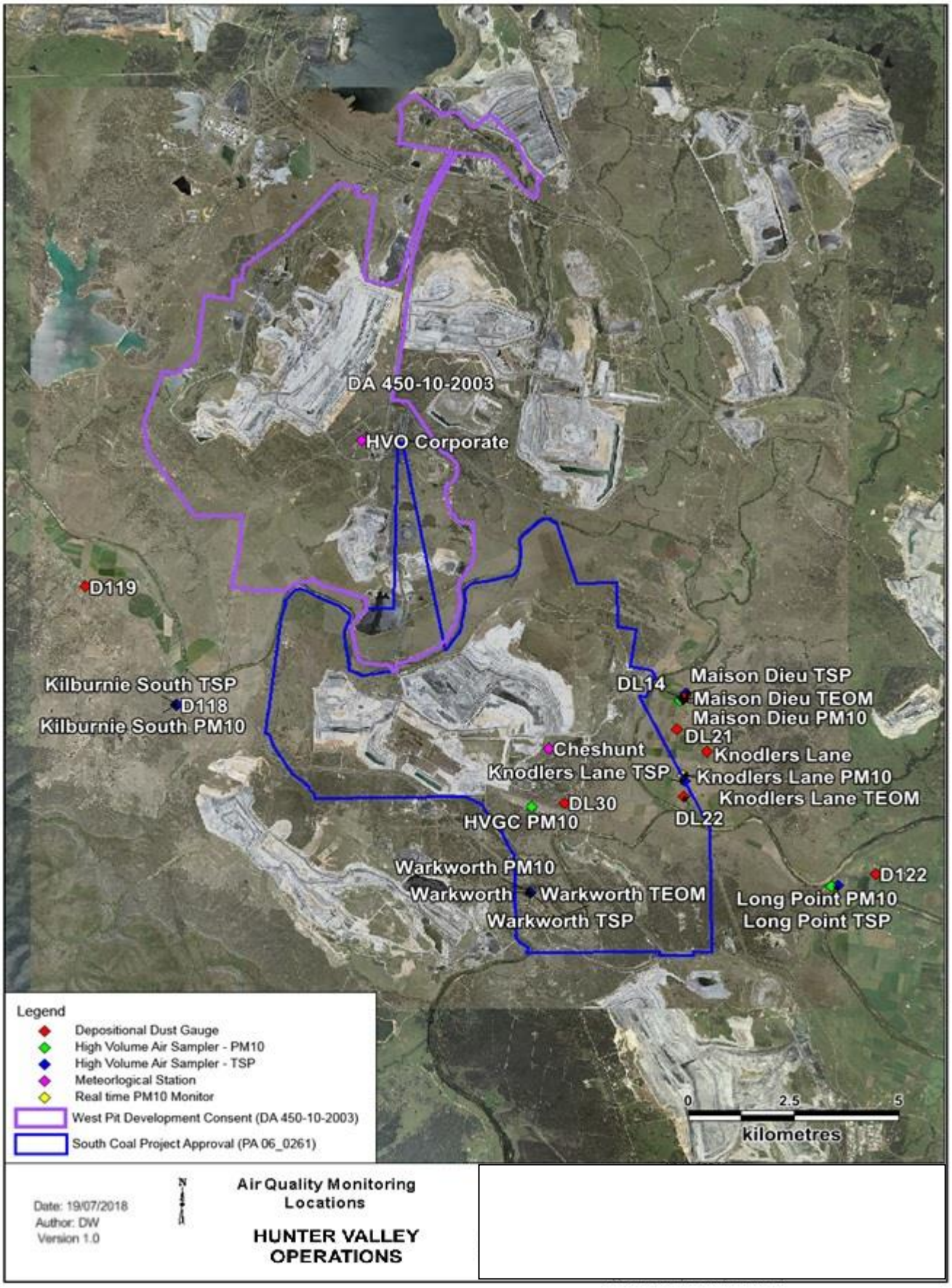

Figure 4: Air Quality Monitoring Location Plan

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 year-to-date average and the annual impact assessment criteria.

During the reporting period the DL21, DL22, and Warkworth monitors recorded monthly results above the long term impact assessment criteria of 4.0 g/m^2 per month.

The field notes associated with the DL21, DL22, and Warkworth monitor's result indicates no evidence to suggest that the result was contaminated and will be included in the annual average calculation.

An assessment of HVO's contribution against the long term impact assessment criteria will be provided in the 2018 Annual Review.

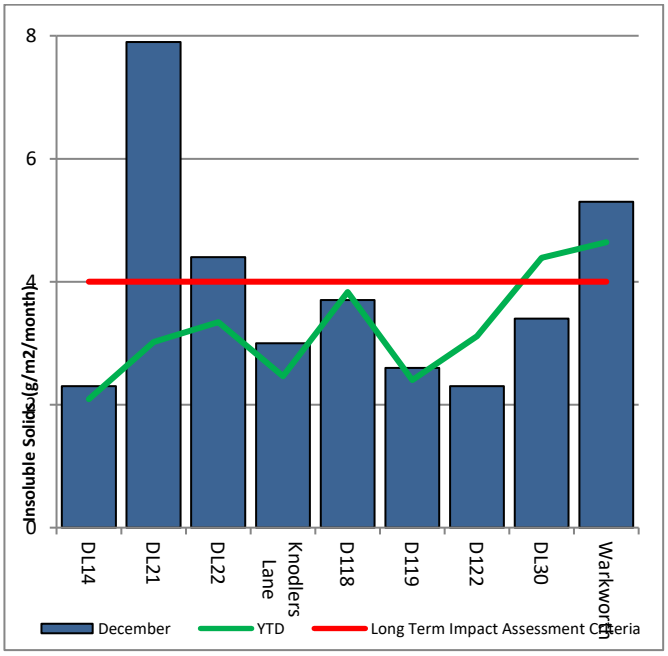

Figure 5: Depositional Dust Results – December 2018

2.3 Suspended Particulates

Suspended particulates are measured by a network of High Volume Air Samplers (HVAS) measuring Total Suspended Particulates (TSP) and Particulate Matter <10µm (PM_{10}). The location of these monitors can be found in Figure 4. Each HVAS was run for 24 hours on a six-day cycle.

2.3.1 HVAS PM_{10} Results

Figure 6 shows individual PM_{10} results at each monitoring station against the short term impact assessment criteria of 50 µg/m3.

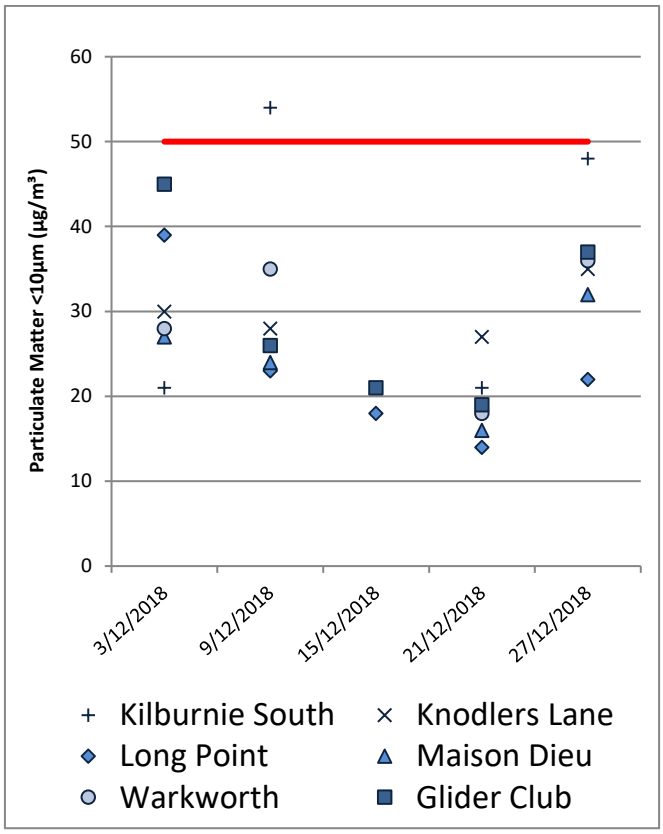

Figure 6: Individual PM_{10} Results – December 2018

The PM_{10} 24hr criterion was exceeded at Kilburnie South on 9 December. HVO's maximum contribution was calculated to be 29µg/m^3 or 53% of the measured result.

In addition, no samples were collected on 15 December at Kilburnie South, Maison Dieu and Warkworth as all ran under timer criterion due to power interruptions caused by storms activity.

Figure 7 shows the year to date annual average PM_{10} results. An assessment of HVO's contribution against the long term impact assessment criteria will be provided in the 2018 Annual Review.

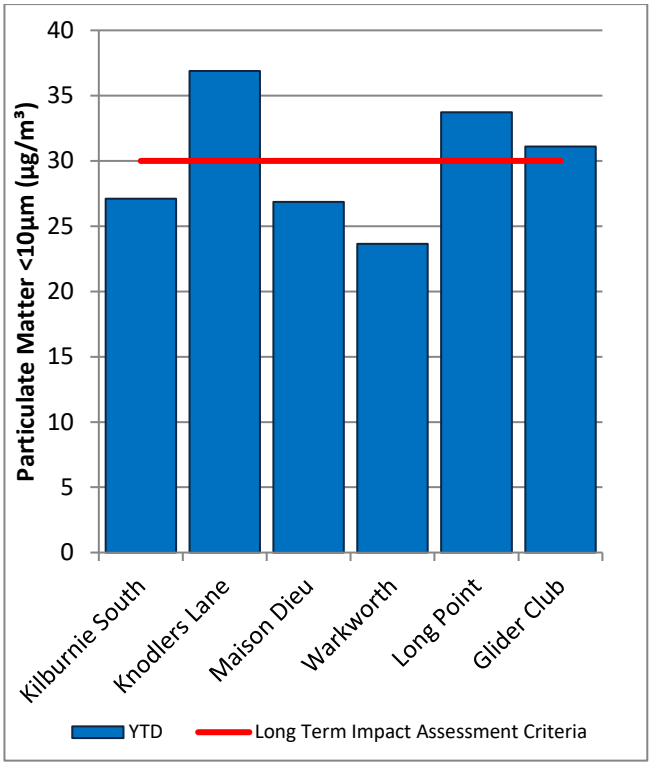

Figure 7: Year to Date Average PM_{10} – December 2018

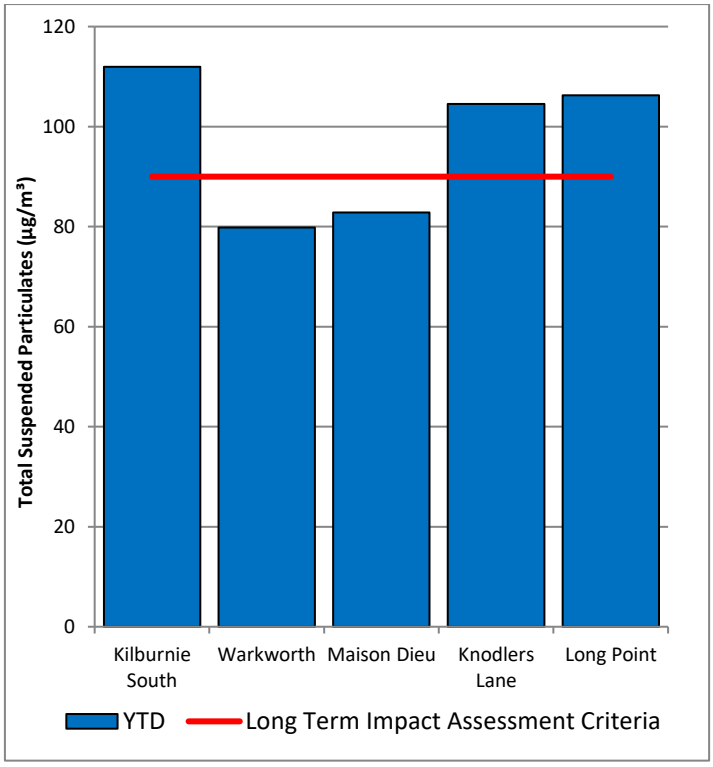

Figure 8: Year to Date Average Total Suspended Particulates – December 2018

2.3.2 TSP Results

Figure 8 shows the annual average TSP results compared against the long term impact assessment criteria of 90µg/m³.

An assessment of HVO's contribution against the long term impact assessment criteria will be provided in the 2018 Annual Review.

2.3.3 Real Time PM_{10} Results

Hunter Valley Operations 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 ensure compliance with the relevant conditions of the project approval.

Results for real time dust sampling is shown in Figure 9, including the daily 24 hour average PM_{10} result and the year to date 24 hour PM_{10} annual average.

Table 2 shows the exceedances for real time PM_{10} monitoring for December.

2.3.4 Real Time Alarms for Air Quality

During December the real time monitoring system generated 267 automated air quality related alarms. 117 were related to adverse weather conditions and 150 alarms relating to PM_{10}.

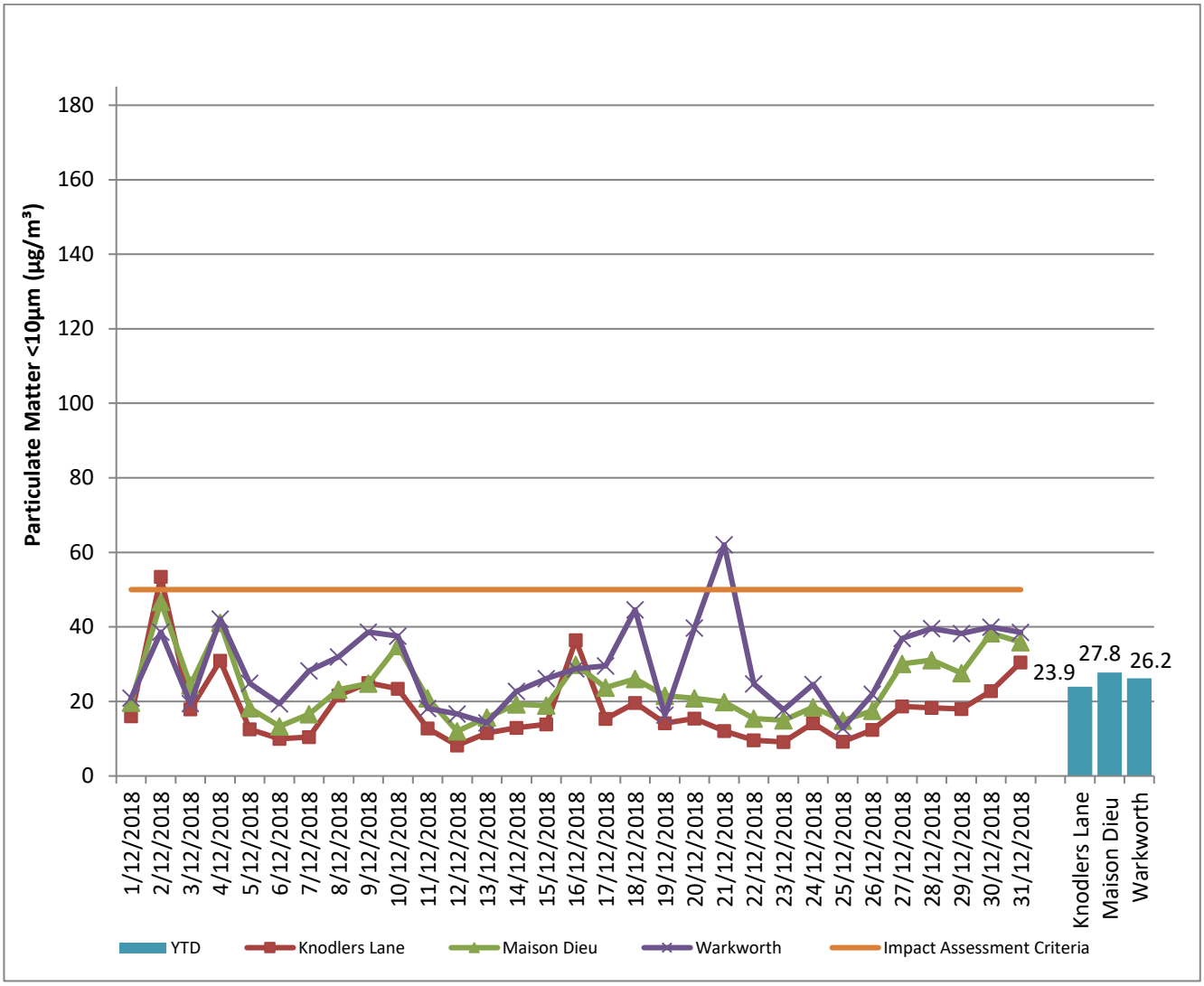

Figure 9: Real Time PM_{10} 24hr average and YTD average – December 2018

Table 2: Real-time PM10 Investigation Results

Date	Site	Total Measured Result (µg/m3)	Estimated contribution from HVO (µg/m3 / %)	Discussion
2/12/2018	Knodlers Lane TEOM	53.5	15.8µg/m3 Or 37.7%	An internal investigation determined HVO maximum potential contribution to be in the order of 15.8ug/m3 or 37.7% of the total measured based on prevailing wind conditions and upwind monitoring results.

3.0 SURFACE WATER

3.1.1 Surface Water Monitoring

Surface water courses are sampled on a quarterly or rain event sampling regime. Water quality is evaluated through the parameters of pH, Electrical Conductivity (EC) and Total Suspended Solids (TSS).

In the absence of licence or applicable ANZECC criteria, the 5th / 95th percentile of the available validated data record for a monitoring station are adopted as the basis for a water quality management guideline trigger as outlined in the Water Management Plan for Electrical Conductivity and pH. The 50mg/L ANZECC criteria has been adopted for TSS. Exceedances of these triggers for Quarter 4 2018 are detailed in Table 3

The location of Surface Water monitoring locations is shown in Figure 22**.**

Figure 10 to Figure 12 show the long term surface water trend (2015- current) within HVO mine dams.

Figures 13 to 21 show the long term surface water trend (2015 – current) in surrounding watercourses

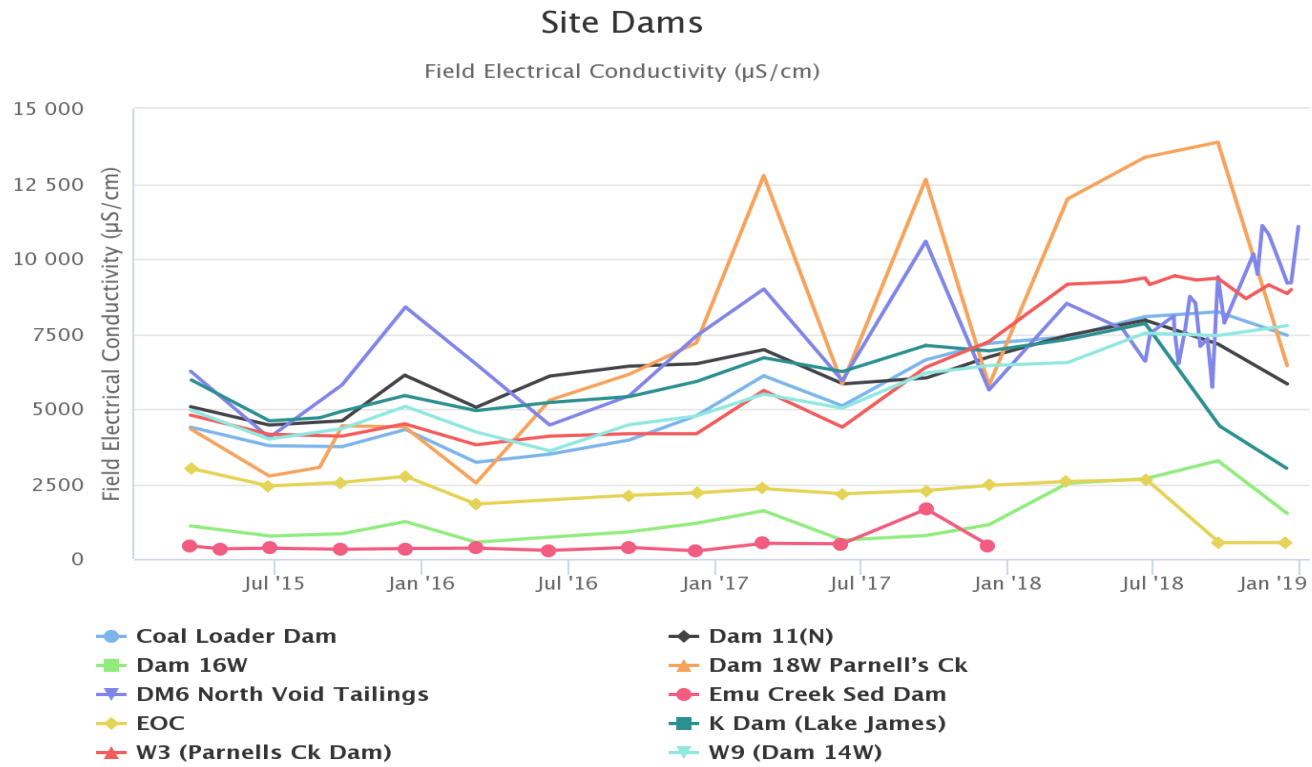

Figure 10: Site Dams Electrical Conductivity Trend – December 2018

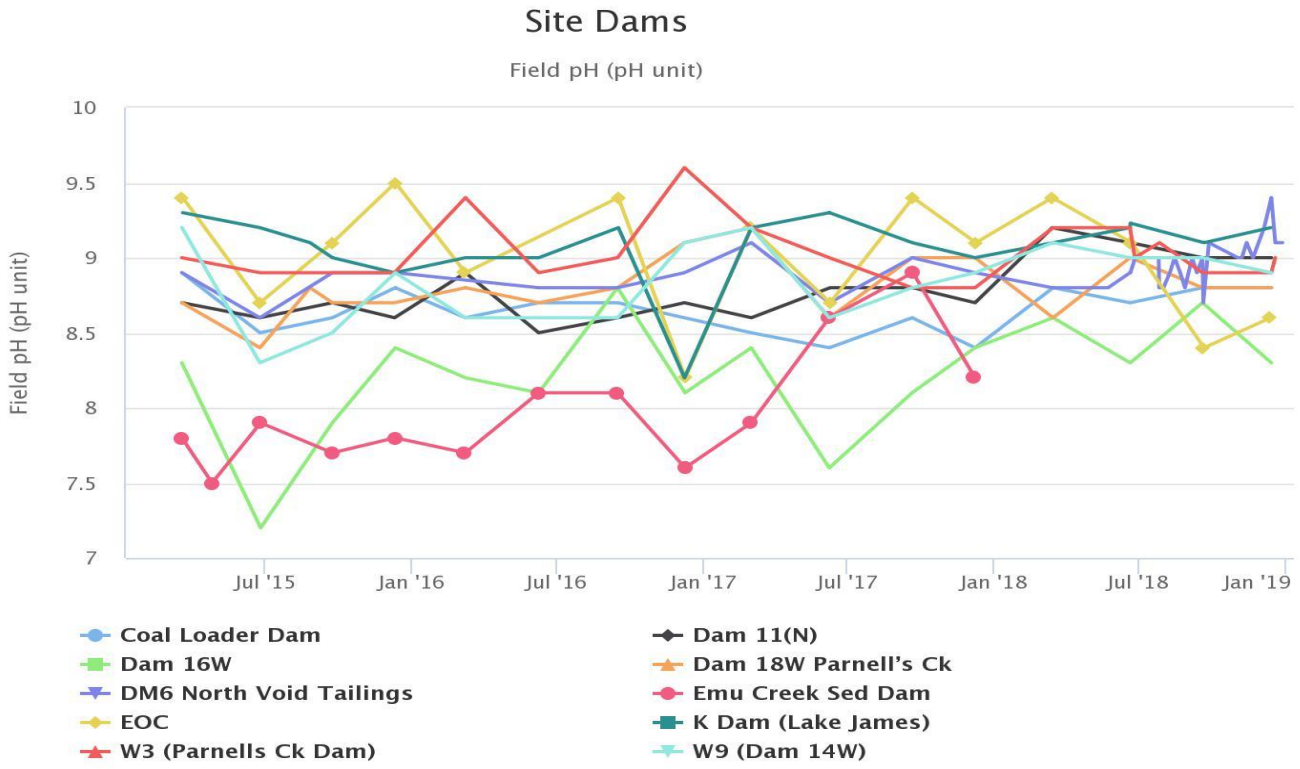

Figure 11: Site Dams pH Trend – December 2018

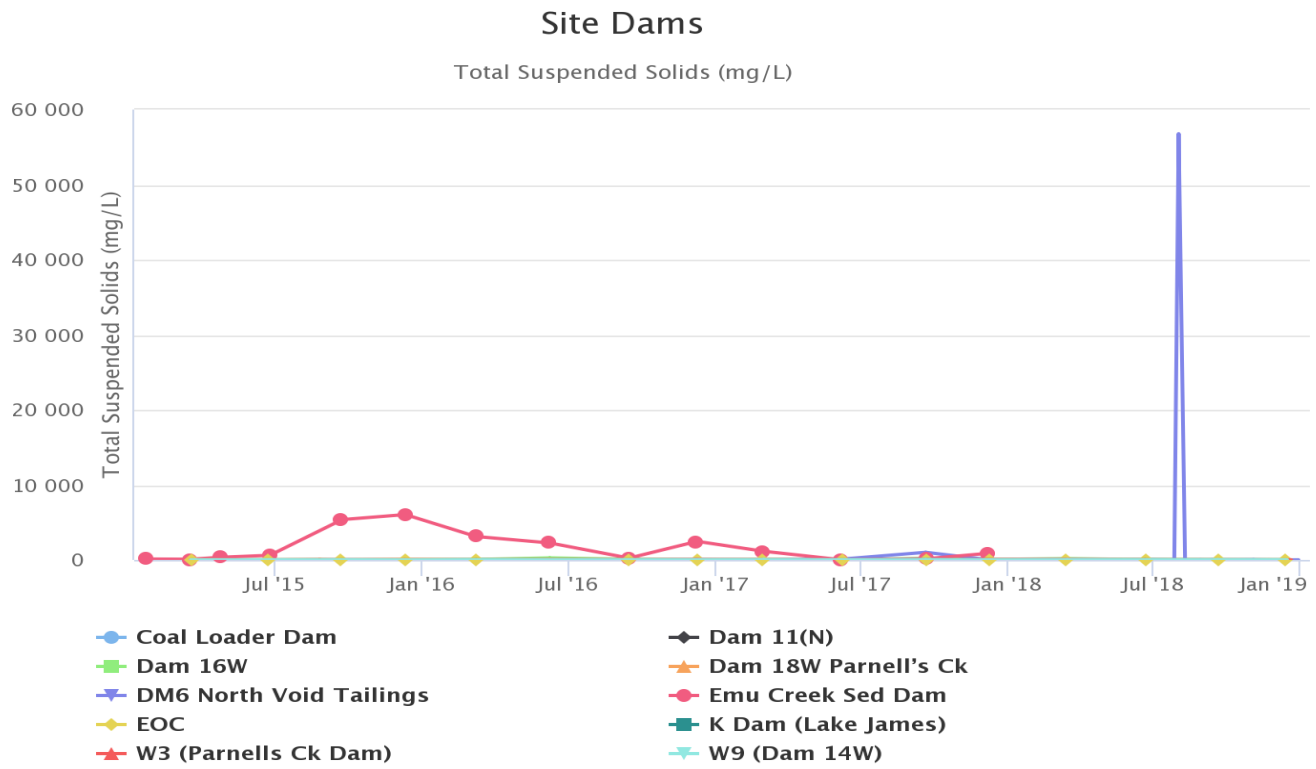

Figure 12: Site Dams Total Suspended Solids Trend – December 2018

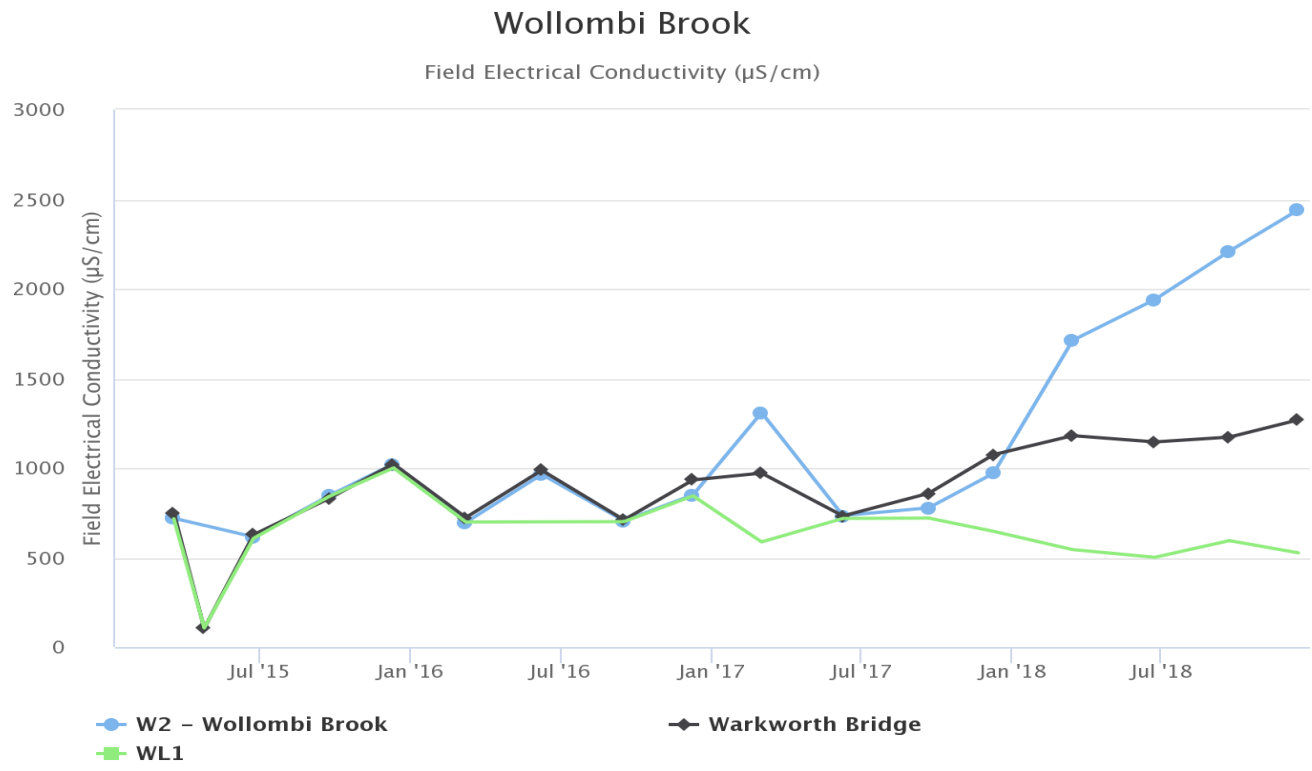

Figure 13: Wollombi Brook Electrical Conductivity Trend – December 2018

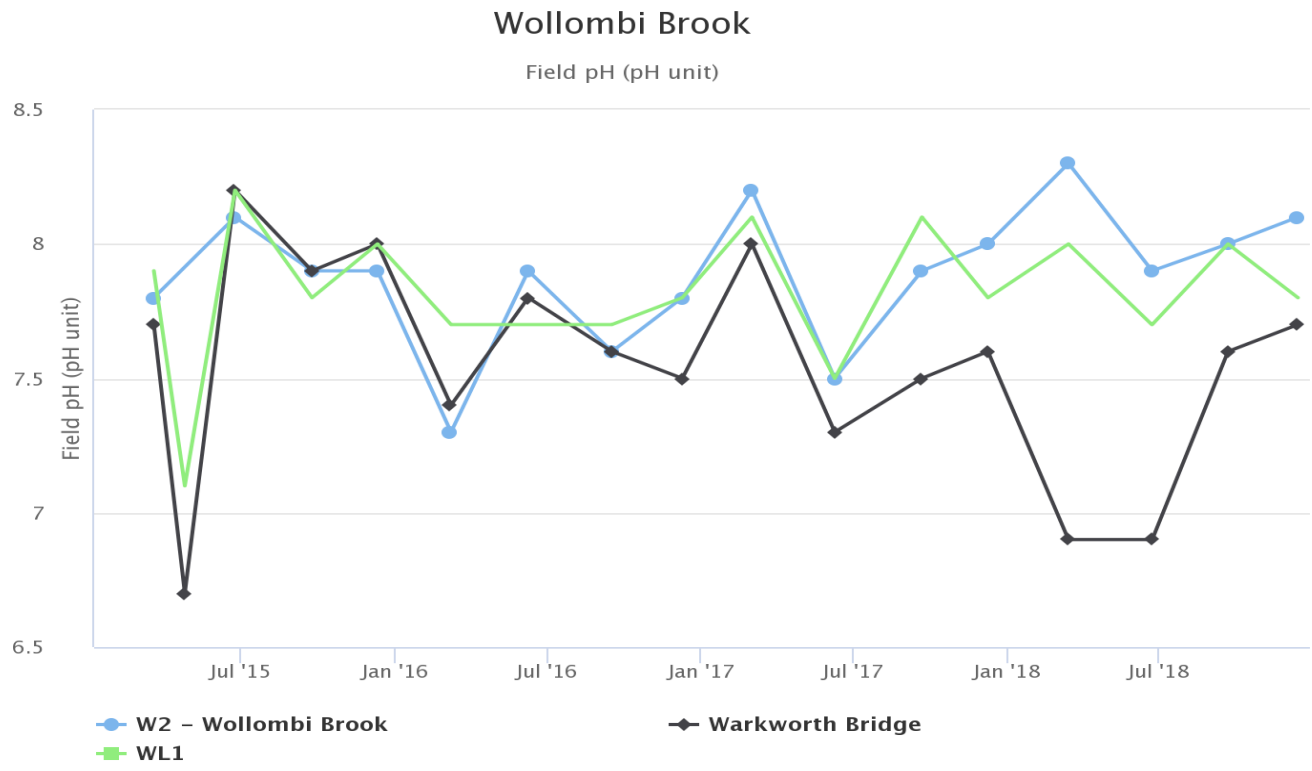

Figure 14: Wollombi Brook pH Trend – December 2018

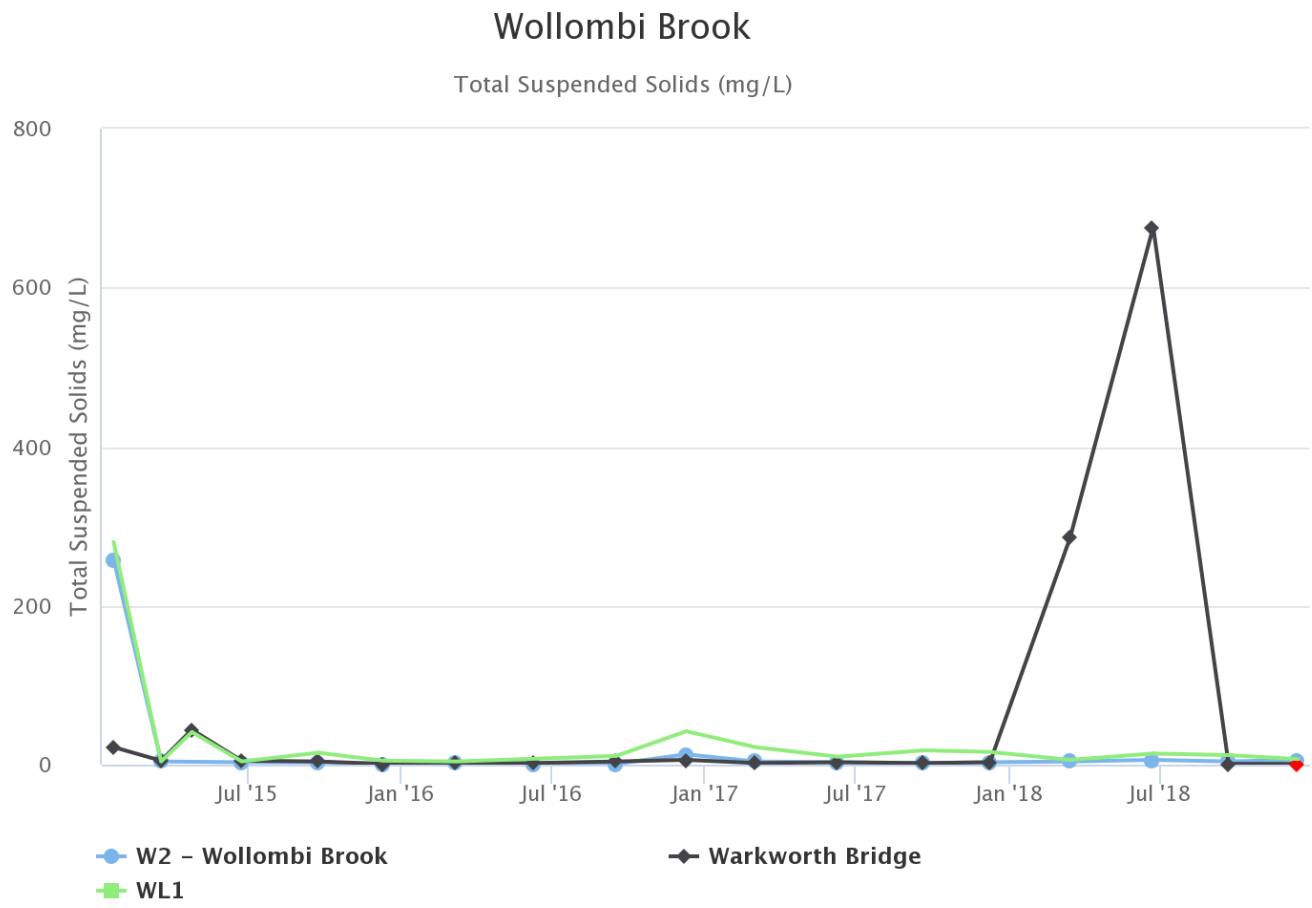

Figure 15: Wollombi Brook Total Suspended Solids Trend – December 2018

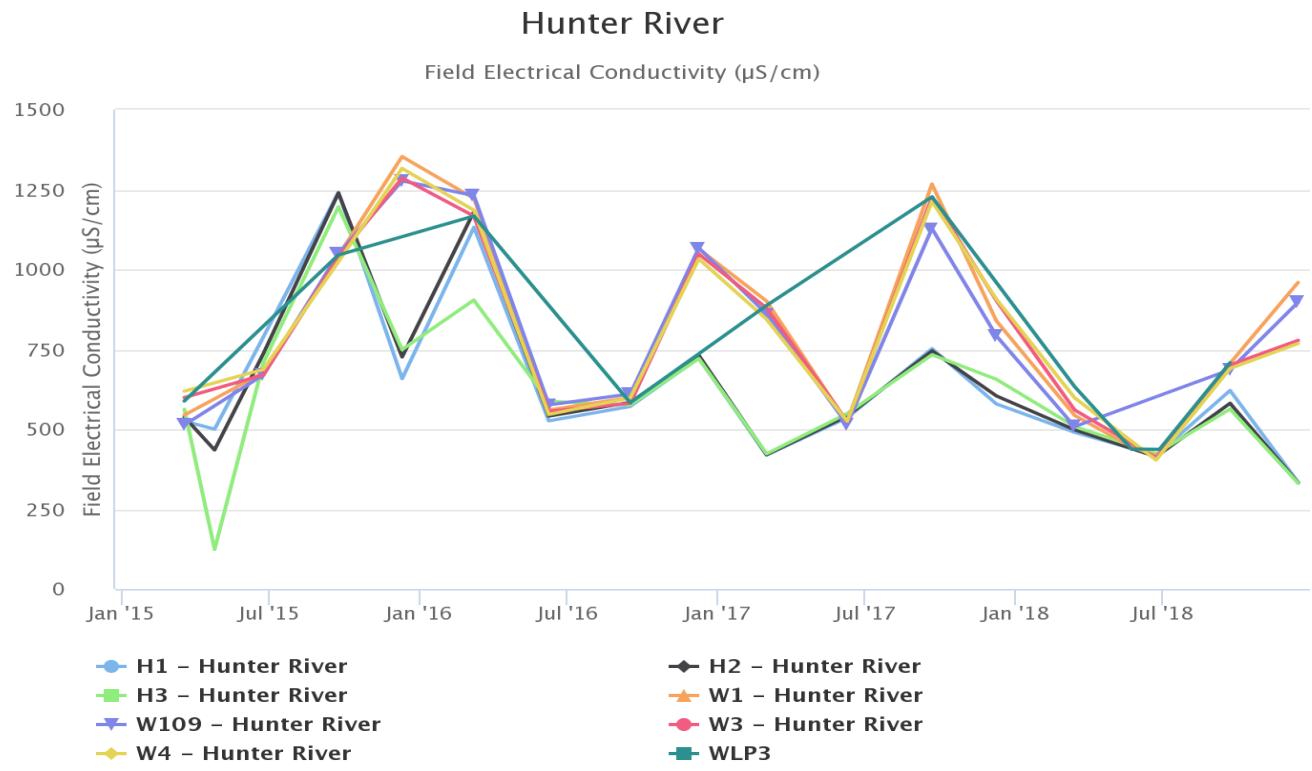

Figure 16: Hunter River Electrical Conductivity Trend – December 2018

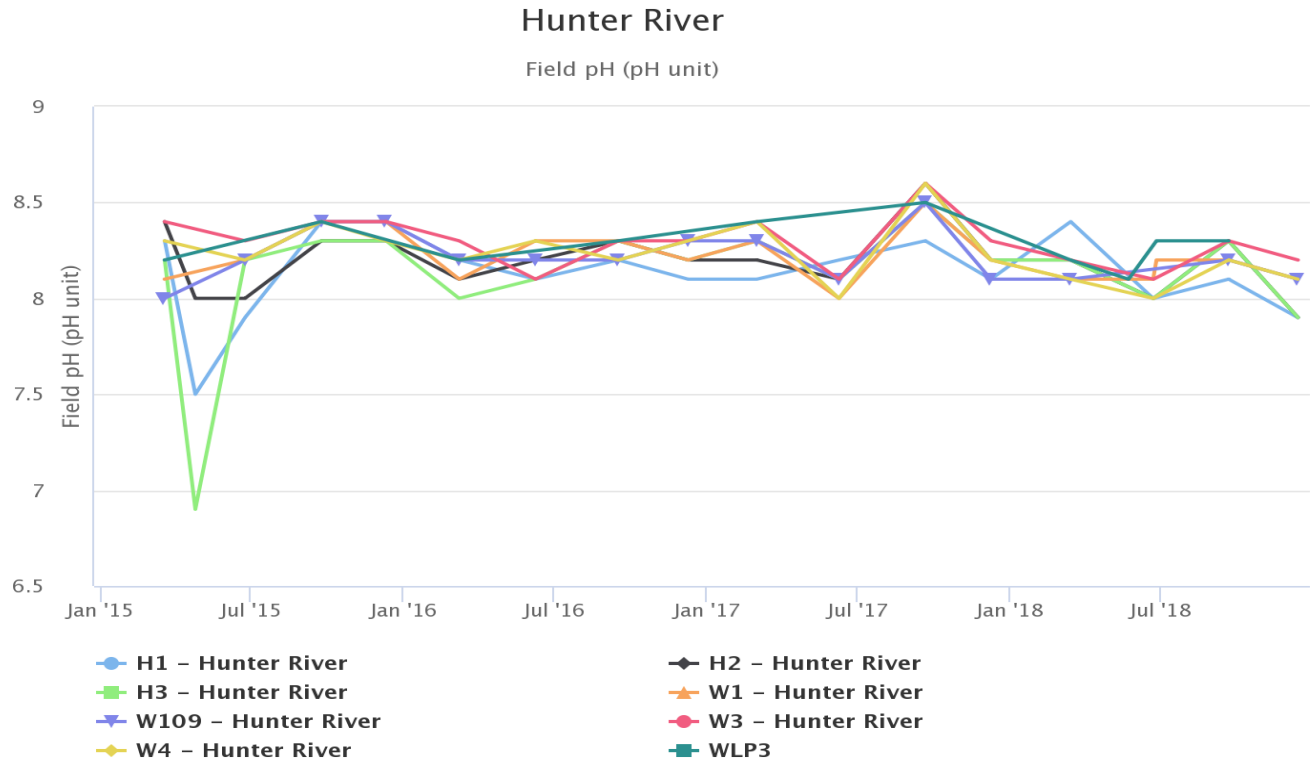

Figure 17: Hunter River pH Trend – December 2018

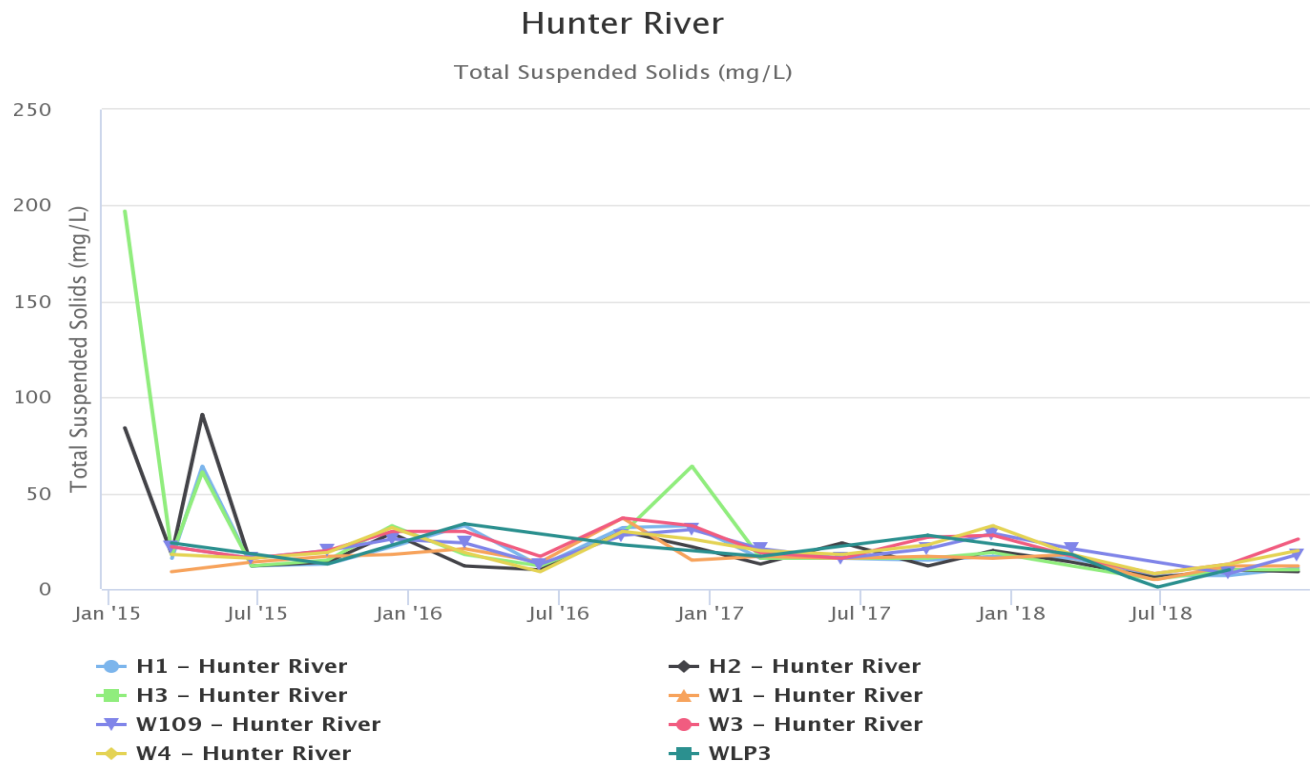

Figure 18: Hunter River Total Suspended Solids – December 2018

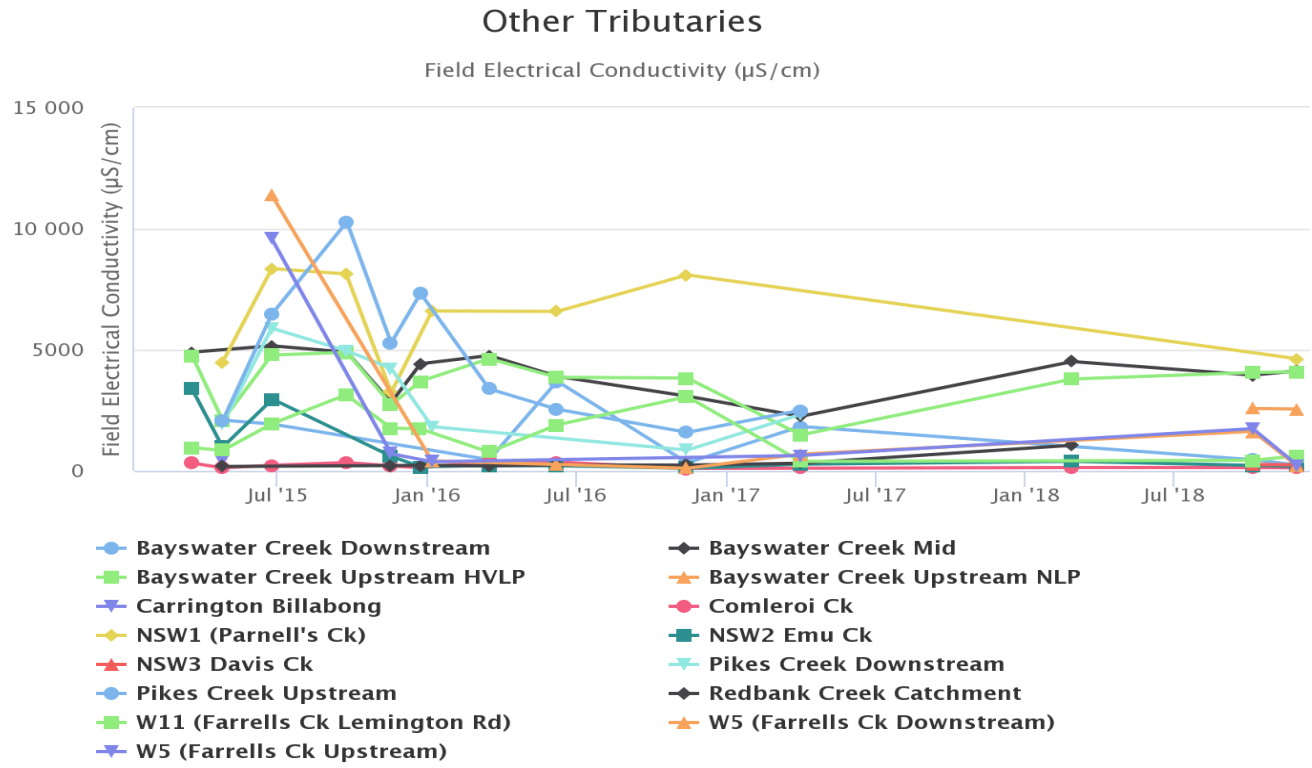

Figure 19: Other Tributaries Electrical Conductivity Trend – December 2018

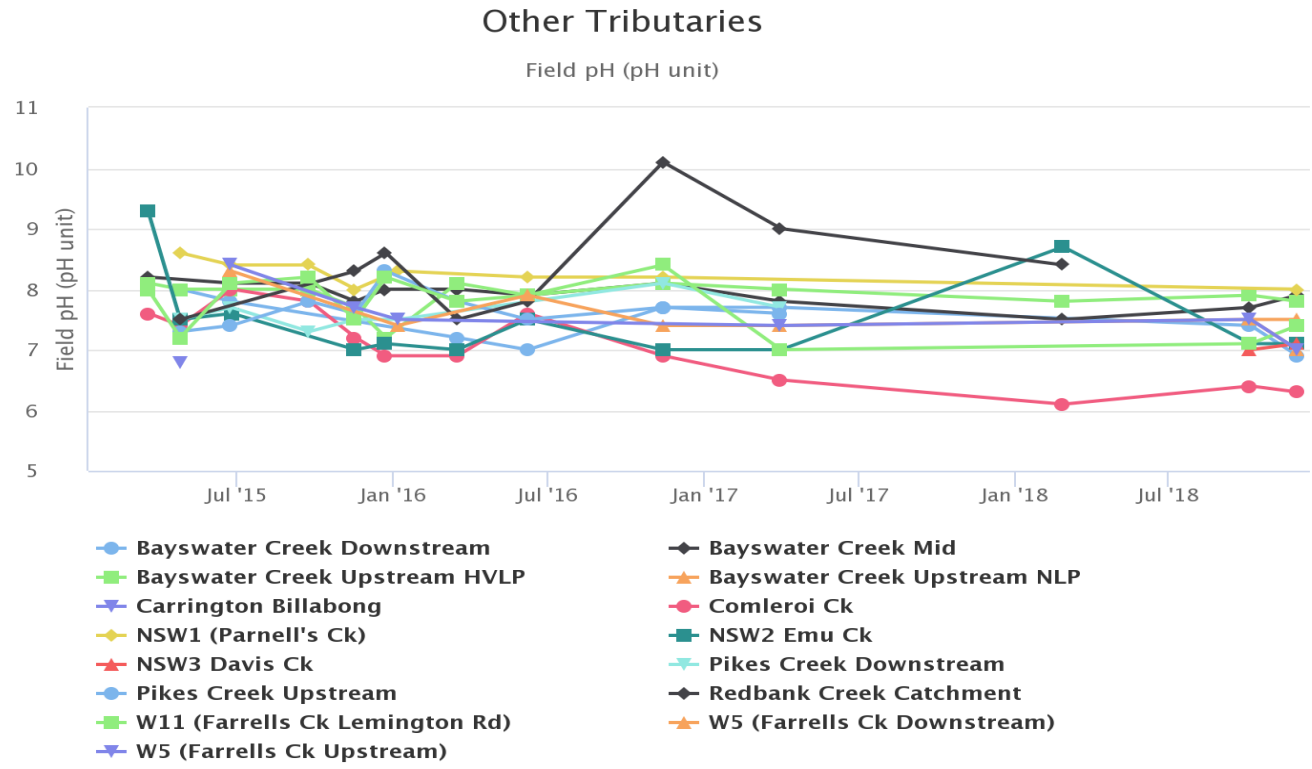

Figure 20: Other Tributaries pH Trend – December 2018

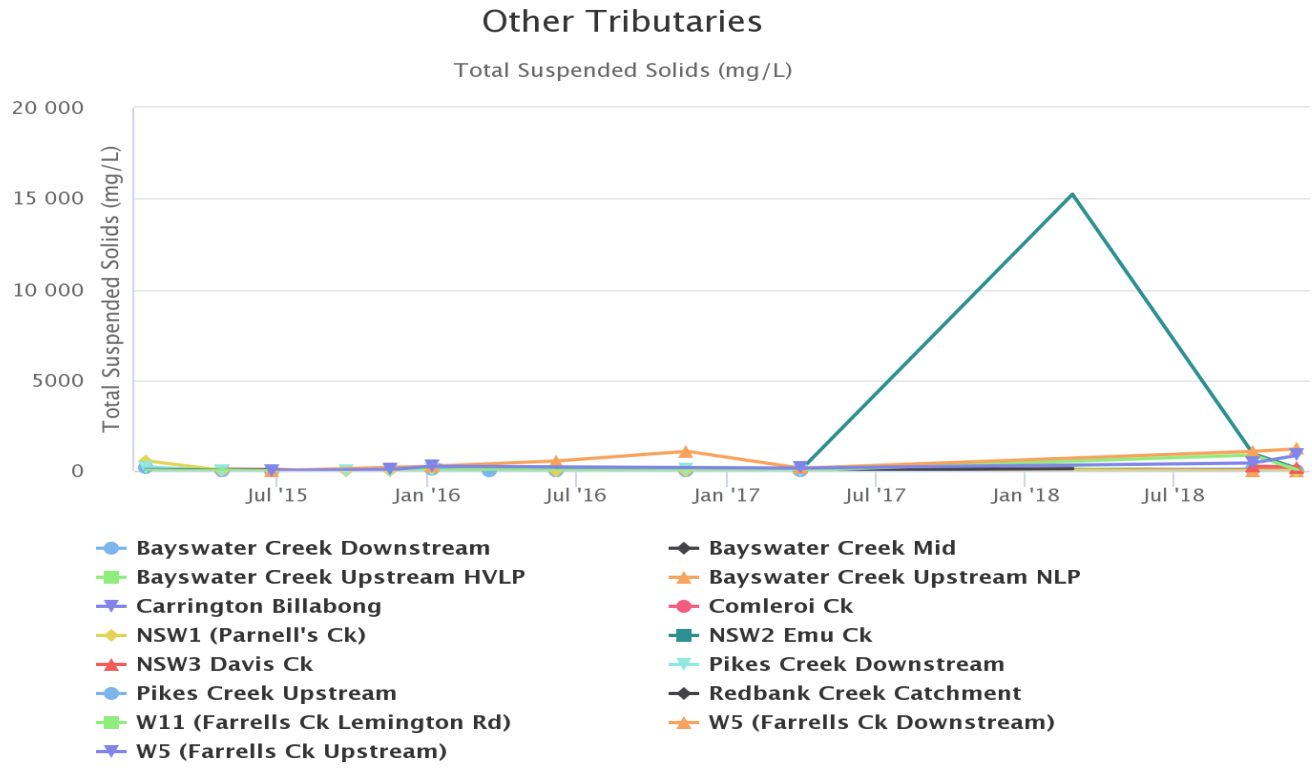

Figure 21: Other Tributaries Total Suspended Solids Trend – December 2018

3.1.2 Site Water Use

Under water allocation licences issued by the NSW Office of Water, HVO is permitted to extract water from the Hunter River. During the reporting period, HVO extracted approximately 211.8ML of water from the Hunter River.

3.1.3 HRSTS Discharge

HVO participates in the HRSTS, allowing it to 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 no water was discharged under the HRSTS.

3.1.4 Surface Water Trigger Limits

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 limits that have been breached are summarised in Table 3.

Table 3: Surface Water Trigger Limit Summary

Site	Date	Trigger Limit Breached	Action taken in response
Bayswater Creek Downstream	5/10/2018	TSS - 50mg/L (ANZECC Guideline)	Elevated TSS associated with rainfall event (76mm 4-5/10/2018). This site typically dry in 12 months prior. Observations indicate that the sample was taken from a turbid pool of water in the creek as there was no flow. Monitoring results upstream indicated there was also no flow in the creek and showed more elevated EC results compared to those downstream. Based on this it can be assumed that the sample taken was not representative of water flows in the creek and that there is no impact to suggest mining influence. Maintain watching brief*.
NSW 2 Emu Creek	5/10/2018	TSS - 50mg/L (ANZECC Guideline)	Elevated TSS associated with rainfall event (76mm 4-5/10/2018). Observations indicate that sample was taken from a slow flow of water through the creek line. No further downstream catchment exists due to mining operations. No further action required.
NSW 3 Davis Creek	5/10/2018	TSS - 50mg/L (ANZECC Guideline)	Elevated TSS associated with rainfall event (76mm 4-5/10/2018). Site is typically dry.Observations indicate that sample was taken from a pool of water through the creek line as there was no flow. Other monitoring parameters also suggest no mining influence. Maintain watching brief*.
Comleroi Ck	29/11/2018	TSS - 50mg/L (ANZECC Guideline)	Elevated TSS associated with rainfall event (52.4mm 28/11/2018). Observations indicate that sample was taken from a pool of water through the creek line as there was no flow. Other monitoring parameters also suggest no mining influence. Maintain watching brief. Maintain watching brief. Maintain watching brief*
NSW 2 Emu Creek	29/11/2018	TSS - 50mg/L (ANZECC Guideline)	Elevated TSS associated with rainfall event (52.4mm 28/11/2018). Observations indicate that sample was taken from a pool of water through the creek line. No further downstream catchment exists due to mining operations. No further action required.
NSW 3 Davis Creek	29/11/2018	TSS - 50mg/L (ANZECC Guideline)	Elevated TSS associated with rainfall event (52.4mm 28/11/2018). Site is typically dry. Observations indicate that sample was taken from a pool of water through the creek line as there was no flow. Other monitoring parameters also suggest no mining influence. Maintain watching brief*.

W11	5/10/2018	pH – 5th Percentile	Watching brief. Sampling event following this indicated pH within trigger range.
Bayswater Creek Downstream	29/11/2018	pH – 5th Percentile	First exceedance, Watching brief*
H2	13/12/2018	pH – 5th Percentile	First exceedance, Watching brief*.
W2	13/12/2018	EC – 95th Percentile	Fourth consecutive exceedance of EC trigger (2440µs/cm) Investigation identified that sample was collected from turbid pooling water in the Wollombi Brook as there was no flow. Samples taken downstream in the Wollombi Brook recorded EC level at 526µs/cm. Maintain watching brief.
Warkworth Bridge	13/12/2018	EC -95th Percentile	Fifth consecutive exceedance of EC trigger (1268µs/cm). Investigation identified that sample was collected from pooling water in the Wollombi Brook as there was no flow. Samples taken downstream in the Wollombi Brook recorded EC level at 526µs/cm. Maintain watching brief.

* = Watching Brief established pending outcomes of subsequent monitoring events. No further action required.

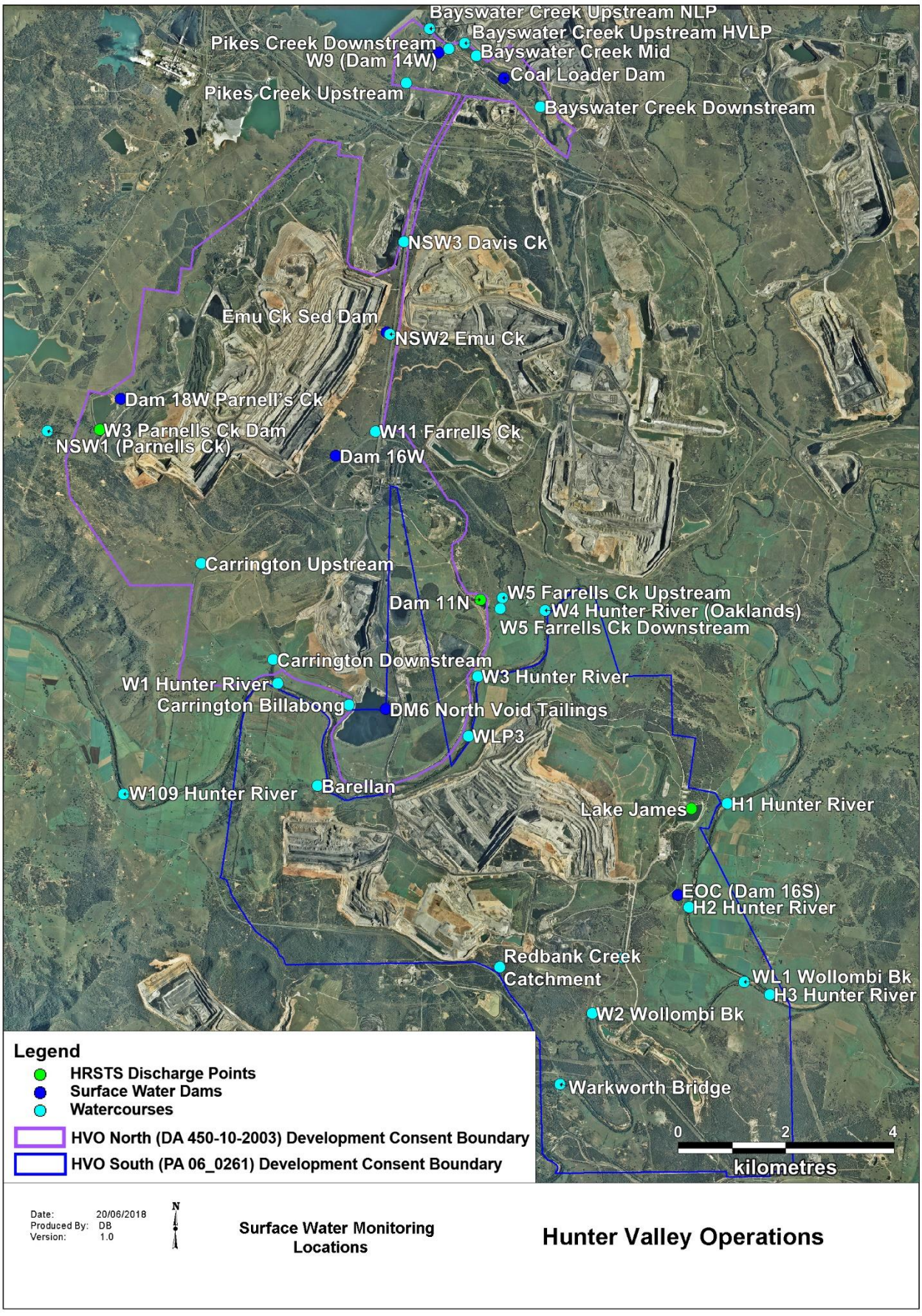

Figure 22: Surface Water Monitoring Location Plan

4.0 GROUNDWATER

4.1.1 Groundwater Monitoring

Groundwater monitoring is undertaken on a quarterly basis in accordance with the HVO Water Management Plan and Ground Water Monitoring Programme. Monitoring sites are shown in Figure 80.

Figure 23 to Figure 76 show the long term trends (2016 – current) for ground water bores monitored at HVO.

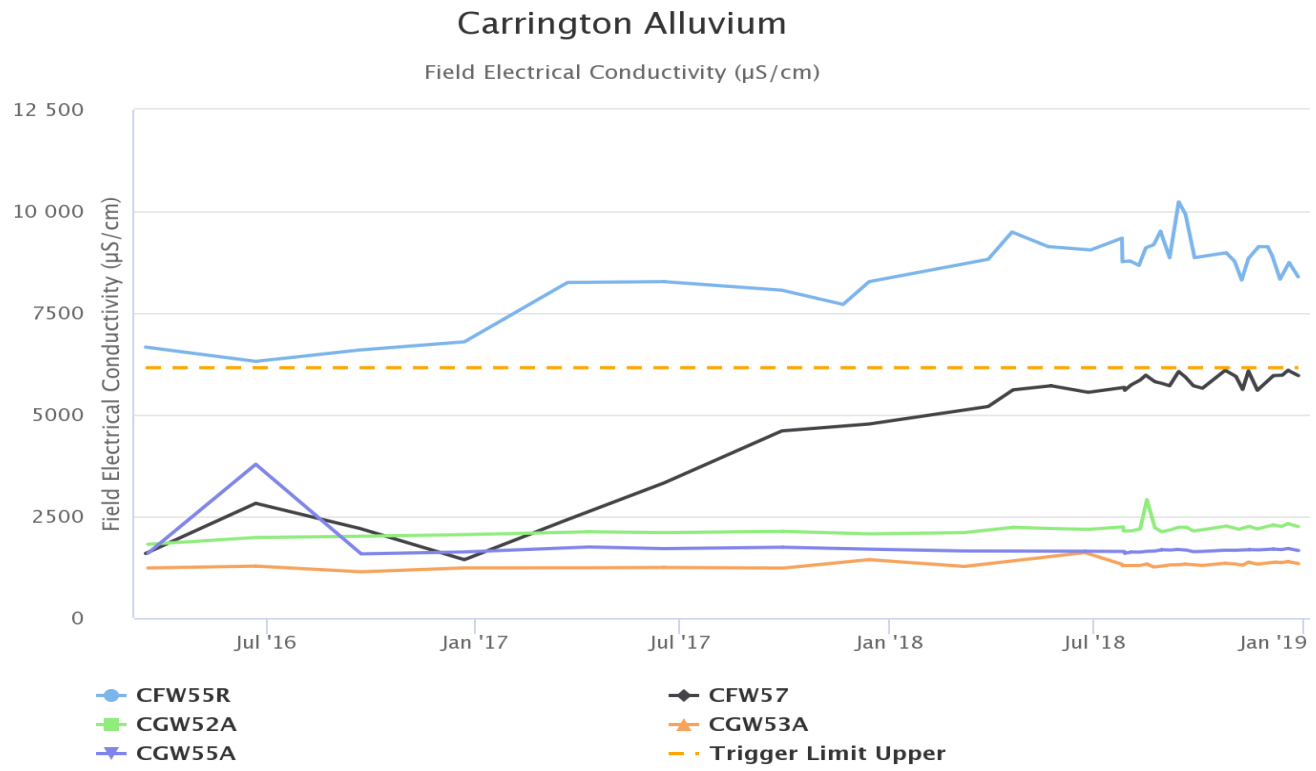

Figure 23: Carrington Alluvium Electrical Conductivity Trend – December 2018

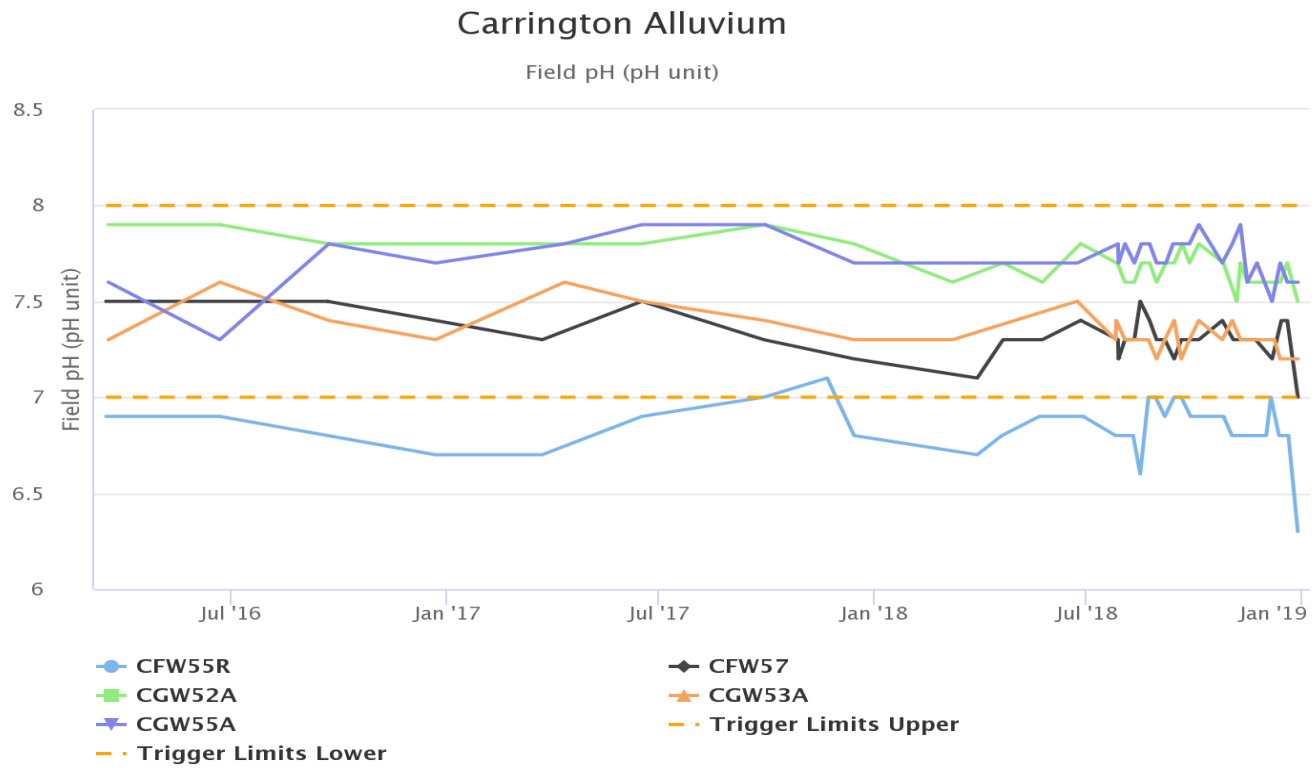

Figure 24: Carrington Alluvium pH Trend – December 2018

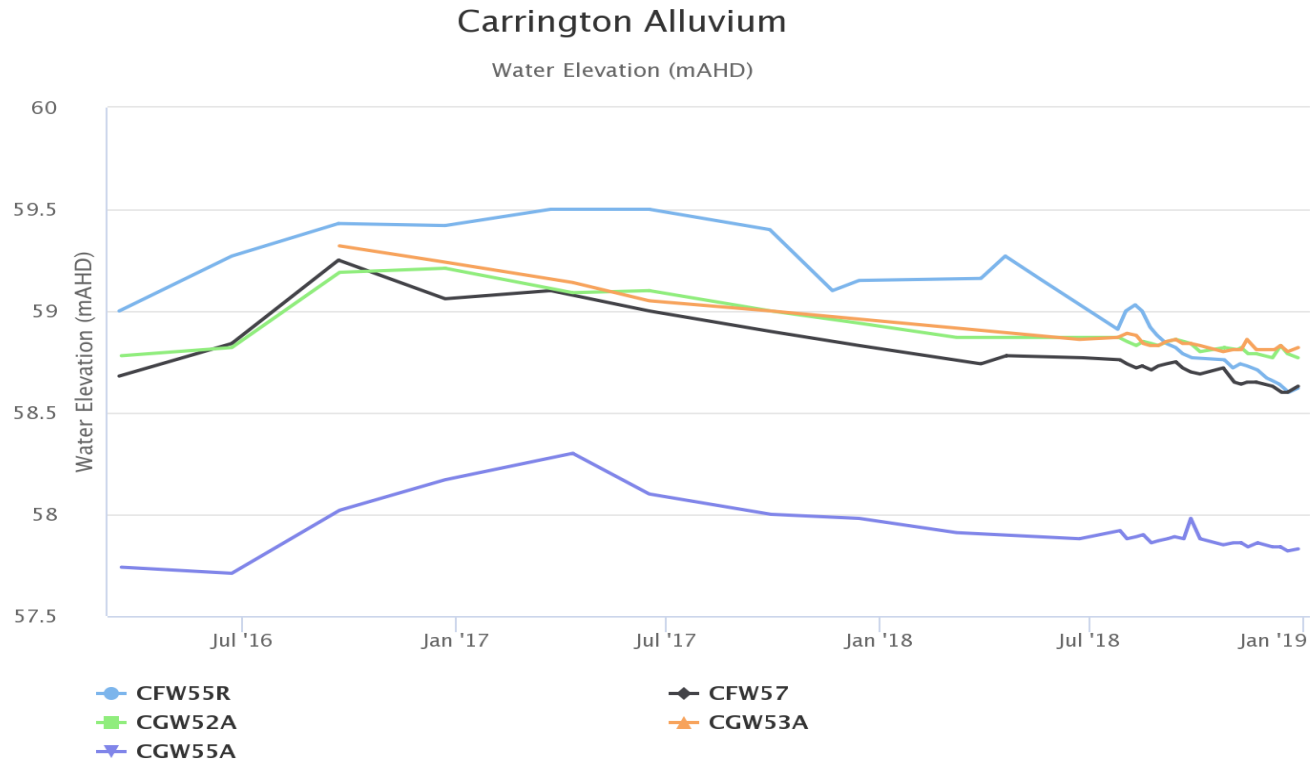

Figure 25: Carrington Alluvium Standing Water Level – December 2018

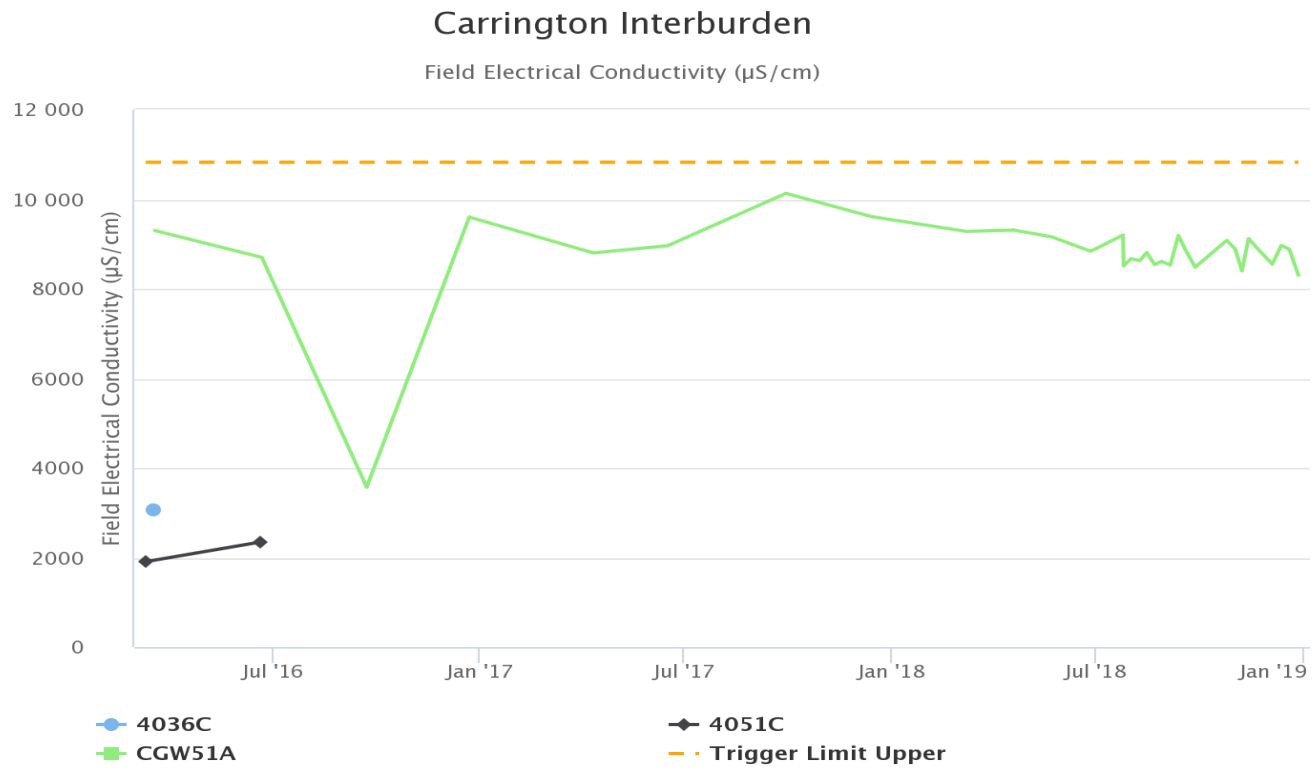

Figure 26: Carrington Interburden Electrical Conductivity Trend – December 2018

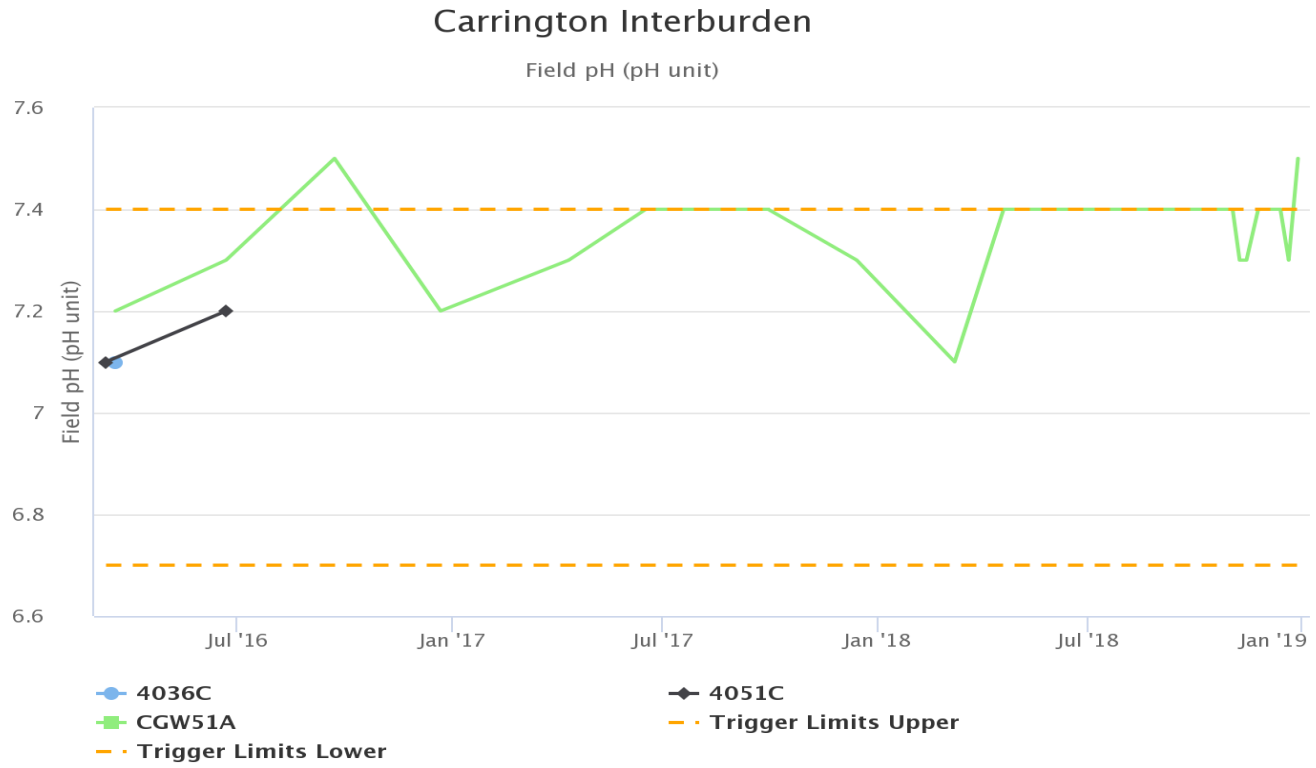

Figure 27: Carrington Interburden pH Trend – December 2018

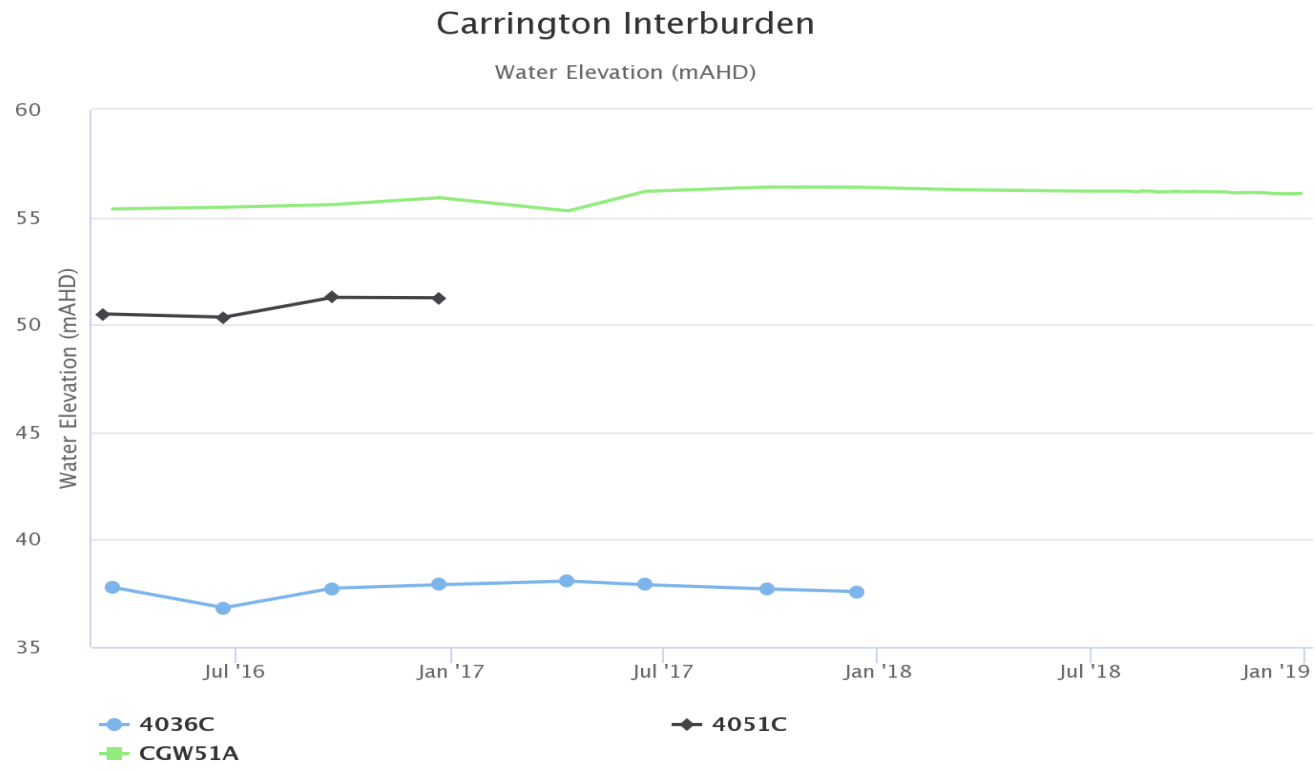

Figure 28: Carrington Interburden Standing Water Level – December 2018

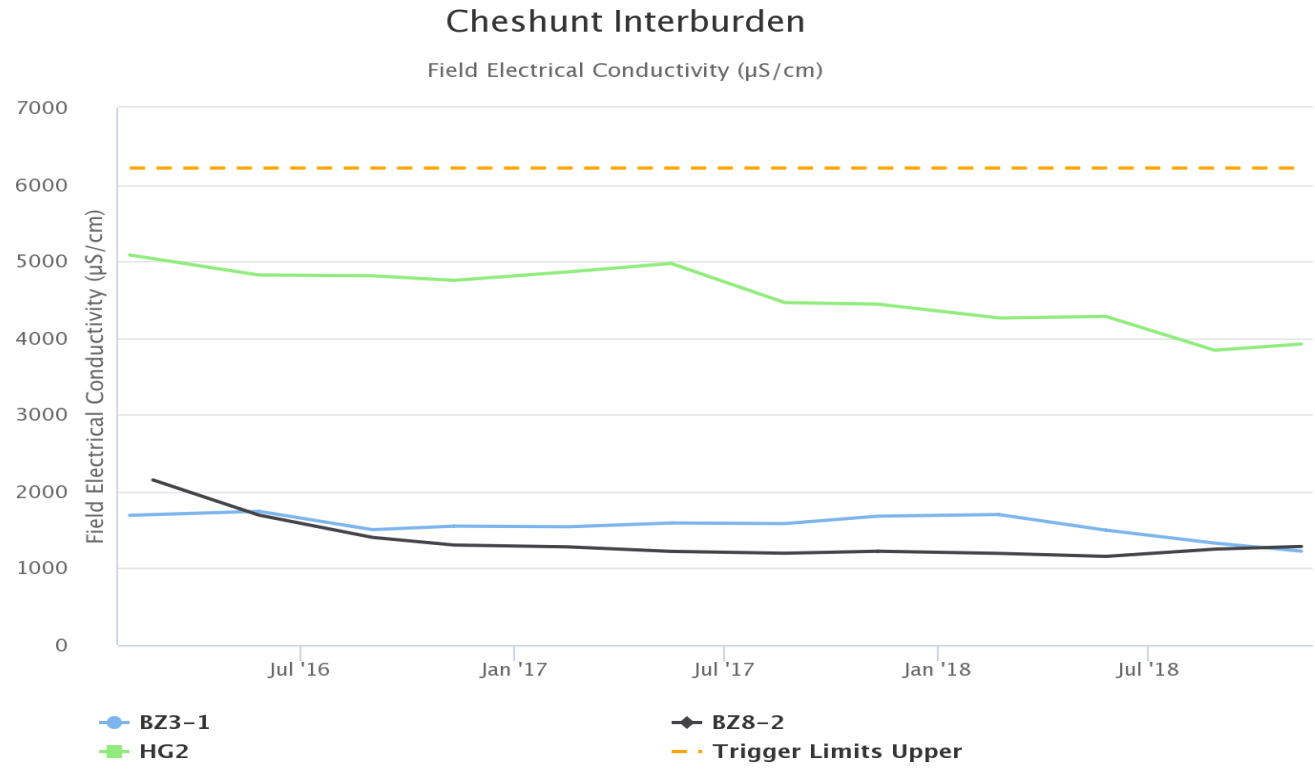

Figure 29: Cheshunt Interburden Electrical Conductivity Trend – December 2018

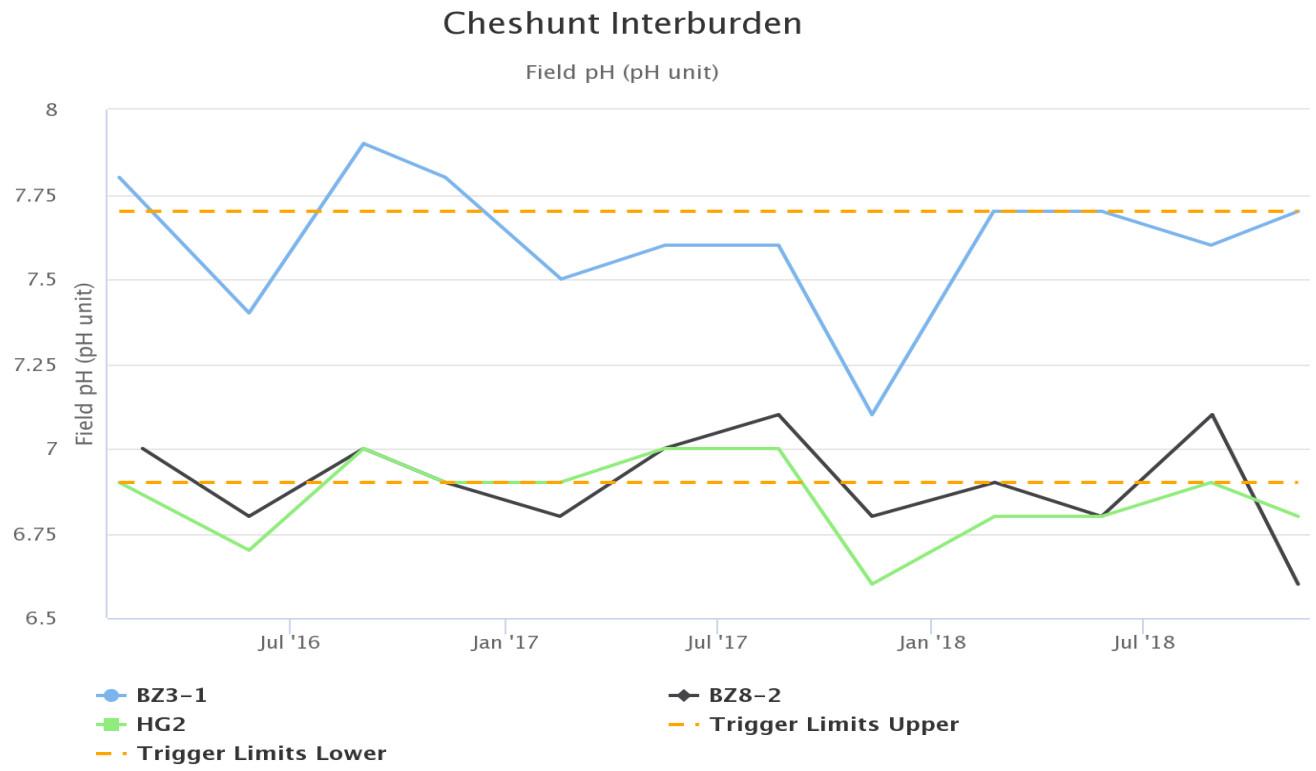

Figure 30: Cheshunt Interburden pH Trend – December 2018

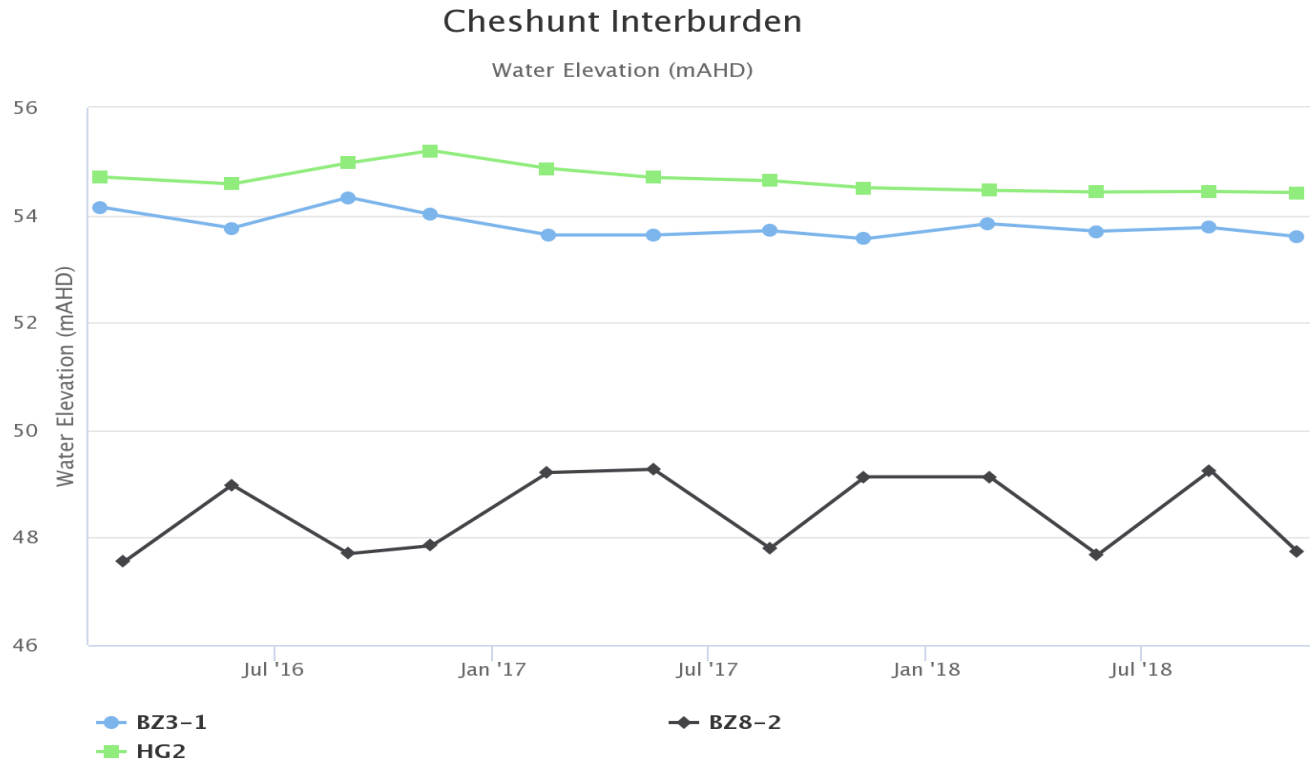

Figure 31: Cheshunt Interburden Standing Water Level – December 2018

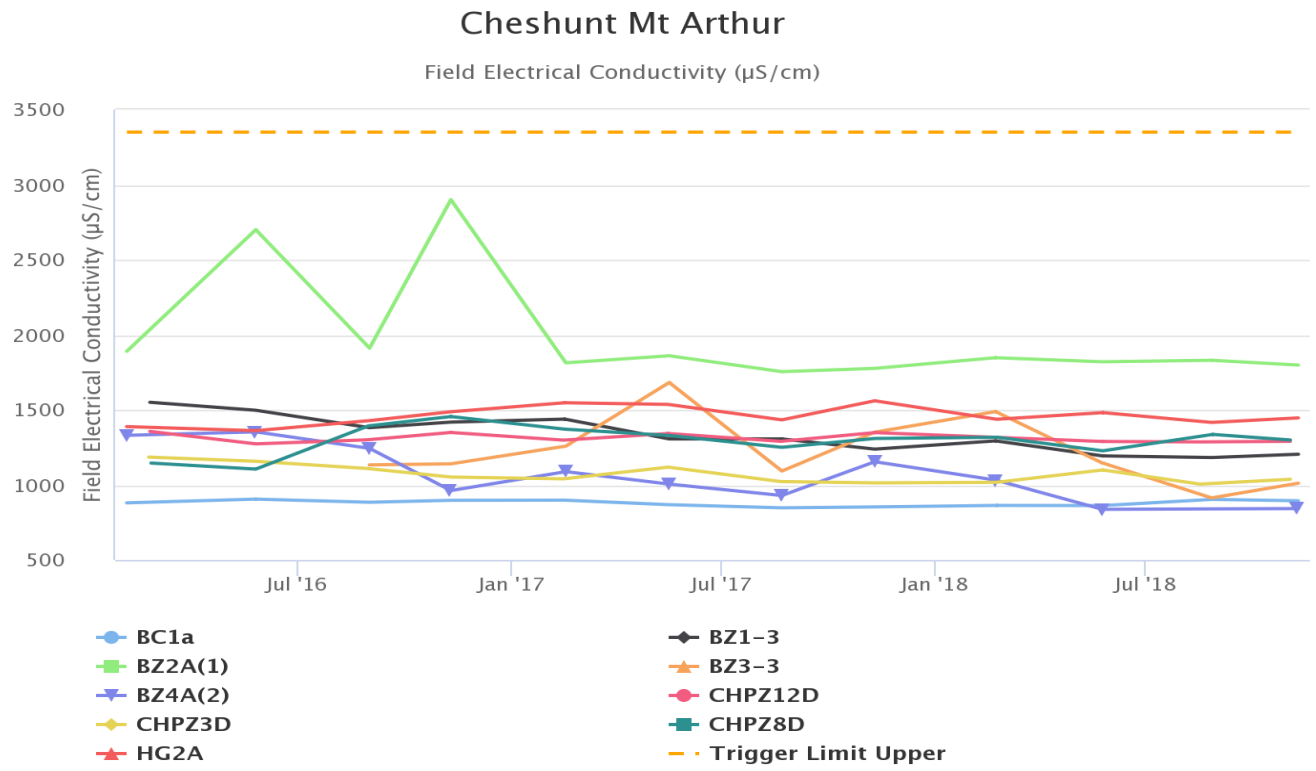

Figure 32: Cheshunt Mt Arthur Electrical Conductivity Trend – December 2018

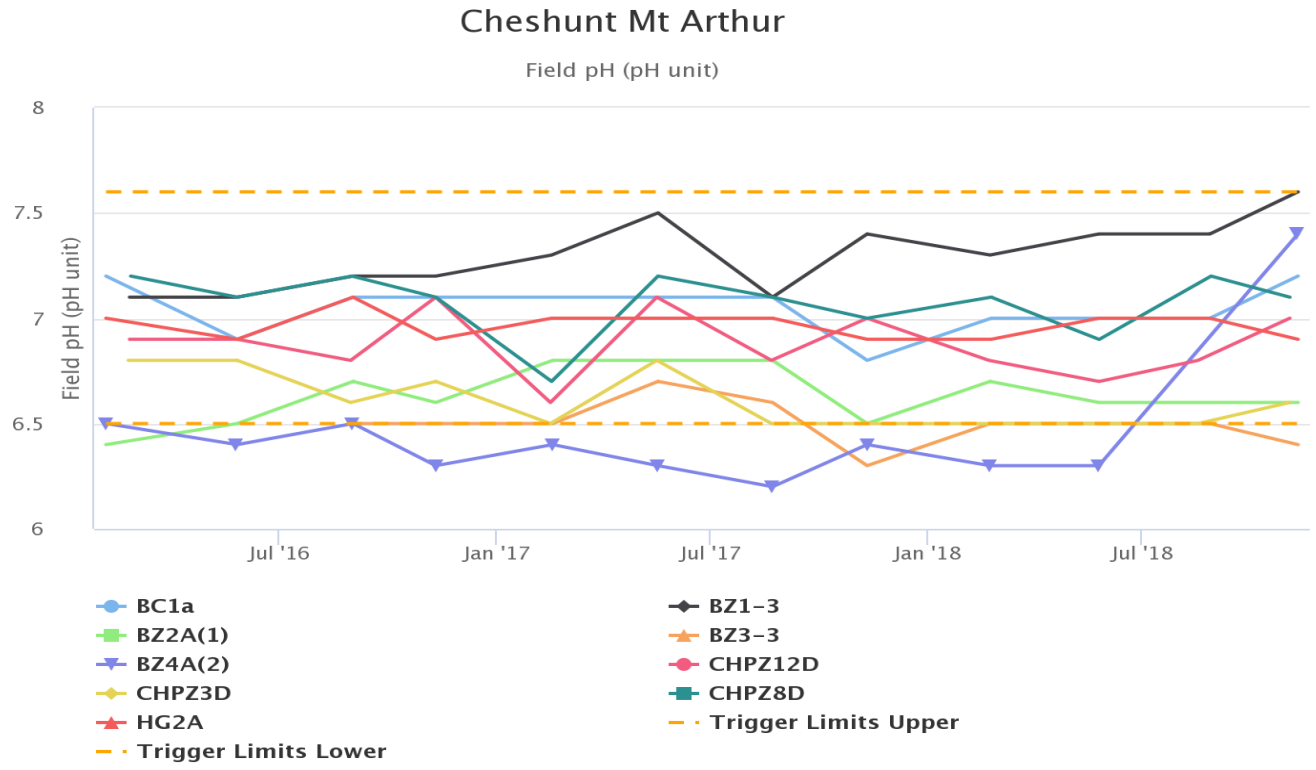

Figure 33: Cheshunt Mt Arthur pH Trend – December 2018

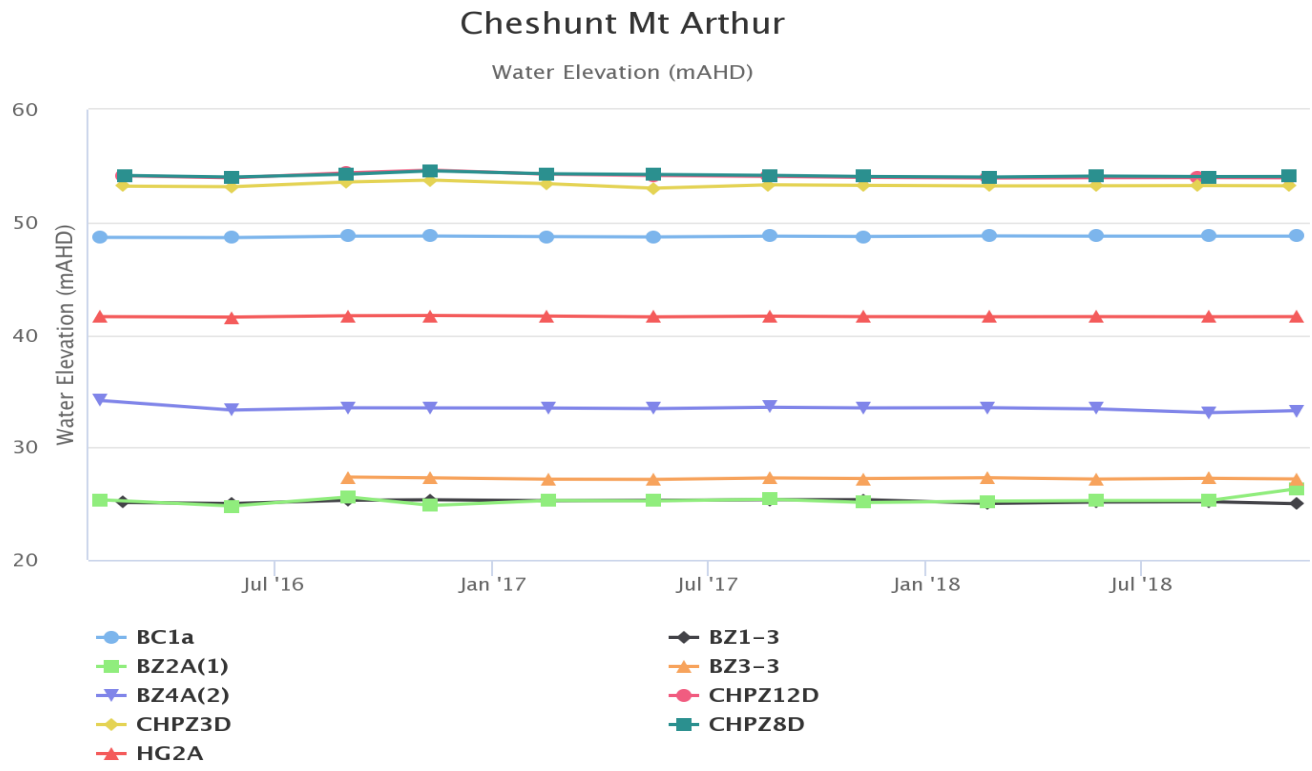

Figure 34: Cheshunt Mt Arthur Standing Water Level – December 2018

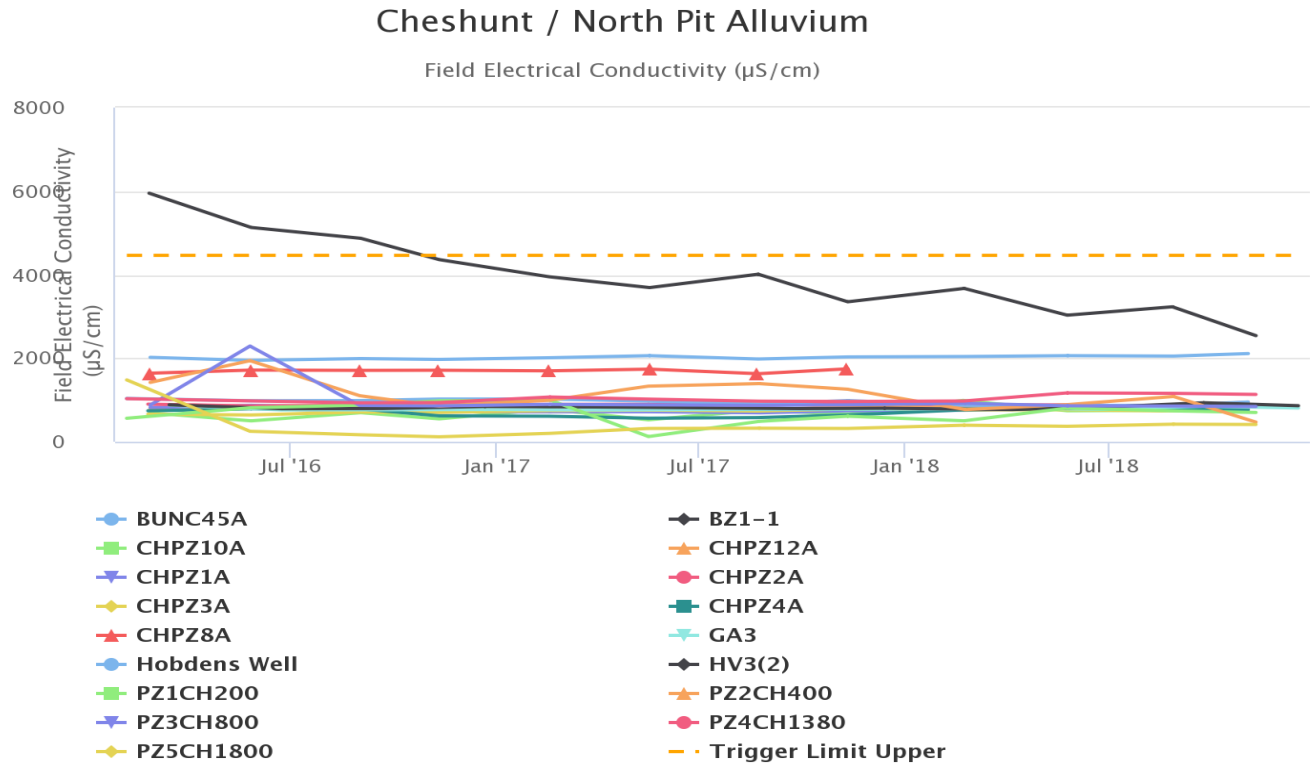

Figure 35: Cheshunt / North Pit Alluvium Electrical Conductivity Trend – December 2018

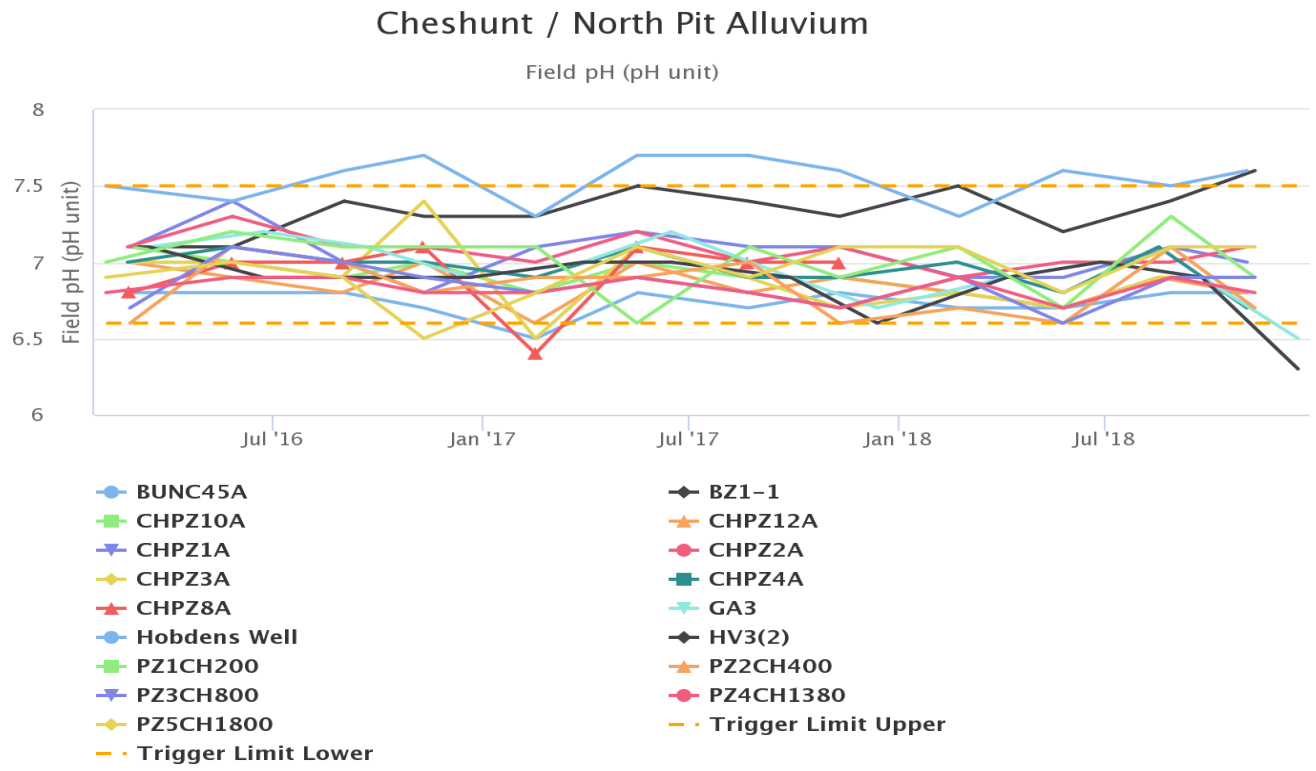

Figure 36: Cheshunt / North Pit Alluvium pH Trend – December 2018

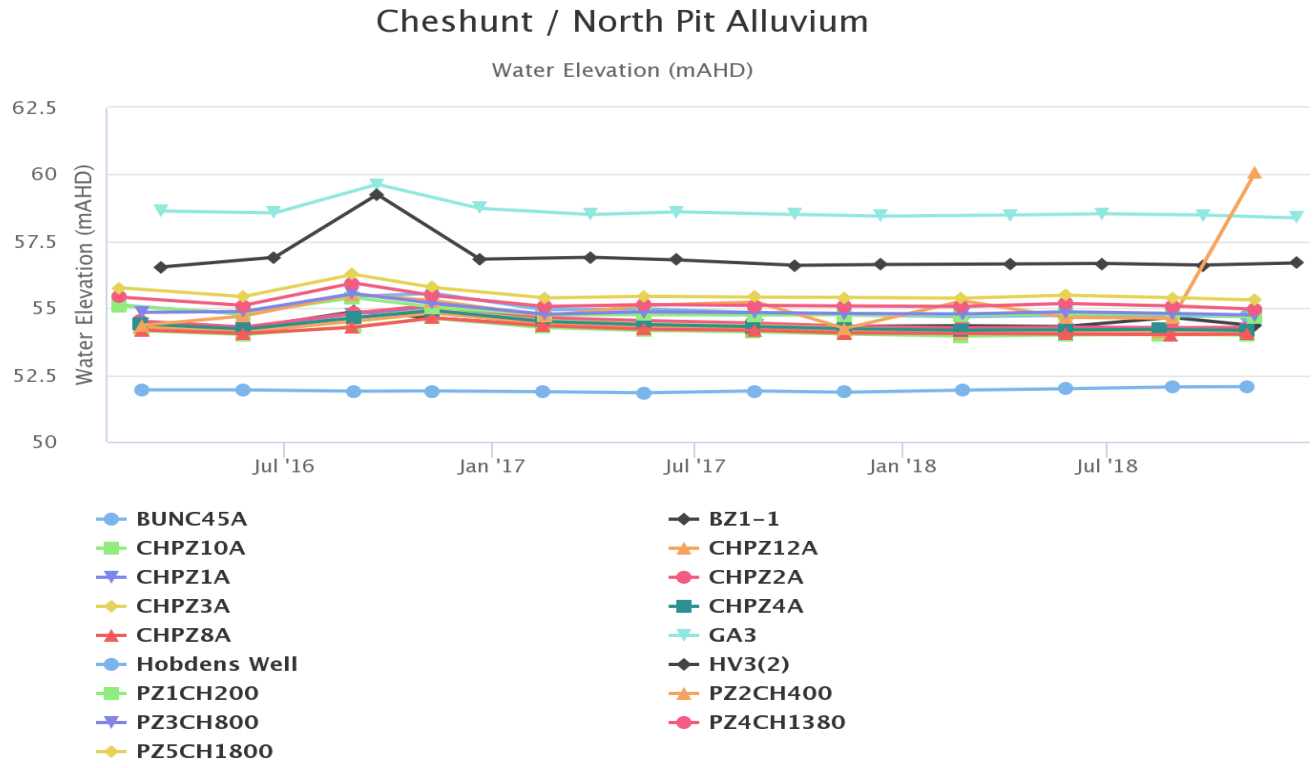

Figure 37: Cheshunt / North Pit Alluvium Standing Water Level – December 2018

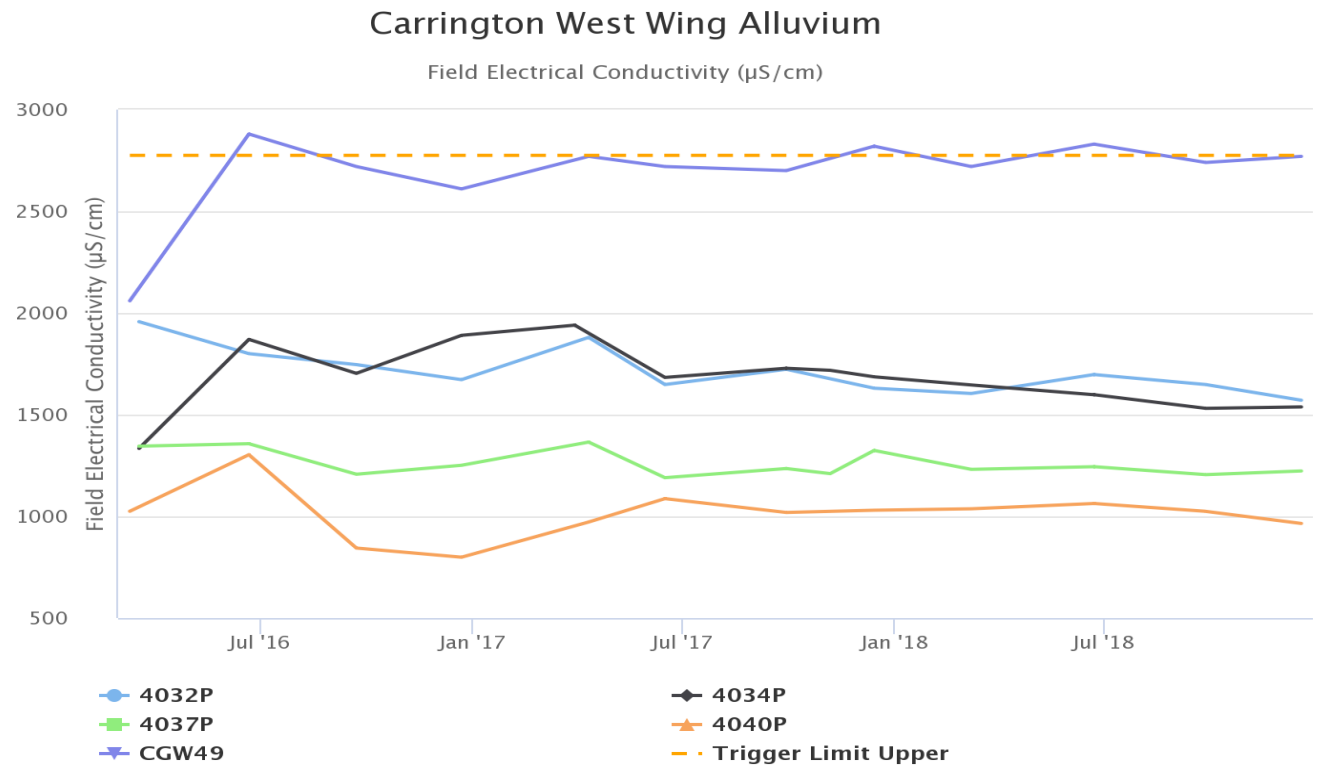

Figure 38: Carrington West Wing Alluvium Electrical Conductivity Trend – December 2018

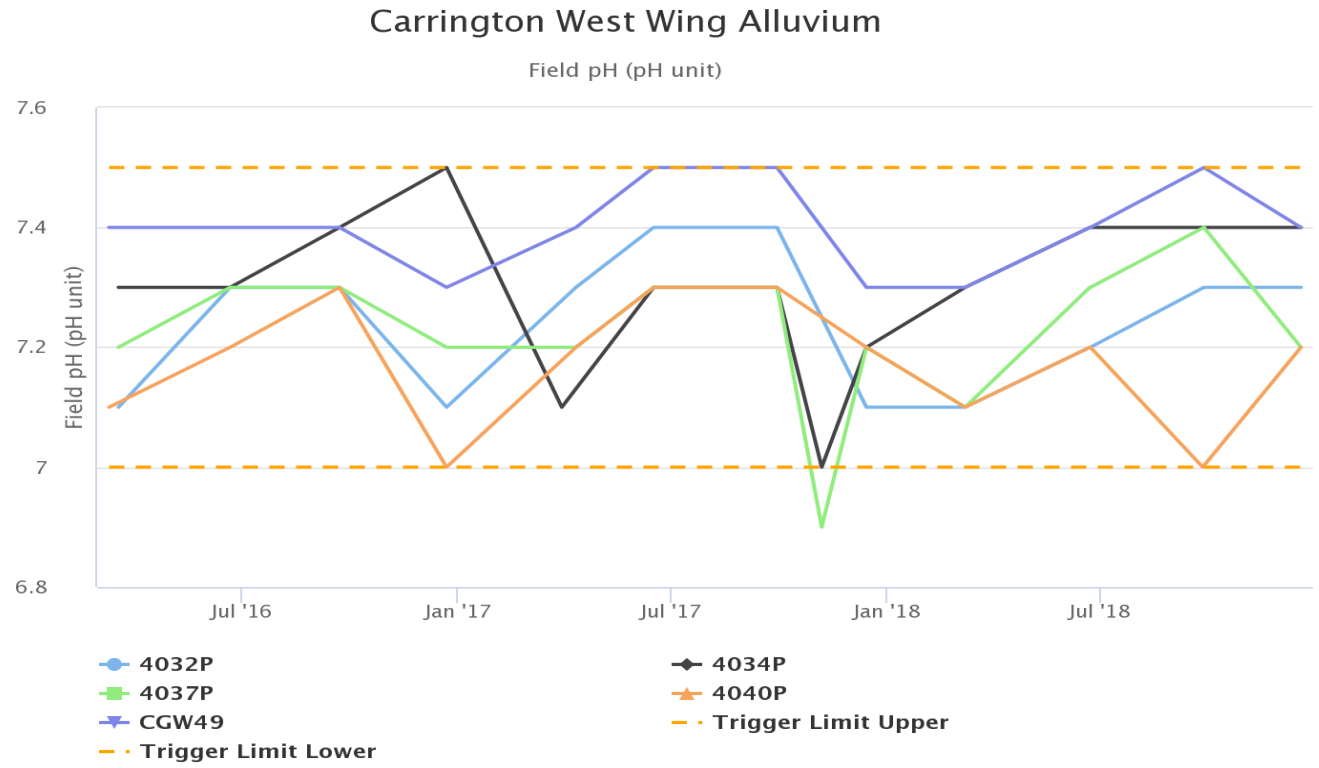

Figure 39: Carrington West Wing Alluvium pH Trend – December 2018

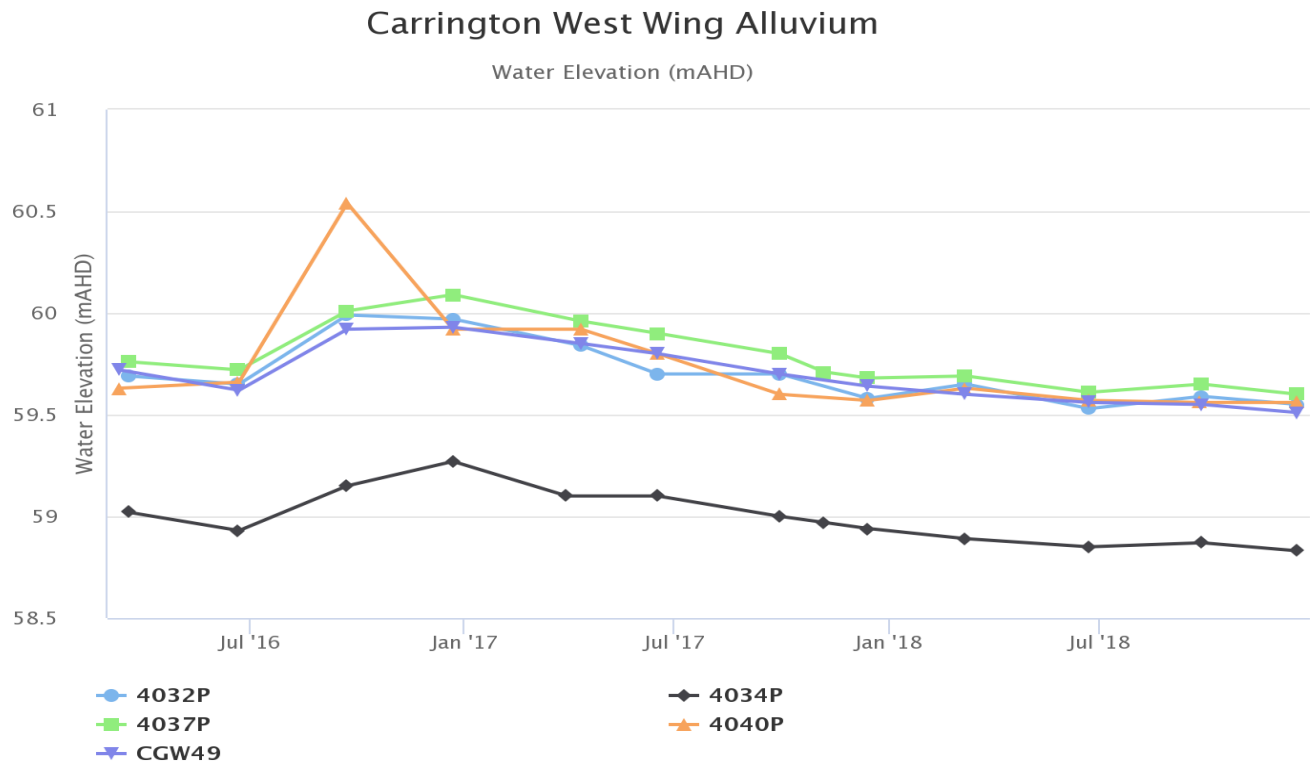

Figure 40: Carrington West Wing Alluvium Standing Water Level – December 2018

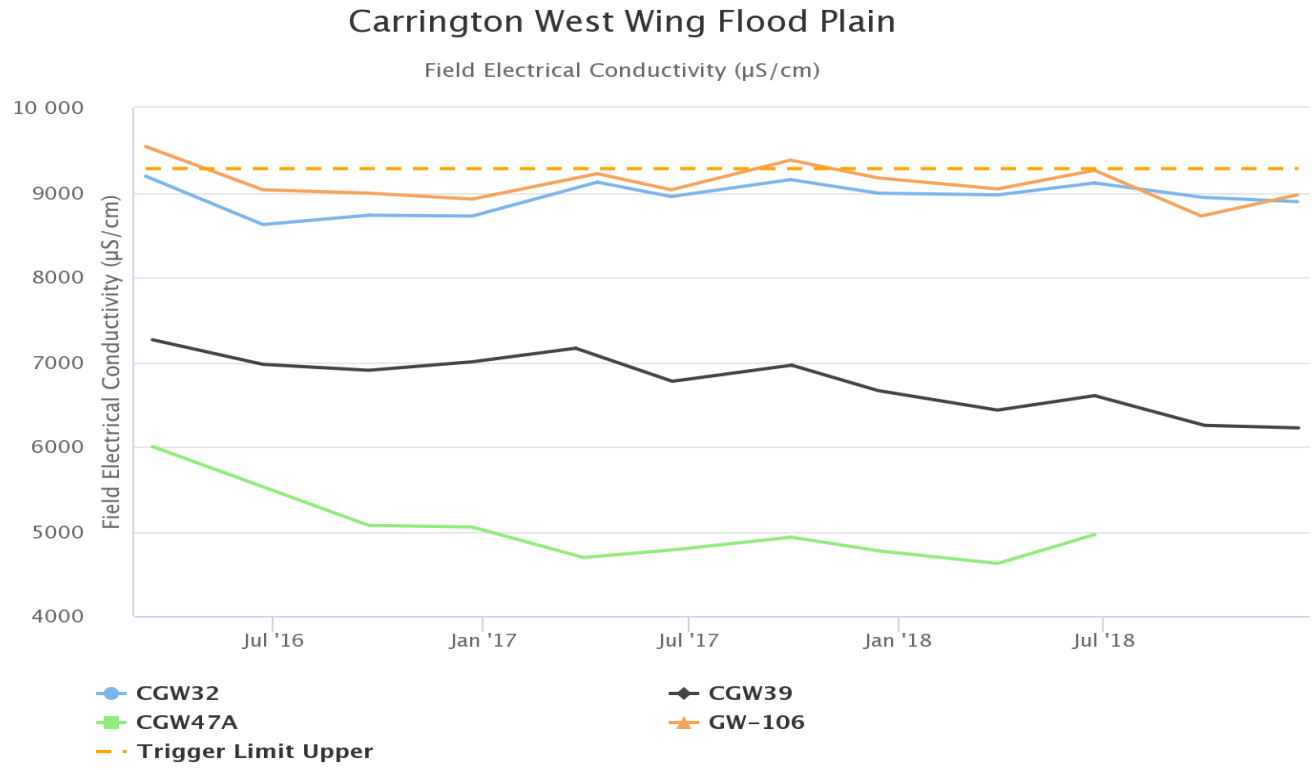

Figure 41: Carrington West Wing Flood Plain Electrical Conductivity Trend – December 2018

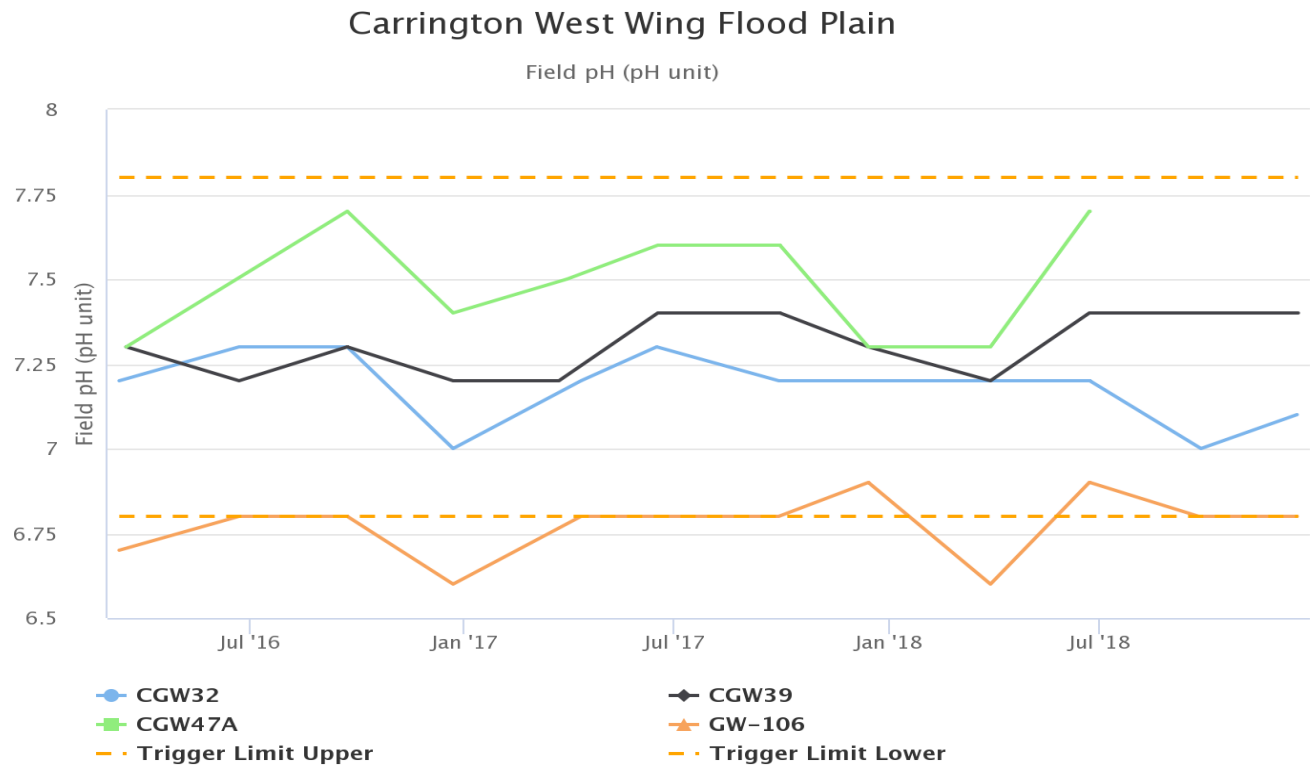

Figure 42: Carrington West Wing Flood Plain pH Trend – December 2018

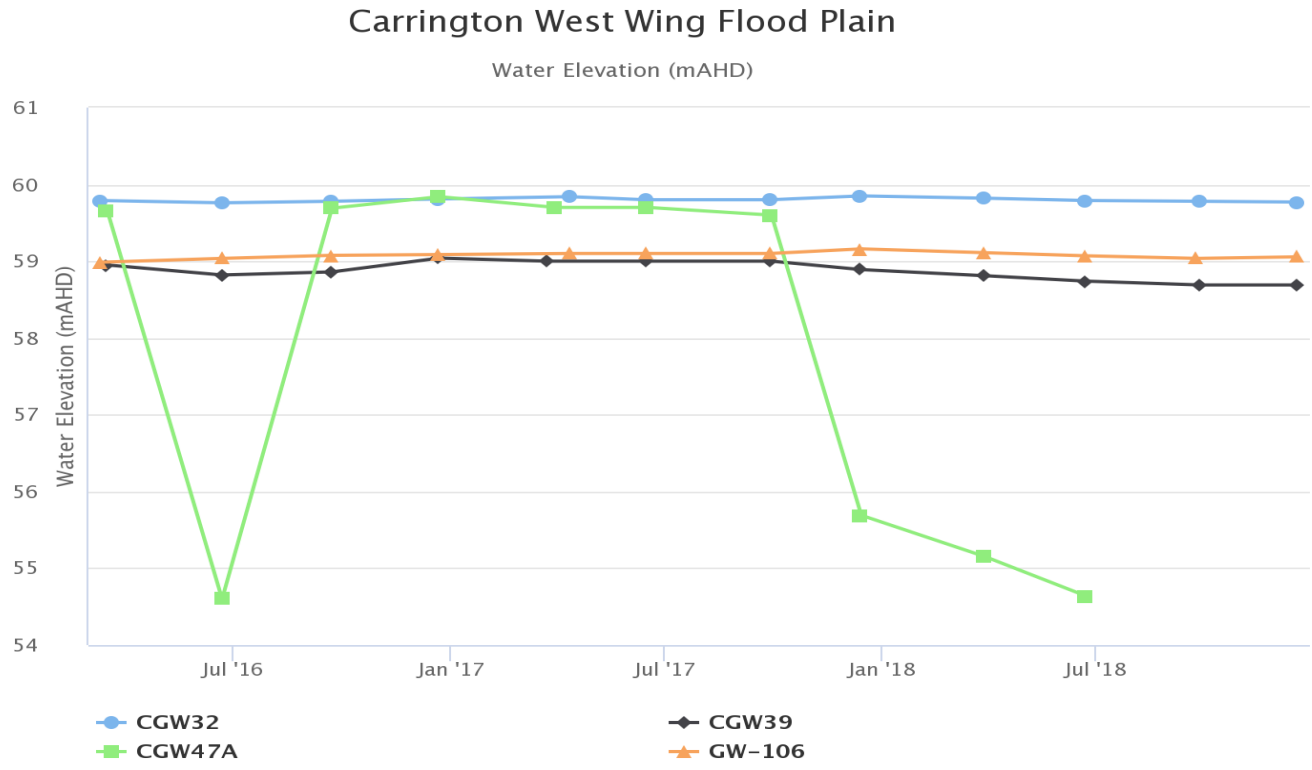

Figure 43: Carrington West Wing Flood Plain Standing Water Level – December 2018

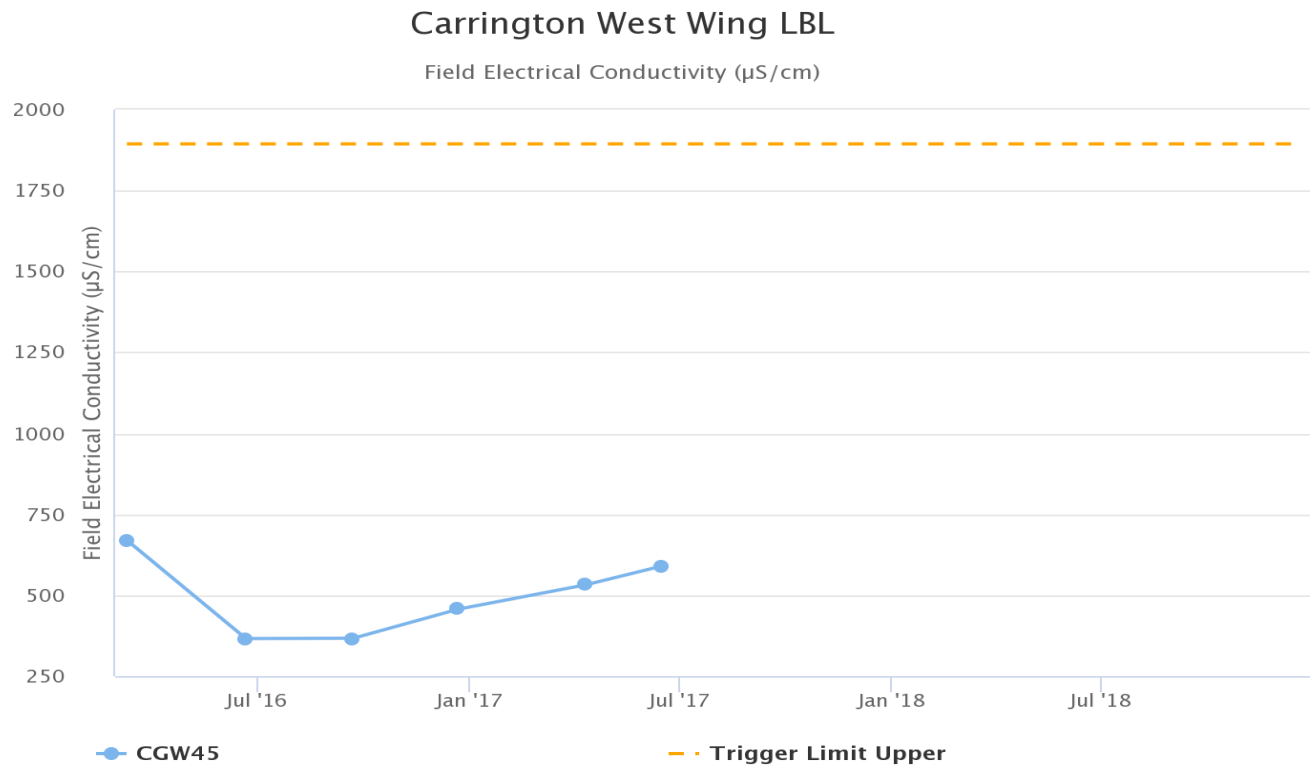

Figure 44: Carrington West Wing LBL Electrical Conductivity Trend – December 2018

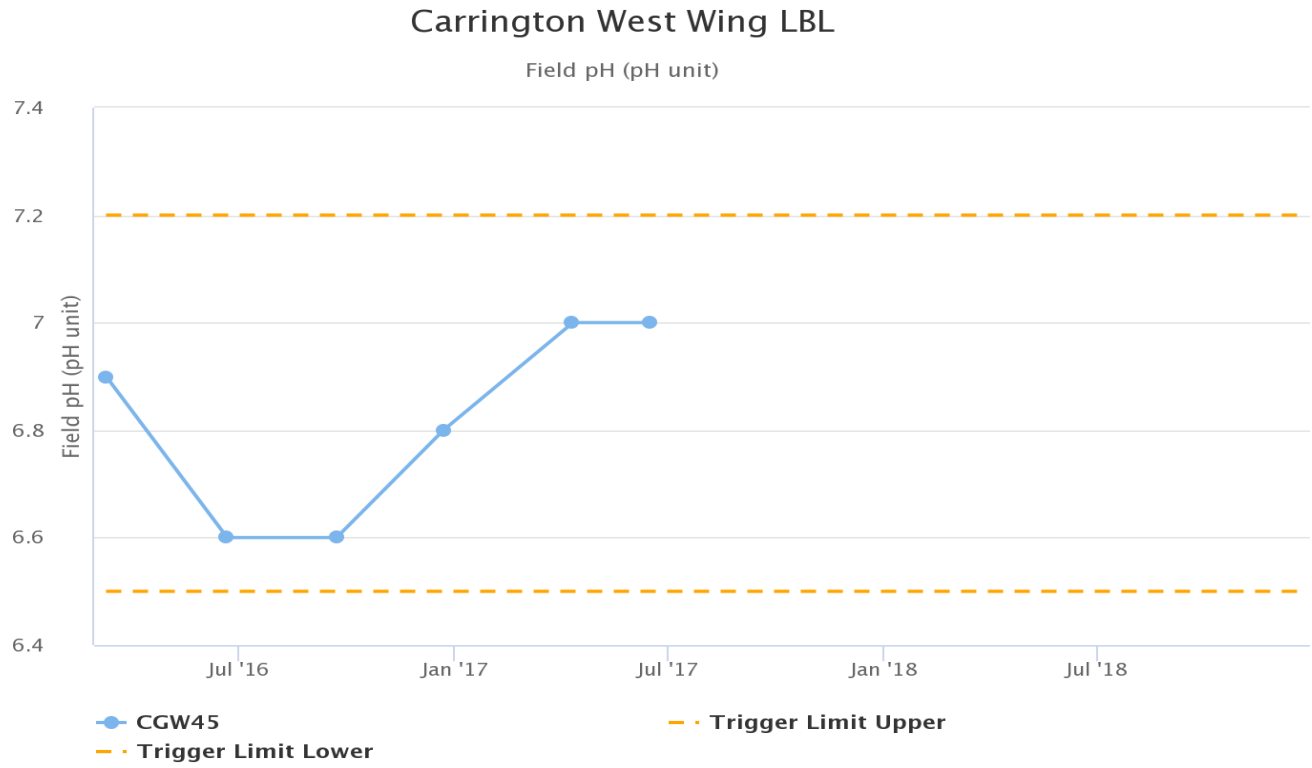

Figure 45: Carrington West Wing LBL pH Trend – December 2018

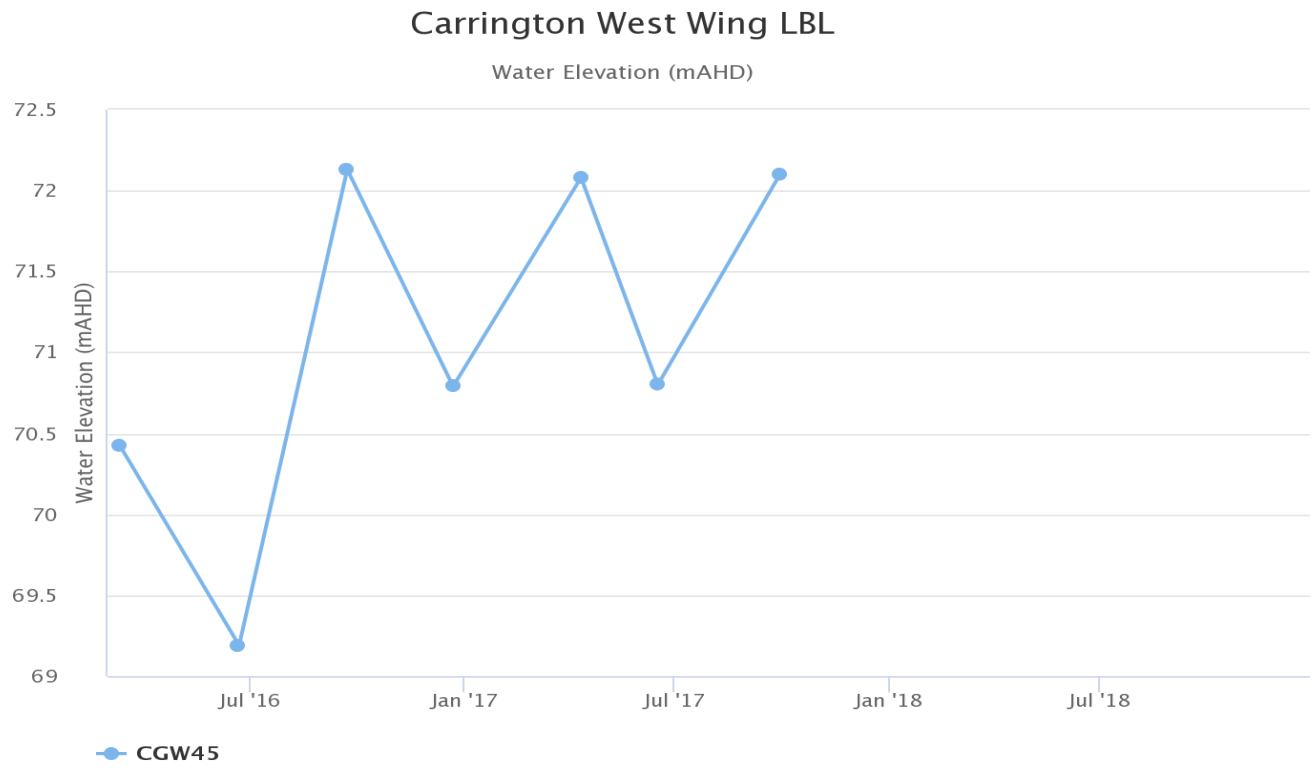

Figure 46: Carrington West Wing LBL Standing Water Level – December 2018

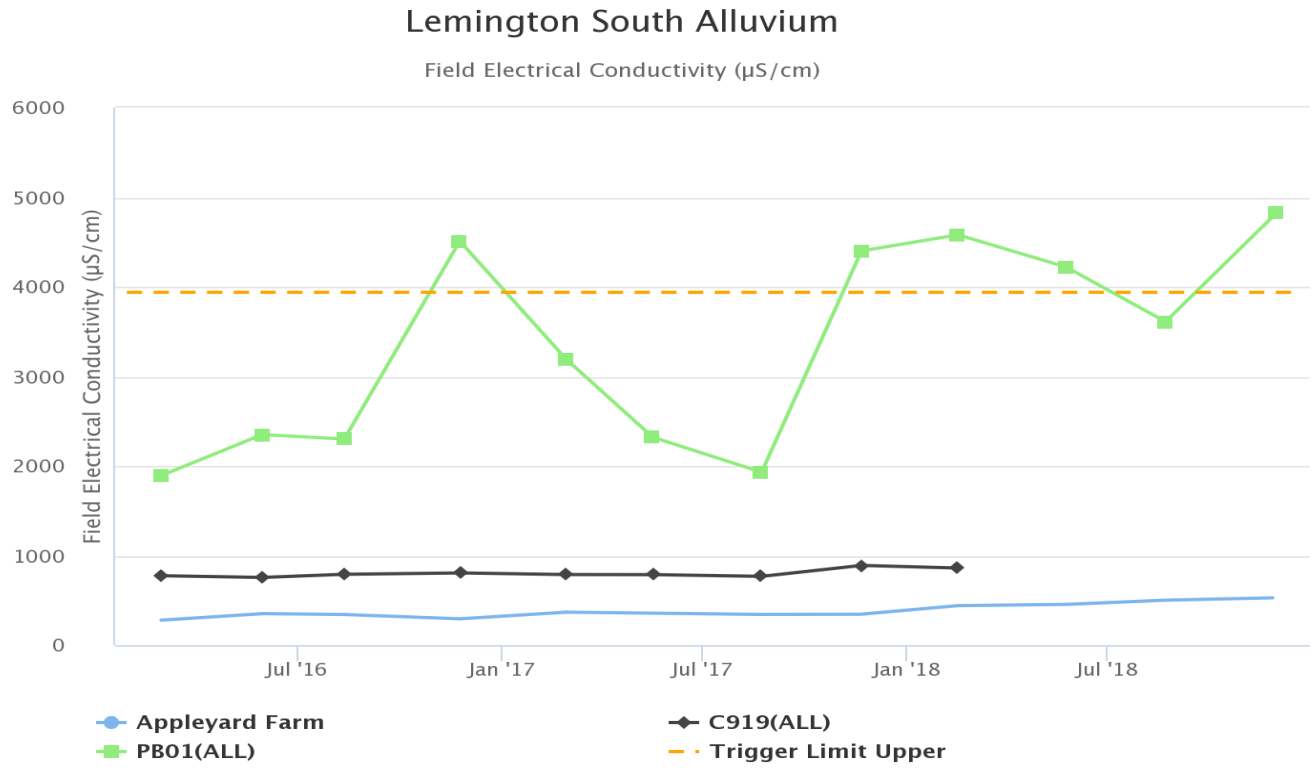

Figure 47: Lemington South Alluvium Electrical Conductivity Trend – December 2018

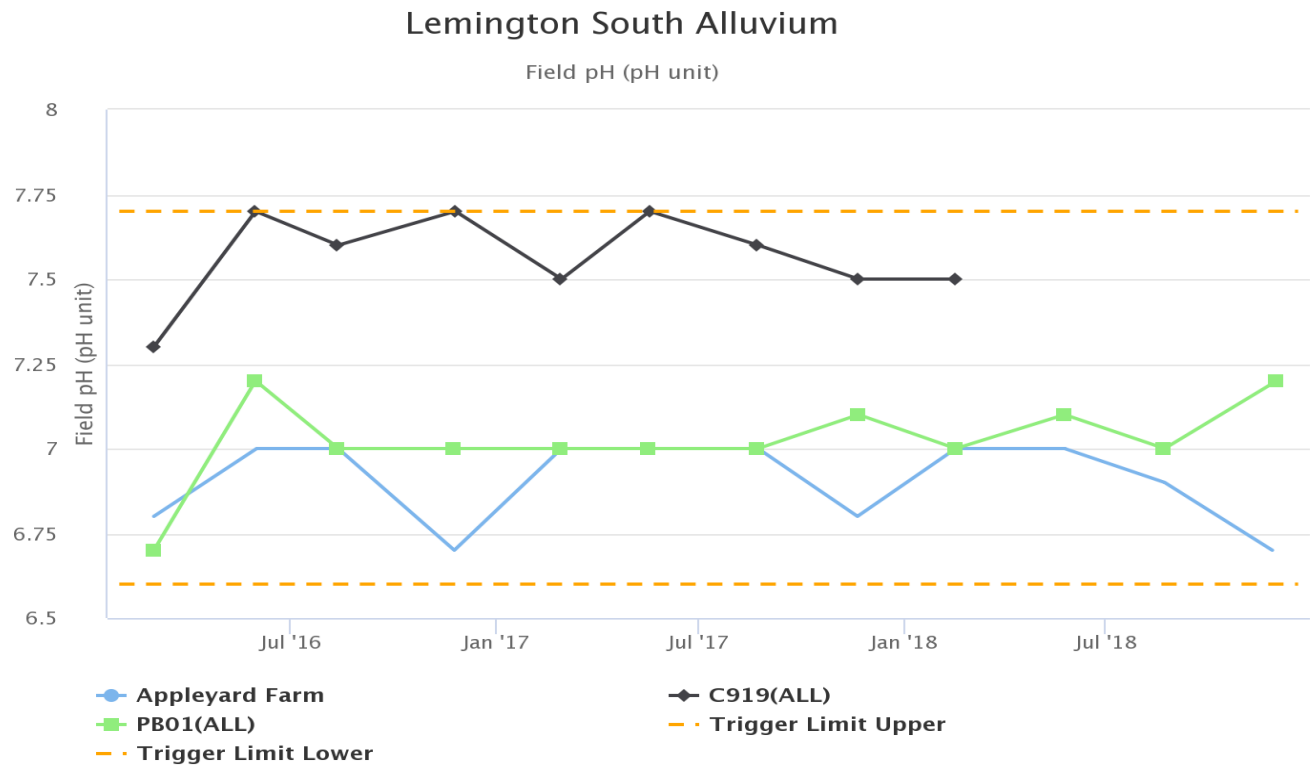

Figure 48: Lemington South Alluvium pH Trend – December 2018

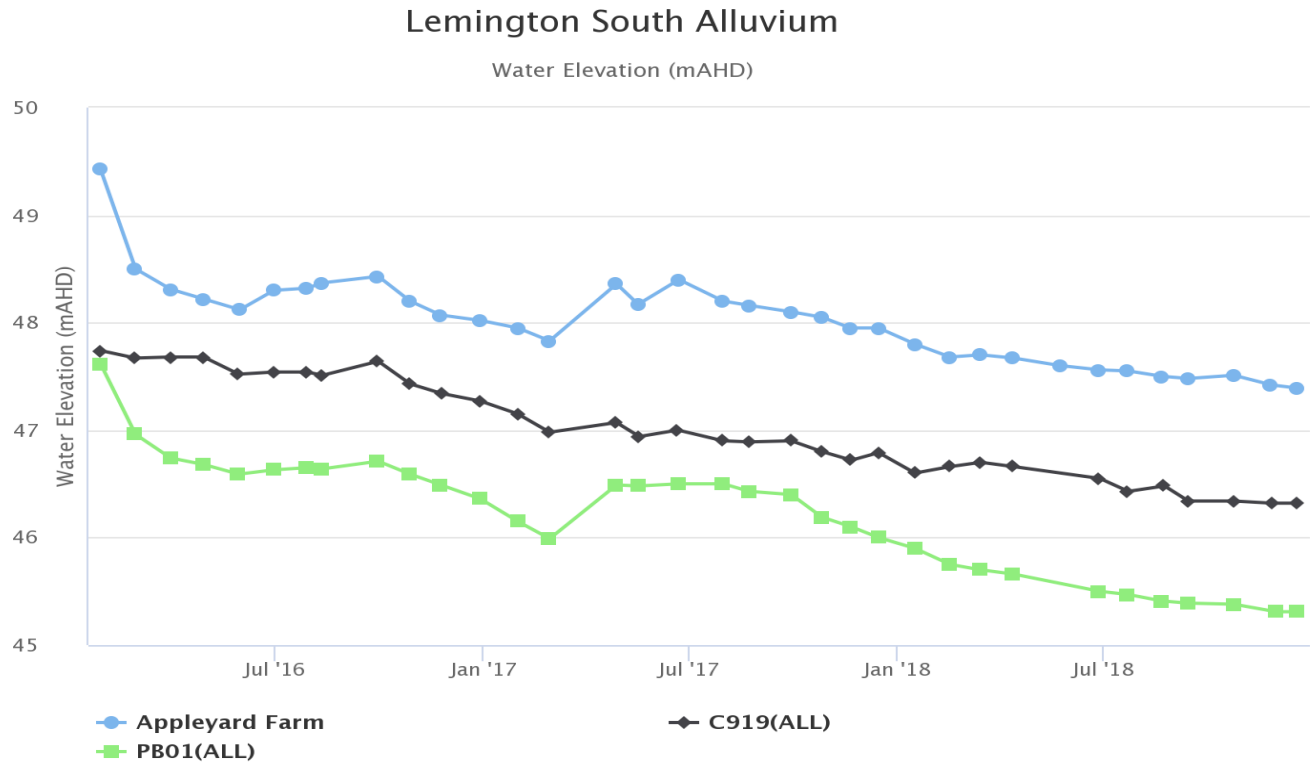

Figure 49: Lemington South Alluvium Standing Water Level Trend – December 2018

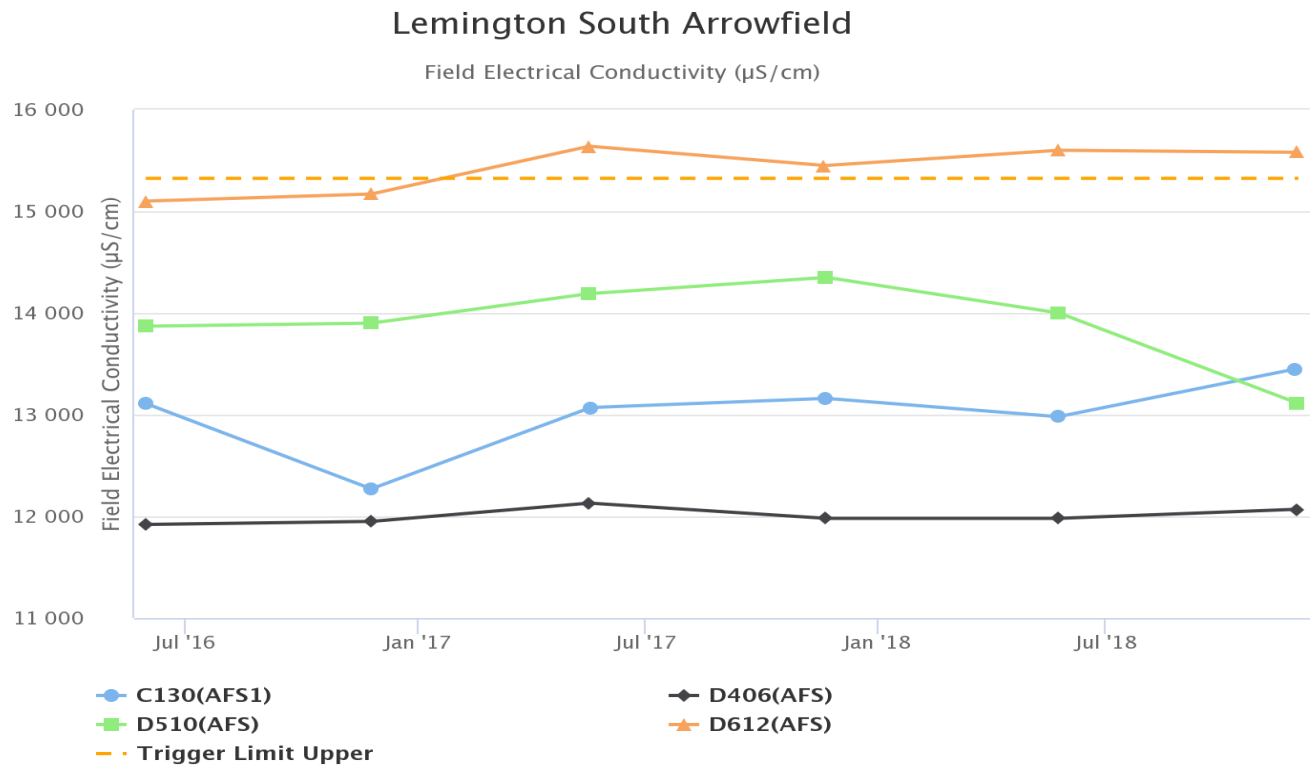

Figure 50: Lemington South Arrowfield Electrical Conductivity Trend – December 2018

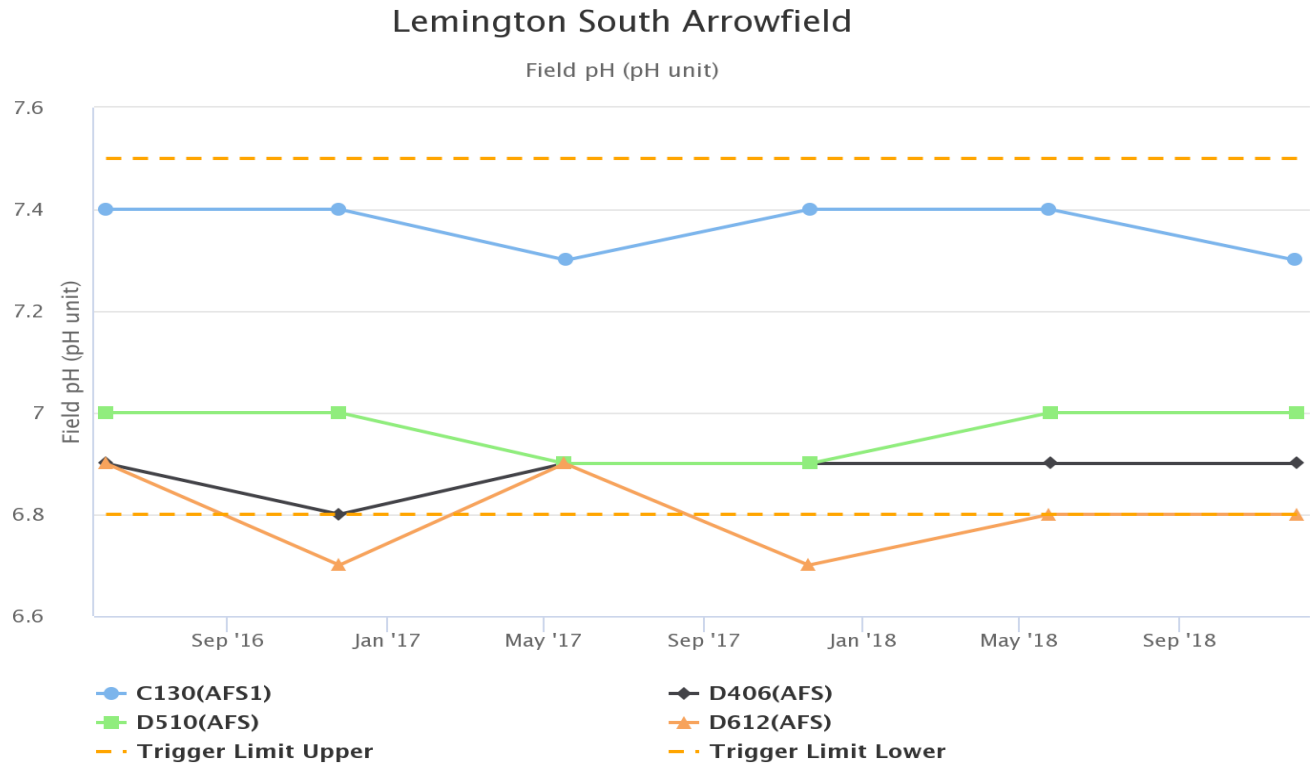

Figure 51: Lemington South Arrowfield pH Trend – December 2018

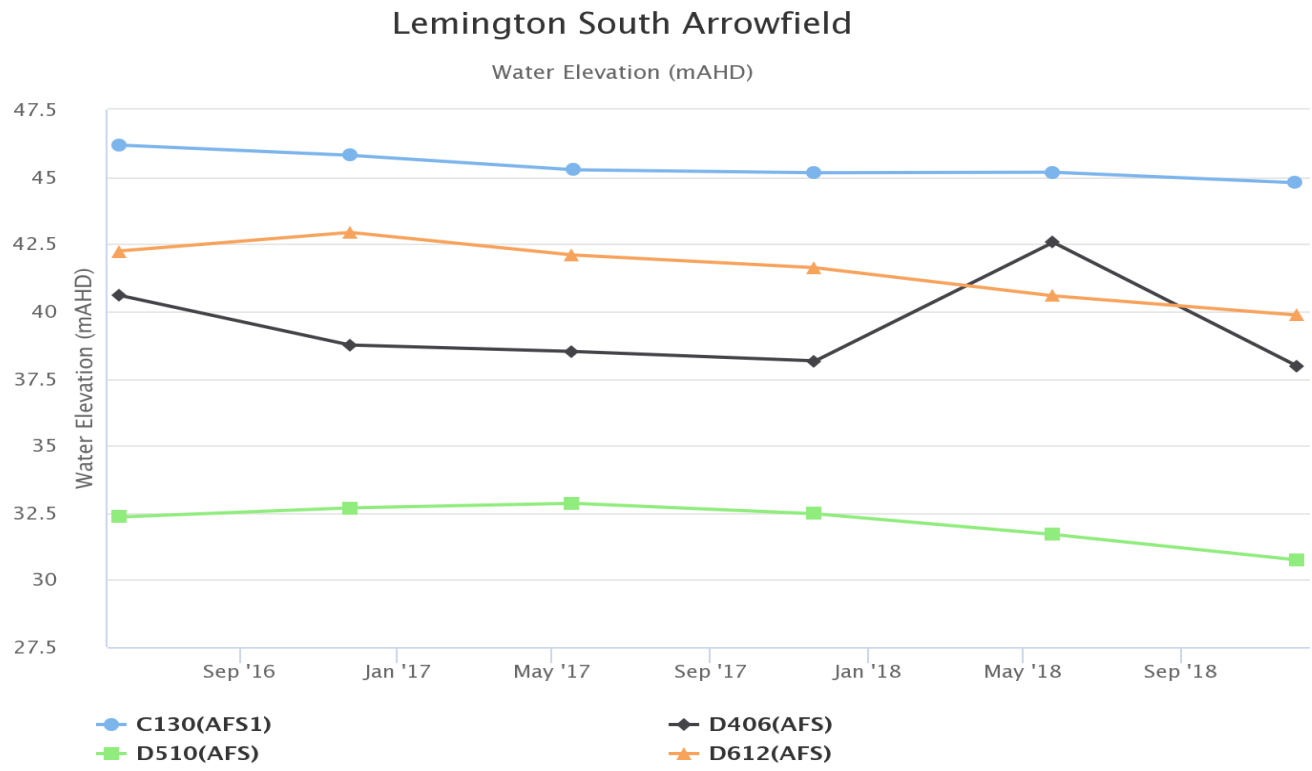

Figure 52: Lemington South Arrowfield Standing Water Level – December 2018

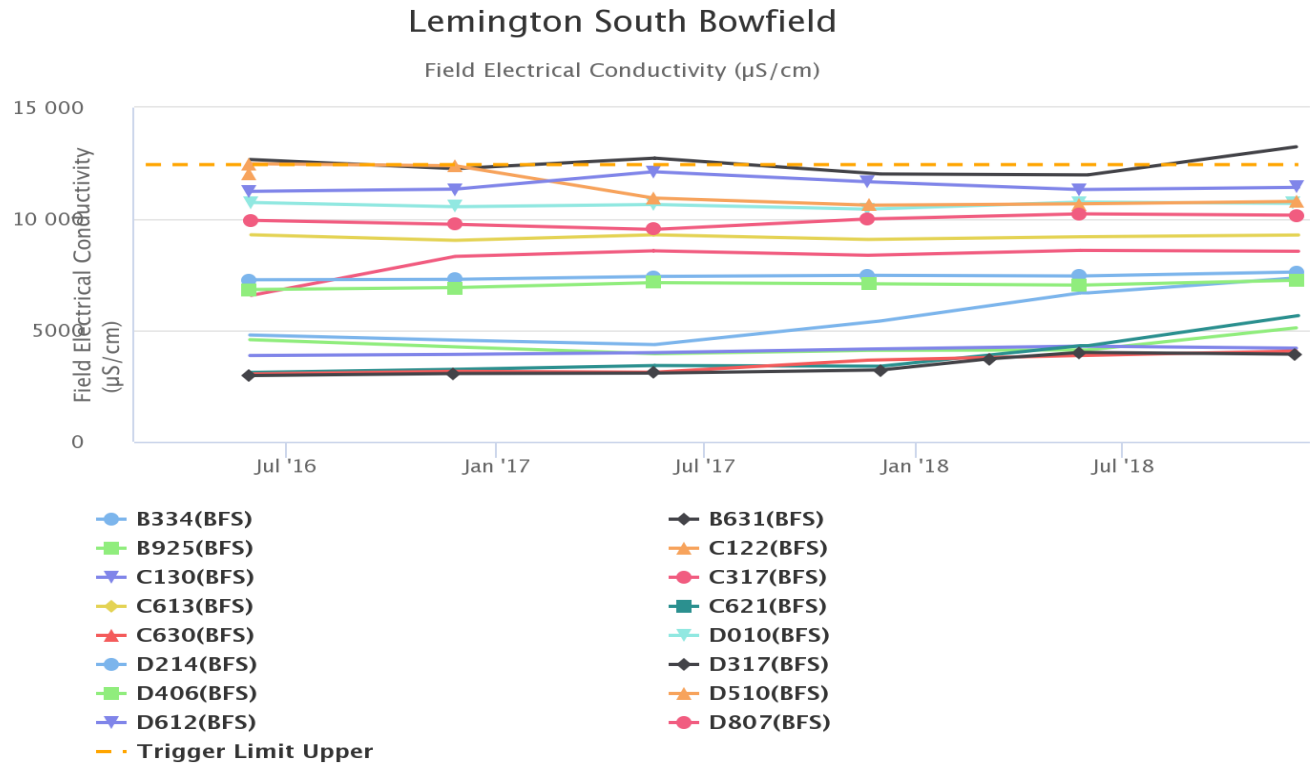

Figure 53: Lemington South Bowfield Electrical Conductivity Trend – December 2018

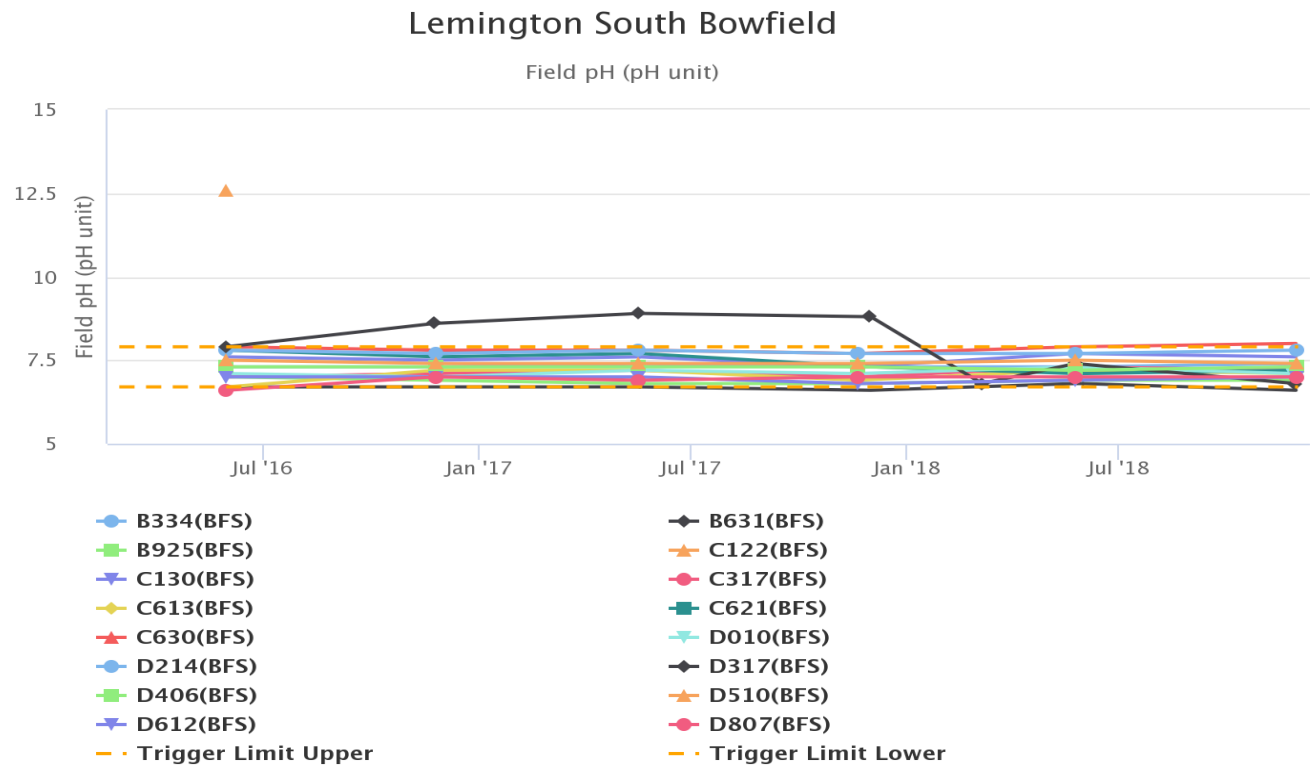

Figure 54: Lemington South Bowfield pH Trend – December 2018

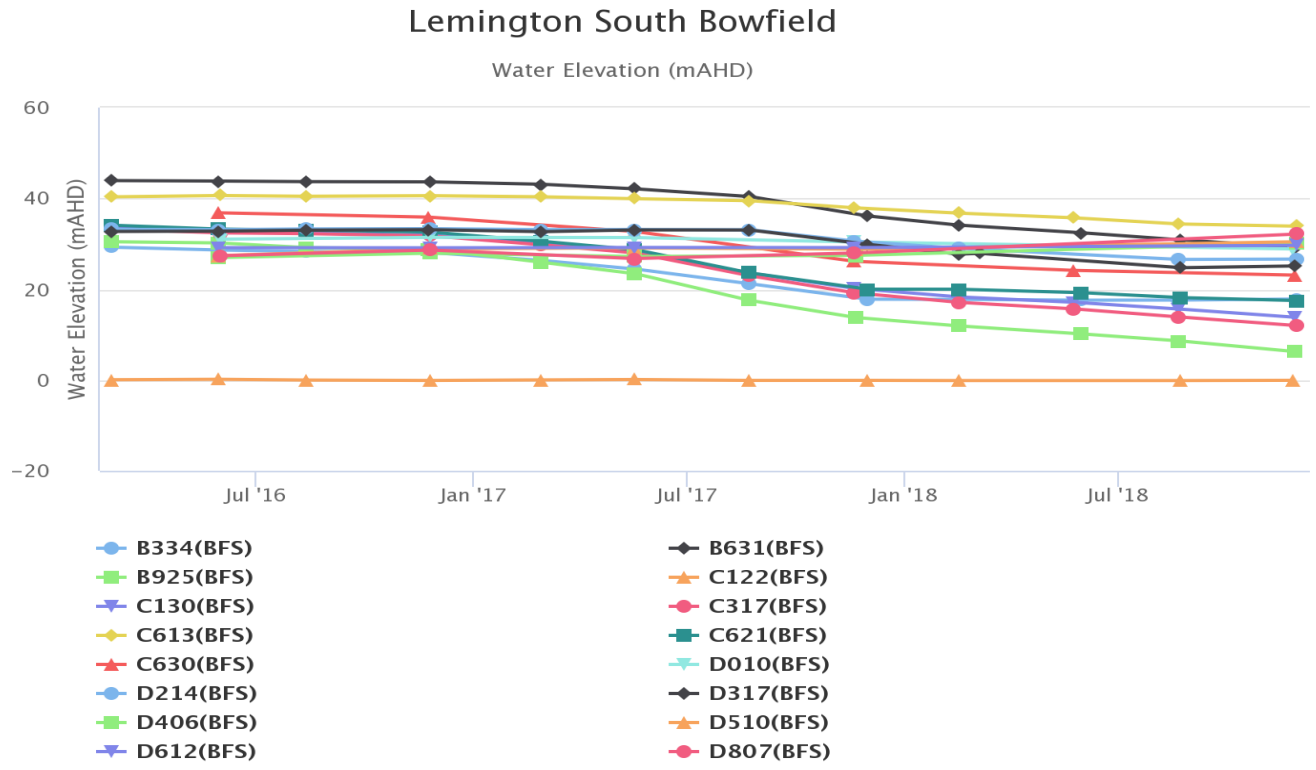

Figure 55: Lemington South Bowfield Standing Water Level – December 2018

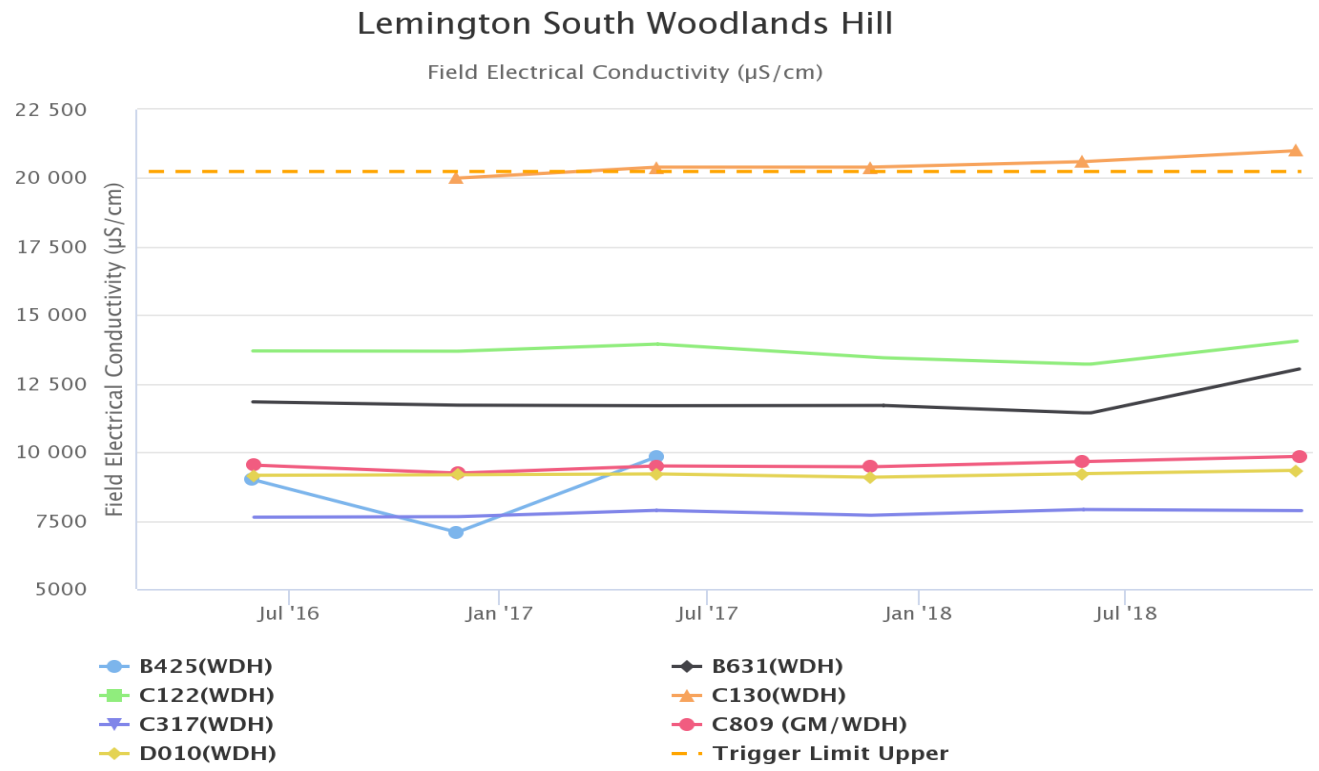

Figure 56: Lemington South Woodlands Hill Electrical Conductivity Trend – December 2018

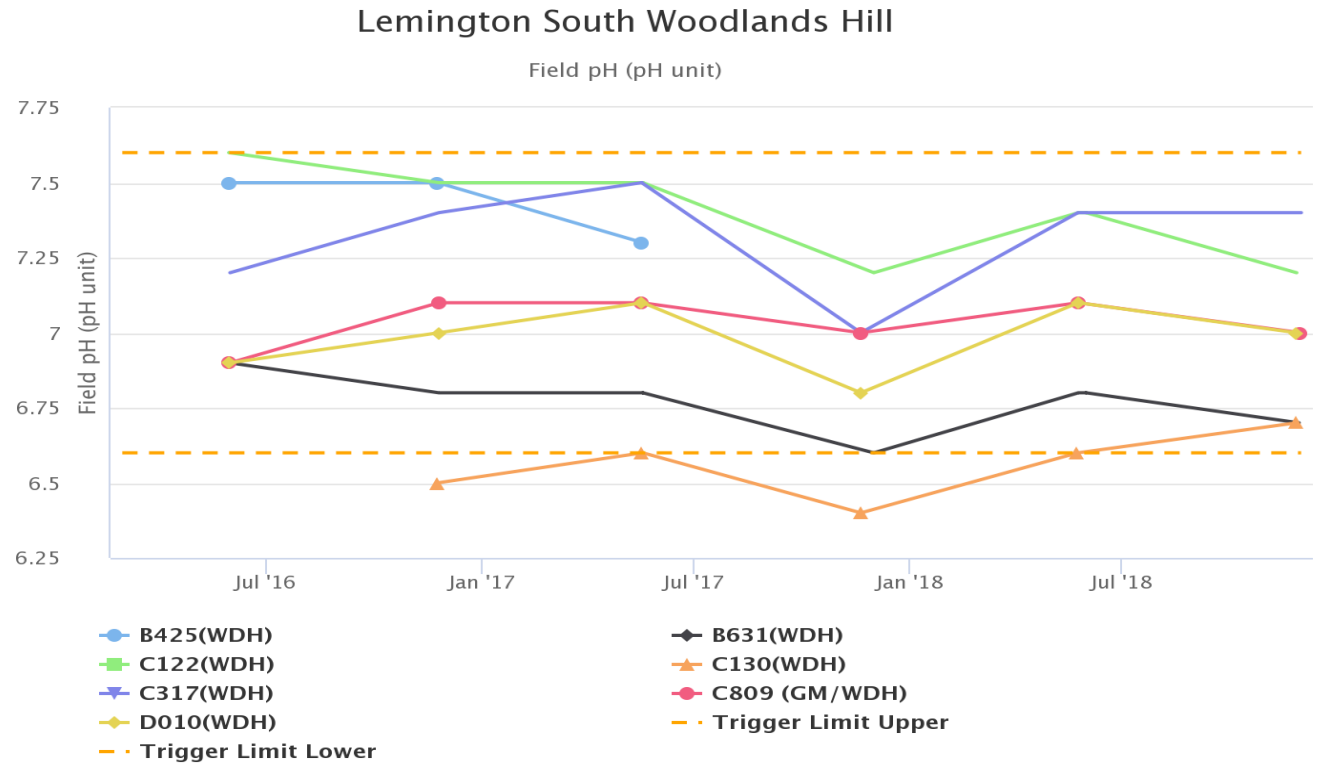

Figure 57: Lemington South Woodlands Hill pH Trend – December 2018

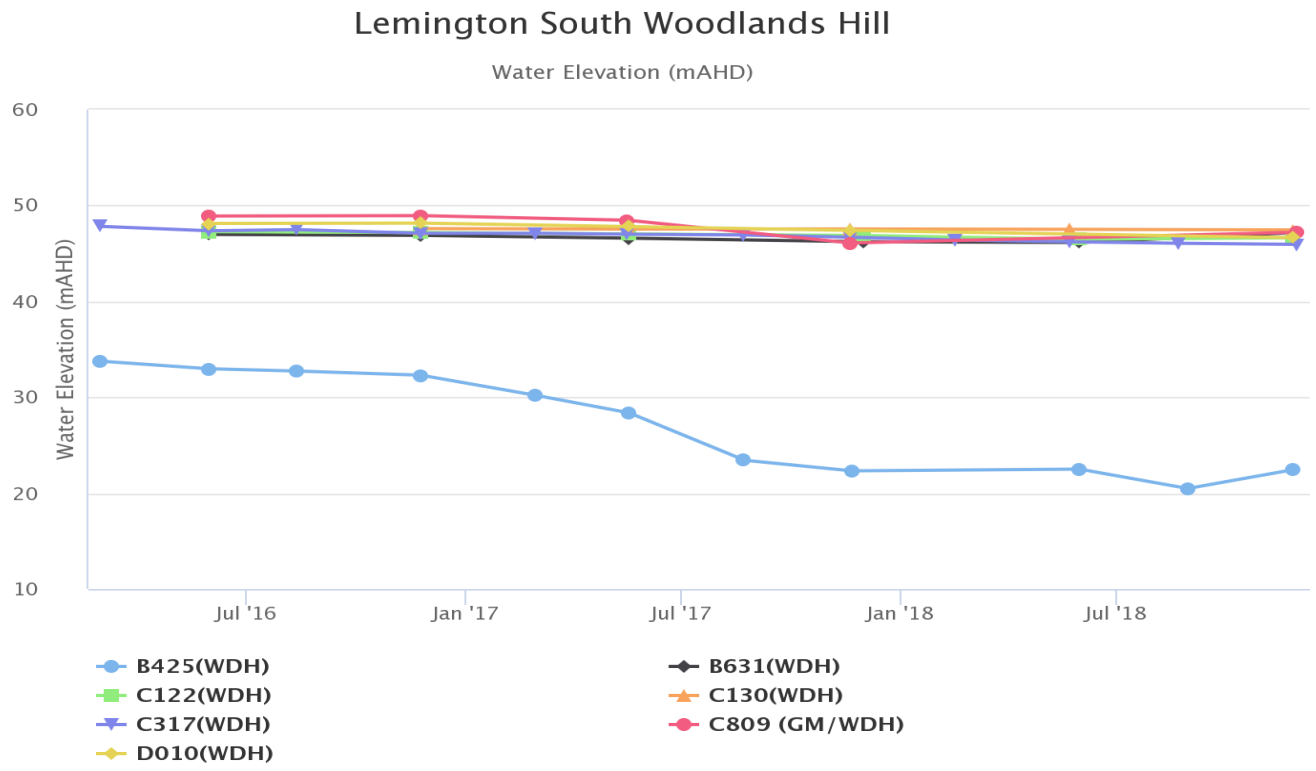

Figure 58: Lemington South Woodlands Hill Standing Water Level – December 2018

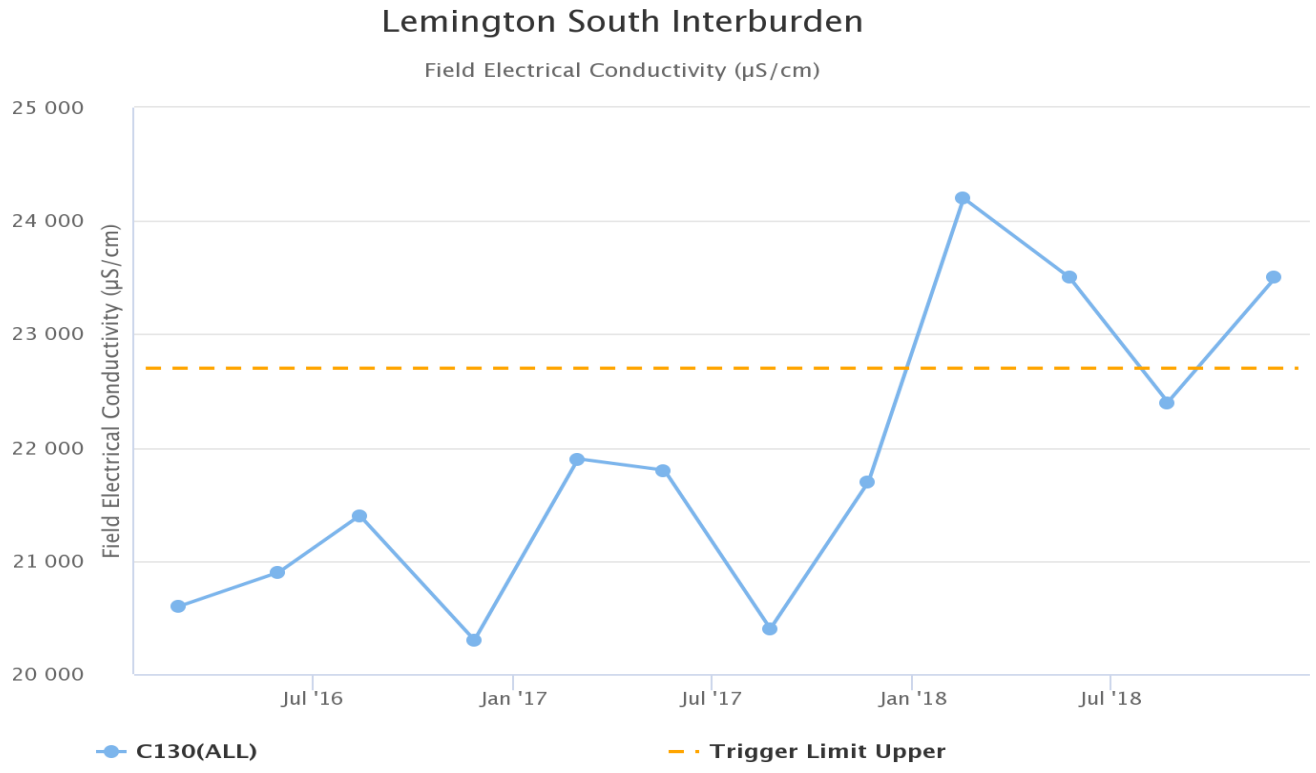

Figure 59: Lemington South Interburden Electrical Conductivity Trend – December 2018

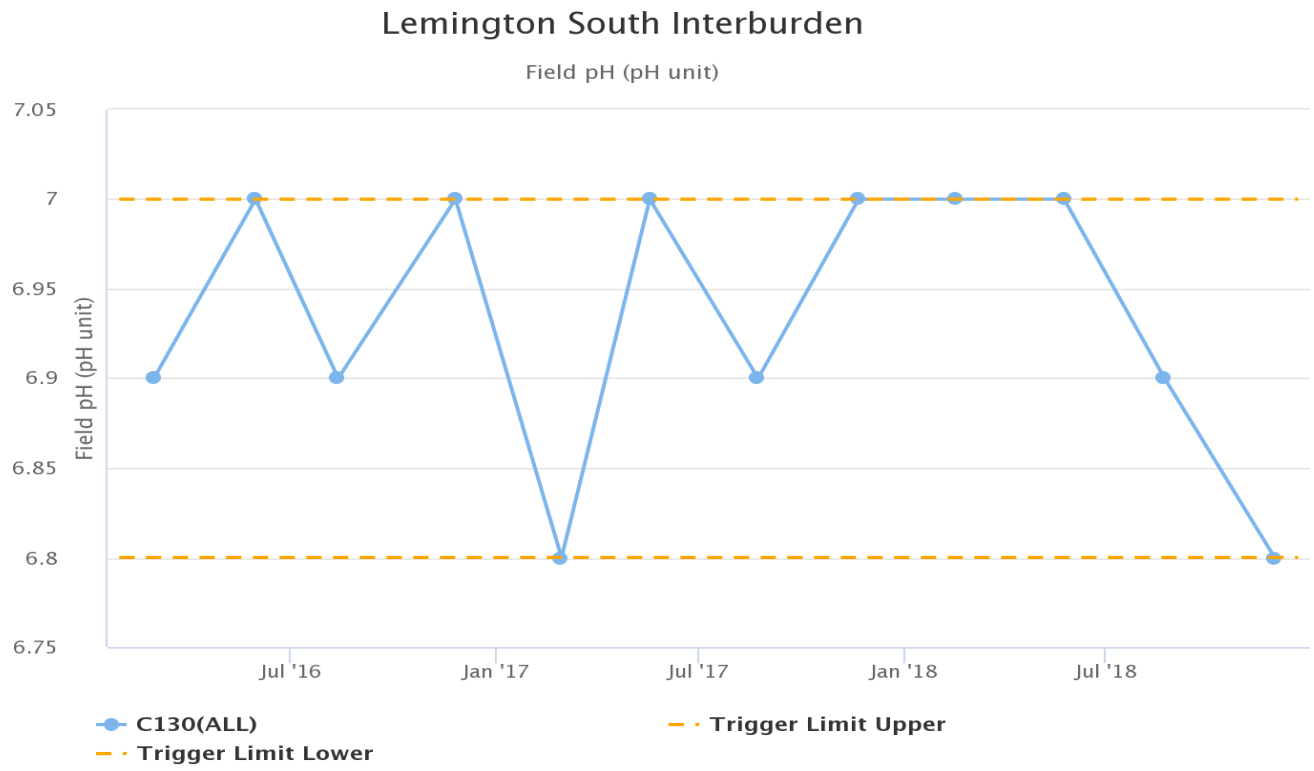

Figure 60: Lemington South Interburden pH Trend – December 2018

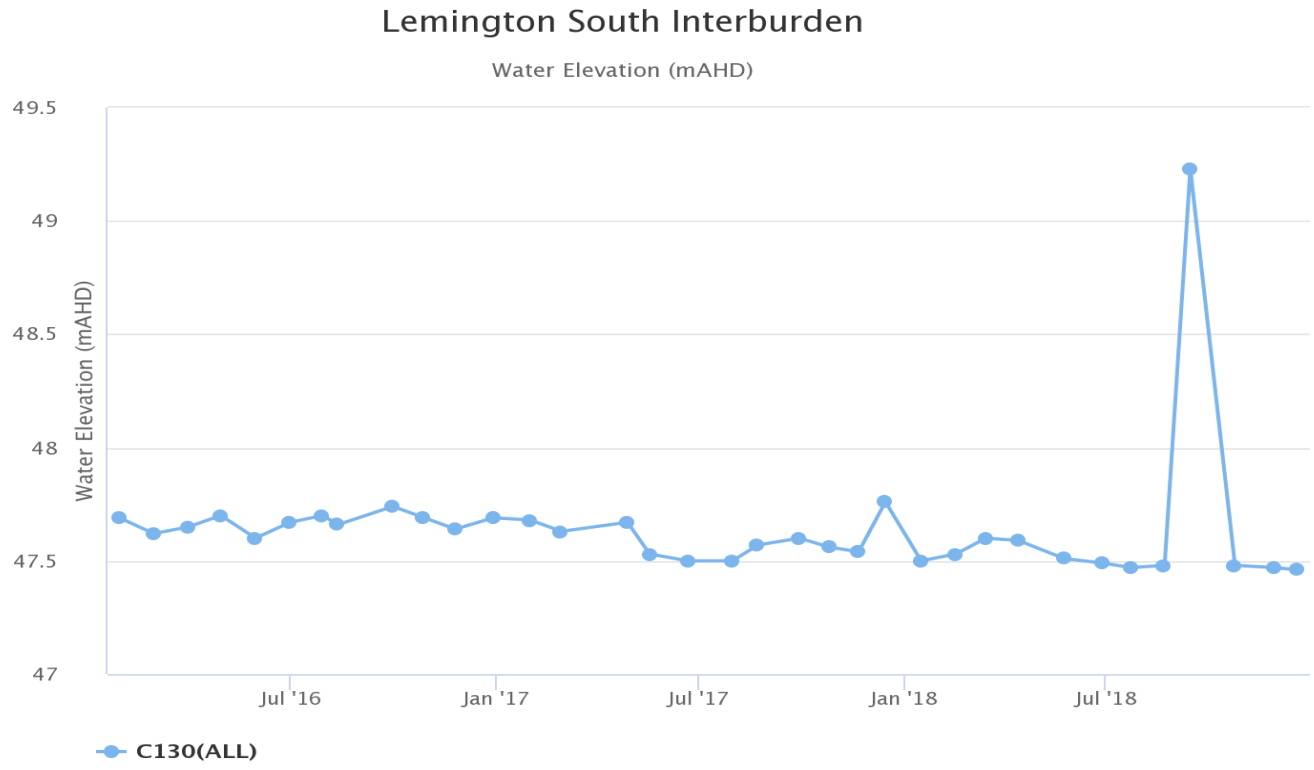

Figure 61: Lemington South Interburden Standing Water Level – December 2018

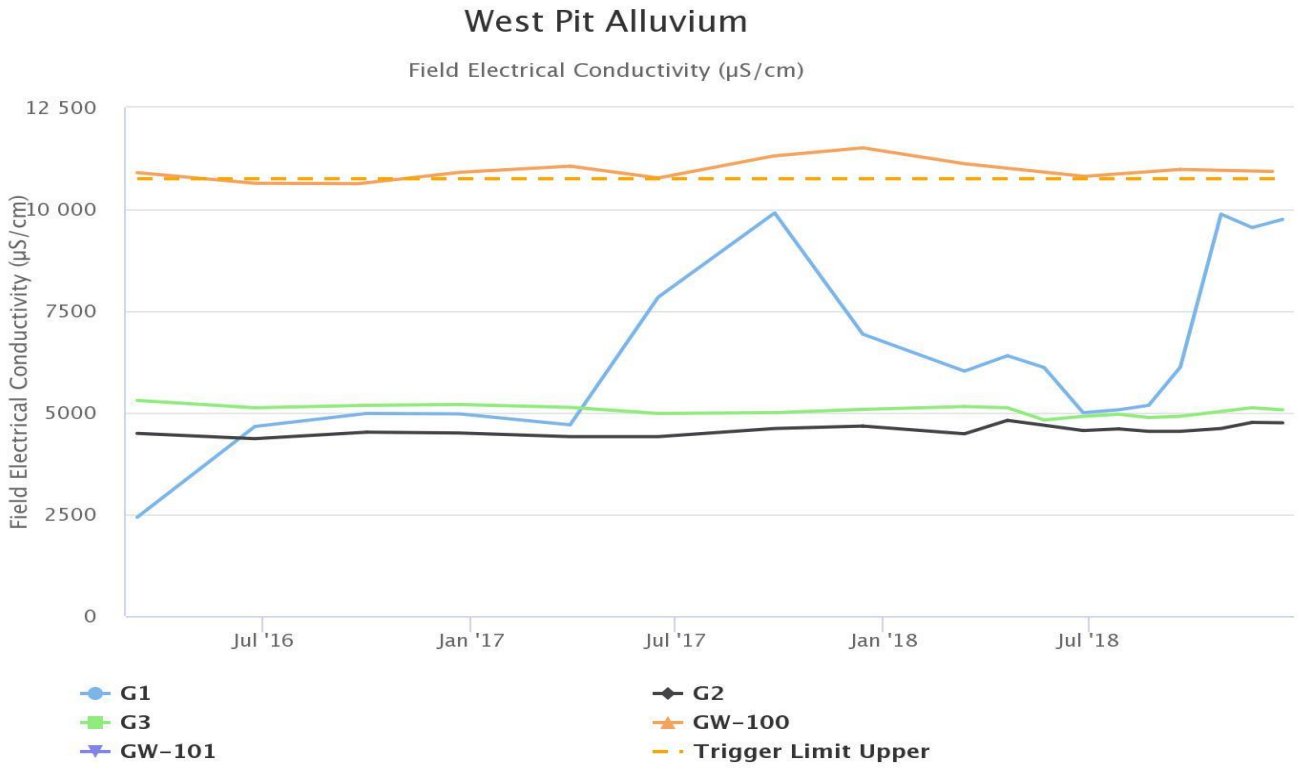

Figure 62: West Pit Alluvium Electrical Conductivity Trend – December 2018

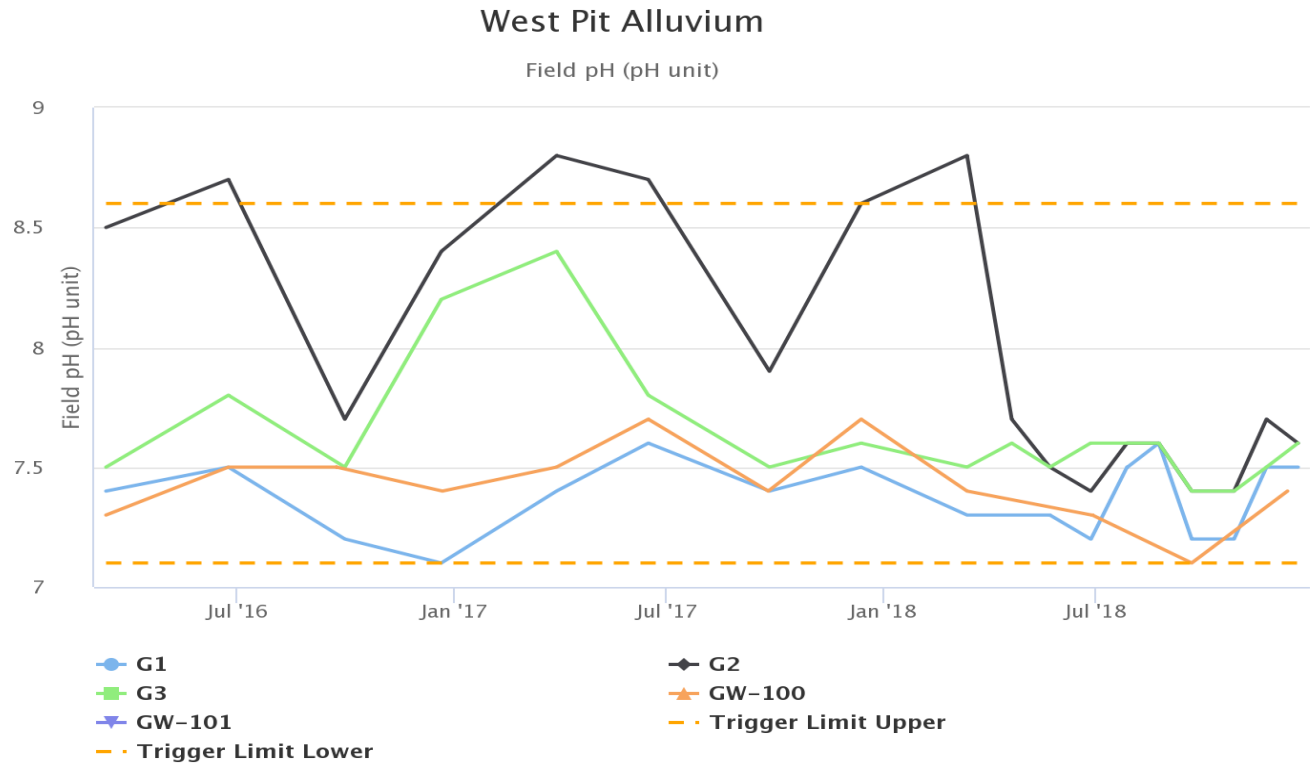

Figure 63: West Pit Alluvium pH Trend – December 2018

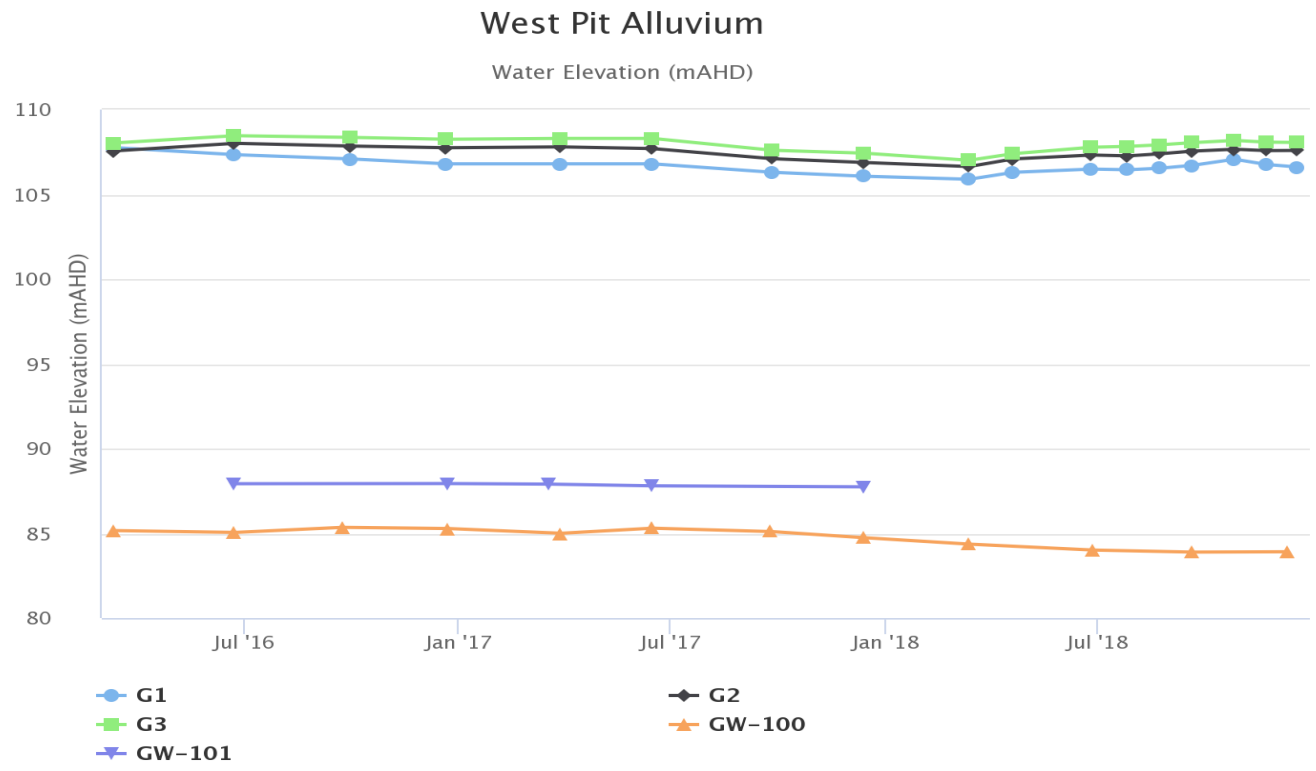

Figure 64: West Pit Alluvium Standing Water Level – December 2018

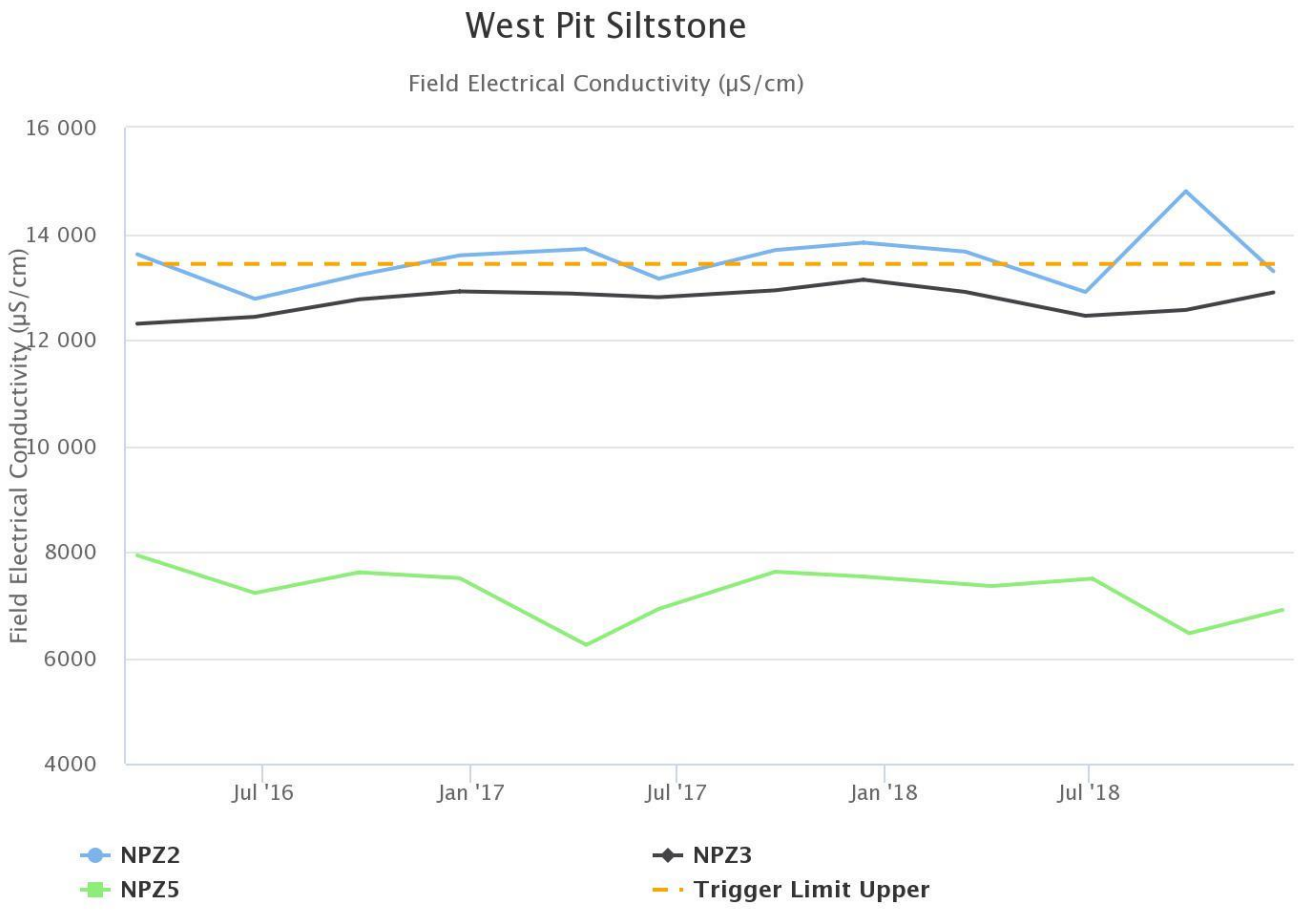

Figure 65: West Pit Siltstone Electrical Conductivity Trend – December 2018

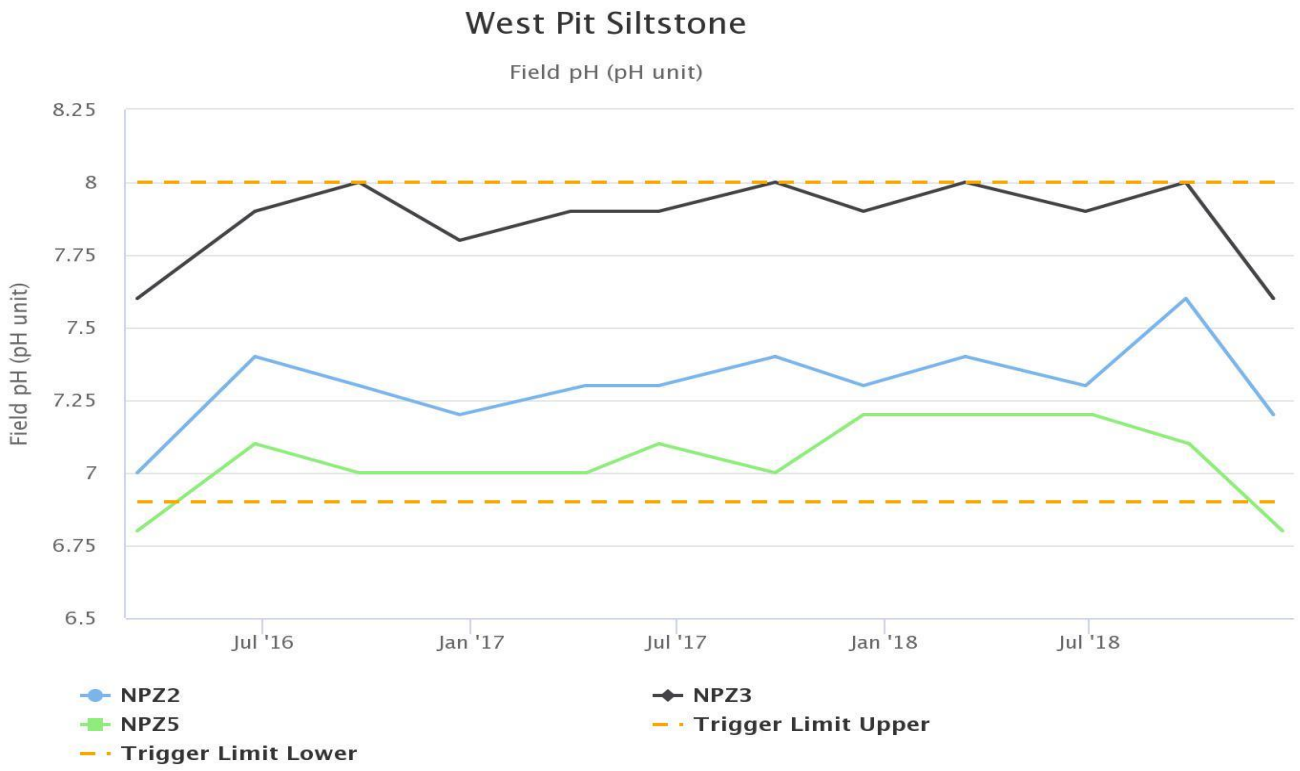

Figure 66: West Pit Siltstone pH Trend – December 2018

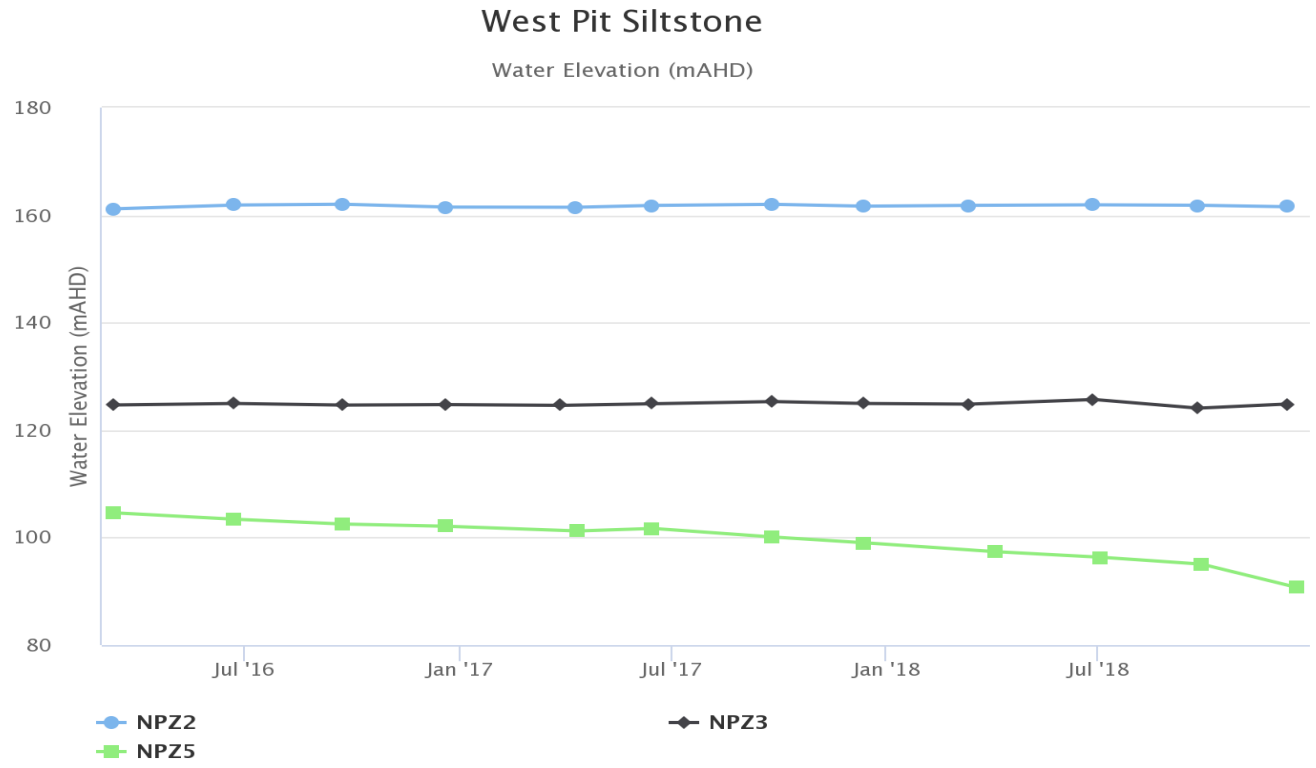

Figure 67: West Pit Siltstone Standing Water Level – December 2018

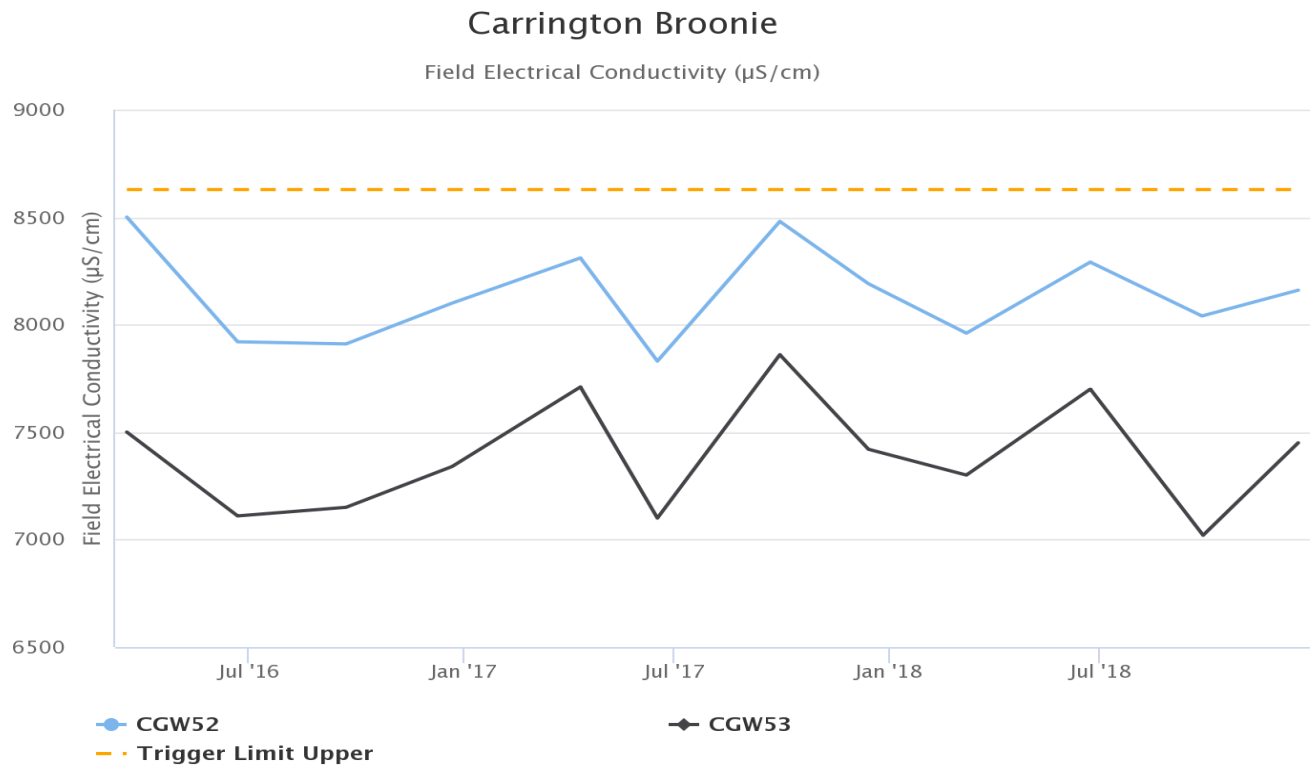

Figure 68: Carrington Broonie Electrical Conductivity Trend – December 2018

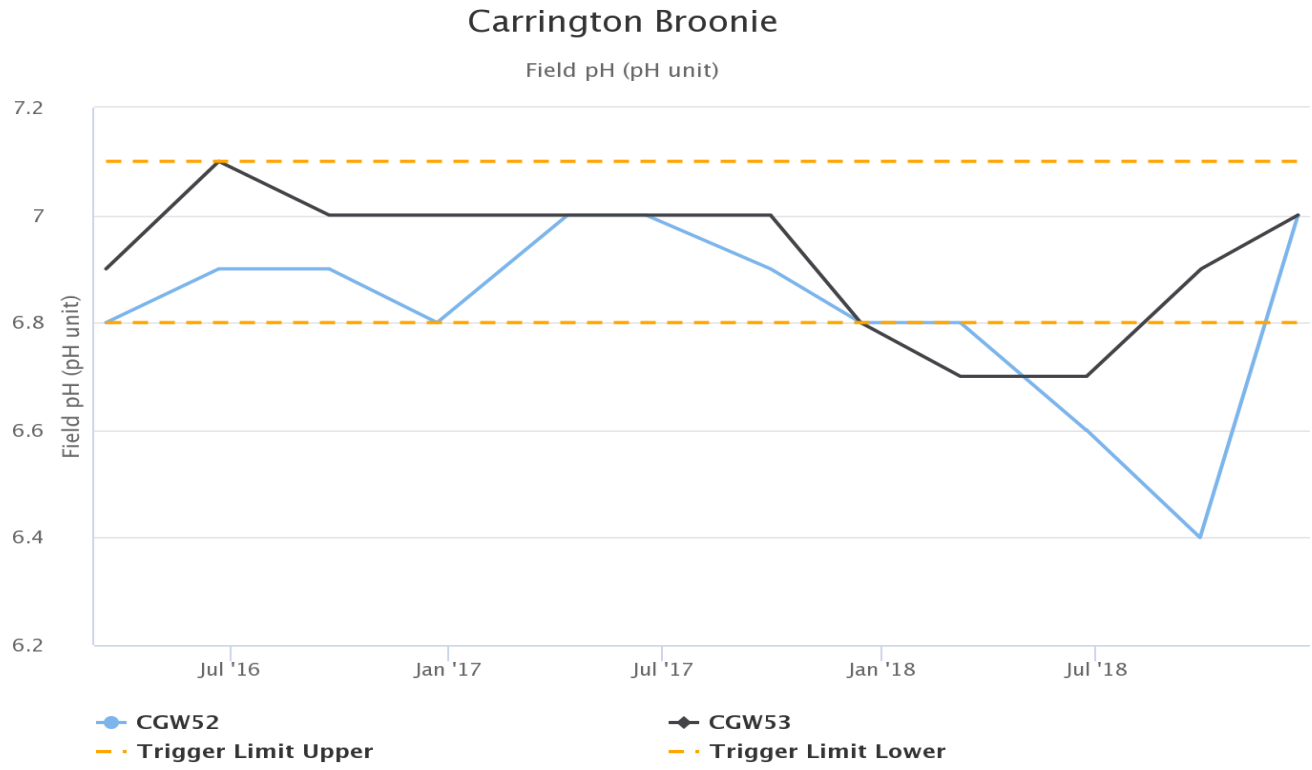

Figure 69: Carrington Broonie pH Trend – December 2018

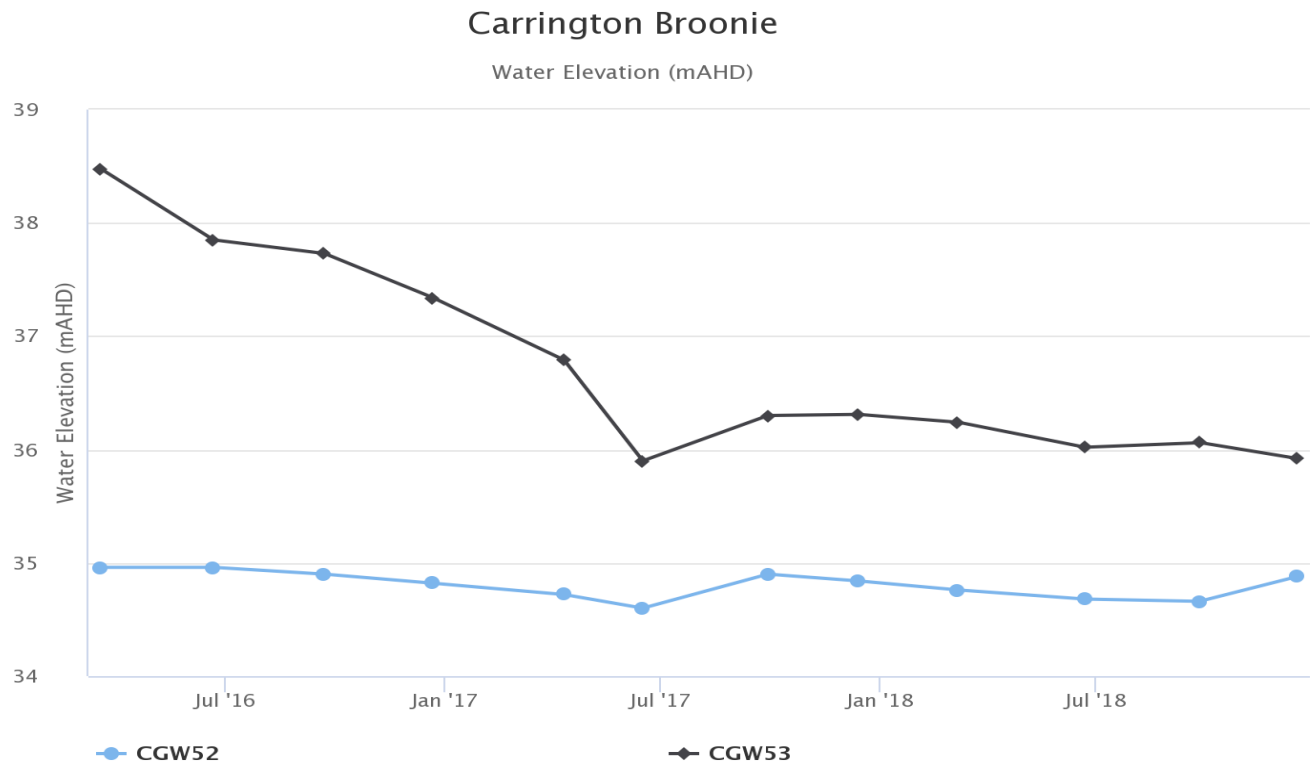

Figure 70: Carrington Broonie Standing Water Level – December 2018

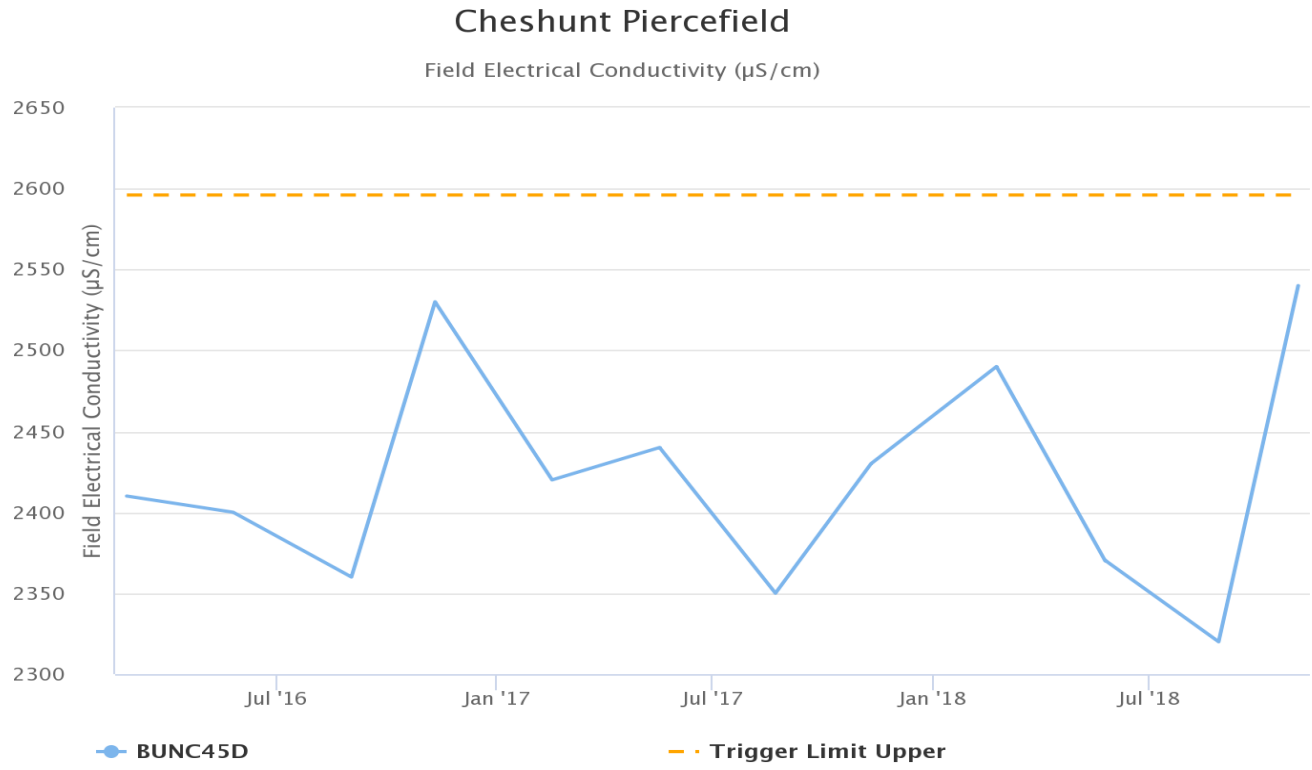

Figure 71: Cheshunt Piercefield Electrical Conductivity Trend – December 2018

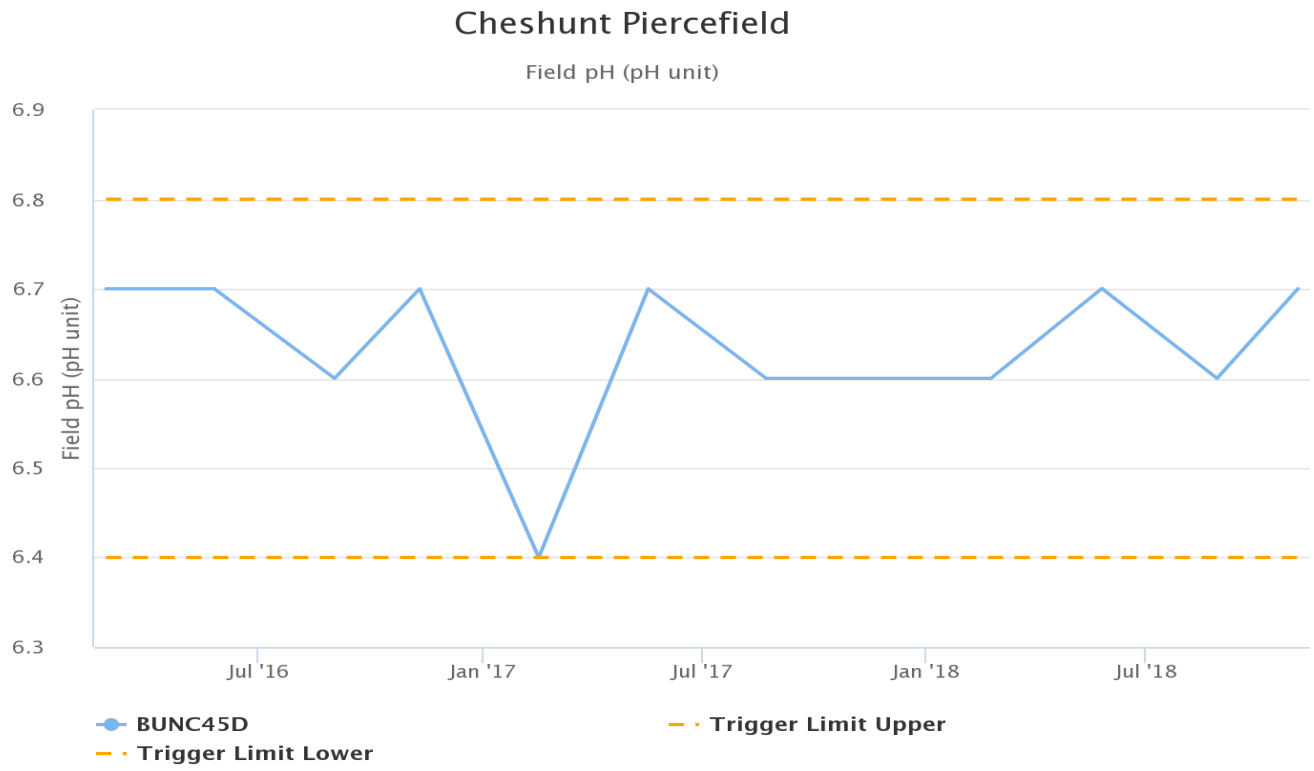

Figure 72: Cheshunt Piercefield pH Trend – December 2018

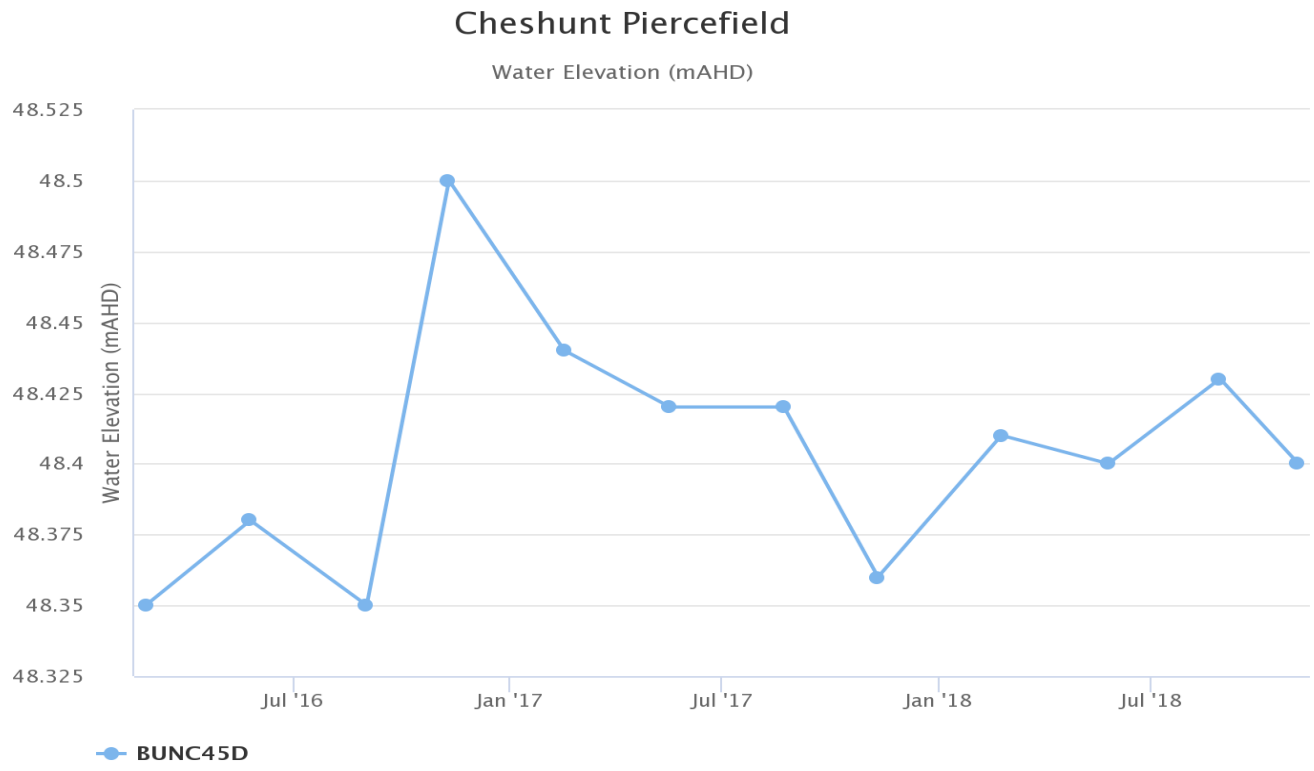

Figure 73: Cheshunt Piercefield Standing Water Level – December 2018

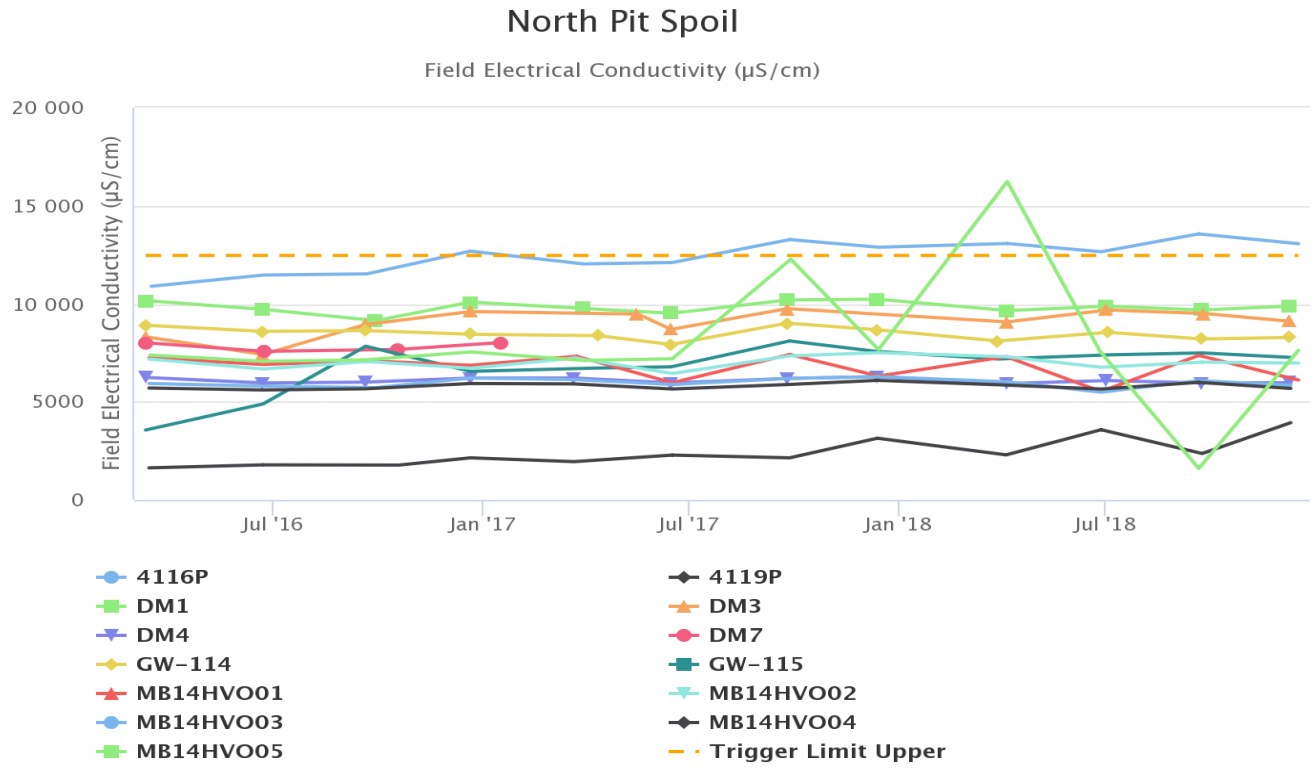

Figure 74: North Pit Spoil Electrical Conductivity Trend – December 2018

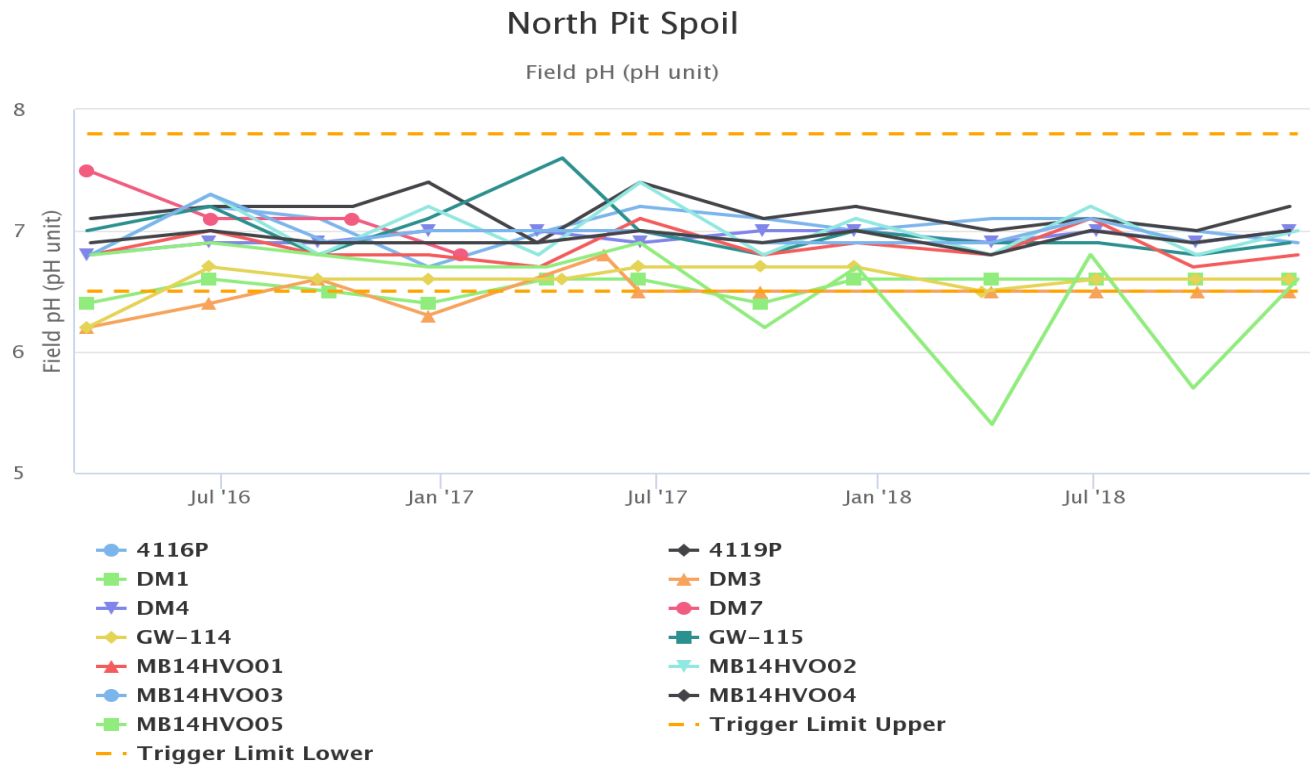

Figure 75: North Pit Spoil pH Trend – December 2018

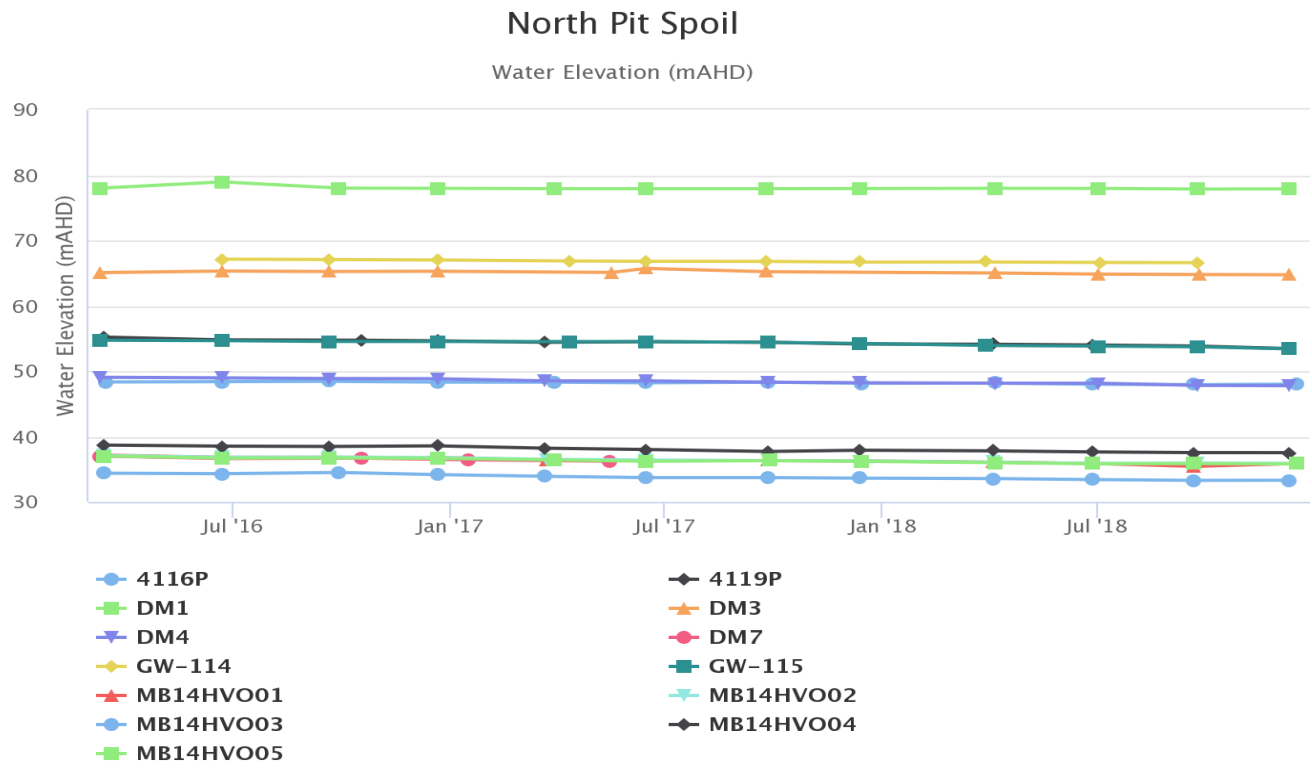

Figure 76: North Pit Spoil Standing Water Level – December 2018

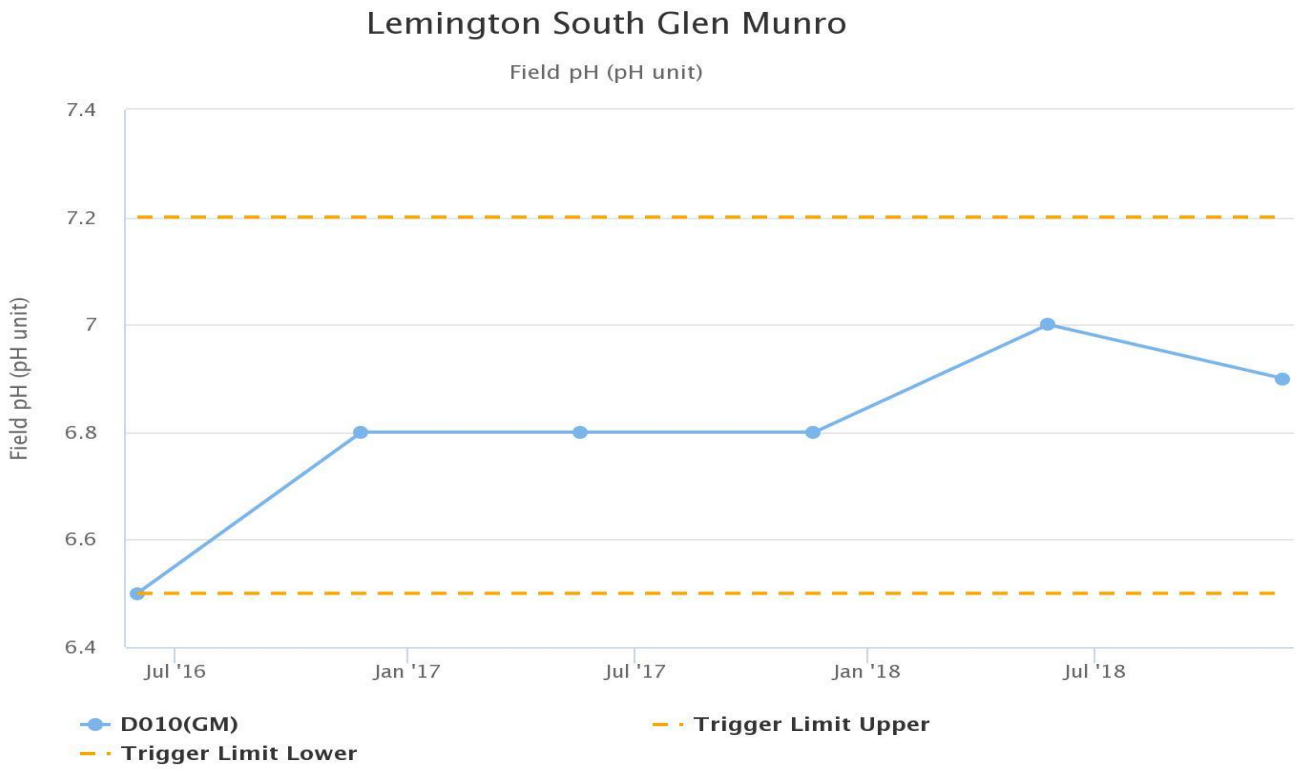

Figure 77: Lemington South Glen Munro pH Trend – December 2018

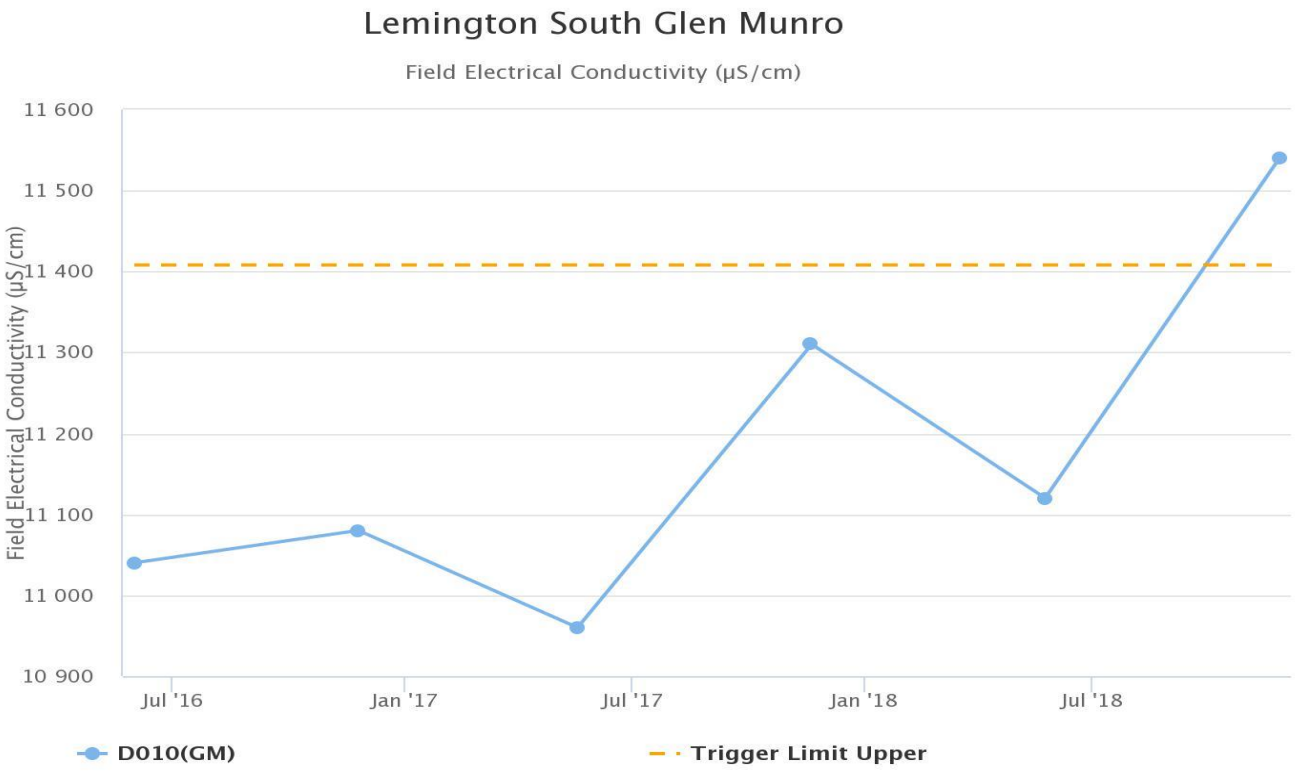

Figure 78: Lemington South Glen Munro Electrical Conductivity Trend – December 2018

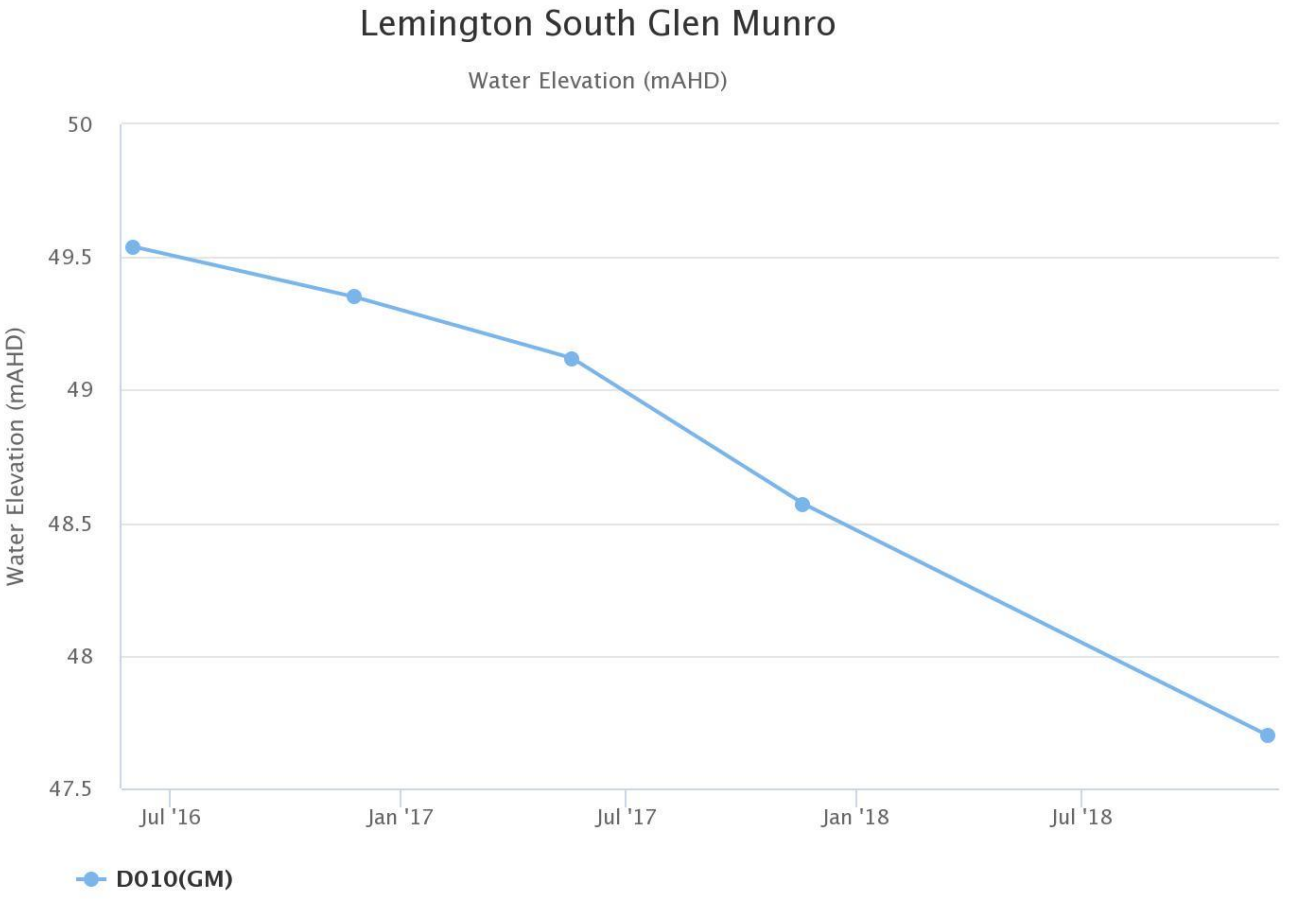

Figure 79: Lemington South Glen Munro Standing Water Level Trend – December 2018

4.2.1 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 limits breaches are summarised in Table 4.

Table 4: Groundwater Triggers – Q4 2018

Site	Date	Trigger Limit Breached	Action Taken in Response
CFW55R	25/10/2018 – 27/12/2018	EC – 95th Percentile	Investigation in progress
CFW55R	25/10/2018 – 27/12/2018	pH – 5th Percentile	Investigation in progress
CGW51a	27/12/2018	pH – 95th Percentile	1st exceedance. Watching Brief*
B631(BFS)	28/11/2018	EC – 95th Percentile	1st exceedance. Watching Brief*
BZ3-3	9/11/2018	pH – 5th Percentile	1st exceedance. Watching Brief*
C130(WDH)	28/11/2018	EC – 95th Percentile	Investigation in progress
D612(AFS)	30/11/2018	EC – 95th Percentile	Investigation in progress
D010 (GM)	26/11/2018	EC – 95th Percentile	1st exceedance. Watching Brief*
C130(ALL)	28/11/2018	EC – 95th Percentile	1st exceedance. Watching Brief*
PBO1(ALL)	30/11/2018	EC – 95th Percentile	Investigation in progress
4116P	17/12/2018	EC – 95th Percentile	Investigation in progress
C630(BFS)	28/11/2018	pH – 95th Percentile	2nd exceedance. Watching Brief*
BZ8-2	9/11/2018	pH – 5th Percentile	1st exceedance. Watching Brief*
HG2	9/11/2018	pH – 5th Percentile	1st exceedance. Watching Brief*
BZ1-1	9/11/2018	pH – 95th Percentile	1st exceedance. Watching Brief*
Hobdens Well	2/11/2018	pH – 95th Percentile	1st exceedance. Watching Brief*
NPz5	18/12/2018	pH – 5th Percentile	1st exceedance. Watching Brief*
GA3	17/12/2018	pH – 5th Percentile	1st exceedance. Watching Brief*

HV3 (2)	17/12/2018	pH – 5th Percentile	1st exceedance. Watching Brief*
GW-100	10/12/2018	EC – 95th Percentile	1st exceedance. Watching Brief*

* = Watching brief established pending outcomes of subsequent monitoring events. No specific actions required.

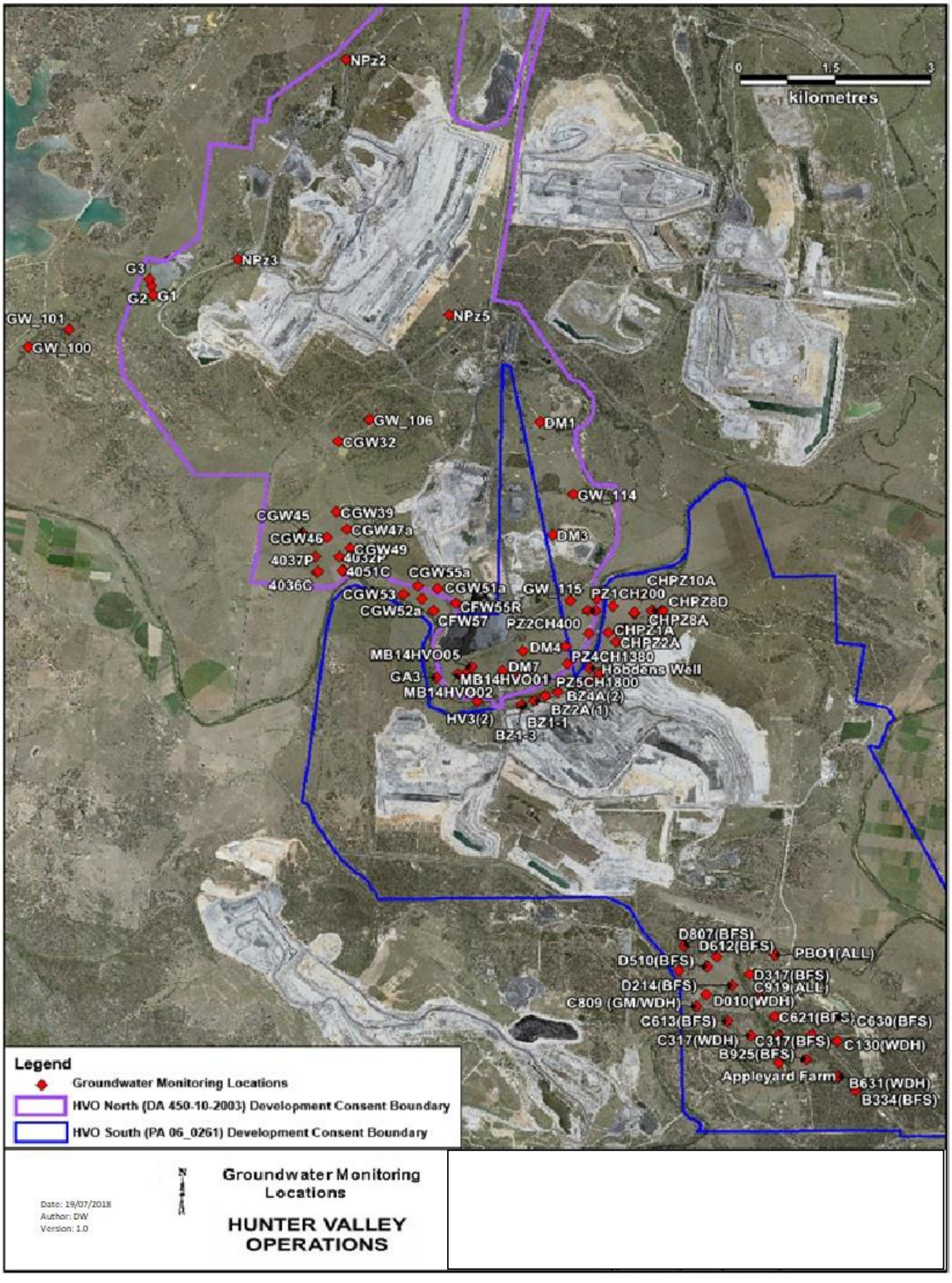

Figure 80: Groundwater Monitoring Location Plan

5.0 BLASTING

5.1.1 Blast Monitoring

HVO have a network of five blast monitoring units. These are located at nearby privately owned residences and function as regulatory compliance monitors. The location of these monitors can be found in Figure 86.

During December, 14 blasts were initiated at HVO. Figure 81 through to Figure 85 show the blast monitoring results for the reporting period against the impact assessment criteria. The criteria are summarised in Table 5.

On 18 December, the Knodlers Lane blast monitor failed to capture both overpressure and vibration results for the shot at 13:19 and vibration data for the shot at 13:18. Further discussion about this incident are discussed in Section 10.

Table 5: Blasting Limits

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

During the reporting period there were no exceedances of the airblast overpressure or ground vibration criteria.

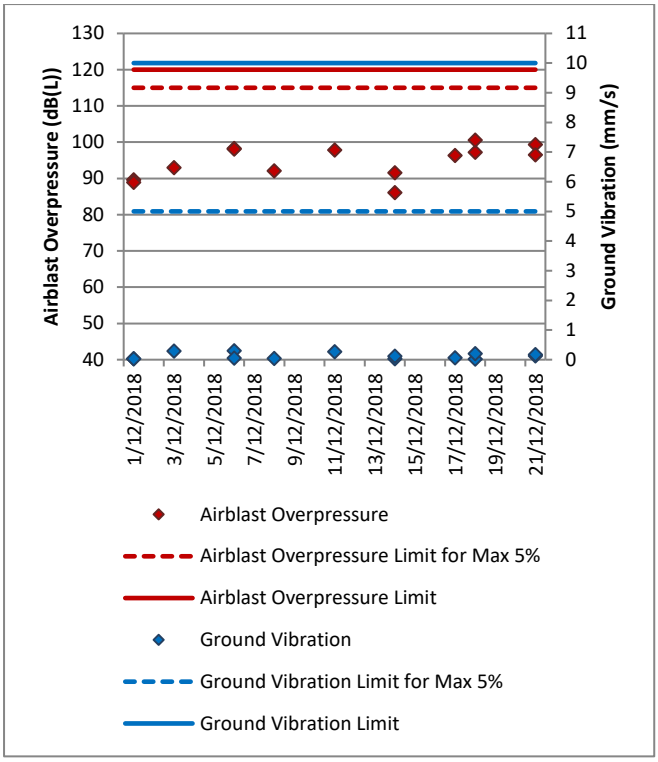

Figure 81: Moses Crossing Blast Monitoring Results – December 2018

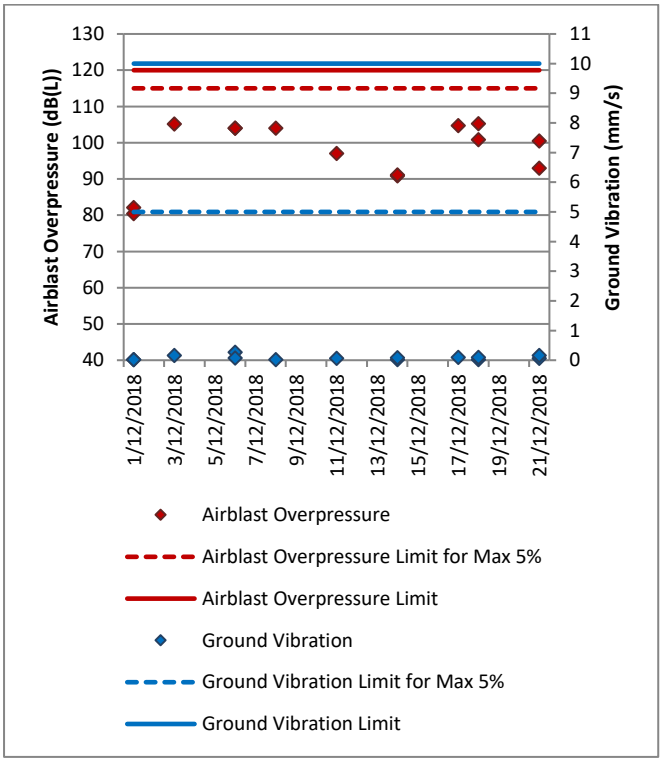

Figure 82: Jerrys Plains Blast Monitoring Results – December 2018

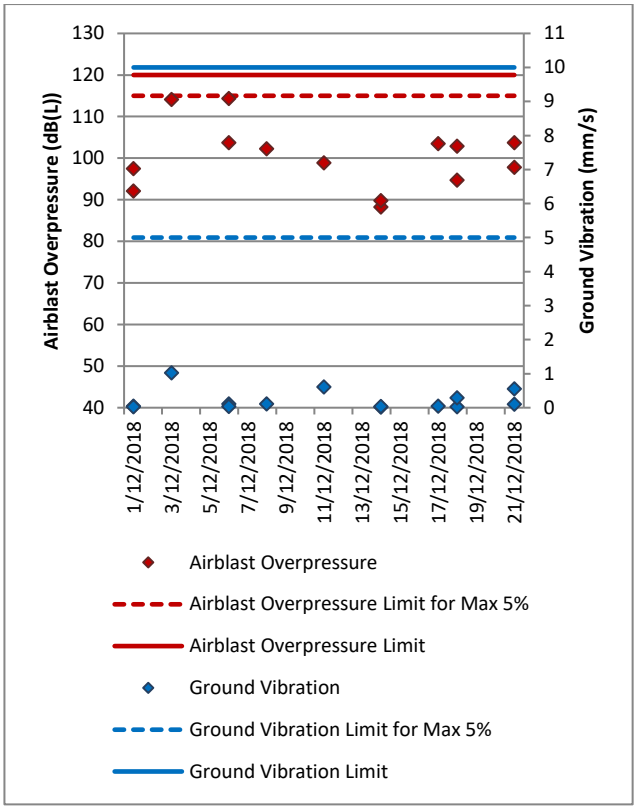

Figure 83: Maison Dieu Blast Monitoring Results – December 2018

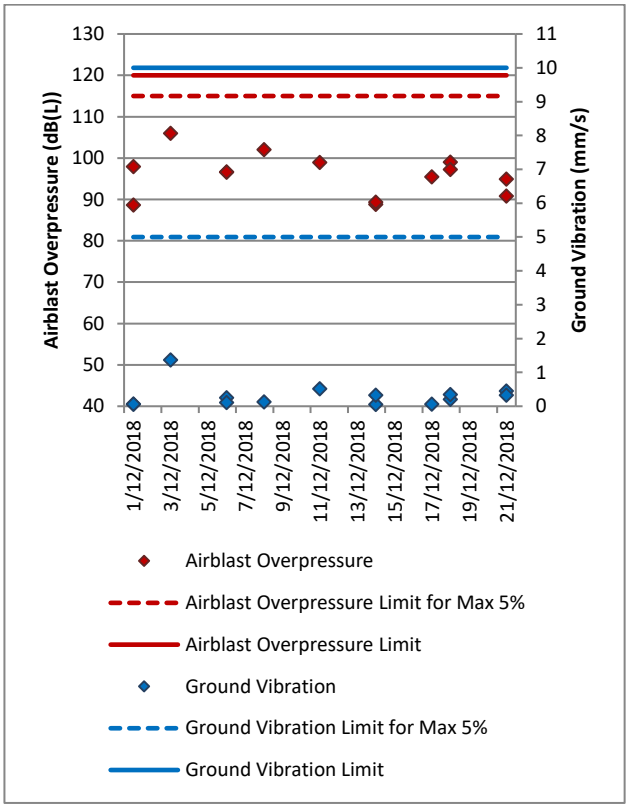

Figure 84: Warkworth Blast Monitoring Results – December 2018

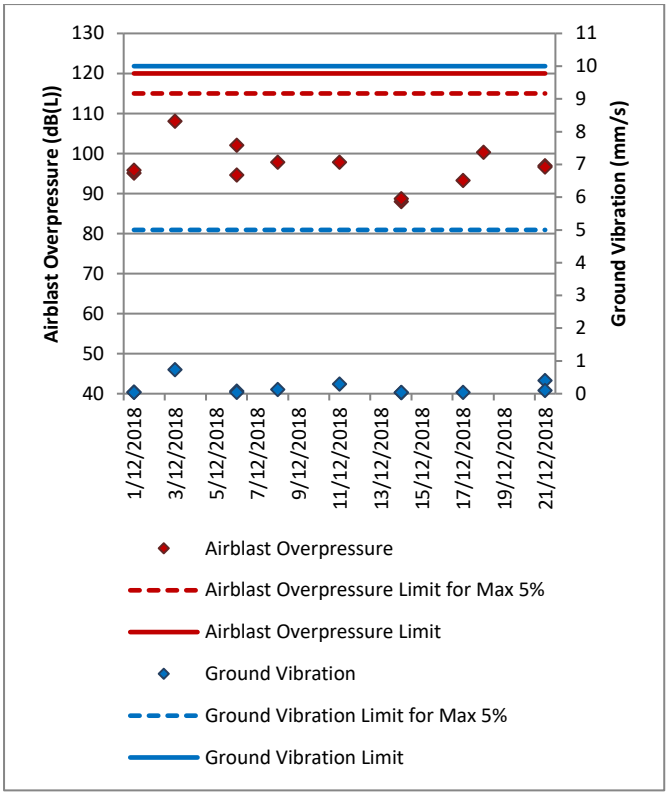

Figure 85: Knodlers Lane Blast Monitoring Results – December 2018

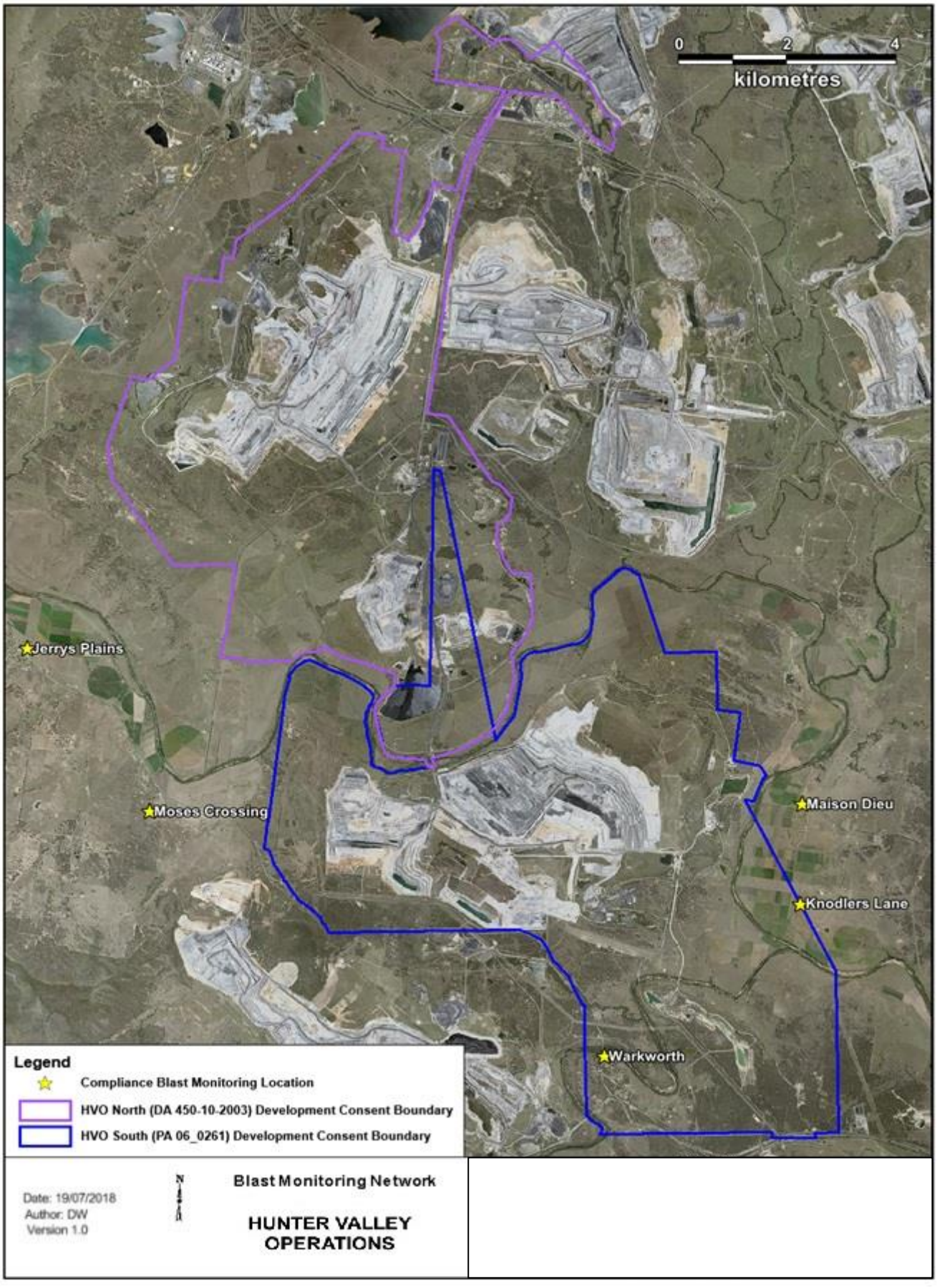

Figure 86: Blast Monitoring Location Plan

6.0 NOISE

Routine attended noise monitoring is carried out at defined locations around HVO as described in the HVO Noise Monitoring Programme. The purpose of the noise surveys is to quantify and describe the acoustic environment around the site and compare results with specified limits. Unattended monitoring (real time noise monitoring) also occurs at five sites surrounding HVO. The attended noise monitoring locations are displayed in Figure 87.

6.1 Attended Noise Monitoring Results

Attended monitoring was conducted at receiver locations surrounding HVO on the night shift of 17 and 18 December 2018. Monitoring results are detailed in Table 6 to Table 11 . During the reporting period, there was one noise exceedance recorded. See section **10.0 Environmental Incidents** of this report for more information.

Table 6: $L_{Aeq,\ 15\ minute}$ HVO South - Impact Assessment Criteria – December 2018

Location	Date and Time	Wind Speed (m/s)[1]	VTG[1]	Criterion dB (A)	Criterion Applies?[2]	HVO South L_{Aeq} dB[3,4]	Exceedance[4,5]
Knodlers Lane	17/12/2018 21:44	4.2	0.5	37	No	IA	NA
Maison Dieu	17/12/2018 21:24	3.7	0.5	37	No	IA	NA
Shearers Lane	17/12/2018 21:01	3.8	0.5	41	No	IA	NA
Kilburnie South	17/12/2018 23:46	3.9	0.5	36	No	NM	NA
Jerrys Plains Village	17/12/2018 21:53	4.2	0.5	35	No	IA	NA
Jerrys Plains Village[6]	18/12/2018 21:16	5.9	-1	35	No	IA	NA
Jerrys Plains East	17/12/2018 21:30	3.7	0.5	35	No	IA	NA
Long Point	17/12/2018 22:57	3.4	-1	35	No	IA	NA
HVGC	18/12/2018 00:21	4.5	0.5	55	No	NM	NA

Notes:
1. Atmospheric data is sourced from the HVO Cheshunt (or MTW Charlton Ridge for Long Point) weather station using logged meteorological data;
2. Assumed noise emission limits (see Section 2.2 of this report for more information) apply for wind speeds up to 3 metres per second (at a height of 10m), or temperature inversion conditions of up to 3 degrees/100m (at a height of 10m). Criterion may or may not apply due to rounding of meteorological data values;
3. Estimated or measured LAeq,15minute attributed to HVO South Pit Area;
4. Bold results in red indicate exceedance of criteria;
5. NA in exceedance column means atmospheric conditions outside specified in approval and so criterion is not applicable; and
6. Follow up measurement

Table 7: $L_{Aeq,\ 15\ minute}$ HVO South - Land Acquisition Criteria – December 2018

Location	Date and Time	Wind Speed (m/s)[1]	VTG[1]	Criterion dB (A)	Criterion Applies?[2]	HVO South L_{Aeq} dB[3,4]	Exceedance[4,5]
Knodlers Lane	17/12/2018 21:44	4.2	0.5	41	No	IA	NA
Maison Dieu	17/12/2018 21:24	3.7	0.5	41	No	IA	NA
Shearers Lane	17/12/2018 21:01	3.8	0.5	41	No	IA	NA
Kilburnie South	17/12/2018 23:46	3.9	0.5	41	No	NM	NA
Jerrys Plains Village	17/12/2018 21:53	4.2	0.5	41	No	IA	NA
Jerrys Plains Village[6]	18/12/2018 21:16	5.9	-1	40	No	IA	NA
Jerrys Plains East	17/12/2018 21:30	3.7	0.5	40	No	IA	NA
Long Point	17/12/2018 22:57	3.4	-1	40	No	IA	NA
HVGC	18/12/2018 00:21	4.5	0.5	40	No	NM	NA

Notes:
1. Atmospheric data is sourced from the HVO Cheshunt (or MTW Charlton Ridge for Long Point) weather station using logged meteorological data;
2. Assumed noise emission limits (see Section 2.2 of this report for more information) apply for wind speeds up to 3 metres per second (at a height of 10m), or temperature inversion conditions of up to 3 degrees/100m (at a height of 10m). Criterion may or may not apply due to rounding of meteorological data values;
3. Estimated or measured LAeq,15minute attributed to HVO South Pit Area;
4. Bold results in red indicate exceedance of criteria;
5. NA in exceedance column means atmospheric conditions outside specified in approval and so criterion is not applicable; and
6. Follow up measurement

Table 8: $L_{A1,\ 1minute}$ HVO South - Impact Assessment Criteria – December 2018

Location	Date and Time	Wind Speed (m/s)[1]	VTG[1]	Criterion dB (A)	Criterion Applies?[2]	HVO South $L_{A1,\ 1min}$ dB[3,4]	Exceedance[4,5]
Knodlers Lane	17/12/2018 21:44	4.2	0.5	45	No	IA	NA
Maison Dieu	17/12/2018 21:24	3.7	0.5	45	No	IA	NA
Shearers Lane	17/12/2018 21:01	3.8	0.5	45	No	IA	NA
Kilburnie South	17/12/2018 23:46	3.9	0.5	45	No	NM	NA
Jerrys Plains Village	17/12/2018 21:53	4.2	0.5	45	No	IA	NA
Jerrys Plains Village[6]	18/12/2018 21:16	5.9	-1	45	No	IA	NA
Jerrys Plains East	17/12/2018 21:30	3.7	0.5	45	No	IA	NA
Long Point	17/12/2018 22:57	3.4	-1	45	No	IA	NA
HVGC	18/12/2018 00:21	4.5	0.5	Nil	No	NM	NA

Notes:
1. Atmospheric data is sourced from the HVO Cheshunt (or MTW Charlton Ridge for Long Point) weather station using logged meteorological data;
2. Assumed noise emission limits (see Section 2.3 of this report for more information) apply for wind speeds up to 3 metres per second (at a height of 10m), or temperature inversion conditions of up to 3 degrees/100m (at a height of 10m). Criterion may or may not apply due to rounding of meteorological data values;
3. These are results for HVO South Pit Area in the absence of all other noise sources;
4. Bold results in red indicate exceedance of criteria;
5. NA in exceedance column means atmospheric conditions outside specified in approval and so criterion is not applicable; and
6. Follow up measurement

Table 9: $L_{Aeq, 15minute}$ HVO North – Impact Assessment Criteria – December 2018

Location	Date and Time	Wind Speed (m/s)[1]	VTG[1]	Criterion dB (A)	Criterion Applies?[2]	HVO North L_{Aeq} dB[3,4]	Exceedance[4,5]
Knodlers Lane	17/12/2018 21:44	3	-1	35	Yes	IA	Nil
Maison Dieu	17/12/2018 21:24	3.8	-1	35	No	IA	NA
Shearers Lane	17/12/2018 21:01	3.9	-1	35	No	IA	NA
Kilburnie South	17/12/2018 23:46	2.3	-1	39	Yes	NM	Nil
Jerrys Plains Village	17/12/2018 21:53	3	-1	36	Yes	38	2
Jerrys Plains Village[6]	18/12/2018 21:16	5.6	-1	36	No	IA	NA
Jerrys Plains East	17/12/2018 21:30	3.8	-1	39	No	35	NA
Long Point	17/12/2018 22:57	3.4	-1	35	No	IA	NA
HVGC	18/12/2018 00:21	1.7	0.5	IA	Yes	NM	Nil

Notes:
1. Atmospheric data is sourced from the HVO Corporate (or MTW Charlton Ridge for Long Point) weather station using logged meteorological data;
2. Noise emission limits apply under all meteorological conditions, except during periods of rain or hail, when average winds speed at microphone heights exceeds 5 metres per second, when wind speeds greater than 3 metres per second are measured at 10m above ground level, or during temperature inversion conditions greater than 3 degrees C/100m. Criterion may or may not apply due to rounding of meteorological data values;
3. Estimated or measured LAeq,15minute attributed to HVO North Pit Area;
4. Bold results in red indicate exceedance of criteria;
5. NA in exceedance column means atmospheric conditions outside specified in approval and so criterion is not applicable; and
6. Follow up measurement

Table 10: $L_{Aeq,15minute}$ HVO North - Land Acquisition Criteria – December 2018

Location	Date and Time	Wind Speed (m/s)[1]	VTG[1]	Criterion dB (A)	Criterion Applies?[2]	HVO North L_{Aeq} dB[3,4]	Exceedance[4,5]
Knodlers Lane	17/12/2018 21:44	3	-1	41	Yes	IA	Nil
Maison Dieu	17/12/2018 21:24	3.8	-1	41	No	IA	NA
Shearers Lane	17/12/2018 21:01	3.9	-1	41	No	IA	NA
Kilburnie South	17/12/2018 23:46	2.3	-1	41	Yes	NM	Nil
Jerrys Plains Village	17/12/2018 21:53	3	-1	41	Yes	38	Nil
Jerrys Plains Village[6]	18/12/2018 21:16	5.6	-1	41	No	IA	NA
Jerrys Plains East	17/12/2018 21:30	3.8	-1	41	No	35	NA
Long Point	17/12/2018 22:57	3.4	-1	41	No	IA	NA
HVGC	18/12/2018 00:21	1.7	0.5	NA	NA	NM	NA

Notes:
1. Atmospheric data is sourced from the HVO Corporate (or MTW Charlton Ridge for Long Point) weather station using logged meteorological data;
2. Noise emission limits apply under all meteorological conditions, except during periods of rain or hail, when average winds speed at microphone heights exceeds 5 metres per second, when wind speeds greater than 3 metres per second are measured at 10m above ground level, or during temperature inversion conditions greater than 3 degrees C/100m. Criterion may or may not apply due to rounding of meteorological data values;
3. Estimated or measured LAeq,15minute attributed to HVO North Pit Area;
4. Bold results in red indicate exceedance of criteria;
5. NA in exceedance column means atmospheric conditions outside specified in approval and so criterion is not applicable; and
6. Follow up measurement

Table 11: $L_{A1, 1Minute}$ HVO North - Impact Assessment Criteria – December 2018

Location	Date and Time	Wind Speed (m/s)[1]	VTG[1]	Criterion dB (A)	Criterion Applies?[2]	HVO North $L_{A1, 1min}$ dB[3,4]	Exceedance[4,5]
Knodlers Lane	17/12/2018 21:44	3	-1	46	Yes	IA	Nil
Maison Dieu	17/12/2018 21:24	3.8	-1	46	No	IA	NA
Shearers Lane	17/12/2018 21:01	3.9	-1	46	No	IA	NA
Kilburnie South	17/12/2018 23:46	2.3	-1	46	Yes	NM	Nil
Jerrys Plains Village	17/12/2018 21:53	3	-1	46	Yes	44	Nil
Jerrys Plains Village[6]	18/12/2018 21:16	5.6	-1	46	No	IA	NA
Jerrys Plains East	17/12/2018 21:30	3.8	-1	46	No	44	NA
Long Point	17/12/2018 22:57	3.4	-1	46	No	IA	NA
HVGC	18/12/2018 00:21	1.7	0.5	NA	NA	NM	NA

Notes:
1. Atmospheric data is sourced from the HVO Corporate or (MTW Charlton Ridge for Long Point) weather station using logged meteorological data;
2. Noise emission limits apply under all meteorological conditions, except during periods of rain or hail, when average winds speed at microphone heights exceeds 5 metres per second, when wind speeds greater than 3 metres per second are measured at 10m above ground level, or during temperature inversion conditions greater than 3 degrees C/100m. Criterion may or may not apply due to rounding of meteorological data values;
3. These are results for HVO North Pit Area in the absence of all other noise sources;
4. Bold results in red indicate exceedance of criteria;
5. NA in exceedance column means atmospheric conditions outside specified in approval and so criterion is not applicable; and
6. Follow up measurement

5.2 Low Frequency Assessment

In accordance with the requirements of the EPA's Noise Policy for Industry (NPfI), the applicability of the low frequency modification penalty has been assessed. During December 2018 one measurement required the penalty to be applied. The assessment for low frequency noise is shown in Table 12.

Table 12: Low Frequency Noise Assessment – December 2018

Location	Date and Time	Measured Site Only LA_{eq} dB (Sth/Nth)	Site Only LC_{eq} dB[1] (Sth/Nth)	Site Only LC_{eq}-LA_{eq} dB [1,2] (Sth/Nth)	Result Max exceedance of ref spectrum dB[1,3] (Sth/Nth)	Penalty dB(A)[1]
Knodlers Lane	17/12/2018 21:44	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA
Maison Dieu	17/12/2018 21:24	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA
Shearers Lane	17/12/2018 21:01	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA
Kilburnie South	17/12/2018 23:46	NM/NM	NA/NA	NA/NA	NA/NA	NA/NA
Jerrys Plains Village	17/12/2018 21:53	IA/36	NA/55	NA/19	NA/3 @ 100Hz	NA/2
Jerrys Plains Village[4]	18/12/2018 21:16	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA
Jerrys Plains East	17/12/2018 21:30	IA/35	NA/NA	NA/NA	NA/NA	NA/NA
Long Point	17/12/2018 22:57	IA/IA	NA/NA	NA/NA	NA/NA	NA/NA
HVGC	18/12/2018 00:21	NM/NM	NA/NA	NA/NA	NA/NA	NA/NA

Notes:
1. Where it is not possible to determine the site only result due to the presence of other low frequency noise sources occurring during the measurement, or where criteria were not applicable due to meteorological conditions, this is noted as NA (not available) and no further assessment has been undertaken;
2. As per NPfI, if LCeq – LAeq ≥ 15 dB further assessment of low frequency noise required;

3. As per NPfl, compare measured spectrum against reference spectrum to determine if the low frequency modifying factor is triggered and application of penalty is required;
4. Follow up measurement.

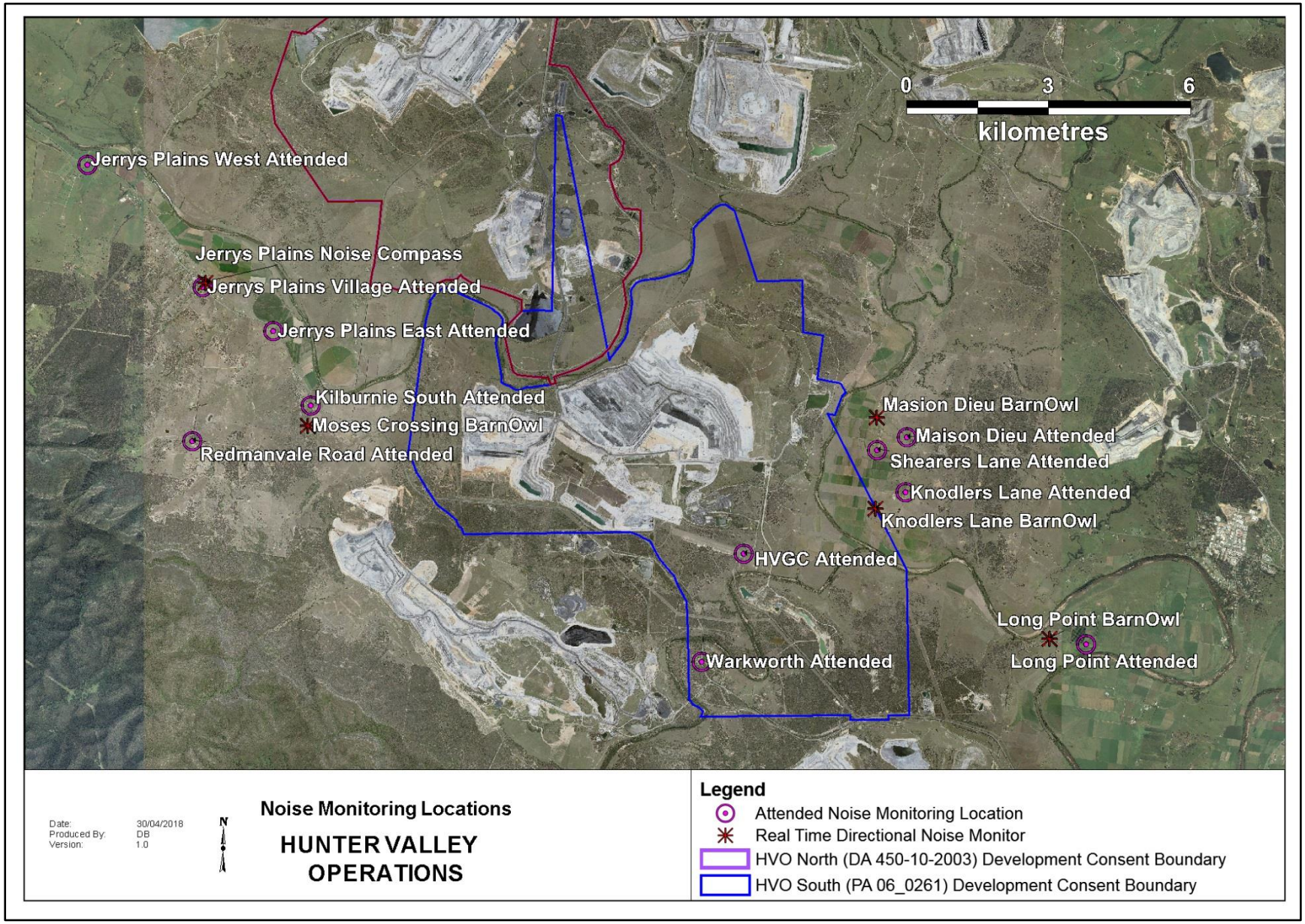

Figure 87: Noise Monitoring Location Plan

6.2 Real Time Noise Monitoring

HVO utilises a network of real-time directional noise monitors to manage noise impacts on a continuous basis. 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. Noise alarms are investigated and responded to with the appropriate level of operational modification. Changes in response to a noise alarm can include replacing equipment with quieter (noise attenuated) units, changing or relocating tasks, and shutting down equipment.

It should be noted that this assessment does not compliment or conflict with attended noise monitoring detailed in Section 6.1, and that real time monitoring data includes non-mine noise sources such as dogs, cows, or more commonly, road traffic.

7.0 OPERATIONAL DOWNTIME

During December, a total of 628 hours of equipment downtime was logged in response to real time monitoring and visual inspections for environmental reasons such as dust, noise and meteorological conditions. Operational downtime by equipment type is shown in Figure 88.

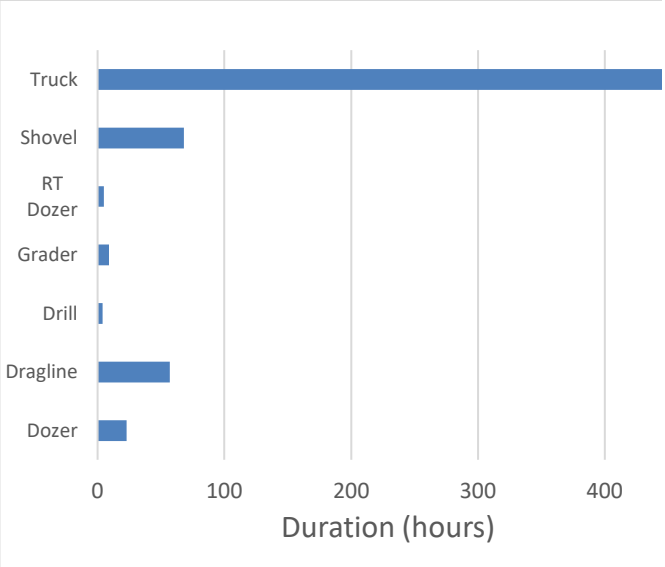

Figure 88: Operational Downtime by Equipment Type – December 2018

8.0 REHABILITATION

During December 18.32 Ha of land was released, 0.71 Ha of land was bulk shaped, 16.93 Ha of land was Topsoiled and 13.07 Ha of land was Rehabilitated. Year to date progress can be viewed in Figure 89.

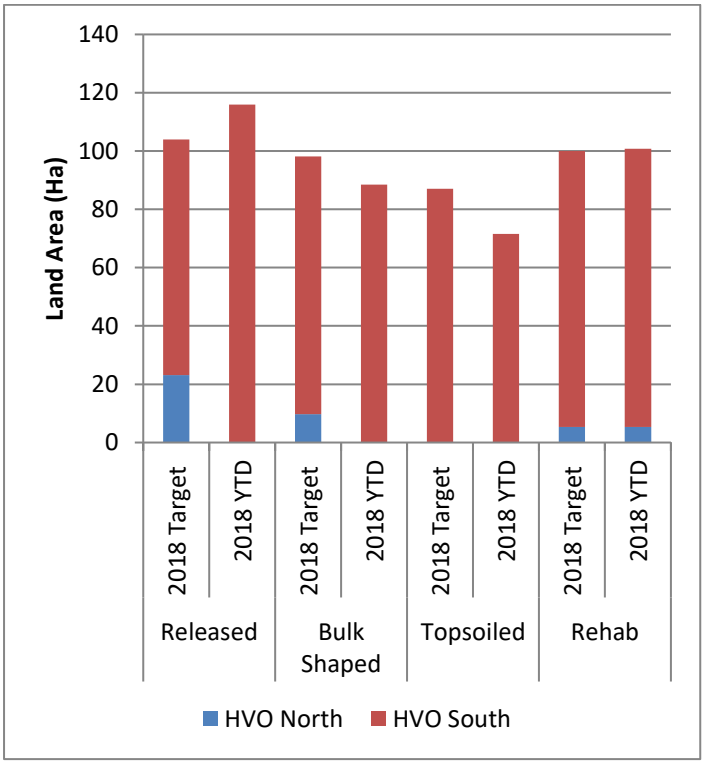

Figure 89: Rehabilitation YTD – December 2018

9.0 COMPLAINTS

During December one complaint was received. Details of complaints received YTD are shown in Table 13.

Table 13: Complaints Summary YTD

	Noise	Dust	Blast	Lighting	Other	Total
January	-	2	4	-	-	6
February	1	-	-	-	1	2
March	-	-	-	-	-	0
April	-	-	1	-	-	1
May	4	1	2	-	-	7
June	1	-	1	-	1	3
July	-	-	2	-	-	2
August	1	-	-	-	-	1
September	1	-	-	-	-	1
October	-	-	-	-	-	-
November	-	2	-	-	-	2
December	-	1	-	-	-	1
Total	8	6	10	-	2	26

10.0 ENVIRONMENTAL INCIDENTS

During the reporting period there were six recordable environmental incidents.

6/12/2018 – Dam 17N pump house pit pump failure

Minor seep from Dam 17N sump overflow pipe with a damp area noted at the end of pipe during inspection. The source of water in sump has been identified as leaking from the Dam 17N through tears in the liner and reporting to the sump via the installed underdrainage system.

Immediate actions included a secondary pump being added to bring water level down, repair work to the capping of the outlet and the water level in Dam 17N lowered below tears in liner to allow repair.

7/12/2018 – Pipe burst at Dam 21N

During an inspection it was identified that the pipeline between Dam 21N and Dam 9 had failed, releasing an estimated 75,000 litres of mine and river water to the local mine drainage system. All water was contained on site with no potential to leave site. All water reported to Dam 20 through the mine drainage system. Immediate actions included isolating the source, area and repairing and reconfiguring the pipeline.

14/12/2018 – Blast Fume – Category 3a

A blast fired at West Pit at 13:59 produced a small fume with a rating of 3a which remained in pit. Wet weather on the days leading up to shot being fired and the blast pattern being at maximum allowable sleep time (5 days) were contributing factors.

17/12/2018 – Noise exceedance

Attended night time monitoring recorded noise levels at 36dB(A) at Jerrys Plains Village against a criteria of 36dB(A). An additional 2dB was added to the reading due application of the low frequency penalty, in accordance with the development consent, bringing the result to 38dB(A). A follow-up measurement was conducted the following evening on 18 December and no exceedance was recorded. The exceedance was notified to DPE.

18/12/2018 – Blast miscapture

Knodlers Lane Blast monitor failed to capture complete blast monitoring results for two blasts initiated in the Cheshunt Pit on the 18 December 2018. Both overpressure and vibration results were not captured for the shot at 13:19 and vibration data was not captured for the shot at 13:18. A second monitor closer to the mine recorded blasting results below criteria.

Immediate actions included the ground unit being exchanged for a calibrated ground unit on the 19 December. In addition, the control unit was also found to have been affected and was exchanged on 20 December.

The event was reported to the DPE.

03/11/2018 – Hydrocarbon Spill Newdell

Oil spill onto the Newdell coal receival pad from a contractor truck. Oil was contained on the receival pad with some minor tracking on Pikes Gully Road which is a public road. A street sweeper was deployed to clean up the wheel tracked oil. The spilled oil on the receival pad will be processed through the CHPP.

Appendix A: Meteorological Data

Table 14: Meteorological Data - HVO Corporate Meteorological Station – December 2018

Date	Air Temperature Maximum (°C)	Air Temperature Minimum (°C)	Relative Humidity Maximum (%)	Relative Humidity Minimum (%)	Solar Radiation Maximum (W/Sq. M)	Wind Direction Average (°)	Wind Speed Average (m/sec)	Rainfall(mm)
1/12/2018	34	19	82	8	1072	222	2.8	0
2/12/2018	36	16	96	9	1595	237	5.0	0
3/12/2018	31	15	90	6	1128	228	3.1	0
4/12/2018	30	15	80	18	1122	179	3.6	0
5/12/2018	23	13	88	49	1724	117	4.9	0
6/12/2018	28	12	89	27	1456	115	3.9	0
7/12/2018	30	11	82	22	1106	131	2.9	0
8/12/2018	33	12	86	13	1092	128	2.3	0
9/12/2018	35	12	99	10	1202	122	2.2	0
10/12/2018	33	15	90	20	1409	109	2.8	0
11/12/2018	23	14	100	62	300	129	2.3	19.4
12/12/2018	24	13	100	67	1243	122	3.0	0.8
13/12/2018	32	15	100	36	1323	237	2.4	5.8
14/12/2018	26	16	100	66	1703	183	2.3	3.8
15/12/2018	29	15	100	33	790	126	2.1	5.6
16/12/2018	33	15	100	32	1265	-	2.1	3.2
17/12/2018	33	16	86	30	1309	226	2.9	0
18/12/2018	30	16	88	44	1439	114	3.3	0
19/12/2018	31	16	100	44	1433	114	2.8	7.6
20/12/2018	36	15	100	28	1558	-	2.7	3.8
21/12/2018	25	15	89	53	1612	127	3.7	0
22/12/2018	26	11	97	29	1524	155	3.7	0
23/12/2018	25	10	81	28	1550	121	3.3	0
24/12/2018	28	7	93	25	1271	125	2.4	0
25/12/2018	34	10	99	10	1117	154	2.0	0
26/12/2018	36	14	78	10	1096	110	1.7	0
27/12/2018	38	20	63	7	1073	146	2.3	0
28/12/2018	40	17	66	5	1115	175	2.3	0
29/12/2018	39	14	87	5	1078	188	2.4	0
30/12/2018	38	20	46	1	1059	227	3.0	0
31/12/2018	39	16	89	8	1122	176	2.5	0.6

"-" Indicates that data was not available due to technical issues.