# Monthly Environmental Monitoring Report

## Yancoal Hunter Valley Operations

## December 2017

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Revision History

| Version No. | Person Responsible | Document Status | Date |
|---|---|---|---|
| **1.0** | **Environmental Graduate** | **Draft** | **09/02/2018** |
| **1.1** | **Environmental Specialist** | **Final** | **14/02/2018** |

# 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.

# 2.0 AIR QUALITY

## 2.1 Meteorological Monitoring

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

### 2.1.1 Rainfall

Rainfall for the period is summarised in
Table **1**, the 2017 trend and historical trend are shown in Figure 1

**Table 1: Monthly Rainfall HVO**

| 2017 | Monthly Rainfall (mm) | Cumulative Rainfall (mm) |
|---|---|---|
| **December** | 29.0 | 468.6 |

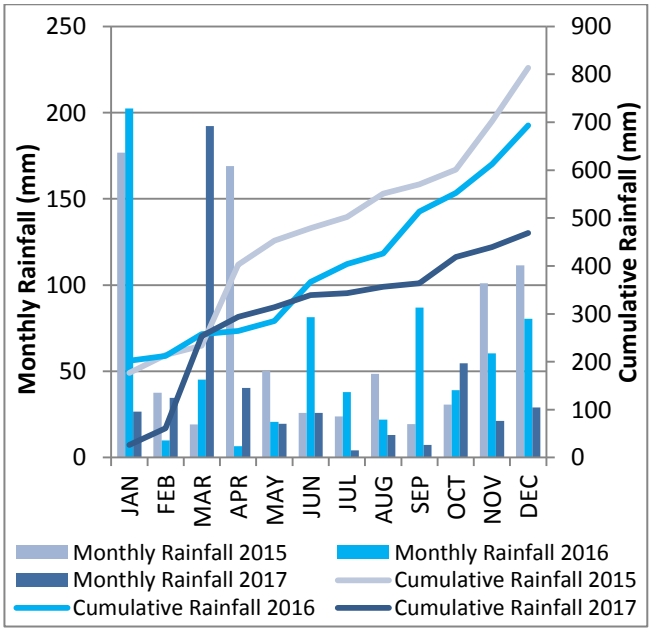


**Figure 1: Rainfall Summary 2017**

### 2.1.2 Wind Speed and Direction

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

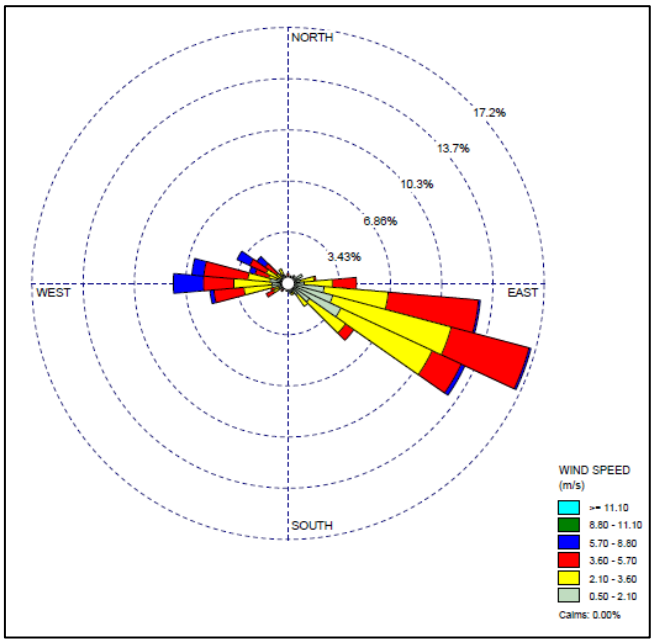


**Figure 2: HVO Corporate Wind Rose – December 2017**

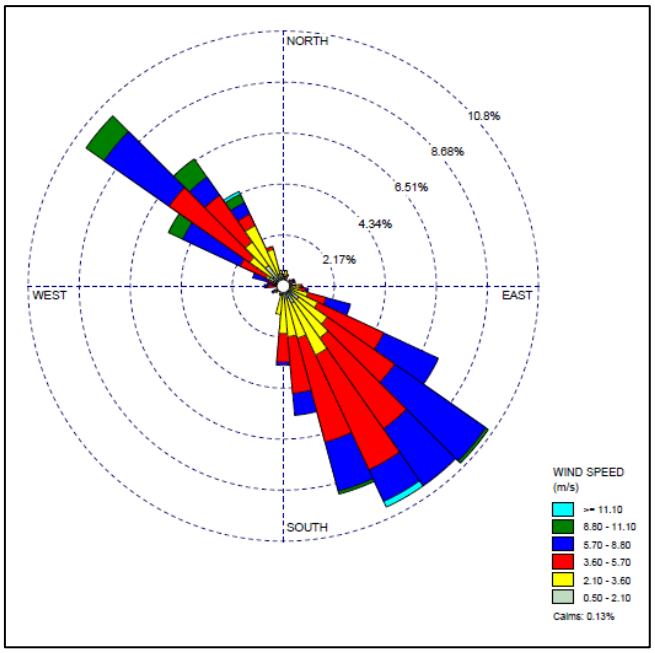


**Figure 3: HVO Cheshunt Wind Rose – December 2017**

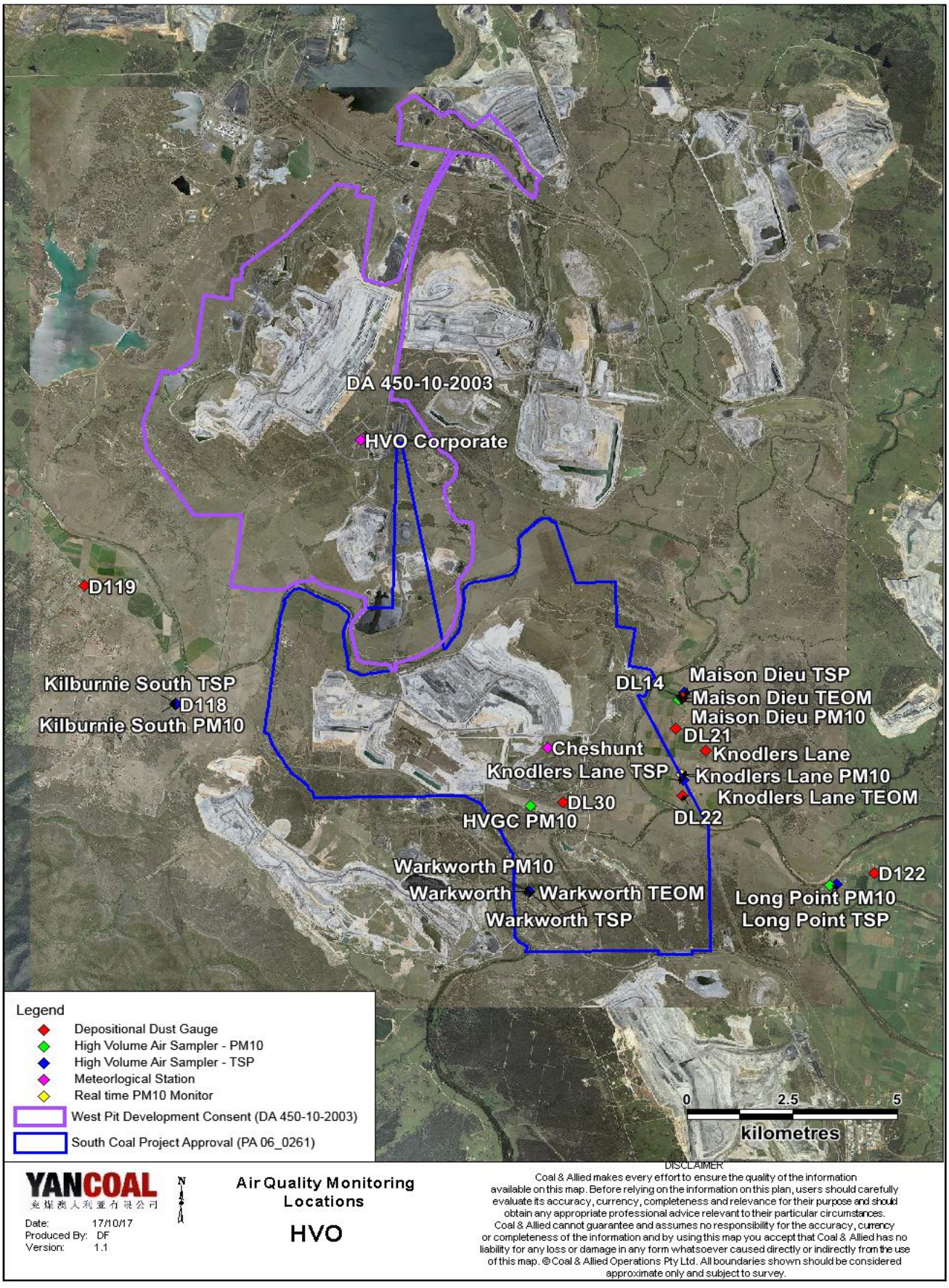


**Figure 4: Air Quality Monitoring Location Plan**

## 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, D118, D122 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 DL22, D118 and D122 results confirm the presence of insects and bird droppings. As such the results are considered contaminated and will be excluded from calculation of the annual average.

The field notes associated with the DL21 and Warkworth monitor's result indicates no evidence to suggest that the result was contaminated. Accordingly, this result will be included in the annual average calculation. An annual assessment against the long term impact assessment criteria will be included in the Annual Review.

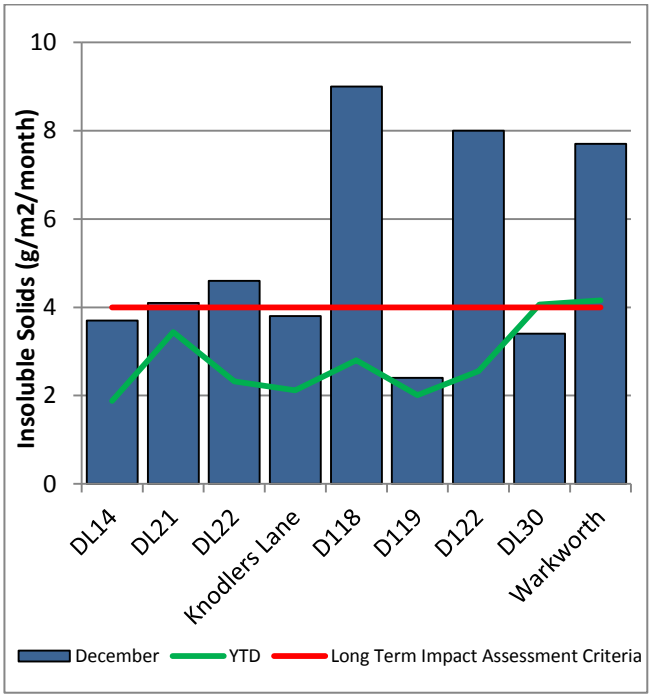


**Figure 5: Depositional Dust Results – December 2017**

## 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.

On 2/12/2017 two HVAS $PM_{10}$ units recorded results which were greater than the short term (24hr) $PM_{10}$ impact assessment criteria; Long Point (90 µg/m$^3$) and Glider Club (62µg/m$^3$).

Investigation determined that HVO's maximum contribution at each monitor is as follows:

- Long Point – less than 22 µg/m$^3$; or less than 24% of the measured result.
- Glider Club - less than 43 µg/m$^3$; or less than 70% of the measured result.

Accordingly, no further action is required (as per approved Air Quality Monitoring Programme).

On 14/12/2017 three HVAS $PM_{10}$ units recorded results which were greater than the short term (24hr) $PM_{10}$ impact assessment criteria; Knodlers Lane (51 µg/m$^3$), Maison Dieu (70 µg/m$^3$) and Glider Club (53 µg/m$^3$).

Investigation determined that HVO's maximum contribution at each monitor is as follows:

- Knodlers Lane - less than 21 µg/m$^3$; or less than 40% of the measured result.
- Maison Dieu - less than 40 µg/m$^3$; or less than 57% of the measured result.
- Glider Club – less than 23 µg/m$^3$; or less than 47% of the measured result.

Accordingly, no further action is required (as per approved Air Quality Monitoring Programme).

On 20/12/2017 four HVAS $PM_{10}$ units recorded results which were greater than the short term (24hr) $PM_{10}$ impact assessment criteria; Knodlers Lane (86 µg/m$^3$), Maison Dieu (72 µg/m$^3$), Long Point (86 µg/m$^3$) and Glider Club (79 µg/m$^3$).

Investigation determined that HVO's maximum contribution at each monitor is as follows:

- Knodlers Lane - less than 47 µg/m$^3$; or less than 65% of the measured result.
- Maison Dieu - less than 43 µg/m$^3$; or less than 60% of the measured result.
- Long Point - less than 46 µg/m$^3$; or less than 54% of the measured result.
- Glider Club – less than 49.5 µg/m$^3$; or less than 63% of the measured result.

Accordingly, no further action is required (as per approved Air Quality Monitoring Programme).

Data was not available on 2/12/2017 at Maison Dieu due to a power outage and an invalid sample.

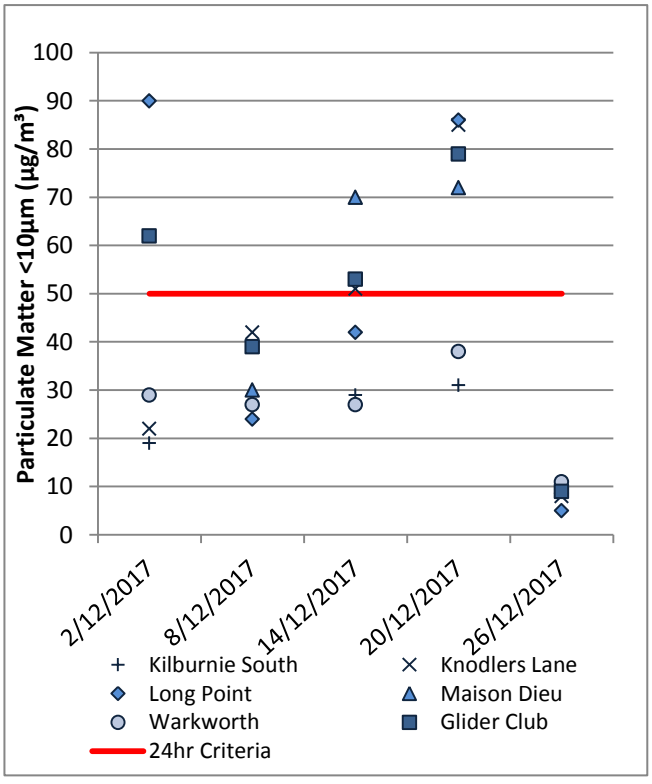


**Figure 6: Individual $PM_{10}$ Results – December 2017**

Figure 7 shows the year to date annual average $PM_{10}$ results.

An annual assessment against the long term impact assessment criteria will be included in the Annual Review.

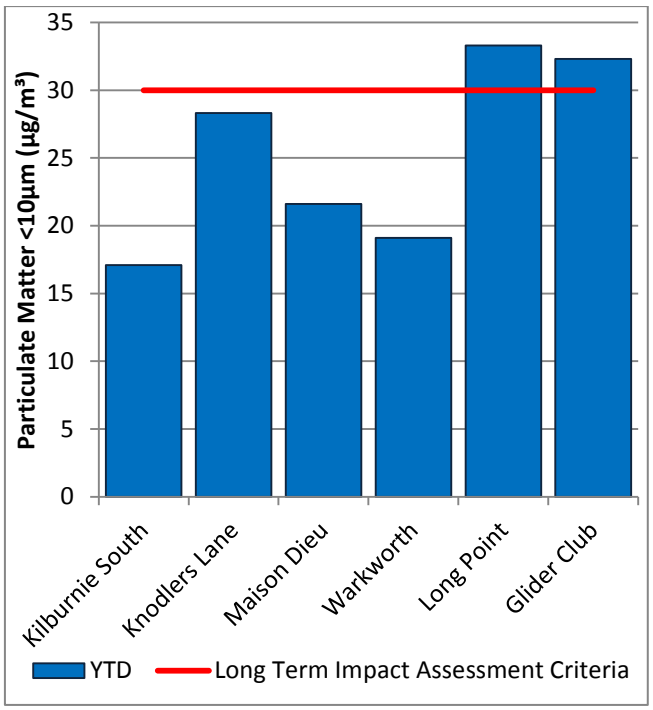


**Figure 7: Year to Date Average $PM_{10}$ – December 2017**

### 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 annual assessment against the long term impact assessment criteria will be included in the Annual Review.

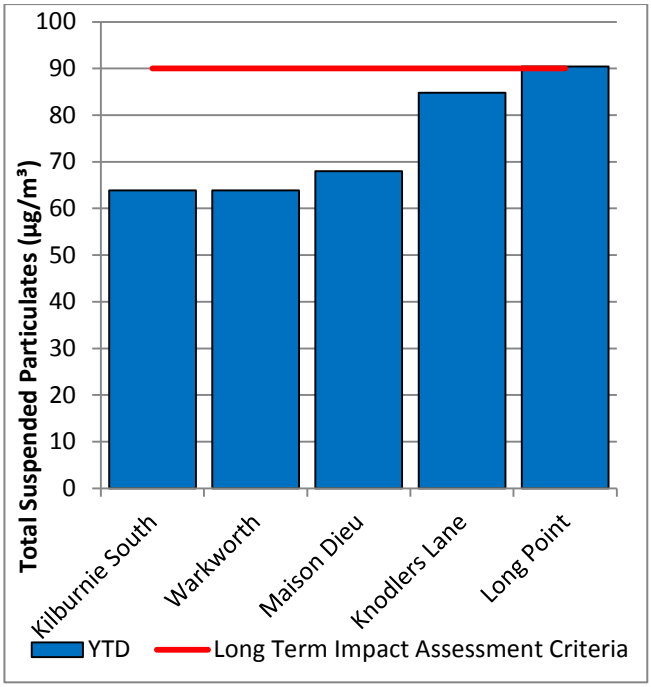


**Figure 8: Year to Date Average Total Suspended Particulates – December 2017**

### 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.

Two results recorded elevated levels at the Maison Dieu TEOM which exceeded the short term (24hr) criteria. These measurements were assessed for HVO's maximum potential contribution based on mining activities and meteorological conditions on these days.

Resulting in the following maximum estimated contributions from the direction of HVO:

- 14 December 2017 – 36.6 µg/m³; and
- 20 December 2017 – 40.6 µg/m³.

### 2.3.4 Real Time Alarms for Air Quality

During December the real time monitoring system generated 84 automated air quality related alarms. 36 were related to adverse weather conditions and 48 alarms relating to $PM_{10}$.

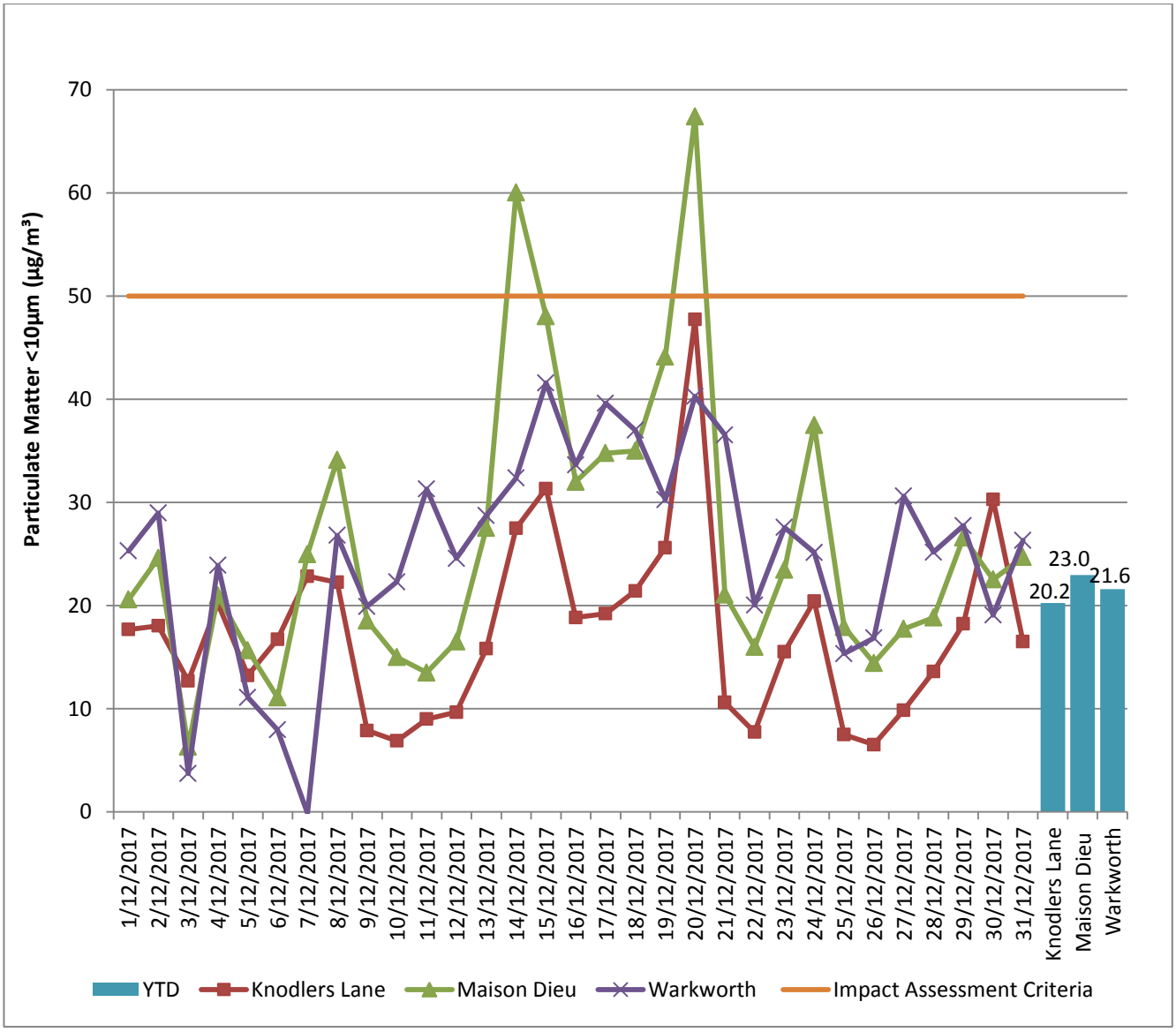


**Figure 9: Real Time $PM_{10}$ 24hr average and YTD average – December 2017**

# 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).

Watercourses are assessed against ANZECC Guidelines for Fresh and Marine Water Quality (2000) for:

- pH (6.5 to 8.5);
- Electrical Conductivity (125 to 2200µS/cm); and

- Total Suspended Solids (maximum 50mg/L)

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

Figure 10 to Figure 12 show the long term surface water trend (2014 – current) within HVO mine dams. Figure 13 to Figure 21 show the long term surface water trend (2014 – current) in surrounding watercourses.

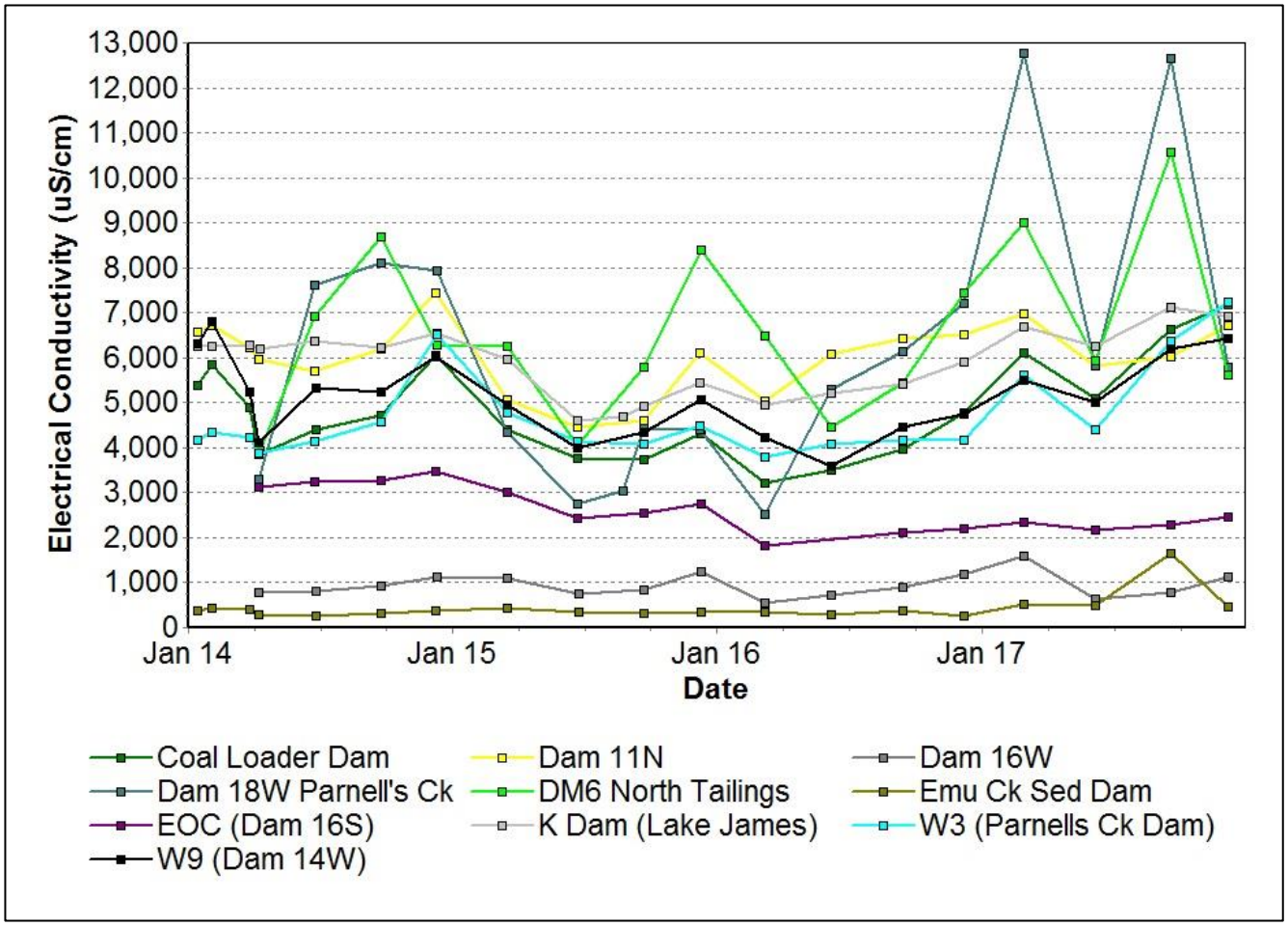


**Figure 10: Site Dams Electrical Conductivity Trend – December 2017**

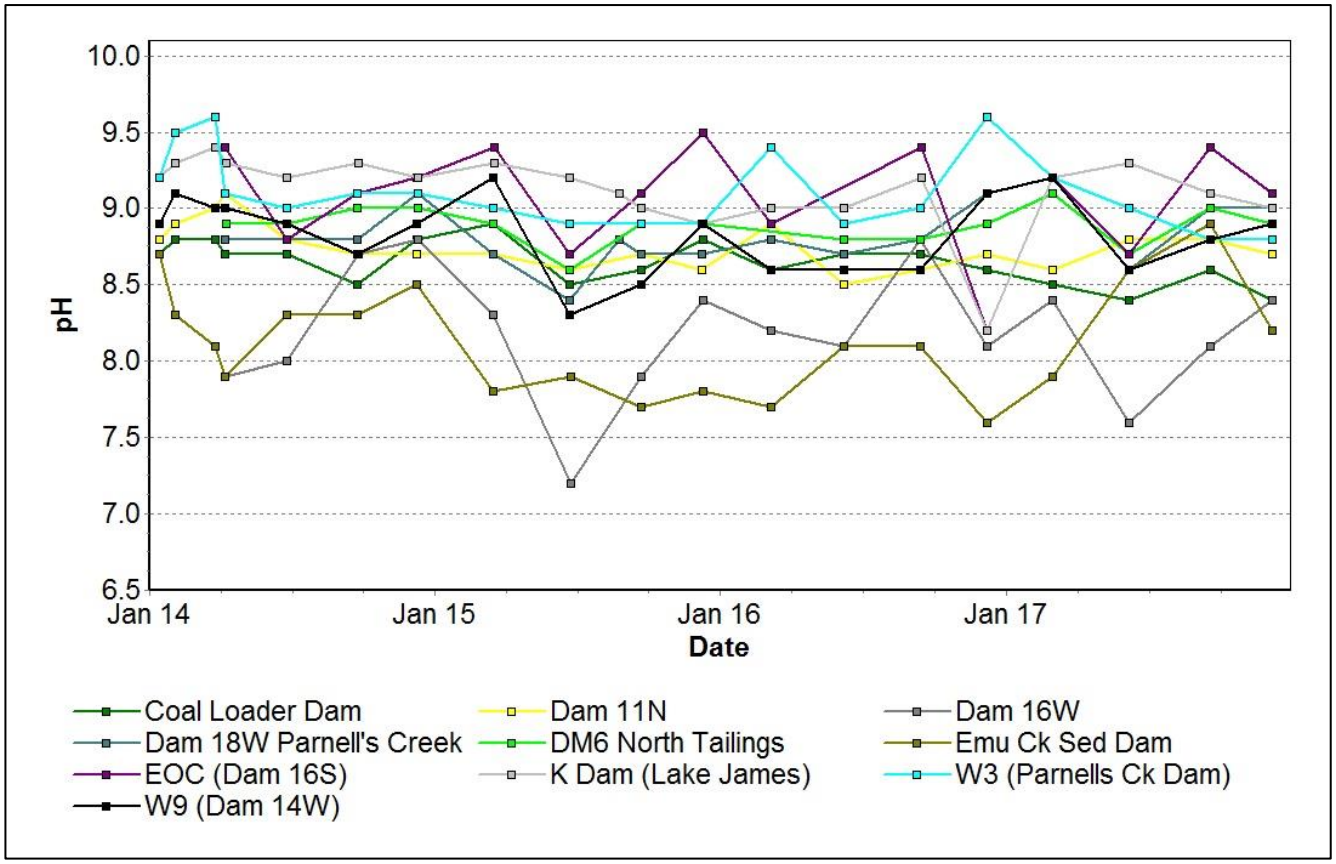


**Figure 11: Site Dams pH Trend – December 2017**

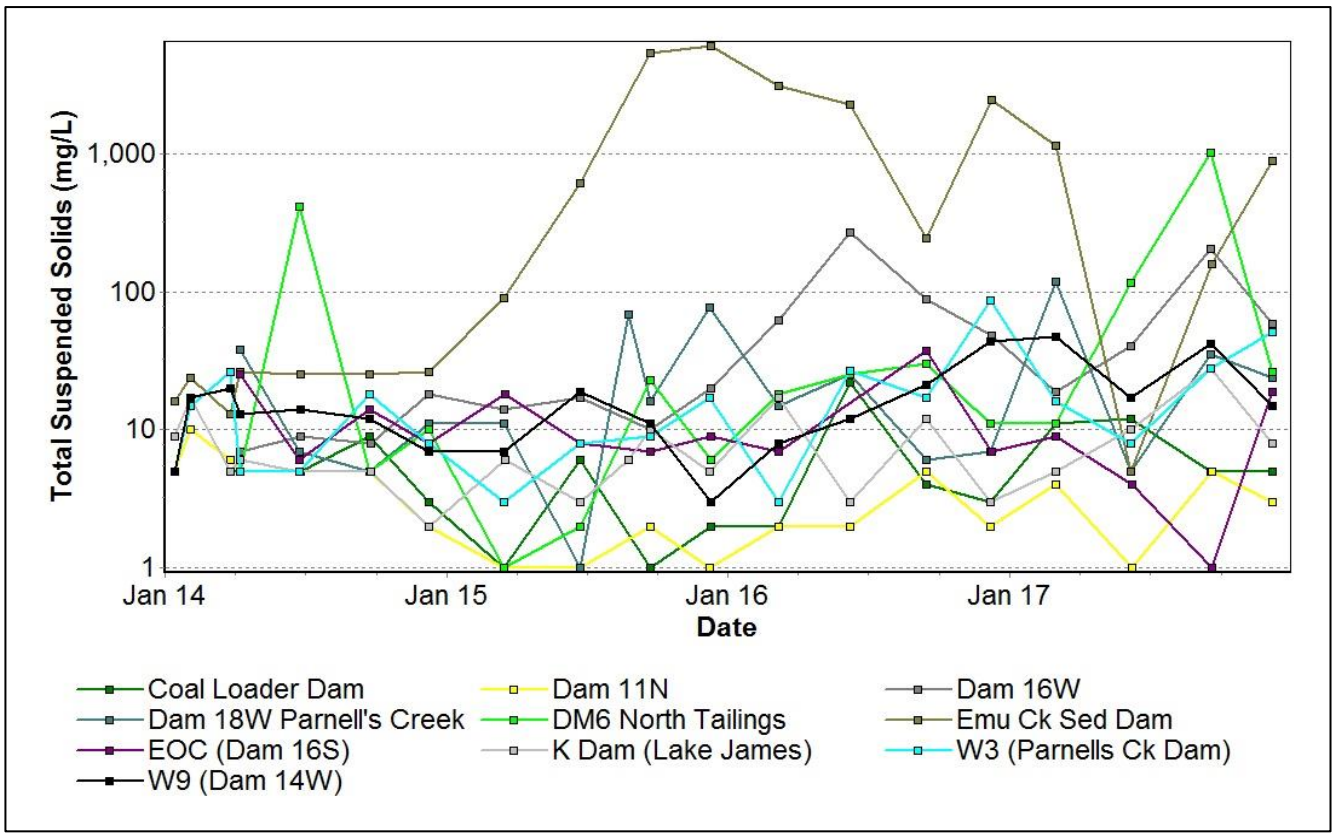


**Figure 12: Site Dams Total Suspended Solids Trend – December 2017**

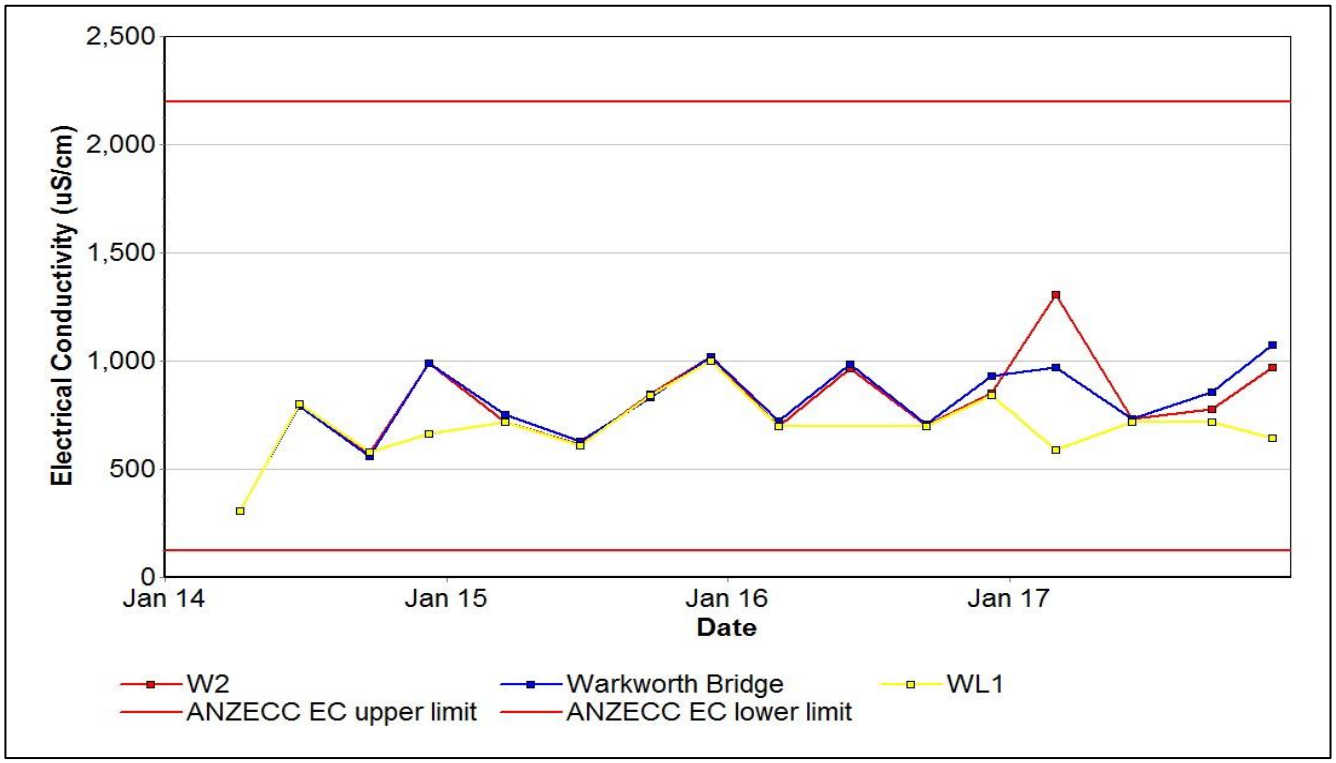


**Figure 13: Wollombi Brook Electrical Conductivity Trend - December 2017**

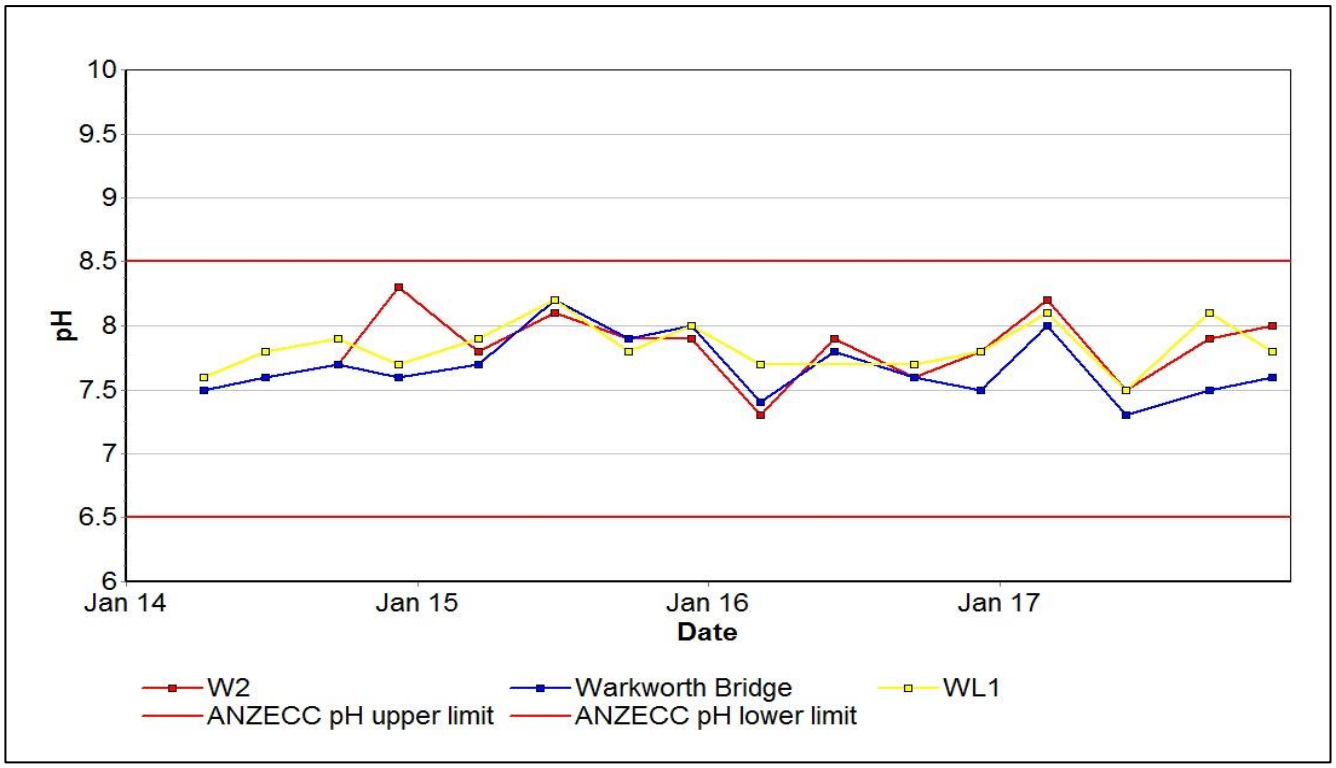


**Figure 14: Wollombi Brook pH Trend - December 2017**

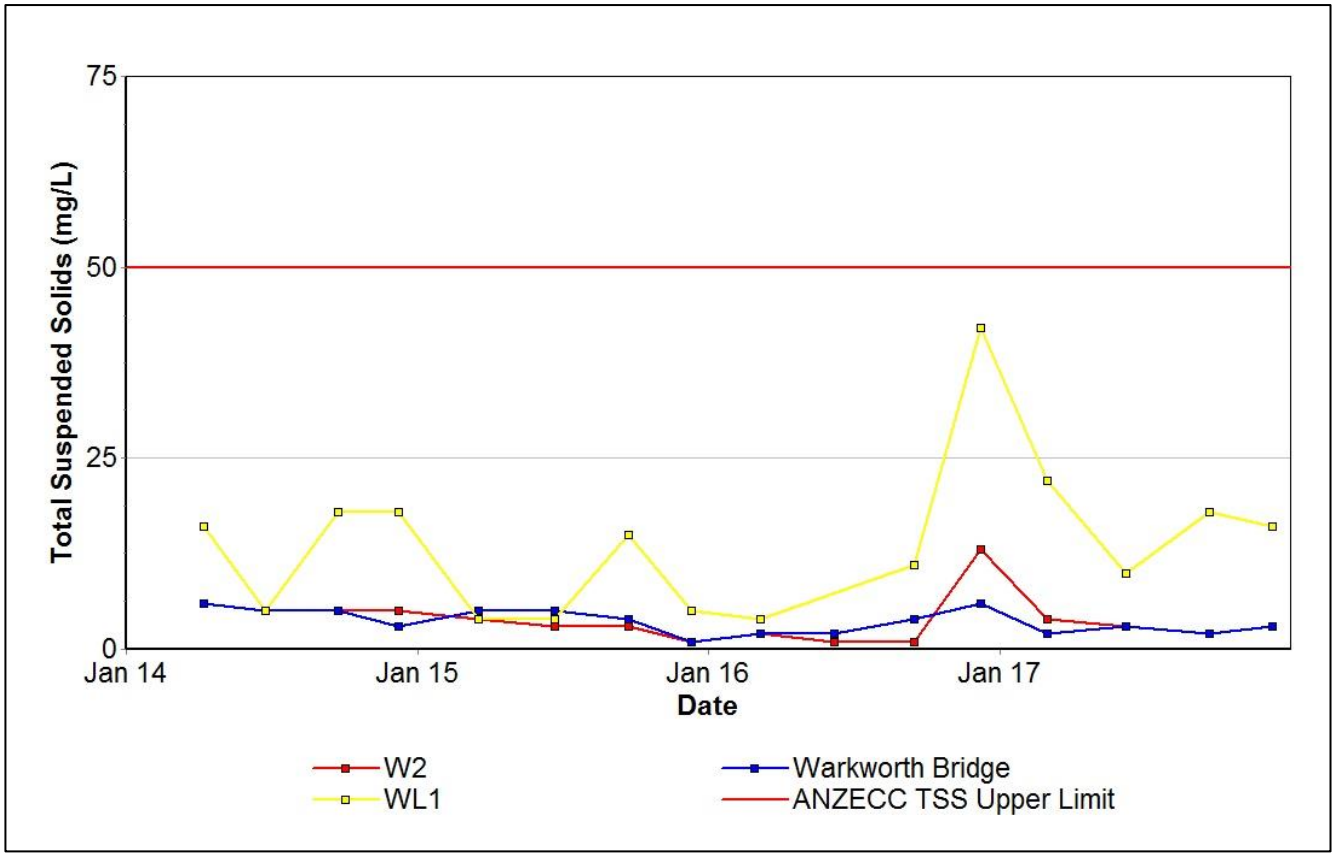


**Figure 15: Wollombi Brook Total Suspended Solids Trend - December 2017**

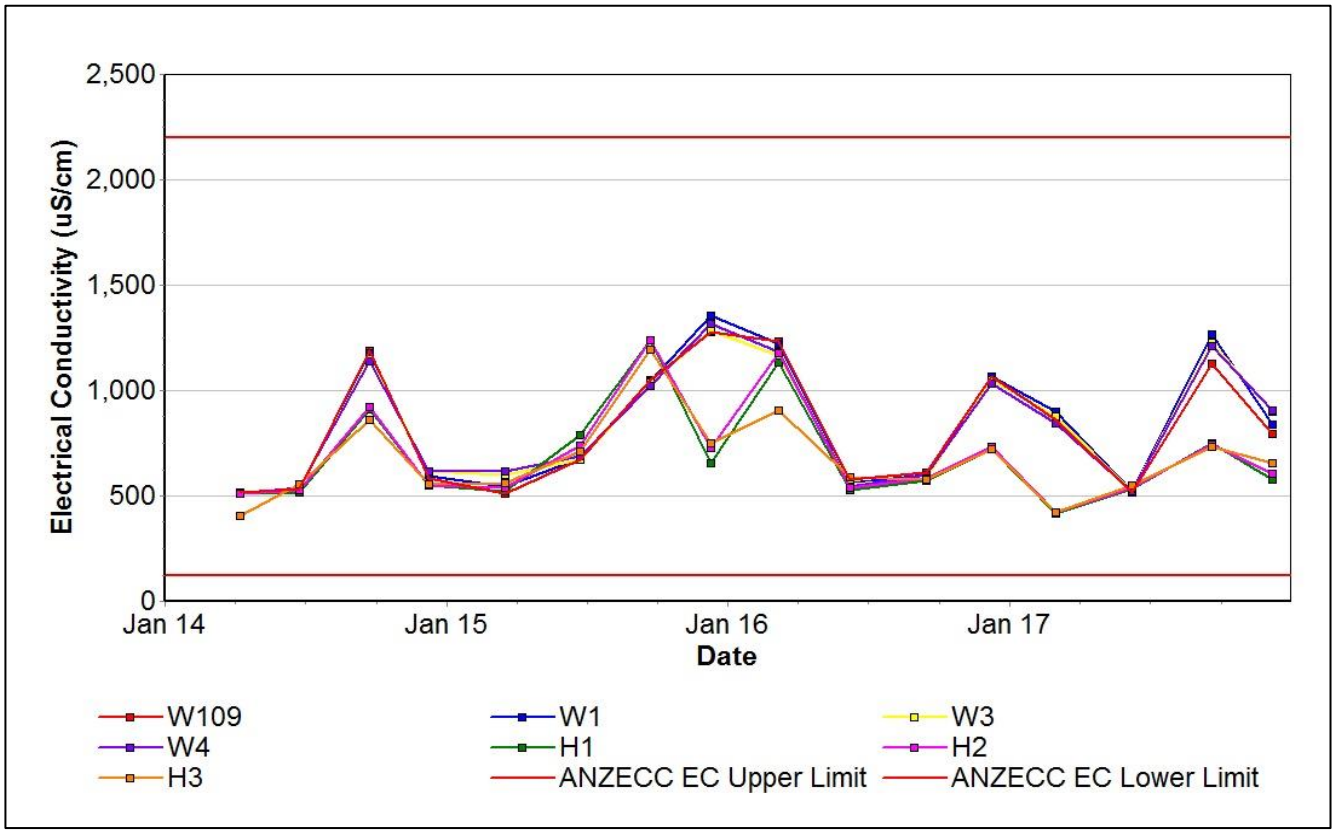


**Figure 16: Hunter River Electrical Conductivity Trend - December 2017**

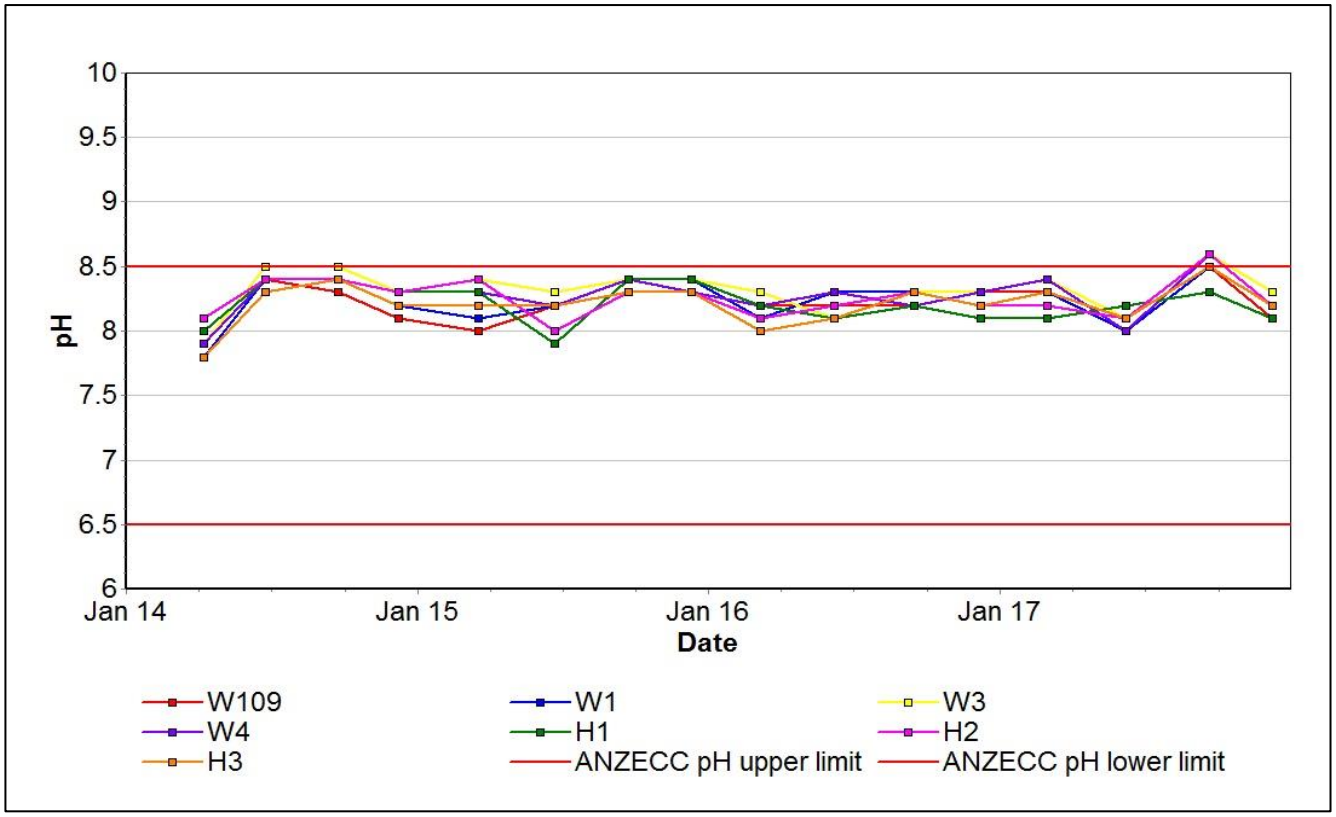


**Figure 17: Hunter River pH Trend - December 2017**

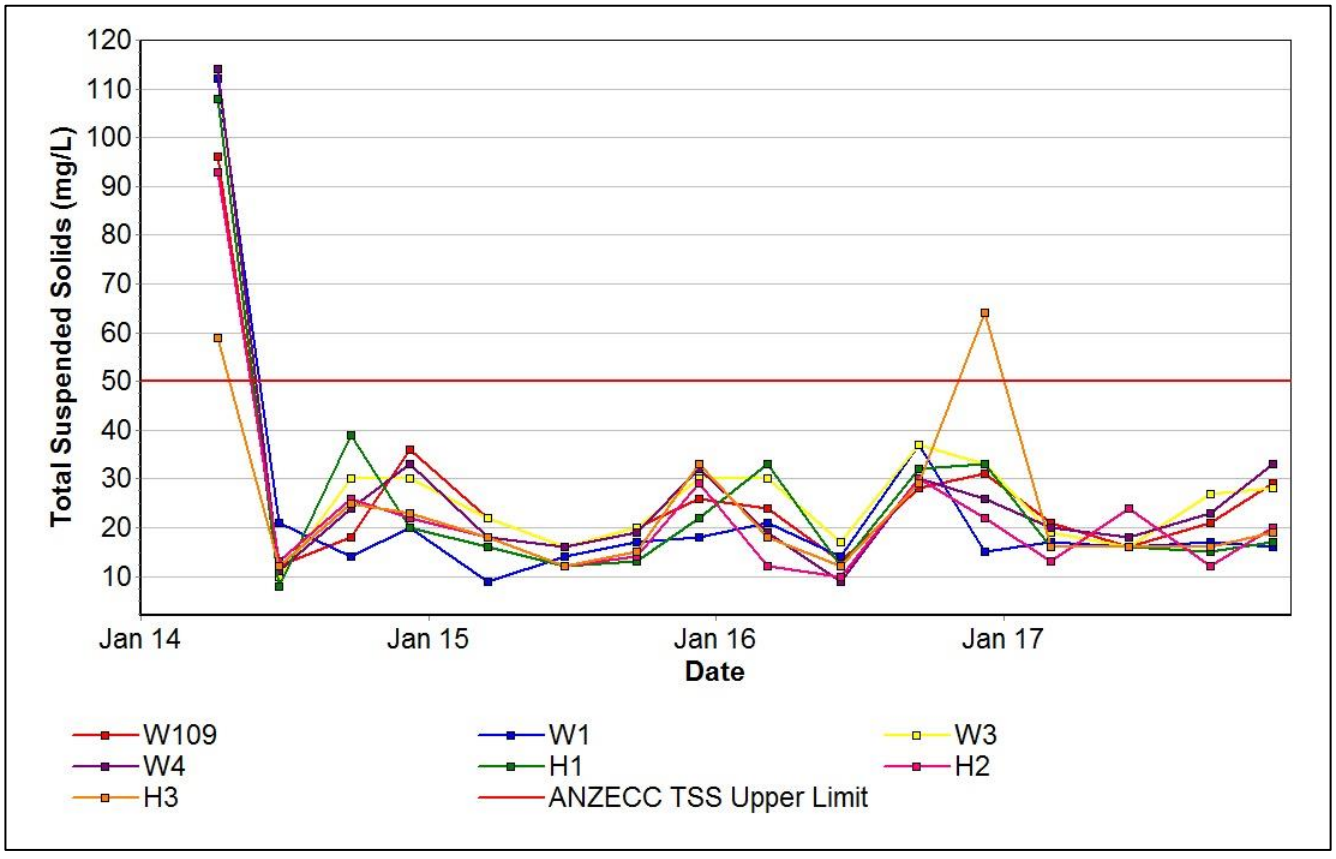


**Figure 18: Hunter River Total Suspended Solids - December 2017**

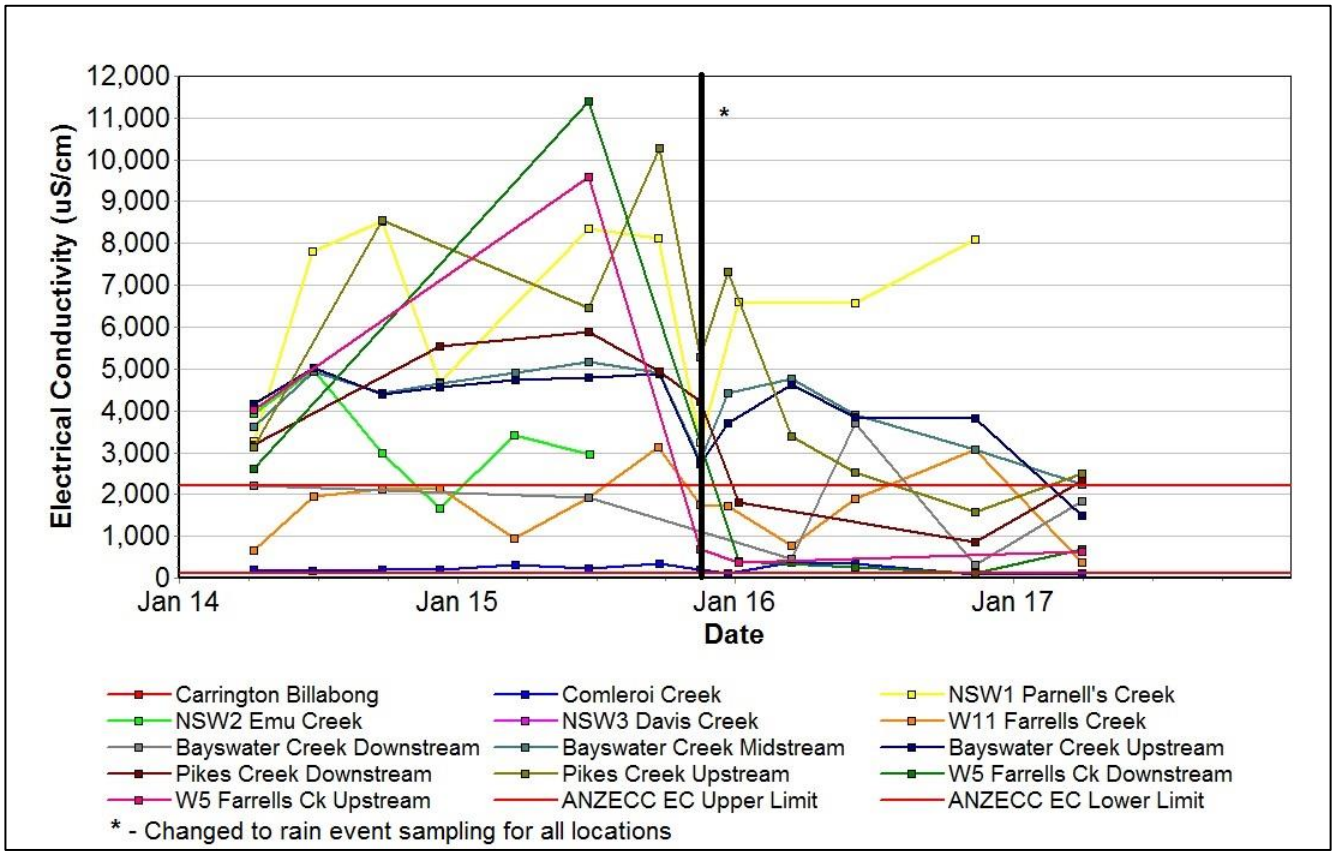


**Figure 19: Other Tributaries Electrical Conductivity Trend - December 2017**

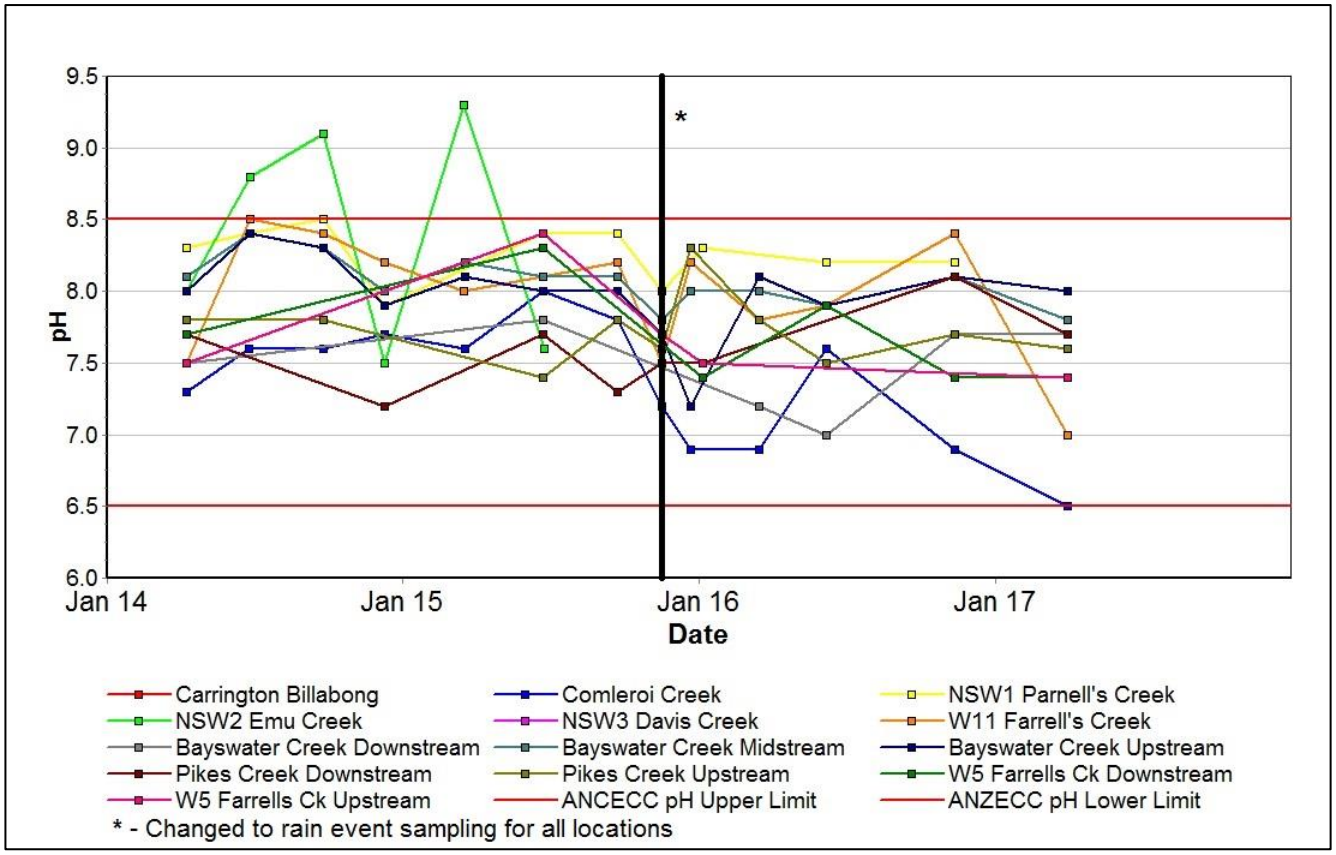


**Figure 20: Other Tributaries pH Trend – December 2017**

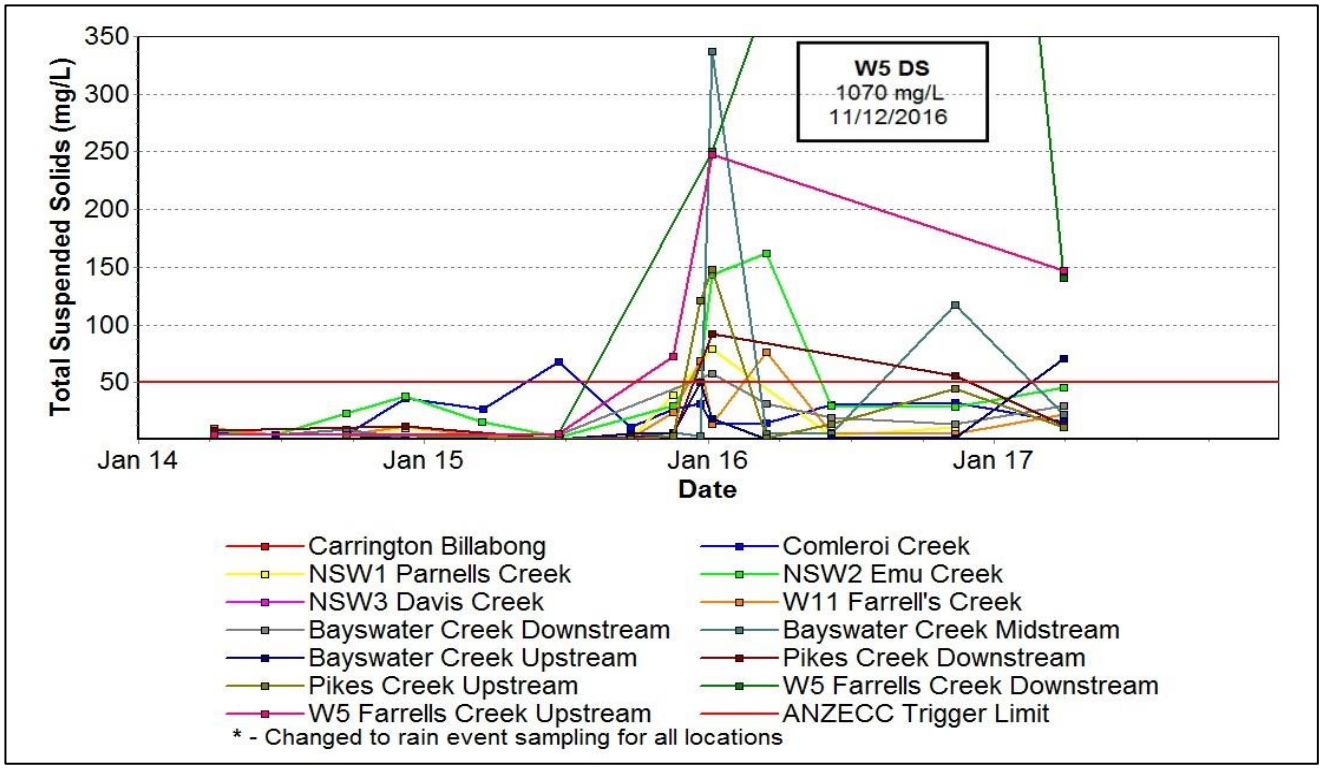


**Figure 21: Other Tributaries Total Suspended Solids Trend - December 2017**

### 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 11.9ML 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 2.

**Table 2: Surface Water Trigger Limit Summary**

| Site | Date | Trigger Limit Breached | Action taken in response |
|---|---|---|---|
| W1 (Hunter River) | 08/06/2017 | pH – 5$^{th}$ Percentile | Watching Brief* |
| W4 Hunter River | 08/06/2017 | pH – 5$^{th}$ Percentile | Watching Brief* |
| H2 | 20/09/2017 | pH – 95$^{th}$ Percentile | Watching Brief* |
| H3 | 20/09/2017 | pH – 95$^{th}$ Percentile | Watching Brief* |
| W1 (Hunter River) | 20/09/2017 | pH – 95$^{th}$ Percentile | Watching Brief* |
| W3 Hunter River | 20/09/2017 | pH – 95$^{th}$ Percentile | Watching Brief* |
| W4 Hunter River | 20/09/2017 | pH – 95$^{th}$ Percentile | Watching Brief* |
| Warkworth Bridge | 08/12/2017 | EC – 95$^{th}$ Percentile | Watching Brief* |

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

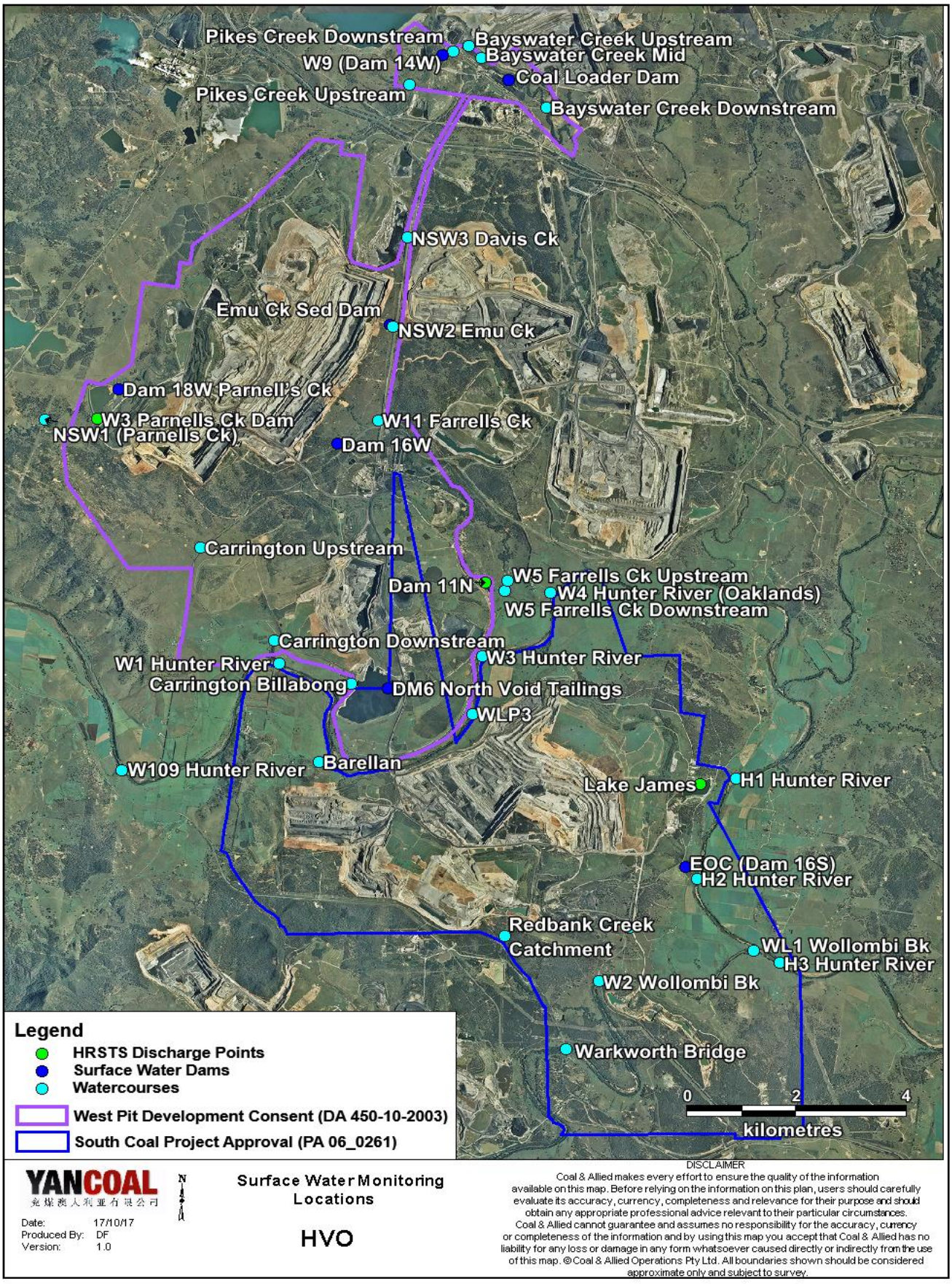


**Figure 22: Surface Water Monitoring Location Plan**

# 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 77.

Figure 23 to Figure 76 show the long term trends (2014 – current) for ground water bores monitored at HVO.

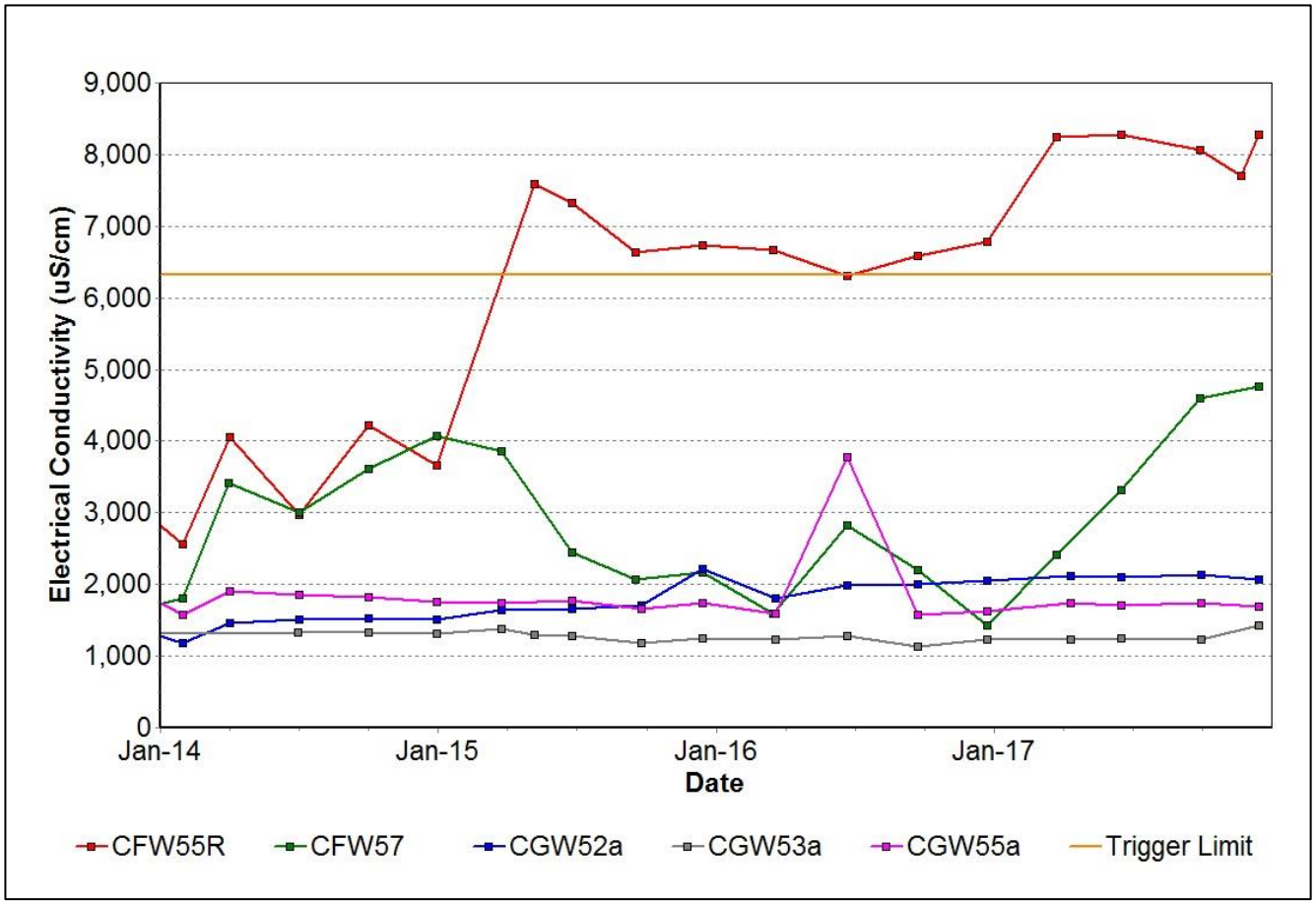


**Figure 23: Carrington Alluvium Electrical Conductivity Trend - December 2017**

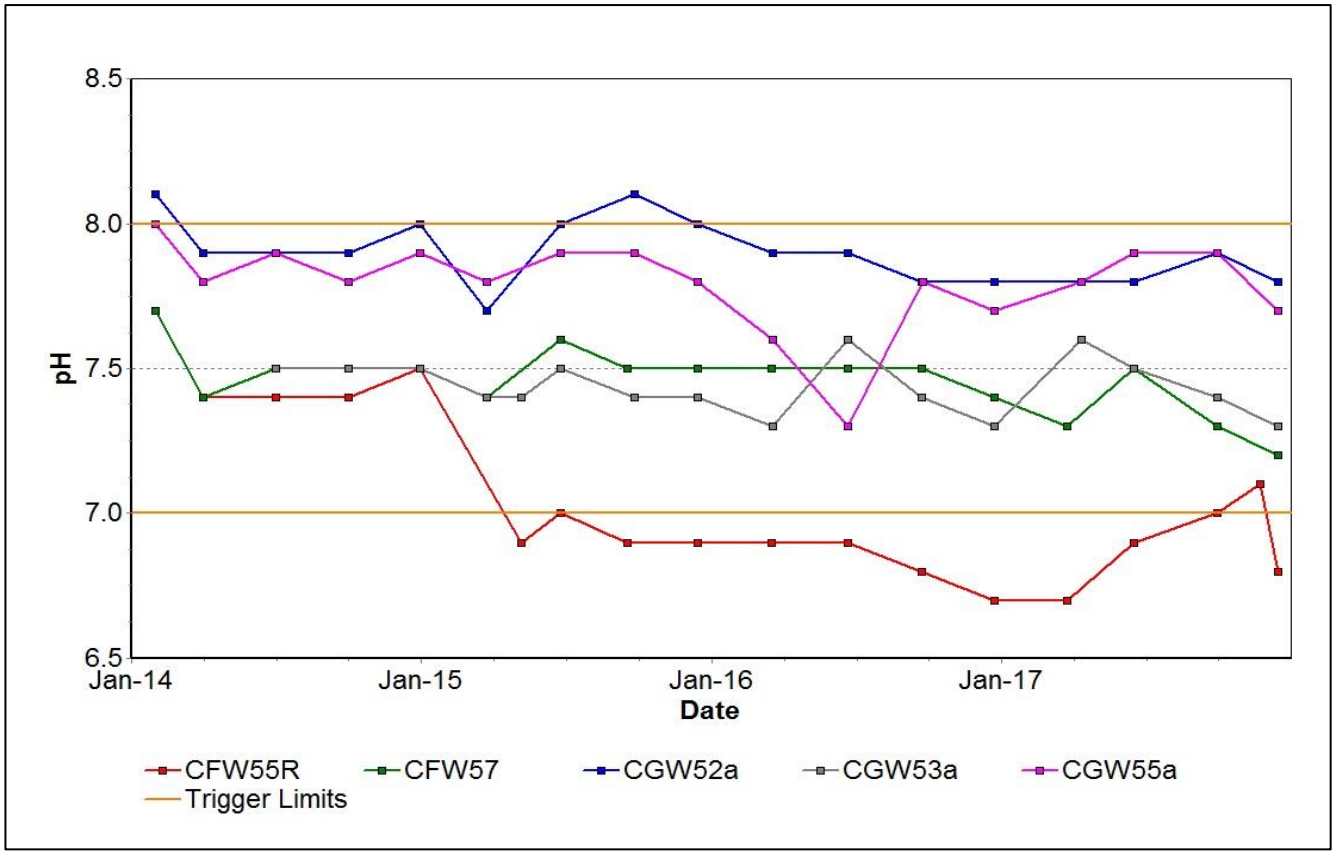


**Figure 24: Carrington Alluvium pH Trend – December 2017**

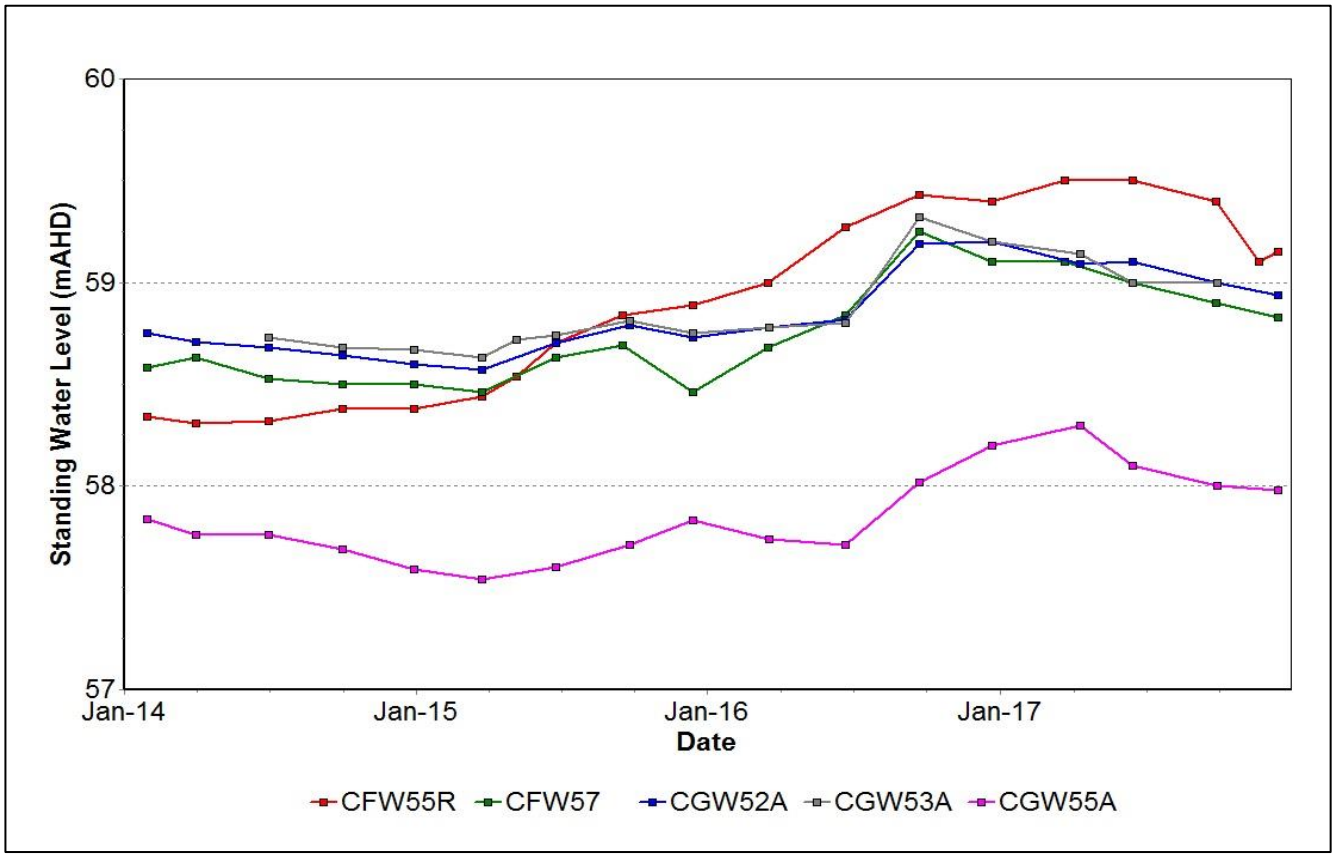


**Figure 25: Carrington Alluvium Standing Water Level - December 2017**

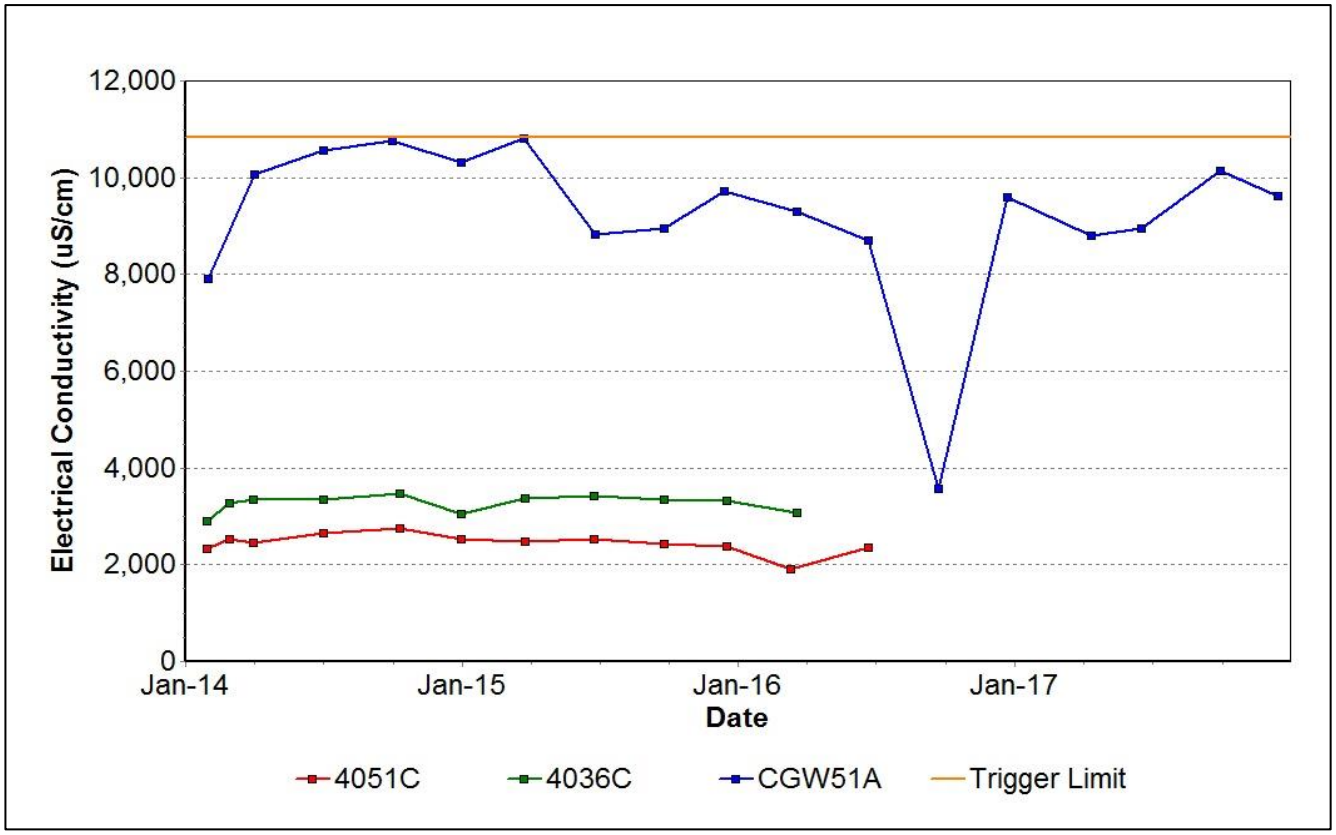


**Figure 26: Carrington Interburden Electrical Conductivity Trend - December 2017**

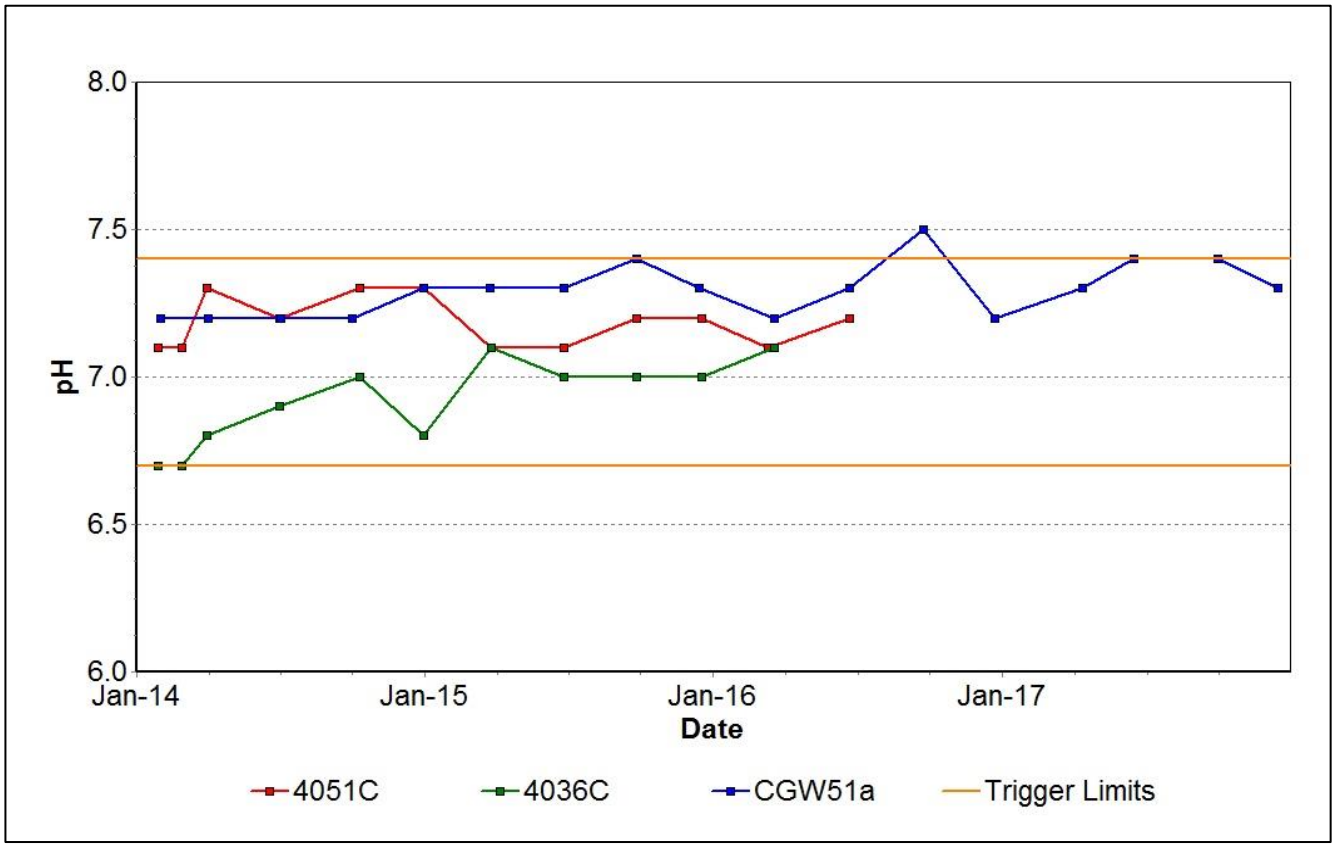


**Figure 27: Carrington Interburden pH Trend – December 2017**

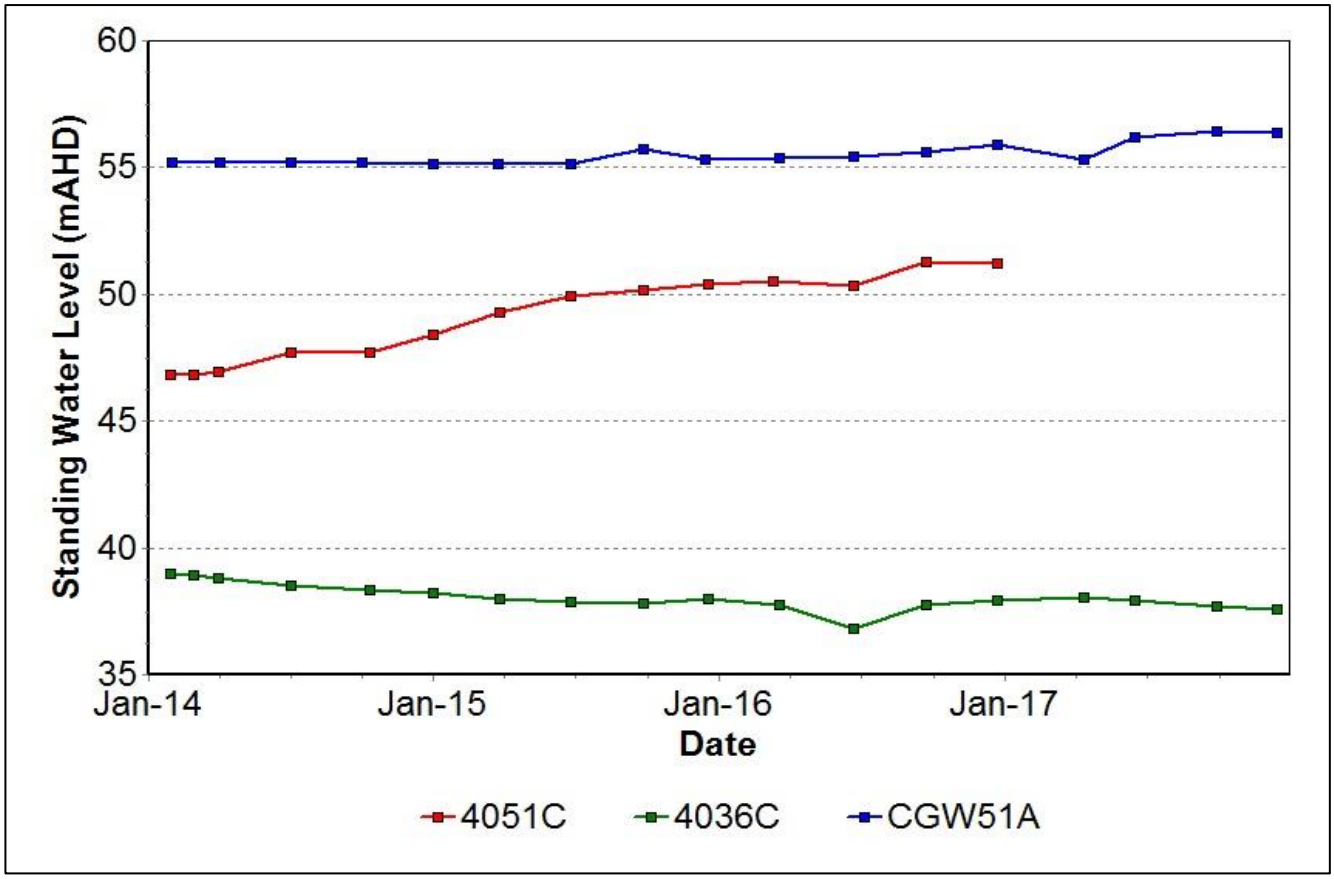


**Figure 28: Carrington Interburden Standing Water Level - December 2017**

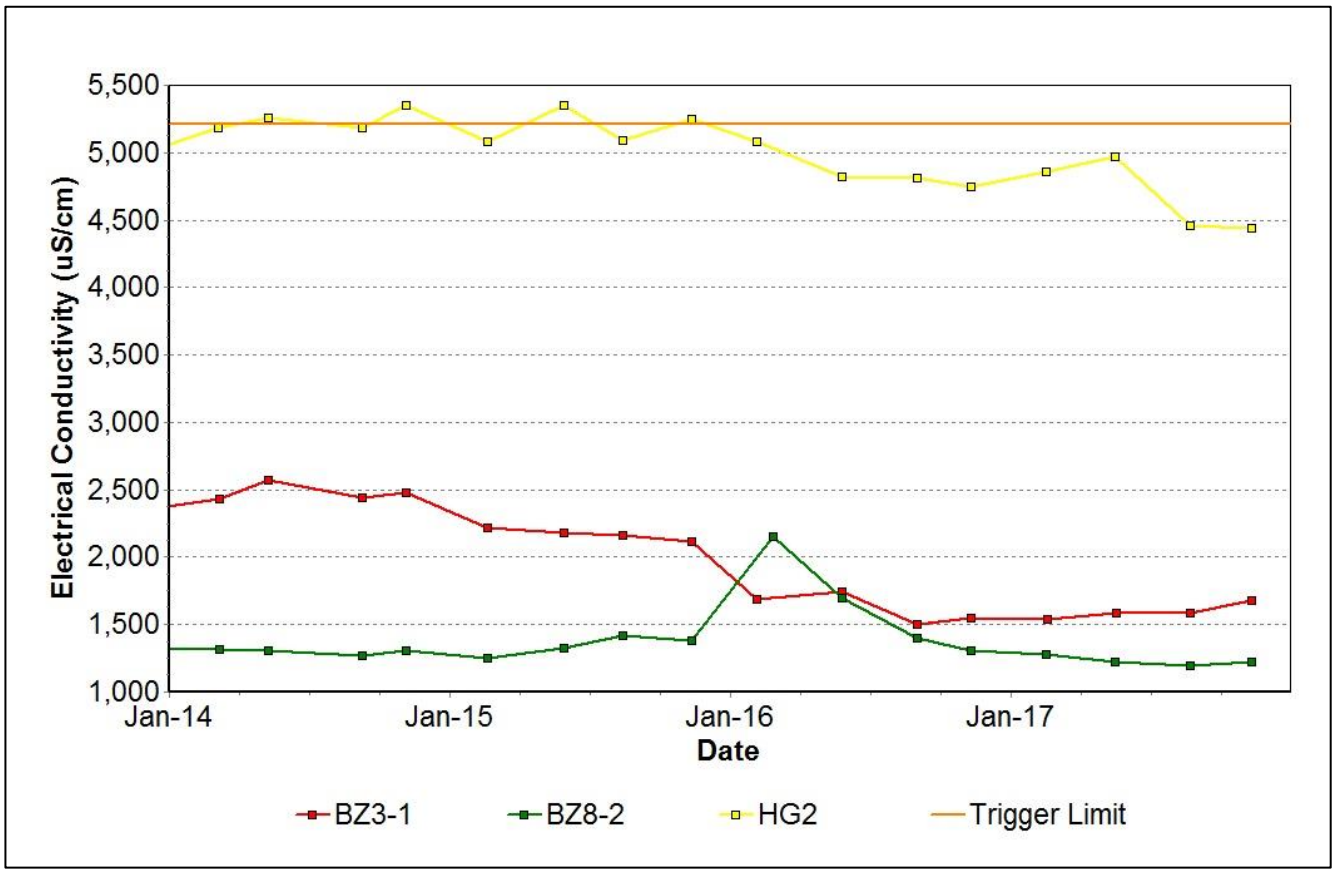

**Figure 29: Cheshunt Interburden Electrical Conductivity Trend - December 2017**

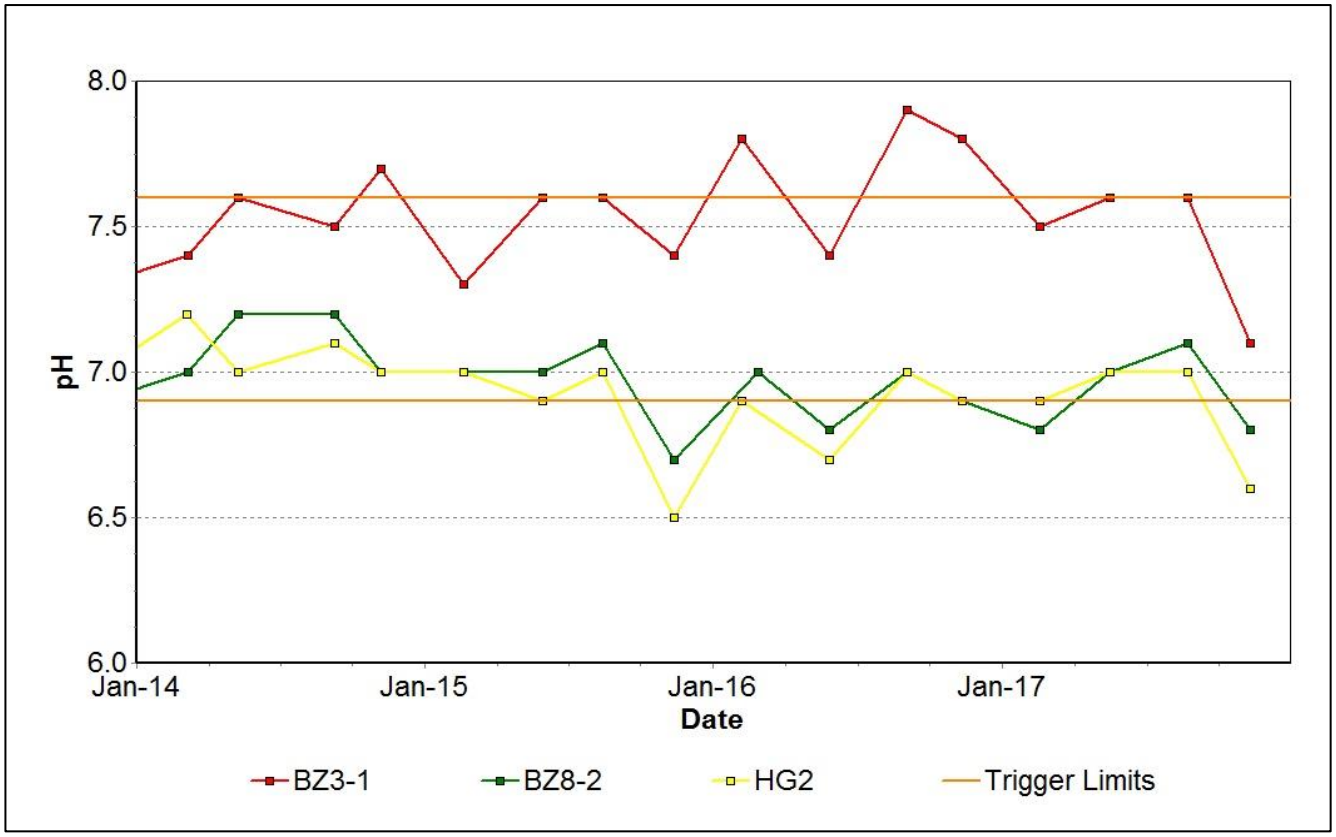


**Figure 30: Cheshunt Interburden pH Trend - December 2017**

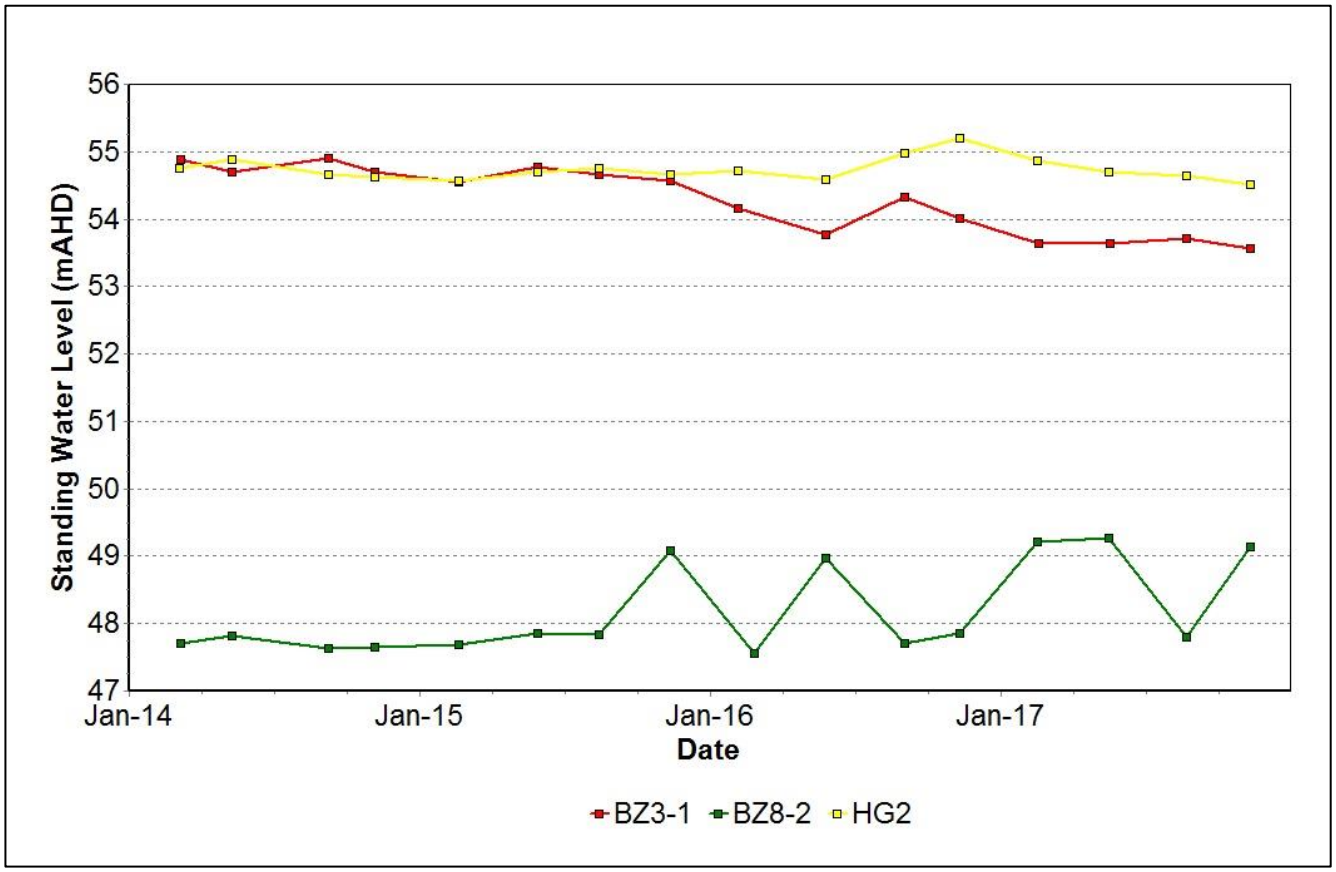

**Figure 31: Cheshunt Interburden Standing Water Level – December 2017**

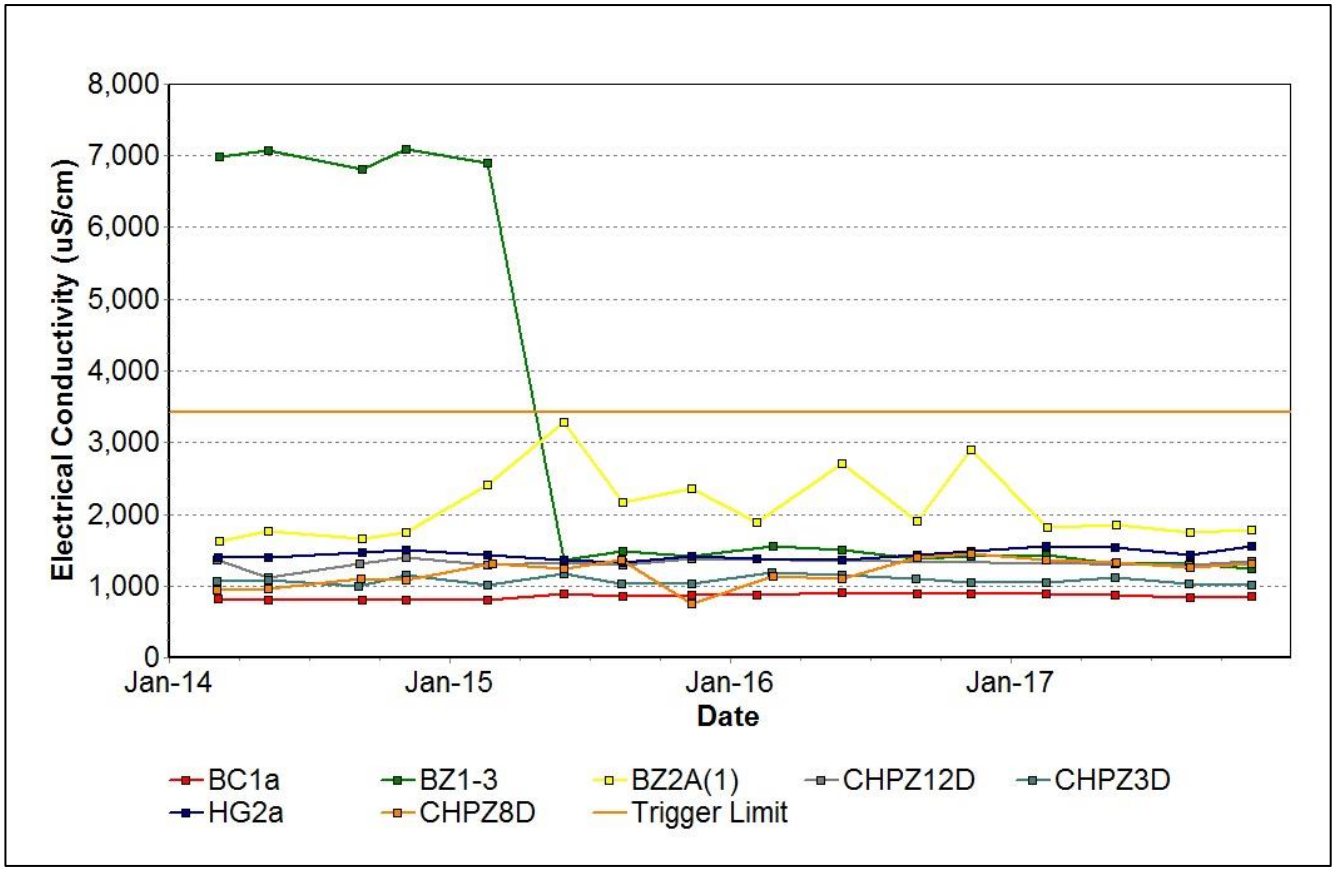


**Figure 32: Cheshunt Mt Arthur Electrical Conductivity Trend - December 2017**

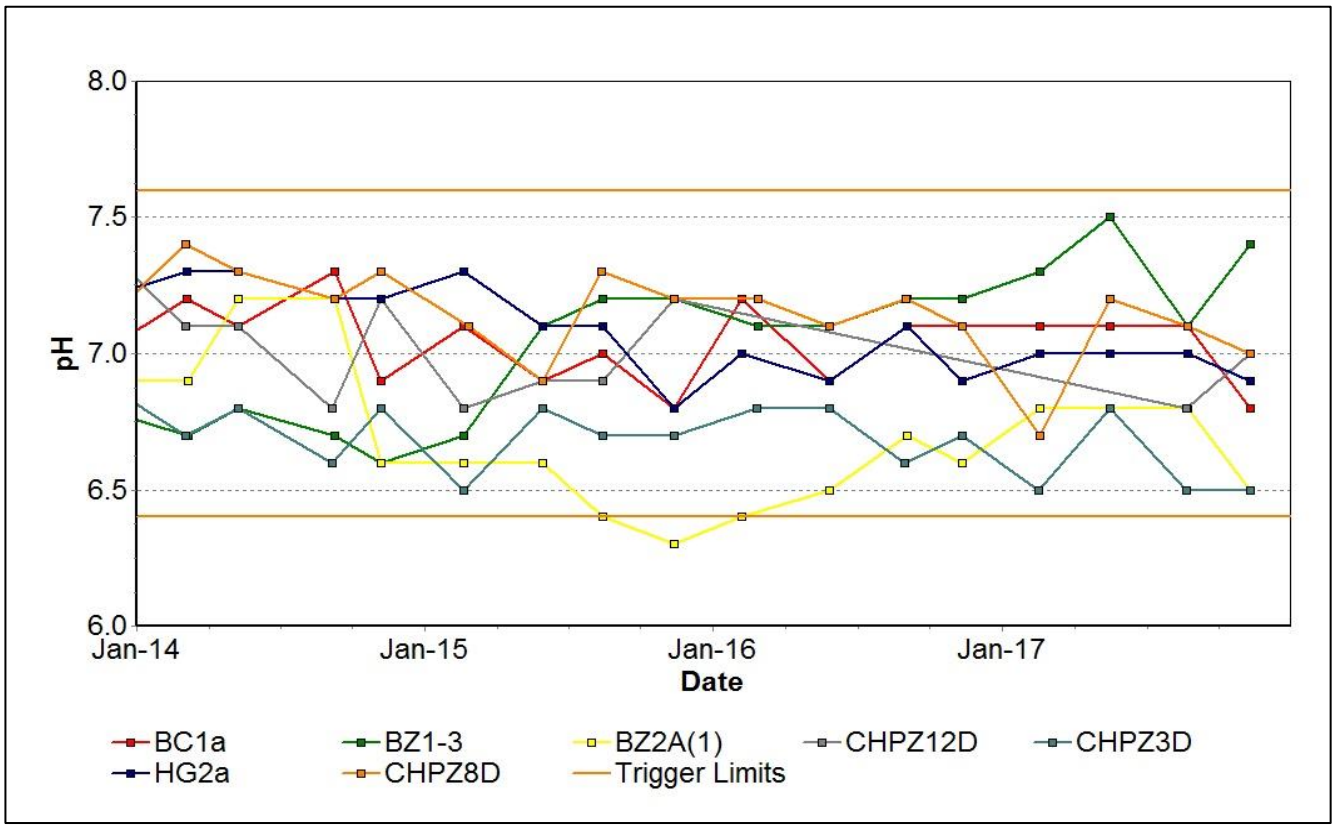

**Figure 33: Cheshunt Mt Arthur pH Trend - December 2017**

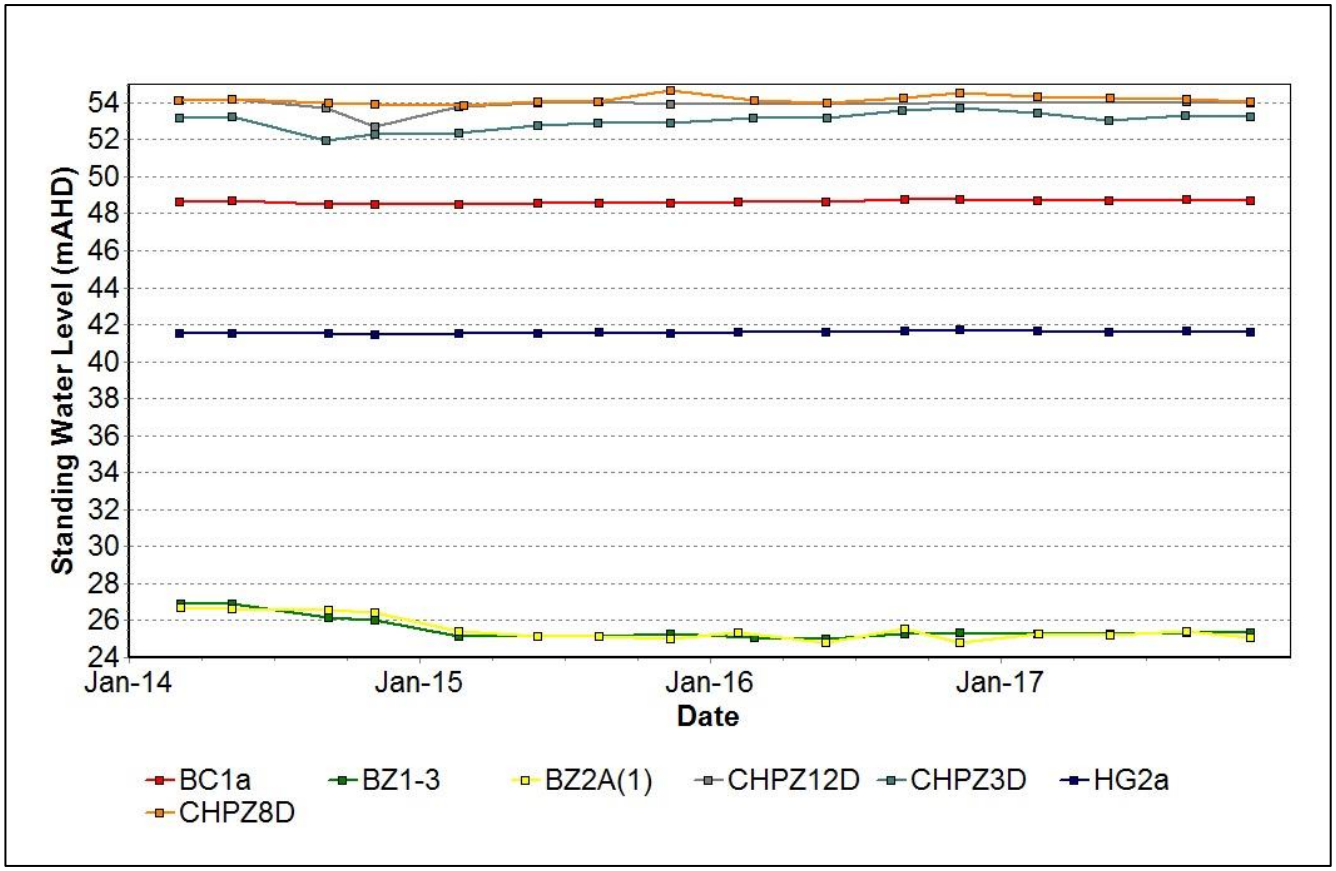


**Figure 34: Cheshunt Mt Arthur Standing Water Level – December 2017**

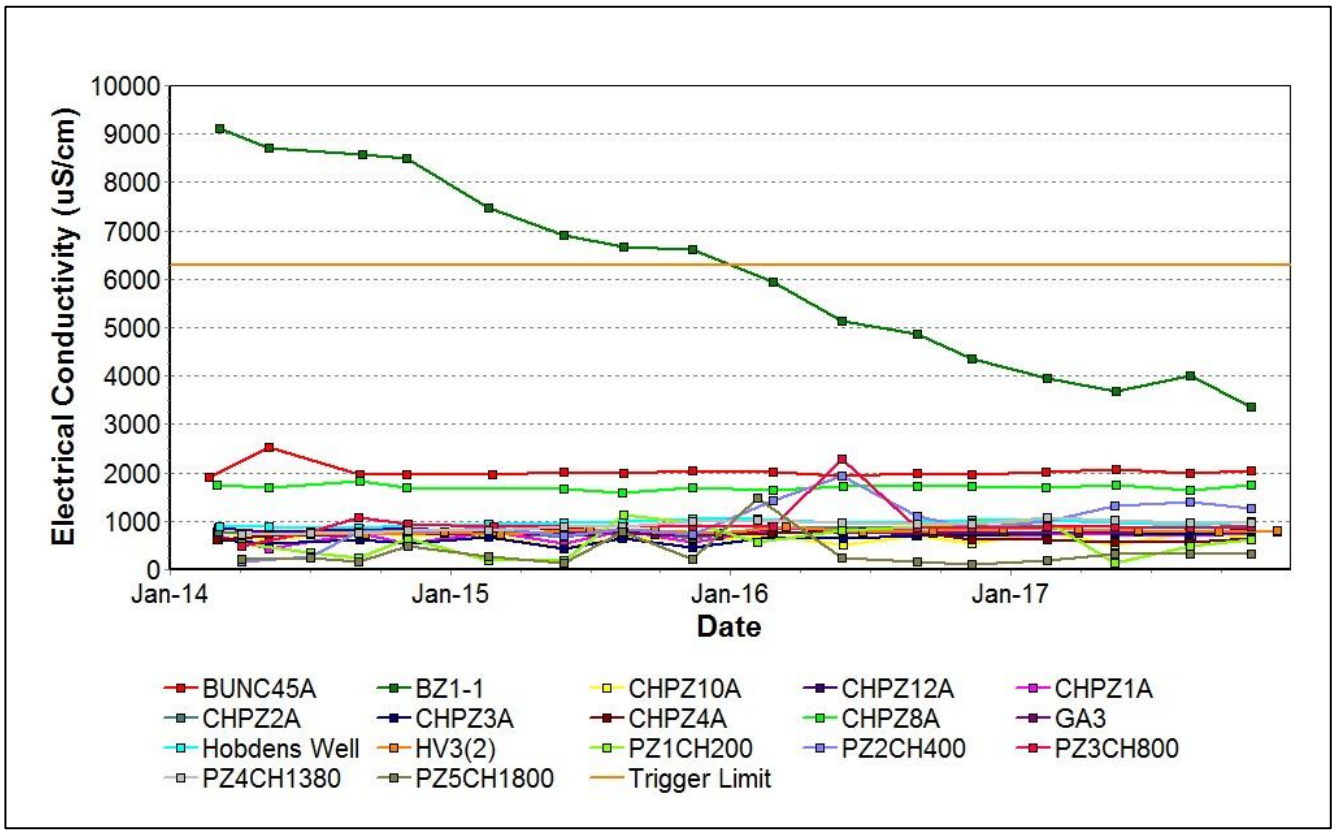

**Figure 35: Cheshunt / North Pit Alluvium Electrical Conductivity Trend - December 2017**

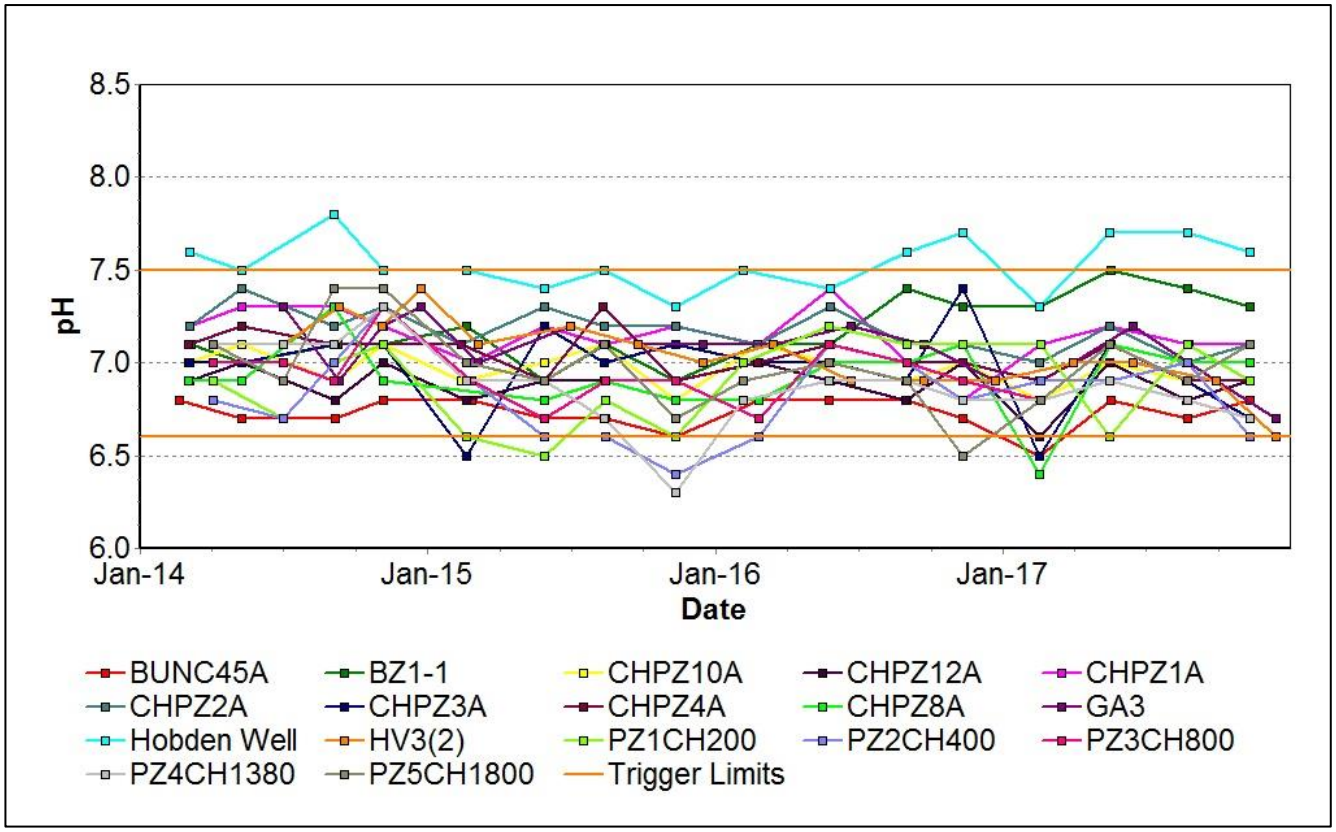


**Figure 36: Cheshunt / North Pit Alluvium pH Trend - December 2017**

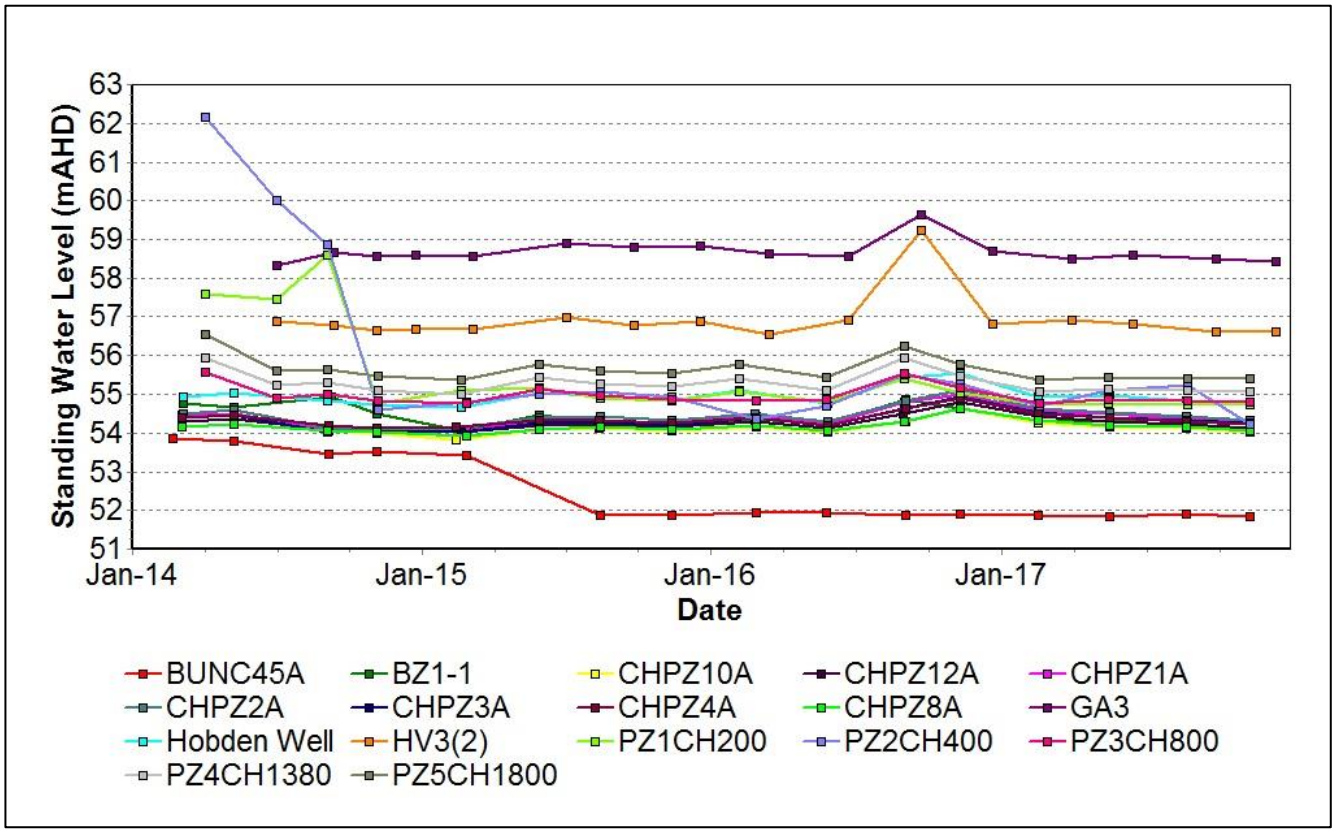

**Figure 37: Cheshunt / North Pit Alluvium Standing Water Level – December 2017**

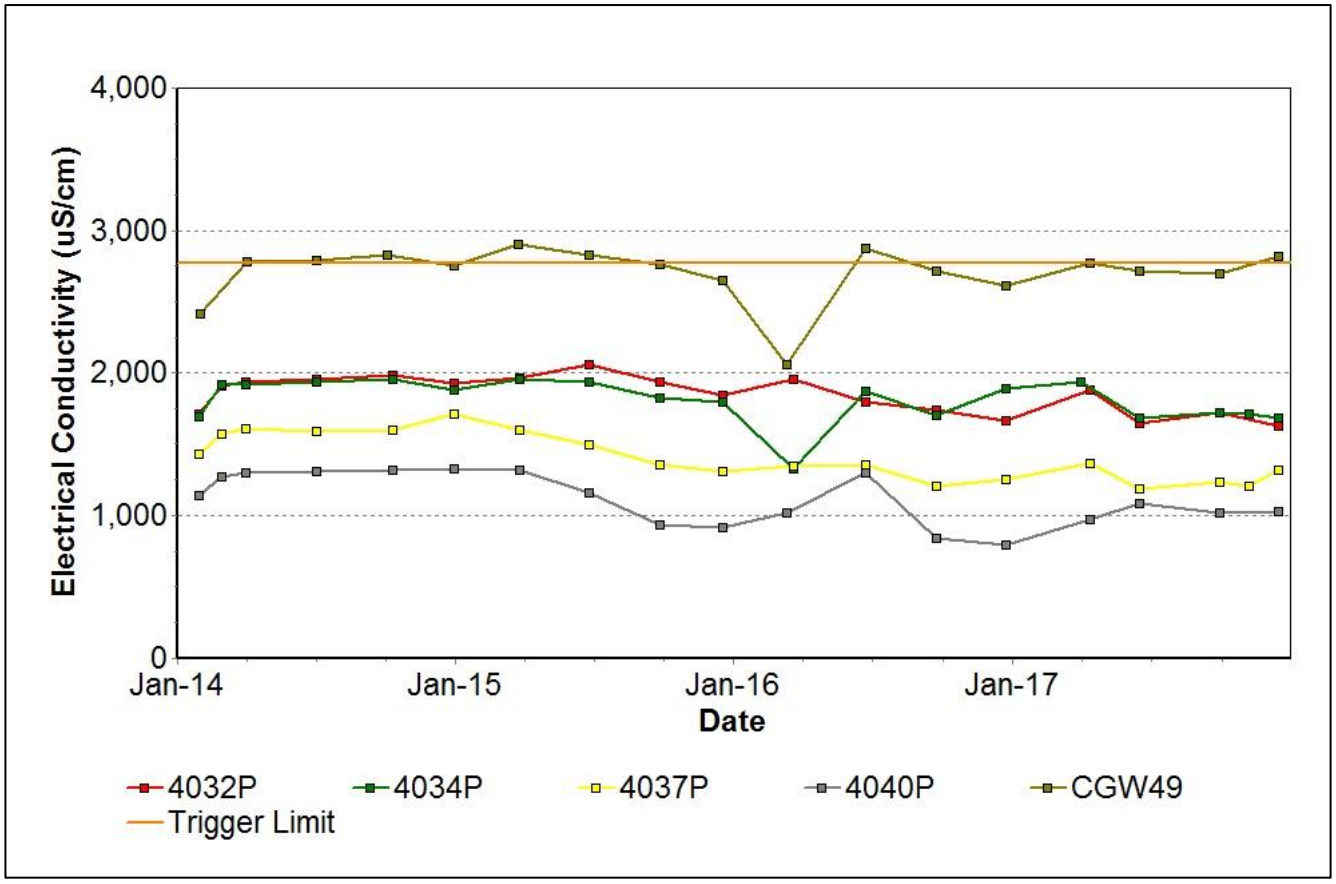


**Figure 38: Carrington West Wing Alluvium Electrical Conductivity Trend - December 2017**

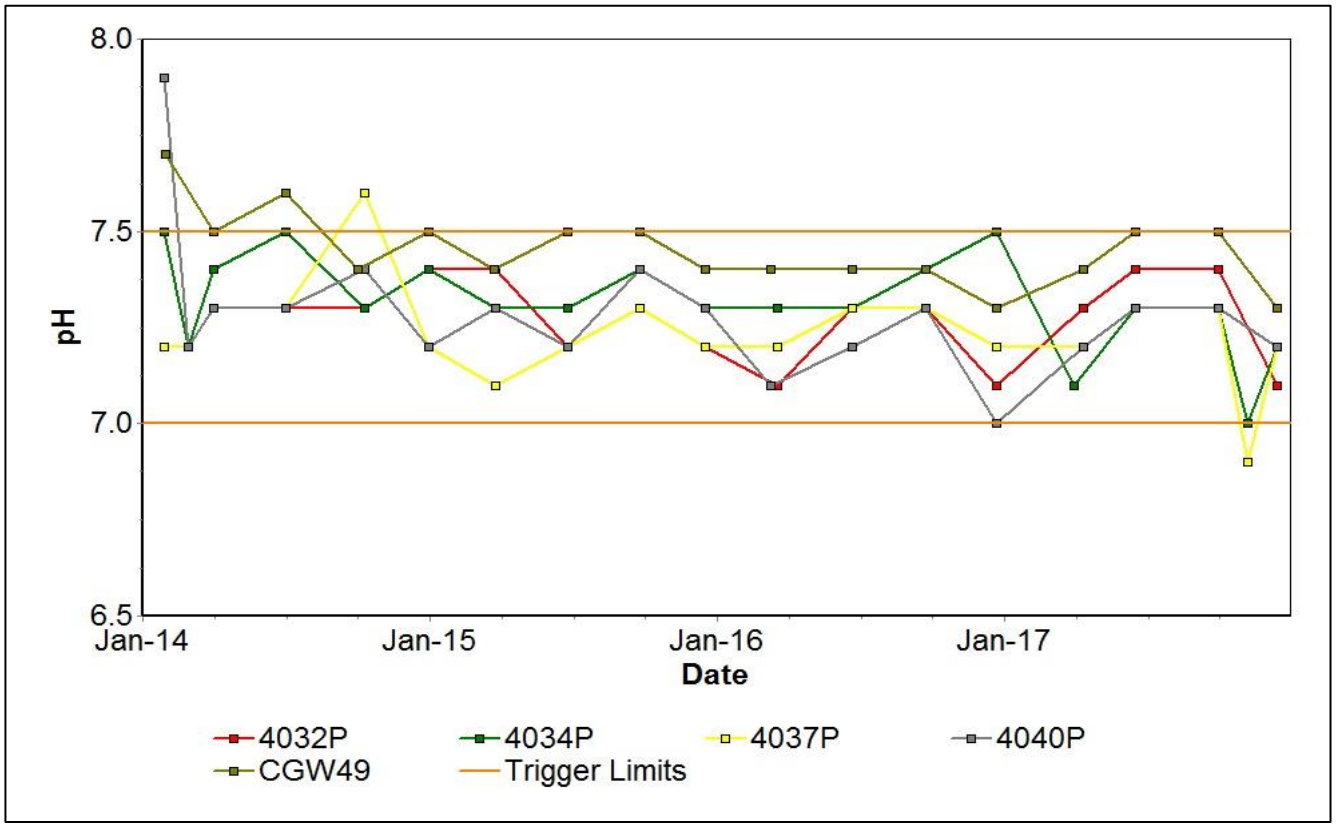

**Figure 39: Carrington West Wing Alluvium pH Trend - December 2017**

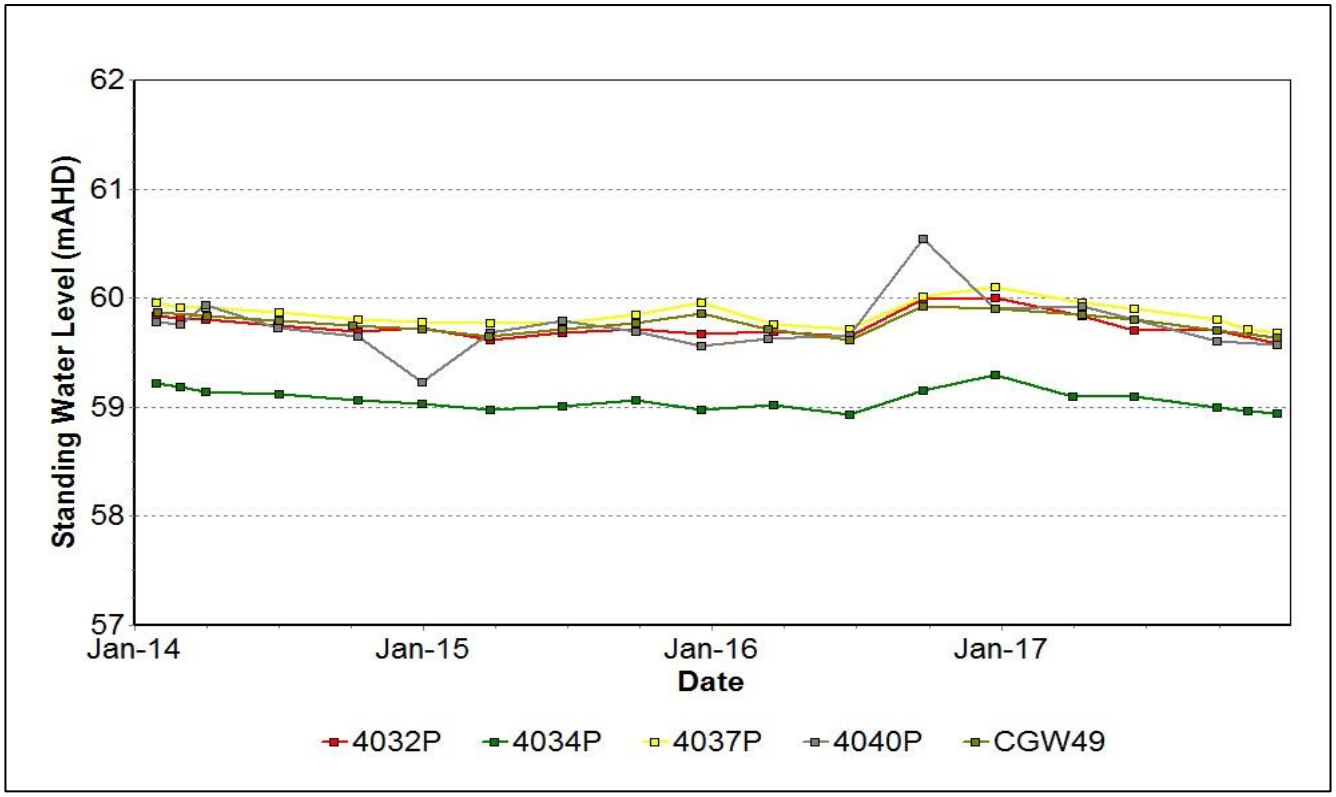


**Figure 40: Carrington West Wing Alluvium Standing Water Level – December 2017**

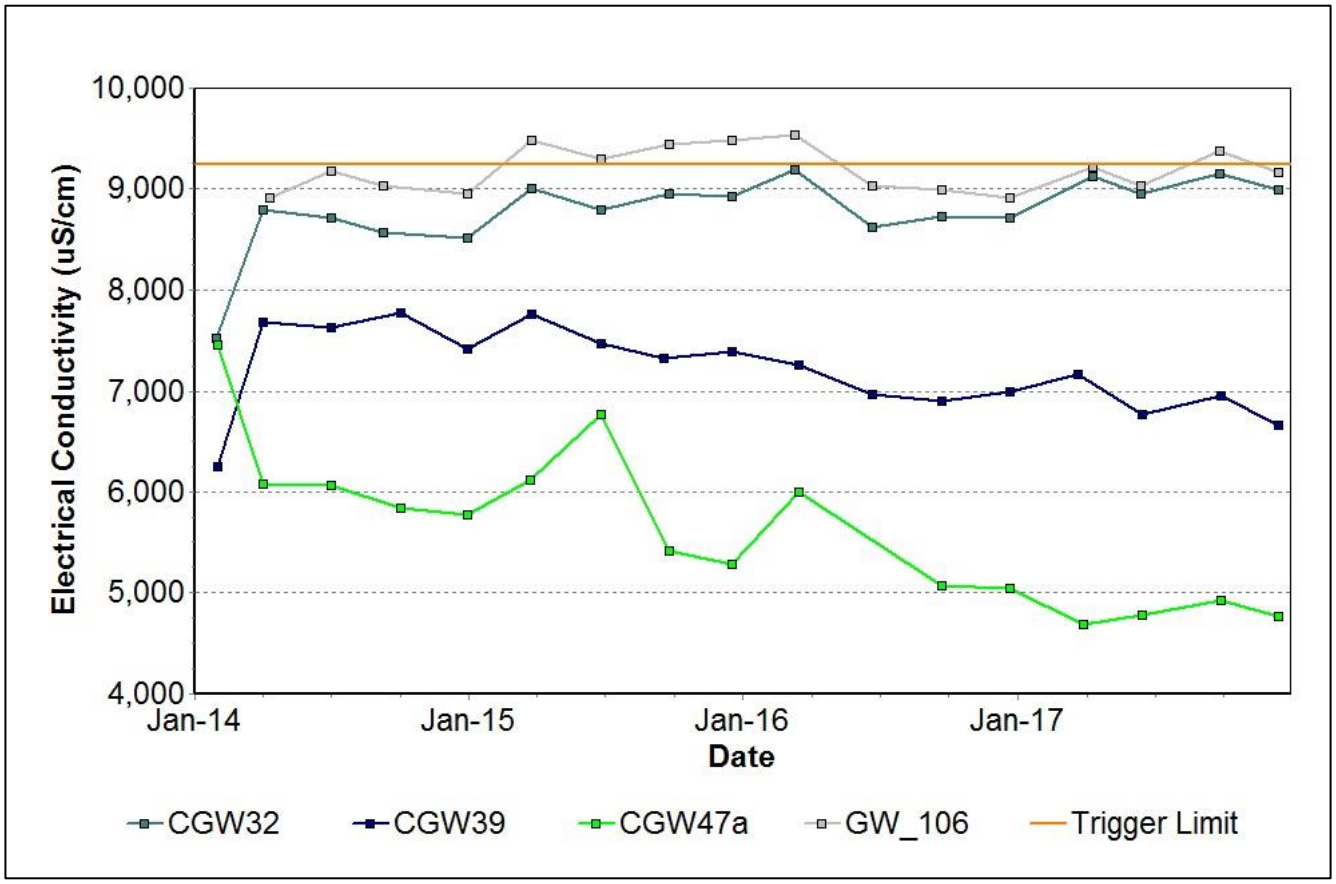

**Figure 41: Carrington West Wing Flood Plain Electrical Conductivity Trend - December 2017**

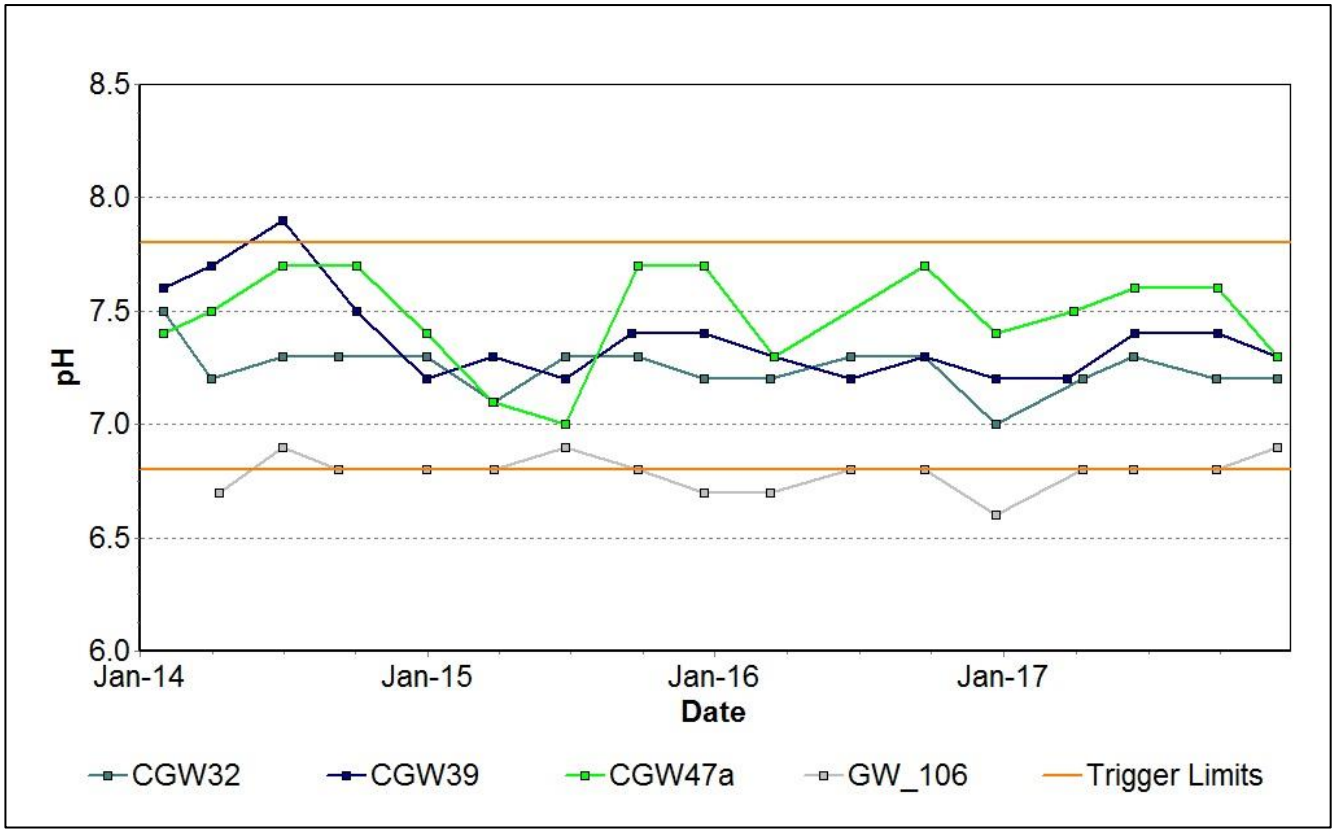


**Figure 42: Carrington West Wing Flood Plain pH Trend - December 2017**

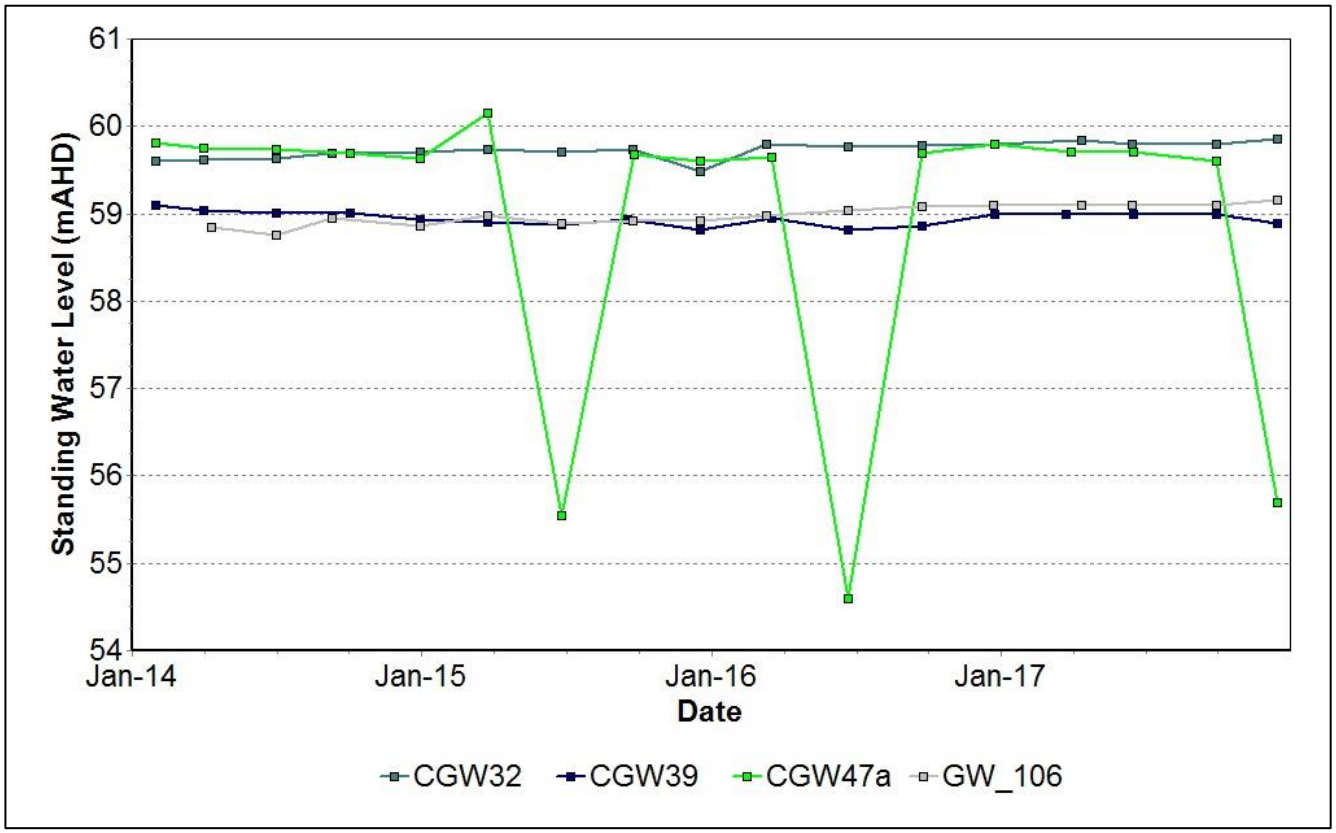

**Figure 43: Carrington West Wing Flood Plain Standing Water Level – December 2017**

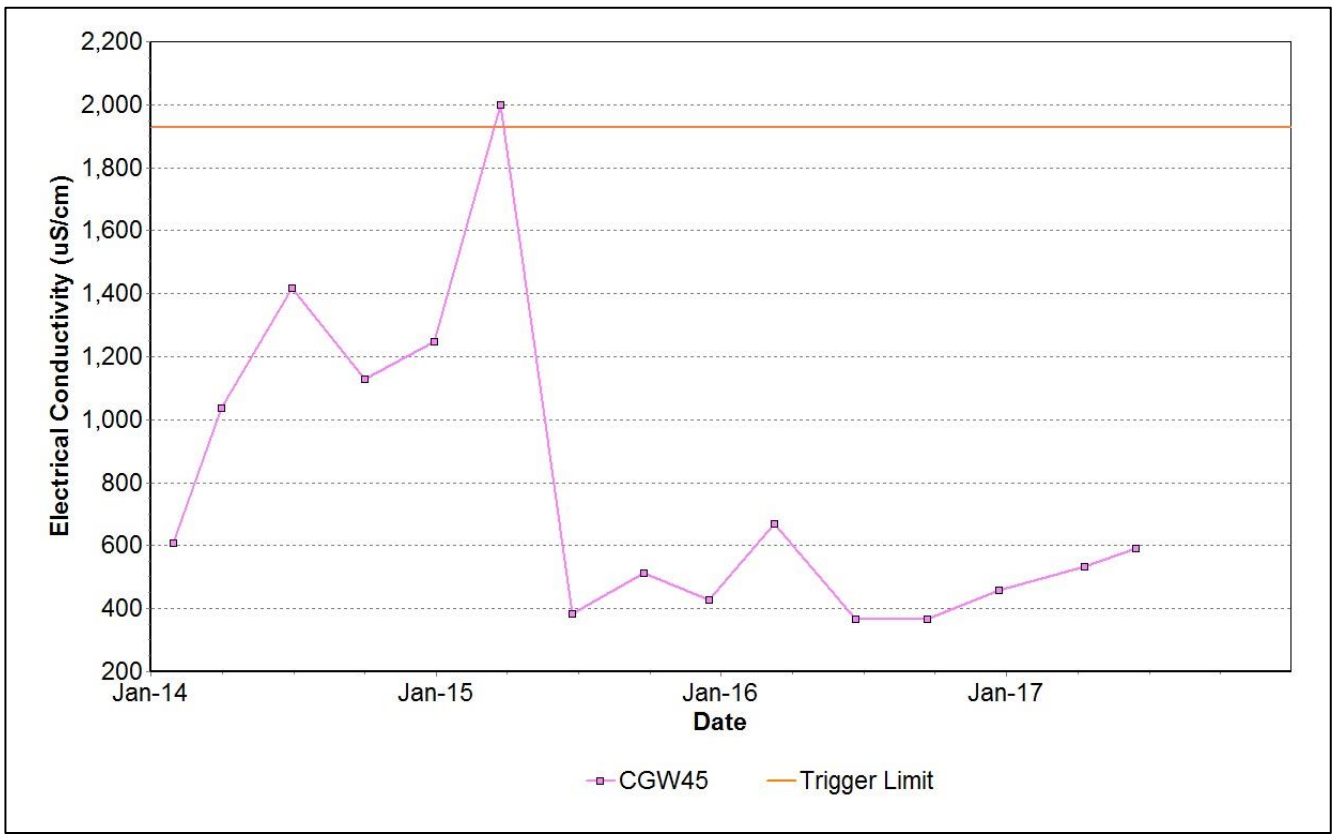


**Figure 44: Carrington West Wing LBL Electrical Conductivity Trend - December 2017**

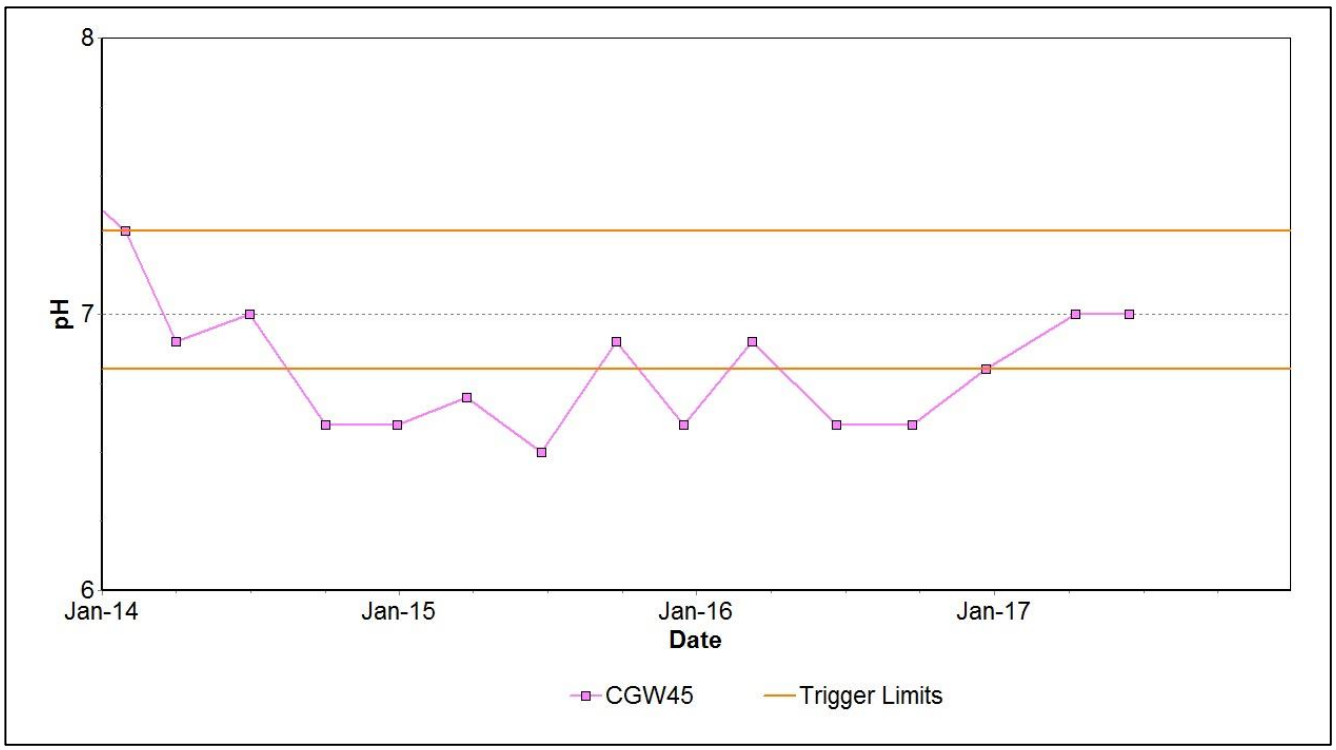

**Figure 45: Carrington West Wing LBL pH Trend - December 2017**

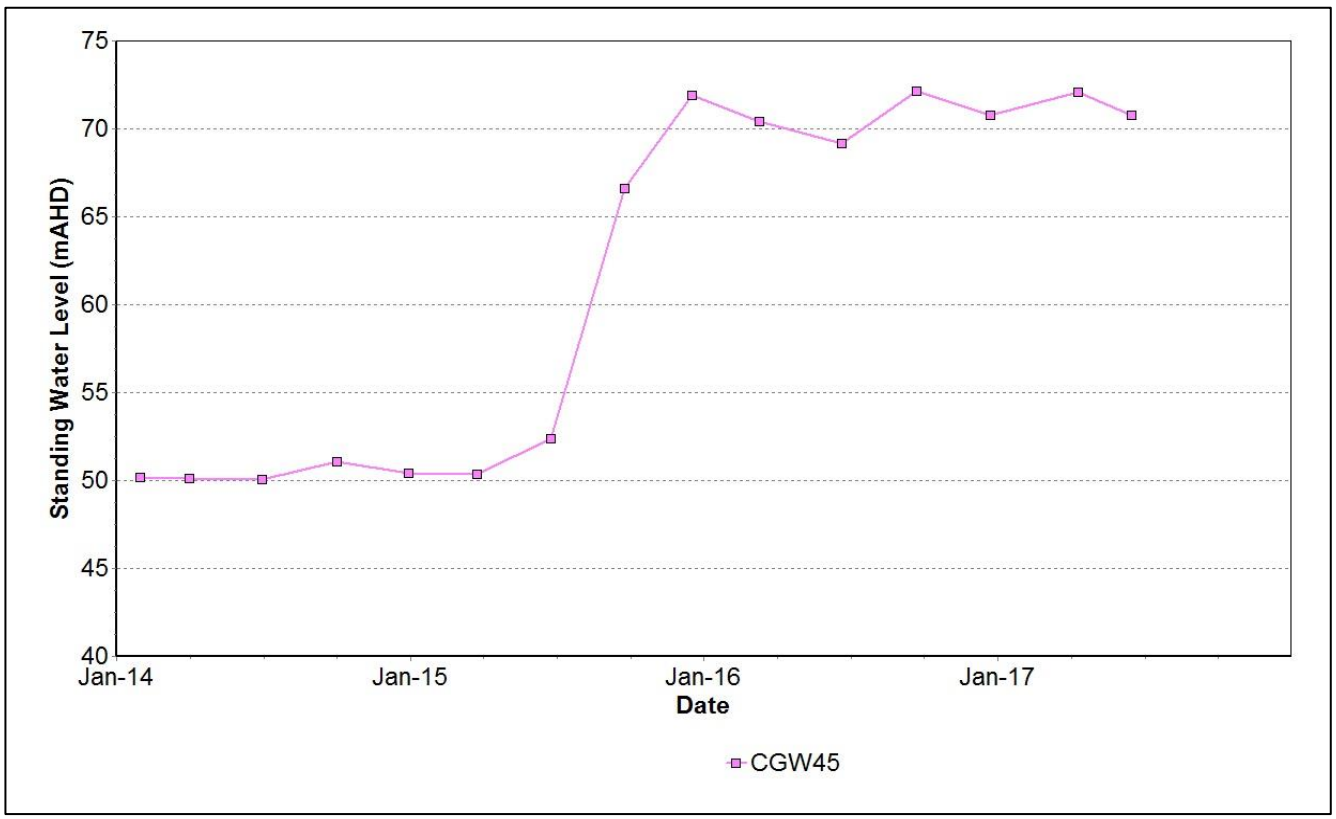


**Figure 46: Carrington West Wing LBL Standing Water Level - December 2017**

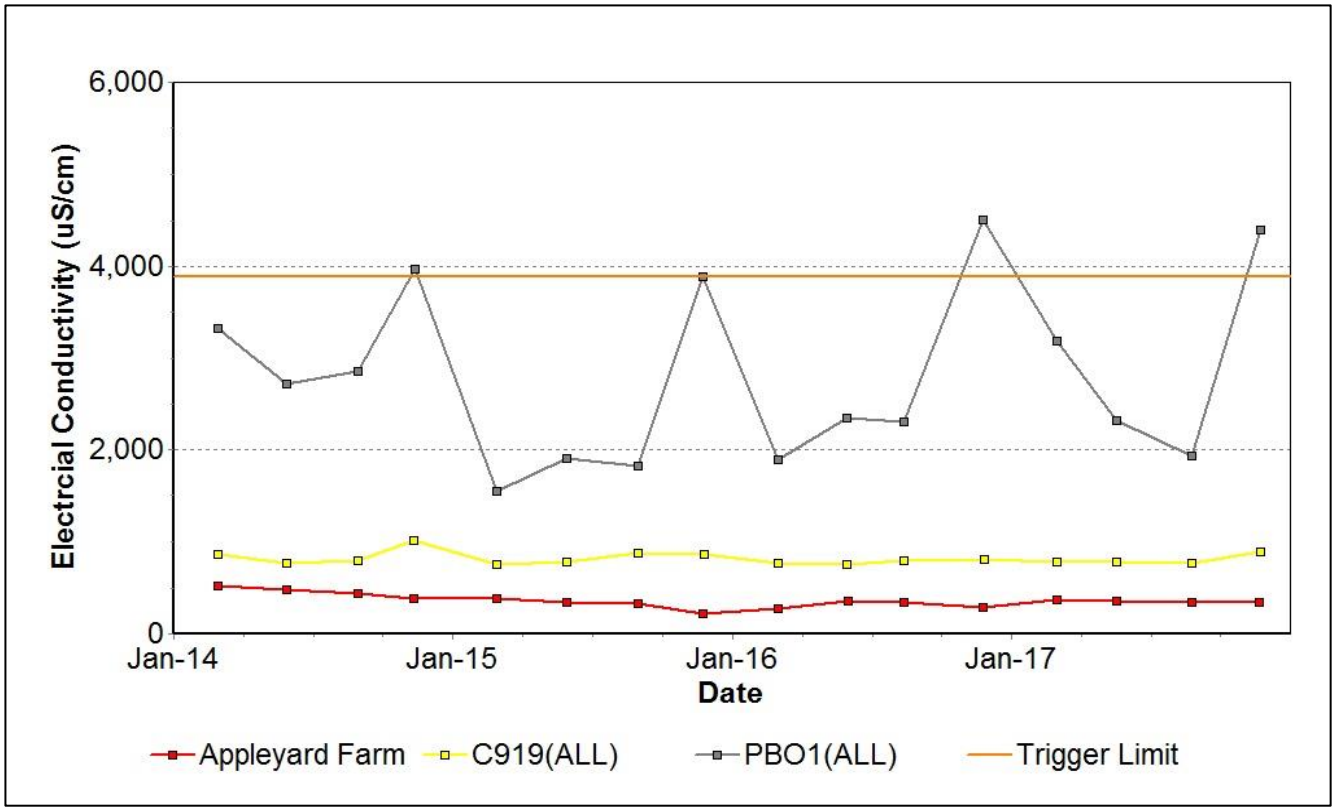

**Figure 47: Lemington South Alluvium Electrical Conductivity Trend - December 2017**

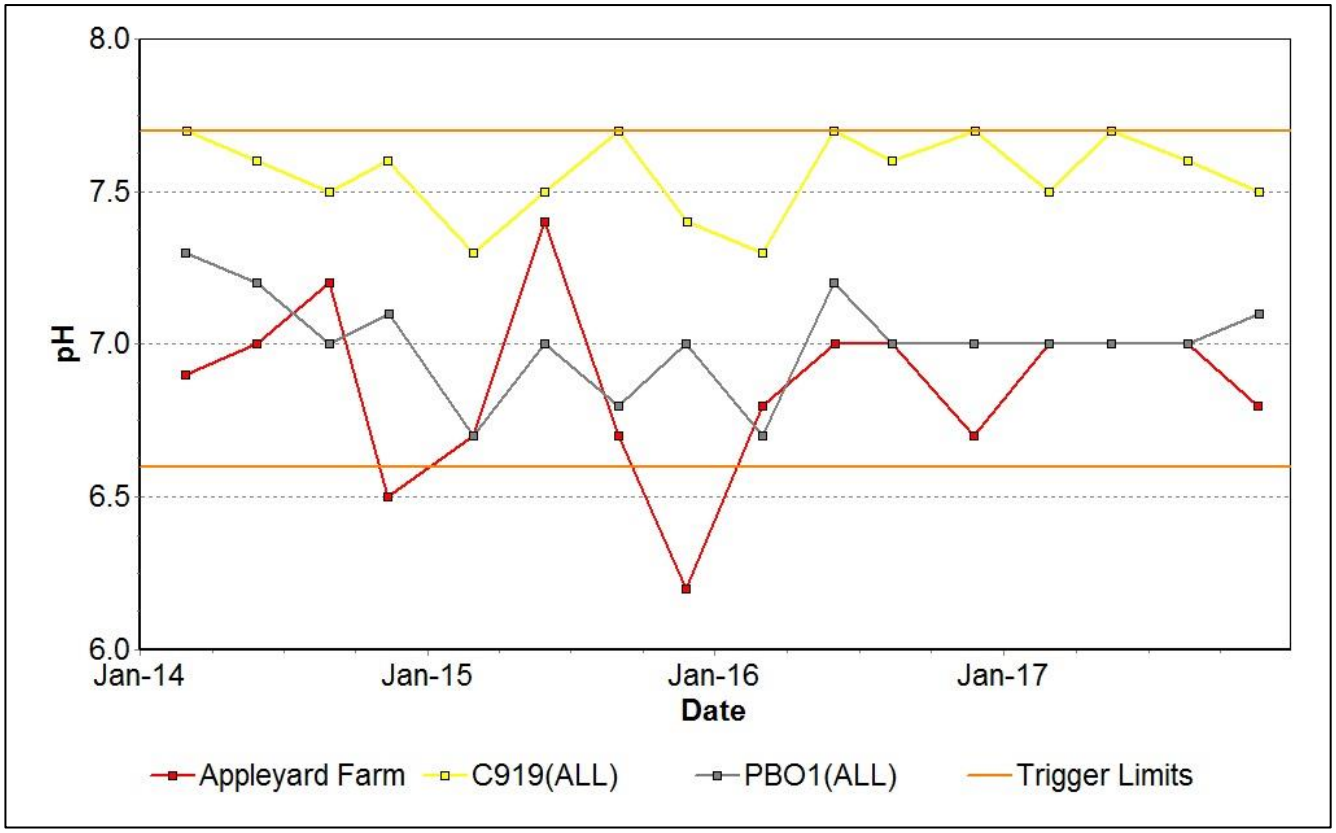


**Figure 48: Lemington South Alluvium pH Trend – December 2017**

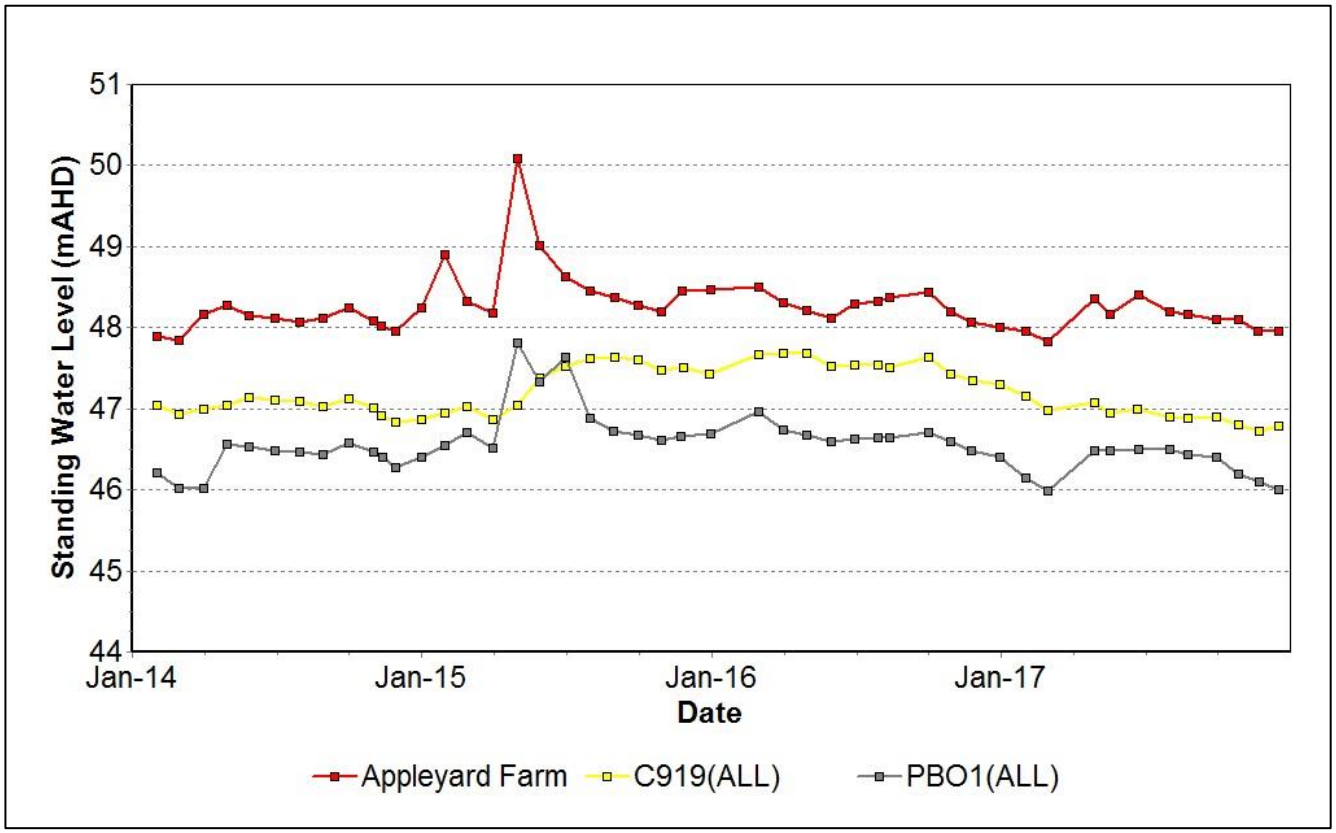

**Figure 49: Lemington South Alluvium Standing Water Level Trend – December 2017**

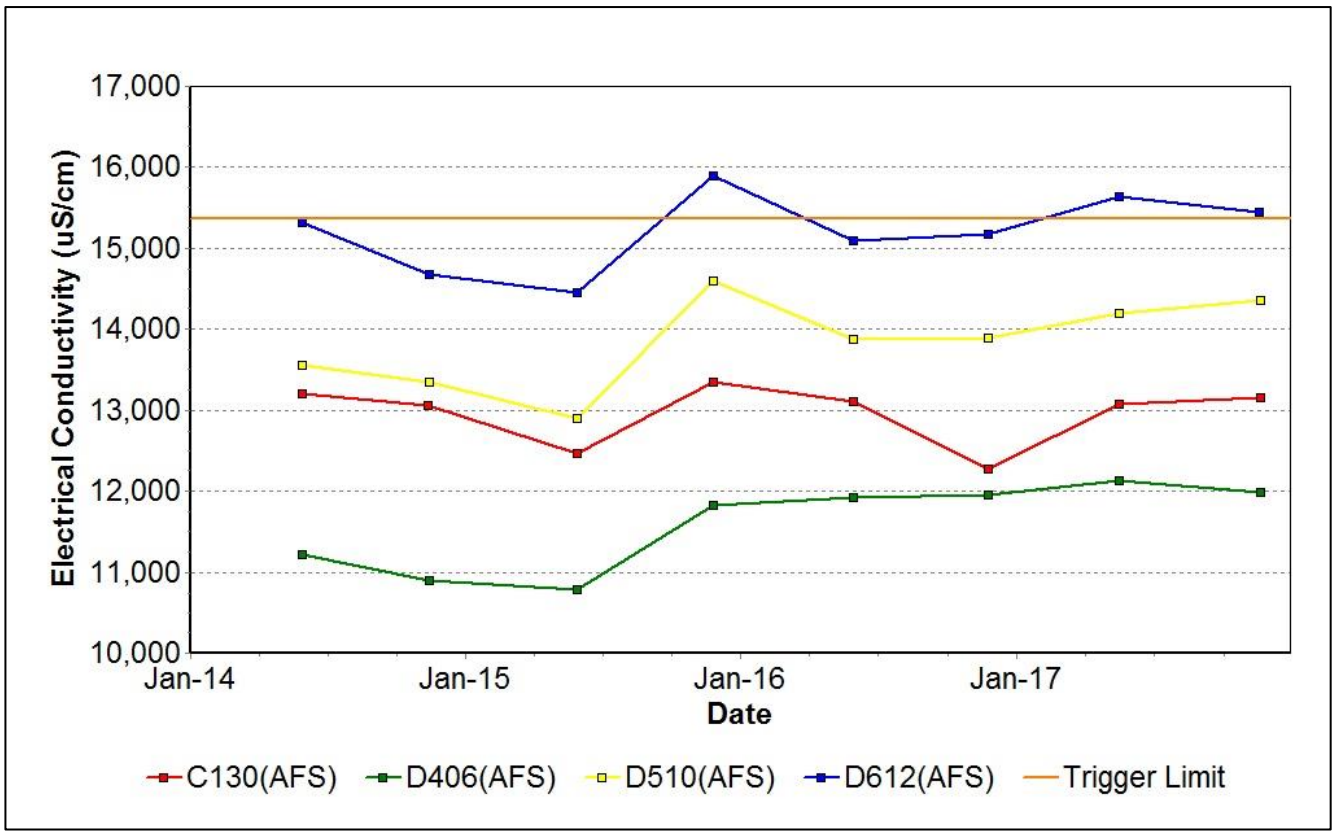


**Figure 50: Lemington South Arrowfield Electrical Conductivity Trend – December 2017**

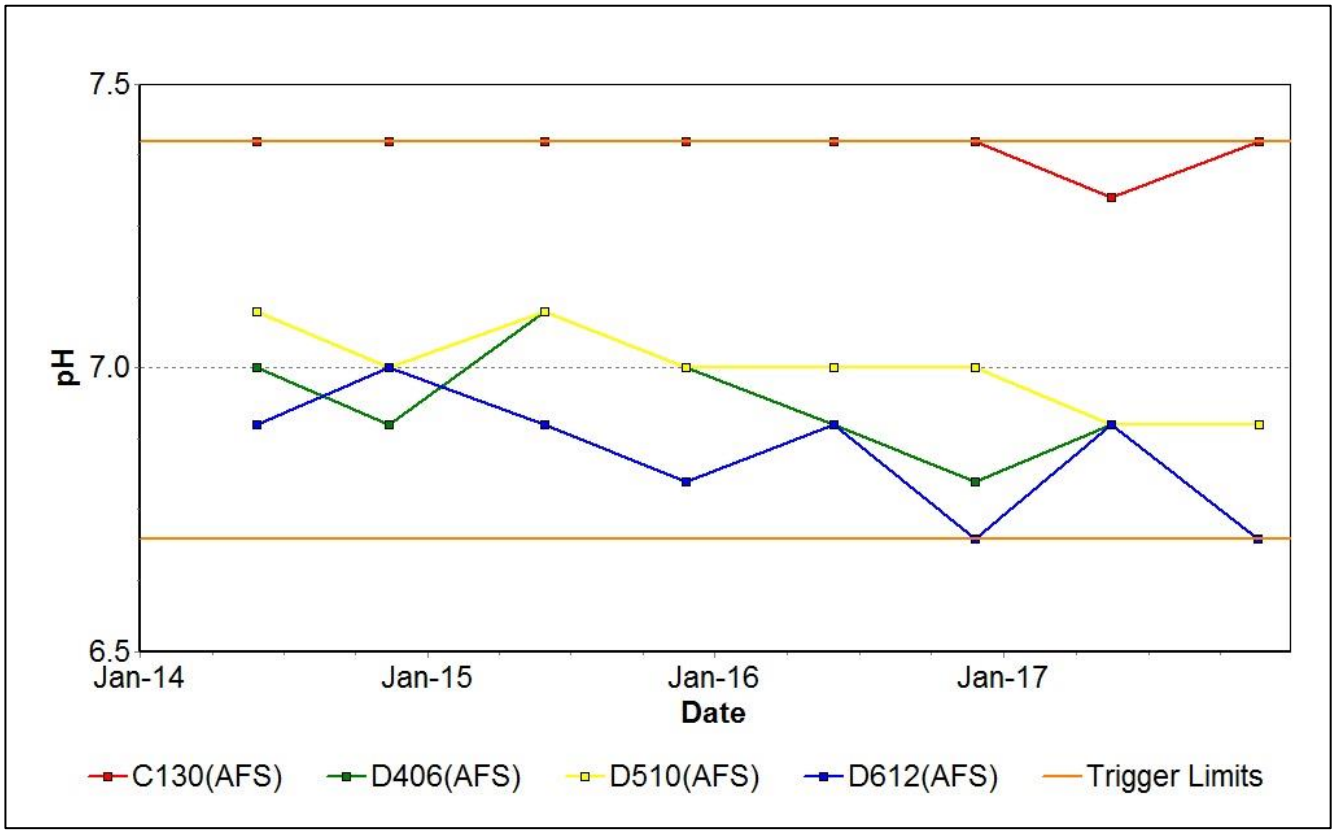

**Figure 51: Lemington South Arrowfield pH Trend – December 2017**

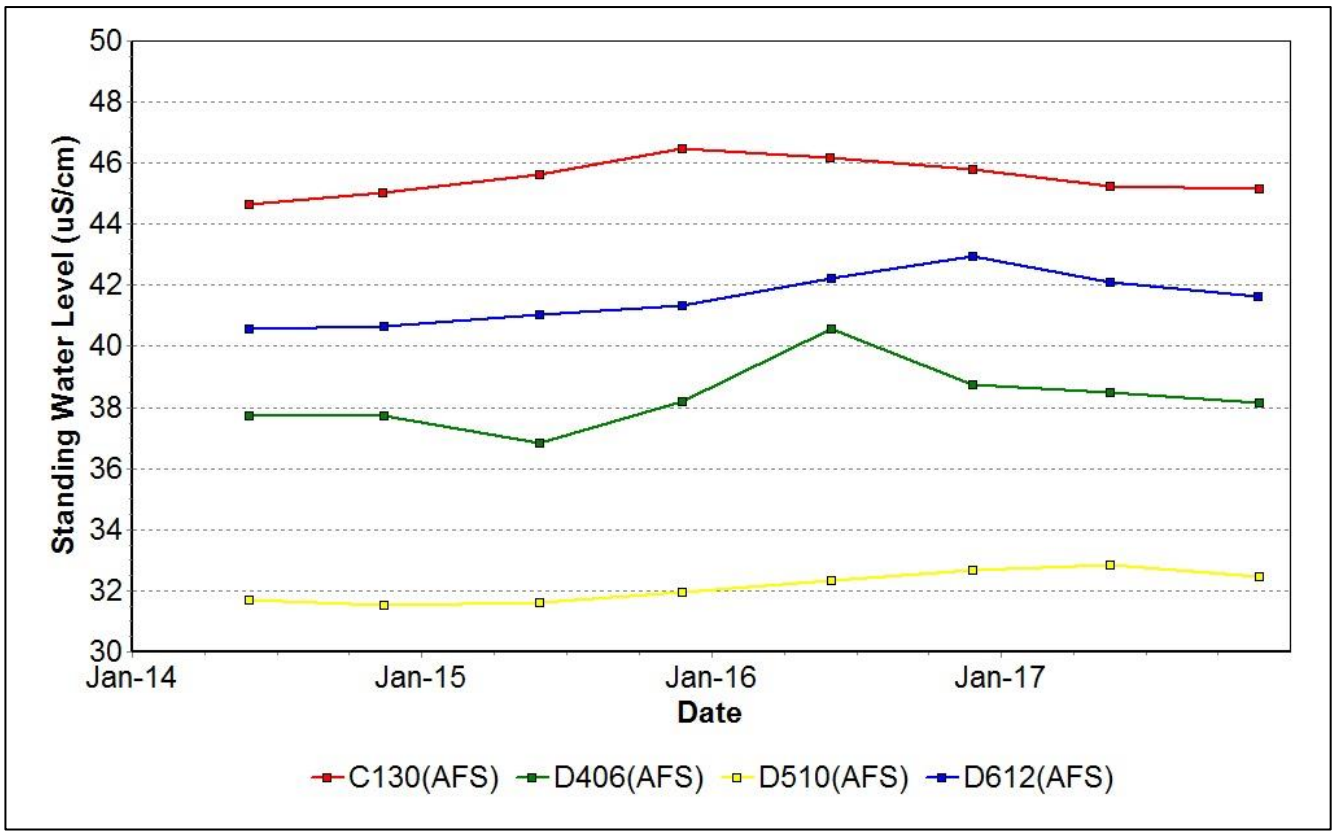


**Figure 52: Lemington South Arrowfield Standing Water Level - December 2017**

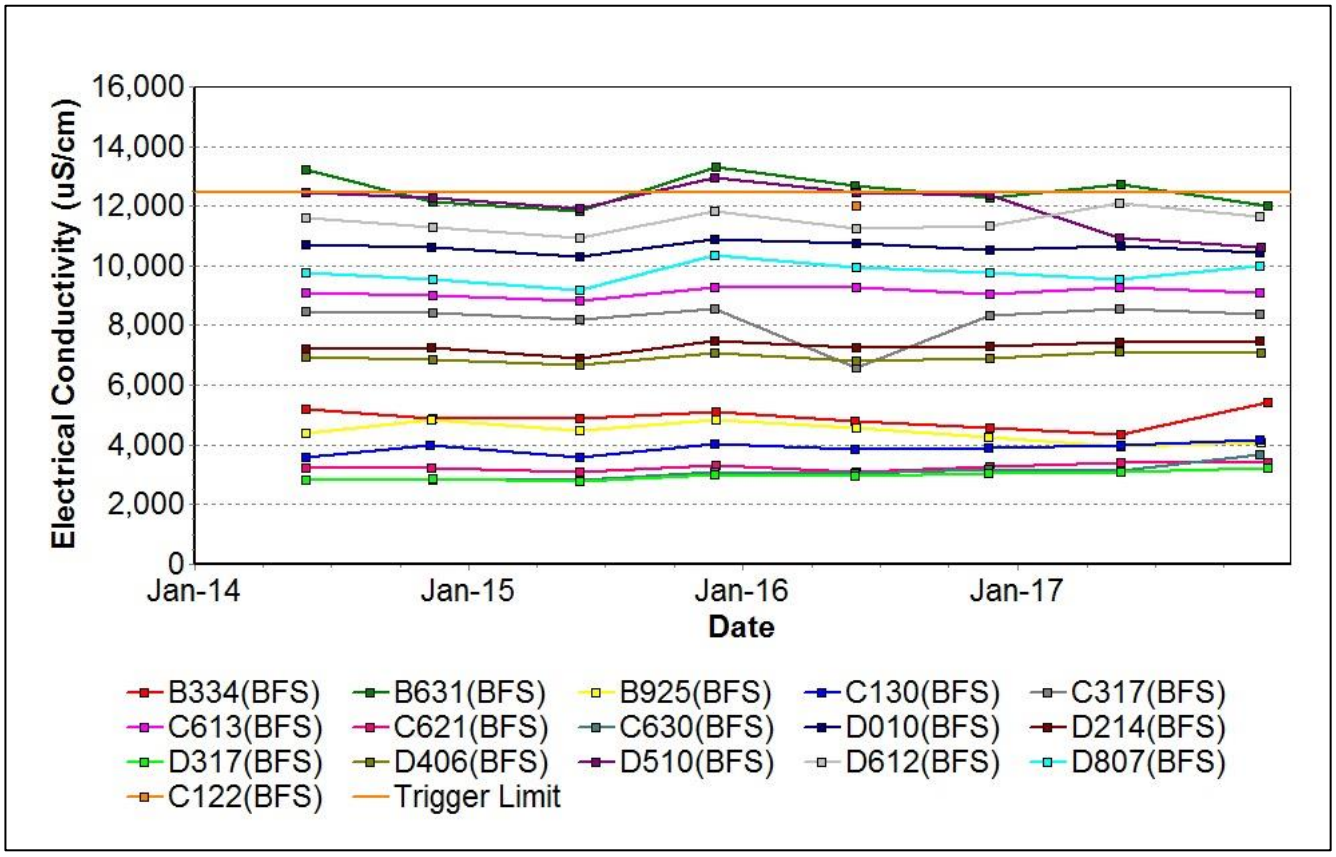

**Figure 53: Lemington South Bowfield Electrical Conductivity Trend - December 2017**

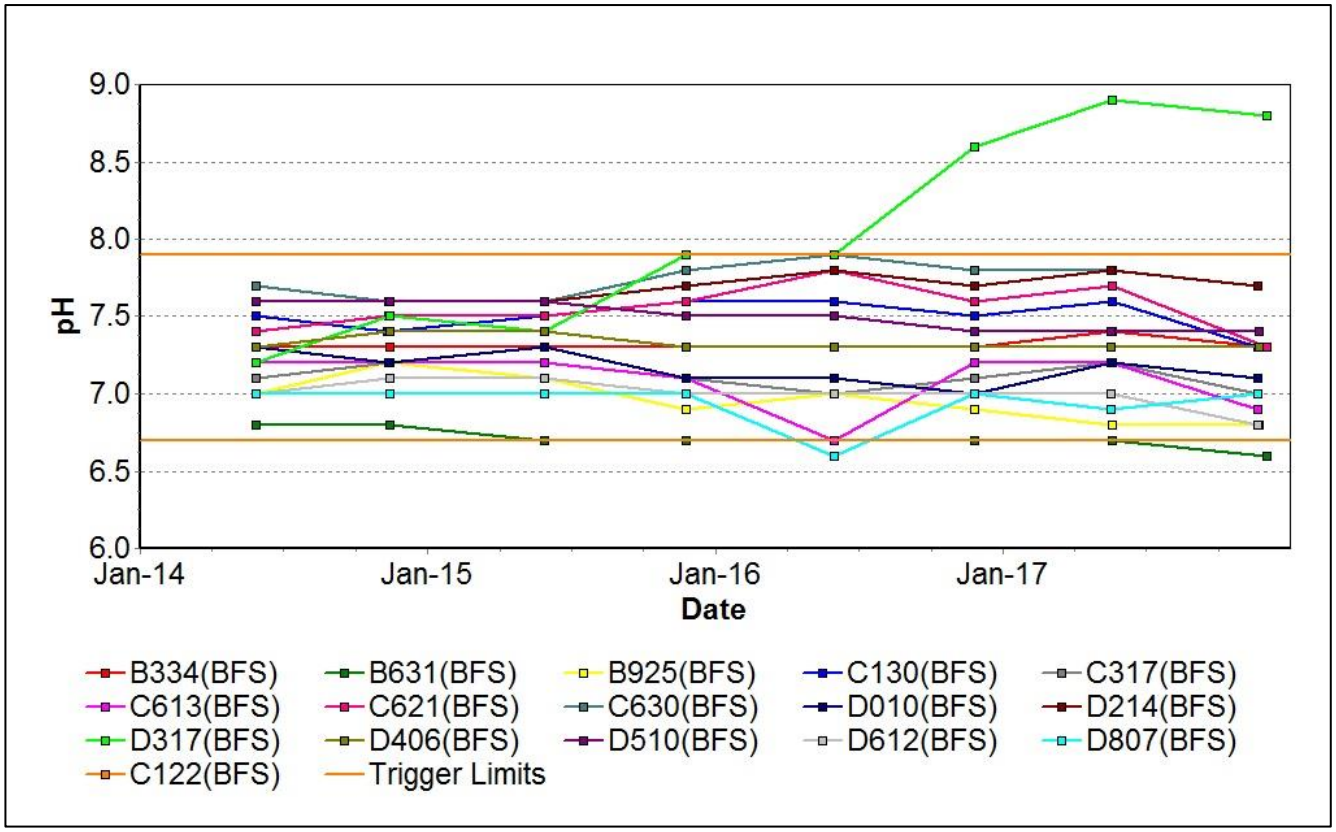


**Figure 54: Lemington South Bowfield pH Trend - December 2017**

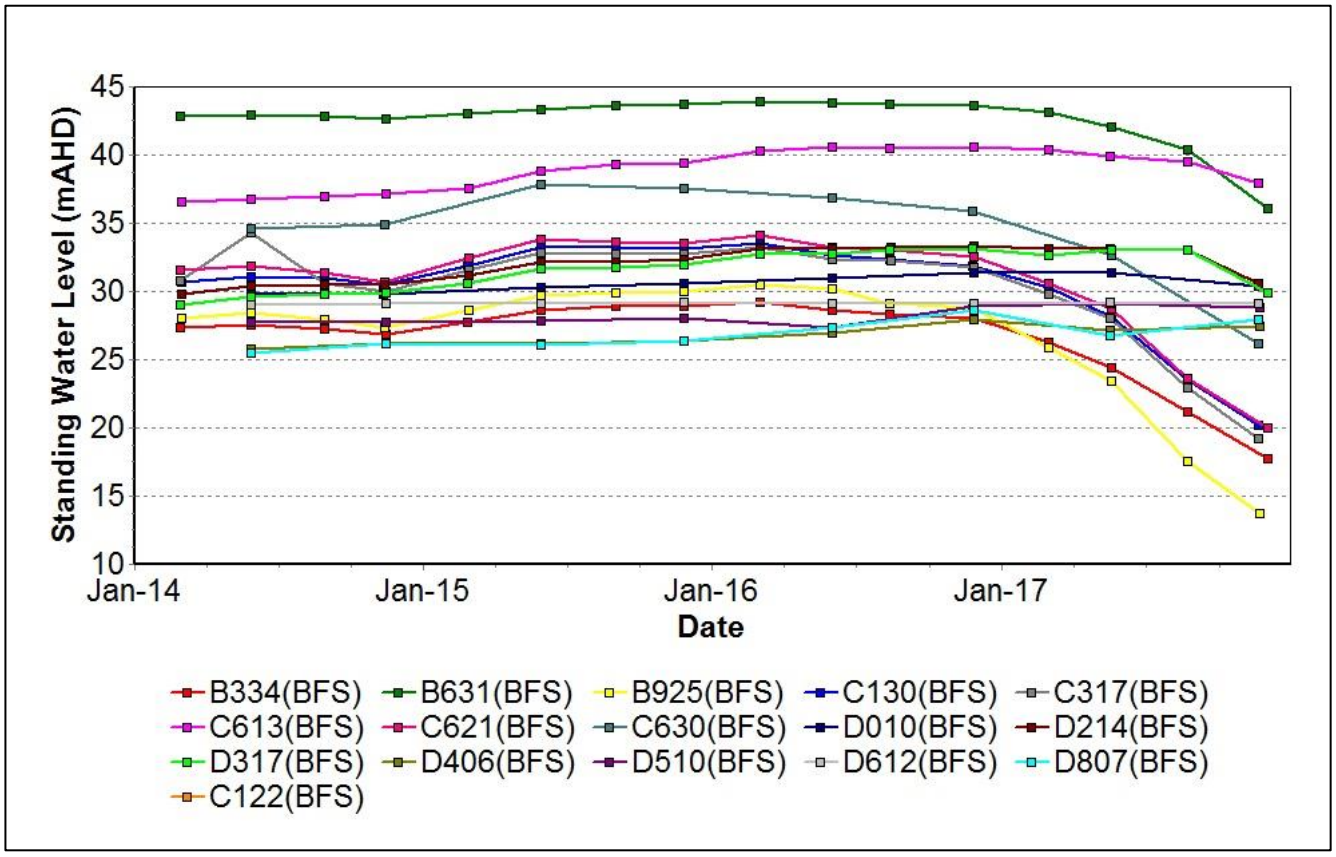

Figure 55: Lemington South Bowfield Standing Water Level - December 2017

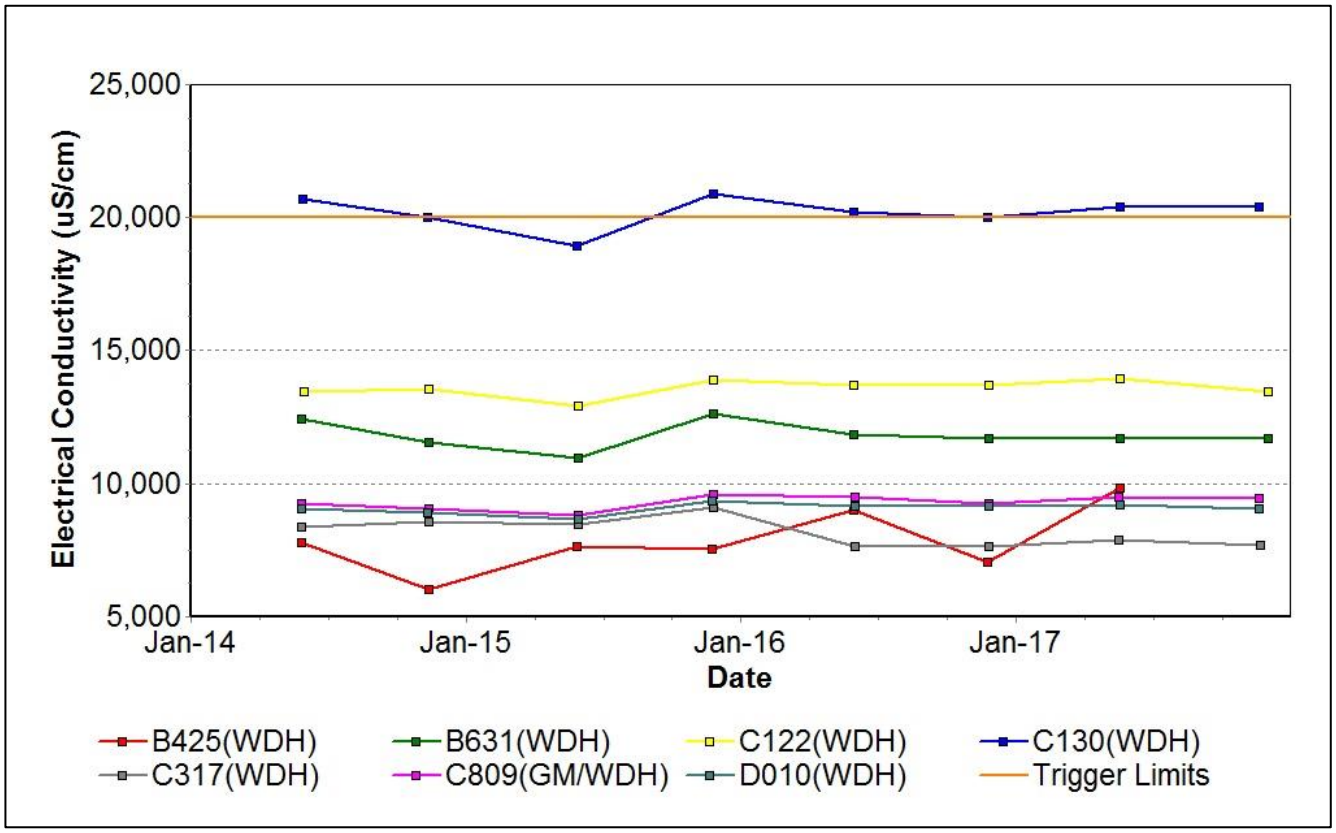


**Figure 56: Lemington South Woodlands Hill Electrical Conductivity Trend - December 2017**

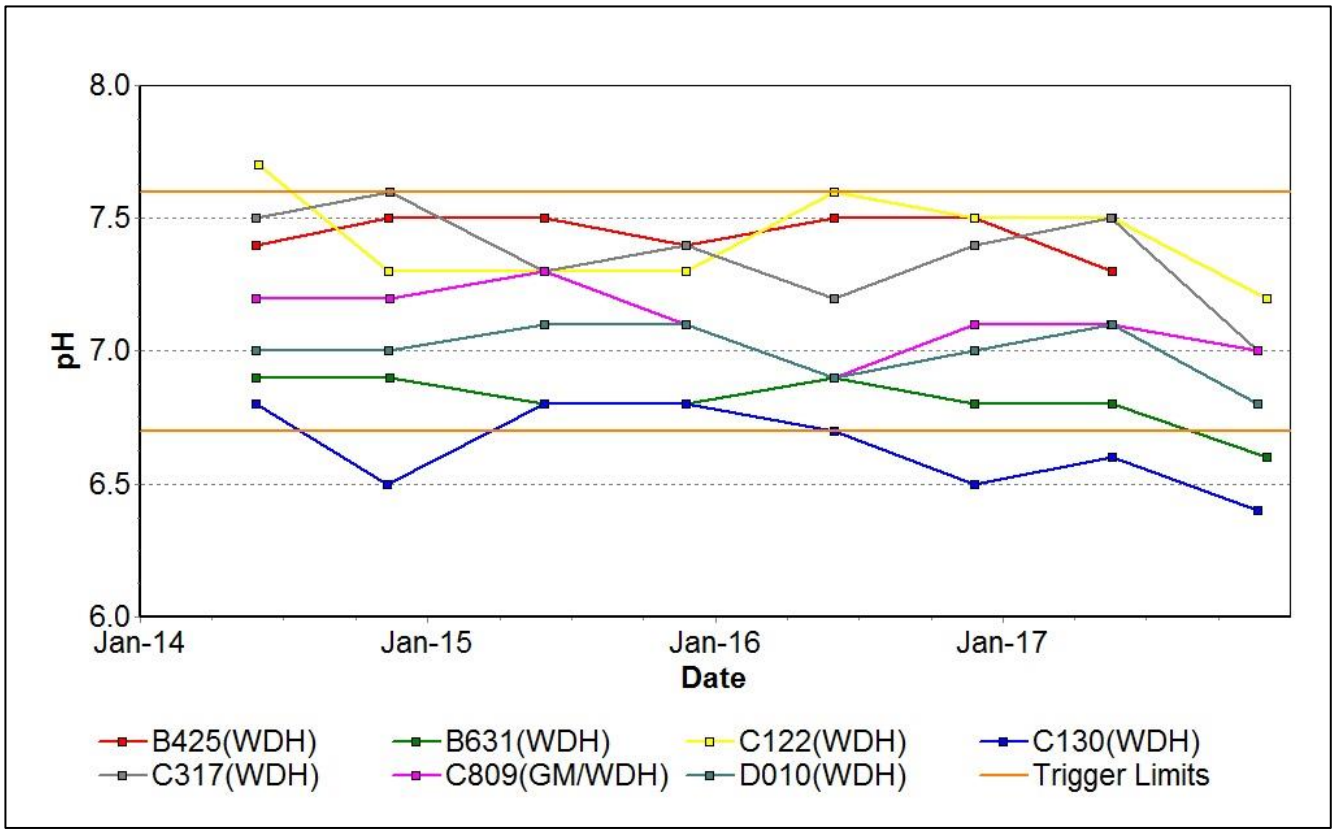

**Figure 57: Lemington South Woodlands Hill pH Trend - December 2017**

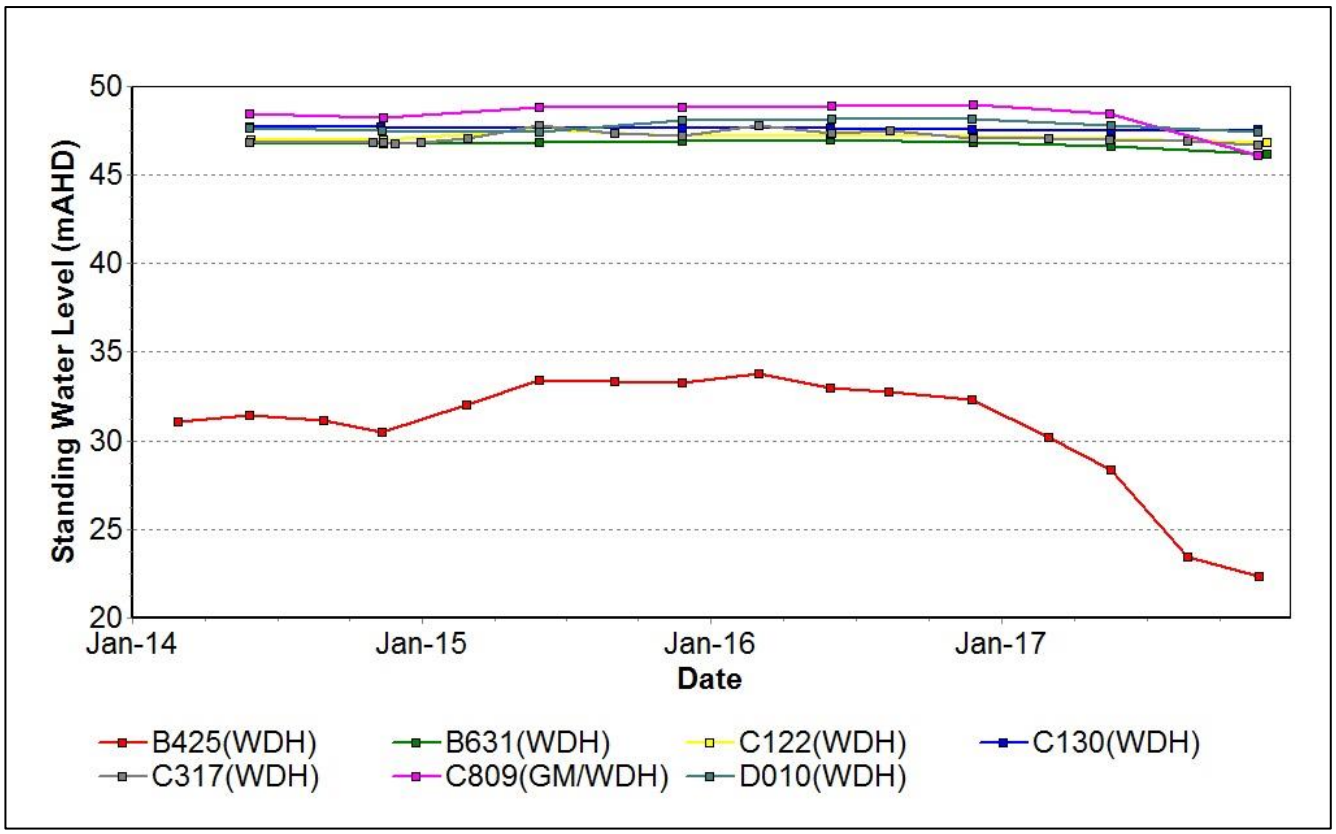


**Figure 58: Lemington South Woodlands Hill Standing Water Level – December 2017**

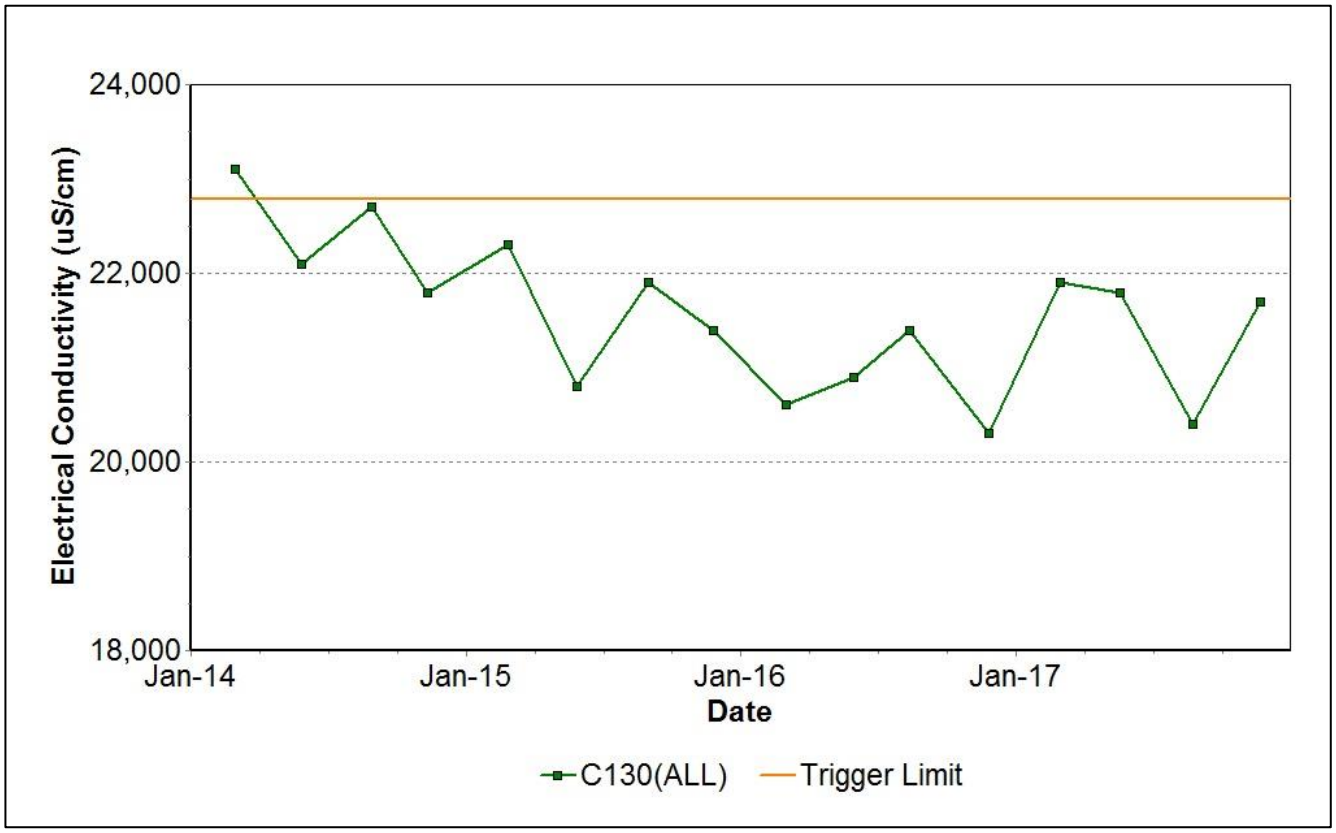

**Figure 59: Lemington South Interburden Electrical Conductivity Trend - December 2017**

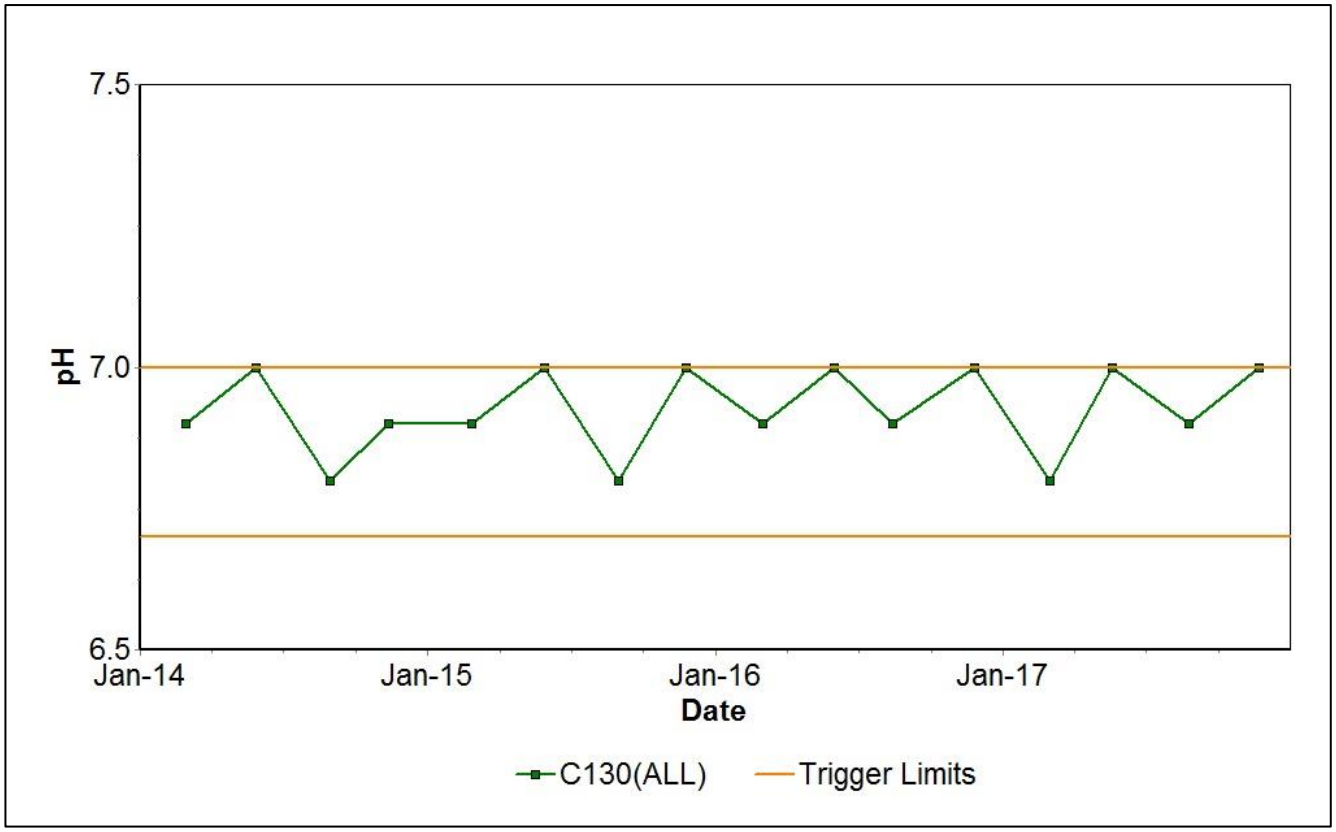


**Figure 60: Lemington South Interburden pH Trend - December 2017**

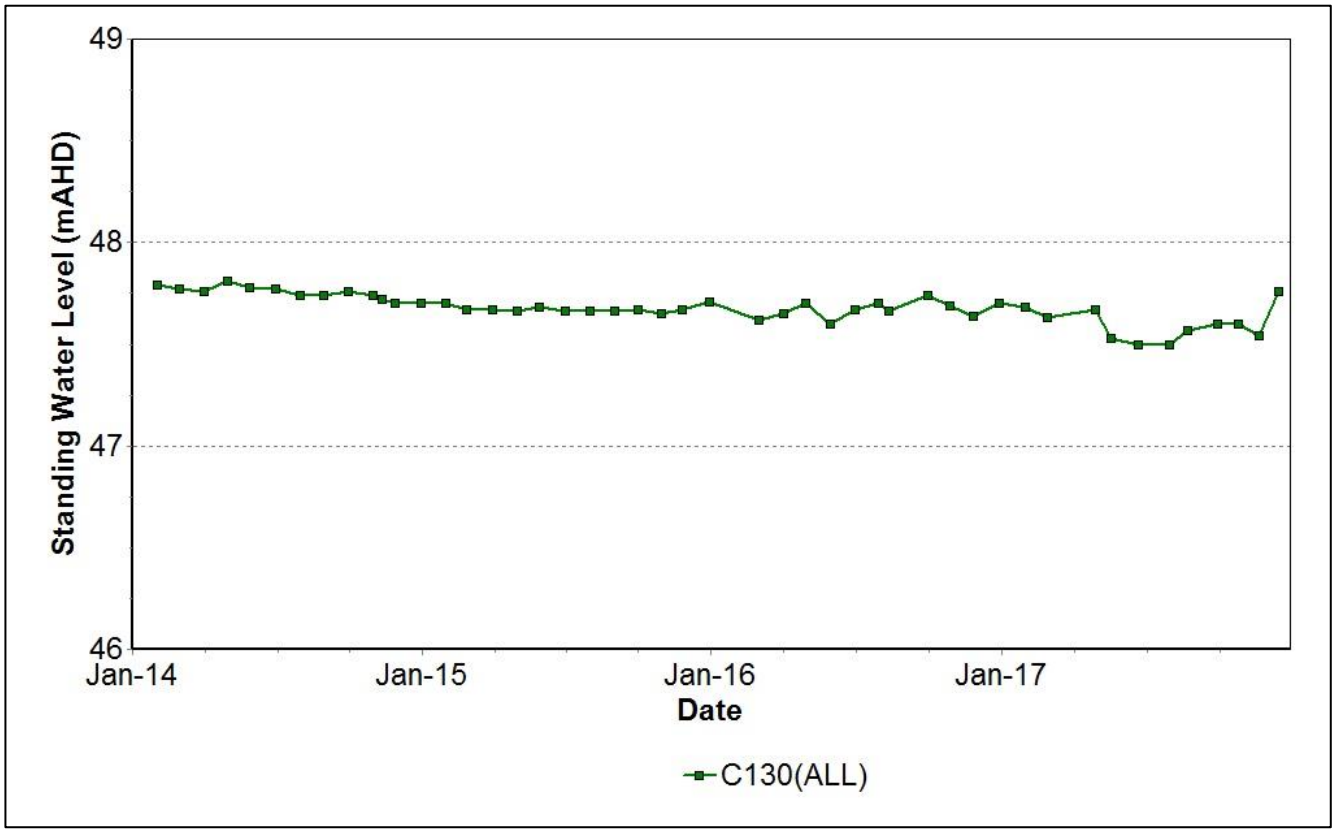

**Figure 61: Lemington South Interburden Standing Water Level - December 2017**

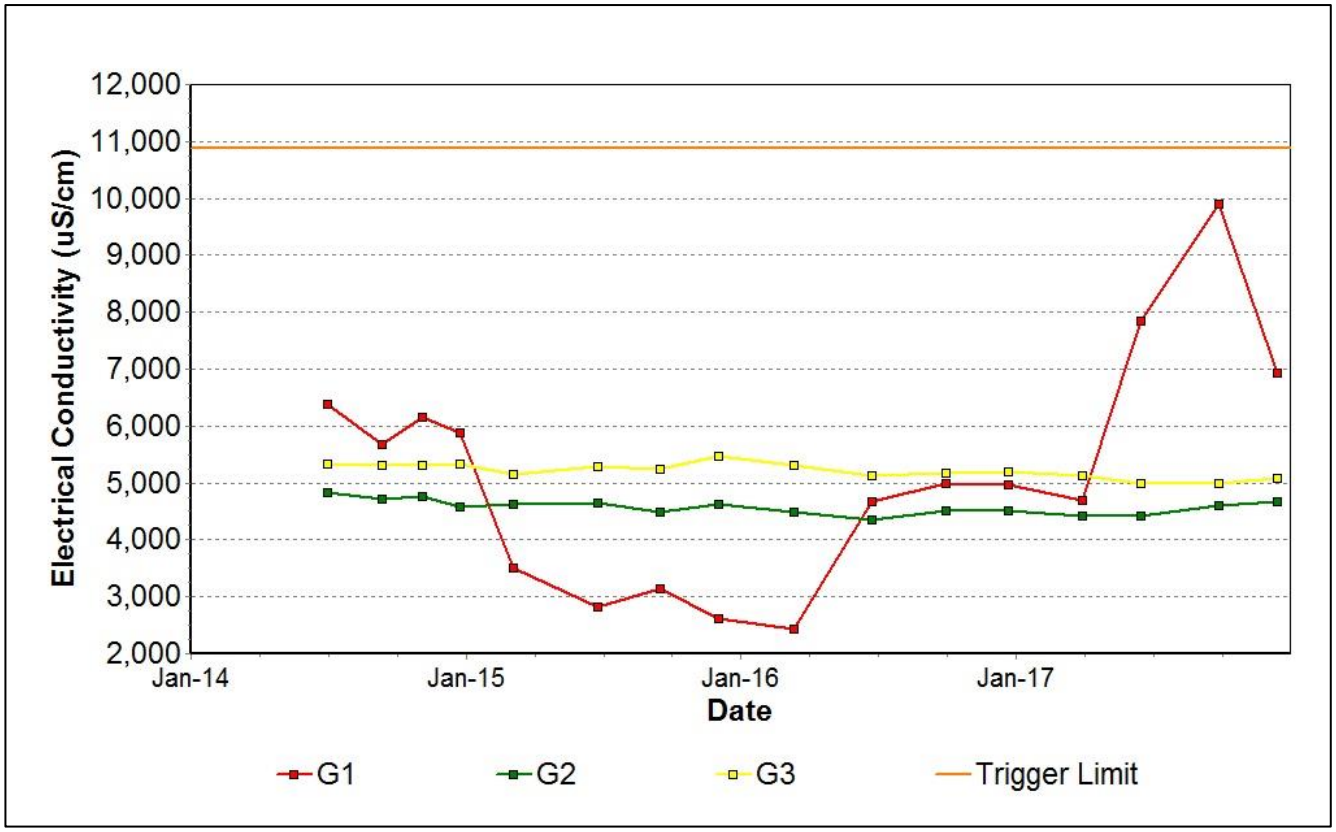


**Figure 62: West Pit Alluvium Electrical Conductivity Trend - December 2017**

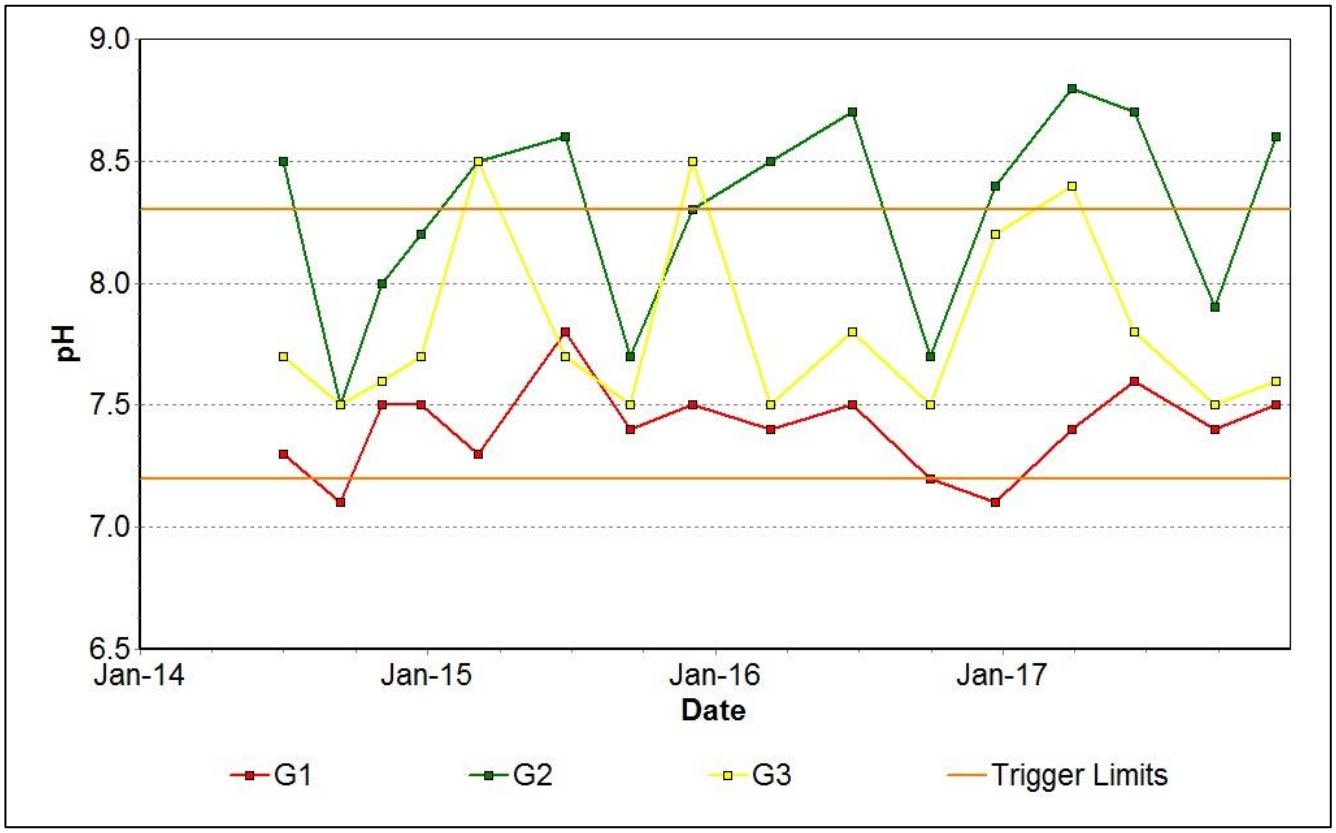

**Figure 63: West Pit Alluvium pH Trend – December 2017**

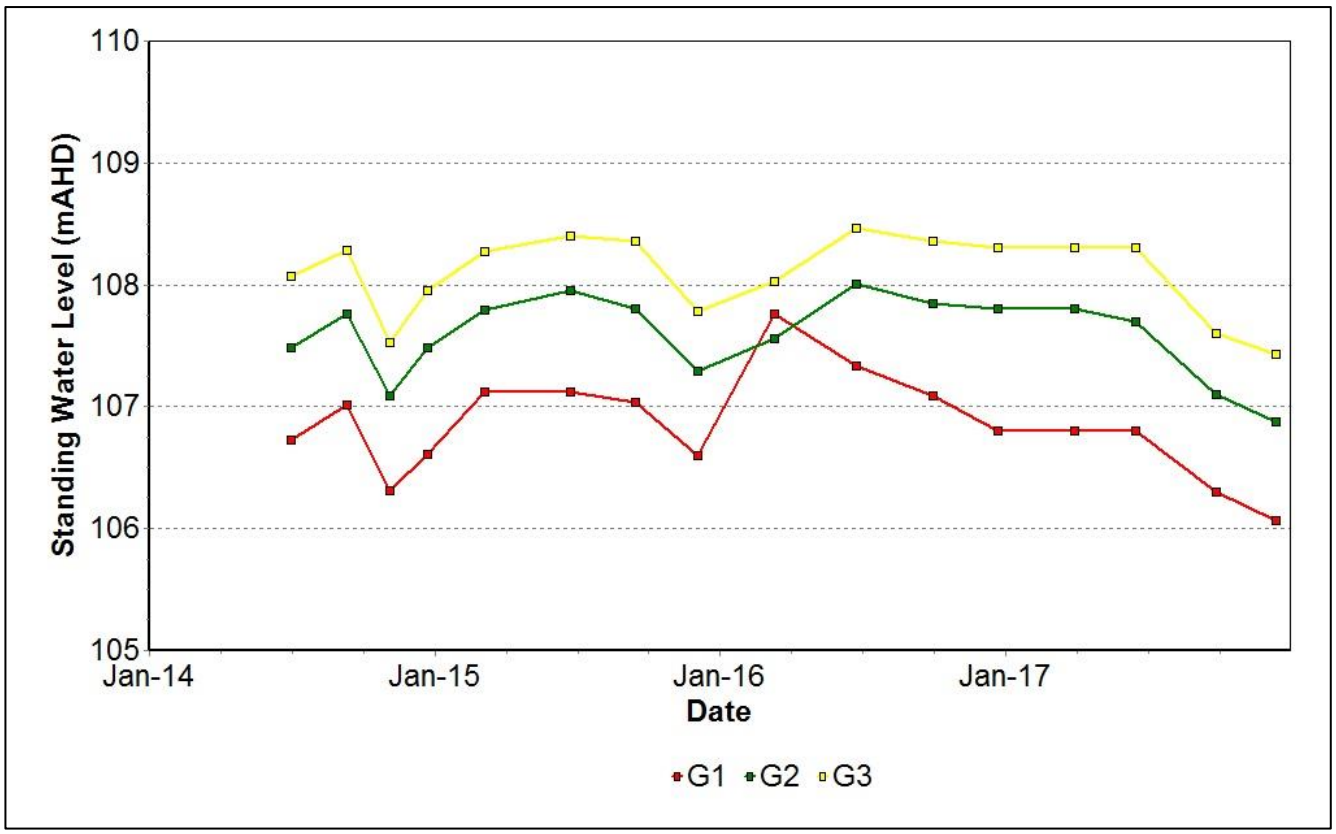


**Figure 64: West Pit Alluvium Standing Water Level - December 2017**

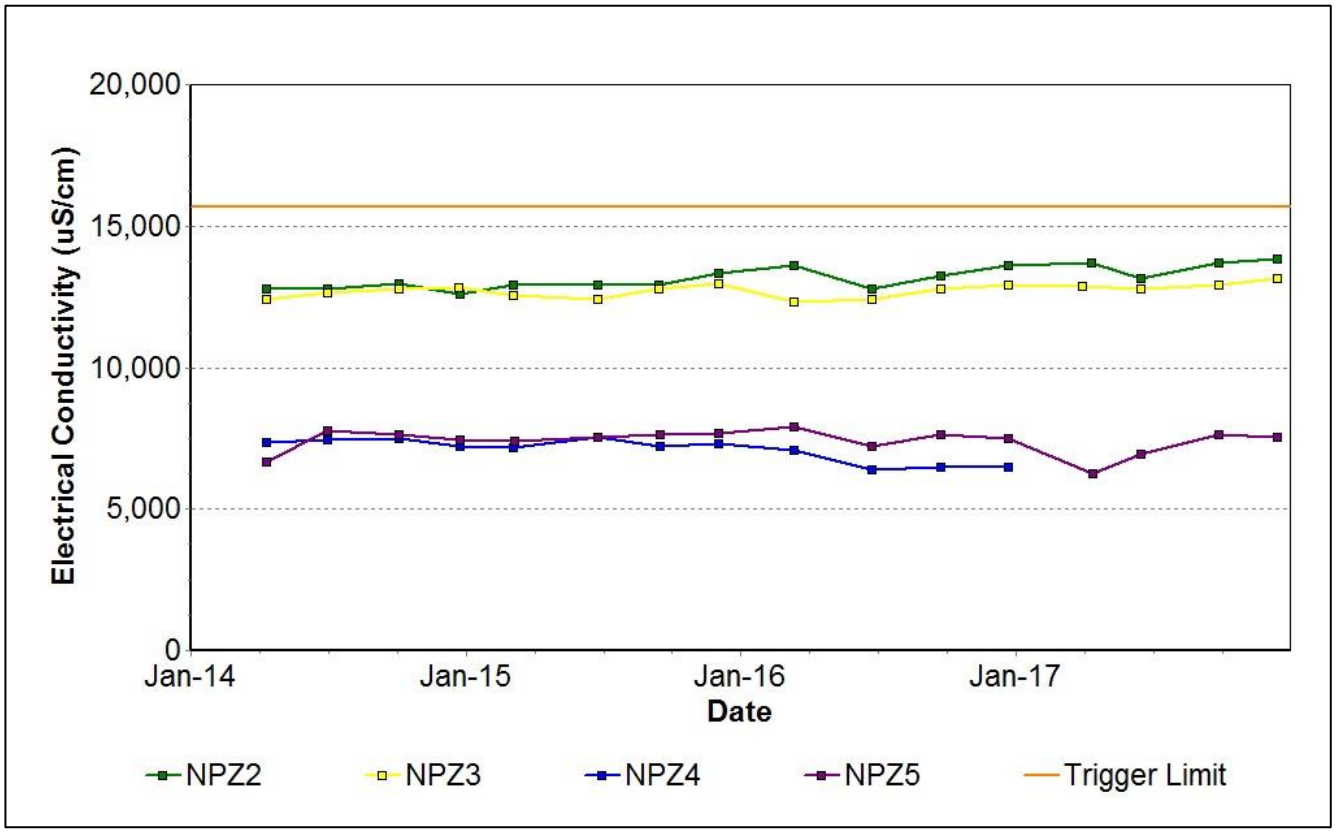

**Figure 65: West Pit Siltstone Electrical Conductivity Trend – December 2017**

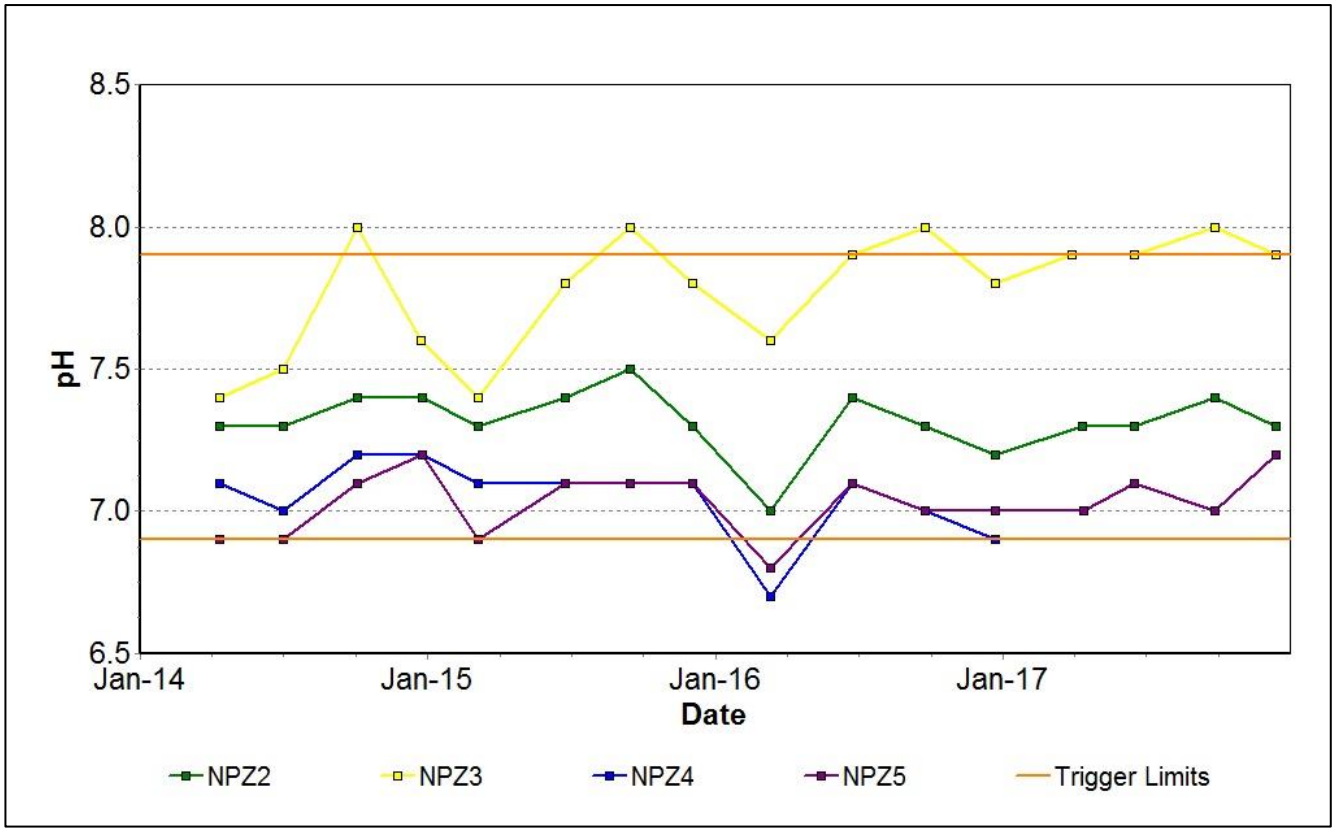


**Figure 66: West Pit Siltstone pH Trend – December 2017**

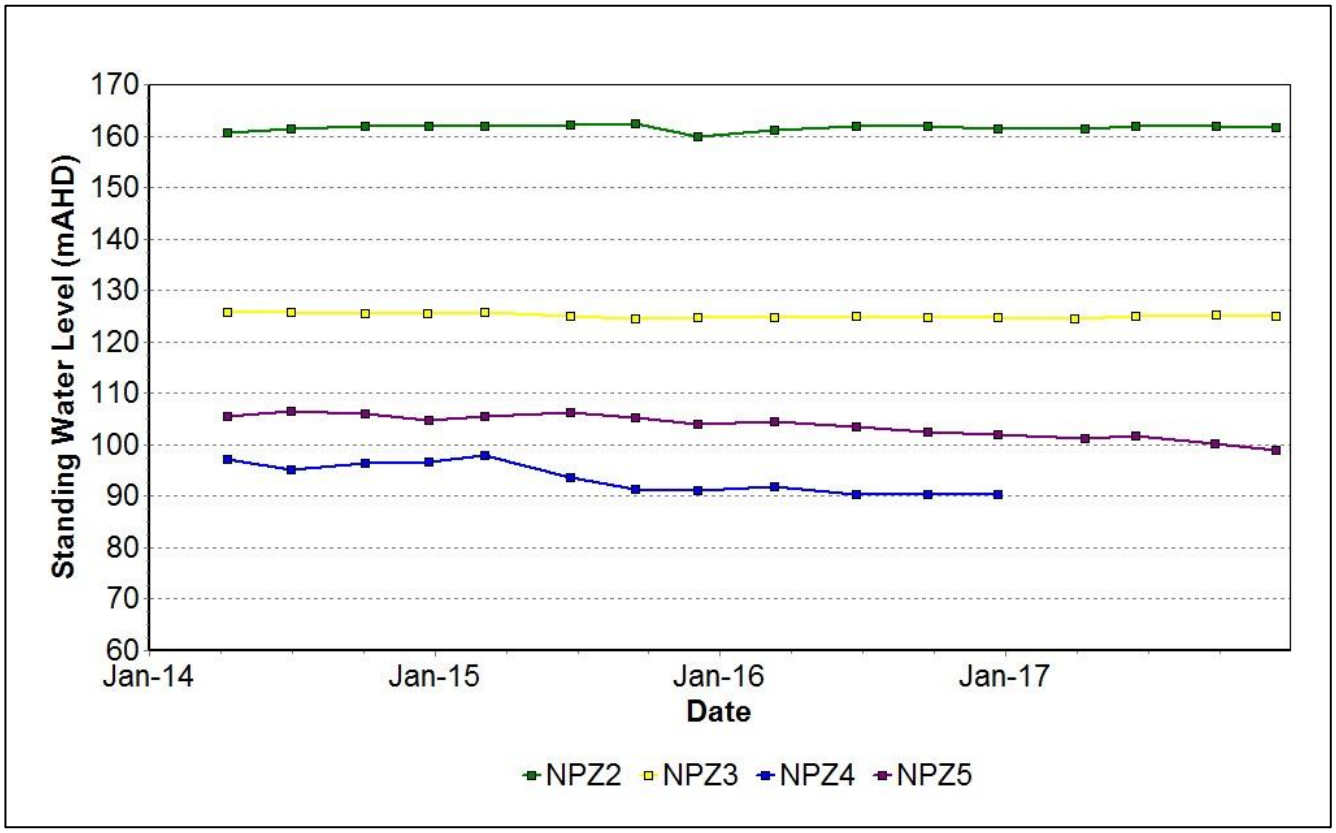

**Figure 67: West Pit Siltstone Standing Water Level – December 2017**

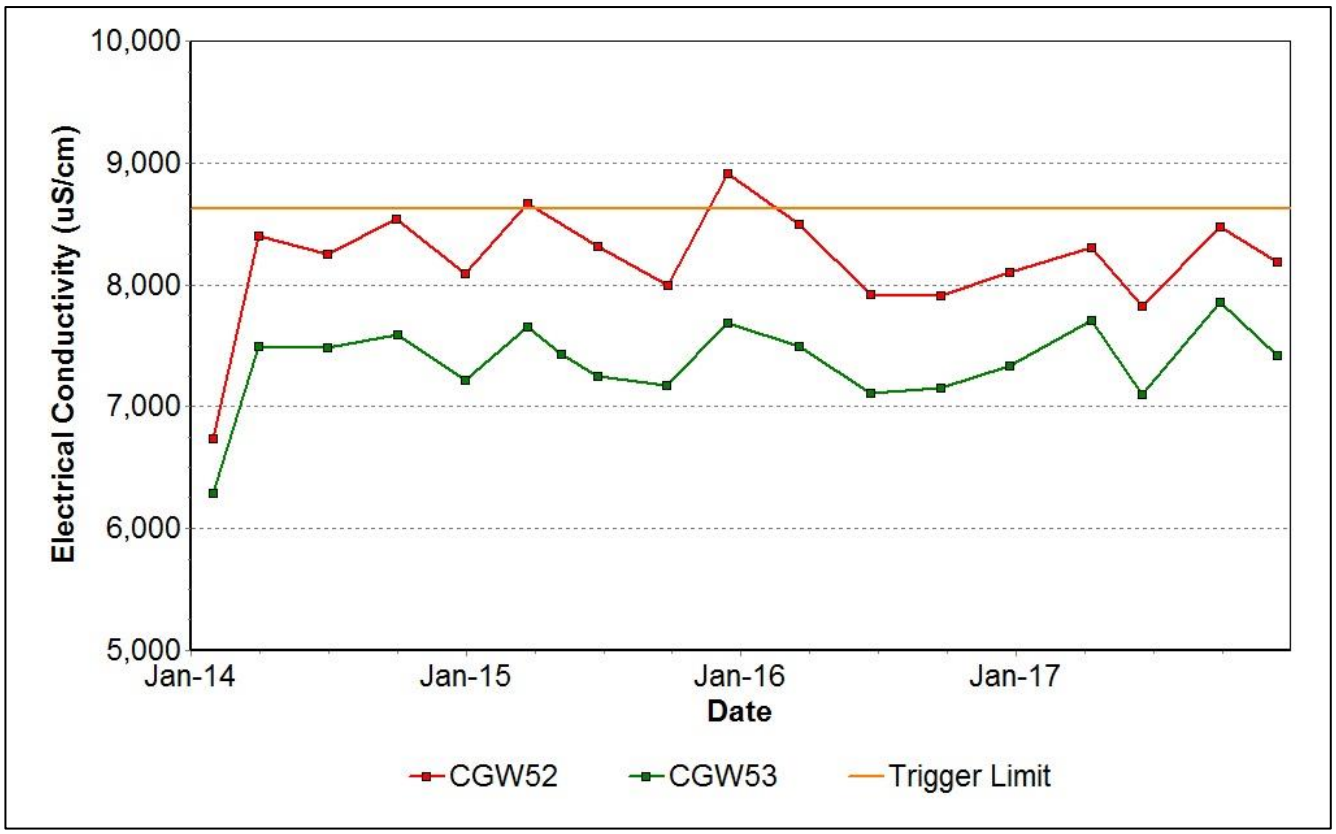


**Figure 68: Carrington Broonie Electrical Conductivity Trend - December 2017**

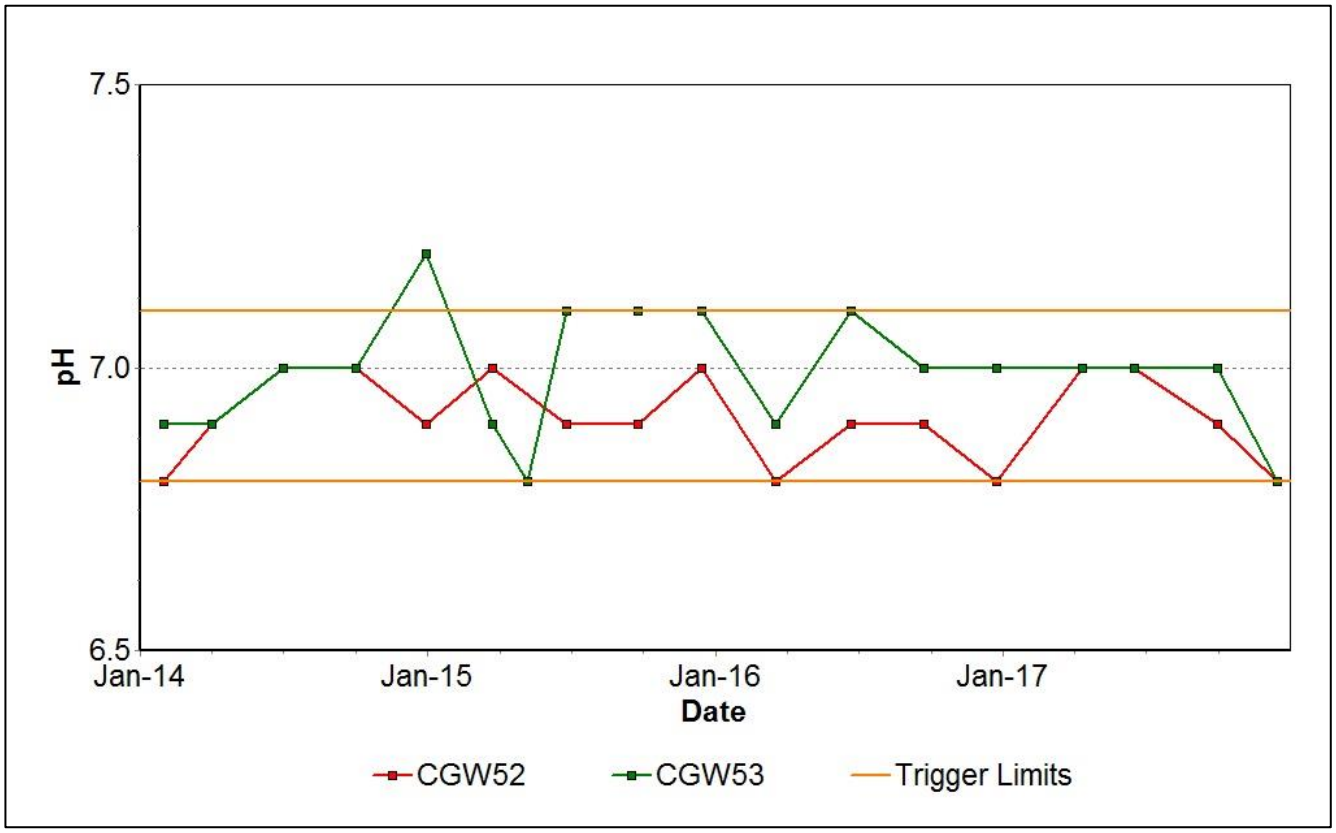

**Figure 69: Carrington Broonie pH Trend - December 2017**

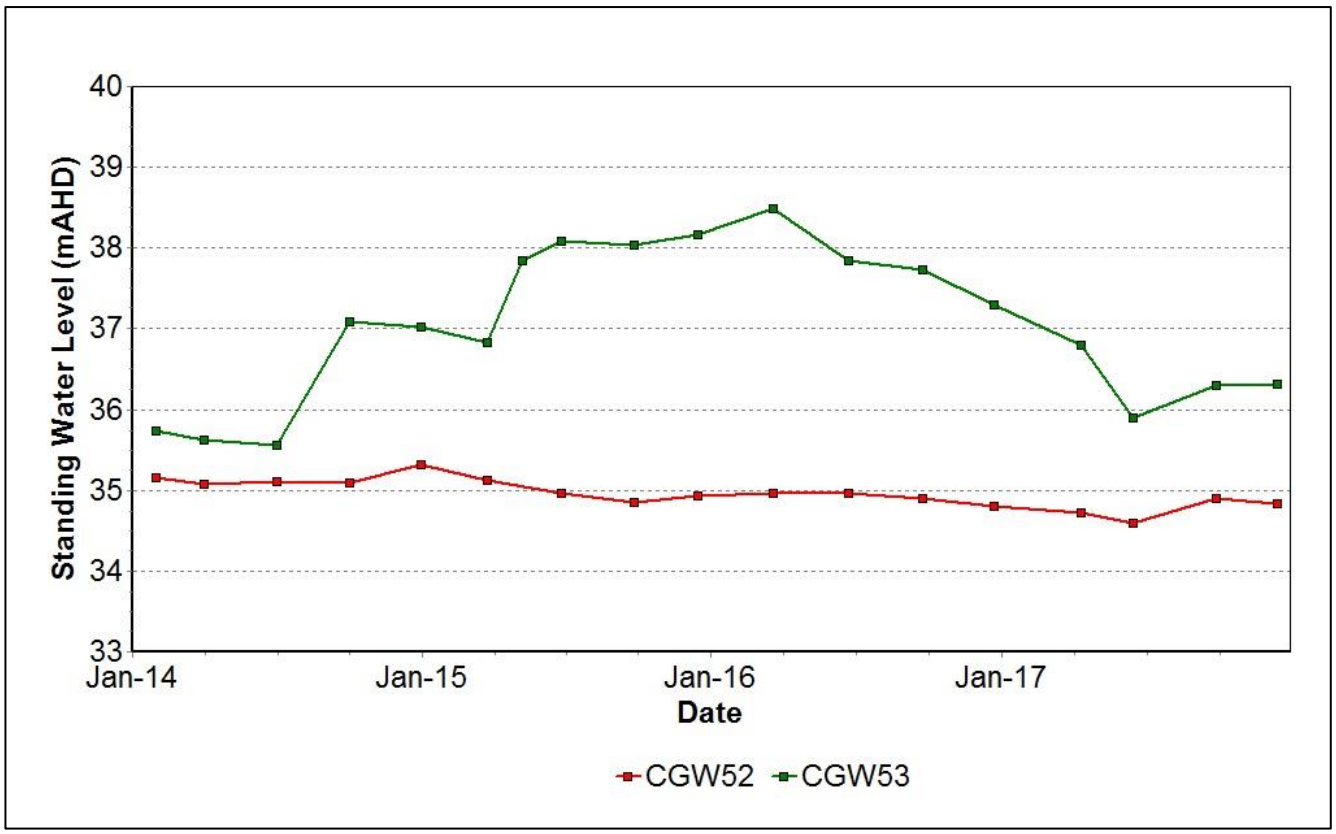


**Figure 70: Carrington Broonie Standing Water Level - December 2017**

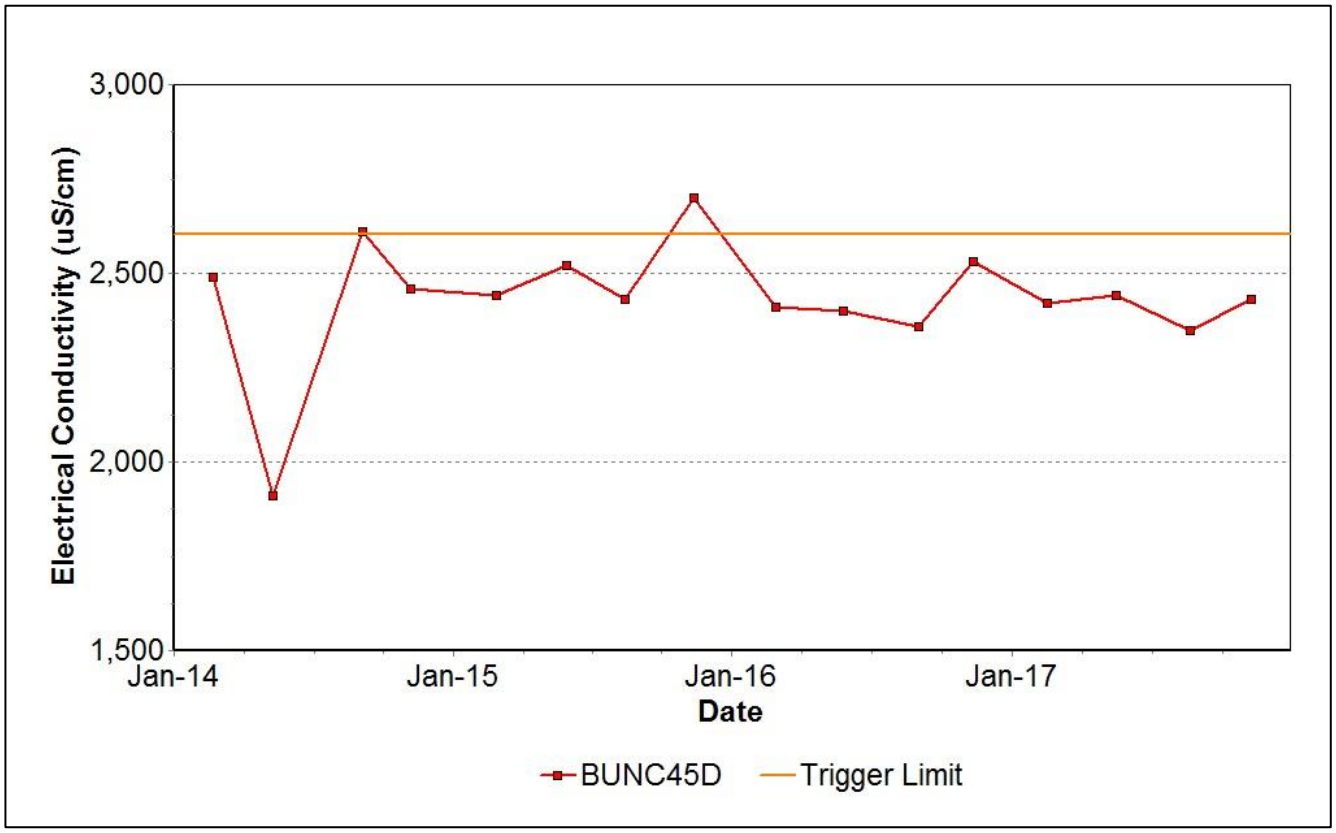

**Figure 71: Cheshunt Piercefield Electrical Conductivity Trend – December 2017**

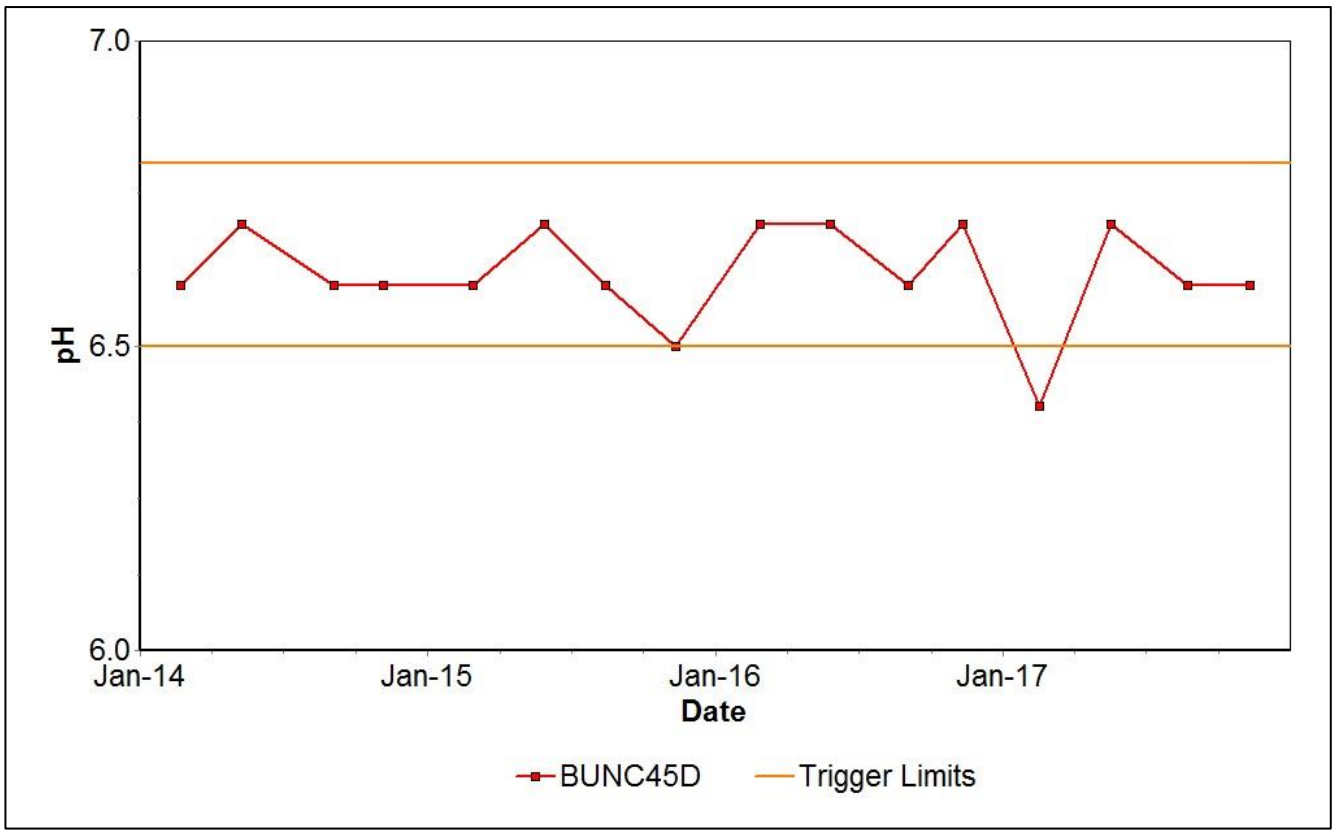


**Figure 72: Cheshunt Piercefield pH Trend - December 2017**

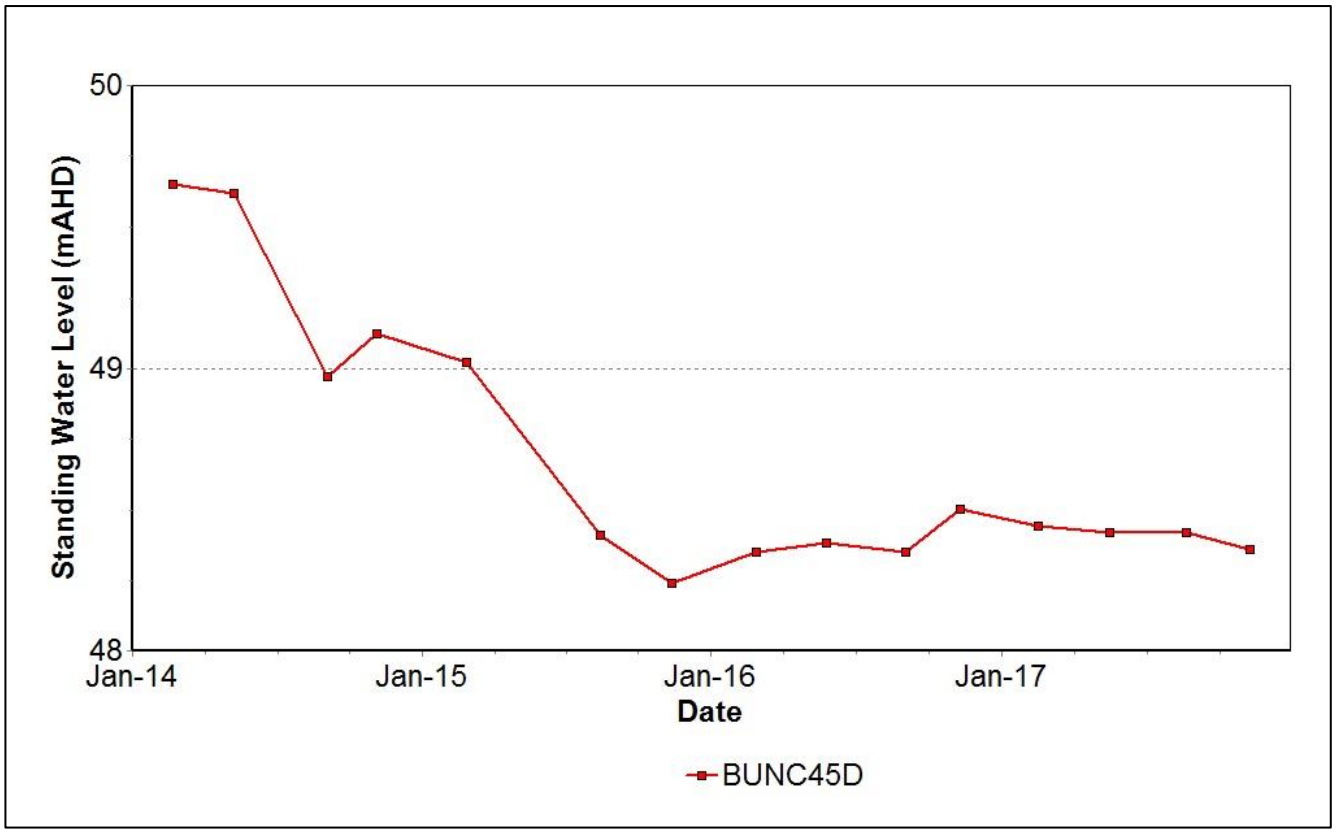

**Figure 73: Cheshunt Piercefield Standing Water Level - December 2017**

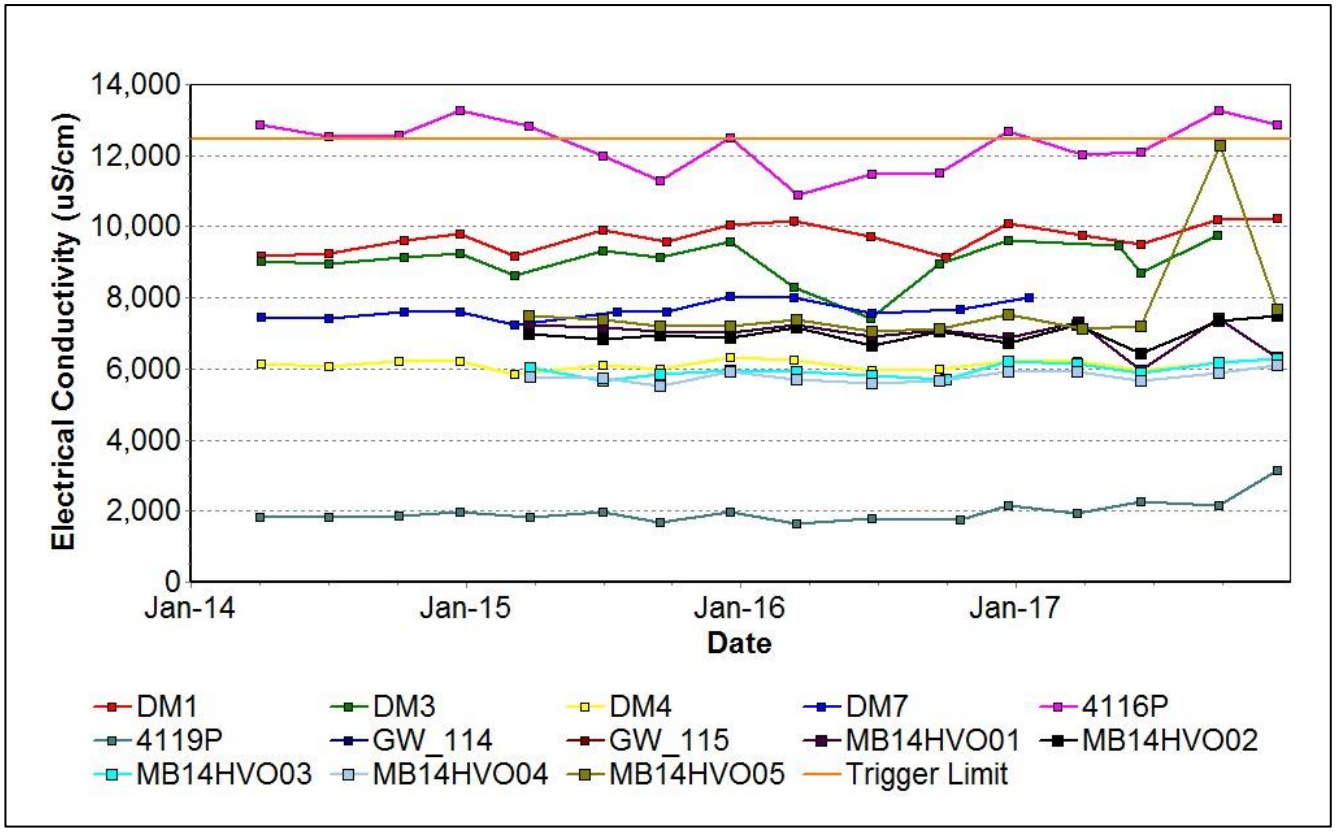


**Figure 74: North Pit Spoil Electrical Conductivity Trend - December 2017**

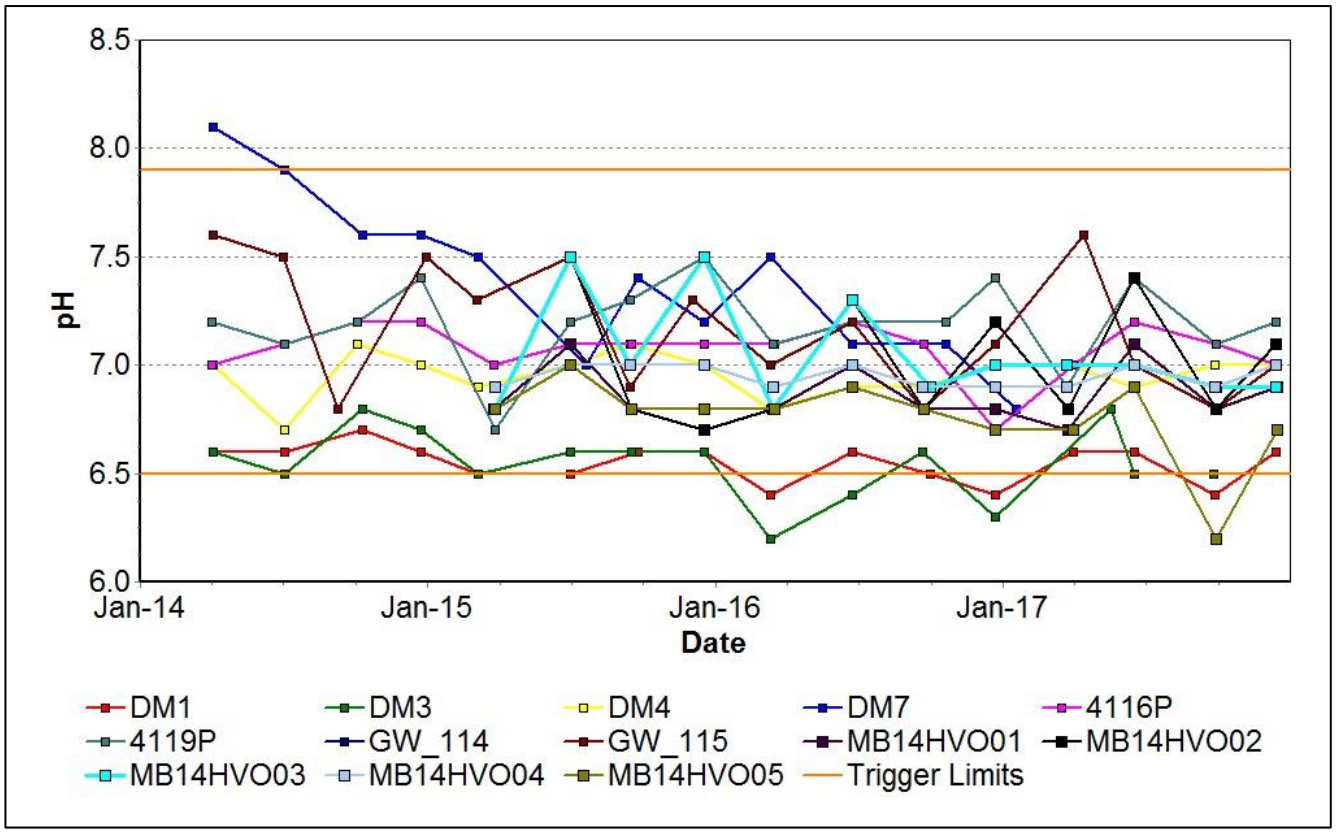


**Figure 75: North Pit Spoil pH Trend - December 2017**

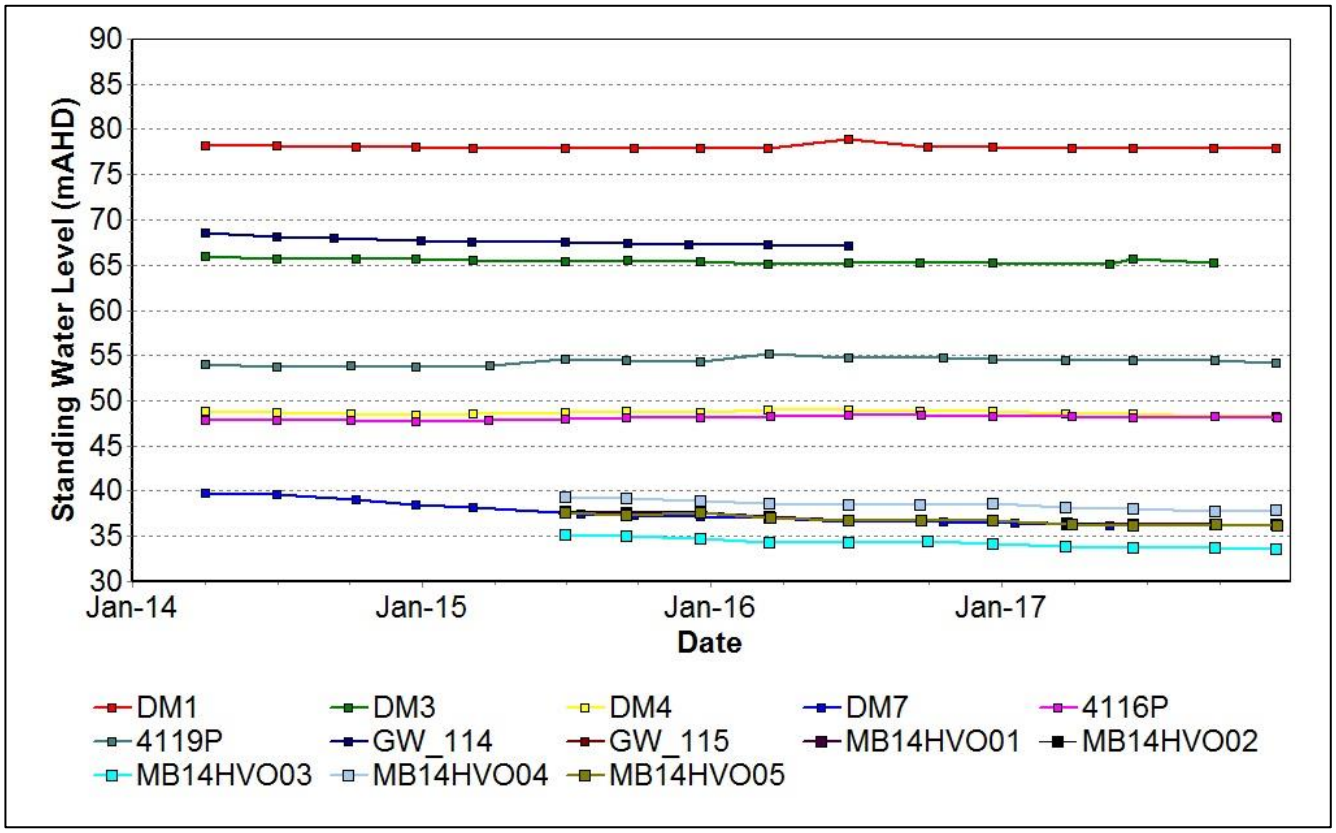


**Figure 76: North Pit Spoil Standing Water Level - December 2017**

### 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 3**.

**Table 3: Groundwater Triggers - 2017**

| Site | Date | Trigger Limit Breached | Action Taken in Response |
|---|---|---|---|
| B631(BFS) | 18/05/2017 | EC – 95$^{th}$ Percentile | Watching Brief* |
| C130(WDH) | 24/11/2016 | EC – 95th Percentile | Results are stable and consistent with historical trend. No further action required. |
| C130WDH | 18/05/2017 | EC – 95$^{th}$ Percentile | Watching Brief* |

| | | | |
|---|---|---|---|
| C130WDH | 20/11/2017 | EC – 95th Percentile | Watching Brief* |
| D612(AFS) | 17/05/2017 | EC – 95th Percentile | Watching Brief* |
| D612(AFS) | 20/11/2017 | EC – 95th Percentile | Watching Brief* |
| CFW55R | 16/06/2017 | EC – 95th Percentile | 5th consecutive exceedance: Previous investigation determined that hydro geochemical speciation has not changed and that water quality is consistent with nearby bore CFW57. This, coupled with historical data showing similar elevated EC and depressed pH, suggests the variations are natural and unlikely to be due to anthropogenic impact. Watching brief, no further action required. |
| PB01(ALL) | 21/11/2017 | EC – 95th Percentile | Watching Brief* |
| 4116P | 27/09/2017 | EC – 95th Percentile | Watching Brief* |
| 4116P | 14/12/2017 | EC – 95th Percentile | Watching Brief* |
| B631(BFS) | 18/05/2017 | PH – 5th Percentile | Watching Brief* |
| BZ2A(2) | 16/05/2017 | PH – 5th Percentile | Watching Brief* |
| CGW46 | 16/06/2017 | PH – 95th Percentile | Watching Brief* |
| D317(BFS) | 24/11/2016 | PH – 95th Percentile | Watching Brief* |
| D317(BFS) | 18/05/2017 | PH – 95th Percentile | Increasing trend in pH not reflected spatially in neighbouring bores. Water level in bore stable, suggesting water quality changes are not related to any mining-related activity. Continue to watch and monitor. |
| D317(BFS) | 01/12/2017 | PH – 95th Percentile | Investigation into pH trend commenced. Results to be |
| G2 | 15/06/2017 | PH – 95th Percentile | Measurements highly variable and consistent with historical range. Watch and monitor. |
| G2 | 13/12/2017 | PH – 95th Percentile | Watching Brief* |
| Hobdens Well | 16/05/2017 | PH – 95th Percentile | Watching Brief* |
| Hobdens Well | 22/08/2017 | PH – 95th Percentile | Watching Brief* |
| Hobdens Well | 10/11/2017 | PH – 95th Percentile | Investigation into pH trend commenced. Results to be |

| | | | |
|---|---|---|---|
| | | | reported in Annual Review |
| CFW55R | 14/12/2017 | PH – 5th Percentile | Watching Brief* |
| B631 (BFS) | 1/12/2017 | PH – 5th Percentile | Watching Brief* |
| B631 (WDH) | 1/12/2017 | PH – 5th Percentile | Watching Brief* |
| C130(WDH) | 24/11/2016 | PH – 5th Percentile | Watching Brief. |
| C130(WDH) | 18/05/2017 | PH – 5th Percentile | Watching Brief* |
| C130(WDH) | 20/11/2017 | PH – 5th Percentile | Investigation into pH trend commenced. Results to be |
| BZ3-3 | 10/11/2017 | PH – 5th Percentile | Watching Brief* |
| BZ8-2 | 10/11/2017 | PH – 5th Percentile | Watching Brief* |
| HG2 | 10/11/2017 | PH – 5th Percentile | Watching Brief* |

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

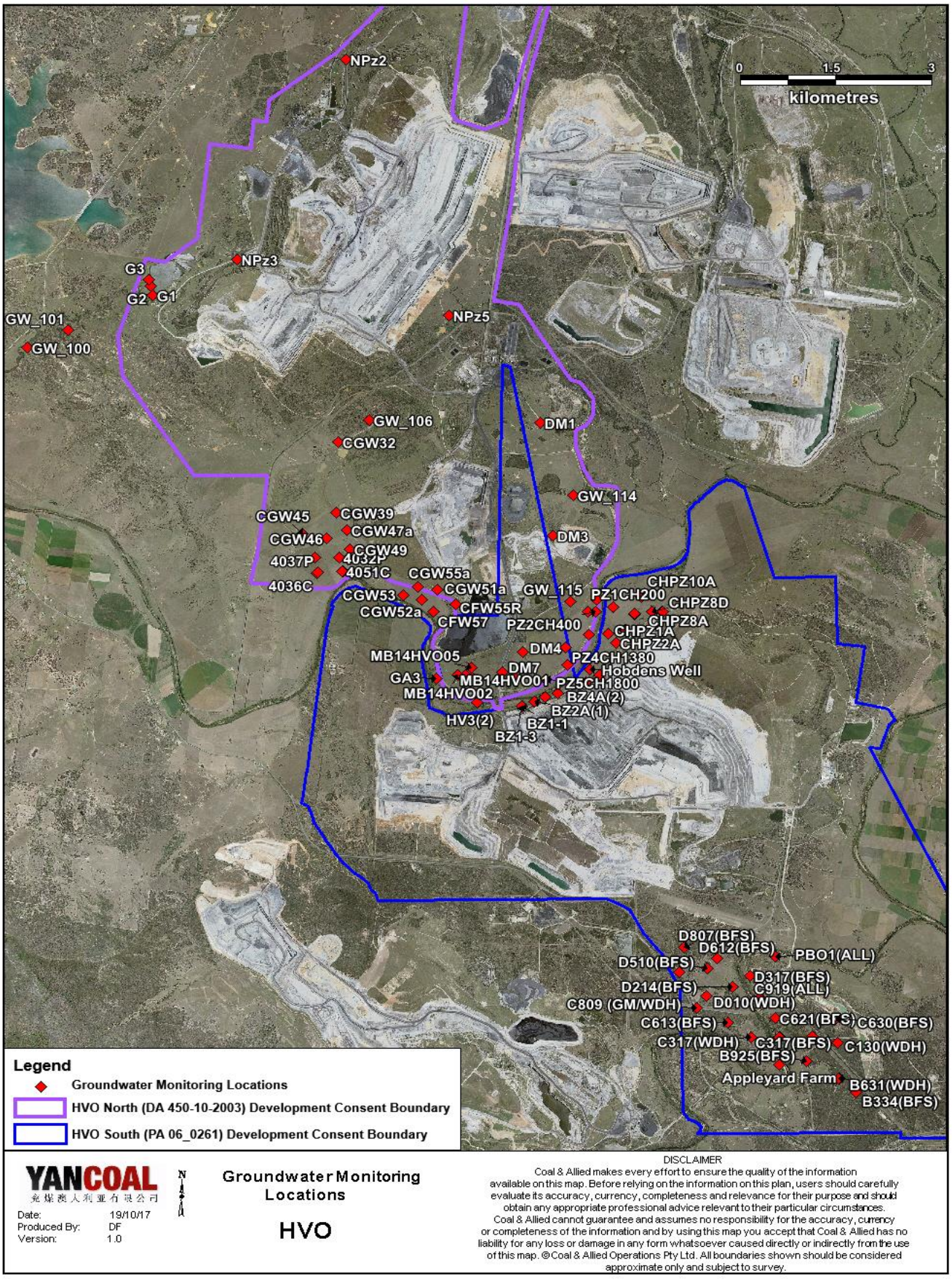


**Figure 77: Groundwater Monitoring Location Plan**

# 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 83.

During December, 22 blasts were initiated at HVO. Figure 78 through to Figure 82 show the blast monitoring results for the reporting period against the impact assessment criteria. The criteria are summarised in Table 4.

**Table 4: 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.

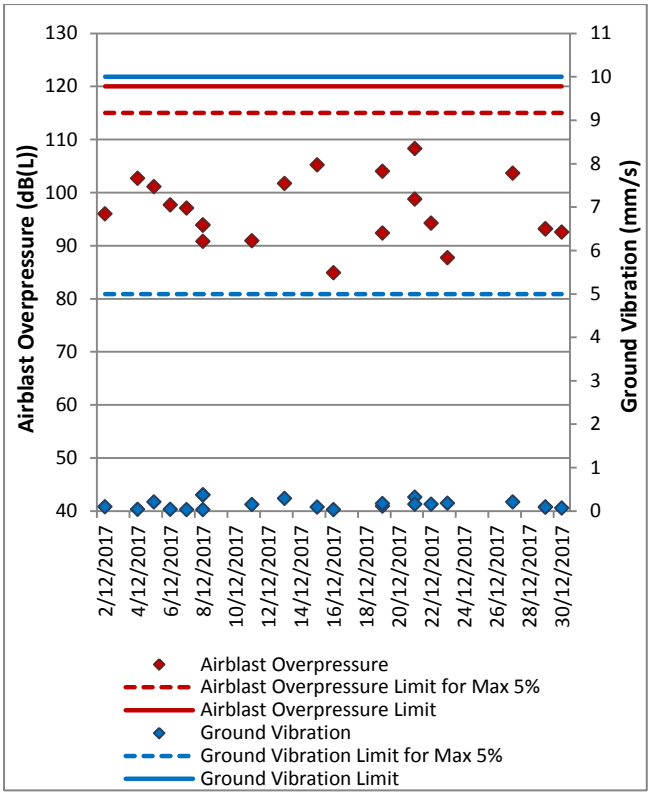


**Figure 78: Moses Crossing Blast Monitoring Results – December 2017**

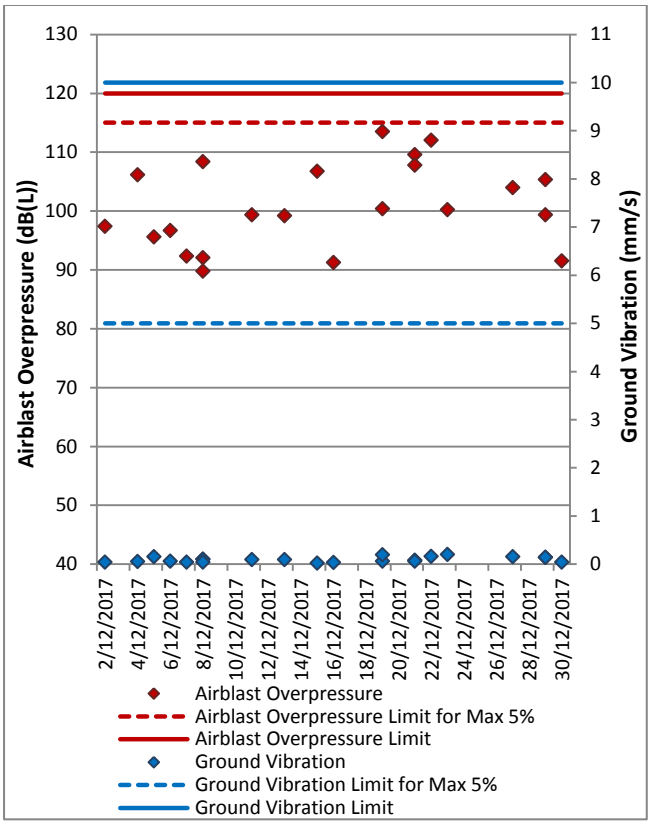


**Figure 79: Jerrys Plains Blast Monitoring Results – December 2017**

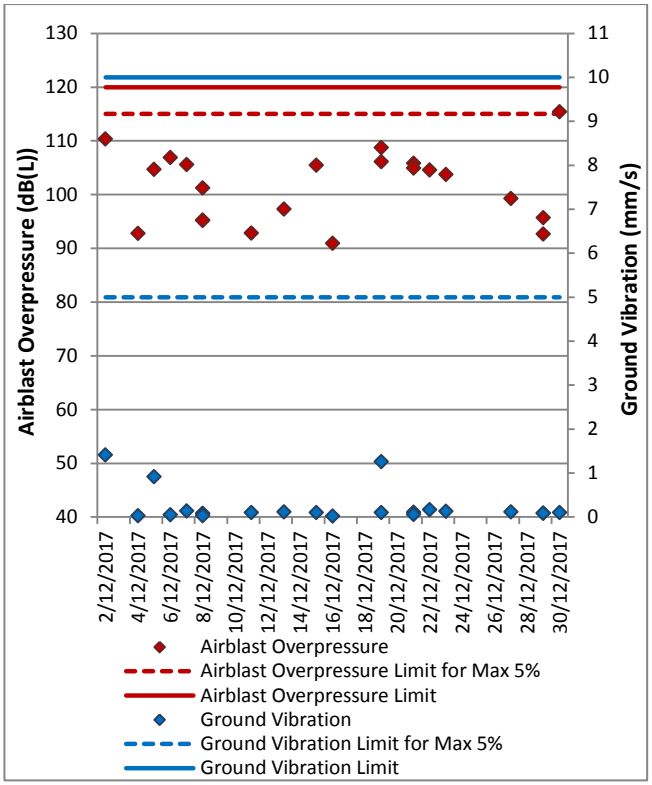


**Figure 80: Maison Dieu Blast Monitoring Results – December 2017**

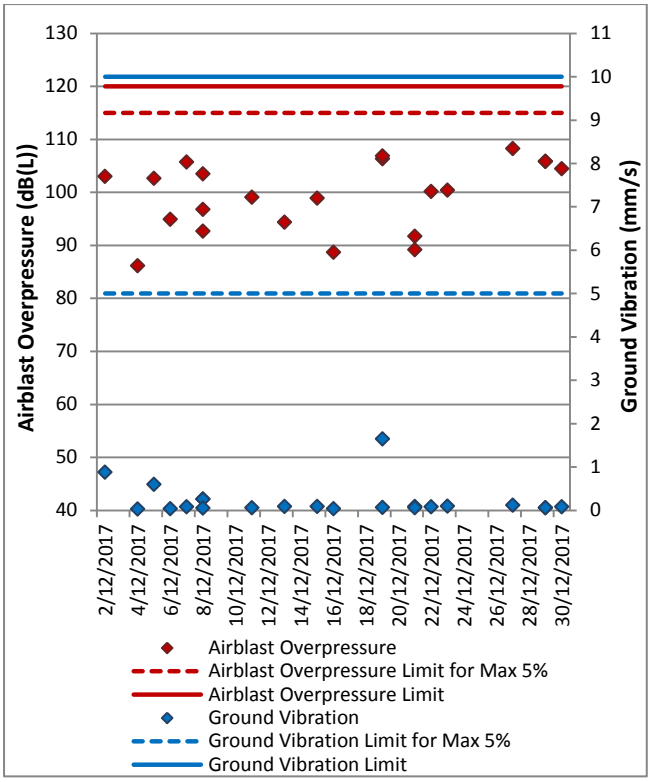


**Figure 82: Knodlers Lane Blast Monitoring Results – December 2017**

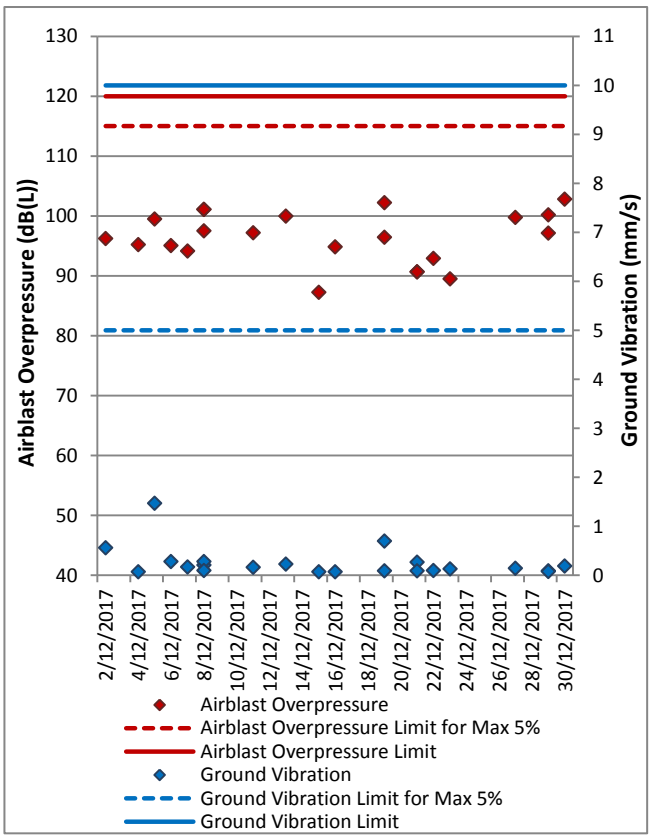


**Figure 81: Warkworth Blast Monitoring Results – December 2017**

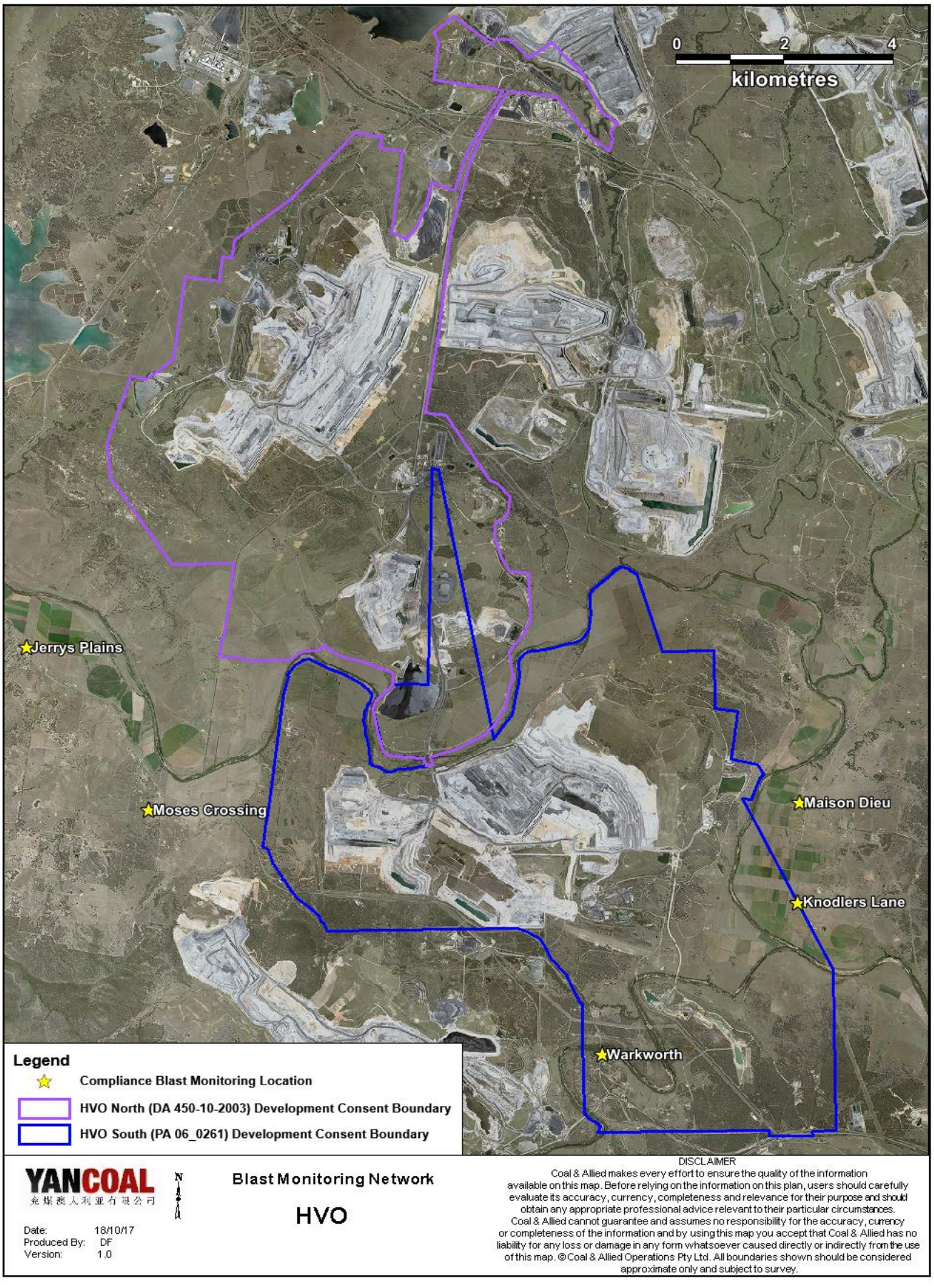


**Figure 83: Blast Monitoring Location Plan**

# 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 84

## 6.1 Attended Noise Monitoring Results

Attended monitoring was conducted at receiver locations surrounding HVO on the night of 4/12/2017. Monitoring results are detailed in Table 5 to Table 10 .

**Table 5: $L_{Aeq,\ 15\ minute}$ HVO South - Impact Assessment Criteria – December 2017**

| Location | Date and Time | Wind Speed (m/s)[5] | VTG[5] | Criterion dB (A) | Criterion Applies?[1,6] | HVO South $L_{Aeq}$ dB[2,4] | Exceedance[3] |
|---|---|---|---|---|---|---|---|
| Knodlers Lane | 4/12/2017 21:01 | 5.5 | -1 | 37 | No | IA | NA |
| Maison Dieu | 4/12/2017 21:21 | 5.8 | -1 | 37 | No | IA | NA |
| Shearers Lane | 4/12/2017 21:42 | 5.3 | -1 | 41 | No | NM | NA |
| Kilburnie South | 4/12/2017 22:32 | 3.8 | -1 | 36 | No | <30 | NA |
| Jerrys Plains Village | 4/12/2017 21:19 | 5.8 | -1 | 35 | No | IA | NA |
| Jerrys Plains East | 4/12/2017 21:00 | 5.5 | -1 | 35 | No | NM | NA |
| Long Point Road | 4/12/2017 22:29 | 4.4 | -1 | 35 | No | IA | NA |
| HVGC | 4/12/2017 23:09 | 5.3 | -1 | 55 | No | <30 | NA |

**Table 6: $L_{Aeq,\ 15\ minute}$ HVO South - Land Acquisition Criteria – December 2017**

| Location | Date and Time | Wind Speed (m/s)[5] | VTG[5] | Criterion dB (A) | Criterion Applies?[1,6] | HVO South $L_{Aeq}$ dB[2,4] | Exceedance[3] |
|---|---|---|---|---|---|---|---|
| Knodlers Lane | 4/12/2017 21:01 | 5.5 | -1 | 41 | No | IA | NA |
| Maison Dieu | 4/12/2017 21:21 | 5.8 | -1 | 41 | No | IA | NA |
| Shearers Lane | 4/12/2017 21:42 | 5.3 | -1 | 41 | No | NM | NA |
| Kilburnie South | 4/12/2017 22:32 | 3.8 | -1 | 41 | No | <30 | NA |
| Jerrys Plains Village | 4/12/2017 21:19 | 5.8 | -1 | 40 | No | IA | NA |
| Jerrys Plains East | 4/12/2017 21:00 | 5.5 | -1 | 40 | No | NM | NA |
| Long Point Road | 4/12/2017 22:29 | 4.4 | -1 | 40 | No | IA | NA |
| HVGC | 4/12/2017 23:09 | 5.3 | -1 | NA | No | <30 | NA |

**Table 7: $L_{A1,\ 1minute}$ HVO South - Impact Assessment Criteria – December 2017**

| Location | Date and Time | Wind Speed (m/s)[5] | VTG[5] | Criterion dB (A) | Criterion Applies?[1,6] | HVO South $L_{A1,\ 1min}$ dB[2,4] | Exceedance[3] |
|---|---|---|---|---|---|---|---|
| Knodlers Lane | 4/12/2017 21:01 | 5.5 | -1 | 45 | No | IA | NA |
| Maison Dieu | 4/12/2017 21:21 | 5.8 | -1 | 45 | No | IA | NA |
| Shearers Lane | 4/12/2017 21:42 | 5.3 | -1 | 45 | No | 22 | NA |
| Kilburnie South | 4/12/2017 22:32 | 3.8 | -1 | 45 | No | <30 | NA |
| Jerrys Plains Village | 4/12/2017 21:19 | 5.8 | -1 | 45 | No | IA | NA |
| Jerrys Plains East | 4/12/2017 21:00 | 5.5 | -1 | 45 | No | <25 | NA |
| Long Point Road | 4/12/2017 22:29 | 4.4 | -1 | 45 | No | IA | NA |
| HVGC | 4/12/2017 23:09 | 5.3 | -1 | NA | No | <35 | NA |

*Notes*
*1. Noise emission limits 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);*
*2. Estimated or measured $L_{Aeq,15minute}$ dB attributed to HVO South Pit Area;*
*3. NA in exceedance column means atmospheric conditions outside specified in approval and so criterion is not applicable;*
*4. Bolded results in red indicate exceedance of criteria;*
*5. Atmospheric data is sourced from the HVO Corporate weather station using logged met data;*
*6. Criterion may or may not apply due to rounding of meteorological data values*

**Table 8: $L_{Aeq,\ 15minute}$ HVO North – Impact Assessment Criteria – December 2017**

| Location | Date and Time | Wind Speed (m/s)[5] | VTG[5] | Criterion dB (A) | Criterion Applies?[1,6] | HVO North $L_{Aeq}$ dB[2,4] | Exceedance[3] |
|---|---|---|---|---|---|---|---|
| Knodlers Lane | 4/12/2017 21:01 | 4.3 | -1 | 35 | No | IA | NA |
| Maison Dieu | 4/12/2017 21:21 | 3.7 | -1 | 35 | No | IA | NA |
| Shearers Lane | 4/12/2017 21:42 | 2.7 | -1 | 35 | Yes | IA | Nil |
| Kilburnie South | 4/12/2017 22:32 | 1.7 | 3 | 39 | Yes | <30 | Nil |
| Jerrys Plains Village | 4/12/2017 21:19 | 3.7 | -1 | 36 | No | NM | NA |
| Jerrys Plains East | 4/12/2017 21:00 | 4.3 | -1 | 39 | No | <30 | NA |
| Long Point Road | 4/12/2017 22:29 | 4.4 | -1 | 35 | No | IA | NA |
| HVGC | 4/12/2017 23:09 | 2.7 | -1 | NA | Yes | IA | NA |

**Table 9: $L_{Aeq,15minute}$ HVO North - Land Acquisition Criteria – December 2017**

| Location | Date and Time | Wind Speed (m/s)[5] | VTG[5] | Criterion dB (A) | Criterion Applies?[1,6] | HVO North $L_{Aeq}$ dB[2,4] | Exceedance[3] |
|---|---|---|---|---|---|---|---|
| Knodlers Lane | 4/12/2017 21:01 | 4.3 | -1 | 41 | No | IA | NA |
| Maison Dieu | 4/12/2017 21:21 | 3.7 | -1 | 41 | No | IA | NA |
| Shearers Lane | 4/12/2017 21:42 | 2.7 | -1 | 41 | Yes | IA | Nil |
| Kilburnie South | 4/12/2017 22:32 | 1.7 | 3 | 41 | Yes | <30 | Nil |
| Jerrys Plains Village | 4/12/2017 21:19 | 3.7 | -1 | 41 | No | NM | NA |
| Jerrys Plains East | 4/12/2017 21:00 | 4.3 | -1 | 41 | No | <30 | NA |
| Long Point Road | 4/12/2017 22:29 | 4.4 | -1 | 41 | No | IA | NA |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| HVGC | 4/12/2017 23:09 | 2.7 | -1 | NA | Yes | IA | NA |

**Table 10: $L_{A1,\ 1Minute}$ HVO North - Impact Assessment Criteria – December 2017**

| Location | Date and Time | Wind Speed (m/s)[5] | VTG[5] | Criterion dB (A) | Criterion Applies?[1,6] | HVO North $L_{A1,\ 1min}$ dB[2,4] | Exceedance[3] |
|---|---|---|---|---|---|---|---|
| Knodlers Lane | 4/12/2017 21:01 | 4.3 | -1 | 46 | No | IA | NA |
| Maison Dieu | 4/12/2017 21:21 | 3.7 | -1 | 46 | No | IA | NA |
| Shearers Lane | 4/12/2017 21:42 | 2.7 | -1 | 46 | Yes | IA | Nil |
| Kilburnie South | 4/12/2017 22:32 | 1.7 | 3 | 46 | Yes | <30 | Nil |
| Jerrys Plains Village | 4/12/2017 21:19 | 3.7 | -1 | 46 | No | NM | NA |
| Jerrys Plains East | 4/12/2017 21:00 | 4.3 | -1 | 46 | No | <30 | NA |
| Long Point Road | 4/12/2017 22:29 | 4.4 | -1 | 46 | No | IA | NA |
| HVGC | 4/12/2017 23:09 | 2.7 | -1 | NA | Yes | IA | NA |

*Notes*
*1. 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;2. Estimated or measured LAeq,15minute dB attributed to HVO North Area;*
*3. NA in exceedance column means atmospheric conditions outside specified in approval and so criterion is not applicable;*
*4. Bolded results in red indicate exceedance of criteria;*
*5. Atmospheric data is sourced from the HVO Corporate weather station using logged met data;*
*6. Criterion may or may not apply due to rounding of meteorological data values*

## 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 2017 no measurements required the penalty to be applied. The assessment for low frequency noise is shown in Table 11.

**Table 11: Low Frequency Noise Assessment - December 2017**

| Location | Date and Time | Measured Site Only $LA_{eq}$ dB (Sth/Nth) | Site Only $LC_{eq}$ dB[4] (Sth/Nth) | Site Only $LC_{eq}$-$LA_{eq}$ dB [1,4] (Sth/Nth) | Result Max exceedance of ref spectrum dB[2,3,4] (Sth/Nth) | Penalty dB(A) | Exceedance |
|---|---|---|---|---|---|---|---|
| Knodlers Lane | 4/12/2017 21:01 | IA/IA | NA/NA | NA/NA | NA/NA | 0 | Nil |
| Maison Dieu | 4/12/2017 21:21 | IA/IA | NA/NA | NA/NA | NA/NA | 0 | Nil |
| Shearers Lane | 4/12/2017 21:42 | NM/IA | NA/NA | NA/NA | NA/NA | 0 | Nil |
| Kilburnie South | 4/12/2017 22:32 | <30/<30 | NA/NA | NA/NA | NA/NA | 0 | Nil |
| Jerrys Plains Village | 4/12/2017 21:19 | IM/NM | NA/NA | NA/NA | NA/NA | 0 | Nil |
| Jerrys Plains East | 4/12/2017 21:00 | NM/<30 | NA/NA | NA/NA | NA/NA | 0 | Nil |
| Long Point | 4/12/2017 22:29 | IA/IA | NA/NA | NA/NA | NA/NA | 0 | Nil |
| HVGC | 4/12/2017 23:09 | <30/IA | NA/NA | NA/NA | NA/NA | 0 | Nil |

*Notes:*
*1. As per NPfI, if LCeq – LAeq >= 15 dB further assessment of low frequency noise required.*
*2. As per NPfI, compare measured spectrum against reference spectrum to determine if the low frequency modifying factor is triggered and application of penalty is required;*
*3. Bold results and penalties in red are where the relevant modifying factor trigger was exceeded; and*
*4. 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.*

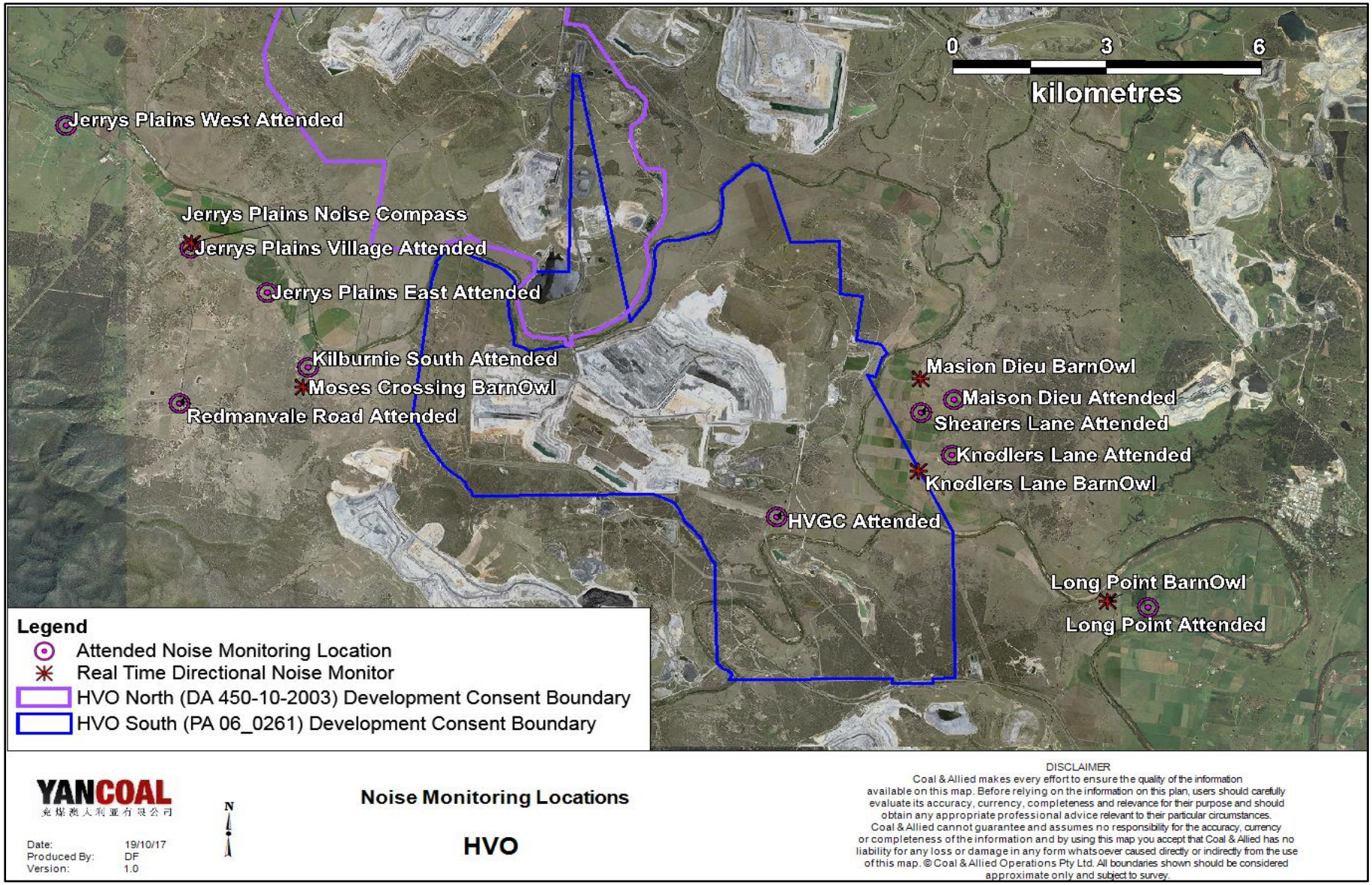


**Figure 84: Noise Monitoring Location Plan**

## 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 472.0 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 85.

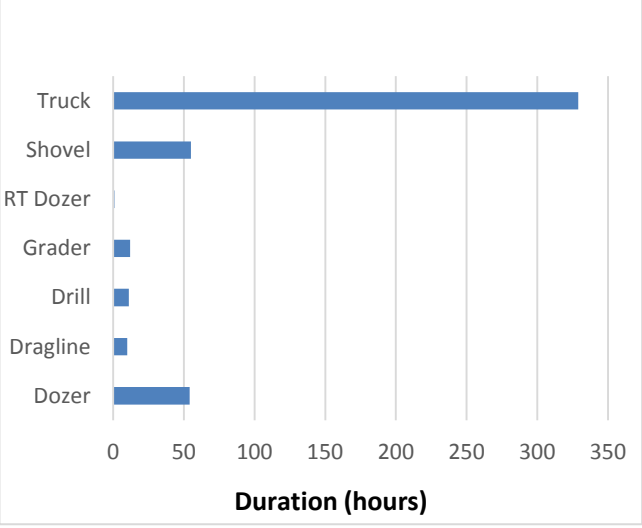


**Figure 85: Operational Downtime by Equipment Type – December 2017**

# 8.0 REHABILITATION

During December 17.1 Ha of land was released, 10.6 Ha of land was bulk shaped, 12.7 Ha of land was topsoiled, 15.1 Ha of land was composted and 10.5 Ha of land was rehabilitated. Year to date progress can be viewed in **Error! Reference source not found.** 86.

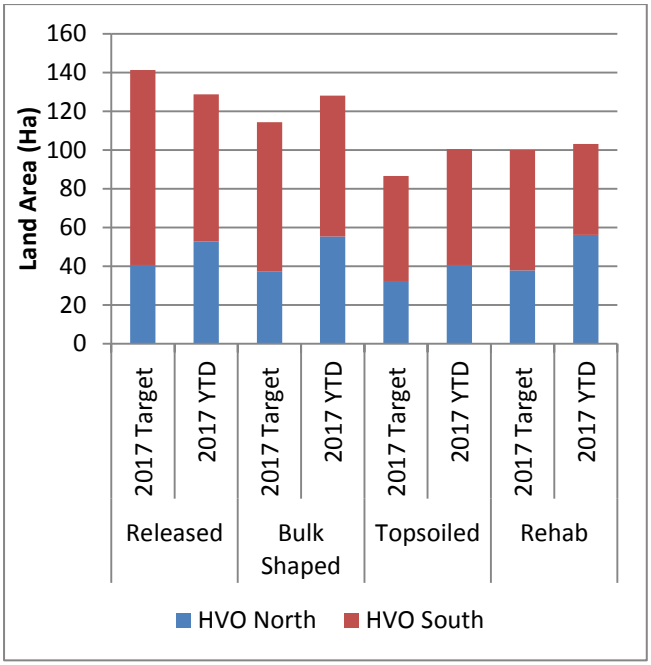


**Figure 86: Rehabilitation YTD - December 2017**

# 9.0 COMPLAINTS

During December 9 complaints were received Details of complaints received YTD are shown in Figure 87 below.

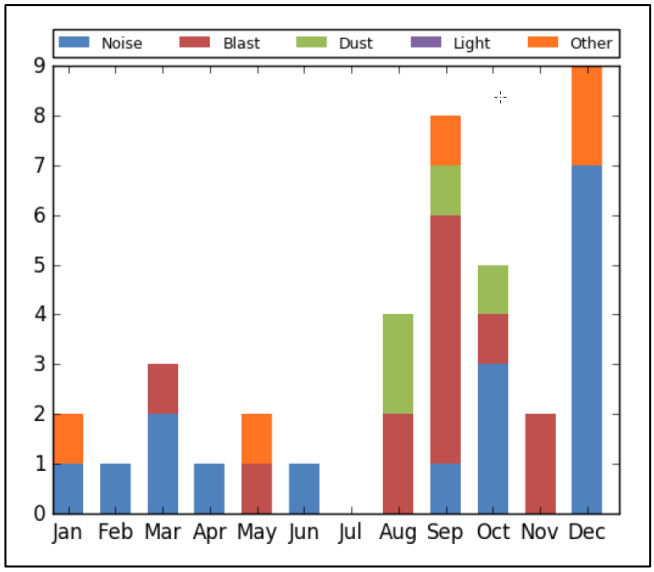


**Figure 87: Complaints Graph - December 2017**

# 10.0 ENVIRONMENTAL INCIDENTS

During the reporting period there were no reportable environmental incidents.

# Appendix A: Meteorological Data

**Table 12: Meteorological Data - HVO Corporate Meteorological Station – December 2017**

| 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) |
|---|---|---|---|---|---|---|---|---|
| 1/12/2017 | 36 | 15 | 98 | 18 | 1382 | - | 2.2 | 0.0 |
| 2/12/2017 | 30 | 16 | 100 | 34 | 1112 | 263 | 3.6 | 21.4 |
| 3/12/2017 | 26 | 13 | 85 | 28 | 1613 | 275 | 4.9 | 0.0 |
| 4/12/2017 | 26 | 13 | 90 | 40 | 1498 | 145 | 2.9 | 0.0 |
| 5/12/2017 | 27 | 12 | 100 | 38 | 1657 | 123 | 2.4 | 4.4 |
| 6/12/2017 | 26 | 20 | 56 | 32 | 872 | 265 | 3.5 | 0.0 |
| 7/12/2017 | 33 | 14 | 69 | 9 | 1313 | 243 | 3.0 | 0.0 |
| 8/12/2017 | 34 | 13 | 79 | 11 | 1556 | 170 | 2.7 | 0.0 |
| 9/12/2017 | 26 | 13 | 100 | 34 | 1735 | 111 | 2.8 | 0.6 |
| 10/12/2017 | 29 | 11 | 99 | 24 | 1450 | 107 | 2.7 | 0.0 |
| 11/12/2017 | 32 | 12 | 92 | 23 | 1117 | 113 | 2.5 | 0.0 |
| 12/12/2017 | 34 | 15 | 86 | 18 | 1089 | 109 | 2.5 | 0.0 |
| 13/12/2017 | 37 | 15 | 84 | 10 | 1086 | 185 | 1.8 | 0.0 |
| 14/12/2017 | 40 | 20 | 53 | 8 | 1082 | 251 | 2.8 | 0.0 |
| 15/12/2017 | 33 | 19 | 82 | 25 | 1189 | 118 | 3.0 | 0.0 |
| 16/12/2017 | 39 | 17 | 97 | 9 | 1134 | 147 | 2.1 | 0.0 |
| 17/12/2017 | 33 | 18 | 88 | 35 | 1050 | 109 | 2.7 | 0.4 |
| 18/12/2017 | 36 | 16 | 99 | 24 | 1177 | 138 | 2.0 | 0.0 |
| 19/12/2017 | 40 | 20 | 78 | 13 | 1398 | - | 3.4 | 0.0 |
| 20/12/2017 | 41 | 18 | 92 | 10 | 1182 | 231 | 4.6 | 0.0 |
| 21/12/2017 | 25 | 16 | 98 | 53 | 466 | 110 | 3.7 | 0.0 |
| 22/12/2017 | 28 | 15 | 100 | 46 | 1251 | 105 | 2.5 | 0.0 |
| 23/12/2017 | 37 | 16 | 97 | 11 | 1090 | 180 | 2.4 | 0.0 |
| 24/12/2017 | 40 | 18 | 78 | 7 | 1345 | 207 | 3.6 | 0.0 |
| 25/12/2017 | 23 | 14 | 100 | 67 | 813 | 112 | 3.7 | 0.0 |
| 26/12/2017 | 21 | 14 | 100 | 66 | 630 | 110 | 3.5 | 0.8 |
| 27/12/2017 | 30 | 15 | 100 | 36 | 1754 | 104 | 3.8 | 0.2 |
| 28/12/2017 | 35 | 13 | 99 | 13 | 1210 | 125 | 1.8 | 0.0 |
| 29/12/2017 | 38 | 18 | 89 | 12 | 1249 | 247 | 2.6 | 0.0 |
| 30/12/2017 | 34 | 19 | 98 | 25 | 1583 | 266 | 4.8 | 1.2 |
| 31/12/2017 | 29 | 17 | 90 | 43 | 1544 | 105 | 3.8 | 0.0 |

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