Monthly Environmental Monitoring Report

Yancoal Mt Thorley Warkworth

September 2020

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Revision History

Version No.	Person Responsible	Document Status	Date
1.0	**Environmental Advisor**	**Final**	**12/02/2021**

1.0 INTRODUCTION

This report has been compiled to provide a monthly summary of environmental monitoring results for Mt Thorley Warkworth (MTW). This report includes all monitoring data collected for the period 1 September to 30 September 2020.

2.0 AIR QUALITY

2.1 Meteorological Monitoring

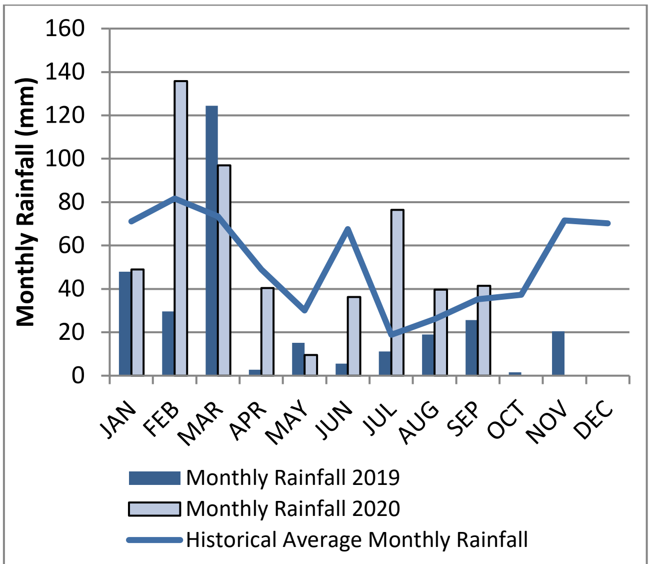
Meteorological data is collected at MTW's 'Charlton Ridge' meteorological station (refer to **Figure 3**: Air Quality Monitoring Locations).

2.1.1 Rainfall

Rainfall for the period is summarised in **Table 1**, the year-to-date trend and historical trend are shown in **Figure 1**.

Table 1: Monthly Rainfall MTW

2020	Monthly Rainfall (mm)	Cumulative Rainfall (mm)
September	41.4	525.4



Note: The historical average monthly rainfall is calculated from 2007 to 2019 monthly totals

Figure 1: Rainfall Trends YTD

2.1.2 Wind Speed and Direction

Winds from the north west and south east were dominant throughout the reporting period as shown in **Figure 2**.

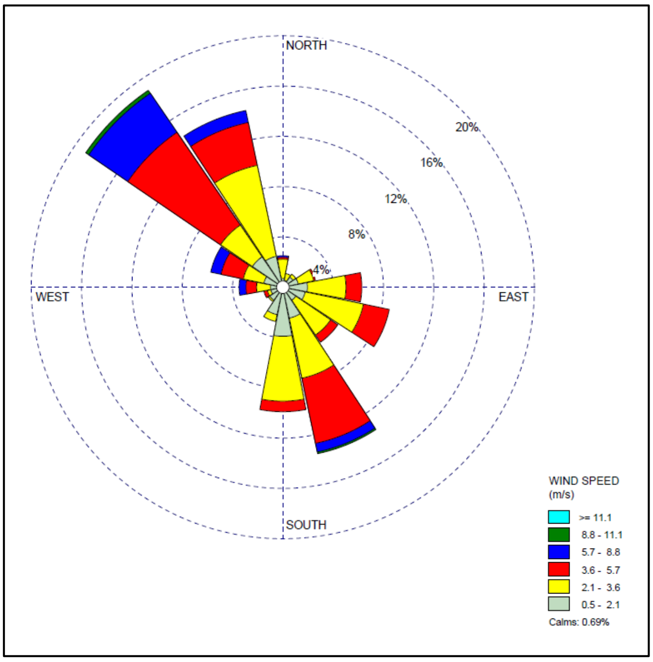


Figure 2: Charlton Ridge Wind Rose – September 2020

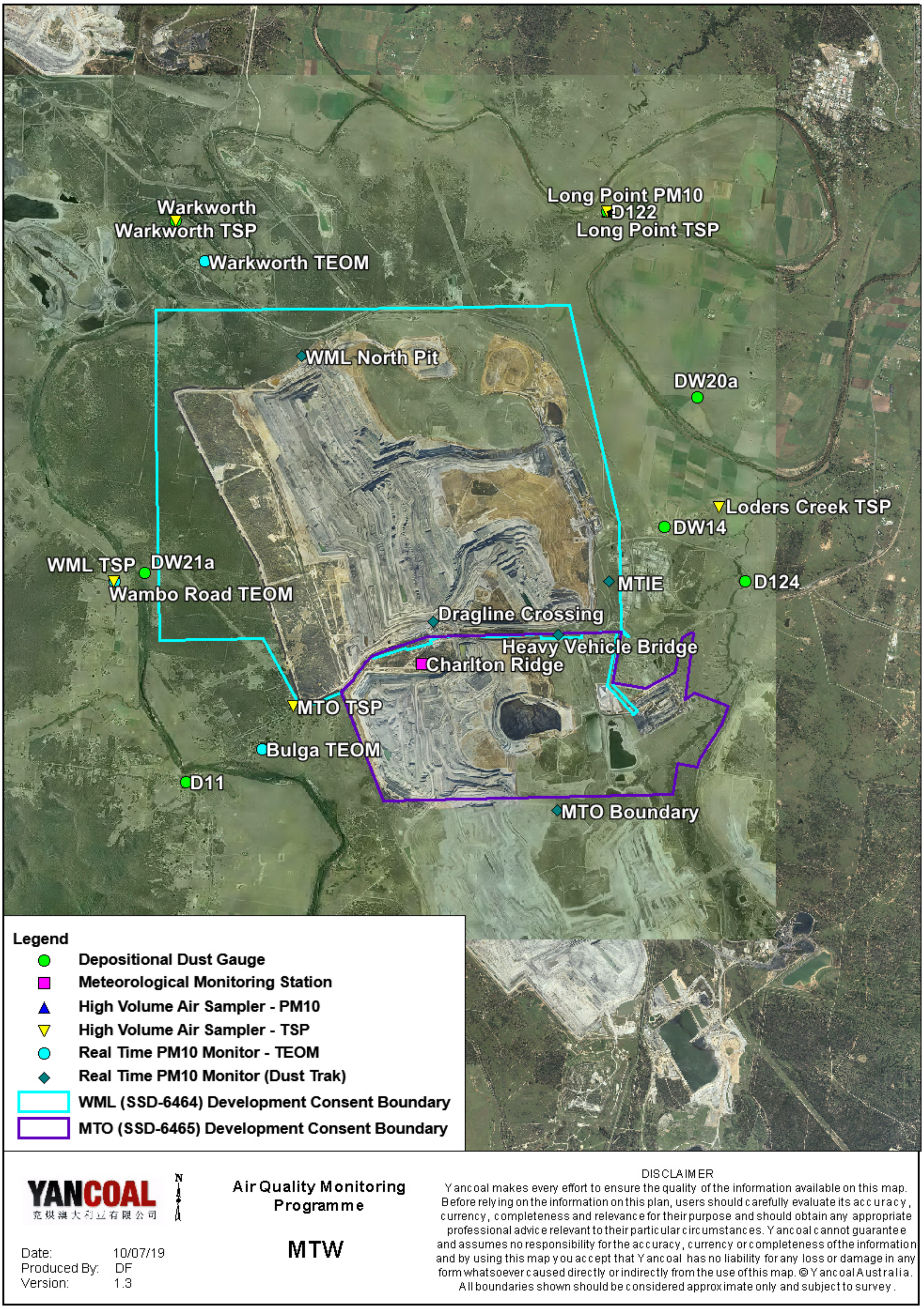


Figure 3: Air Quality Monitoring Locations

2.2 Depositional Dust

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

Figure 4 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 Warkworth monitor recorded a monthly result above the long-term impact assessment criteria of 4.0 g/m^2 per month. There is no evidence to suggest that the Warkworth result is contaminated. Accordingly, the result will be included in the annual average calculation.

An annual assessment of MTW's compliance with the Long-Term Impact Assessment Criteria will be provided in the 2020 Annual Review Report.

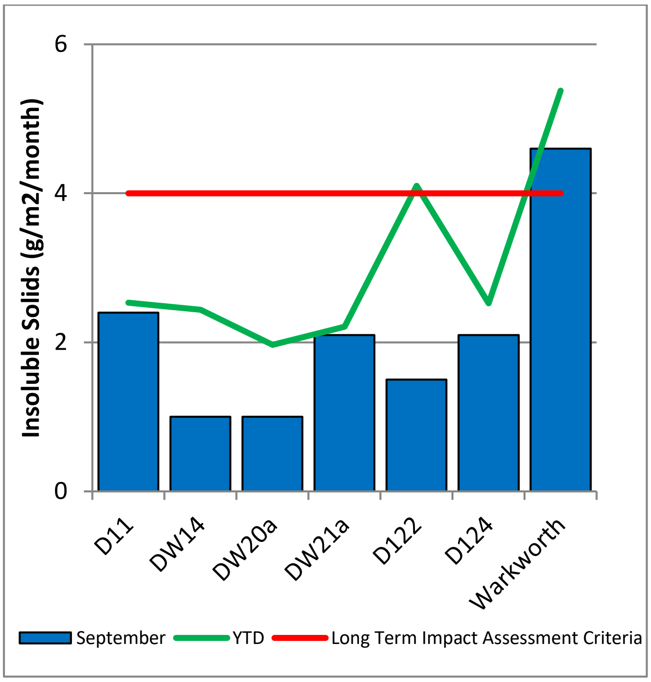


Figure 4: Depositional Dust - September 2020

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 3**. Each HVAS was run for 24 hours on a six-day cycle in accordance with EPA requirements.

2.3.1 HVAS PM_{10} Results

Figure 5 shows the individual PM_{10} results at the monitoring station against the short-term impact assessment criteria of 50µg/m³.

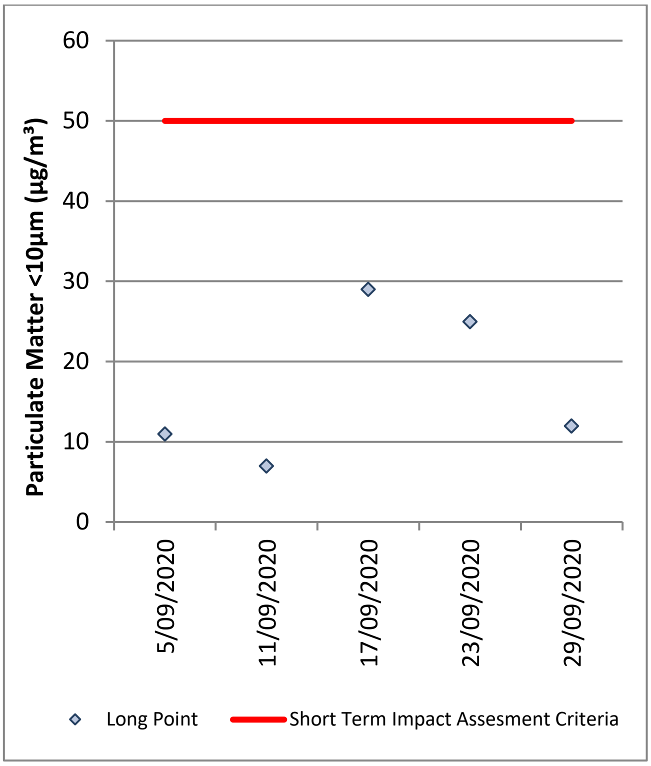


Figure 5: Individual PM_{10} Results – September 2020

Figure 6 shows the annual average PM_{10} results against the long-term impact assessment criteria.

An annual assessment of MTW's compliance with the Long-Term Impact Assessment Criteria will be provided in the 2020 Annual Review Report.

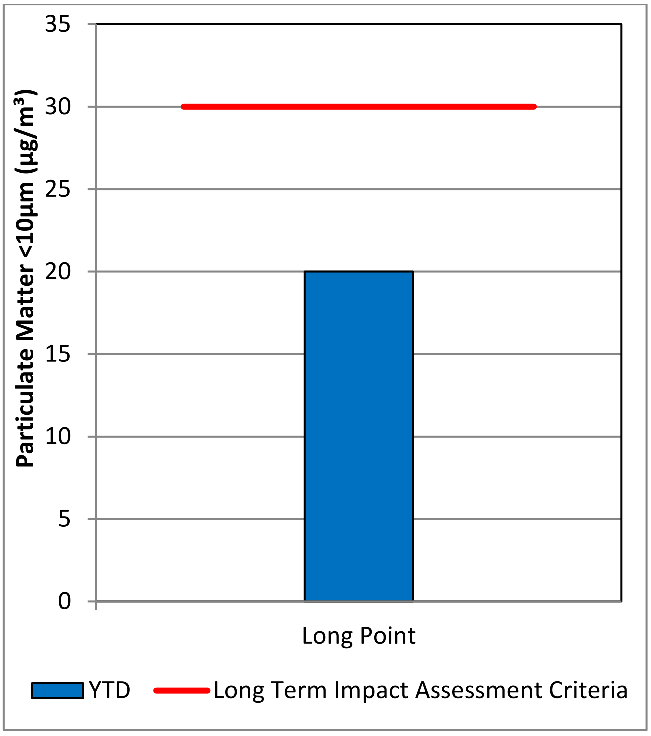


Figure 6: Annual Average PM_{10} – September 2020

2.3.2 TSP Results

Figure 7 shows the annual average TSP results compared against the long-term impact assessment criteria of 90µg/m³.

An annual assessment of MTW's compliance with the Long-Term Impact Assessment Criteria will be provided in the 2020 Annual Review Report.

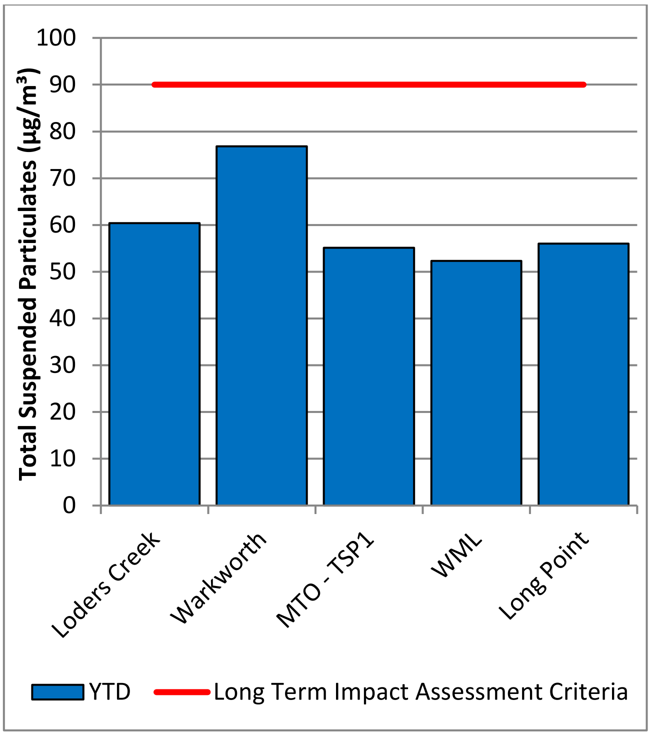


Figure 7: Annual Average Total Suspended Particulates – September 2020

2.3.3 Real Time PM_{10} Results

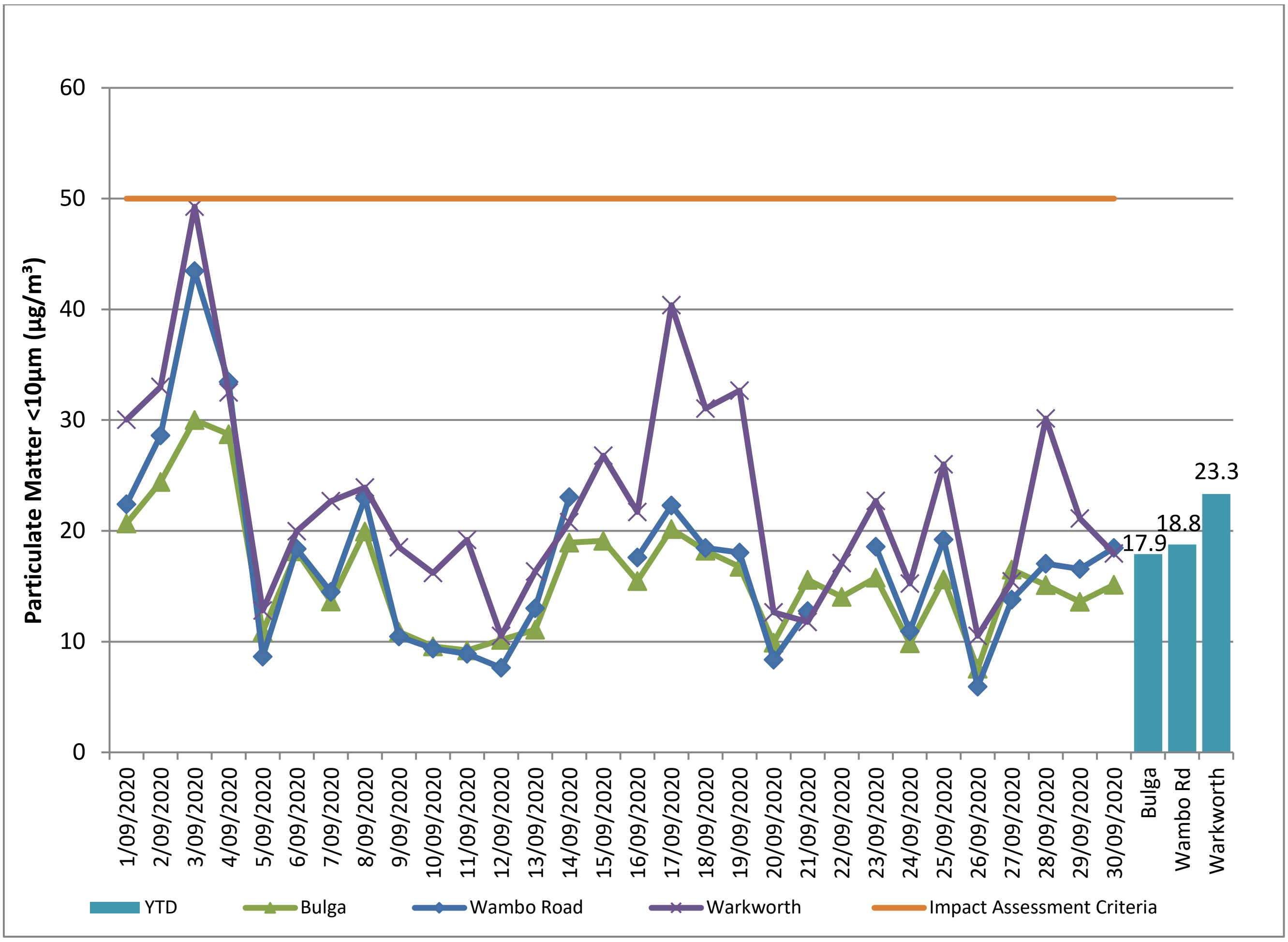
Mt Thorley Warkworth maintains a network of real time PM_{10} monitors. The real-time air quality monitoring stations continuously log information and transmit data to a central database, generating alarms when particulate matter levels exceed internal trigger limits.

Results for real time dust sampling are shown in **Figure 8**, including the daily 24-hour average PM_{10} result and the annual PM_{10} average.

Data was not available on 15 and 22 September 2020 from the Wambo Road TEOM due to communications issues.

2.3.4 Real Time Alarms for Air Quality

During September, the real-time monitoring system generated 84 automated air quality related alerts, including 34 alerts for adverse meteorological conditions and 50 alerts for elevated PM10 levels.



Note: The Year to Date (YTD) PM10 average result for the Wambo Road monitoring location has been calculated using data from the Wallaby Scrub Road TEOM location for January 2020 and from the Wambo Road TEOM from February 2020 onwards.

Figure 8: Real Time PM10 24hr average and Year-to-date average – September 2020

3.0 WATER QUALITY

MTW maintains a network of surface water and groundwater monitoring sites.

3.1 Surface Water

Monitoring is conducted at mine site dams and surrounding natural watercourses. The surface water monitoring locations are outlined in **Figure 15**.

Surface water courses are sampled on a monthly or quarterly sampling regime. Water quality is evaluated through the parameters of pH, Electrical Conductivity (EC) and Total Suspended Solids (TSS). The Hunter River and the Wollombi Brook are sampled both upstream and downstream of mining operations, to monitor the potential impact of mining. Other Hunter River tributaries are also monitored.

3.1.1 Surface Water Monitoring Results

Figure 9 to **Figure 11** show the long-term surface water trend (2017 – current) within MTW mine dams. **Figure 12** to **Figure 14** show the long-term surface water trend (2017 - current) in surrounding watercourses.

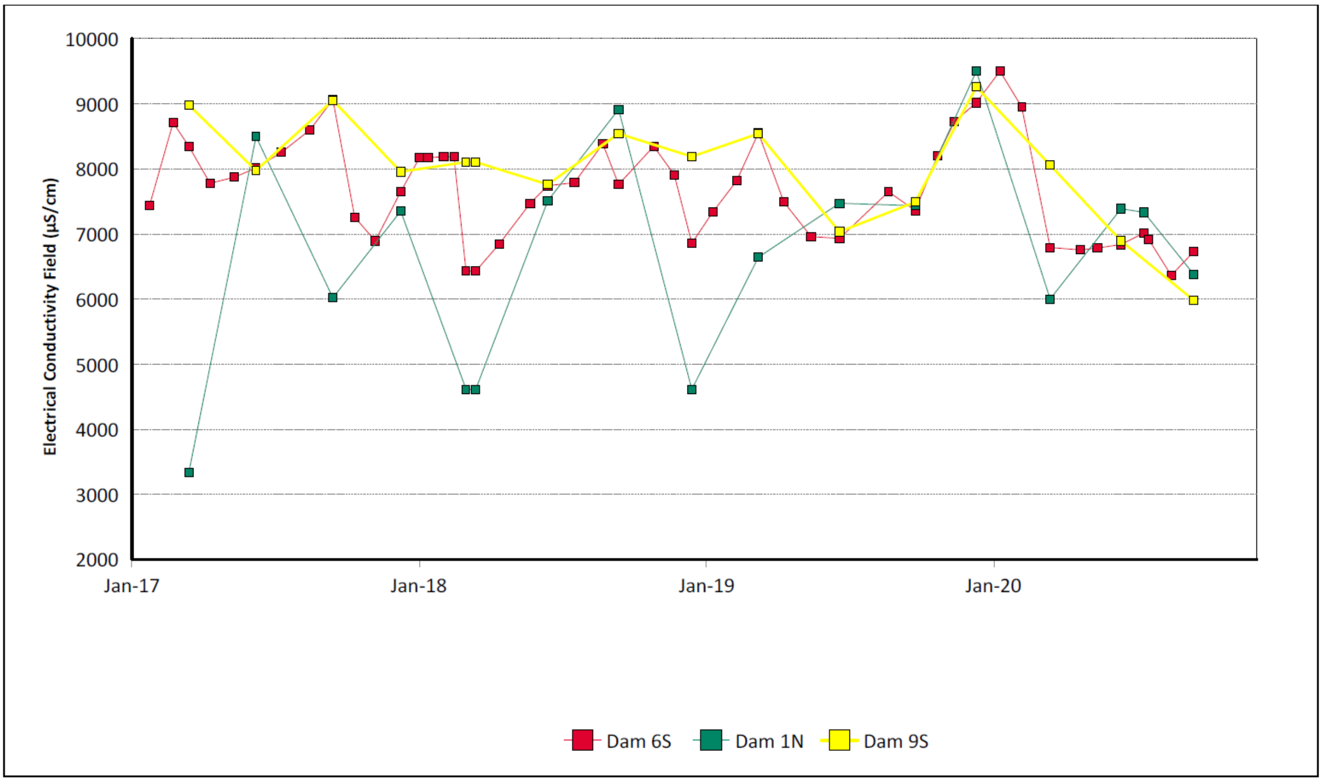


Figure 9: Site Dams Electrical Conductivity Trend – September 2020

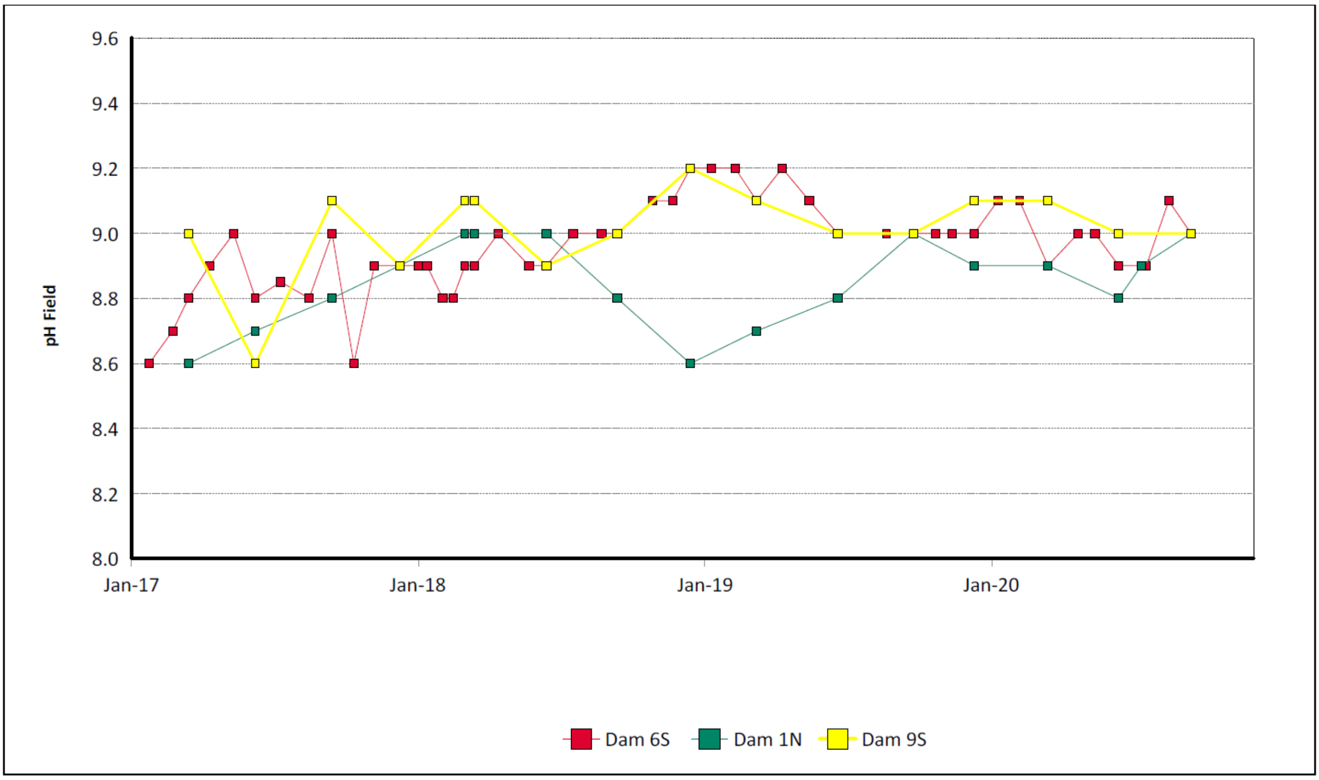


Figure 10: Site Dams pH Trend – September 2020

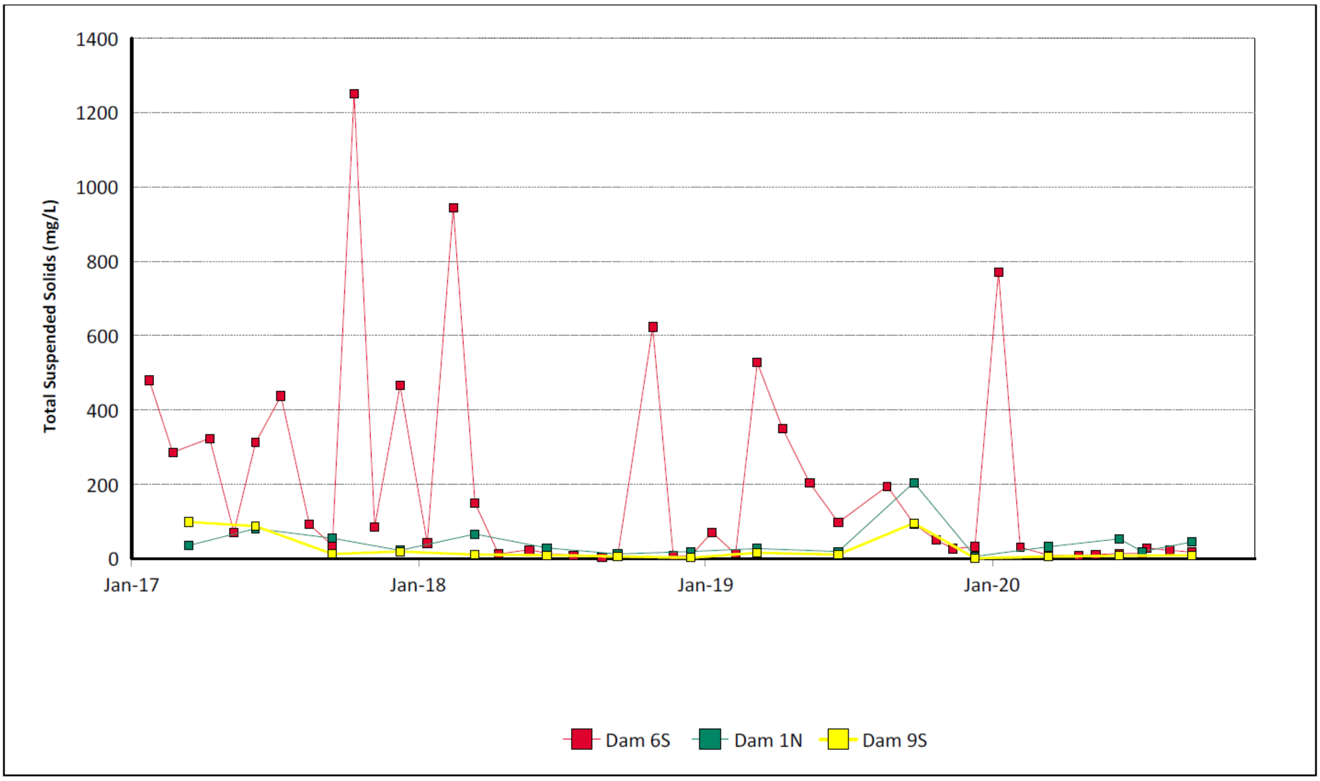
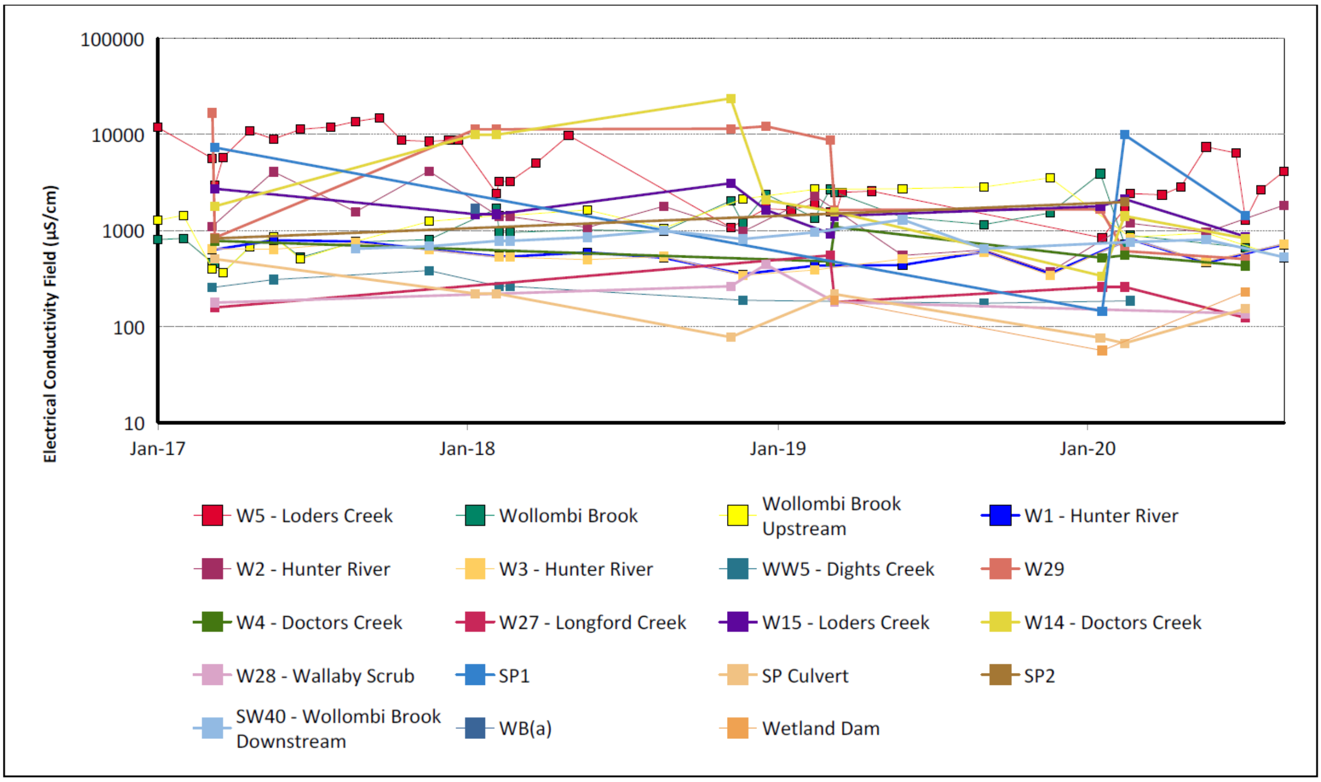
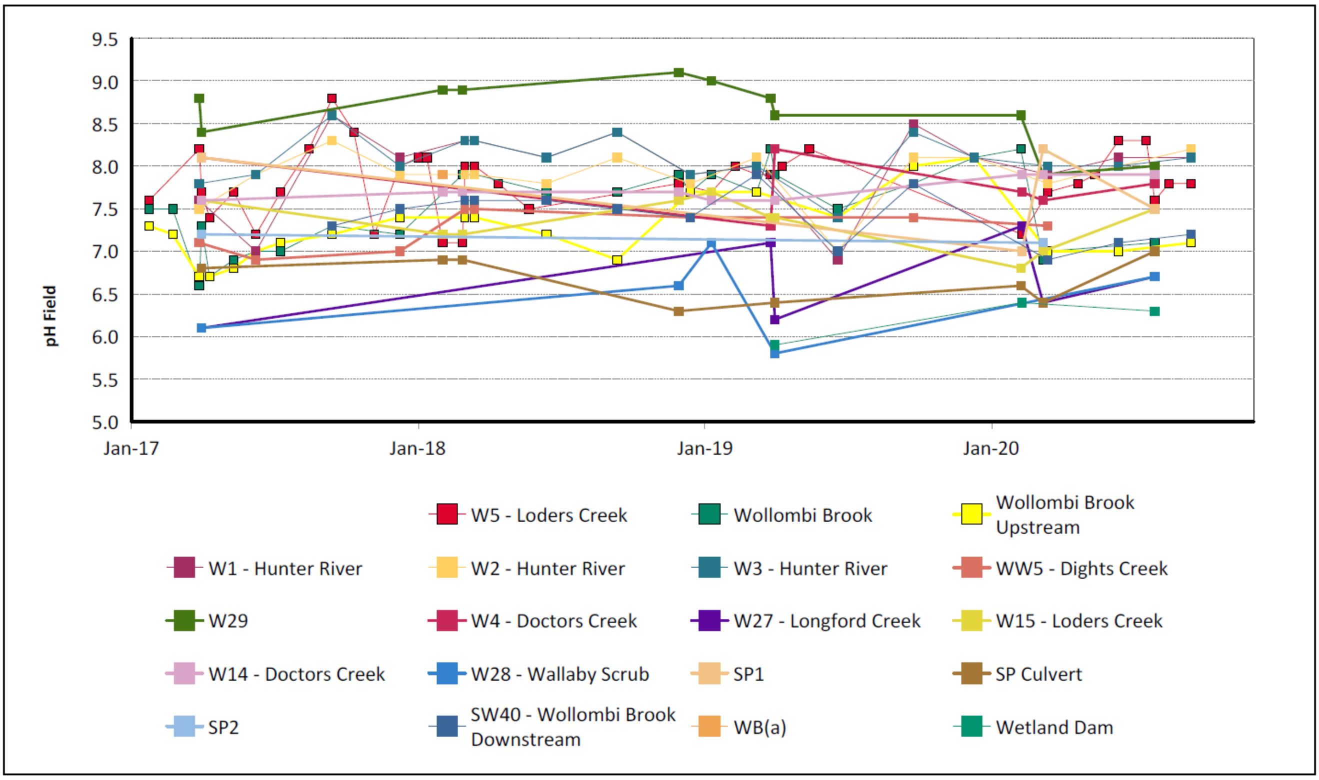


Figure 11: Site Dams Total Suspended Solids Trend – September 2020



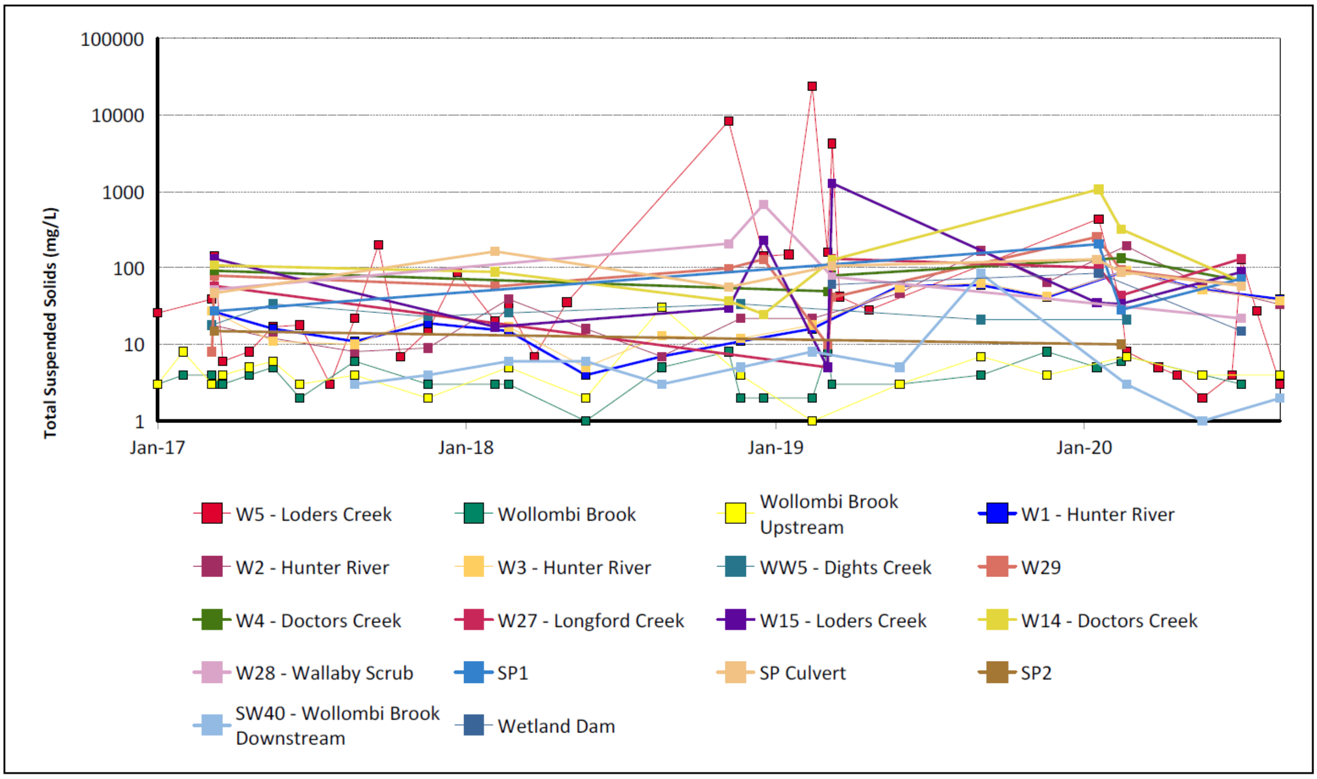
Note: Missing data indicates that there was insufficient water to take a sample, or that there was no safe access.

Figure 12: Watercourse Electrical Conductivity Trend – September 2020



Note: Missing data indicates that there was insufficient water to take a sample, or that there was no safe access.

Figure 13: Watercourse pH Trend – September 2020



Note: Missing data indicates that there was insufficient water to take a sample, or that there was no safe access.

Figure 14: Watercourse Total Suspended Solids Trend – September 2020

3.1.2 Surface Water Trigger Tracking

Internal trigger limits have been developed to assess monitoring data on an on-going basis, and to highlight potentially adverse surface water impacts. The process for evaluating monitoring results against the internal triggers and subsequent responses are outlined in the MTW Water Management Plan.

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

Table 2: Surface Water Trigger Tracking – September YTD 2020

Site	Date	Trigger Limit Breached	Action Taken in Response
W5	09/02/2020	pH –5th Percentile	Watching Brief*
W15	07/02/2020	pH –5th Percentile	Watching Brief*
W15	07/03/2020	pH –5th Percentile	Watching Brief*
W27	07/03/2020	pH –5th Percentile	Watching Brief*
W29	27/07/2020	pH –5th Percentile	Watching Brief*
SW40	13/03/2020	pH –5th Percentile	Watching Brief*
SP1	09/02/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief* Elevated TSS results most likely attributable to rainfall event (91.4mm from 6 February to and including 9 February)
SP1	27/07/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief* Elevated TSS results most likely attributable to rainfall event (39.8mm on 26 July and another 13.4mm on 27 July)
W1	13/03/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Note: Unlikely to be associated with MTW mining related impacts. Elevated TSS results most likely attributable to regional rainfall.
W1	11/06/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Note: Unlikely to be associated with MTW mining related impacts. Elevated TSS results most likely attributable to regional rainfall.
W2	13/03/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Note: Unlikely to be associated with MTW mining related impacts. Elevated TSS results most likely attributable to regional rainfall.
W2	11/06/2020	TSS – 50mg/L (ANZECC criteria)	Investigation undertaken. Note: Elevated TSS considered associated with recent rainfall and increased flow rates in the river at the time. Consistent with nearby W1 and W3 measurements. No signs of mining related impact.
W3	13/03/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Note: Unlikely to be associated with MTW mining related impacts. Elevated TSS results most likely attributable to regional rainfall.
W3	11/06/2020	TSS – 50mg/L (ANZECC criteria)	Investigation undertaken. Note: Elevated TSS considered associated with recent rainfall and increased flow rates in the river at the time. Consistent with nearby W1 and W3 measurements. No signs of mining related impact.

Site	Date	Trigger Limit Breached	Action Taken in Response
W4	09/02/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to a rainfall event (91.4mm from 6 February to and including 9 February).
W4	07/03/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to rainfall event (56mm from 3 March to and including 7 March)
W4	27/07/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to rainfall event (39.8mm on 26 July and another 13.4mm on 27 July)
W5	09/02/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to a rainfall event (91.4mm from 6 February to and including 9 February).
W5	27/07/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to rainfall event (39.8mm on 26 July and another 13.4mm on 27 July)
W14	09/02/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to a rainfall event (91.4mm from 6 February to and including 9 February).
W14	07/03/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to rainfall event (56mm from 3 March to and including 7 March)
W14	27/07/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to rainfall event (39.8mm on 26 July and another 13.4mm on 27 July)
W15	27/07/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to rainfall event (39.8mm on 26 July and another 13.4mm on 27 July)
W27	09/02/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to a rainfall event (91.4mm from 6 February to and including 9 February).
W27	27/07/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to rainfall event (39.8mm on 26 July and another 13.4mm on 27 July)
W29	07/02/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to a rainfall event (91.4mm from 6 February to and including 9 February).
W29	07/03/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to rainfall event (56mm from 3 March to and including 7 March)
W29	27/07/2020	TSS – 50mg/L (ANZECC criteria)	Watching Brief*. Elevated TSS results most likely attributable to rainfall event (39.8mm on 26 July and another 13.4mm on 27 July)

* = Watching brief established pending outcomes of subsequent monitoring events.

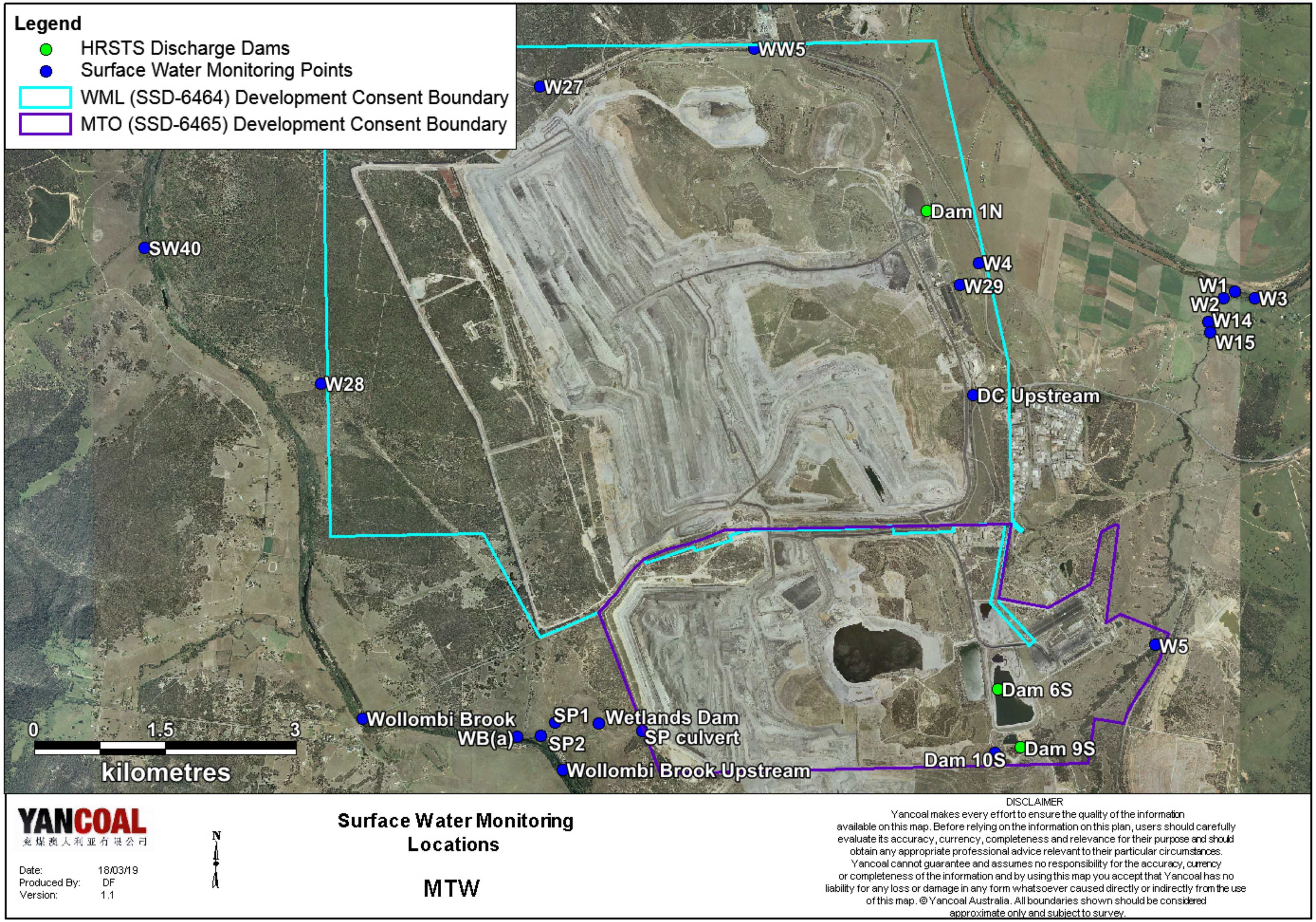
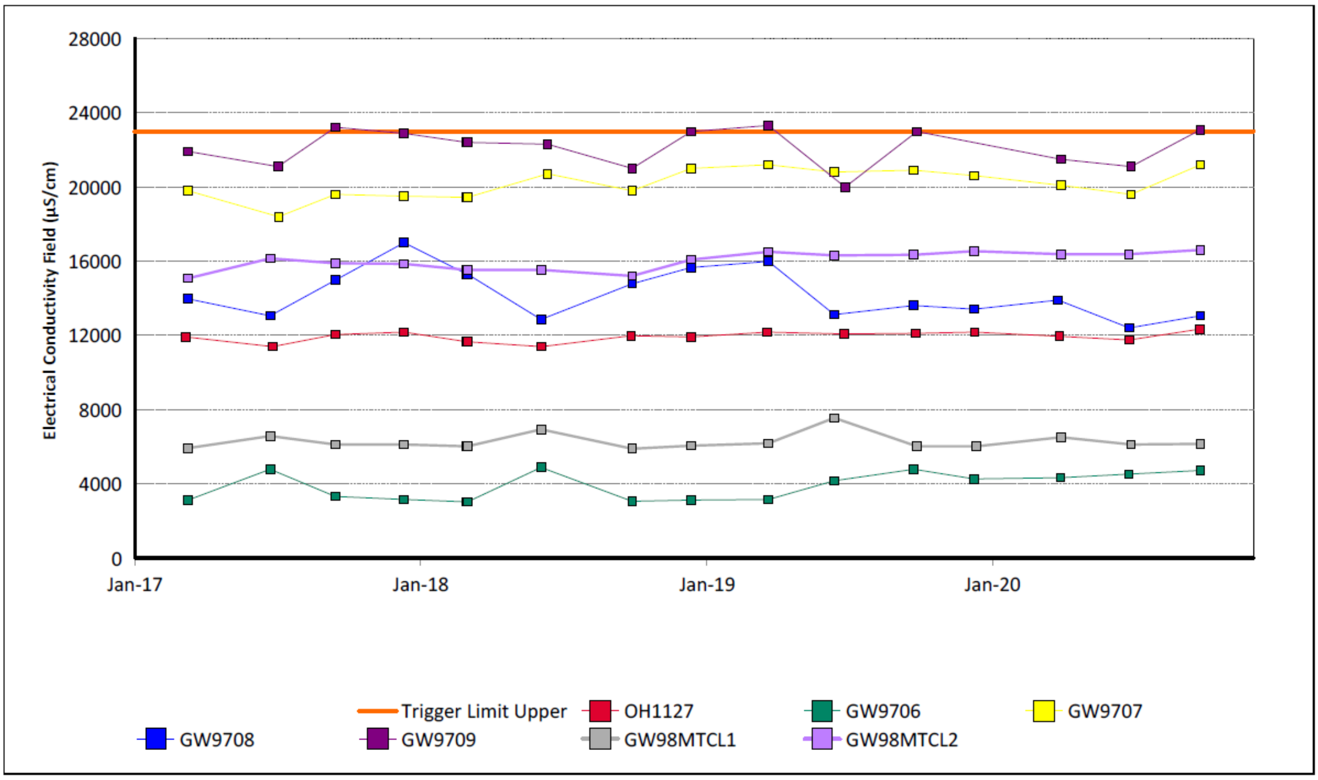


Figure 15: Surface Water Monitoring Location Plan

3.2 Groundwater Monitoring

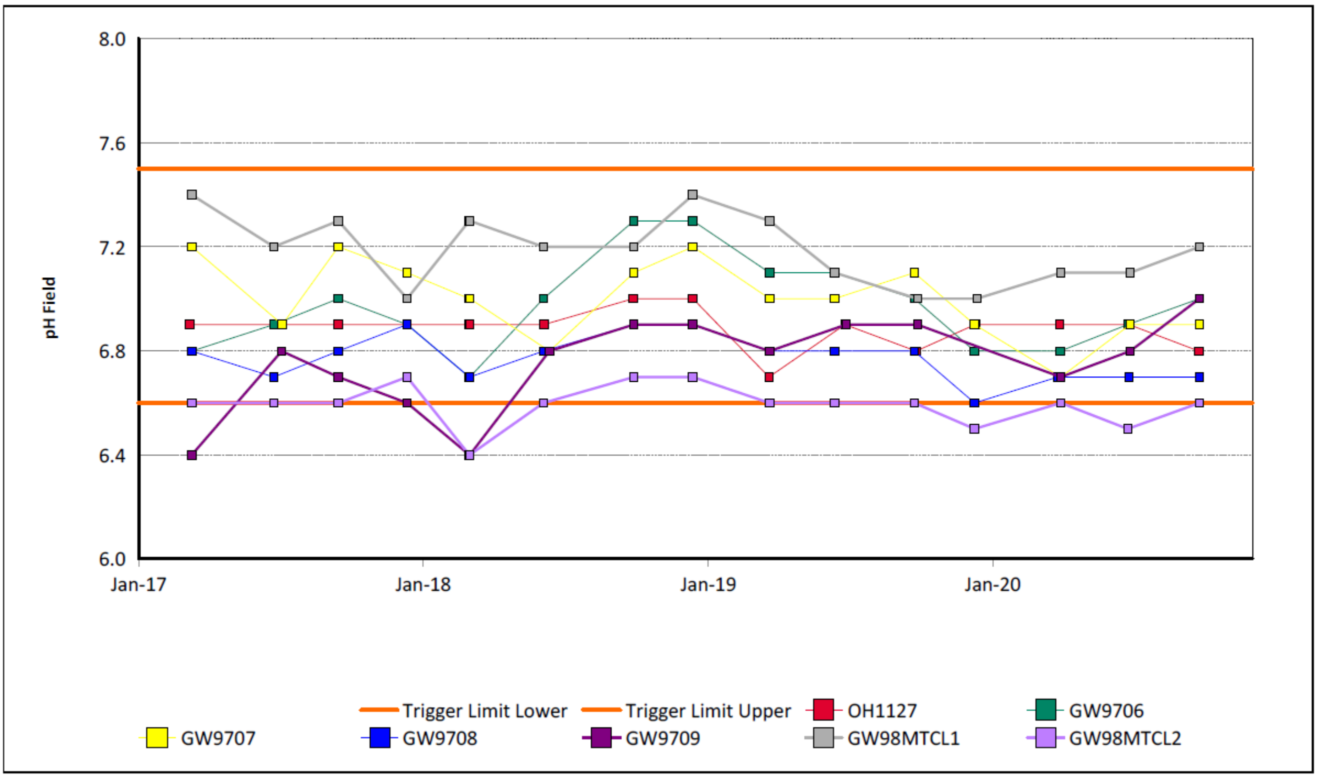
Groundwater monitoring is undertaken on a quarterly basis in accordance with the MTW Groundwater Monitoring Programme.

Figure 16 to **Figure 61** show the long-term water quality trends (2017 – current) for groundwater bores monitored at MTW.



Note: Missing data indicates that there was insufficient water to take a sample.

Figure 16: Bayswater Seam Electrical Conductivity Trend – September 2020



Note: Missing data indicates that there was insufficient water to take a sample.

Figure 17: Bayswater Seam pH Trend – September 2020

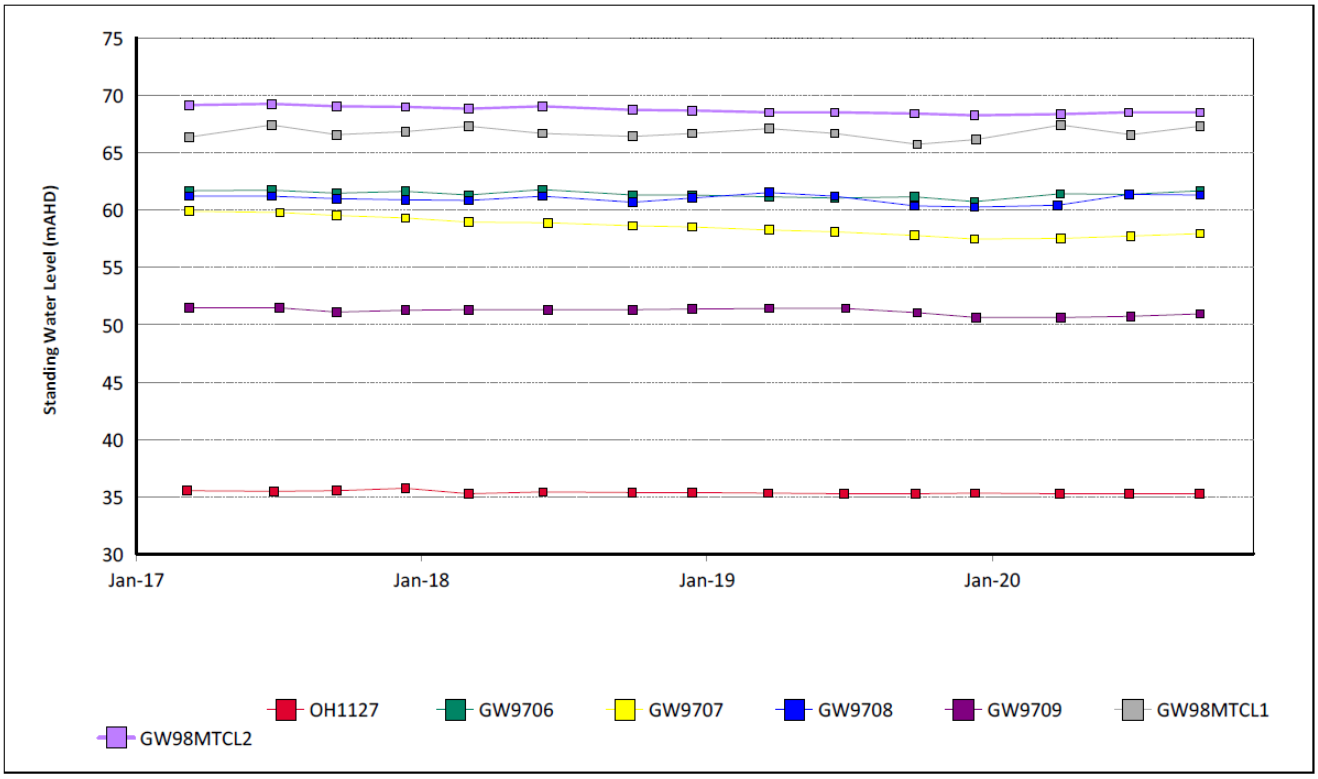


Figure 18: Bayswater Seam Standing Water Level Trend – September 2020

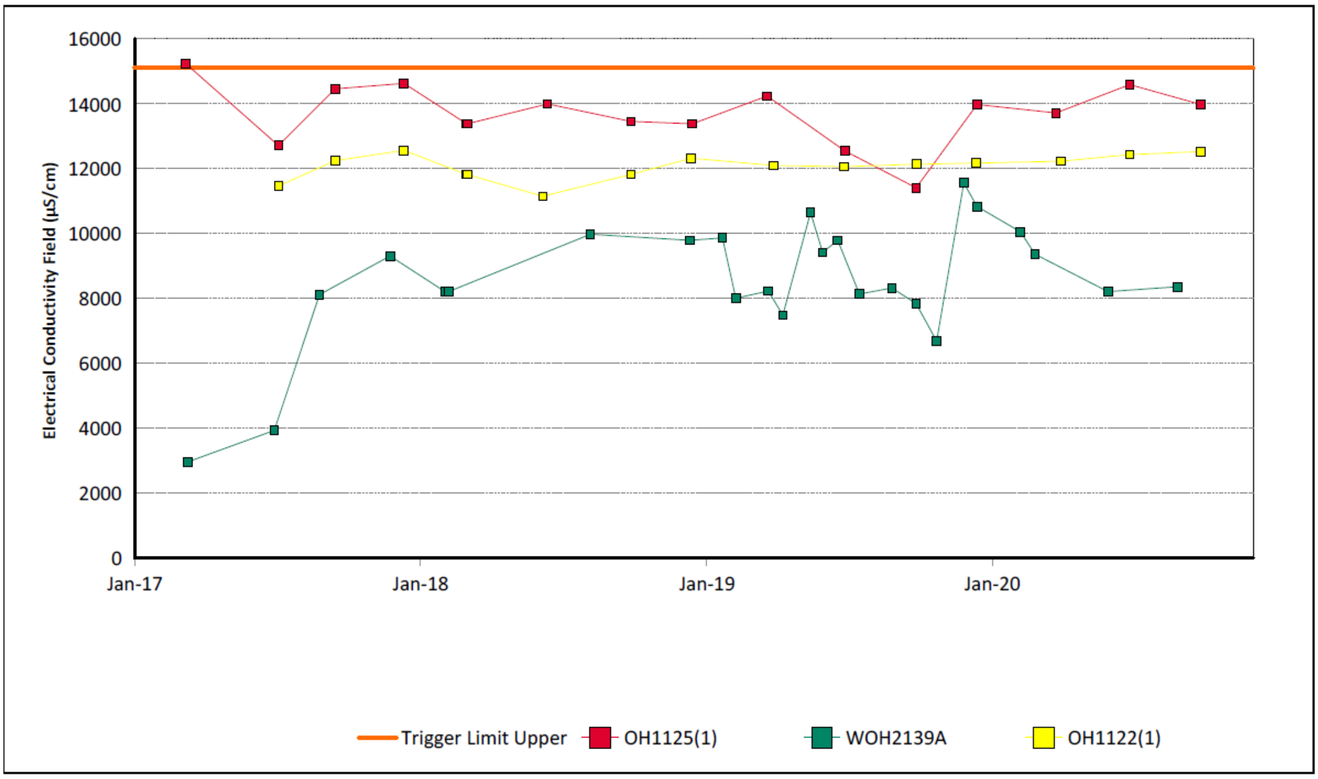


Figure 19: Blakefield Seam Electrical Conductivity Trend – September 2020

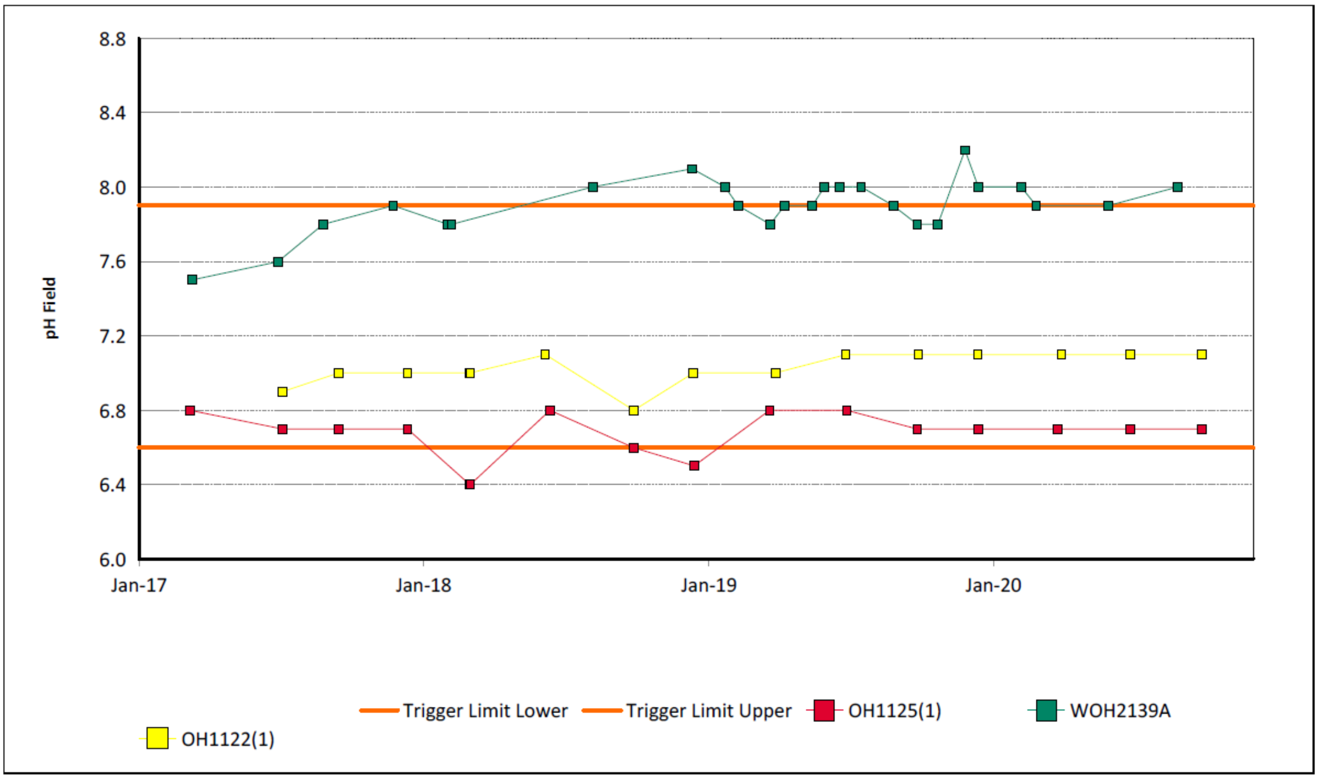


Figure 20: Blakefield Seam pH Trend – September 2020

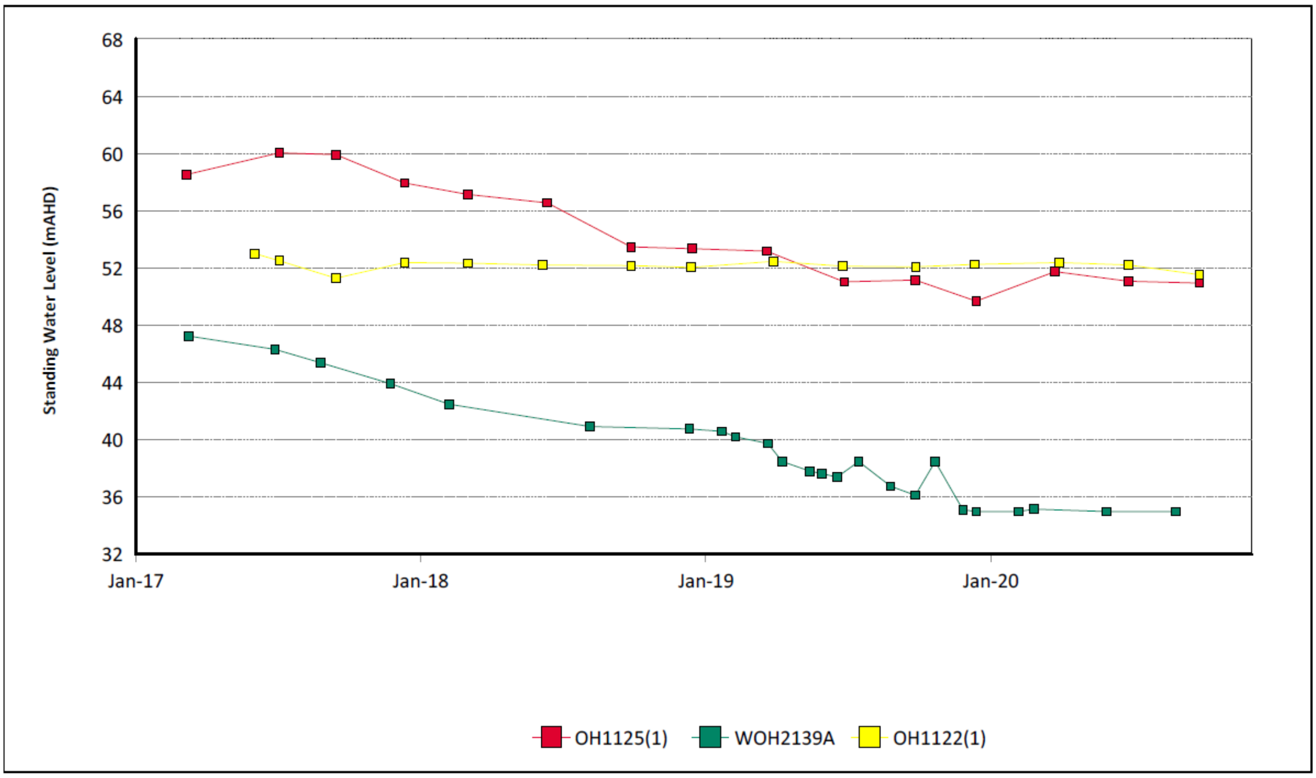


Figure 21: Blakefield Seam Standing Water Level Trend – September 2020

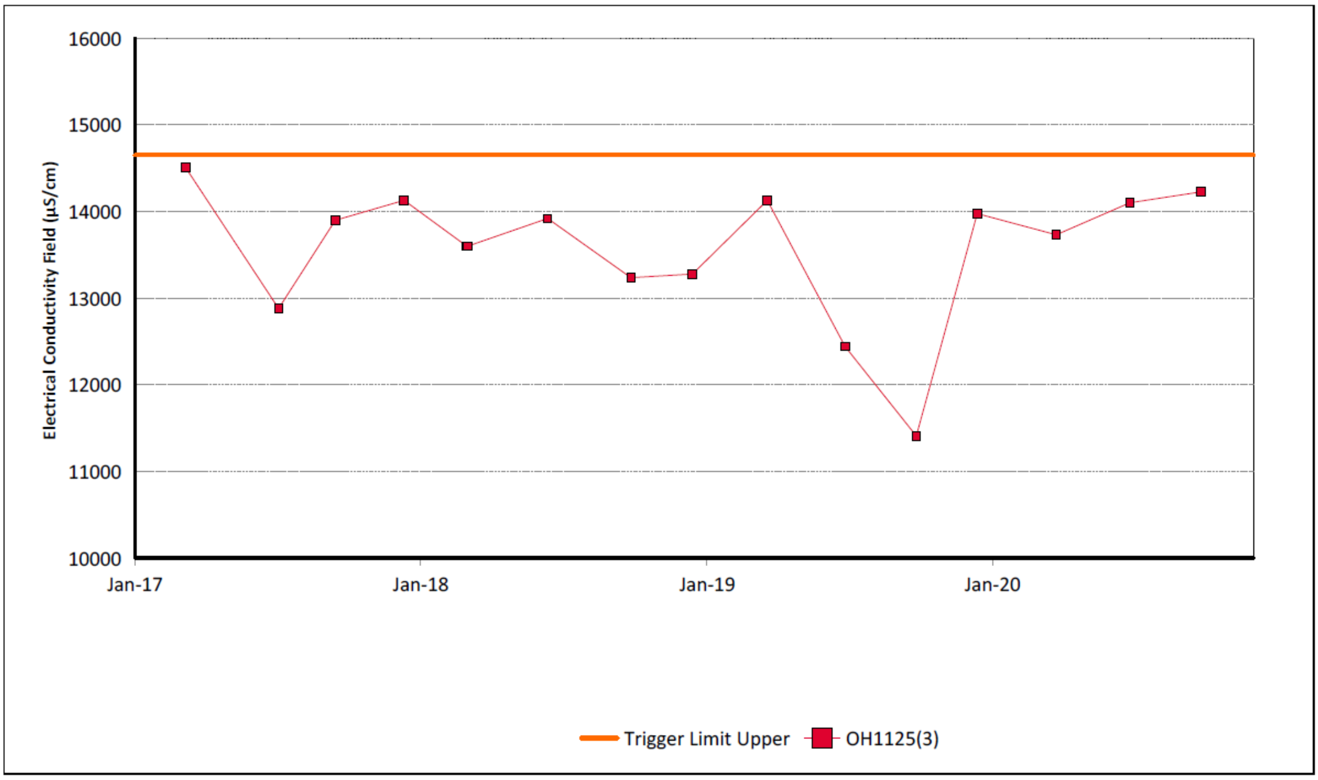


Figure 22: Bowfield Seam Electrical Conductivity Trend – September 2020

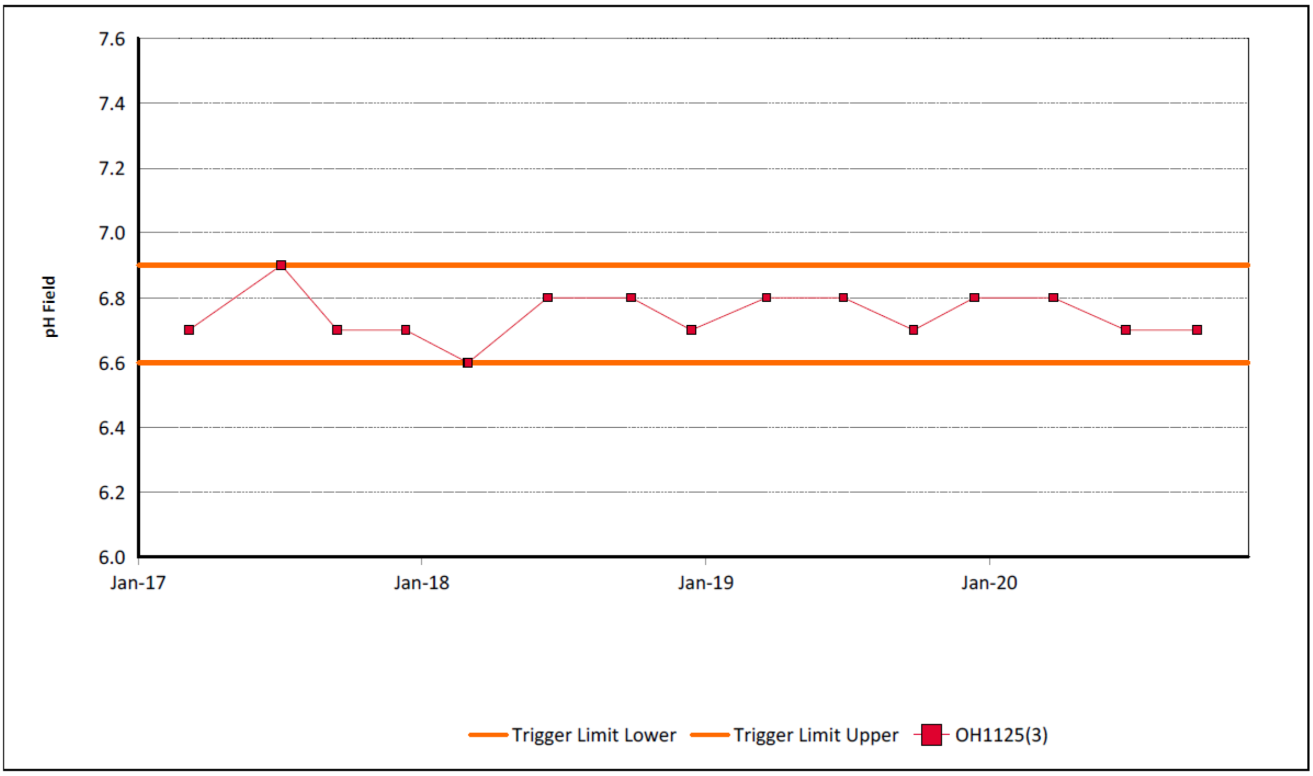


Figure 23: Bowfield Seam pH Trend – September 2020

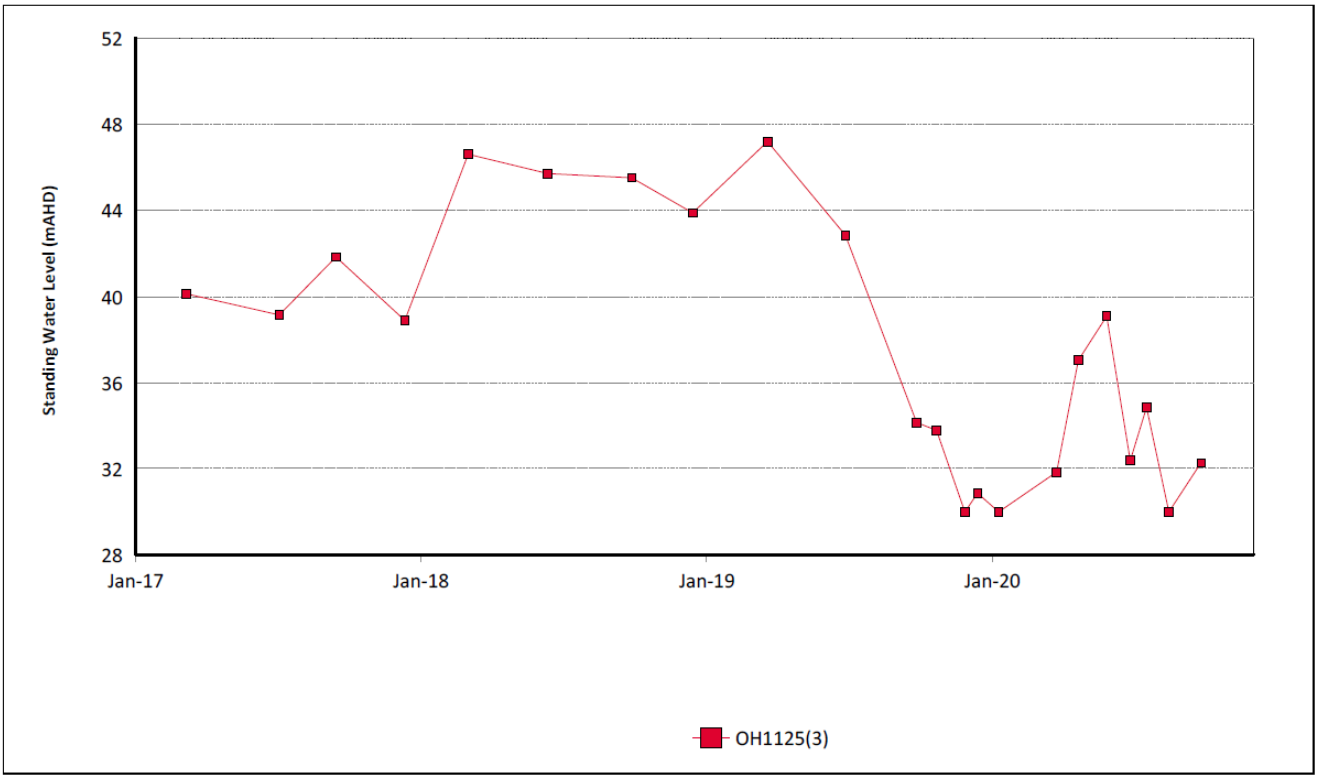


Figure 24: Bowfield Seam Standing Water Level Trend – September 2020

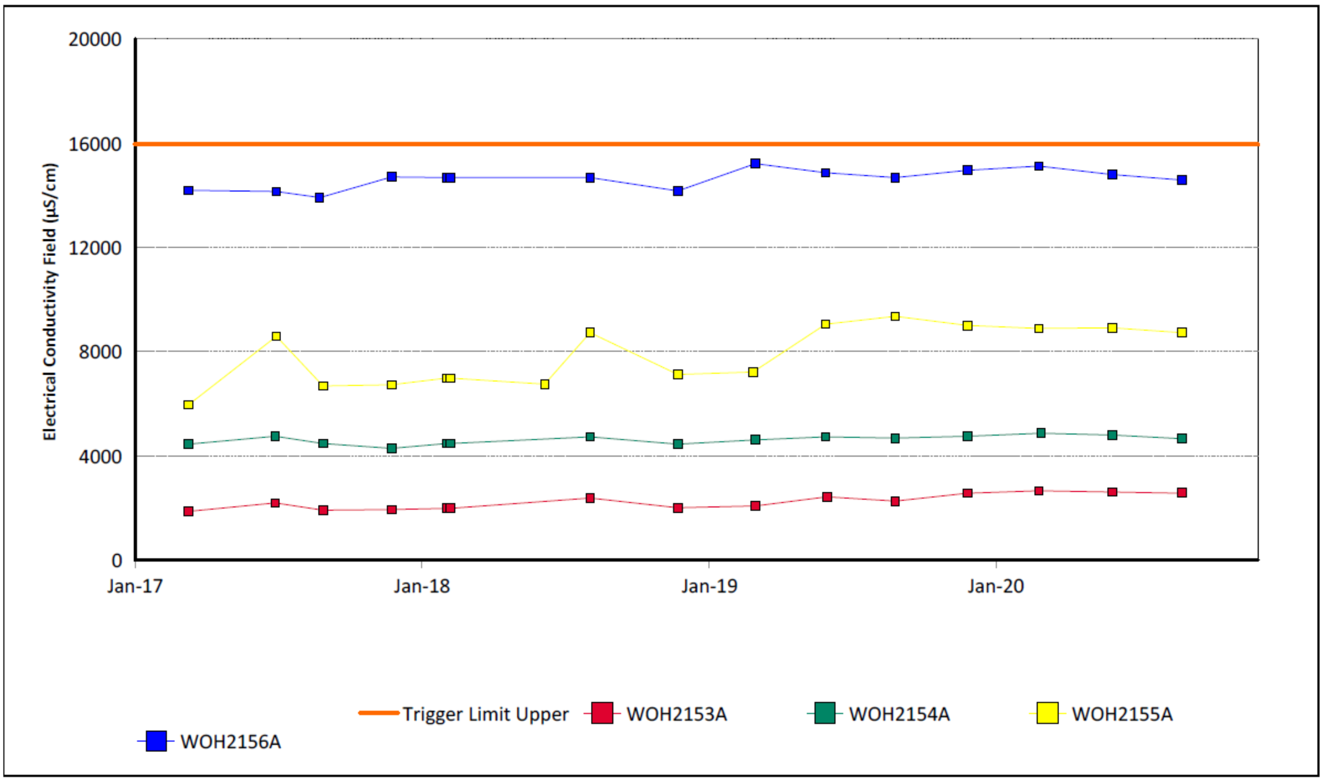


Figure 25: Redbank Seam Electrical Conductivity Trend – September 2020

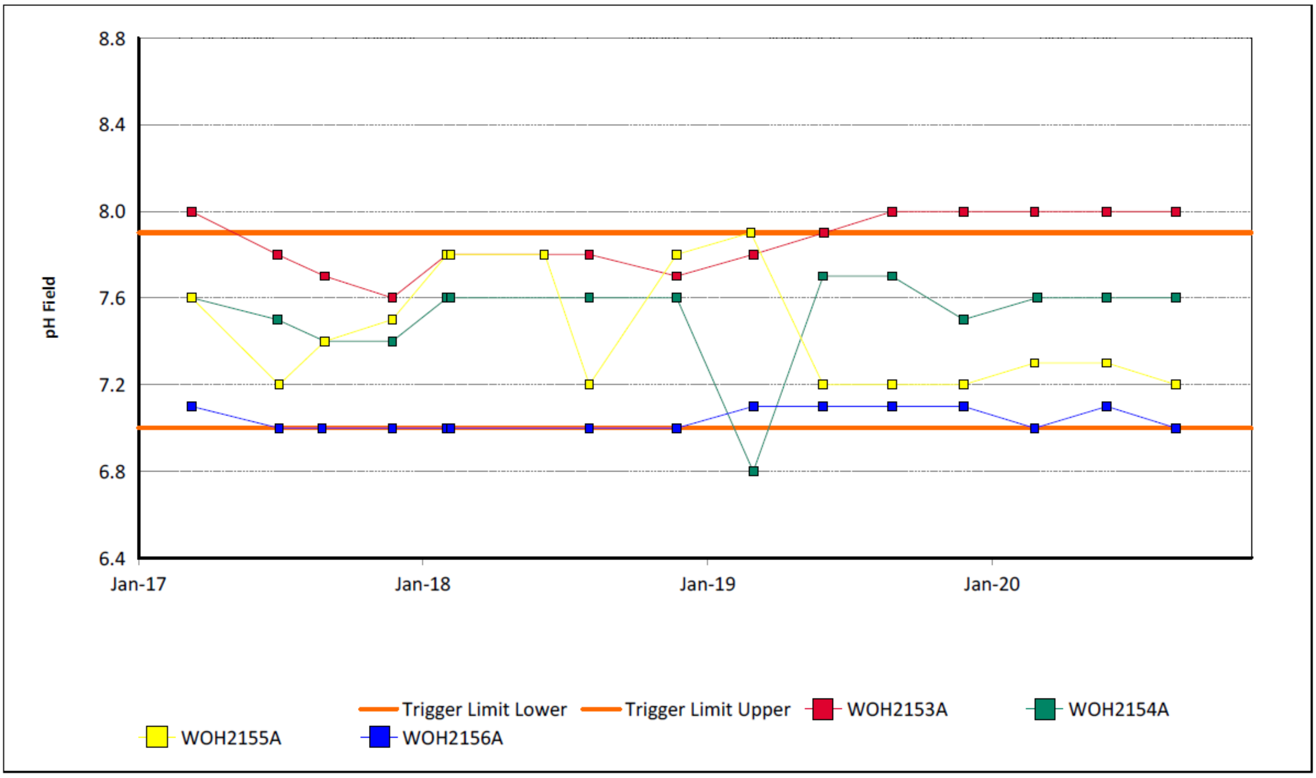


Figure 26: Redbank Seam pH Trend – September 2020

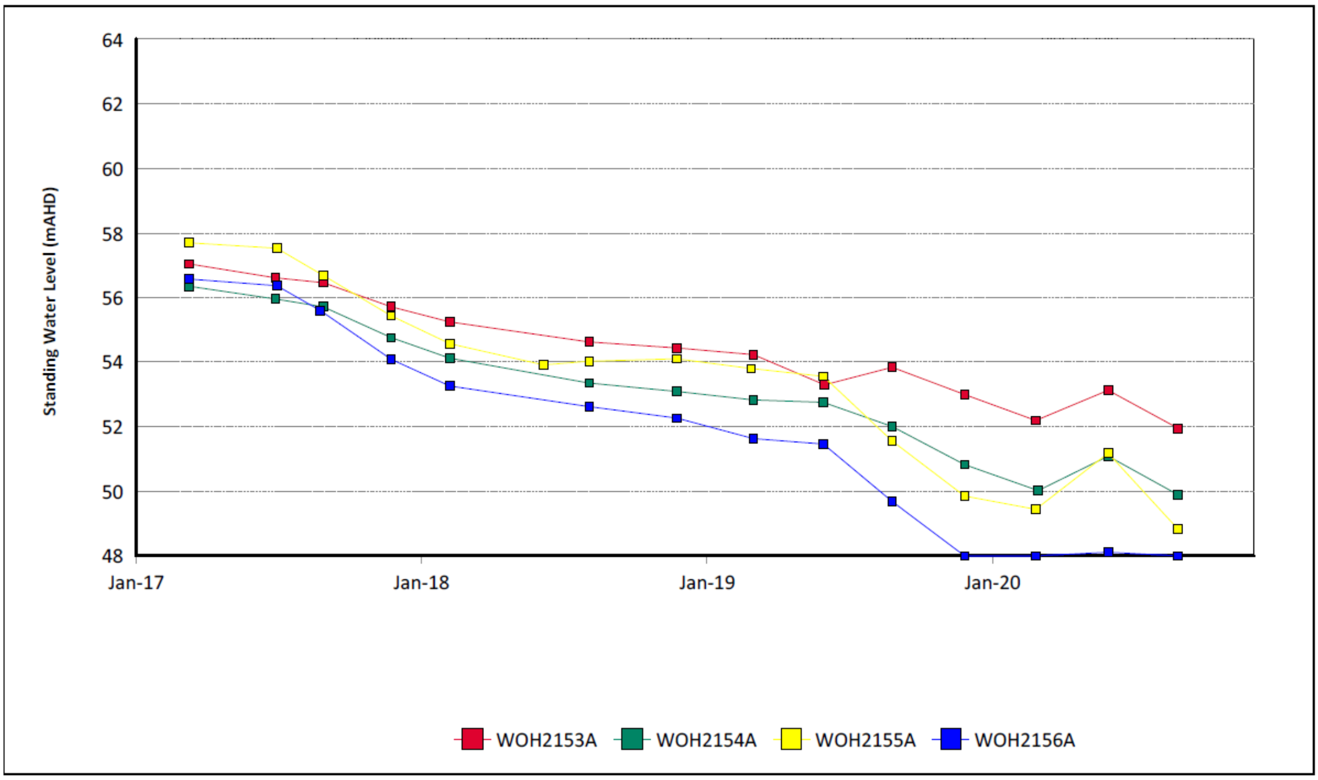


Figure 27: Redbank Seam Standing Water Level Trend – September 2020

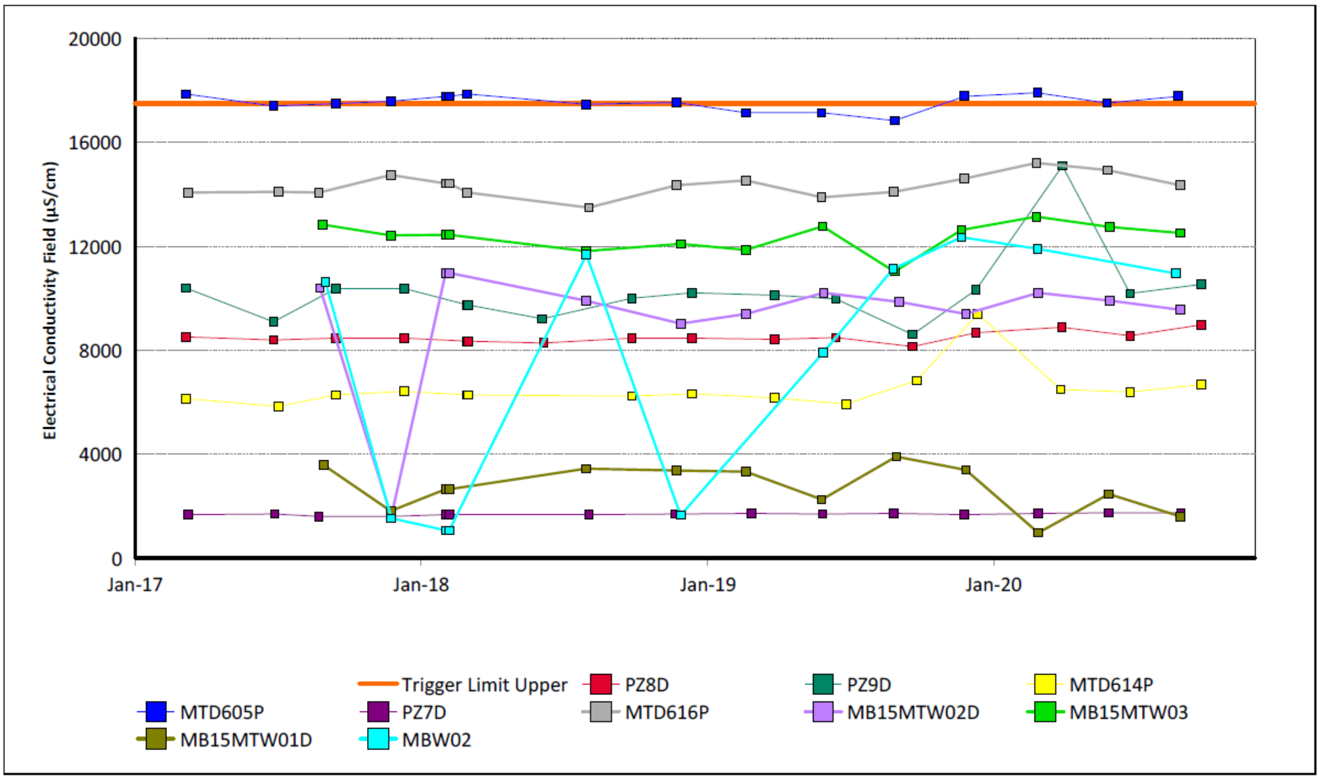


Figure 28: Shallow Overburden Electrical Conductivity Trend – September 2020

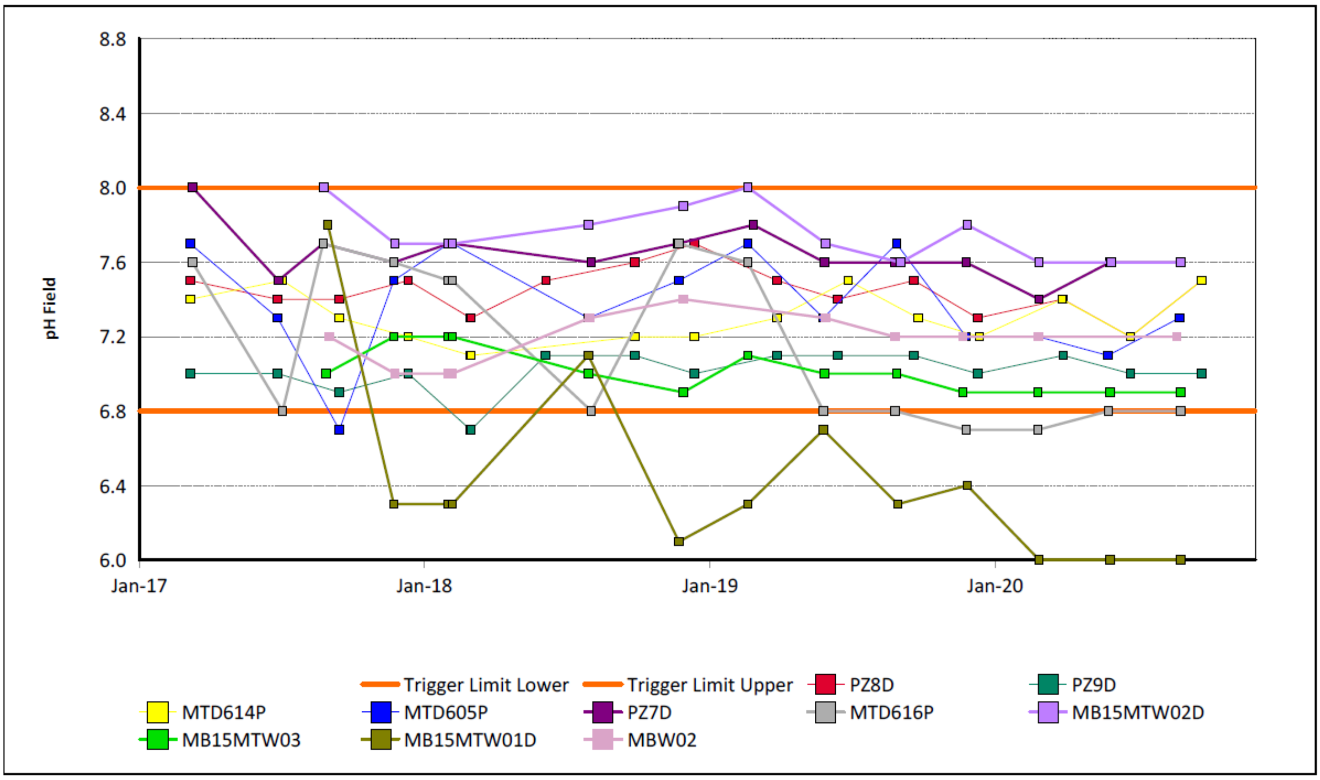


Figure 29: Shallow Overburden pH Trend – September 2020

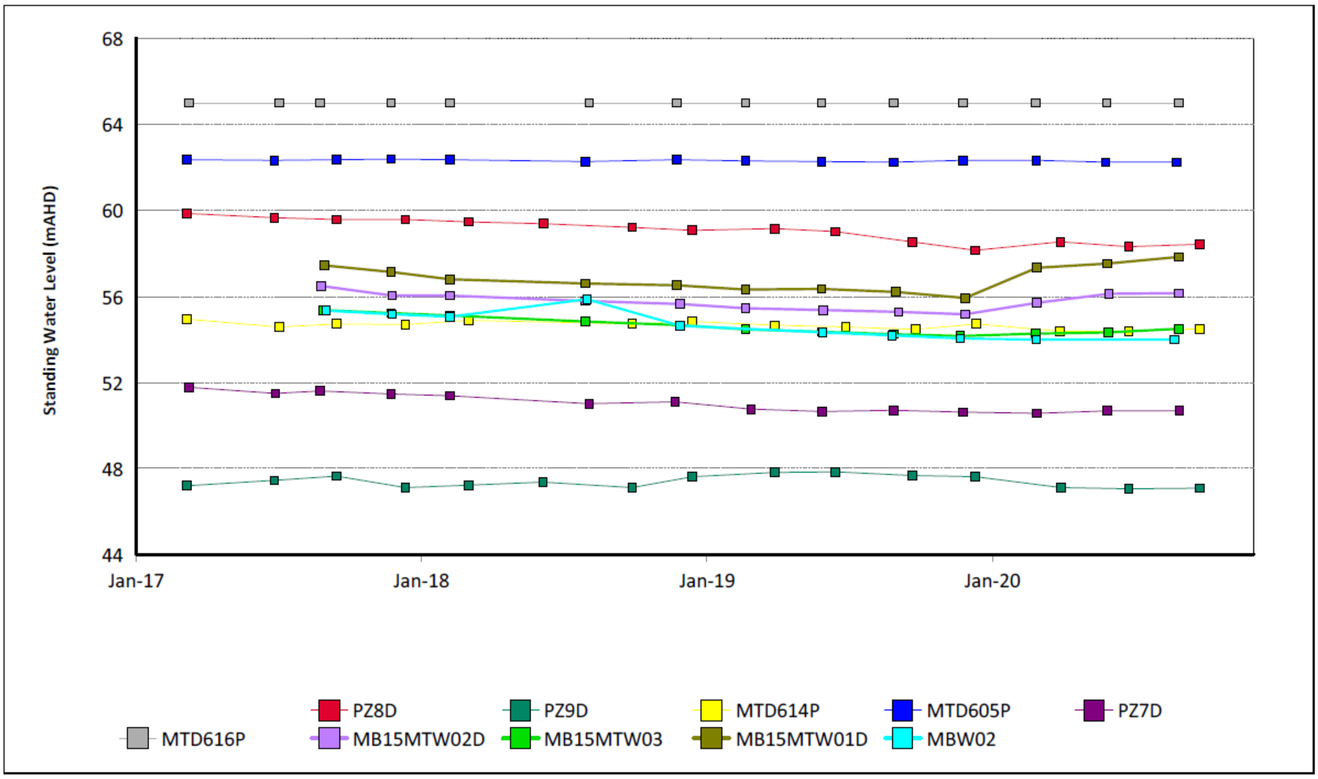
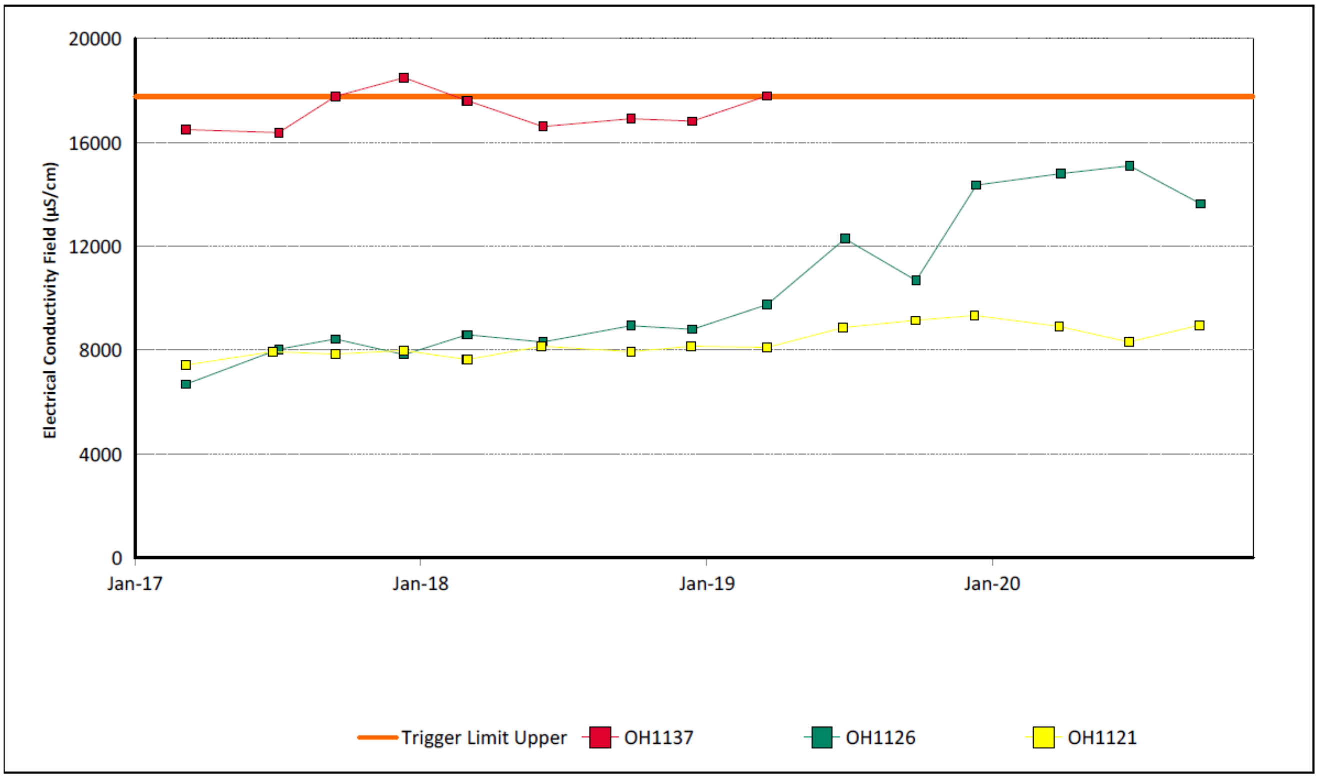
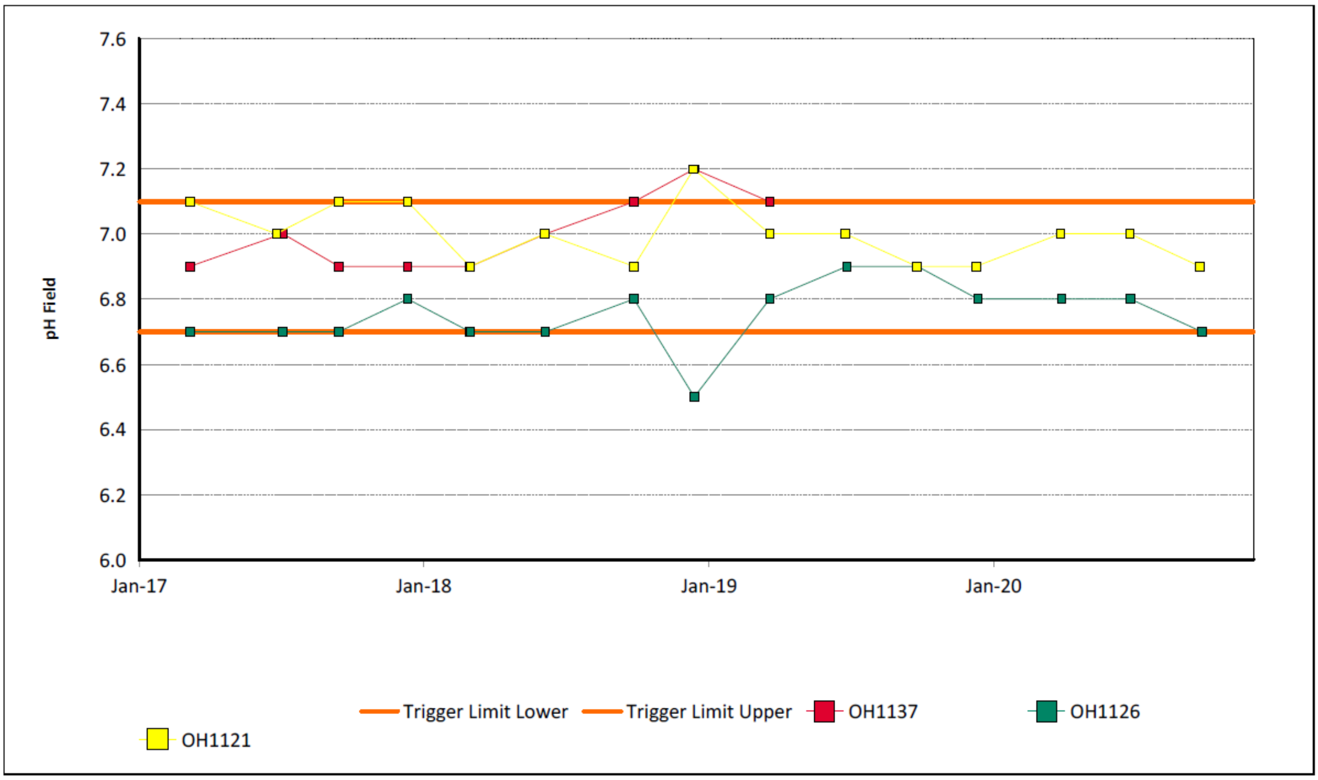


Figure 30: Shallow Overburden Standing Water Level Trend – September 2020



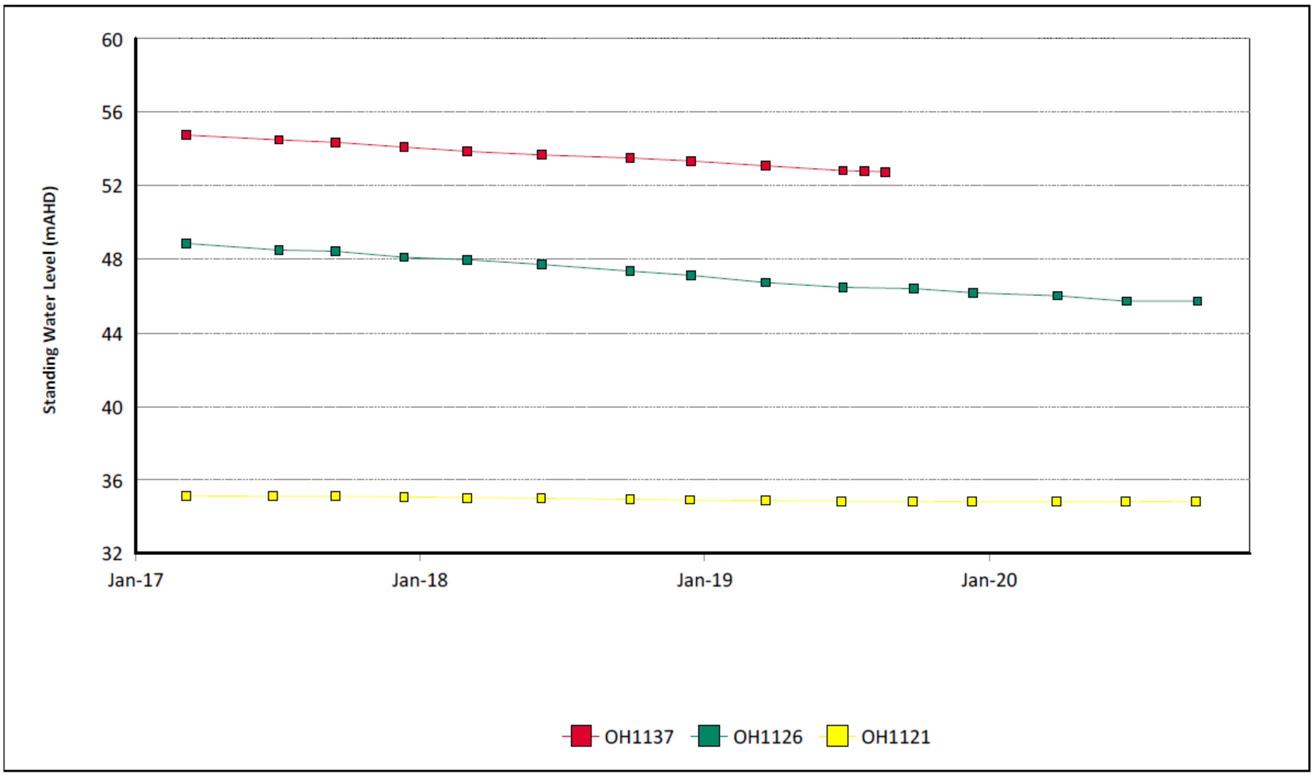
Note: Missing data indicates that there was insufficient water to take a sample.

Figure 31: Vaux Seam Electrical Conductivity Trend – September 2020



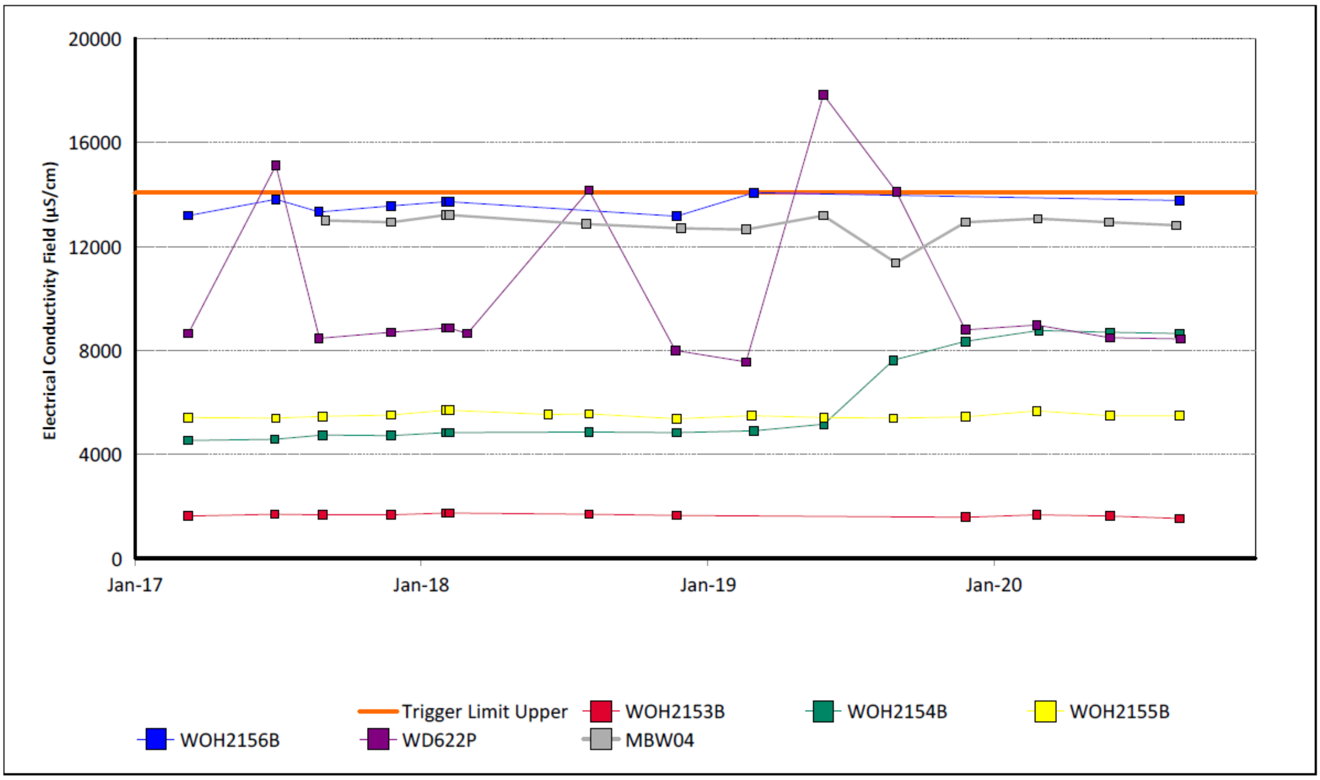
Note: Missing data indicates that there was insufficient water to take a sample.

Figure 32: Vaux Seam pH Trend – September 2020



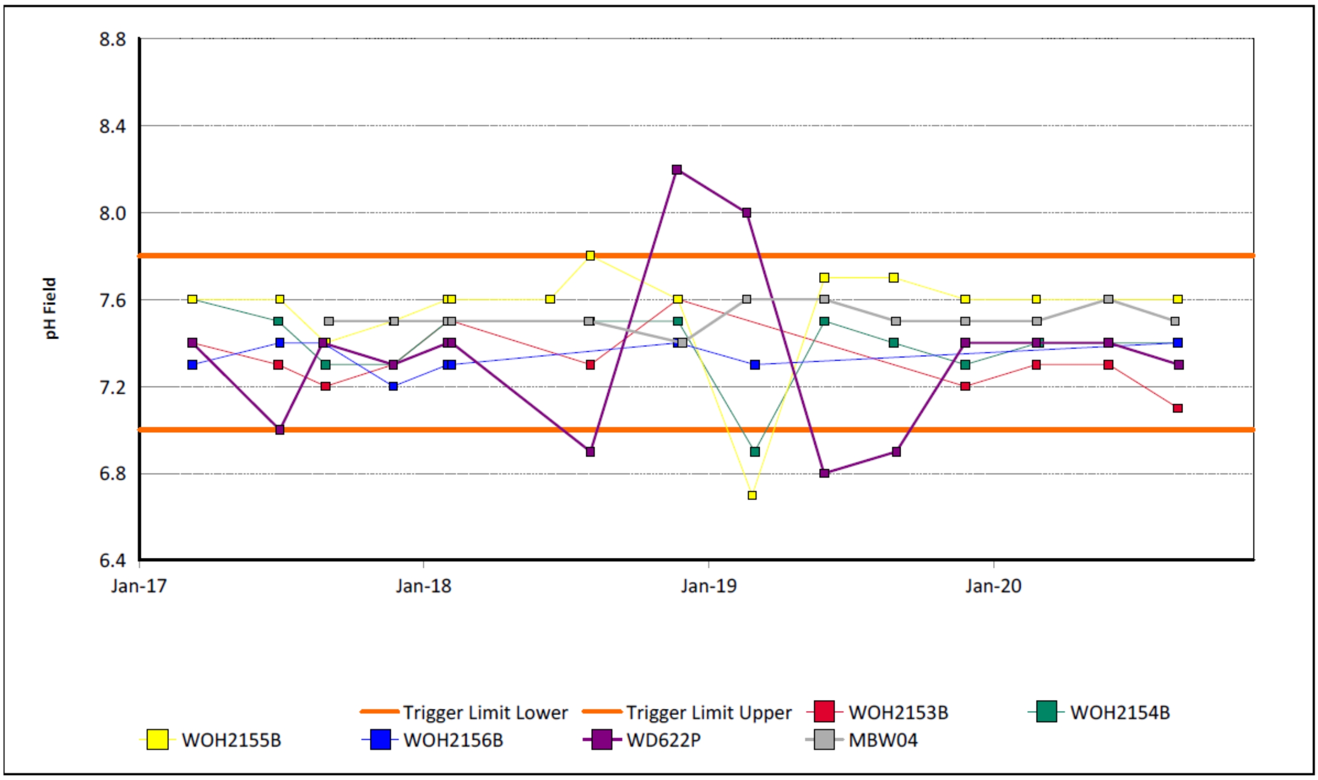
Note: Missing data indicates that there was insufficient water to take a sample.

Figure 33: Vaux Seam Standing Water Level Trend – September 2020



Note: Missing data indicates that there was insufficient water to take a sample.

Figure 34: Wambo Seam Electrical Conductivity Trend – September 2020



Note: Missing data indicates that there was insufficient water to take a sample.

Figure 35: Wambo Seam pH Trend – September 2020

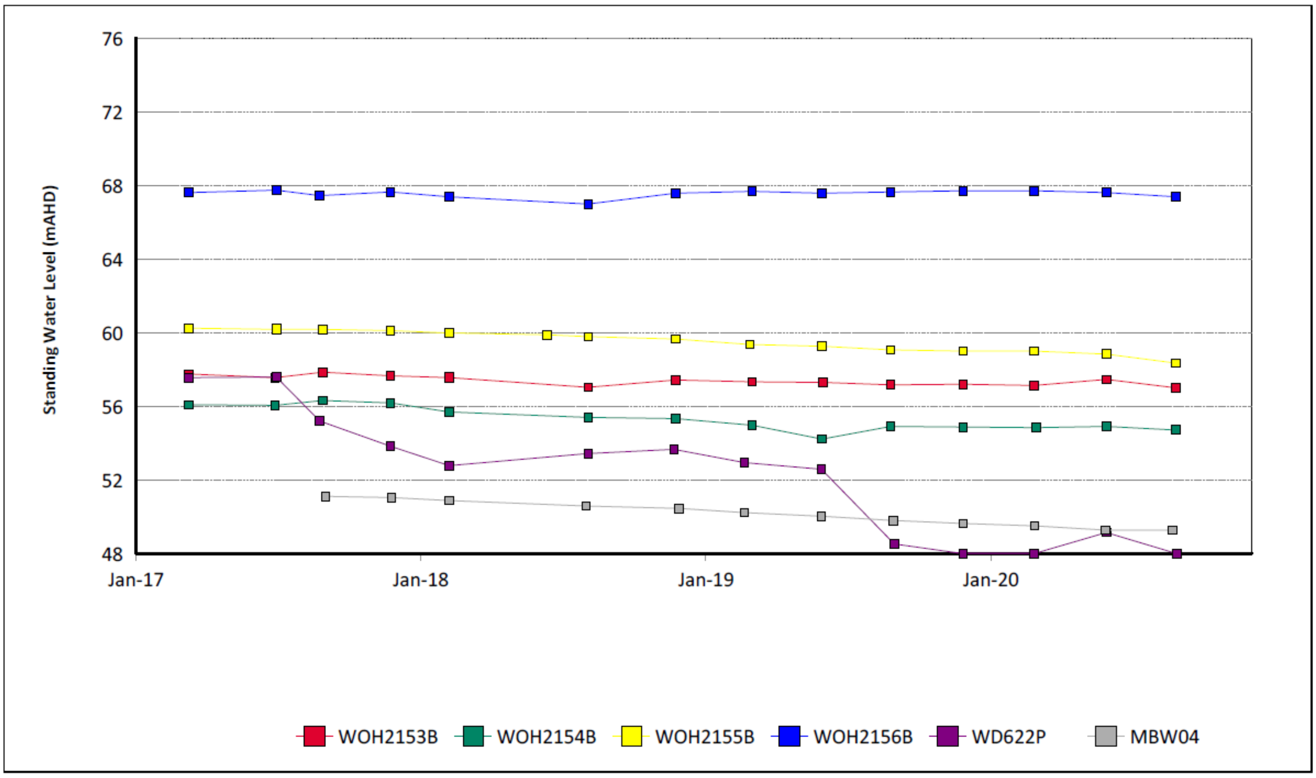


Figure 36: Wambo Seam Standing Water Level Trend – September 2020

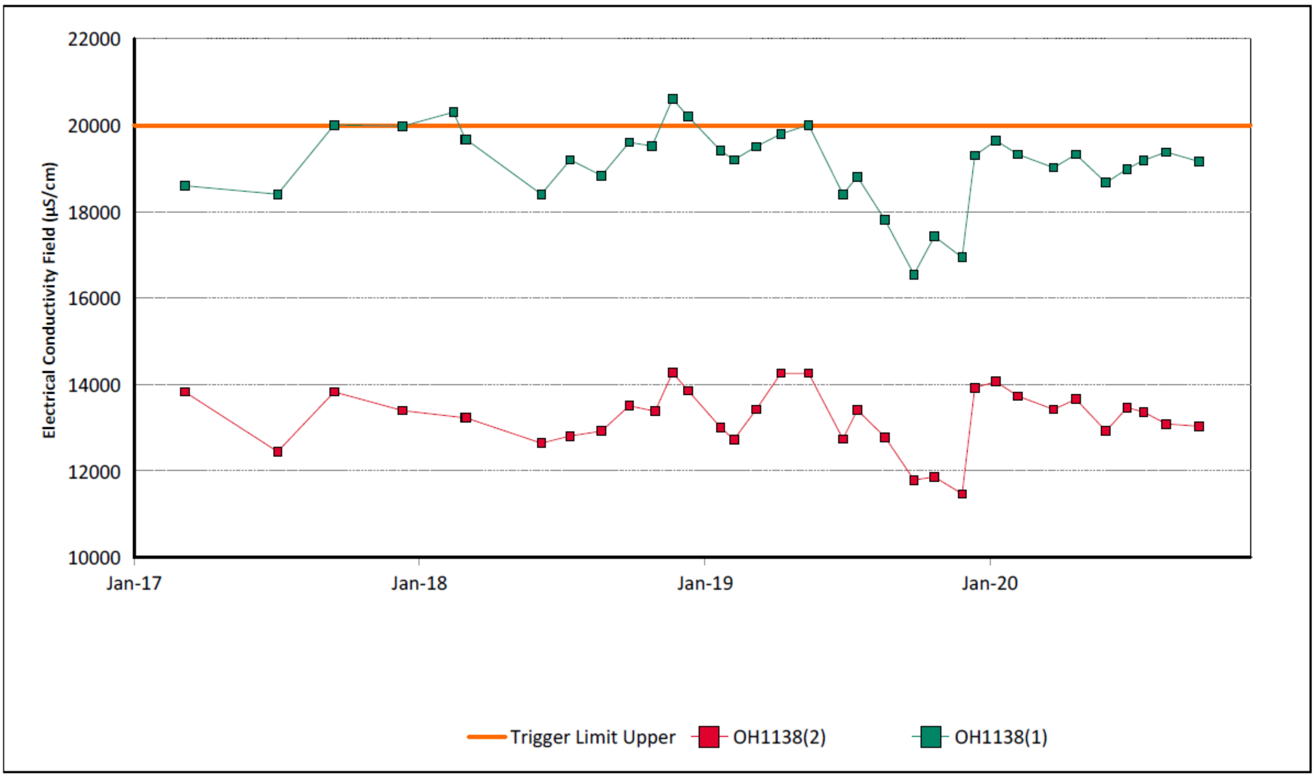


Figure 37: Warkworth Seam Electrical Conductivity Trend – September 2020

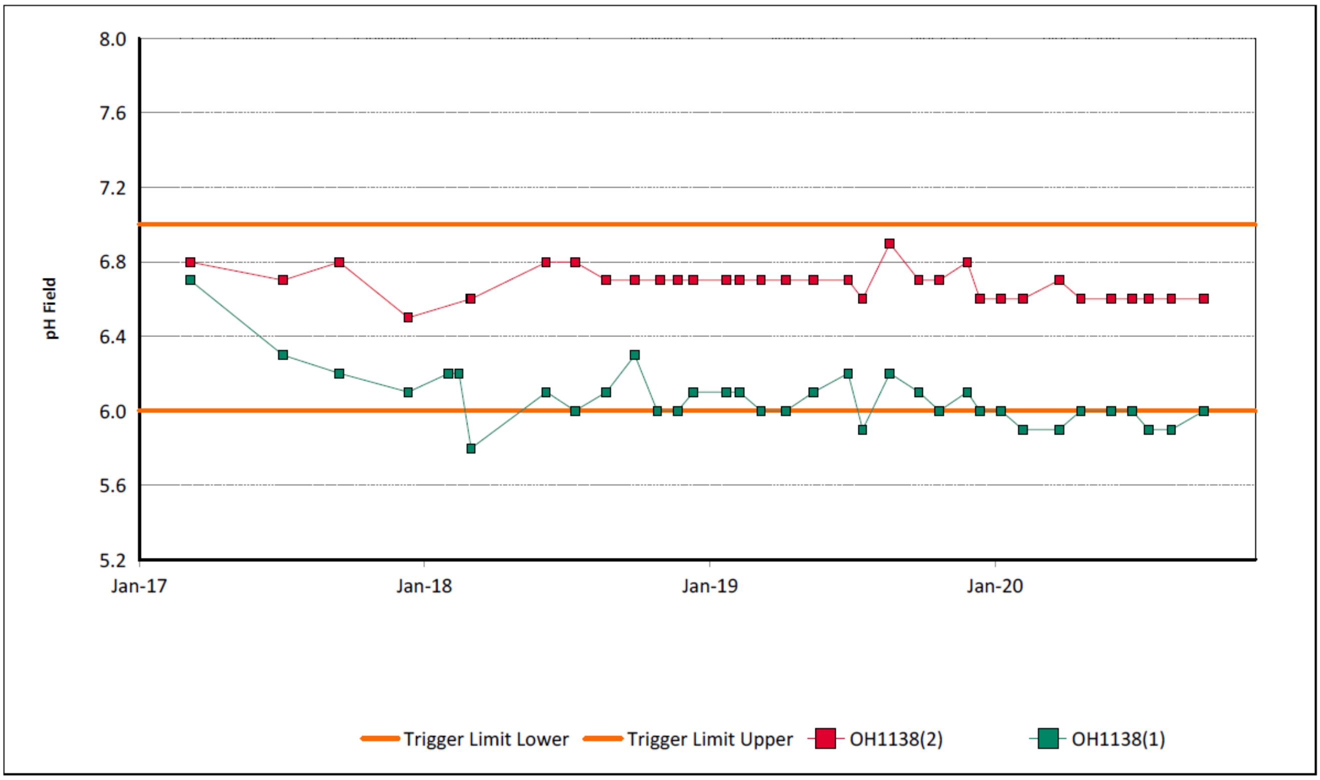


Figure 38: Warkworth Seam pH Trend – September 2020

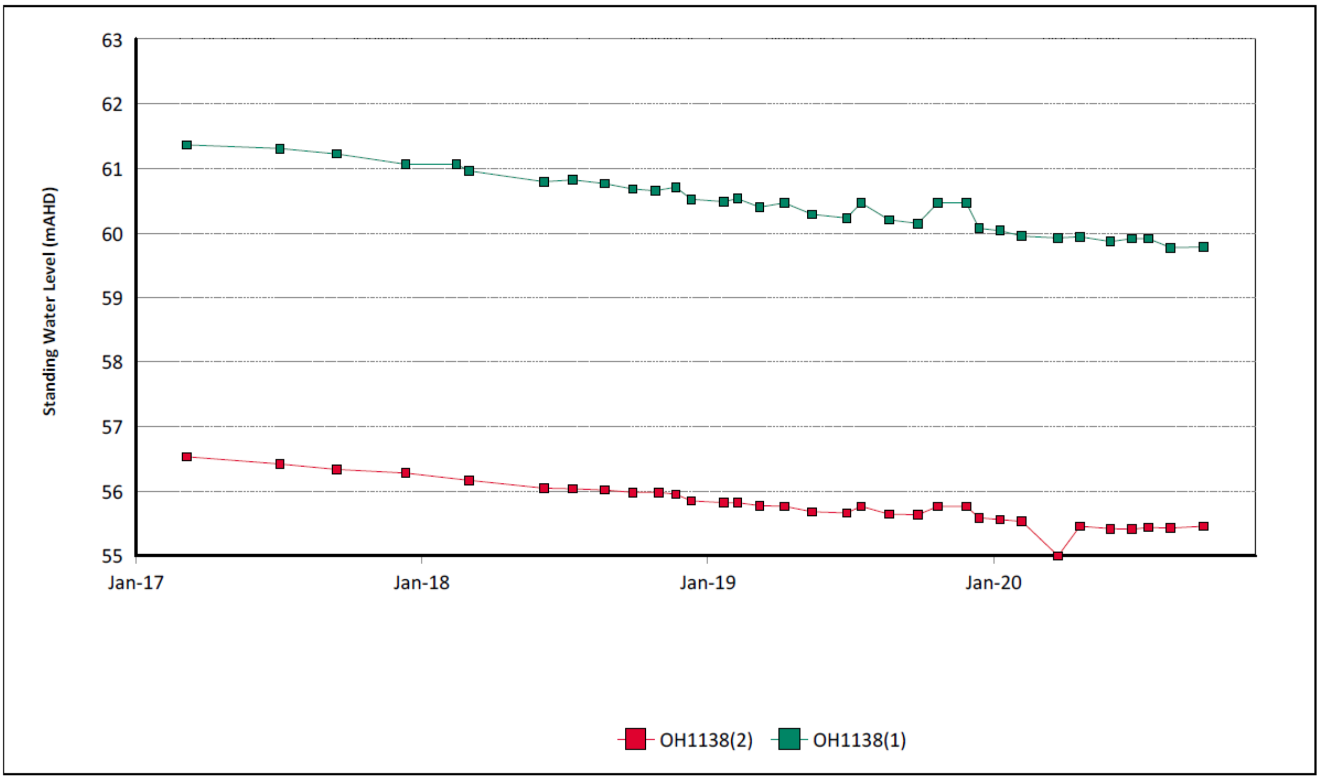


Figure 39: Warkworth Seam Standing Water Level Trend – September 2020

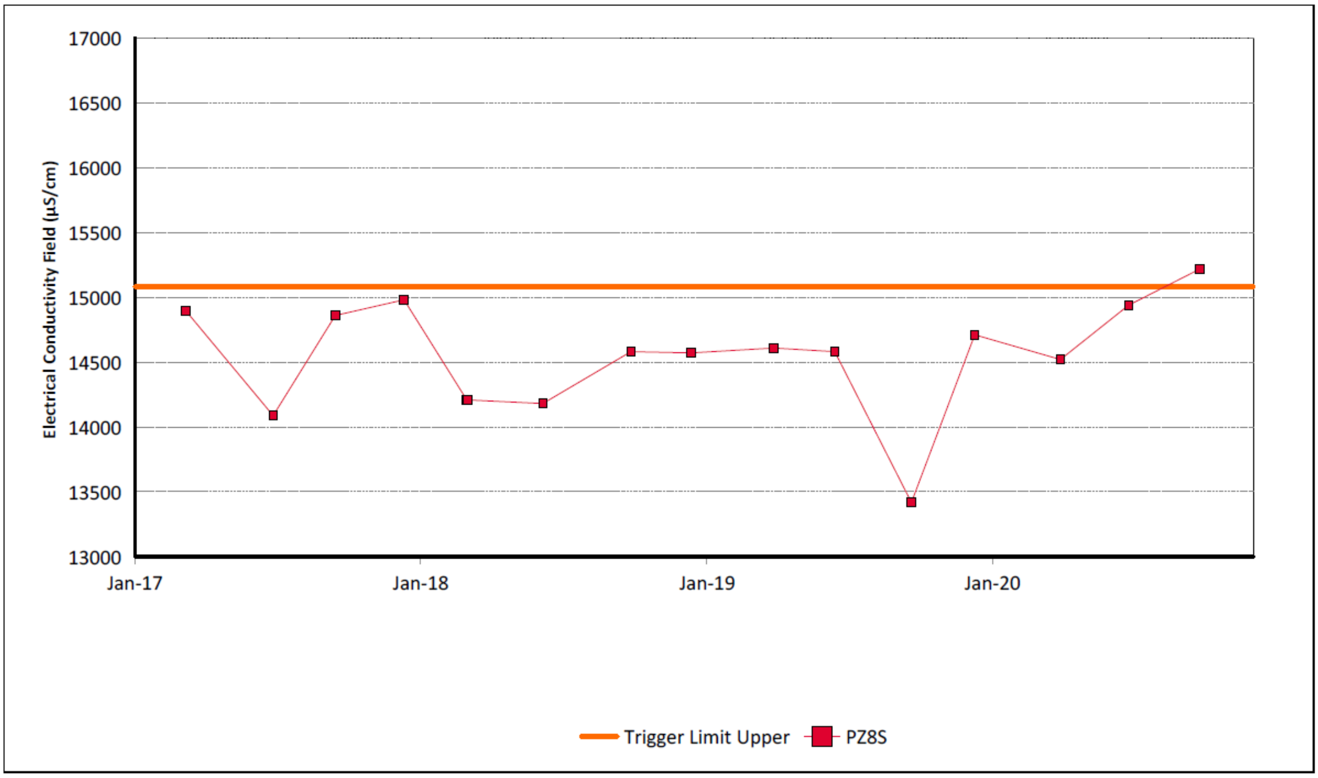


Figure 40: Wollombi Alluvium Electrical Conductivity Trend – September 2020

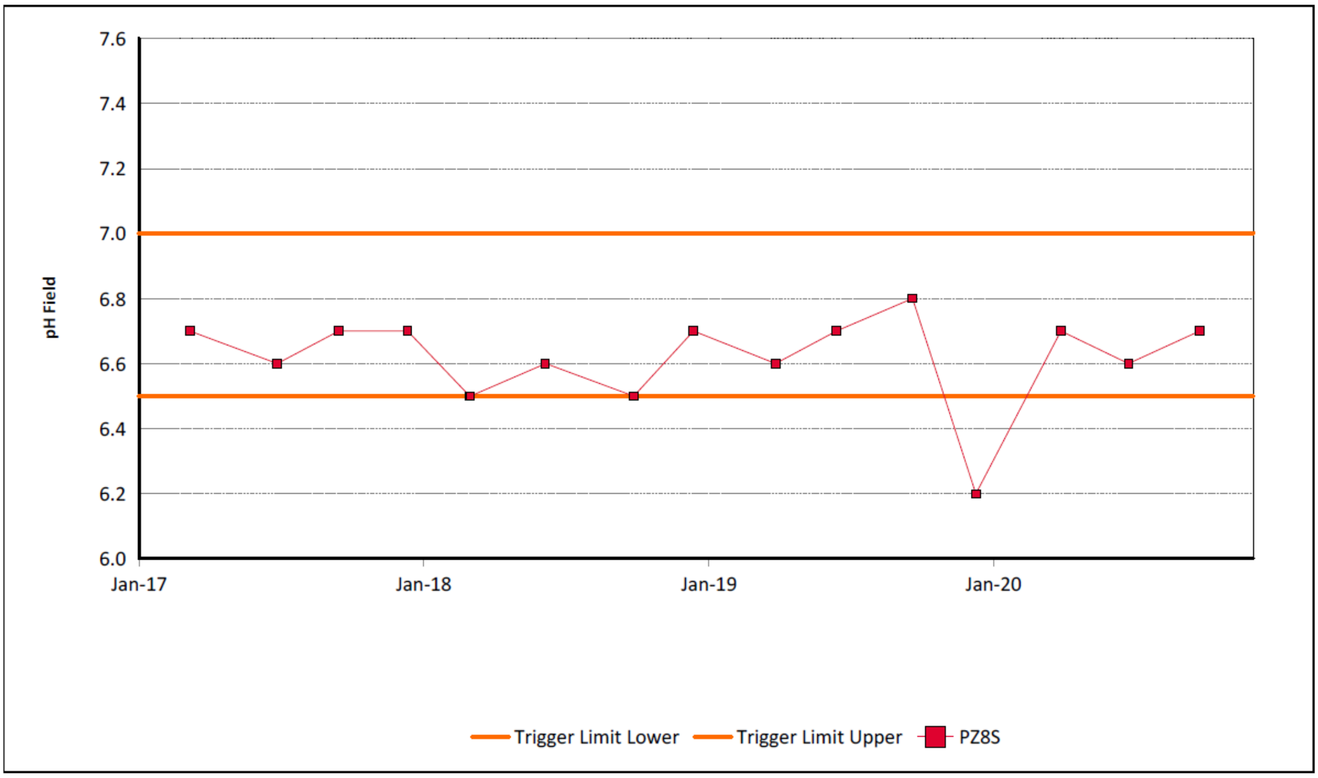
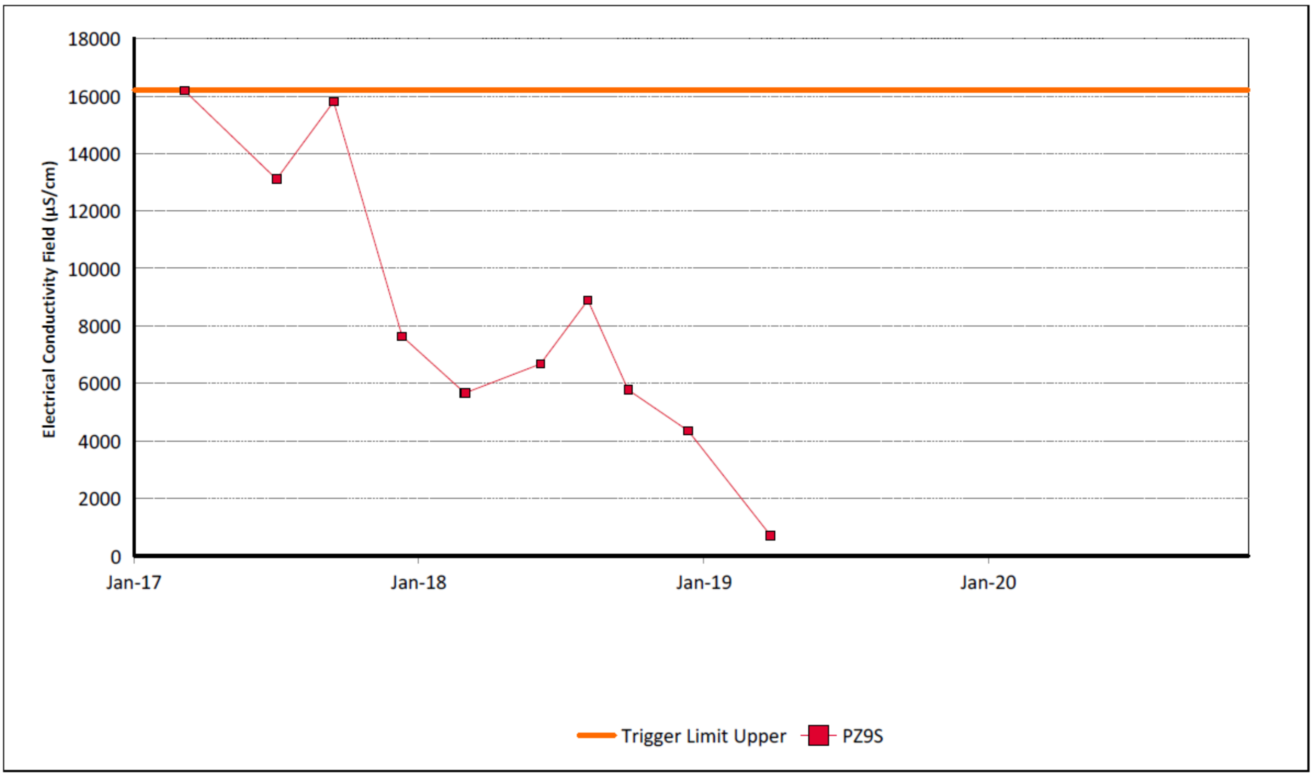
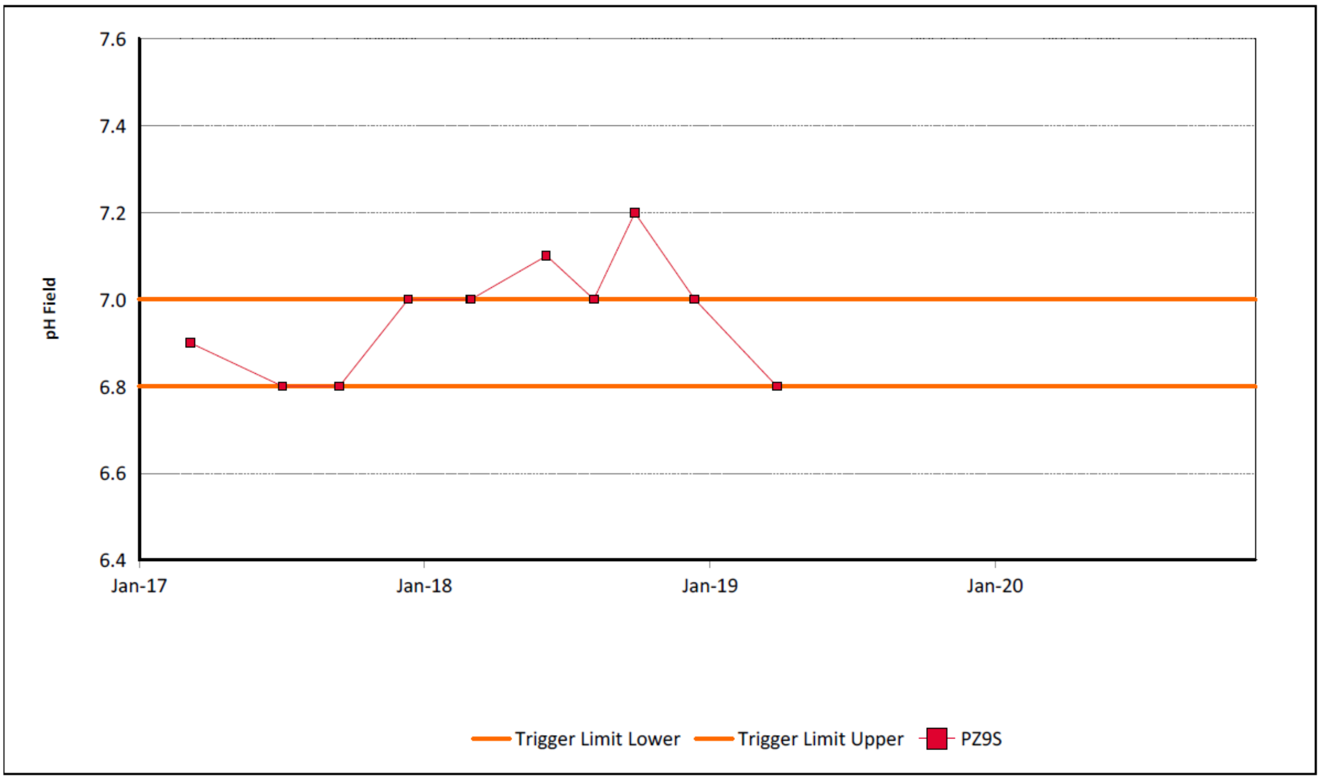


Figure 41: Wollombi Alluvium pH Trend – September 2020



Note: Missing data indicates that there was insufficient water to take a sample.

Figure 42: Wollombi Alluvium 2 Electrical Conductivity Trend – September 2020



Note: Missing data indicates that there was insufficient water to take a sample.

Figure 43: Wollombi Alluvium 2 pH Trend – September 2020

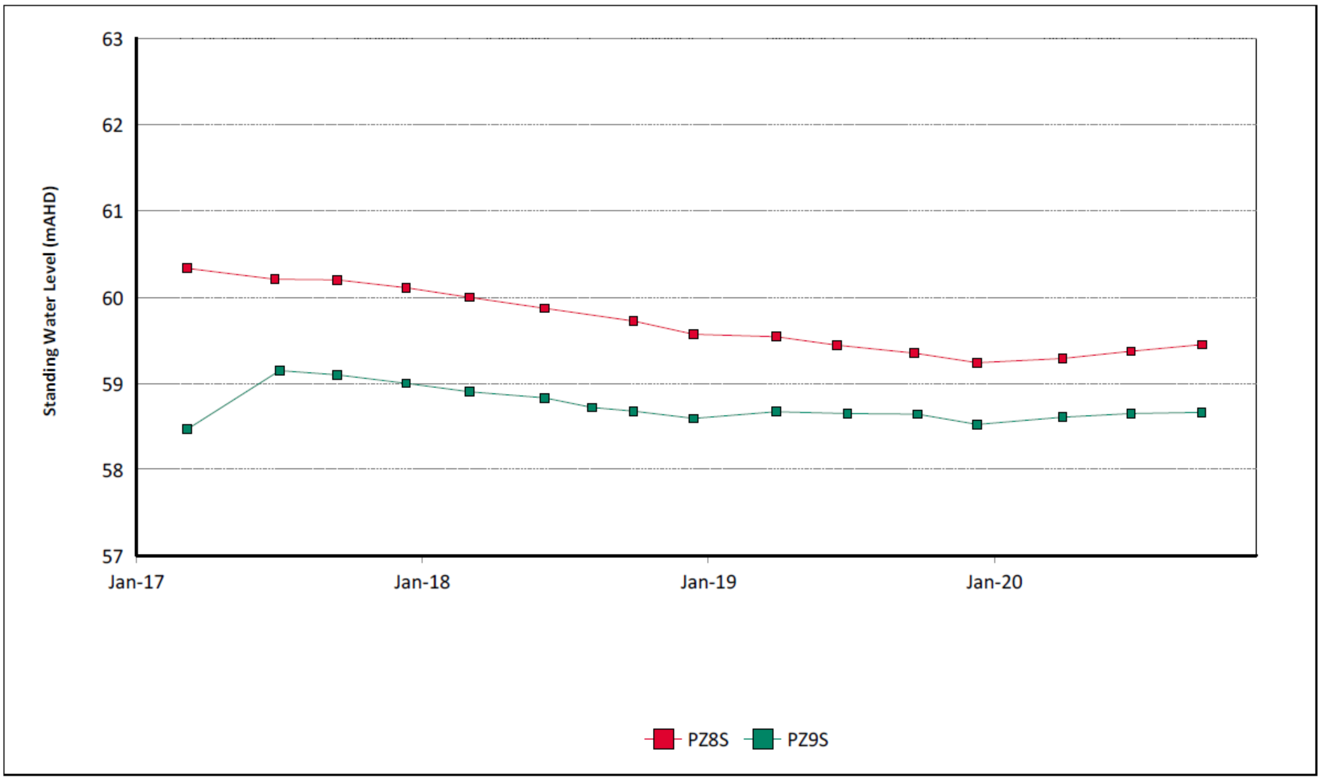


Figure 44: Wollombi Alluvium Standing Water Level Trend – September 2020

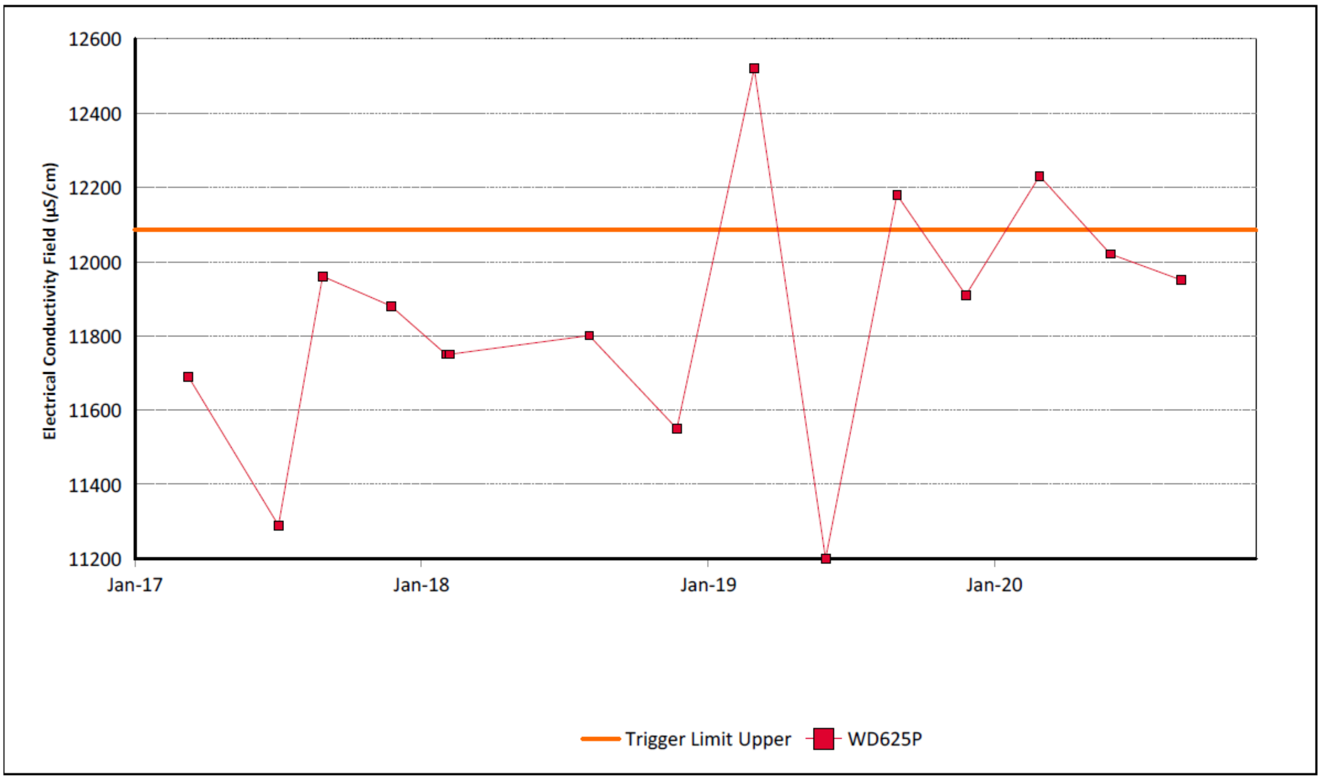


Figure 45: Woodlands Hill Seam Electrical Conductivity Trend - September 2020

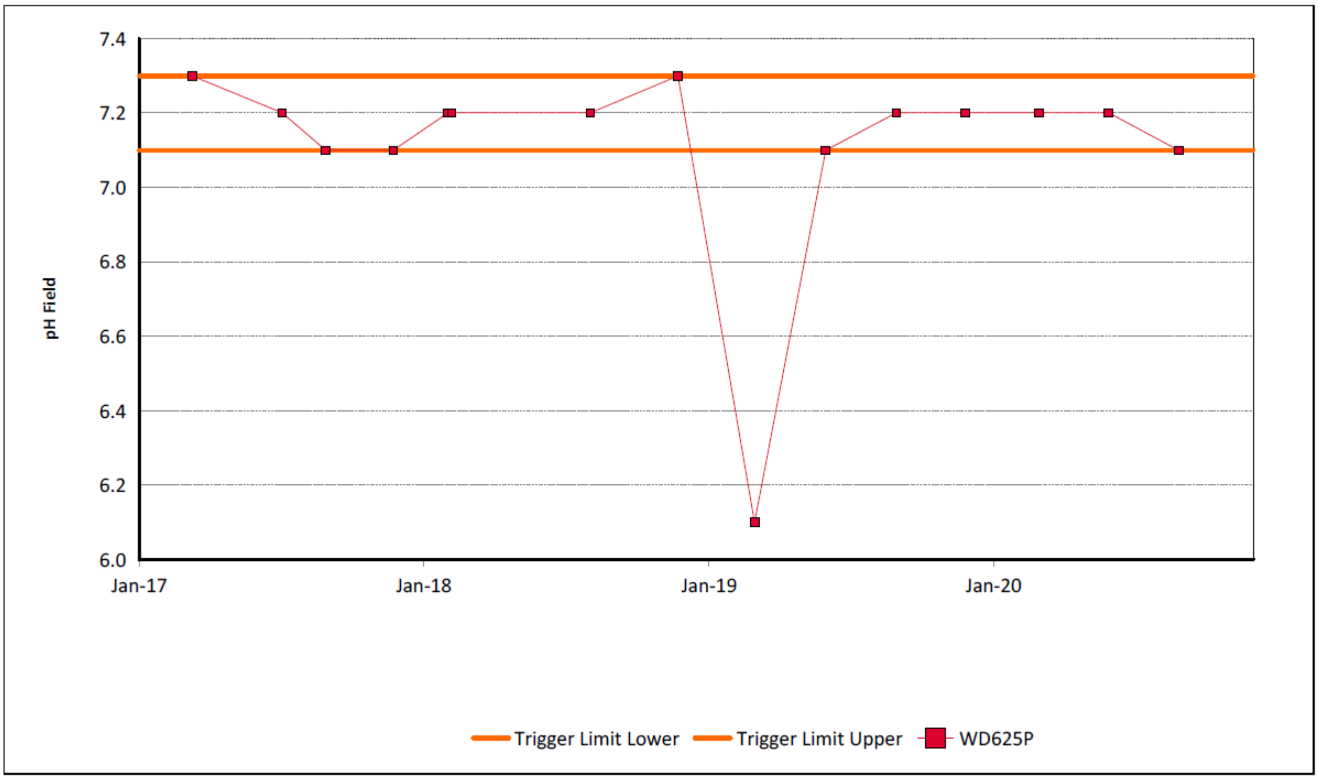


Figure 46: Woodlands Hill Seam pH Trend - September 2020

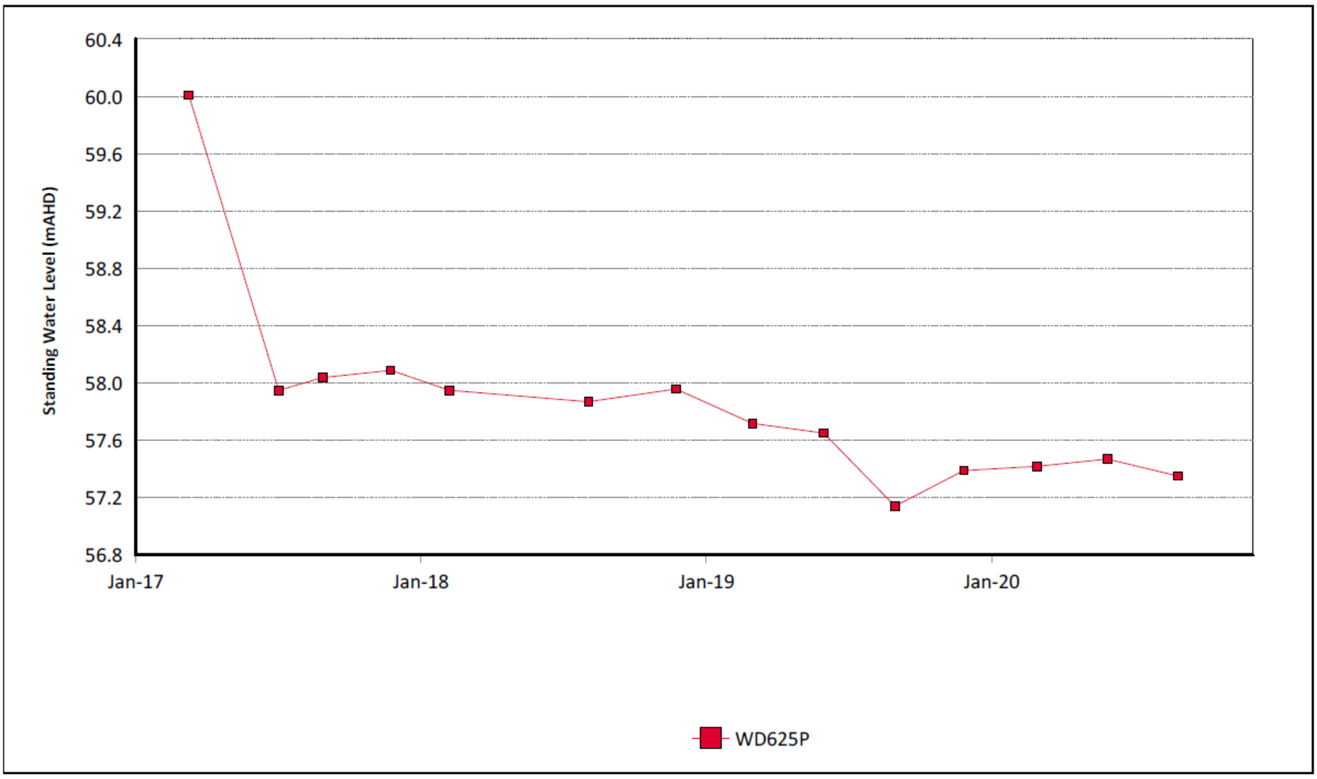


Figure 47: Woodlands Hill Seam Standing Water Level Trend - September 2020

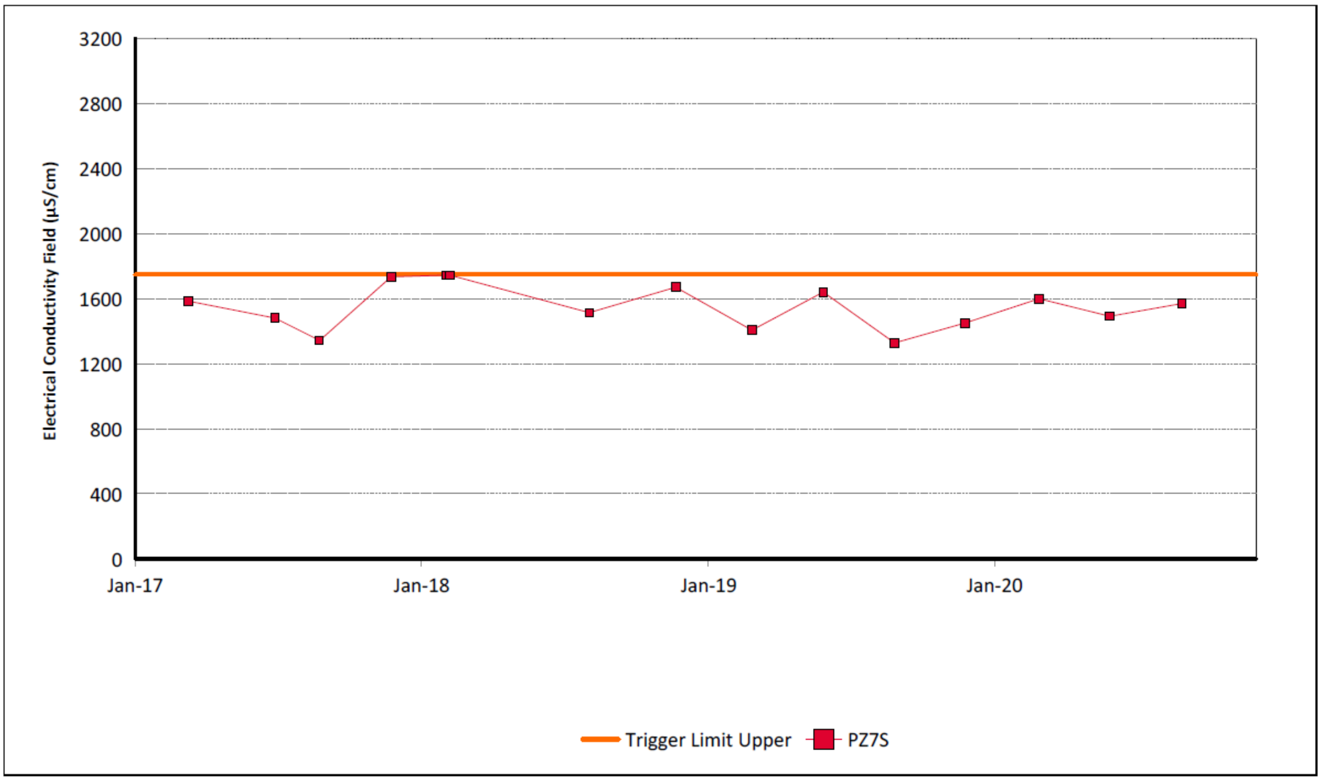


Figure 48: Aeolian Warkworth Sands Electrical Conductivity Trend – September 2020

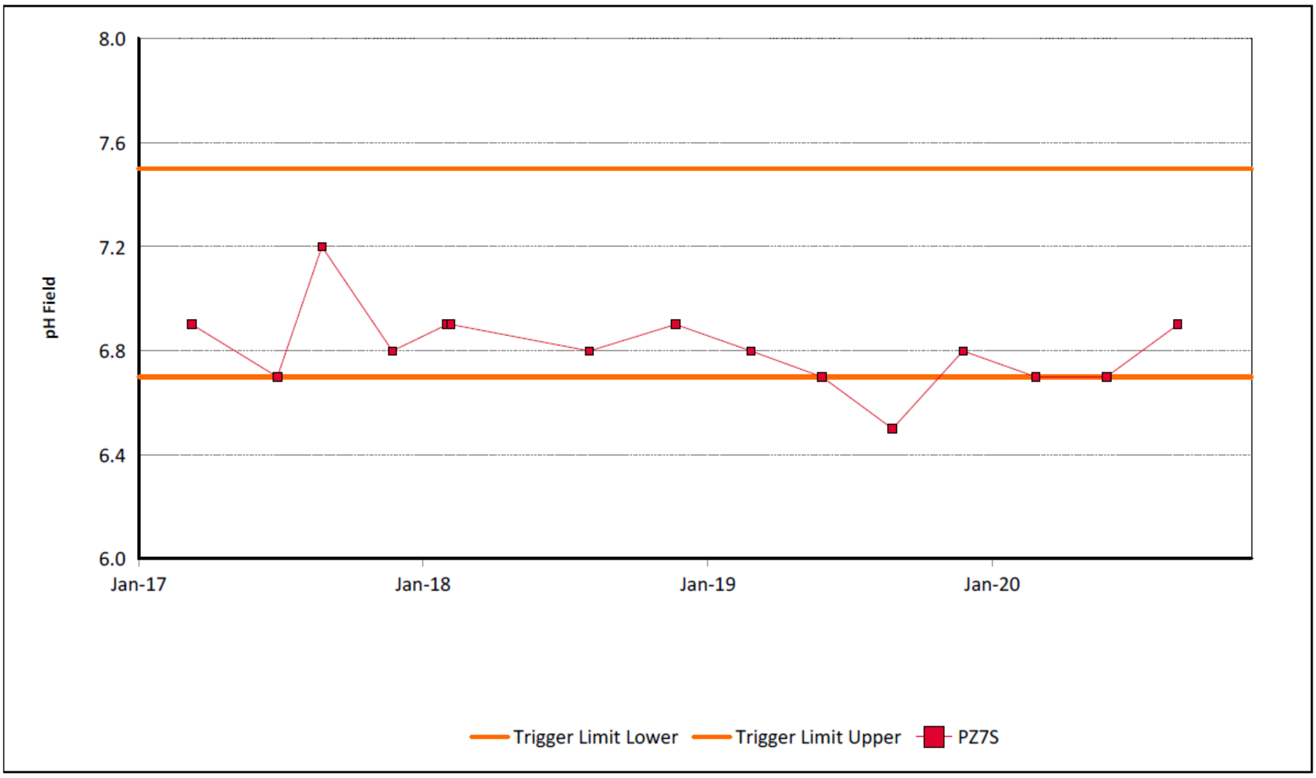


Figure 49: Aeolian Warkworth Sands pH Trend – September 2020

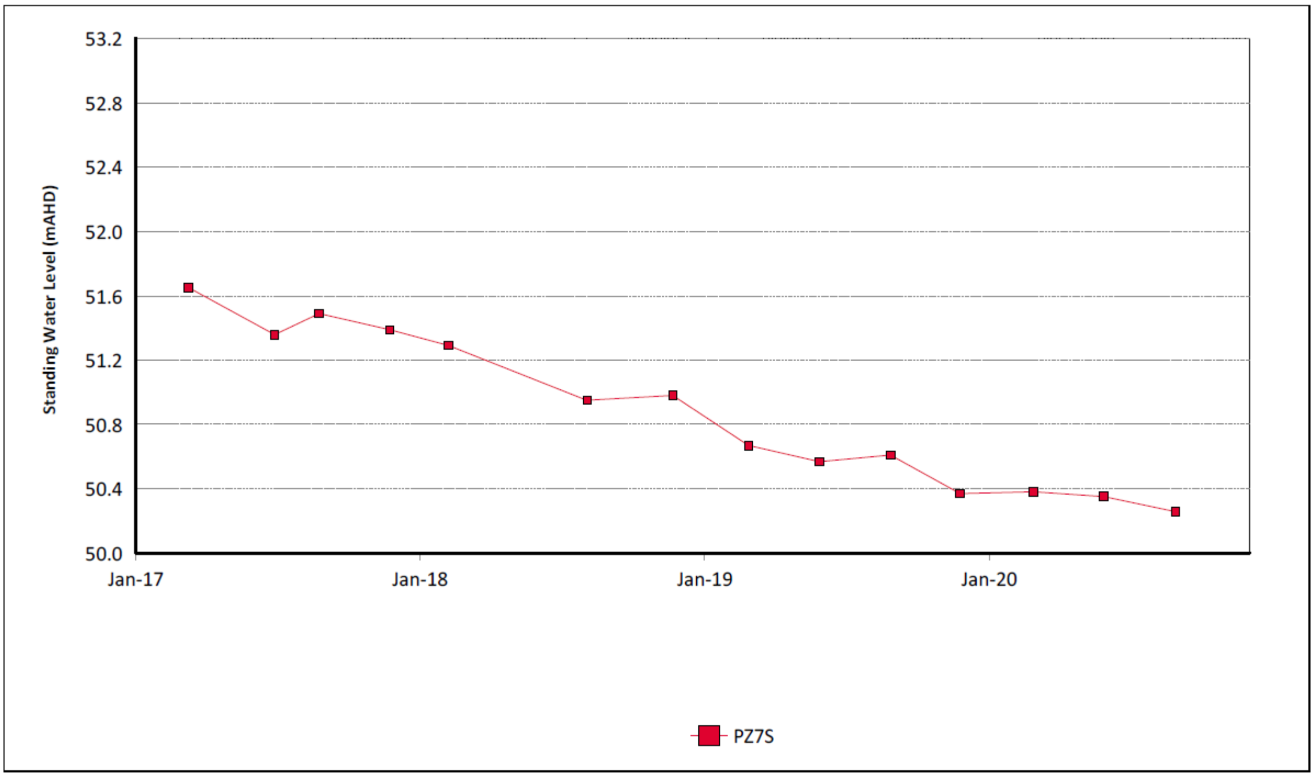


Figure 50: Aeolian Warkworth Sands Standing Water Level Trend – September 2020

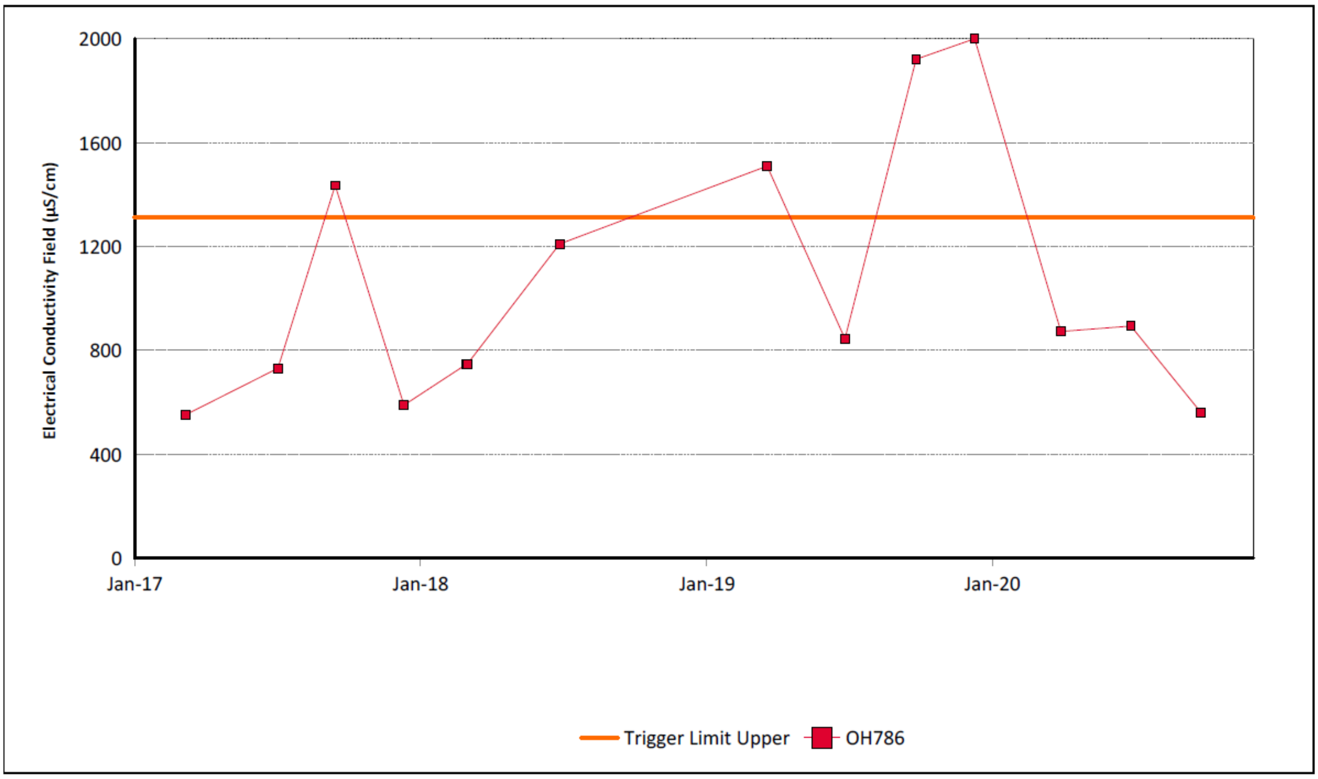


Figure 51: Hunter River Alluvium 1 Electrical Conductivity Trend – September 2020

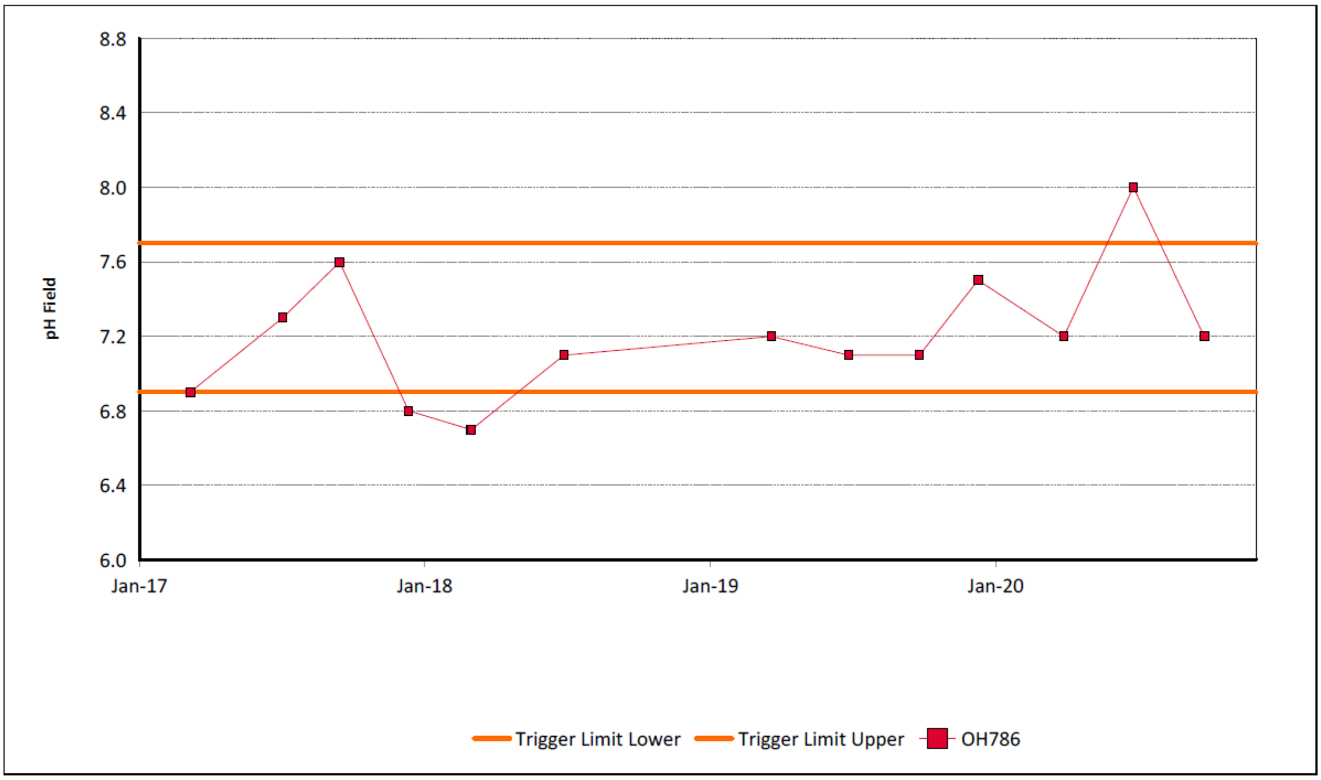


Figure 52: Hunter River Alluvium 1 pH Trend – September 2020

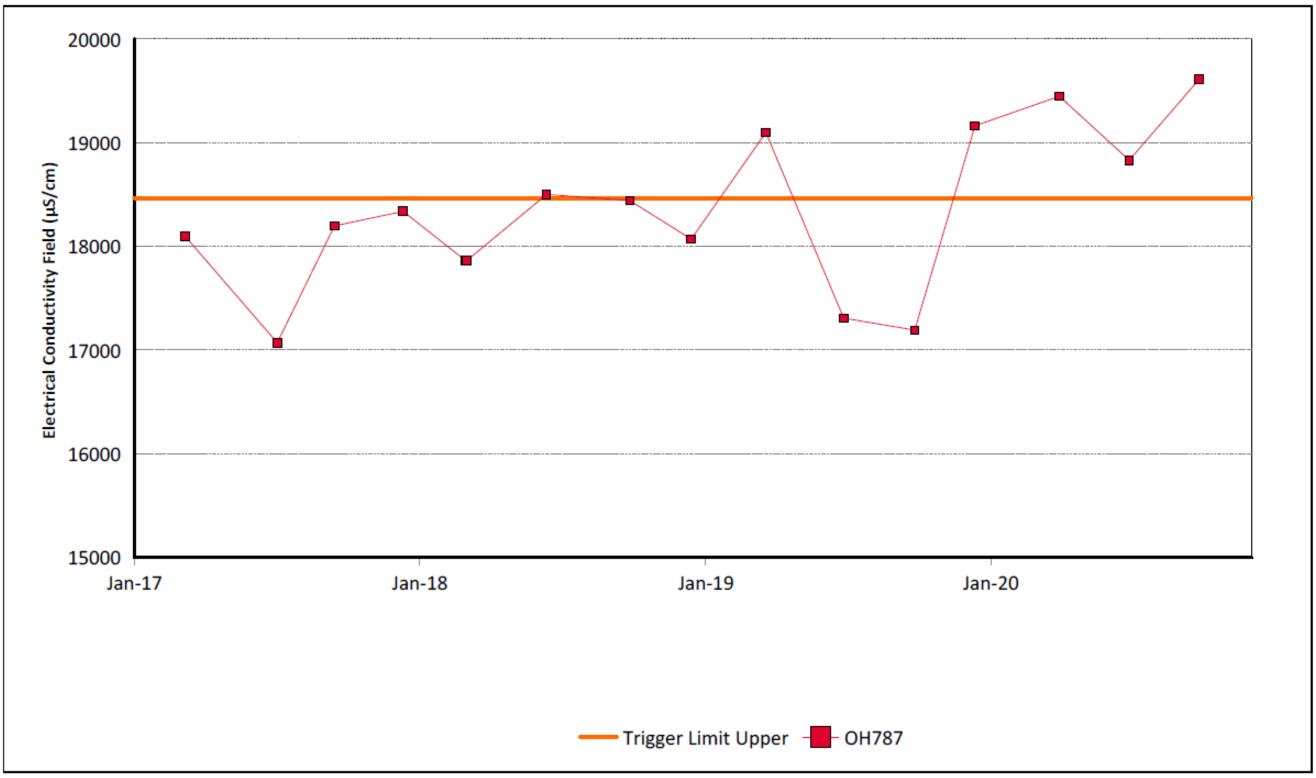


Figure 53: Hunter River Alluvium 2 Electrical Conductivity Trend – September 2020

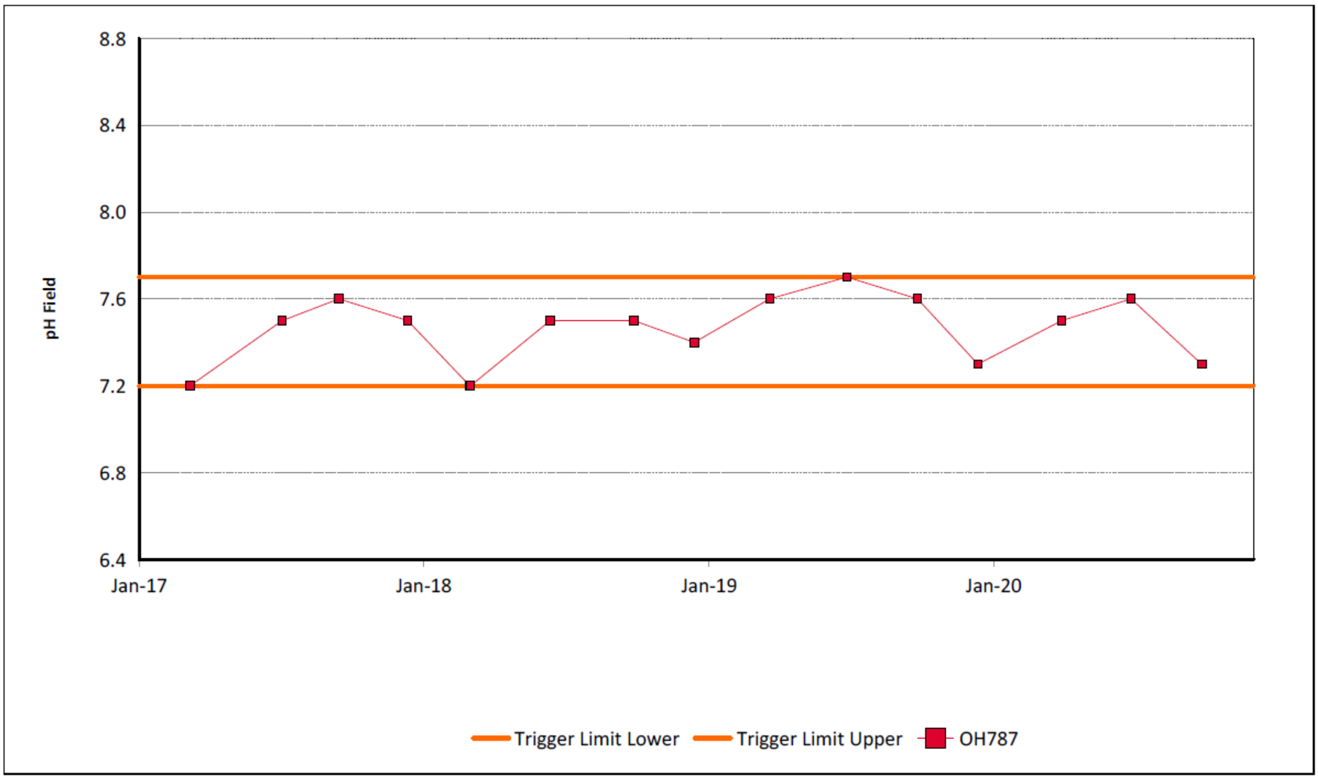


Figure 54: Hunter River Alluvium 2 pH Trend – September 2020

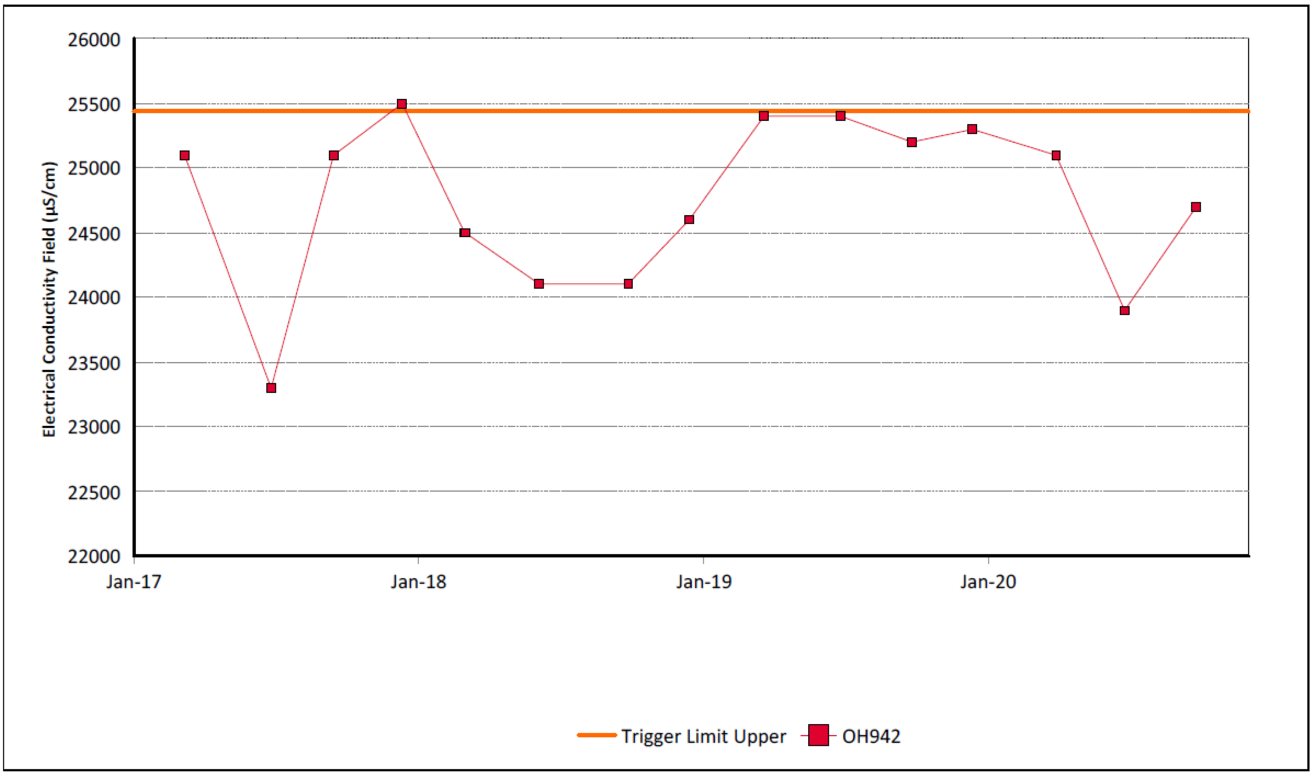


Figure 55: Hunter River Alluvium 3 Electrical Conductivity Trend – September 2020

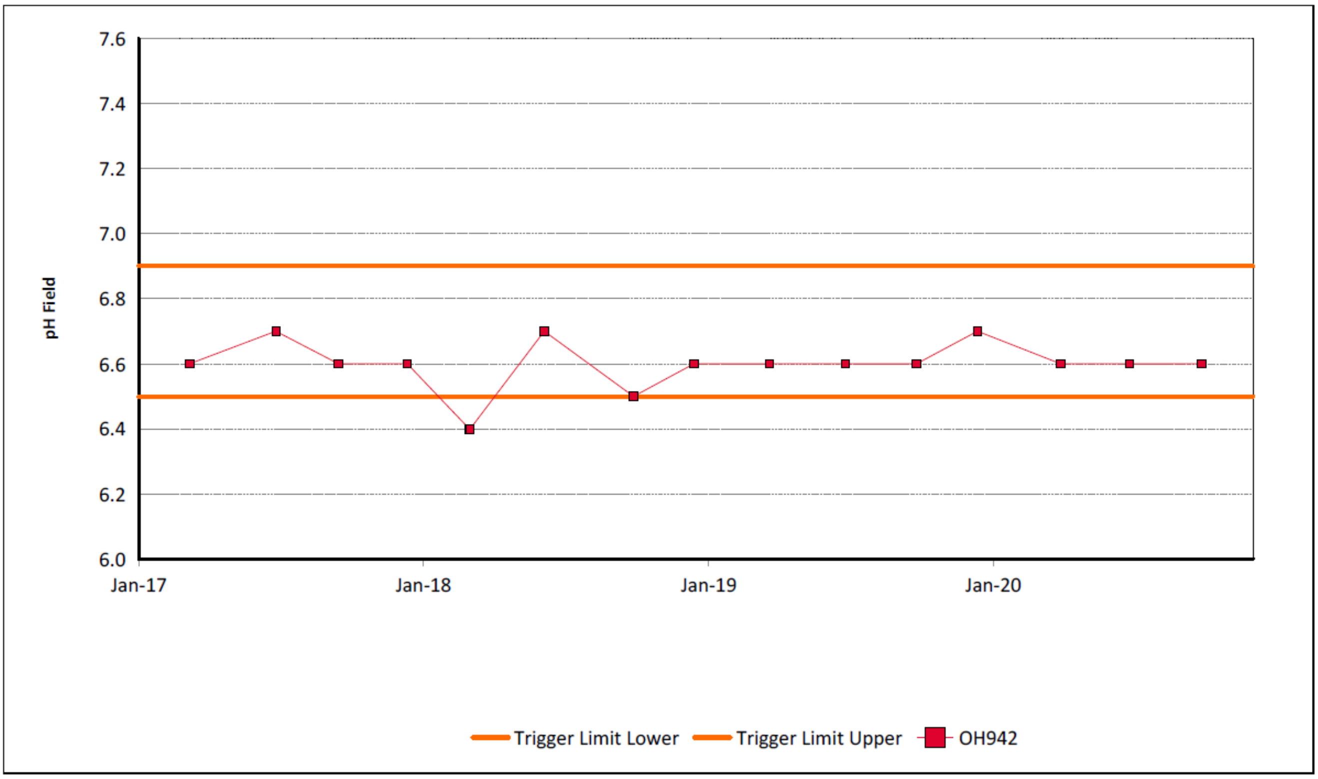
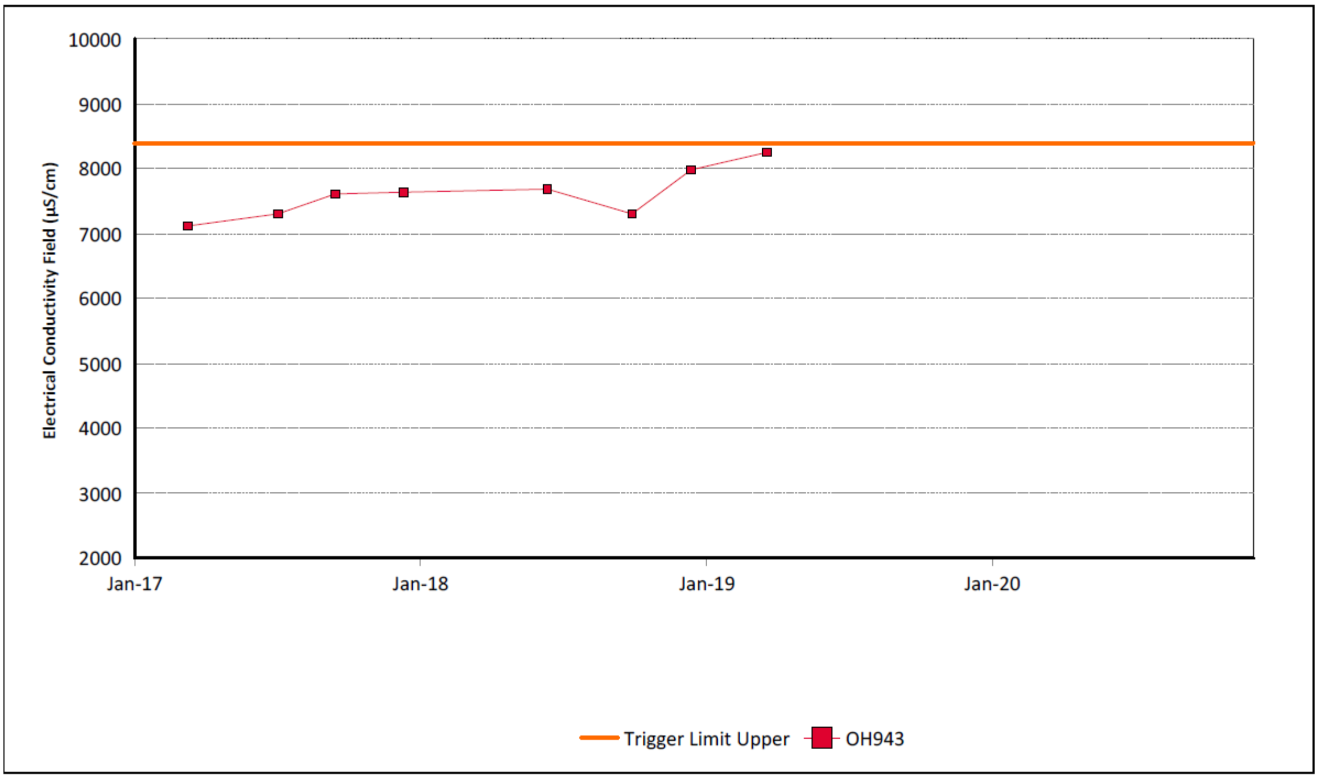
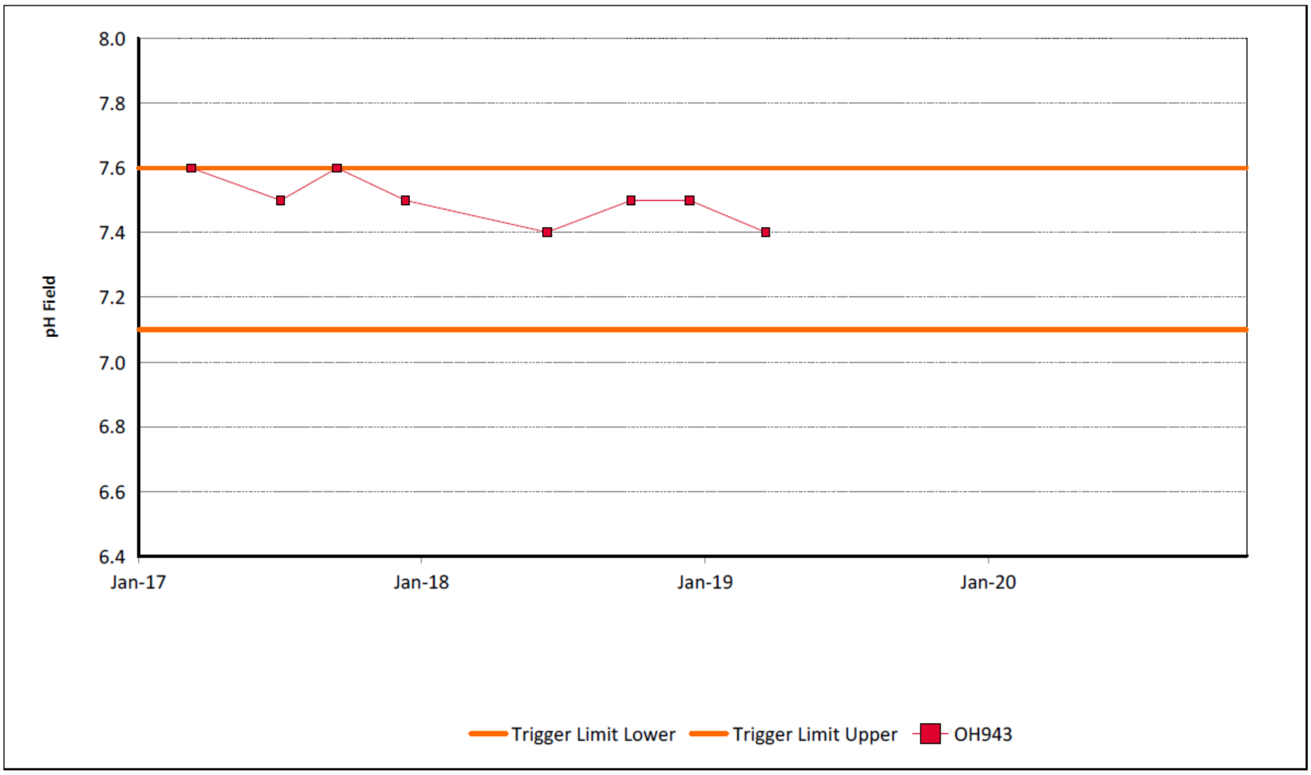


Figure 56: Hunter River Alluvium 3 pH Trend – September 2020



Note: Missing data indicates that there was insufficient water to take a sample.

Figure 57: Hunter River Alluvium 4 Electrical Conductivity Trend – September 2020



Note: Missing data indicates that there was insufficient water to take a sample.

Figure 58: Hunter River Alluvium 4 pH Trend – September 2020

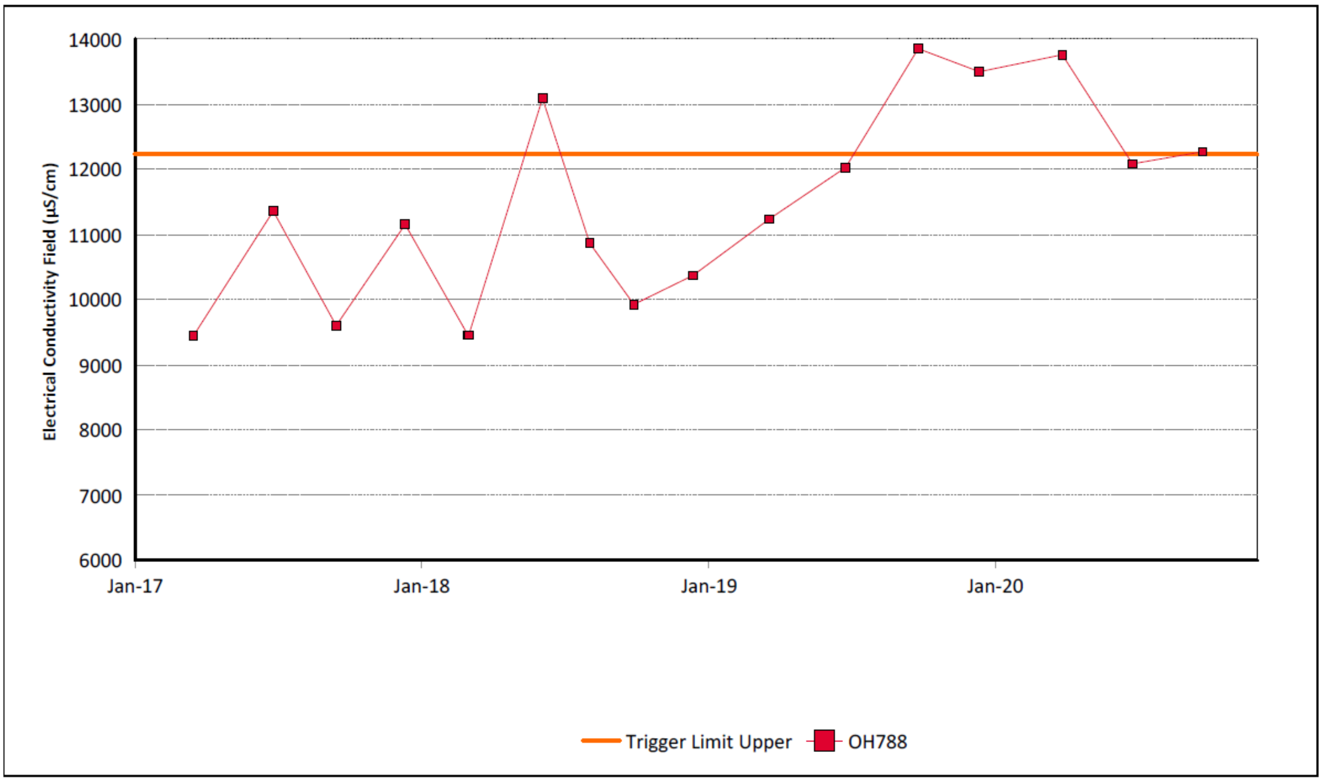


Figure 59: Hunter River Alluvium 5 Electrical Conductivity – September 2020

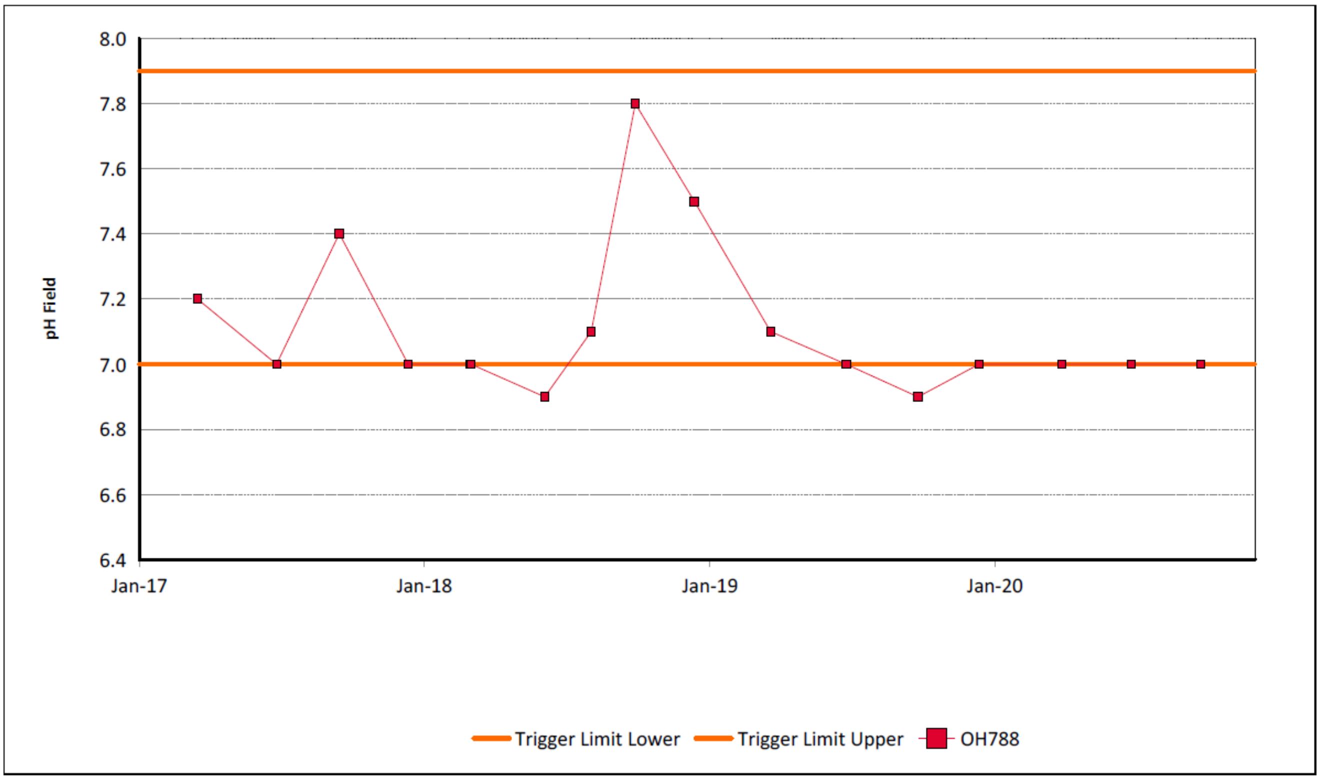


Figure 60: Hunter River Alluvium 5 pH Trend – September 2020

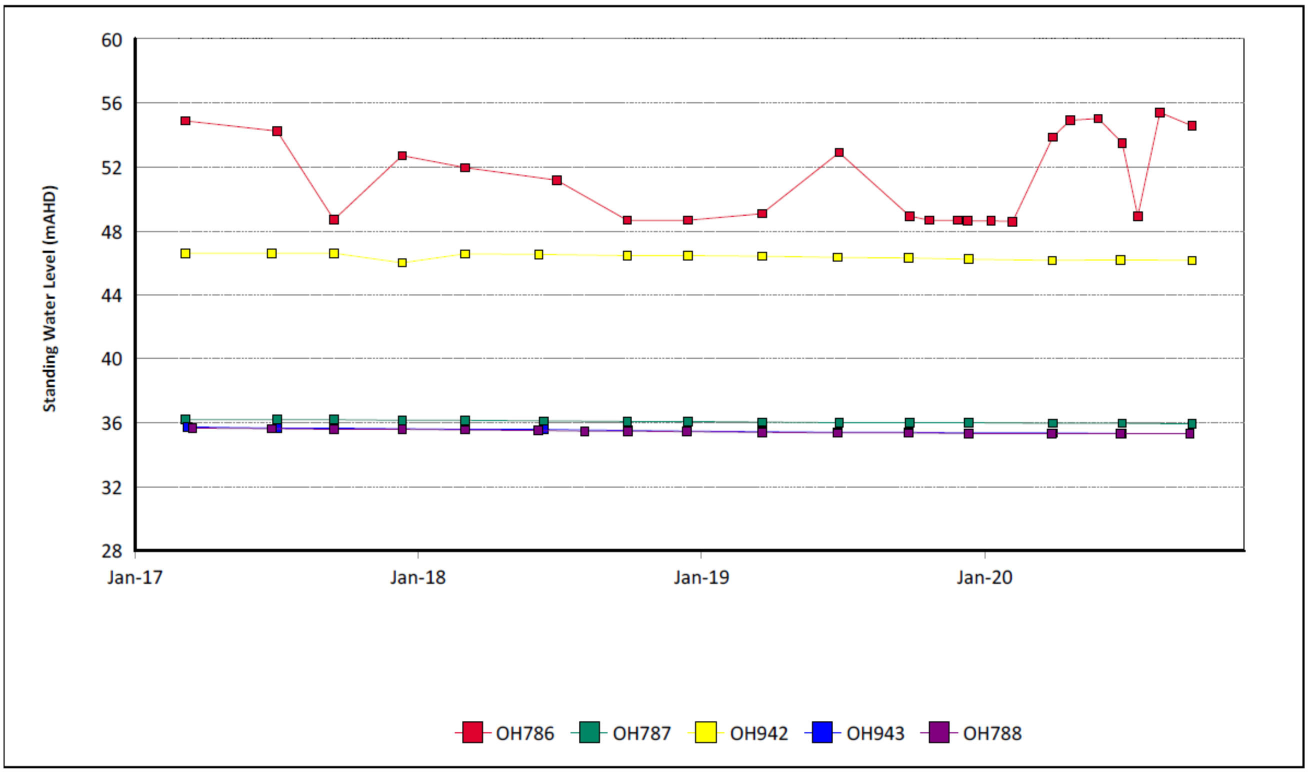


Figure 61: Hunter River Alluvium Standing Water Level Trend – September 2020

3.2.1 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 MTW Water Management Plan. Locations of groundwater bores are shown in **Figure 62**.

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

Table 3: Groundwater Triggers – 2020

Site	Date	Trigger Limit Breached	Action Taken in Response
GW9709	23/09/2020	EC – 95th Percentile	Watching Brief*
MTD605P	26/02/2020	EC – 95th Percentile	Watching Brief*
MTD605P	25/05/2020	EC – 95th Percentile	Investigation undertaken. Results trending back within trigger levels following recent rainfall.
MTD605P	24/08/2020	EC – 95th Percentile	Investigation Commenced
OH787	29/03/2020	EC – 95th Percentile	Watching Brief*
OH787	26/06/2020	EC – 95th Percentile	Investigation undertaken. Results trending back within trigger levels following recent rainfall.
OH787	24/09/2020	EC – 95th Percentile	Investigation Commenced
OH788	27/03/2020	EC – 95th Percentile	Investigation Undertaken. Monitoring results back within trigger limits following recent rainfall.
OH788	21/09/2020	EC – 95th Percentile	Watching Brief*
PZ8S	22/09/2020	EC – 95th Percentile	Watching Brief*
WD625P	28/02/2020	EC – 95th Percentile	Watching Brief* EC result from bore WD625P has returned within trigger limits during the June 20 sample round.
GW98MTCL2	23/06/2020	pH – 5th Percentile	Watching Brief*
MB15MTW01D	27/02/2020	pH – 5th Percentile	Watching Brief*
MB15MTW01D	27/05/2020	pH – 5th Percentile	Investigation Required*
MB15MTW01D	26/08/2020	pH – 5th Percentile	Investigation Commenced
MTD616P	25/02/2020	pH – 5th Percentile	Investigation Undertaken. Historically, fluctuations in pH at this location coincide with changes to the sampling methodology, from quarterly grab sampling to low flow pumping/purging prior to annual comprehensive sampling and analysis. A change to the sampling methodology implemented in 2019 i.e. low flow pumping/purging prior to all sampling and analysis, is considered the cause of the measured drop in pH. pH has returned to within lower pH trigger limit in May 2020 sample event
OH1138(1)	09/01/2020	pH – 5th Percentile	Investigation Required*
OH1138(1)	06/02/2020	pH – 5th Percentile	Under Investigation

Site	Date	Trigger Limit Breached	Action Taken in Response
OH1138(1)	23/03/2020	pH – 5th Percentile	Investigation Completed. As outlined in the MTW 2019 Annual Groundwater Review pH results for monitoring bore OH1138 likely to be attributable to the regional drawdown associated within the active mining in North Pit and the potential influences from the abstraction of water from the Lemington underground workings. Monthly results obtained since March 2020 (April, May and June) have confirmed pH to be back within trigger limits. Monitoring frequency will return to quarterly.
OH786	26/06/2020	pH – 95th Percentile	pH returned to within trigger limits for the September 2020 sample.
WOH2139A	25/02/2020	pH – 95th Percentile	Investigation Completed* As outlined in the 2019 Annual Groundwater Review pH values associated with bore WOH2139A are most likely attributable to the decreasing standing water level as a result of depressurisation from active mining in North Pit. Monitoring to continue to be undertaken quarterly.
WOH2139A	25/08/2020	pH – 95th Percentile	Watching Brief*
WOH2153A	25/02/2020	pH – 95th Percentile	Investigation Required* pH results from bore WOH2153A likely to be attributable to the declining standing water levels recorded in this bore.
WOH2153A	28/05/2020	pH – 95th Percentile	Under Investigation*
WOH2153A	25/08/2020	pH – 95th Percentile	Investigation Commenced
* = Watching brief established pending outcomes of subsequent monitoring events. No specific actions required.			

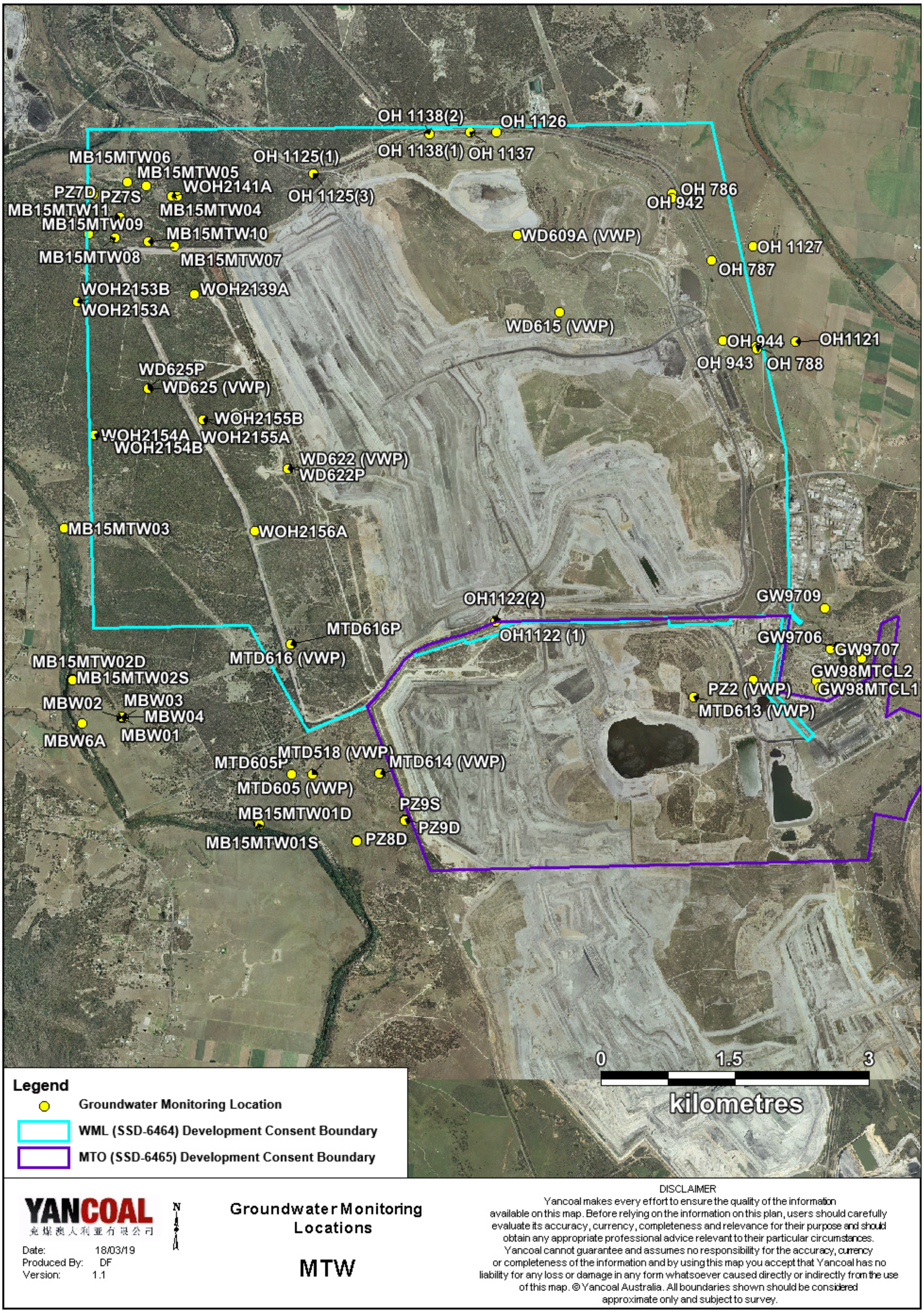


Figure 62: Groundwater Monitoring Location Plan

4.0 BLAST MONITORING

MTW have a network of six 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 69**.

4.1 Blast Monitoring Results

During September 2020, 18 blasts were initiated at MTW. **Figure 63** to **Figure 68** 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 no blasts exceeded the 115 dB(L) 5% threshold for airblast overpressure or 5mm/s 5% threshold for ground vibration.

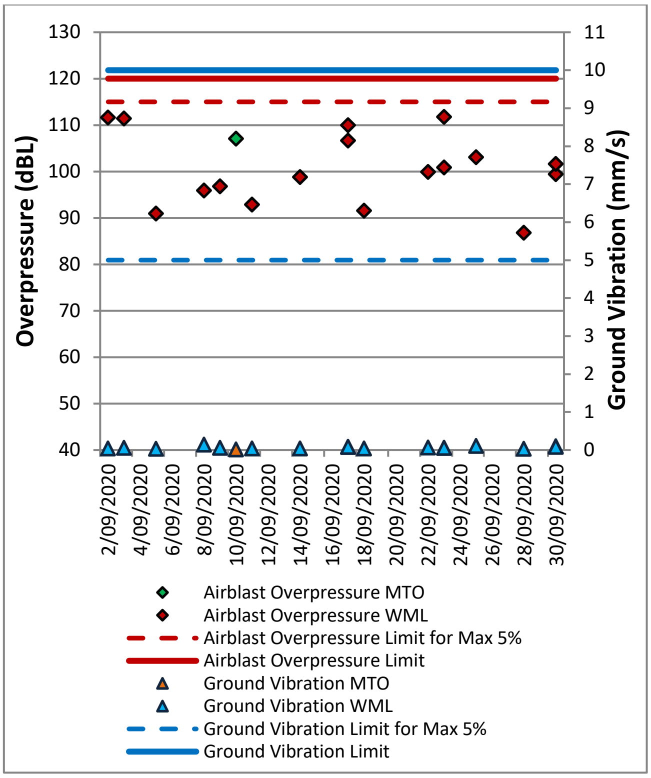


Figure 63: Abbey Green Blast Monitoring Results – September 2020

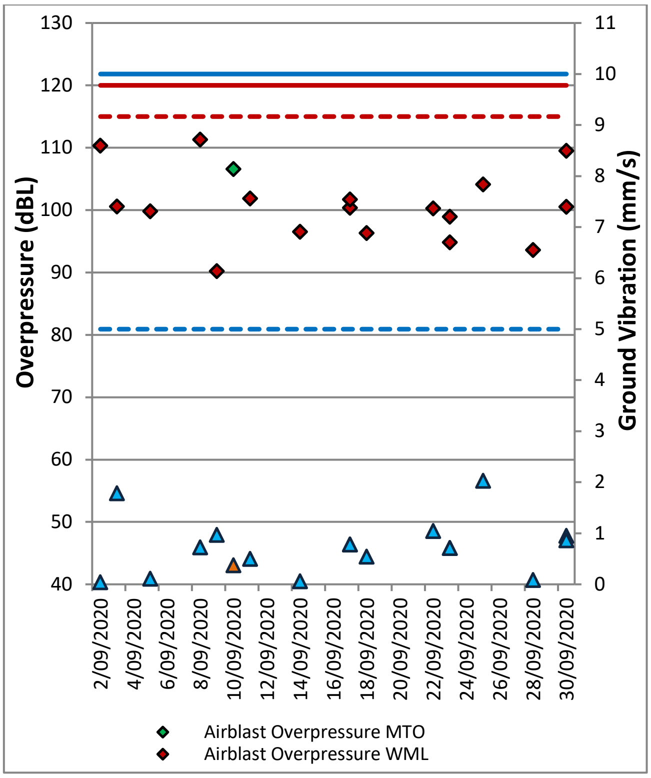


Figure 64: Bulga Village Blast Monitoring Results – September 2020

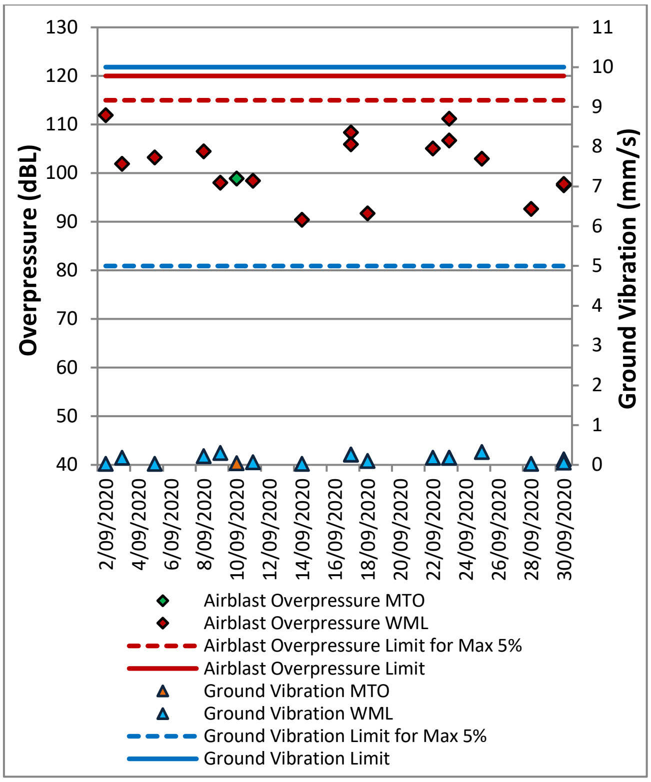


Figure 65: MTIE Blast Monitoring Results – September 2020

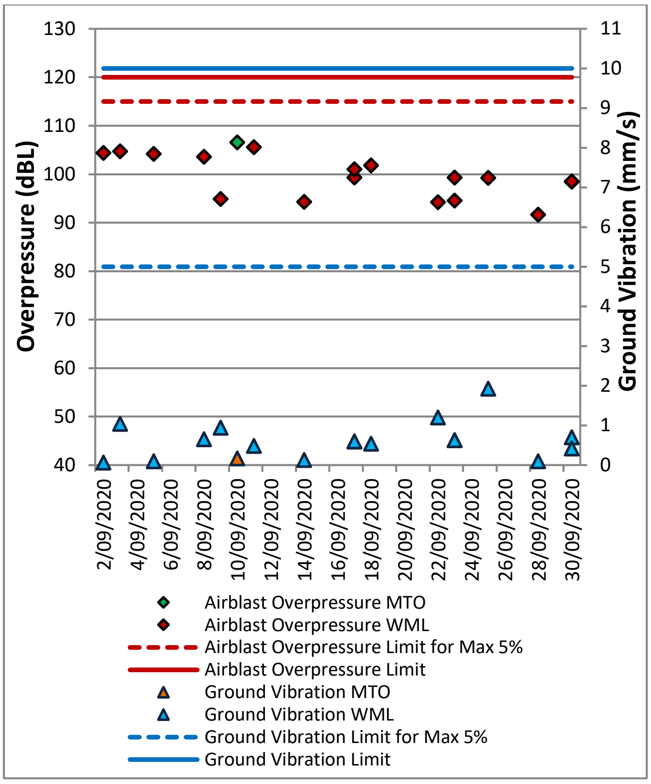


Figure 67: Wambo Road Blast Monitoring Results – September 2020

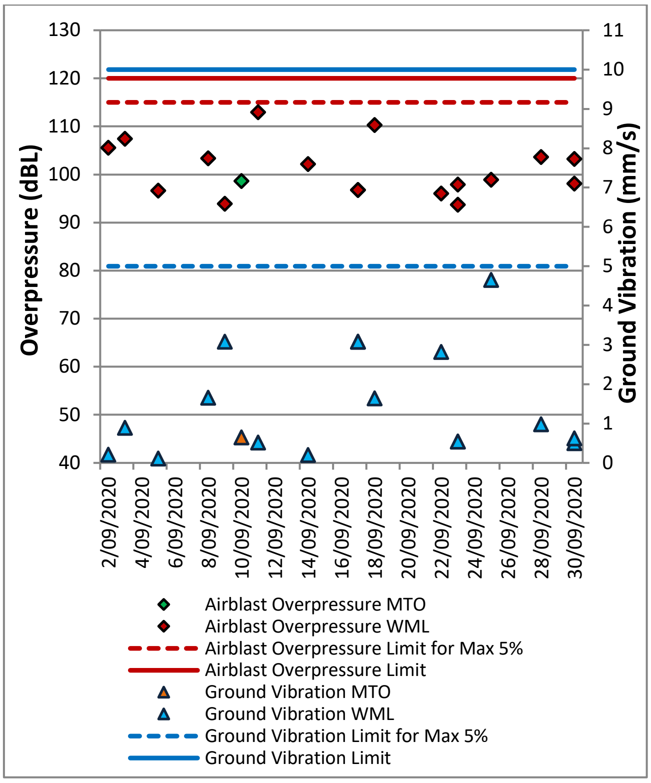


Figure 66: Warkworth Blast Monitoring Results - September 2020

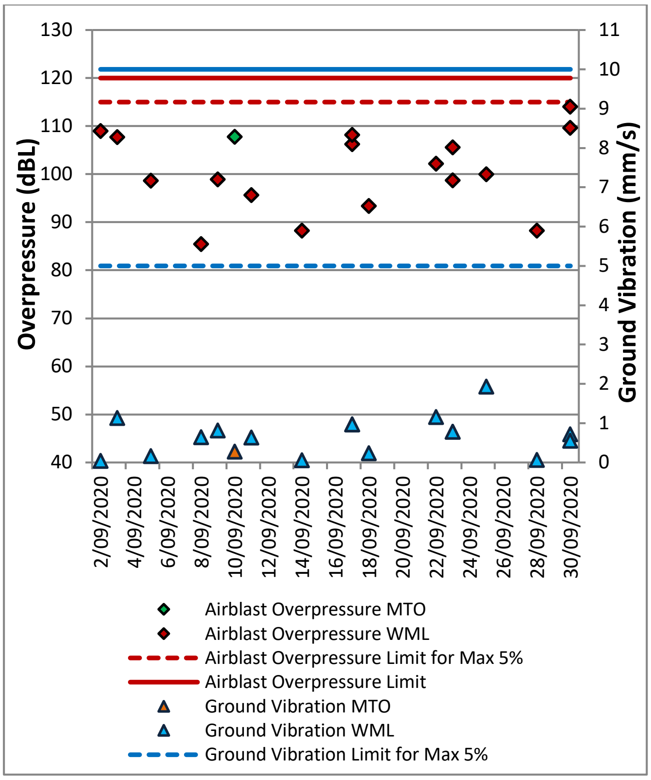


Figure 68: Wollemi Peak Road Blast Monitoring Results - September 2020

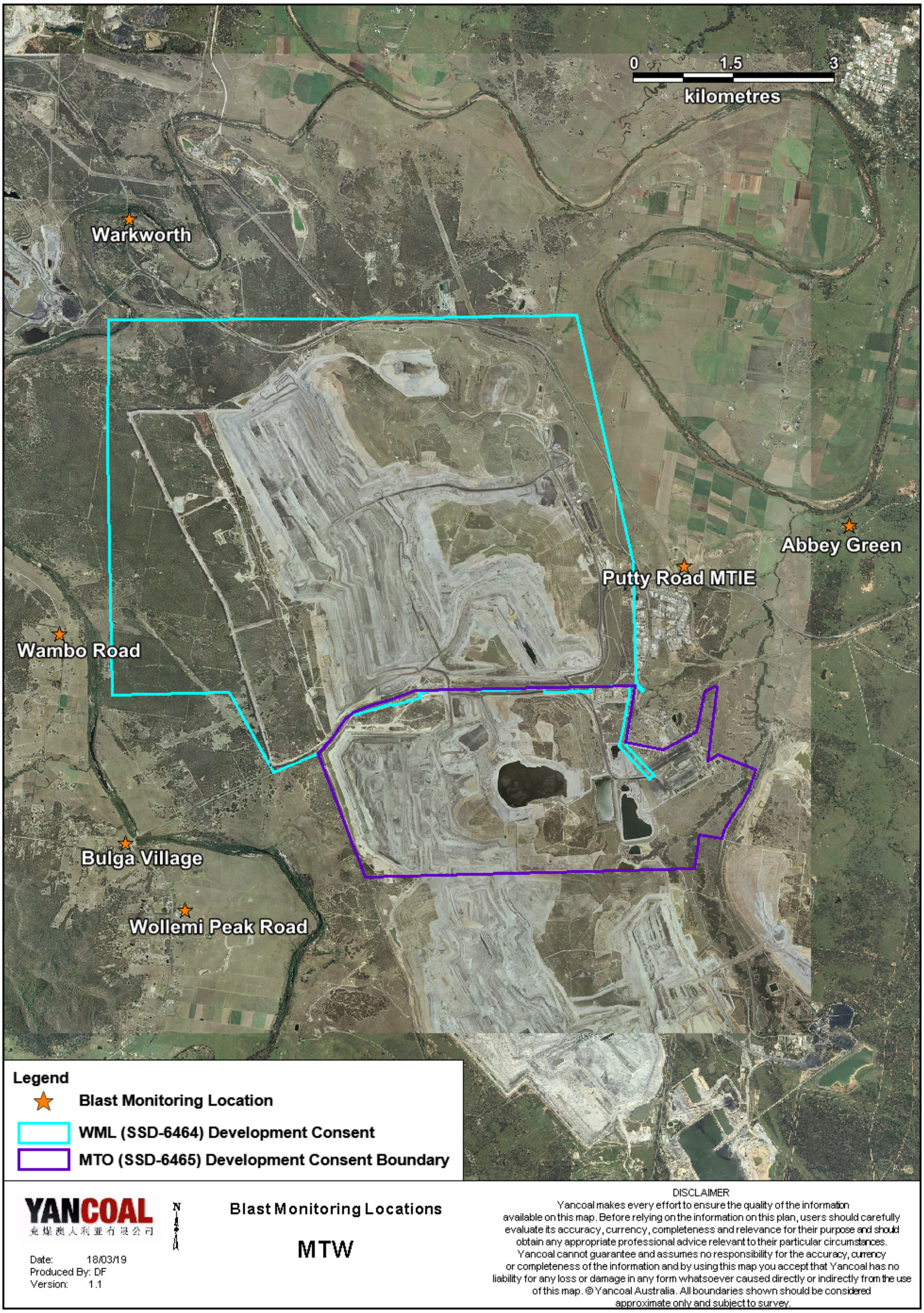


Figure 69: Blast and Vibration Monitoring Location Plan

5.0 NOISE

Routine attended noise monitoring is carried out in accordance with the MTW Noise Management Plan. A review against EIS predictions will be reported in the Annual Review Report. 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 MTW. The attended noise monitoring locations are displayed in **Figure 70.**

5.1 Attended Noise Monitoring Results

Attended monitoring was conducted at receiver locations surrounding MTW on the night of 8 September 2020. All measurements complied with the relevant criteria. Results are detailed in **Table 5** to **Table 8**.

5.1.1 WML Noise Assessment

Compliance assessments undertaken against the WML noise criteria are presented in **Table 5** and **Table 6**.

Table 5: $L_{Aeq, 15 minute}$ Warkworth Impact Assessment Criteria – September 2020

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion (dB(A))	Criterion Applies?[1]	WML L_{Aeq} dB[2,3]	Exceedance[3,4]
Bulga RFS	8/09/2020 23:07	1.9	D	37	Yes	30	Nil
Bulga Village	8/09/2020 23:26	2	D	38	Yes	36	Nil
Gouldsville	8/09/2020 21:28	1.7	F	38	Yes	IA	Nil
Inlet Rd	8/09/2020 21:32	1.7	F	37	Yes	34	Nil
Inlet Rd West	8/09/2020 21:03	1.4	D	35	Yes	34	Nil
Long Point	8/09/2020 21:02	1.4	D	35	Yes	IA	Nil
South Bulga	8/09/2020 23:50	1.1	D	35	Yes	<30	Nil
Wambo Road	8/09/2020 22:59	1.8	E	38	Yes	33	Nil

Notes:
1. Noise emission limits apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions. Criterion may or may not apply due to rounding of meteorological data values;
2. Estimated or measured LAeq,15minute attributed to WML;
3. Bold results in red are possible exceedances of relevant criteria;
4. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not Applicable.

Table 6: $L_{A1, 1 minute}$ Warkworth Impact Assessment Criteria – September 2020

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion (dB(A))	Criterion Applies?[1]	WML L_{Aeq} dB[2,3]	Exceedance[3,4]
Bulga RFS	8/09/2020 23:07	1.9	D	47	Yes	32	Nil
Bulga Village	8/09/2020 23:26	2	D	48	Yes	39	Nil
Gouldsville	8/09/2020 21:28	1.7	F	48	Yes	IA	Nil
Inlet Rd	8/09/2020 21:32	1.7	F	47	Yes	36	Nil
Inlet Rd West	8/09/2020 21:03	1.4	D	45	Yes	36	Nil
Long Point	8/09/2020 21:02	1.4	D	45	Yes	IA	Nil
South Bulga	8/09/2020 23:50	1.1	D	45	Yes	<30	Nil
Wambo Road	8/09/2020 22:59	1.8	E	48	Yes	35	Nil

Notes:
1. Noise emission limits apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions. Criterion may or may not apply due to rounding of meteorological data values;
2. Estimated or measured LA1,1minute attributed to WML;
3. Bold results in red are possible exceedances of relevant criteria;
4. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not Applicable.

5.1.2 MTO Noise Assessment

Compliance assessments undertaken against the MTO noise criteria are presented in **Table 7** and **Table 8**.

Table 7: $L_{Aeq, 15minute}$ Mount Thorley Operations - Impact Assessment Criteria – September 2020

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB	Criterion Applies?[1]	MTO L_{Aeq} dB[2,3]	Exceedance[3,4]
Bulga RFS	8/09/2020 23:07	1.9	D	37	Yes	30	Nil
Bulga Village	8/09/2020 23:26	2	D	38	Yes	IA	Nil
Gouldsville	8/09/2020 21:28	1.7	F	35	Yes	IA	Nil
Inlet Rd	8/09/2020 21:32	1.7	F	37	Yes	IA	Nil
Inlet Rd West	8/09/2020 21:03	1.4	D	35	Yes	NM	Nil
Long Point	8/09/2020 21:02	1.4	D	35	Yes	IA	Nil
South Bulga	8/09/2020 23:50	1.1	D	36	Yes	30	Nil
Wambo Road	8/09/2020 22:59	1.8	E	38	Yes	IA	Nil

Notes:
1. Noise emission limits apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions. Criterion may or may not apply due to rounding of meteorological data values;
2. Estimated or measured LAeq,15minute attributed to MTO;
3. Bold results in red are possible exceedances of relevant criteria;
4. NA in exceedance column means atmospheric conditions outside conditions specified in project approval and so criterion is not applicable.

Table 8: $L_{A1, 1Minute}$ Mount Thorley Operations - Impact Assessment Criteria – September 2020

Location	Date and Time	Wind Speed (m/s)	Stability Class	Criterion dB	Criterion Applies?[1]	MTO $L_{A1, 1min}$ dB[2,3]	Exceedance[3,4]
Bulga RFS	8/09/2020 23:07	1.9	D	47	Yes	35	Nil
Bulga Village	8/09/2020 23:26	2	D	48	Yes	IA	Nil
Gouldsville	8/09/2020 21:28	1.7	F	45	Yes	IA	Nil
Inlet Rd	8/09/2020 21:32	1.7	F	47	Yes	IA	Nil
Inlet Rd West	8/09/2020 21:03	1.4	D	45	Yes	NM	Nil
Long Point	8/09/2020 21:02	1.4	D	45	Yes	IA	Nil
South Bulga	8/09/2020 23:50	1.1	D	46	Yes	33	Nil
Wambo Road	8/09/2020 22:59	1.8	E	48	Yes	IA	Nil

Notes:
1. Noise emission limits apply during all meteorological conditions except the following: during periods of rain or hail; average wind speed at microphone height exceeds 5 m/s; wind speeds greater than 3 m/s measured at 10 metres above ground level; stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or stability category G temperature inversion conditions. Criterion may or may not apply due to rounding of meteorological data values;
2. Estimated or measured LAeq,15minute attributed to MTO;
3. Bold results in red are possible exceedances of relevant criteria;
4. NA in exceedance column means atmospheric conditions outside conditions specified in project approval and so criterion is not applicable.

5.1.3 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. There were no noise measurements taken during the reporting period which required the penalty to be applied. The WML assessment for low frequency noise is shown in **Table 9** and the MTO assessment for low frequency noise is shown in **Table 10**

Table 9: Warkworth Low Frequency Noise Assessment – September 2020

Location	Date and Time	Measured WML LAeq dB	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?	Frequency of Tonality[1]	Low-frequency Modifying Factor?	Maximum Exceedance of Reference Spectrum [1,2]	Penalty dB[2]	Exceedance
Bulga RFS	8/09/2020 23:07	30	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	8/09/2020 23:26	36	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	8/09/2020 21:28	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd	8/09/2020 21:32	34	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd West	8/09/2020 21:03	34	Yes	No	No	NA	No	NA	Nil	NA
Long Point	8/09/2020 21:02	IA	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	8/09/2020 23:50	<30	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	8/09/2020 22:59	33	Yes	No	No	NA	No	NA	Nil	NA

Notes:
1. NA denotes 'not applicable'; and
2. Bold results indicate that application of NPfI modifying factor/s is required.

Table 10: Mount Thorley Operations Low Frequency Noise Assessment – September 2020

Location	Date and Time	Measured WML LAeq dB	Criterion Applies?	Intermittency Modifying Factor?	Tonality Modifying Factor?	Frequency of Tonality[1]	Low-frequency Modifying Factor?	Maximum Exceedance of Reference Spectrum [1,2]	Penalty dB[2]	Exceedance
Bulga RFS	8/09/2020 23:07	30	Yes	No	No	NA	No	NA	Nil	NA
Bulga Village	8/09/2020 23:26	IA	Yes	No	No	NA	No	NA	Nil	NA
Gouldsville	8/09/2020 21:28	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd	8/09/2020 21:32	IA	Yes	No	No	NA	No	NA	Nil	NA
Inlet Rd West	8/09/2020 21:03	NM	Yes	No	No	NA	No	NA	Nil	NA
Long Point	8/09/2020 21:02	IA	Yes	No	No	NA	No	NA	Nil	NA
South Bulga	8/09/2020 23:50	30	Yes	No	No	NA	No	NA	Nil	NA
Wambo Road	8/09/2020 22:59	IA	Yes	No	No	NA	No	NA	Nil	NA

Notes:
1. NA denotes 'not applicable'; and
2. Bold results indicate that application of NPfI modifying factor/s is required.

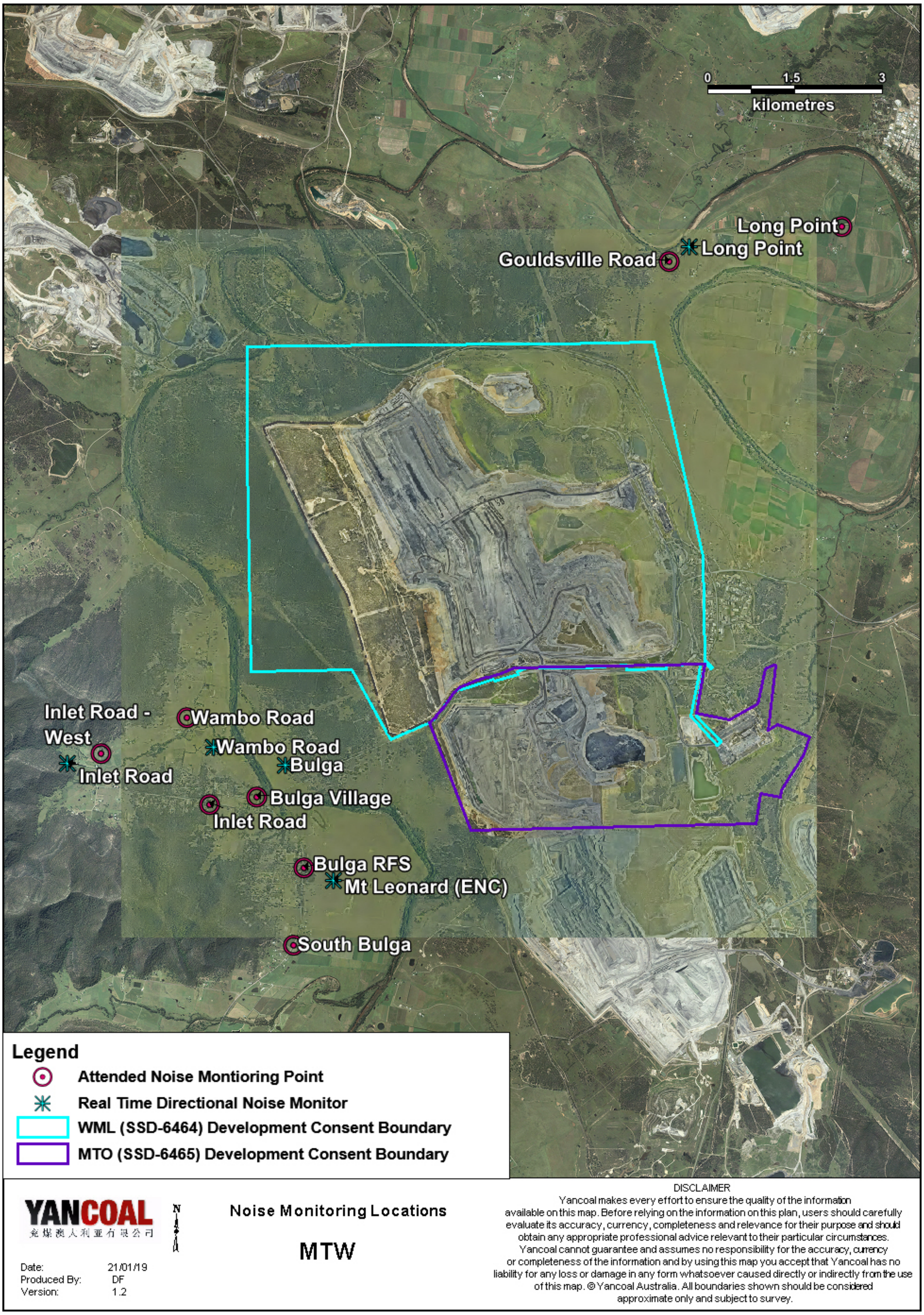


Figure 70: Noise Monitoring Location Plan

5.2 Noise Management Measures

A program of targeted supplementary attended noise monitoring is in place at MTW, supported by the real-time directional monitoring network and ensuring the highest level of noise management is maintained. The supplementary program is undertaken by MTW personnel and involves:

- Routine inspections from both inside and outside the mine boundary;
- Routine and as-required handheld noise assessments (undertaken in response to noise alarm and/or community complaint), comparing measured levels against consent noise limits; and
- Validation monitoring following operational modifications to assess the adequacy of the modifications.

Where a noise assessment identifies noise emissions which are exceeding the relevant noise limit(s) for any particular residence, modifications will be made so as to ensure that the noise event is resolved within 75 minutes of identification. The actions taken are commensurate with the nature and severity of the noise event, but can include:

- Changing the haul route to a less noise sensitive haul;
- Changing dump locations (in-pit or less exposed dump option)
- Reducing equipment numbers;
- Shut down of task; or
- Site shut down.

A summary of these assessments undertaken during September are provided in **Table 11**.

Table 11: Supplementary Attended Noise Monitoring Data – September 2020

No. of assessments	No. of assessments > trigger	No. of nights where assessments > trigger	% greater than trigger
646	15	5	2.3

Note: Measurements are taken under all meteorological conditions, including conditions under which the consent noise criteria do not apply.

6.0 OPERATIONAL DOWNTIME

During September a total of 477 hours of equipment downtime was logged in response to environmental events such as dust, noise and elevated wind impacts. Operational downtime by equipment type is shown in **Figure 71**.

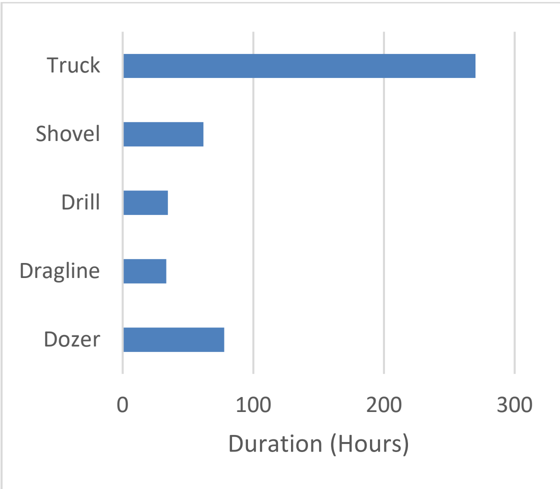


Figure 71: Operational Downtime by Equipment Type – September 2020

7.0 REHABILITATION

During September 1.9Ha of land was released for rehabilitation, 2.2Ha was bulk shaped and 10.4Ha was rehabilitated. Year-to-date progress can be viewed in **Figure 72.**

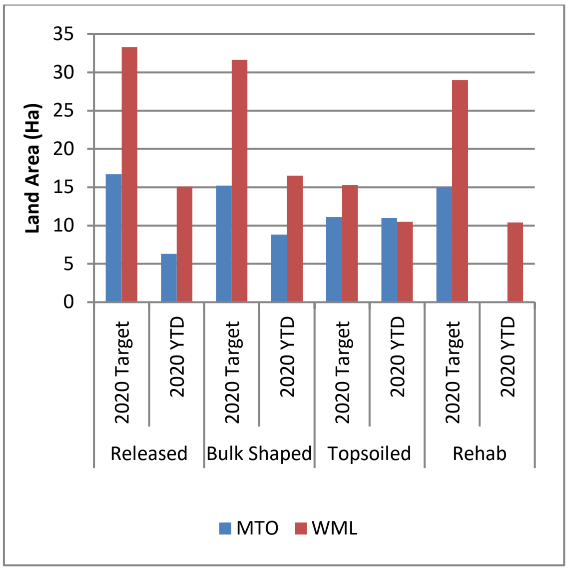


Figure 72: Rehabilitation YTD – September 2020

8.0 ENVIRONMENTAL INCIDENTS

There were no reportable environmental incidents recorded during the reporting period.

9.0 COMPLAINTS

During the reporting period 18 complaints were received, details of these complaints are displayed in **Table 12** below.

Table 12: Complaints Summary - YTD September 2020

	Noise	Dust	Blast	Lighting	Other	Total
January	2	4	5	0	0	11
February	6	1	4	2	1	14
March	13	3	7	0	0	23
April	21	7	1	1	1	31
May	4	4	11	6	1	26
June	8	1	10	7	0	26
July	4	2	12	5	0	23
August	6	4	3	6	0	19
September	14	0	3	1	0	18
October						
November						
December						
Total	78	26	56	28	3	191

Appendix A: Meteorological Data

Table 13: Meteorological Data – Charlton Ridge Meteorological Station – September 2020

Date	Air Temperature Maximum (°C)	Air Temperature Minimum (°C)	Relative Humidity Maximum (%)	Relative Humidity Minimum (%)	Wind Direction Average (°)	Wind Speed Average (m/sec)	Rainfall(mm)
1/09/2020	19	5	74	36	130	2.5	0.0
3/09/2020	23	1	90	31	253	2.4	0.0
4/09/2020	27	7	81	32	309	4.0	0.0
5/09/2020	27	14	86	29	282	4.0	3.4
6/09/2020	24	10	91	23	207	2.1	0.8
7/09/2020	20	5	82	49	129	3.3	0.0
8/09/2020	22	6	86	31	129	2.6	0.0
9/09/2020	25	4	91	28	203	2.1	0.0
10/09/2020	17	8	96	64	173	2.9	13.2
11/09/2020	16	5	97	48	154	4.4	3.8
12/09/2020	18	8	96	52	139	3.4	0.2
13/09/2020	23	6	98	31	208	2.2	0.0
14/09/2020	23	4	88	28	291	2.3	0.0
15/09/2020	25	7	85	29	206	2.7	0.0
16/09/2020	24	8	88	41	121	2.4	0.0
17/09/2020	26	5	96	32	279	2.8	0.0
18/09/2020	29	8	81	27	255	3.7	0.0
19/09/2020	19	11	86	66	142	3.4	0.0
20/09/2020	25	9	94	36	117	2.6	0.0
21/09/2020	18	10	96	67	170	1.6	16.4
22/09/2020	26	11	100	44	241	2.3	2.6
23/09/2020	26	12	94	18	302	4.2	0.2
24/09/2020	23	12	58	22	301	4.5	0.0
25/09/2020	21	7	66	22	296	3.8	0.0
26/09/2020	24	6	85	20	284	4.7	0.8
27/09/2020	18	3	77	27	294	5.4	0.0
28/09/2020	19	1	74	28	220	3.1	0.0
29/09/2020	21	4	84	24	138	2.2	0.0
30/09/2020	22	3	78	30	131	2.7	0.0

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