Huntly Bauxite Mine – WQMS Data Review

October 2025

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RARE Environmental

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1. Executive Summary

This report, prepared by RARE Environmental Pty Ltd and SciDev Pty Ltd for Alcoa, provides an analysis of turbidity data collected from Water Quality Monitoring Systems (WQMS) deployed at the Huntly bauxite mining operations during October 2025. The primary objective of this analysis was to evaluate the quality of the data, identify potential "true" turbidity exceedance events, and support Alcoa's compliance reporting obligations under Schedule 1, Division 2, Clause 6 of the **Environmental Protection (Darling Range Bauxite Mining Proposal) Exemption Order 2023**.

The analysis focused on identifying and classifying turbidity events where levels exceeded 25 nephelometric turbidity units (NTU) for at least one hour. Events were categorized as "true" or "false" based on Alcoa's **Turbidity Event Classification Guidelines**, which distinguish actual turbidity increases (true events) from false readings caused by environmental factors such as debris, air bubbles, or fluctuating water levels.

Key findings include:

- **Excluded Units**: Ten WQMS units were excluded from the analysis due to invalid data caused by equipment faults or environmental interference.
- **False Events**: Twenty-seven 'False' events were identified, primarily attributed to factors such as debris accumulation, sensor obstructions, and water turbulence.
- **Further Investigation**: Eight events were flagged for further investigation.
- **True Events**: Eight "True" turbidity exceedance events were identified.

The report also highlights periods of missing data, which occurred due to system logoffs, equipment faults, or unplanned shutdowns. These gaps are detailed in the report to ensure transparency in data handling.

2. Scope

RARE Environmental Pty Ltd and SciDev Pty Ltd were engaged by Alcoa to analyse turbidity data collected from the Huntly Water Quality Monitoring Systems (WQMSs). The primary objective of this engagement is to assess the quality of the collected data and identify potential "true" turbidity events. This analysis supports Alcoa's reporting obligations under *Schedule 1, Division 2, Clause 6 of the Environmental Protection (Darling Range Bauxite Mining Proposal) Exemption Order 2023*.

3. Introduction

3.1. Background

Alcoa of Australia Ltd (Alcoa) operates two bauxite mines, Huntly and Willowdale, approximately 100 km southeast of Perth, Western Australia. These mining operations are subject to environmental controls mandated by the *Environmental Protection (Darling Range Bauxite Mining Proposal) Exemption Order 2023*.

Under this Exemption Order, Alcoa is required to implement drainage control measures and monitor effectiveness in water bodies within and downstream of mining operations. Turbidity, a critical water quality parameter, is monitored using Water Quality Monitoring Systems (WQMSs), to detect deviations and identify high-turbidity events.

Alcoa is obligated to report monthly on-stream turbidity, including the identification and classification of any “true” high-turbidity exceedance events. (Refer to Appendix B for the site map showing WQMS locations.)

3.2. Monitoring requirements

Environmental Protection (Darling Range Bauxite Mining Proposal) Exemption Order 2023 specifies that a drainage incident occurs when:

> *a) runoff from a disturbance area enters the surrounding environment, resulting in surface water turbidity of at least 25 NTU for a duration of at least one hour; or*
>
> *b) a discharge from containment infrastructure includes, or October include, environmentally hazardous material.*

Trigger levels for drainage incidents are outlined in *Schedule 1* of the Exemption Order. To meet these requirements, Alcoa has developed "Turbidity Event Classification Guidelines" which define a true turbidity exceedance event as a WQMS recording turbidity levels of at least 25 NTU for a period exceeding one hour.

3.3. Water Quality Management Systems (WQMSs)

During the October 2025 monitoring period, forty-three WQMS units were deployed to monitor turbidity levels in streams subject to surface water runoff within and downstream of Huntly mining operations.

Each WQMS unit consists of the following components:

Aquas SMR10 Turbidity Probe

> Positioned at a 90-degree angle to water flow, each probe is equipped with an automatic lens wiper and a guard to protect against larger debris.

Data Taker DT82 Logger

> Records data locally every six seconds, with six-minute averages transmitted via IoT-enabled modems to a cloud-based platform.

Float Switch

Detects whether the sensor is submerged, or the stream is dry.

3.4. Purpose

This report aims to analyse turbidity data collected during October 2025, focusing on the identification and classification of "true" turbidity exceedance events based on Alcoa's Turbidity Event Classification Guidelines.

3.5. Exclusions

This report is not intended as:

- An assessment of the WQMS network or Alcoa's compliance with relevant legislation and requirements.
- An evaluation of the suitability of the trigger levels or event classification procedures adopted by Alcoa.

3.6. Abbreviations

	Term
IoT	Internet of Things
NTU	Nephelometric Turbidity Units
WQMS	Water Quality Management System

4. Methodology

4.1. WQMS Locations

A site map showing the WQMSs locations is provided in Appendix B.

4.2. Data Review

Data recorded by the WQMS Units was reviewed and potential events where turbidity levels exceeded 25 NTU for at least one hour. Each potential event was categorised as either 'true 'or 'false'.

4.2.1. True Turbidity Exceedance Events

These events are caused by an actual increase in stream turbidity. Per Alcoa's "Turbidity Event Classification Guidelines" true exceedance events typically exhibit:

- A sharp, sudden incline in turbidity levels.
- A return to baseline turbidity levels in a pattern resembling a normal (Gaussian) distribution.

Figure 1 Typical 'true' exceedance event showing the sharp incline and gradual return to background levels.

4.2.2. False Turbidity Exceedance Events

These events are caused by factors unrelated to actual turbidity increase, such as:

- Organic debris (e.g., leaves, sticks, algae) obstructing the sensor
- Air bubbles or water turbulence near the sensor
- Fluctuating water levels intermittently covering and uncover the sensor lens.

False events typically exhibit sharp inclines and declines without the characteristic bell curve shape of true events.

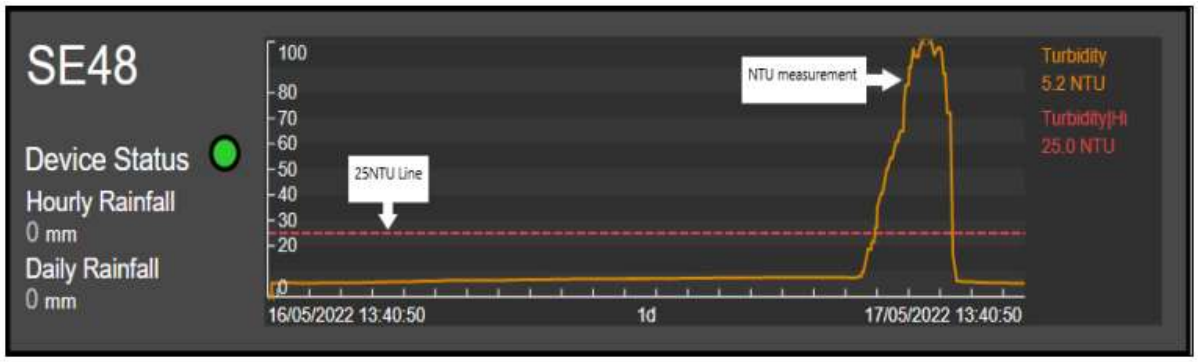

Figure 2 Typical 'false' exceedance event showing both a sharp incline and decline

4.2.3. Missing Data

Missing data occurs when a WQMS unit fails to record information, this can occur from unexpected system logoffs, equipment faults, or unplanned shutdowns.

5. Results and Discussion

5.1. Events

Table 1 provides a summary of identified events. Table 2 offers detailed information about each event.

Table 1 Events Summary

Category	# of events
Flagged for further investigation	8
False	27

Table 2 Events Details

Event ID	WQMS ID	Event Category	Start	End	Duration	Peak Turbidity (NTU)	Average Turbidity (NTU)
HUN-2510-001	ND12T	'False'	15/10/2025 19:48	17/10/2025 14:30	42 h 42 min	64.31	37.53
HUN-2510-002	SE02T	'False'	7/10/2025 20:42	7/10/2025 21:48	1 h 5 min	25.63	25.33
HUN-2510-003	SE02T	False'	8/10/2025 0:36	8/10/2025 14:48	14 h 11 min	42.28	31.74
HUN-2510-004	SE02T	Additional Investigation Required	20/10/2025 11:12	20/10/2025 12:42	1 h 30 min	35.52	33.06
HUN-2510-005	SE05T	'False'	1/10/2025 14:24	3/10/2025 14:06	47 h 41 min	50.82	36.38
HUN-2510-006	SE05T	'False'	15/10/2025 2:18	15/10/2025 10:06	7 h 47 min	28.62	27.00
HUN-2510-007	SE05T	'False'	15/10/2025 14:18	17/10/2025 13:06	46 h 48 min	69.24	40.99
HUN-2510-008	SE05T	Additional Investigation Required	20/10/2025 11:18	20/10/2025 13:12	1 h 54 min	65.23	48.14
HUN-2510-009	SE06T	'False'	11/10/2025 1:36	11/10/2025 3:06	1 h 29 min	516.76	105.22
HUN-2510-010	SE08T	'False'	3/10/2025 13:24	3/10/2025 16:00	2 h 36 min	59.94	44.04
HUN-2510-011	SE08T	'False'	3/10/2025 20:18	4/10/2025 2:42	6 h 24 min	51.48	38.39
HUN-2510-012	SE08T	'False'	5/10/2025 16:12	6/10/2025 0:18	8 h 6 min	59.27	44.58
HUN-2510-013	SE08T	'False'	6/10/2025 9:24	6/10/2025 11:42	2 h 17 min	59.81	48.81

Event ID	WQMS ID	Event Category	Start	End	Duration	Peak Turbidity (NTU)	Average Turbidity (NTU)
HUN-2510-014	SE08T	'False'	7/10/2025 6:06	7/10/2025 11:24	5 h 17 min	49.51	44.47
HUN-2510-015	SE08T	'False'	8/10/2025 1:06	8/10/2025 10:24	9 h 18 min	56.25	45.12
HUN-2510-016	SE11T	'False'	15/10/2025 3:15	15/10/2025 7:48	4 h 32 min	785.31	353.64
HUN-2510-017	SE11T	'False'	15/10/2025 7:56	15/10/2025 9:39	1 h 43 min	146.98	79.67
HUN-2510-018	SE11T	'False'	16/10/2025 12:20	16/10/2025 13:27	1 h 6 min	57.59	46.77
HUN-2510-019	SE12INV	Additional Investigation Required	20/10/2025 10:42	20/10/2025 12:06	1 h 23 min	1030.65	293.03
HUN-2510-020	SE12INV	'False'	29/10/2025 15:18	29/10/2025 20:30	5 h 11 min	31.66	29.21
HUN-2510-021	SE12INV	'False'	30/10/2025 14:24	30/10/2025 21:42	7 h 17 min	46.37	37.36
HUN-2510-022	SE12INV	'False'	31/10/2025 12:12	31/10/2025 20:24	8 h 12 min	143.55	89.38
HUN-2510-023	SE12T	Additional Investigation Required	20/10/2025 10:48	20/10/2025 12:48	1 h 59 min	1459.71	280.02
HUN-2510-024	SE23T	'False'	2/10/2025 9:24	2/10/2025 10:36	1 h 12 min	80.26	54.23
HUN-2510-025	SE48T	'False'	2/10/2025 16:50	2/10/2025 21:17	4 h 26 min	55.92	42.33
HUN-2510-026	SE48T	'False'	3/10/2025 7:47	3/10/2025 13:50	6 h 3 min	44.00	35.84
HUN-2510-027	SE48T	'False'	4/10/2025 11:22	4/10/2025 17:19	5 h 57 min	53.99	38.77
HUN-2510-028	SE48T	'False'	6/10/2025 20:27	7/10/2025 17:28	21 h 0 min	57.67	46.59
HUN-2510-029	SE51T	Additional Investigation Required	20/10/2025 13:12	20/10/2025 14:36	1 h 23 min	29.48	28.43
HUN-2510-030	SE52T	'False'	9/10/2025 15:00	10/10/2025 21:30	30 h 29 min	70.20	60.48
HUN-2510-031	SE52T	'False'	11/10/2025 5:18	13/10/2025 13:54	56 h 35 min	1753.39	391.64
HUN-2510-032	SE52T	Additional Investigation Required	20/10/2025 12:12	20/10/2025 15:36	3 h 24 min	89.02	37.17

Event ID	WQMS ID	Event Category	Start	End	Duration	Peak Turbidity (NTU)	Average Turbidity (NTU)
HUN-2510-033	SE52T	Additional Investigation Required	20/10/2025 15:48	20/10/2025 16:54	1 h 6 min	37.09	31.06
HUN-2510-034	SE52T	'False'	28/10/2025 10:36	28/10/2025 14:00	3 h 24 min	114.99	89.71
HUN-2510-035	SE59T	Additional Investigation Required	20/10/2025 11:24	20/10/2025 14:06	2 h 42 min	37.18	31.27

5.2. Additional Investigation

Eight events were flagged for additional investigation.

5.2.1. HUN-2510-004 Additional Investigation

The event, occurring between 11:12 and 12:42 on the 20th of October at SE02T does not exhibit the typical sharp, incline in turbidity levels however the initial spike and gradual return to baseline levels in pattern resembling a normal (Gaussian) distribution as shown in Figure 3 below indicates a potential drainage event.

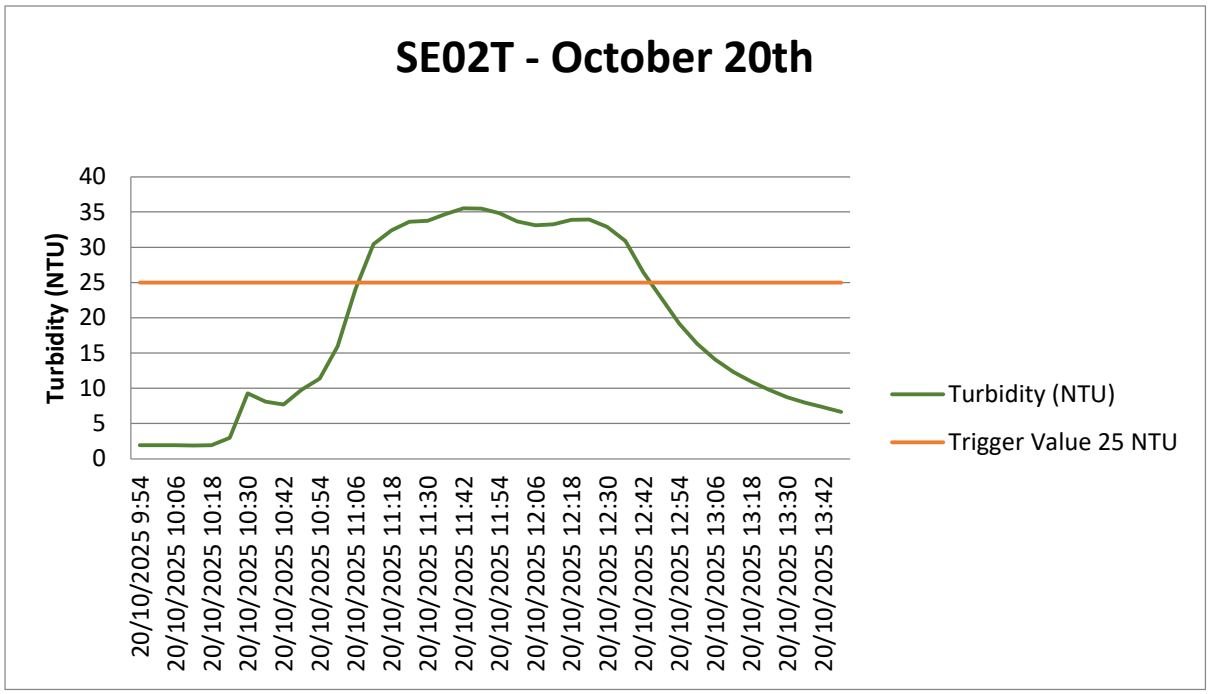

Figure 3 - HUN-2510-004

Further investigation into the event and location has determined the following

- The event occurred during a rainfall period.
- The monitoring site and catchment were inspected within 24 hours; the stream was clear and flowing at low turbidity.

- No evidence of mining-related disturbance or discharge was observed in the upstream catchment.

Field notes provided by Alcoa are included below.

"Compliance turbidity monitoring site SE02T recorded a turbidity event exceeding 25 NTU for >1 hour on 20 October 2025. The event was recorded on 20 October 2025 from 11:12 AM to 12:42 PM, with a duration of 1 hour and 30 minutes. The average turbidity value during the event was 33.06 NTU, with a peak of 35.52 NTU. There was 14.5 mm of rainfall recorded in the 24 hours preceding the event. The monitoring site was inspected on 21 October 2025. The stream was clear and flowing, with a measured value of 1.2 NTU. Data trend shows a gradual incline and decline in turbidity values which coincides with rainfall. The SE02T catchment area was inspected, no evidence of mining related contribution to the turbidity exceedance was found."

The SE02T turbidity exceedance on 20/10/2025 shows a short-lived rise and fall in turbidity that closely follows the rainfall event, with values returning to background soon after the event and no evidence of an ongoing discharge. The clear, low-turbidity conditions observed at the follow-up inspection and the absence of any mining-related disturbance in the catchment support rainfall-runoff mechanisms rather than a mining source event. On this basis, the SE02T event is interpreted as a rainfall-driven turbidity response from non-mining areas upstream of the monitor and is classified as a True, non-mining-related event.

HUN-2510-008 Additional Investigation

The event, occurring between 11:18 and 13:12 on the 20th of October at SE05T does not exhibit the typical sharp, incline in turbidity levels however the initial spike and gradual return to baseline levels in pattern resembling a normal (Gaussian) distribution as shown Figure 4 below indicates a potential drainage event.

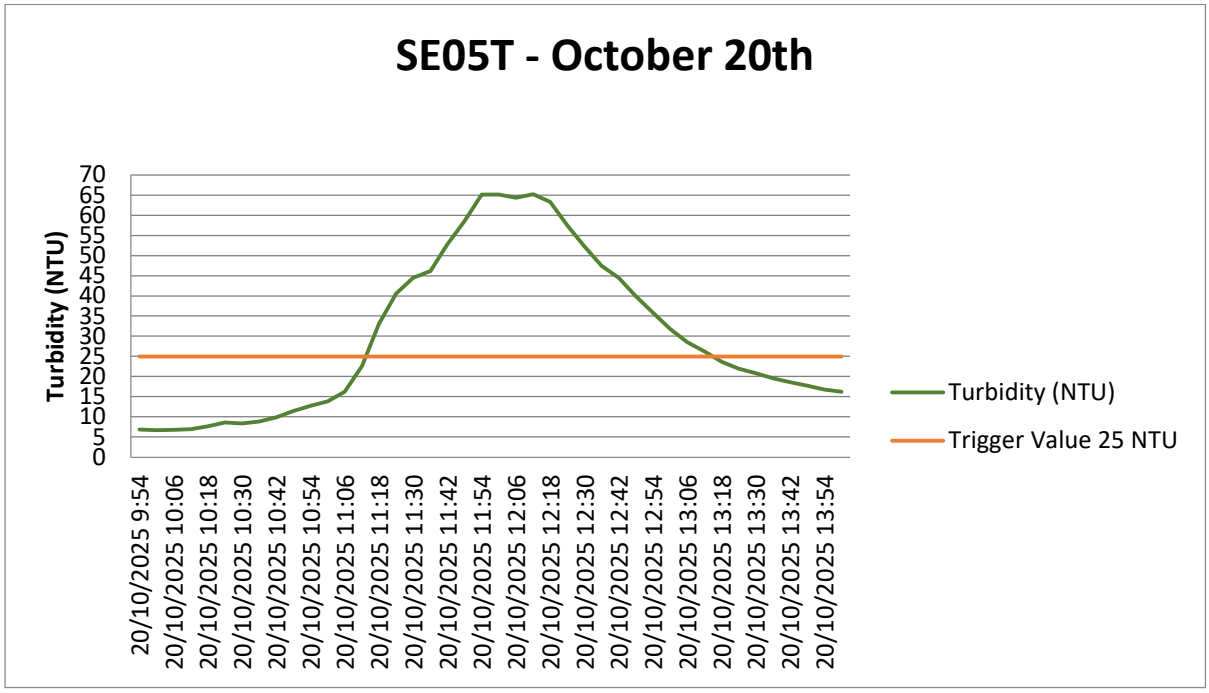

Figure 4 - HUN-2510-008

Further investigation into the event and location has determined the following

- The event occurred during a rainfall period
- The monitoring site and catchment were inspected following the event; the stream showed slightly elevated turbidity associated with organic debris and bed sediment.
- No evidence of mining-related disturbance or discharge was observed in the upstream catchment.

Field notes provided by Alcoa are included below.

"Compliance turbidity monitoring site SE05T recorded a turbidity event exceeding 25 NTU for >1 hour on 20 October 2025. The event was recorded on 20 October 2025 from 11:18 AM to 1:12 PM with a duration of 1 hour and 54 minutes. The average turbidity value during the event was 48.14 NTU, with a peak of 65.23 NTU. There was 15.6mm of rainfall recorded in the 24 hours preceding the event. The monitoring site was inspected on 25 October 2025. The stream displayed slightly elevated turbidity, attributed to substantial organic debris and streambed sediment, with a measured value of 7.7 NTU. Analysis of the data indicates a gradual increase in turbidity values coinciding with rainfall, followed by a subsequent decline. During the next period of increasing rainfall intensity in the hours following the event, turbidity values remained below 13 NTU. The SE05T catchment area was inspected, no evidence of mining related contribution to the turbidity exceedance was found."

The SE05T turbidity exceedance on 20/10/2025 shows a rainfall-driven rise and fall in turbidity, with values returning to relatively low levels despite further rainfall and no indication of an ongoing source. The follow-up inspection recorded only slightly elevated turbidity (7.7 NTU), attributed to organic debris and bed sediment, and catchment inspections did not

identify any mining-related disturbance or discharge upstream of the monitor. Taken together, these lines of evidence support a short-lived, rainfall-runoff response affecting in-stream sediments and organic material rather than a mining source. On this basis, the SE05T event is interpreted as a rainfall-related turbidity response from non-mining areas and is classified as a True, non-mining-related event.

5.2.2. HUN-2510-019 Additional Investigation

The event, occurring between 10:42 and 12:06 on the 20th of October at SE12INV exhibits a sharp, incline in turbidity levels followed by a gradual return to baseline levels in a pattern resembling a normal (Gaussian) distribution as shown in Figure 5 below. This criteria is in line with a typical true event as per the 'Turbidity Event Classification Guidelines'.

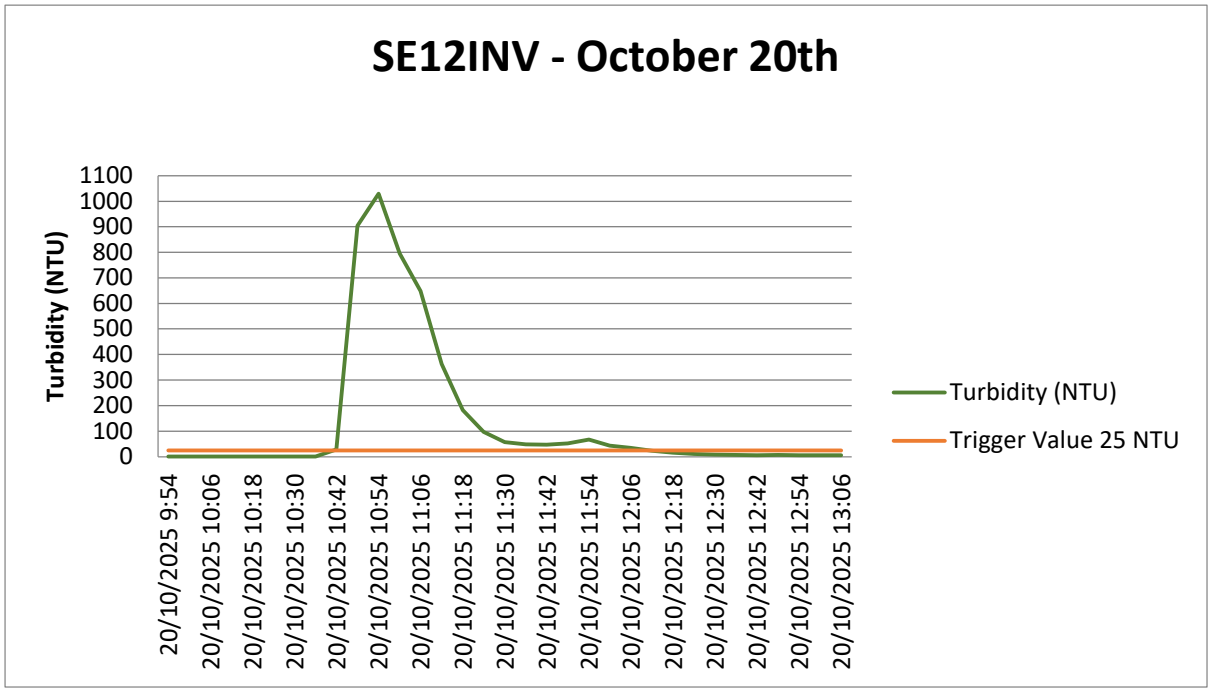

Figure 5 - HUN-2510-019

Further investigation into the event and location has determined the following

- Rainfall occurred in the 12 hours prior to the event.
- Erosion controls were installed in 2024 adjacent the embankment of the Wittwer haul, inspection of these controls identified that they are still operating effectively.
- This area has recorded previous events triggered by runoff from adjacent forest track during high rainfall events.

Field notes provided by Alcoa are included below.

"Local turbidity monitoring site SE12INV recorded a turbidity event exceeding 25NTU for >1 hour on 20/10/2025 for 1 hour and 24 minutes, following 12.3mm of rainfall in the preceding 24 hours. Data trend shows a sharp incline of turbidity at 10:42 am with an equally sharp decline in turbidity at 12:06 pm. The monitoring site was inspected on 21/10/2025 and the

stream was clear, shallow and clear. Data trend coincides with the heavy rainfall event. The SE12INV catchment was inspected, no evidence of mining related contribution to the turbidity exceedance was found."

The SE12INV event on 20/10/2025 is characterised by a sharp, short-lived spike in turbidity that closely aligns with rainfall, followed by a rapid return to clear, shallow flow conditions at the time of inspection. Erosion controls adjacent to the Wittwer haul embankment were found to be functioning as intended, and the catchment has a known history of rainfall-driven turbidity linked to runoff from the adjacent forest track rather than from mining activities. No mining-related disturbance or discharge was identified during catchment inspections. On this basis, the SE12INV event is interpreted as a brief, rainfall-runoff response mobilising sediment from non-mining areas (as per previous months events) and is classified as a True, non-mining-related turbidity event.

5.2.3. HUN-2510-023 Additional Investigation

The event, occurring between 10:48 and 12:48 on the 20th of October at SE12T exhibits a sharp, incline in turbidity levels followed by a gradual return to baseline levels in a pattern resembling a normal (Gaussian) distribution as shown in Figure 6 below. This criteria is in line with a typical true event as per the 'Turbidity Event Classification Guidelines'.

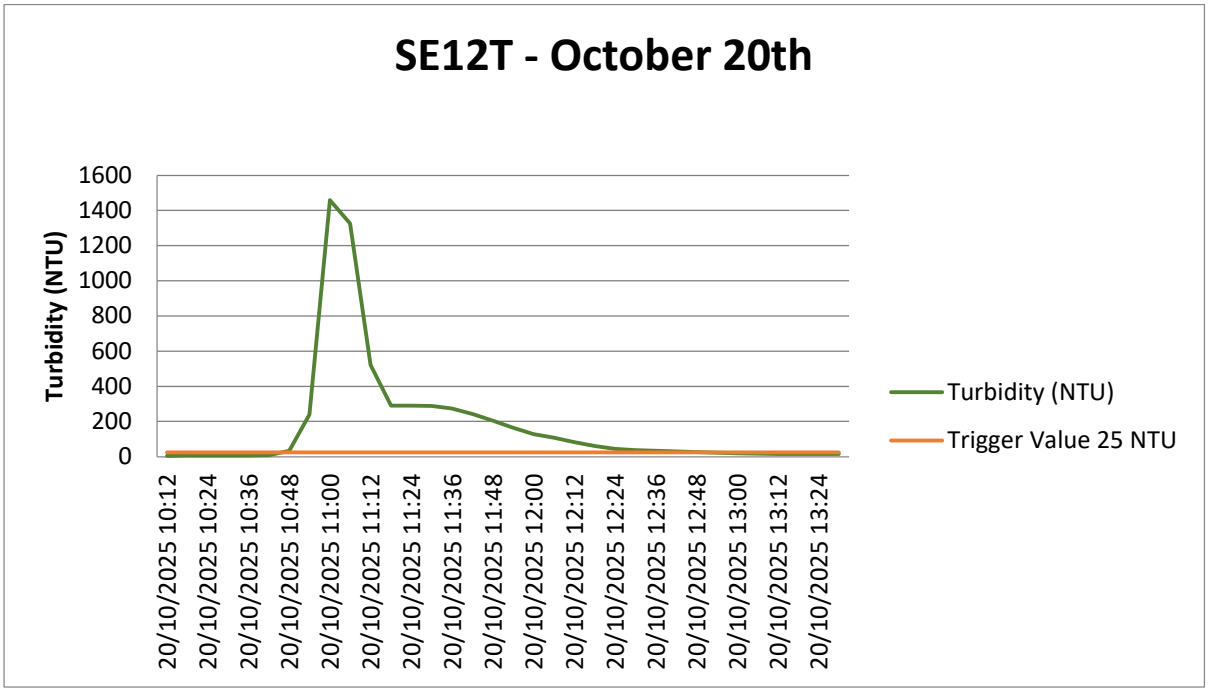

Figure 6 - HUN-2510-023

Further investigation into the event and location has determined the following

- Rainfall occurred in the 12 hours prior to the event.
- Erosion controls were installed in 2024 adjacent the embankment of the Wittwer haul road, inspection of these controls identified that they are still operating effectively.

Field notes provided by Alcoa are included below.

"Local turbidity monitoring site SE12T recorded a turbidity event exceeding 25NTU for >1 hour on 20/10/2025 for 1 hour and 30 minutes, following 22.2mm of rainfall in the preceding 24 hours. Data trend shows a sharp incline of turbidity at 10:48 am with a gradual decline in turbidity at 12:48pm. The monitoring site was inspected on 21/10/2025 and the stream was clear, shallow and clear. Data trend coincides with the heavy rainfall event. The SE12 catchment was inspected, inclusive of the SE12T investigation monitors. No evidence of mining related contribution to the turbidity exceedance was found."

The SE12T event on 20/10/2025 shows a short-lived turbidity exceedance with a sharp rise and gradual decline that aligns with a 22.2 mm rainfall event, consistent with a rainfall-runoff response rather than a sustained discharge. At the time of inspection on 21/10/2025, the stream was clear, shallow and flowing at low turbidity, and erosion controls adjacent to the Wittwer haul road were found to be operating effectively. Catchment inspections, including the SE12T investigation sites, did not identify any mining-related disturbance or discharge that could account for the exceedance. On this basis, the SE12T event is interpreted as a transient, rainfall-driven turbidity response from non-mining areas within the SE12 catchment as per previous reports, and is classified as a True, non-mining-related event.

5.2.4. HUN-2510-029 Additional Investigation

The event, occurring between 13:12 and 14:36 on the 20th of October at SE51T does not exhibit the typical sharp, incline in turbidity levels however the initial spike and gradual return to baseline levels in pattern resembling a normal (Gaussian) distribution as shown Figure 7 below indicates a potential drainage event.

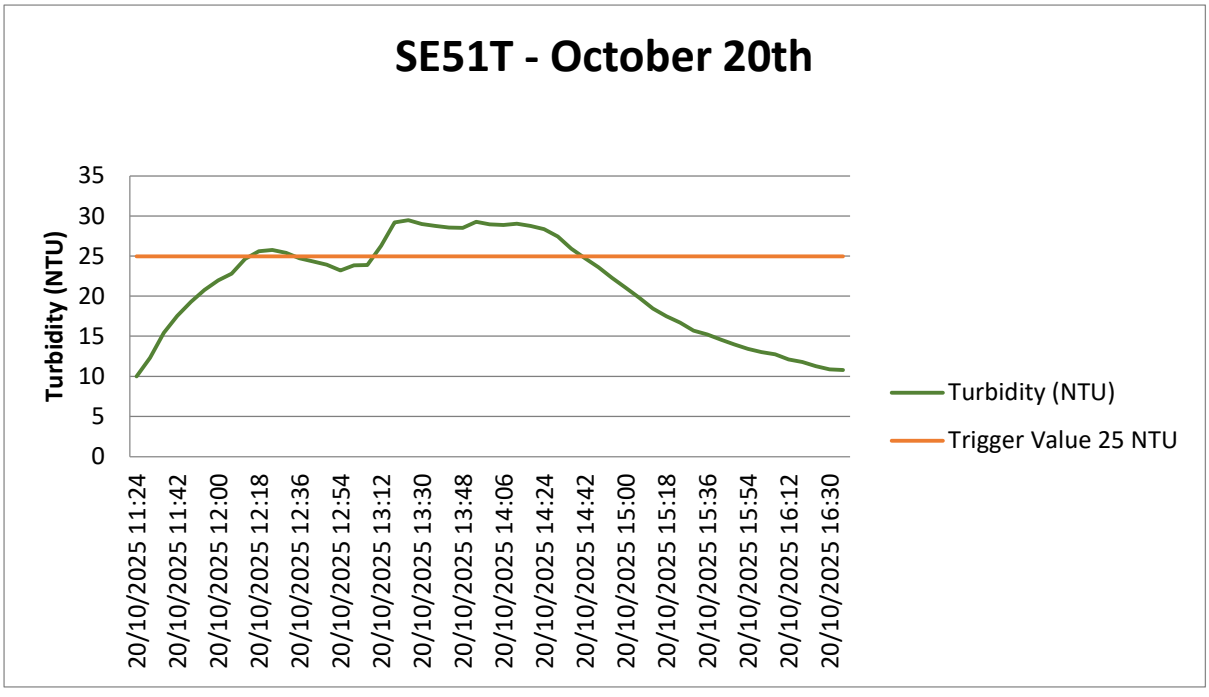

Figure 7 – HUN-2510-029

Further investigation into the event and location has determined the following

- The event occurred following a period of intense rainfall, with 13mm recorded in less than 2.5 hours.
- The inspection of the SE51T monitoring site following the rain event identified an increase in depth and flow in comparison to previous inspections.
- The increase in turbidity aligns with the receipt of rainfall, potentially indicating a turbidity source in close proximity to the monitor. The drainage event at Ingpen 5 occurred approximately 2.8km upstream.
- Inspection of the drainage event showed localised sediment deposition approximately 3 meters into the forest, and evidence of water movement approximately 35m into the forest. The stream is approximately 330m away.
- No further potential mining contributions were found during inspection of the SE51T catchment

Field notes provided by Alcoa are included below.

"Compliance monitoring site SE51T recorded a turbidity event exceeding 25 NTU for >1 hour on the 20 October 2025. The event was recorded on 20 October 2025 from 1:12 PM to 2:36 PM, with a duration of 1 hour and 24 minutes. The average turbidity value during the event was 28.43 NTU, with a peak of 29.48 NTU. There was 16.4mm of rainfall recorded in the preceding 24 hours. The SE51T turbidity monitor has been offline on the Alcoa telemetry platform since 12 October 2025 due to signal loss and was manually downloaded in-field on 26 October 2025. At the time of inspection, the stream was clear, and the sensor was clean and free of debris. Data analysis indicates that turbidity values increased in correlation with rising rainfall, with both trends closely aligned, suggesting a close source. Inspection of the SE51T catchment area commenced on 26 October 2025 which identified erosion from a long-term forest track reinstated during the previous year's rehabilitation at Ingpen 5. Stormwater run-off bypassed installed sediment controls, resulting in sediment deposition approximately 3 meters from the pit edge and water flow extending approximately 35m into the forest."

The SE51T event on 20/10/2025 shows a turbidity exceedance that rises and falls in step with a 16.4 mm rainfall period, which is consistent with a rainfall-runoff response rather than a sustained discharge. The manual data download and subsequent inspection confirmed a clear stream and clean sensor, ruling out logger malfunction or probe fouling as the cause. Catchment inspections considered the reinstated DBCA forest track at Ingpen 5 (rehabilitated by Alcoa); however, investigation of the drainage incident found no evidence of water flowing from that area to the stream, and Alcoa does not consider it to have contributed to the event. Overall, the temporal alignment between rainfall intensity and indicates the exceedance was driven by rainfall-related catchment runoff rather than mining activities. The SE51T exceedance is therefore classified as a True, non-mining-related turbidity event.

5.2.5. HUN-2510-031 and HUN-2510-032 Additional Investigation

On 20 October 2025, compliance turbidity monitoring site SE52T recorded two turbidity events during a rainfall event. The first event (12:12–15:36) and the second event (15:48–16:54) both show a rise in turbidity followed by a gradual return towards baseline in a bell-shaped pattern (Figures 8 and 9), consistent with the characteristics of a True event under the *Turbidity Event Classification Guidelines*.

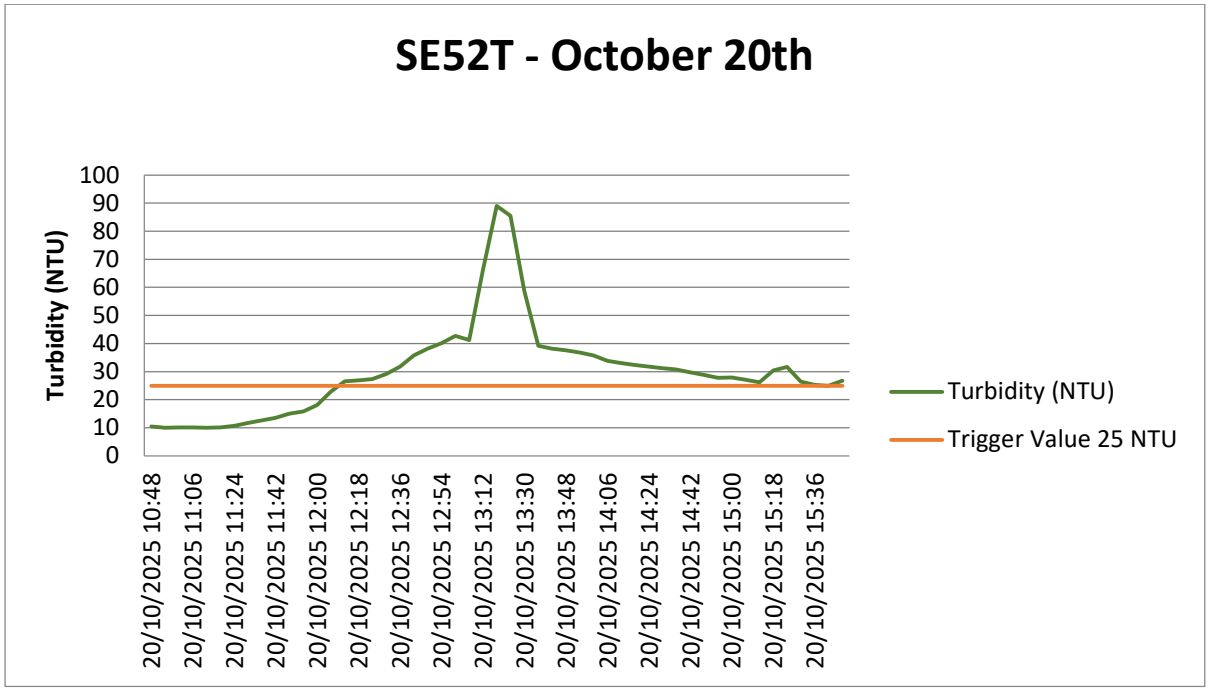

Figure 8 – HUN-2510-031

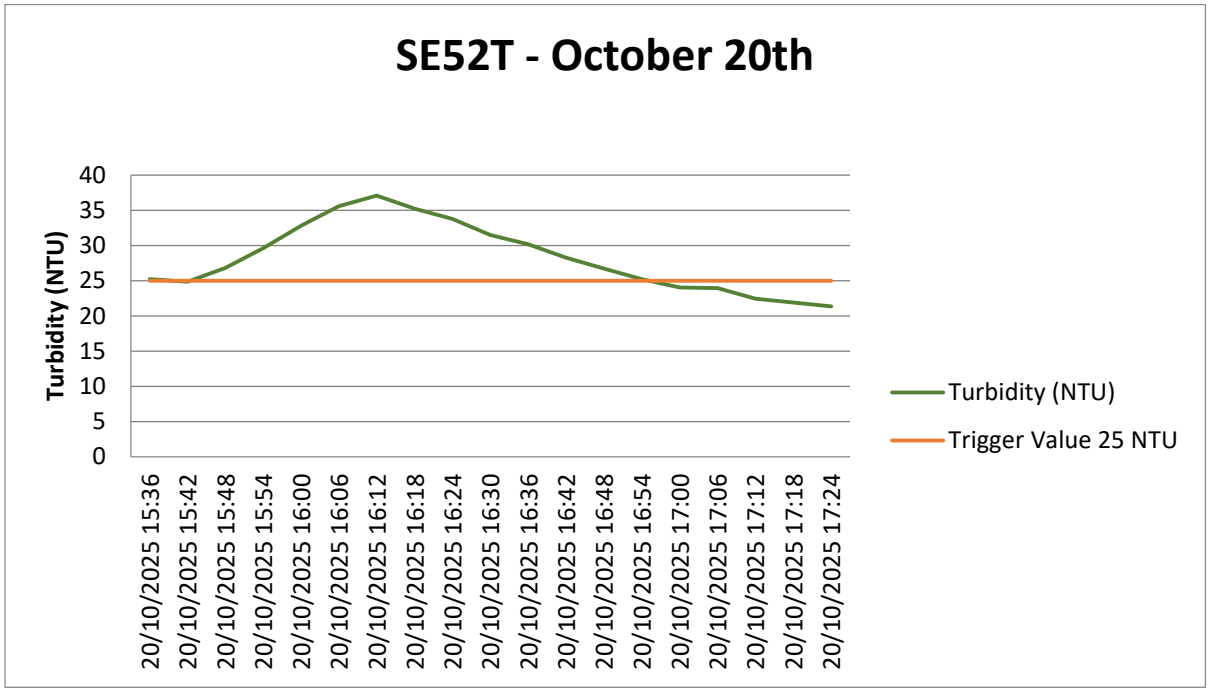

Figure 9 – HUN-2510-032

Further investigation into the event and location has determined the following

- Both events coincided with rainfall, with 19.6 mm and 17.2 mm recorded in the preceding 24 hours at the onset of the first and second events respectively.
- The monitoring site was inspected on 21 October 2025; the stream was flowing and clear with a measured turbidity of 8.7 NTU.
- Catchment inspection identified no evidence of mining-related contributions to the turbidity exceedances.

Field notes provided by Alcoa are included below.

"Compliance turbidity monitoring site SE52T recorded 2 turbidity events exceeding 25 NTU for >1 hour on 20 October 2025, during a 23 mm rain event. The first event was recorded on 20 October 2025 from 12:12 PM to 3:36 PM, with a duration of 3 hours and 24 minutes. The average turbidity value during the event was 37.17 NTU, with a peak of 89.02 NTU. There was 19.6mm of rainfall recorded in the preceding 24 hours. The second event was recorded on 20 October 2025 from 3:48 PM to 4:54 PM, with a duration of 1 hour and 6 minutes. The average turbidity value during the event was 31.06 NTU, with a peak of 37.09 NTU. There was 17.2mm of rainfall recorded in the preceding 24 hours. The monitoring site was inspected on 21 October 2025. The stream was flowing and clear, with a measured value of 8.7 NTU. Data analysis shows a rise in turbidity values coinciding with a period of increasing rainfall intensity, followed by a brief spike potentially caused by debris interference. Turbidity values then begin to decline during a period of no rainfall, before again increasing with the rain. The SE52T catchment area was inspected, no mining related contributions to the turbidity exceedance were found."

The two SE52T events on 20/10/2025 occur within the same rainfall system and show turbidity rising and falling in step with changes in rainfall intensity, rather than remaining persistently elevated. The first event and second event both display a typical rainfall-runoff response, with a brief sharper spike consistent with short-term debris or hydraulic interference rather than a separate discharge source. At the time of inspection, the stream was flowing and clear at 8.7 NTU, and no mining-related disturbance or discharge was identified in the catchment. On this basis, the SE52T exceedances on 20/10/2025 are interpreted as rainfall-driven turbidity responses from non-mining areas and are classified as True, non-mining-related turbidity events.

5.2.6. HUN-2510-034 Additional Investigation

The event, occurring between 11:24 and 14:06 on the 20th of October at SE59T does not exhibit the typical sharp, incline in turbidity levels however the initial spike and gradual return to baseline levels in pattern resembling a normal (Gaussian) distribution as shown Figure 10 below indicates a potential drainage event.

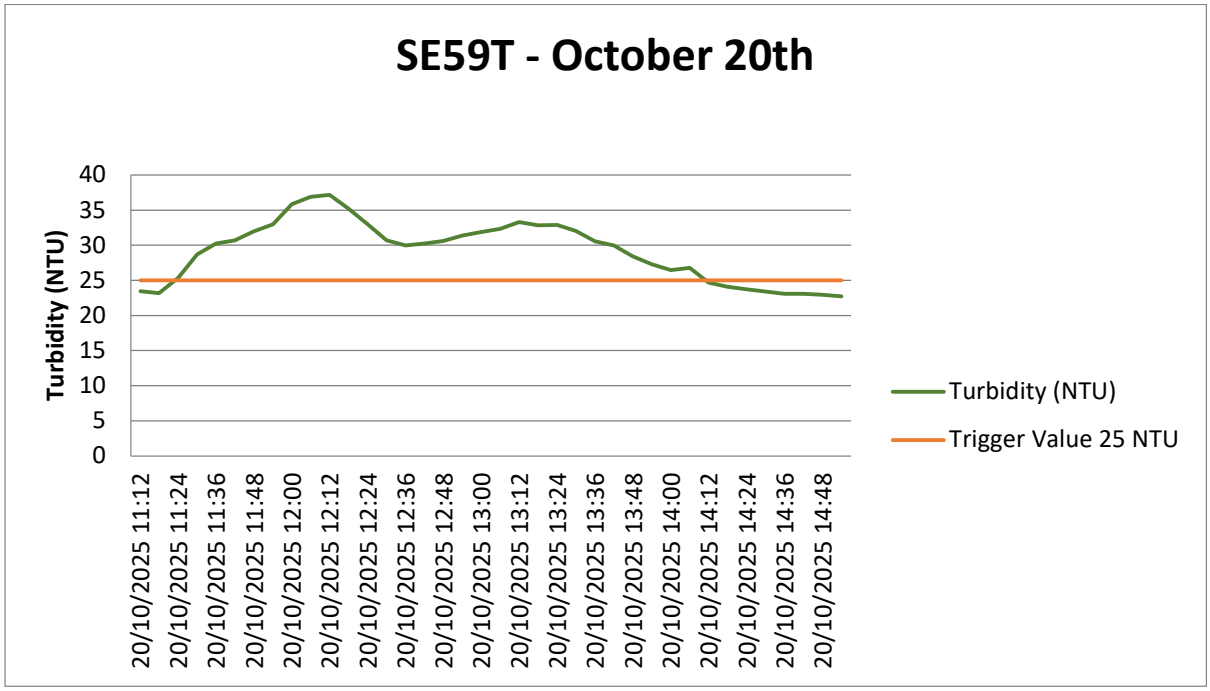

Figure 10 - HUN-2510-034

Further investigation into the event and location has determined the following

- The event occurred during a rainfall period.
- Catchment inspection identified no evidence of mining-related contributions to the turbidity exceedance.
- At the time of inspection on 21 October 2025, the stream was flowing at high velocity with cascading water, creating turbulence around the sensor.

Field notes provided by Alcoa are included below.

"Compliance turbidity monitoring site SE59T recorded a turbidity event exceeding 25 NTU for >1 hour on 20 October 2025. The event was recorded on 20 October 2025 from 11:24 AM to 2:06 PM, with a duration of 2 hours and 42 minutes. The average turbidity value during the event was 31.27 NTU, with a peak of 37.18 NTU. There was 15.6 mm of rainfall recorded in the 24 hours preceding the event. The monitoring site was inspected on 21 October 2025. The stream was flowing at high velocity, with turbulence generated by cascading water likely contributing to sensor interference. Data analysis shows an initial rapid spike potentially caused by debris interference, followed by a gradual trend. The SE59T catchment area was inspected, no evidence of mining related contribution to the turbidity exceedance was found."

The SE59T exceedance on 20/10/2025 occurred under high-flow conditions following 15.6 mm of rainfall, with the turbidity record showing an initial sharp spike and then a more gradual pattern as flows stabilised. The high-velocity, cascading flow observed during inspection is consistent with turbulence and short-term debris interference around the sensor, rather than a sustained source of sediment or discharge. No mining-related

disturbance or discharge was identified in the catchment. On this basis, the SE59T event is interpreted as a rainfall-related turbidity response influenced by high-flow sensor disturbance from non-mining sources and is classified as a True, non-mining-related turbidity event.

5.3. True Event(s)

Eight 'True' turbidity events were identified during the reporting period, all occurring on 20 October 2025 at sites SE02T, SE05T, SE12T, SE12INV, SE51T, SE52T and SE59T, including two separate events at SE52T. Each event met the trigger criteria of turbidity >25 NTU sustained for ≥1 hour. Based on rainfall timing, event shape (turbidity rising and falling in step with rainfall intensity), paired-site information, and field observations, all events are assessed as True but non-mining related. The events at SE02T, SE12T and SE12INV are consistent with rainfall-runoff mobilising sediment from non-mining disturbed areas and/or forest track catchments upstream of the monitors. The SE51T event similarly displays a rainfall-runoff signature, and investigation of the drainage incident found no evidence of water flowing from the reinstated DBCA forest track at Ingpen 5 to the stream; accordingly, the turbidity response is attributed to rainfall-driven catchment runoff rather than a specific track discharge or mining activity. The events at SE05T and SE52T are aligned with short-lived, rainfall-driven increases in turbidity, with one SE52T event showing an additional brief spike consistent with debris or hydraulic interference. The SE59T event is likely associated with high-velocity flows causing localised sensor disturbance under elevated streamflow conditions, rather than mining-related discharge.

5.4. False Event(s)

Twenty-seven 'False' events were identified during the reporting period. Rationale on potential causes is summarised below.

Table 3 False Events Rationale

Event ID	Monitor ID	Rationale	Field Notes
HUN-2510-001	ND12T	This event is marked by a gradual increase in turbidity followed by a rapid decrease. This is indicative of a false event.	Site Inspected due to exceedance notification. Stream was flowing and clear. However, the sensor was heavily impacted by red algae. Turbidity reading on arrival was 58.98NTU, then post clean significantly dropped to 2.04 NTU. No rainfall was received during the event period.
HUN-2510-002	SE02T	This event is marked by a gradual increase in turbidity followed by a rapid decrease. This is indicative of a false event.	Site visited on 08/10/2025, stream flowing and clear. Stream bed and sensor heavily impacted with red algae. Data trend slowly inclining with some spikes indicates sensor impacted by algae and organic debris. Event occurred outside rain event. NTU on arrival 34.3803, post clean 6.4737.
HUN-2510-003	SE02T	This event is marked by a gradual increase in turbidity followed by a rapid decrease. This is indicative of a false event.	Site visited on 08/10/2025, stream flowing and clear. Stream bed and sensor heavily impacted with red algae. Data trend slowly inclining with some spikes indicates sensor impacted by algae and organic debris. Event occurred outside rain event. NTU on arrival 34.3803, post clean 6.4737.
HUN-2510-005	SE05T	This event is marked by a gradual increase in turbidity followed by a rapid decrease. This is indicative of a false event.	Site inspected due to exceedance notification and end of month download. The stream was clear and flowing, however the sensor was impacted by the silty stream bed. Turbidity recorded 48.18 NTU upon arrival and decreased to 8.65 NTU after sensor cleaned. 0.4 mm rainfall was received in the 24 hours proceeding this event. A Review of the turbidity trend indicates a gradual rise and significant drop when the sensor was cleaned, thereby indicating a false event.
HUN-2510-006	SE05T	This event is marked by a gradual increase in turbidity followed by a rapid	Site Inspected due to exceedance notification. Stream was flowing and clear. However, there was built up debris

Event ID	Monitor ID	Rationale	Field Notes
		decrease with multiple sporadic peaks. This is indicative of a false event.	surrounding the sensor and the sensor/float cell were heavily impacted by red algae. Turbidity reading on arrival was 70 NTU, then post clean significantly dropped to 7.75 NTU. The float cell is also reading correctly after being cleaned. No rainfall was received in the 24 hours proceeding this event.
HUN-2510-007	SE05T	This event is marked by a gradual increase in turbidity followed by a rapid decrease. This is indicative of a false event.	Site Inspected due to exceedance notification. Stream was flowing and clear. However, there was built up debris surrounding the sensor and the sensor/float cell were heavily impacted by red algae. Turbidity reading on arrival was 70 NTU, then post clean significantly dropped to 7.75 NTU. The float cell is also reading correctly after being cleaned. No rainfall was received in the 24 hours proceeding this event.
HUN-2510-009	SE06T	This event is marked by a rapid increase in turbidity followed by a rapid decrease. This is indicative of a false event.	Site visited on 12/10/2025, stream is flowing, shallow and clear. No rainfall prior or during this event. The data trend spike of rapid incline and decline, it is likely organic debris or fauna crossing impacted the sensor.
HUN-2510-010	SE08T	This event is marked by multiple sporadic peaks. This is indicative of a false event.	Site visited on 08/10/2025, stream flowing and clear. Observed stream depth has dropped as sensor was partially above the stream. No rainfall preceding or across this event.
HUN-2510-011	SE08T	This event is marked by multiple sporadic peaks. This is indicative of a false event.	Site visited on 08/10/2025, stream flowing and clear. Observed stream depth has dropped as sensor was partially above the stream. No rainfall preceding or across this event.
HUN-2510-012	SE08T	This event is marked by a gradual increase in turbidity followed by a rapid decrease with multiple sporadic peaks. This is indicative of a false event.	Site visited on 08/10/2025, stream flowing and clear. Observed stream depth has dropped as sensor was partially above the stream. No rainfall preceding or across this event.

Event ID	Monitor ID	Rationale	Field Notes
HUN-2510-013	SE08T	This event is marked by a rapid increase in turbidity followed by a rapid decrease. This is indicative of a false event.	Site visited on 08/10/2025, stream flowing and clear. Observed stream depth has dropped as sensor was partially above the stream. No rainfall preceding or across this event.
HUN-2510-014	SE08T	This event is marked by a rapid increase in turbidity followed by a rapid decrease. This is indicative of a false event.	Site visited on 08/10/2025, stream flowing and clear. Observed stream depth has dropped as sensor was partially above the stream. No rainfall preceding or across this event.
HUN-2510-015	SE08T	This event is marked by a gradual increase in turbidity followed by a rapid decrease. This is indicative of a false event.	Site visited on 08/10/2025, stream flowing and clear. Observed stream depth has dropped as sensor was partially above the stream. Rainfall of 0.4mm preceding this event.
HUN-2510-016	SE11T	This event is marked by multiple sporadic peaks. This is indicative of a false event.	Analysis of turbidity data trend shows rapid incline and decline, indicating a false event. There was no rainfall in the 24 hours proceeding the event.
HUN-2510-017	SE11T	This event is marked by multiple sporadic peaks. This is indicative of a false event.	Analysis of turbidity data trend shows rapid incline and decline, indicating a false event. There was no rainfall in the 24 hours proceeding the event.
HUN-2510-018	SE11T	This event is marked by a gradual increase in turbidity followed by a gradual decrease. This is indicative of a false event.	Analysis of turbidity data trend shows rapid incline and decline, indicating a false event. There was no rainfall in the 24 hours proceeding the event.
HUN-2510-020	SE12INV	This event is marked by a gradual increase in turbidity followed by a gradual decrease. This is indicative of a false event.	Site visited on 01/11/2025. Stream is flowing, very shallow. No signs of silt or turbidity.
HUN-2510-021	SE12INV	This event is marked by a gradual increase in turbidity followed by a	Site visited on 01/11/2025. Stream is flowing, very shallow. No signs of silt or turbidity.

Event ID	Monitor ID	Rationale	Field Notes
		gradual decrease. This is indicative of a false event.	
HUN-2510-022	SE12INV	This event is marked by a gradual increase in turbidity followed by a gradual decrease with multiple sporadic peaks. This is indicative of a false event.	Site visited on 01/11/2025. Stream is flowing, very shallow. No signs of silt or turbidity.
HUN-2510-024	SE23T	This event is marked by a gradual increase in turbidity followed by a gradual decrease. This is indicative of a false event.	Site visited on 13/10/2025 and stream is dry. Stream was ponded at site visit on 03/10/2025. The float activated to dry on 03/10/2025 at 13:48. No rainfall during the preceding 24 hrs. This event has occurred due to inadequate stream depth for sensor due to stream drying.
HUN-2510-025	SE48T	This event is marked by a gradual increase in turbidity followed by a gradual decrease with multiple sporadic peaks. This is indicative of a false event.	Site visited on 08/10/2025, stream flowing and clear. Observed stream depth has dropped as sensor was above the stream on arrival. No rainfall preceding or across this event.
HUN-2510-026	SE48T	This event is marked by a gradual increase in turbidity followed by a gradual decrease with multiple sporadic peaks. This is indicative of a false event.	Site visited on 08/10/2025, stream flowing and clear. Observed stream depth has dropped as sensor was above the stream on arrival. No rainfall preceding or across this event.
HUN-2510-027	SE48T	This event is marked by a gradual increase in turbidity followed by a gradual decrease with multiple sporadic peaks. This is indicative of a false event.	Site visited on 08/10/2025, stream flowing and clear. Observed stream depth has dropped as sensor was above the stream on arrival. Rainfall of 4.8mm preceding this event.
HUN-2510-028	SE48T	This event is marked by a gradual increase in turbidity followed by a gradual decrease with multiple sporadic peaks. This is indicative of a false event.	Site visited on 08/10/2025, stream flowing and clear. Observed stream depth has dropped as sensor was above the stream on arrival. No rainfall preceding or across this event.

Event ID	Monitor ID	Rationale	Field Notes
HUN-2510-030	SE52T	This event is marked by a gradual increase in turbidity followed by a rapid decrease with multiple sporadic peaks. This is indicative of a false event.	Sensor removed for assessment to verify the recent baseline measurements of 13-15NTU as the stream is very clear. Replacement sensor faulty and logging erroneous data - high NTU and dropping below calibration. Site inspected 13/10/2025, stream very clear and no algae/debris impacting the lens. Sensor scheduled for assessment/repair
HUN-2510-030	SE52T	This event is marked by a gradual increase in turbidity followed by a rapid decrease with multiple sporadic peaks. This is indicative of a false event.	Sensor removed for assessment to verify the recent baseline measurements of 13-15NTU as the stream is very clear. Replacement sensor faulty and logging erroneous data - high NTU and dropping below calibration. Site inspected 13/10/2025, stream very clear and no algae/debris impacting the lens. Sensor scheduled for assessment/repair
HUN-2510-033	SE52T	This event is marked by a rapid increase in turbidity followed by a rapid decrease. This is indicative of a false event.	Compliance turbidity monitor site SE52T was inspected 1 November 2025 due to turbidity exceedance 28 October 2025. The stream was clear and flowing, however the sensor is thought to have been impacted from algae. No rainfall was recorded 24 hours before the turbidity event & the data appears to be erroneous. The probe was cleaned and repositioned in the stream. After the clean the turbidity data read 3.4 NTU.

5.5. Excluded WQMS Units

Ten WQMS Units were excluded from analysis due to erroneous data. Alcoa confirmed the invalidity of data recorded from these units and provided commentary on the condition of each.

Table 4 Excluded WQMS Units

Unit	Dates/	Comments
ND07T	10/10/2025-16/10/2025	Sensor reading fault code on 10/10/2025, 15/10/2025 & 16/10/2025 due to damaged sensor cable. Sensor cable replaced on 16/10/2025.
PD02T	01/10/2025-31/10/2025	Awaiting water Corp approval to access Pipe head catchment
PD03T	01/10/2025-31/10/2025	Awaiting water Corp approval to access Pipe head catchment
SE01T	18/09/2025-31/10/2025	Unit removed from the field on 18/09/2025 due to DBCA prescribed burns
SE07T	17/09/2025-31/10/2025	Unit removed from the field on 18/09/2025 due to DBCA prescribed burns. Awaiting DBCA approval to access for reinstatement once prescribed burns are completed.
SE15T	18/09/2025-31/10/2025	Unit removed from the field on 18/09/2025 due to DBCA prescribed burns
SE23T	10/10/2025-31/10/2025	Stream dry as of 10/10/2025 (dry stream turbidity events omitted)
SE53T	18/09/2025-31/10/2025	Unit removed from the field on 18/09/2025 due to DBCA prescribed burns
SE60T	18/09/2025-31/10/2025	Unit removed from the field on 18/09/2025 due to DBCA prescribed burns
SE61T	18/09/2025-31/10/2025	Unit removed from the field on 18/09/2025 due to DBCA prescribed burns

5.6. Missing Data

Periods of missing data are detailed in Table 5.

Table 5 Missing Data Summary

Missing Data ID	Unit	Start	End	Comments
MD-2510-001	SE11T	22/10/2025 9:11	22/10/2025 10:41	Some erroneous data. Sensor intermittently dropping below calibration and recording blocks of repetitive values. Sensor recalibrated on 23/10/2025, this did not resolve the issue. Scheduled for replacement.
MD-2510-002	SE34T	16/10/2025 22:21	17/10/2025 8:02	Sensor reading fault code intermittently between 8/10/2025 & 19/10/2025.

				Potential water ingress to the cable, fault is being monitored and will be scheduled for repair if required.
MD-2510-003	SE34T	17/10/2025 18:39	18/10/2025 0:00	Sensor reading fault code intermittently between 8/10/2025 & 19/10/2025. Potential water ingress to the cable, fault is being monitored and will be scheduled for repair if required.
MD-2510-004	SE34T	18/10/2025 17:41	19/10/2025 11:15	Sensor reading fault code intermittently between 8/10/2025 & 19/10/2025. Potential water ingress to the cable, fault is being monitored and will be scheduled for repair if required.

6. Appendices

Appendix A. Huntly Raw WQMS Data

Date	Huntly WQMS Data – October 2025 - Events with turbidity > 25 NTU for an hour or more																
	DB01T	DB02T	FPWR1	ND04T	ND06T	ND07T	ND12T	ND13T	ND14T	PD01T	SE01T	SE02T	SE03T	SE05T	SE06T	SE07T	SE08T
1/10/2025														**1**			
2/10/2025																	
3/10/2025																	**2**
4/10/2025																	
5/10/2025																	**1**
6/10/2025																	**1**
7/10/2025												**1**					**1**
8/10/2025												**1**					**1**
9/10/2025																	
10/10/2025																	
11/10/2025															**1**		
12/10/2025																	
13/10/2025																	
14/10/2025																	
15/10/2025							**1**							**2**			
16/10/2025																	
17/10/2025																	
18/10/2025																	
19/10/2025																	
20/10/2025												**1**		**1**			
21/10/2025																	
22/10/2025																	
23/10/2025																	
24/10/2025																	
25/10/2025																	
26/10/2025																	
27/10/2025																	
28/10/2025																	
29/10/2025																	
30/10/2025																	
31/10/2025																	

Note: False events have been annotated by **black** bold text. True events are annotated by **red** bold text

Date	Huntly WQMS Data -October 2025 - Events with turbidity > 25 NTU for an hour or more																
	SE09T	SE10T	SE11T	SE12T	SE12INV	SE15T	SE34T	SE36T	SE48T	SE51T	SE52T	SE53T	SE59T	SE60T	SE61T	SE62T	SN07T
1/10/2025																	
2/10/2025									**1**								
3/10/2025									**1**								
4/10/2025									**1**								
5/10/2025																	
6/10/2025									**1**								
7/10/2025																	
8/10/2025																	
9/10/2025											**1**						
10/10/2025																	
11/10/2025											**1**						
12/10/2025																	
13/10/2025																	
14/10/2025																	
15/10/2025			**2**														
16/10/2025			**1**														
17/10/2025																	
18/10/2025																	
19/10/2025																	
20/10/2025				**1**	**1**					**1**	**2**		**1**				
21/10/2025																	
22/10/2025																	
23/10/2025																	
24/10/2025																	
25/10/2025																	
26/10/2025																	
27/10/2025																	
28/10/2025											**1**						
29/10/2025					**1**												
30/10/2025					**1**												
31/10/2025					**1**												

Note: False events have been annotated by **black** bold text. True events are annotated by **red** bold text

Date	Huntly WQMS Data – October 2025 - Events with turbidity > 25 NTU for an hour or more																	
	SE22T	SE23T	SE24T	SE25T	SE26T	SE03INV1	SE03INV3											
1/10/2025																		
2/10/2025		**1**																
3/10/2025																		
4/10/2025																		
5/10/2025																		
6/10/2025																		
7/10/2025																		
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30/10/2025																		
31/10/2025																		

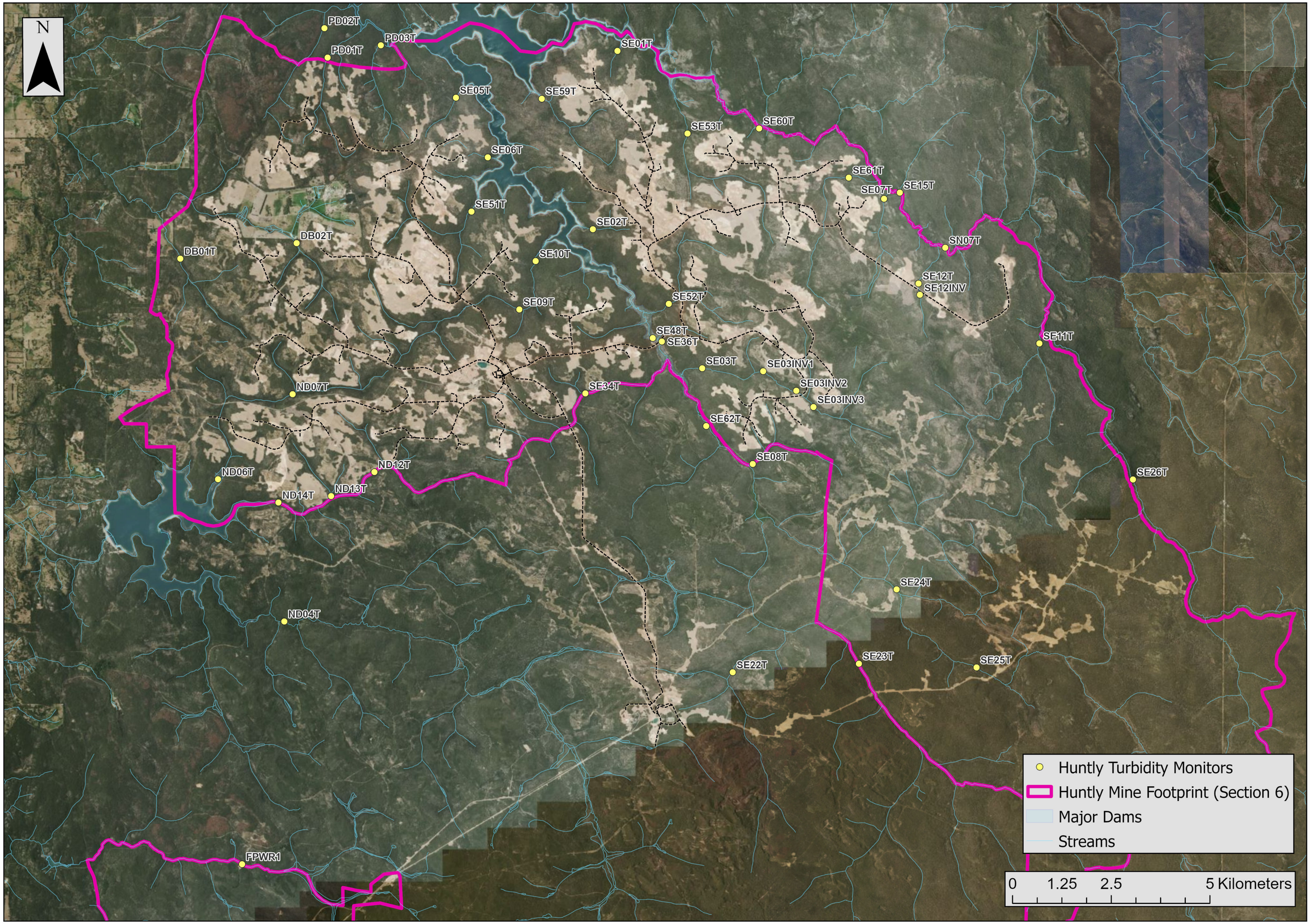
Note: False events have been annotated by **black** bold text. True events are annotated by **red** bold text

Date	Huntly WQMS Data – October 2025 - Turbidity (Daily Average, NTU)																
	DB01T	DB02T	FPWR1	ND04T	ND06T	ND07T	ND12T	ND13T	ND14T	PD01T	SE01T	SE02T	SE03T	SE05T	SE06T	SE07T	SE08T
1/10/2025	1.01	1.69	0.02	0.92	3.02	0.79	3.29	0.34	0.88	4.19	0.73	1.01	5.45	25.05	0.71		1.36
2/10/2025	1.01	2.00	0.03	1.12	1.91	0.79	3.60	0.35	0.83	4.30	0.73	1.01	5.49	34.57	0.80		1.49
3/10/2025	1.01	1.42	0.05	1.15	2.08	0.80	4.07	0.36	0.84	4.54	0.78	1.01	4.32	30.36	0.83		14.07
4/10/2025	1.00	1.46	0.02	1.29	3.71	0.88	4.57	0.36	1.08	4.96	1.78	1.00	3.70	9.67	1.36		33.53
5/10/2025	1.00	1.52	0.04	1.53	2.14	0.84	4.37	0.34	0.91	5.08	4.58	1.00	3.76	9.06	1.42		16.77
6/10/2025	1.01	1.62	0.05	1.45	1.83	0.82	4.48	0.35	0.85	4.94	11.72	1.01	3.37	9.15	0.97		11.31
7/10/2025	1.01	1.53	0.03	1.21	1.89	0.82	5.08	0.36	0.84	5.00	21.79	1.01	3.35	9.70	1.69		13.88
8/10/2025	1.01	1.60	0.24	1.12	2.06	0.82	5.61	0.35	0.86	5.20	19.83	1.01	3.54	10.28	1.21		19.52
9/10/2025	1.21	1.56	0.04	2.52	2.27	0.84	6.74	0.37	0.86	5.61	1.10	1.21	3.31	11.29	1.02		1.25
10/10/2025	1.01	1.47	0.02	1.07	2.15	0.84	7.53	0.36	0.89	5.56	1.14	1.01	3.51	12.34	2.31		1.11
11/10/2025	1.01	1.53	0.34	1.03	3.03	0.86	8.41	0.37	0.93	5.72	1.14	1.01	3.63	12.29	11.02		1.11
12/10/2025	1.01	1.50	0.14	1.55	2.23	0.85	8.81	0.36	0.95	5.93	1.12	1.01	3.71	13.43	1.06		1.12
13/10/2025	1.00	1.49	0.04	1.04	2.25	0.92	10.36	0.34	0.91	6.02	1.16	1.00	3.86	16.67	0.71		1.10
14/10/2025	0.99	1.54		0.90	1.59	0.84	14.26	0.33	0.94	6.05	1.17	0.99	4.04	20.04	0.81		1.08
15/10/2025	0.99	1.54		0.74	1.69	0.84	21.83	0.32	1.01	6.07	1.16	0.99	4.24	26.69	0.88		1.06
16/10/2025	0.99	1.87		0.77	1.79	0.83	34.66	0.32	1.00	6.27	1.22	0.99	4.25	37.30	1.26		1.07
17/10/2025	0.99	2.03	0.18	0.78	1.89	0.84	29.72	0.31	1.04	6.38	1.32	0.99	4.27	34.09	2.38		1.07
18/10/2025	0.98	3.79	0.27	0.82	1.96	0.88	2.06	0.30	1.09	6.46	1.51	0.98	4.22	6.36	1.67		1.05
19/10/2025	1.00	2.54	0.06	1.18	2.29	0.97	2.15	0.34	1.13	6.72	2.55	1.00	4.63	7.41	2.10		1.08
20/10/2025	1.06	2.53	0.14	6.00	2.95	1.17	2.24	0.49	1.98	7.82	5.40	1.06	11.42	11.92	2.30		1.14
21/10/2025	1.02	1.86	0.11	1.33	2.33	0.94	2.14	0.37	1.30	4.90	1.18	1.02	6.96	6.05	1.03		1.10
22/10/2025	1.01	1.62	0.06	0.87	2.62	0.81	2.12	0.35	1.40	4.72	0.95	1.01	5.45	6.16	1.98		1.10
23/10/2025	1.00	3.17	0.88	0.79	2.16	0.82	2.15	0.34	0.94	4.70	0.91	1.00	4.99	6.68	1.89		1.10
24/10/2025	1.01	4.19	0.96	2.40	3.94	0.92	2.20	0.37	1.02	5.18	1.67	1.01	6.04	8.56	2.39		1.11
25/10/2025	1.01	1.52	0.96	1.21	2.07	0.87	2.12	0.35	1.05	4.46	1.01	1.01	4.20	7.05	2.43		1.09
26/10/2025	1.00	1.44	0.96	0.84	1.75	0.81	2.09	0.35	0.94	3.27	1.03	1.00	1.99	6.39	0.61		1.11
27/10/2025	0.99	1.43	45.05	1.03	1.64	0.80	2.09	0.32	0.92	3.56	1.07	0.99	1.89	6.85	0.94		1.10
28/10/2025	0.99	1.40	1.28	0.93	1.80	0.78	2.12	0.31	0.98	3.73	1.19	0.99	1.84	7.31	1.03		1.07
29/10/2025	0.98	1.43	16.58	0.96	1.87	0.79	2.15	0.30	1.04	3.83	1.48	0.98	1.85	7.65	1.65		1.09
30/10/2025	0.98	1.60	0.87	1.38	1.97	0.72	2.20	0.32	1.05	4.02	1.48	0.98	1.89	8.06	3.01		1.09
31/10/2025	0.97	2.79	23.92	0.93	2.17	0.63	2.22	0.31	1.12	4.43	2.66	0.97	1.96	9.86	7.21		1.85

Date	Huntly WQMS Data – October 2025 - Turbidity (Daily Average, NTU)																
	SE09T	SE10T	SE11T	SE12T	SE12INV	SE15T	SE34T	SE36T	SE48T	SE51T	SE52T	SE53T	SE59T	SE60T	SE61T	SE62T	SN07T
1/10/2025	1.05	1.24	4.73	2.49	0.79		0.61	1.89	4.33	1.89	15.02		4.01			1.18	7.55
2/10/2025	1.05	0.92	4.41	2.80	0.80		0.62	1.85	16.56	1.89	15.24		4.09			1.17	7.51
3/10/2025	1.05	0.92	4.44	3.04	0.66		0.69	1.88	19.10	1.88	15.47		4.34			1.31	7.60
4/10/2025	1.04	0.96	4.50	3.40	1.57		0.61	1.79	15.22	2.50	15.69		5.96			1.15	7.61
5/10/2025	1.05	1.06	4.33	2.61	0.66		1.33	1.96	3.61	2.15	15.39		5.82			1.22	7.60
6/10/2025	1.05	0.97	4.38	3.05	0.60		0.64	1.92	11.68	1.90	15.32		5.24			1.33	7.61
7/10/2025	1.06	0.96	4.44	3.13	0.66		0.63	1.80	35.93	1.94	15.52		5.93			1.27	7.61
8/10/2025	1.07	0.96	4.48	3.14	0.67		0.63	2.05	4.22	1.89	15.41		6.54			1.24	7.62
9/10/2025	1.07	1.09	4.46	3.29	0.78		0.63	1.98	3.50	1.90	28.93		5.69			1.17	7.62
10/10/2025	1.07	0.96	4.58	4.10	0.79		0.61	2.06	3.48	1.89	59.63		5.87			1.04	7.63
11/10/2025	1.06	0.94	4.48	5.13	0.90		0.62	2.02	3.61	1.89	243.76		7.04			1.05	7.63
12/10/2025	1.05	1.75	4.24	5.24	1.03		0.63	1.78	3.58	1.91	404.20		6.86			1.06	7.64
13/10/2025	1.05	0.93	4.44	5.27	1.15		0.61	1.75	3.52	2.04	278.57		6.69			1.06	7.64
14/10/2025	1.04	0.94	4.19	6.78	1.27		0.63	2.12	3.53	1.98	0.01		6.97			1.05	7.64
15/10/2025	1.04	0.94	77.85	7.30	1.39		0.62	2.19	3.59	2.07	0.01		7.76			1.05	7.64
16/10/2025	1.05	0.96	12.80	8.19	1.62		0.57	2.30	3.61	2.05	4.66		9.92			1.05	7.64
17/10/2025	1.05	0.97	8.88	9.36	2.48		0.53	2.31	3.59	2.08	6.02		7.57			1.12	7.66
18/10/2025	1.03	3.66	9.63	9.94	4.47		0.54	2.45	3.61	2.09	5.85		7.98			1.14	7.65
19/10/2025	1.05	1.20	9.17	7.82	5.69		0.62	2.62	3.74	2.92	6.89		10.22			1.35	7.65
20/10/2025	1.12	1.50	7.84	31.55	20.74		0.71	3.01	4.61	8.13	16.23		16.26			1.68	7.56
21/10/2025	1.05	2.49	4.41	3.90	1.22		0.67	3.32	4.14	2.74	6.95		7.20			1.35	7.63
22/10/2025	1.04	0.96	3.83	3.51	0.68		0.66	2.24	3.80	2.06	3.48		5.05			1.33	7.64
23/10/2025	1.03	0.95	4.68	4.34	0.68		0.66	2.60	3.51	1.97	3.57		5.76			1.53	7.65
24/10/2025	1.05	0.99	4.79	4.84	1.19		0.65	2.79	3.60	2.66	4.31		7.85			1.80	7.65
25/10/2025	1.04	0.96	4.73	5.14	0.74		0.64	2.68	3.56	2.36	2.83		9.07			1.88	7.65
26/10/2025	1.05	0.98	4.81	5.53	0.72		0.64	2.45	3.56	1.91	11.63		7.59			1.08	7.65
27/10/2025	1.04	0.97	4.64	6.42	1.10		2.15	2.02	3.61	1.89	31.86		7.03			1.09	7.35
28/10/2025	1.03	9.56	4.79	12.72	8.59		0.63	1.92	3.60	1.94	26.18		6.75			1.37	7.66
29/10/2025	1.04	0.98	4.84	13.56	17.84		0.59	1.93	3.54	2.02	3.12		5.32			1.30	7.64
30/10/2025	1.04	0.98	4.68	13.18	20.08		0.63	2.05	3.59	1.94	3.48		6.41			1.64	7.61
31/10/2025	1.04	1.04	5.25	13.10	36.83		0.60	1.79	3.75	2.60	4.25		6.65			1.63	7.66

Date	Huntly WQMS Data – October 2025 - Turbidity (Daily Average, NTU)																	
	SE22T	SE23T	SE24T	SE25T	SE26T	SE03INV1	SE03INV3											
1/10/2025	5.74	3.26	2.29	3.10	3.70	2.89	6.07											
2/10/2025	6.46	8.72	2.25	3.80	3.84	2.95	4.97											
3/10/2025	4.03	5.82	2.26	3.01	4.07	2.93	4.63											
4/10/2025	4.22	4.12	2.23	3.01	49.99	5.00	30.98											
5/10/2025	4.73	6.28	2.45	3.12	3.23	29.42	3.59											
6/10/2025	3.90	8.31	2.50	3.06	4.84	3.19	5.04											
7/10/2025	3.92	8.36	2.41	3.50	4.97	30.76	4.85											
8/10/2025	7.84	8.36	2.31	3.51	4.84	29.37	3.27											
9/10/2025	5.84	8.66	2.28	3.05	5.04	29.93	0.72											
10/10/2025	4.45	8.60	2.23	3.18	5.02	81.09	0.71											
11/10/2025	5.17		2.29	3.18	5.00	37.54	0.87											
12/10/2025	6.02		2.26	3.62	4.94	54.65	0.78											
13/10/2025	5.36		2.22	3.86	4.88	2.76	0.84											
14/10/2025	3.68		2.28	3.96	4.79	2.61	0.89											
15/10/2025	3.73		2.35	3.97	4.87	2.68	0.79											
16/10/2025	3.91		2.42	4.44	5.91	2.73	0.98											
17/10/2025	4.32		2.47	4.56	4.98	2.79	0.57											
18/10/2025	4.75		2.55	5.97	4.82	2.86	0.59											
19/10/2025	3.86		2.80	9.16	4.74	3.26	0.90											
20/10/2025	3.82		3.05	6.57	64.60	7.13	1.49											
21/10/2025	3.64		2.73	4.59	4.52	3.72	0.83											
22/10/2025	3.68		2.48	3.89	5.89	3.06	0.76											
23/10/2025	4.32		2.58	4.65	5.81	2.97	0.77											
24/10/2025	3.75		3.43	4.75	7.64	3.33	0.93											
25/10/2025	3.69		5.82	4.23	4.99	3.08	0.84											
26/10/2025	3.71		10.07	4.44	6.50	2.39	0.84											
27/10/2025	4.56		15.34	5.84	6.37	2.33	0.93											
28/10/2025	5.93		5.96	6.68	6.09	2.32	1.13											
29/10/2025	5.70		11.27	6.14	50.46	2.40	0.89											
30/10/2025	6.91		9.68	6.33	5.20	2.34	0.86											
31/10/2025	4.98		3.14	6.17	5.12	2.40	0.81											

Appendix B. Huntly WQMS Locations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PD03T
PD01T
SE01T
SE05T
SE59T
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SE03INV3
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SE62T
SE08T
ND12T
ND06T
ND13T
ND14T
SE26T
SE24T
ND04T
SE23T
SE25T
SE22T
FPWR1
Huntly Turbidity Monitors
Huntly Mine Footprint (Section 6)
Major Dams
Streams
0
1.25
2.5
5 Kilometers

Appendix C. WQMS General Arrangement

ANTENNA

SOLAR PANEL

DATA TRANSMISSION TO IOT

DATA OUTLET

POWER INLET

40 X 60 MM CABLE DUCT

20 AMP MPPT
SOLAR CHARGER

40 X 60 MM CABLE DUCT

SIERRA WIRELESS FX30

40 X 60 MM CABLE DUCT

12 V, 120 AH LI-ION BATTERY

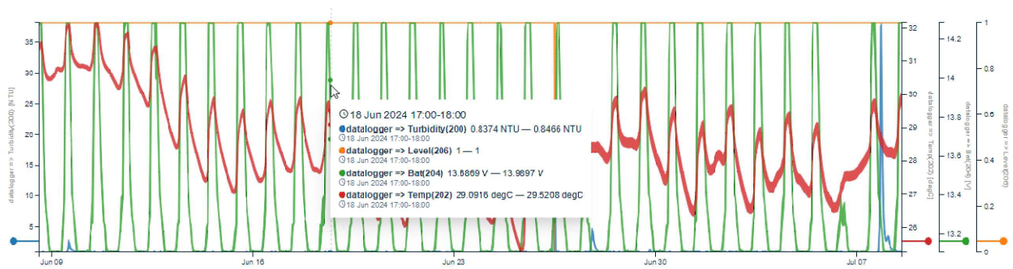
DATA INLET

SENSOR

STREAM DRY

SENSOR

STREAM FLOWING



REV.	REMARKS	DATE	DESIGNED	DRAWN	CHECKED	APPROVED	REFERENCE DRAWINGS
0	ISSUE FOR APPROVAL	05.07.2024	A.K.	S.A.	A.K.	A.K.	

ALL DIMENSIONS IN MILLIMETRES U.N.O.
LEVELS ARE IN METRES ON AHD U.N.O.
DO NOT SCALE DRAWING
IF IN DOUBT - ASK
TOLERANCES ISO2768-m U.N.O.

CLIENT

NSW - BUILDING G, 22 POWERS RD, SEVEN HILLS, NSW 2147
(02) 8385 5357
WA - 512, 1A QUEEN ST FREEMANTLE WA 6160
(08) 6245 9843
waterservices@scidev.com.au
www.scidev.com.au
SCIDEV

TITLE
IOT TURBIDITY MONITORING STATION
SITE LAYOUT
GENERAL ARRANGEMENT

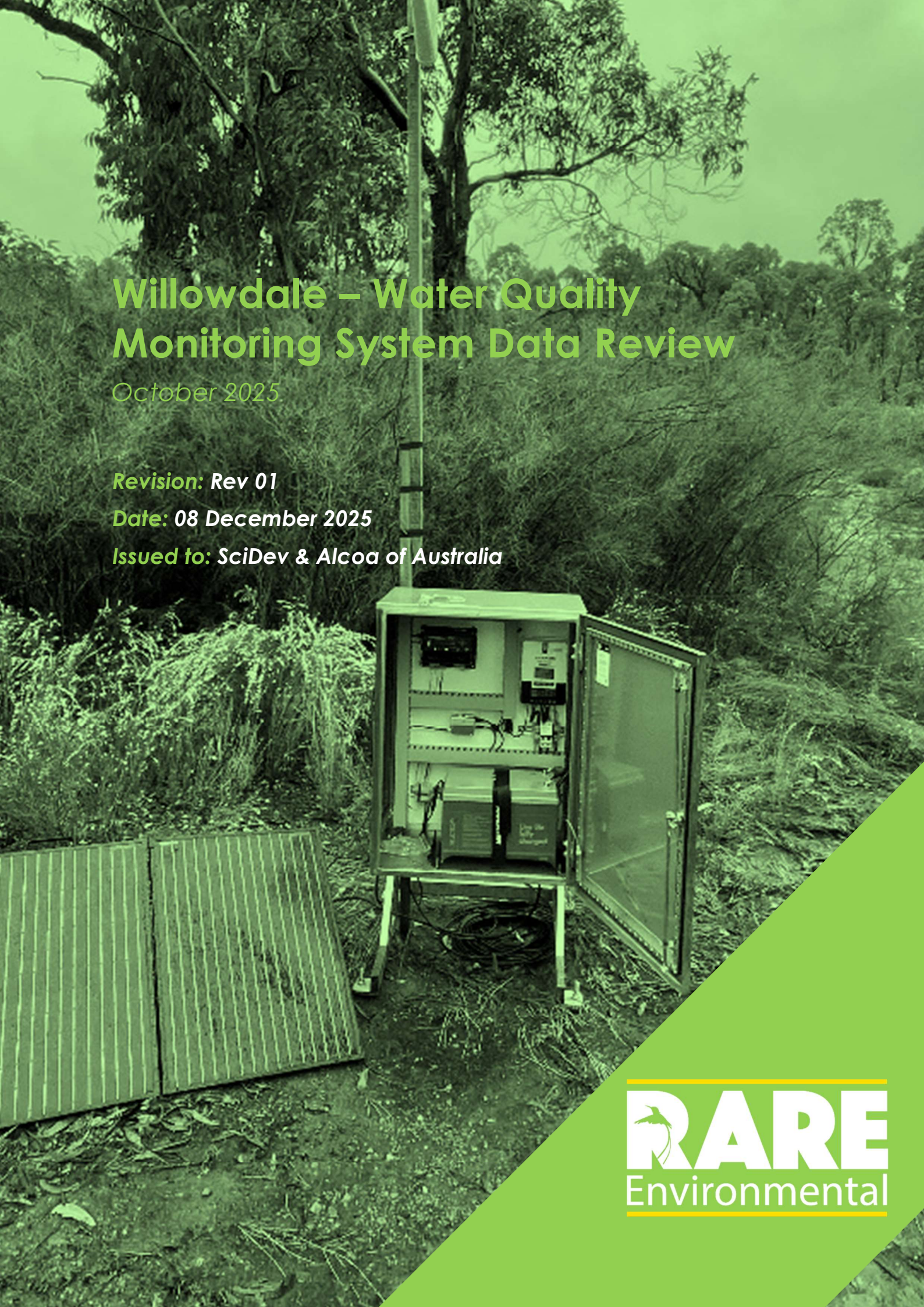
SHEET 1 OF 2

SCALE NTS OR AS SHOWN

DRAWING NO.
HI0090 - ALCOA WQMS

SHEET SIZE
A3

REV.
1



Willowdale – Water Quality Monitoring System Data Review

October 2025

Revision: ***Rev 01***

Date: ***08 December 2025***

Issued to: ***SciDev & Alcoa of Australia***

RARE Environmental

Document Control

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Document History and Status						
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01	08/12/25	Issued to client	MM	GD	GD	Alcoa

Report Sign Off					
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Prepared by		Technical Review		Approved for Issue	
Michael Minter		Georgia Duffy		Georgia Duffy	
Name	Michael Minter	Name	Georgia Duffy	Name	Georgia Duffy
Position	Env. Engineer	Position	Chemical Engineer	Position	Chemical Engineer
Date	08/12/25	Date	08/12/25	Date	08/12/25

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Infrastructure Sustainability Council MEMBER

Contents

1. Executive Summary

This report, prepared by RARE Environmental Pty Ltd and SciDev Pty Ltd for Alcoa, provides an analysis of turbidity data collected from Water Quality Monitoring Systems (WQMS) deployed at the Willowdale bauxite mining operations during October 2025. The primary objective of this analysis was to evaluate the quality of the data, identify potential "true" turbidity exceedance events, and support Alcoa's compliance reporting obligations under Schedule 1, Division 2, Clause 6 of the **Environmental Protection (Darling Range Bauxite Mining Proposal) Exemption Order 2023**.

The analysis focused on identifying and classifying turbidity events where levels exceeded 25 nephelometric turbidity units (NTU) for at least one hour. Events were categorized as "true" or "false" based on Alcoa's **Turbidity Event Classification Guidelines**, which distinguish actual turbidity increases (true events) from false readings caused by environmental factors such as debris, air bubbles, or fluctuating water levels.

Key findings include:

- **False Events**: One 'False' event was identified, primarily attributed to sensor obstruction, and water turbulence.
- **Further Investigation**: Zero events were flagged for further investigation.
- **True Events**: Zero "True" turbidity exceedance event were identified.
- **Excluded Units**: Zero WQMS units were temporarily excluded from the analysis due to invalid data caused by equipment faults or environmental interference.

The report also highlights periods of missing data, which occurred due to system logoffs, equipment faults, or unplanned shutdowns. These gaps are detailed in the report to ensure transparency in data handling.

2. Scope

RARE Environmental Pty Ltd and SciDev Pty Ltd were engaged by Alcoa to analyse turbidity data collected from the Willowdale Water Quality Monitoring Systems (WQMSs). The primary objective of this engagement is to assess the quality of the collected data and identify potential "true" turbidity events. This analysis supports Alcoa's reporting obligations under *Schedule 1, Division 2, Clause 6 of the Environmental Protection (Darling Range Bauxite Mining Proposal) Exemption Order 2023*.

3. Introduction

3.1. Background

Alcoa of Australia Ltd (Alcoa) operates two bauxite mines, Huntly and Willowdale, approximately 100 km southeast of Perth, Western Australia. These mining operations are subject to environmental controls mandated by the *Environmental Protection (Darling Range Bauxite Mining Proposal) Exemption Order 2023*.

Under this Exemption Order, Alcoa is required to implement drainage control measures and monitor effectiveness in water bodies within and downstream of mining operations. Turbidity, a critical water quality parameter, is monitored using Water Quality Monitoring Systems (WQMSs), to detect deviations and identify high-turbidity events.

Alcoa is obligated to report monthly on-stream turbidity, including the identification and classification of any “true” high-turbidity exceedance events. (Refer to Appendix B for the site map showing WQMS locations.)

3.2. Monitoring requirements

Environmental Protection (Darling Range Bauxite Mining Proposal) Exemption Order 2023 specifies that a drainage incident occurs when:

> *a) runoff from a disturbance area enters the surrounding environment, resulting in surface water turbidity of at least 25 NTU for a duration of at least one hour; or*
>
> *b) a discharge from containment infrastructure includes, or October include, environmentally hazardous material.*

Trigger levels for drainage incidents are outlined in *Schedule 1* of the Exemption Order. To meet these requirements, Alcoa has developed "Turbidity Event Classification Guidelines" which define a true turbidity exceedance event as a WQMS recording turbidity levels of at least 25 NTU for a period exceeding one hour.

3.3. Water Quality Management Systems (WQMSs)

During the October 2025 monitoring period, four Turbidity units were deployed in section six areas to monitor turbidity levels in streams subject to surface water runoff within and downstream of Willowdale mining operations.

Each WQMS unit consists of the following components:

Aquas SMR10 Turbidity Probe

> Positioned at a 90-degree angle to water flow, each probe is equipped with an automatic lens wiper and a guard to protect against larger debris.

Data Taker DT82 Logger

> Records data locally every six seconds, with 6-minute averages transmitted via IoT-enabled modems to a cloud-based platform.

Float Switch

Detects whether the sensor is submerged, or the stream is dry.

3.4. Purpose

This report aims to analyse turbidity data collected during October 2025, focusing on the identification and classification of "true" turbidity exceedance events based on Alcoa's Turbidity Event Classification Guidelines.

3.5. Exclusions

This report is not intended as:

- An assessment of the WQMS network or Alcoa's compliance with relevant legislation and requirements.
- An evaluation of the suitability of the trigger levels or event classification procedures adopted by Alcoa.

3.6. Abbreviations

	Term
IoT	Internet of Things
NTU	Nephelometric Turbidity Units
WQMS	Water Quality Management System

4. Methodology

4.1. WQMS Locations

A site map showing the WQMSs locations is provided in Appendix B.

4.2. Data Review

Data recorded by the WQMS Units was reviewed and potential events where turbidity levels exceeded 25 NTU for at least one hour. Each potential event was categorised as either 'true 'or 'false'.

4.2.1. True Turbidity Exceedance Events

These events are caused by an actual increase in stream turbidity. Per Alcoa's "Turbidity Event Classification Guidelines" true exceedance events typically exhibit:

- A sharp, sudden incline in turbidity levels.
- A return to baseline turbidity levels in a pattern resembling a normal (Gaussian) distribution.

Figure 1 Typical 'true' exceedance event showing the sharp incline and gradual return to background levels.

4.2.2. False Turbidity Exceedance Events

These events are caused by factors unrelated to actual turbidity increase, such as:

- Organic debris (e.g., leaves, sticks, algae) obstructing the sensor
- Air bubbles or water turbulence near the sensor
- Fluctuating water levels intermittently covering and uncover the sensor lens.

False events typically exhibit sharp inclines and declines without the characteristic bell curve shape of true events.

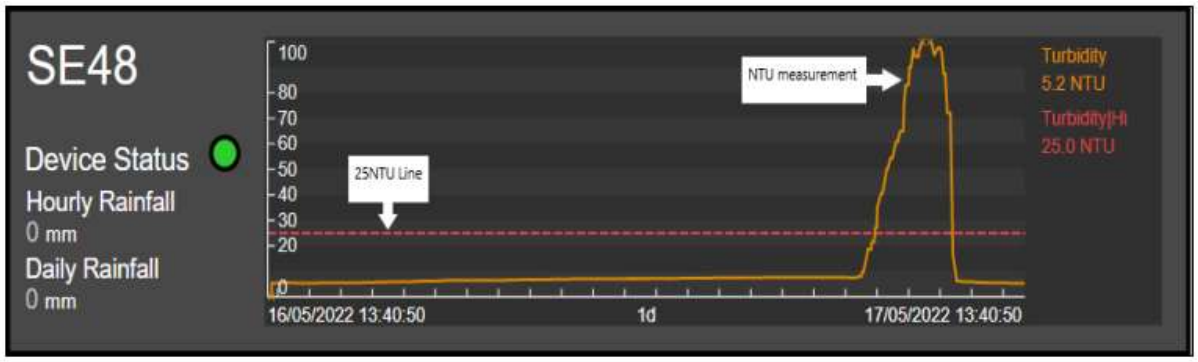


Figure 2 Typical 'false' exceedance event showing both a sharp incline and decline

4.2.3. Missing Data

Missing data occurs when a WQMS unit fails to record information, this can occur from unexpected system logoffs, equipment faults, or unplanned shutdowns.

5. Results and Discussion

5.1. Events

Table 1 provides a summary of identified events. Table 2 offers detailed information about each event.

Table 1 Events Summary

Category	# of events
Flagged for further investigation	0
False	1

Table 2 Events Details

Event ID	WQMS ID	Event Category	Start	End	Duration	Peak Turbidity (NTU)	Average Turbidity (NTU)
WDL-2510-001	RHB2	'False'	16/10/2025 19:34	16/10/2025 20:34	1 hr 0 min	826.8	349.3

5.2. Additional Investigation

Zero events were flagged for additional investigation

5.3. True Event(s)

Zero 'True' turbidity events were identified during the reporting period.

5.4. False Event(s)

One 'False' event was identified during the reporting period. Rationale on potential causes is summarised below.

Table 3 False Events Rationale

Event ID	Monitor ID	Rationale	Field Notes
WDL-2510-001	RHB2	This event is marked by a rapid increase in turbidity followed by a rapid decrease with multiple peaks. This is indicative of a false event.	Stream inspected on 25/10/2025 at 12pm. Stream was flowing and clear at the time of the inspection. Stream appears to be groundwater fed as upstream the stream was dry. A rehab bowl has formed a small lake upstream, however, the water level was low and had not breached the edge of the bowl. There were no signs of runoff from the forest tracks. No sources of turbidity were identified in the catchment. The trends showed sharp inclines and declines indicative of a false event. No rain received at time of event. Event classified as a false event.

5.5. Excluded WQMS Units

Zero WQMS units were excluded from analysis due to erroneous data during the reporting period.

5.6. Missing Data

No periods of missing data were identified.

6. Appendices

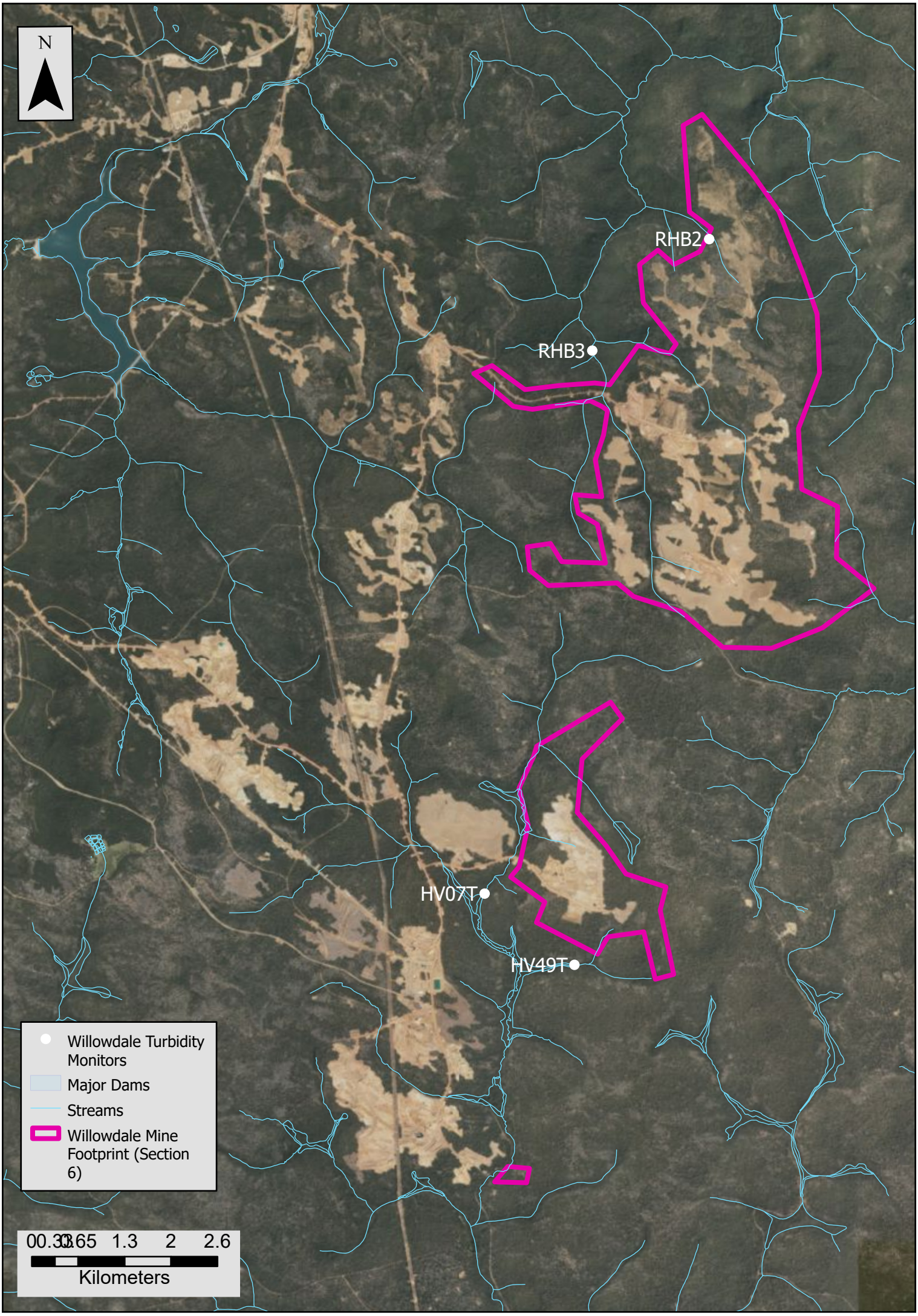
Appendix A. Willowdale Raw WQMS Data

Date	Willowdale WQMS Data - October 2025 - Events with turbidity > 25 NTU for an hour or more			
	HV07T	HV49T	RHB2	RHB3
1/10/2025	0.94	0.73	0.52	2.10
2/10/2025	1.04	0.73	0.69	2.21
3/10/2025	0.95	0.73	1.76	1.90
4/10/2025	1.05	0.72	0.98	3.26
5/10/2025	0.95	0.69	1.57	2.03
6/10/2025	0.97	0.68	0.52	2.06
7/10/2025	0.95	0.68	0.52	1.99
8/10/2025	0.95	0.70	0.52	2.03
9/10/2025	0.96	0.70	0.52	2.10
10/10/2025	0.94	0.69	0.52	2.08
11/10/2025	0.95	0.69	0.52	2.06
12/10/2025	0.95	0.68	0.52	2.10
13/10/2025	0.95	0.68	0.53	2.07
14/10/2025	0.95	0.68	0.52	2.08
15/10/2025	0.94	0.68	0.52	1.94
16/10/2025	0.95	0.67	48.65	1.91
17/10/2025	0.95	0.67	0.53	1.88
18/10/2025	0.94	0.67	0.52	1.93
19/10/2025	0.95	0.67	0.51	1.89
20/10/2025	0.95	0.66	0.48	1.87
21/10/2025	0.95	0.67	0.46	1.85
22/10/2025	0.95	0.66	0.48	1.87
23/10/2025	0.95	0.67	0.46	1.88
24/10/2025	0.95	0.67	0.45	1.85
25/10/2025	0.95	0.66	0.45	1.85
26/10/2025	0.96	0.66	0.46	1.84
27/10/2025	0.96	0.67	0.46	1.78
28/10/2025	0.95	0.64	0.44	1.81
29/10/2025	0.93	0.64	0.48	2.03
30/10/2025	0.94	0.64	0.43	5.97
31/10/2025	1.78	0.65	0.49	1.87

Date	Willowdale WQMS Data - October 2025 – Daily Average Turbidity (NTU)			
	HV07T	HV49T	RHB2	RHB3
1/10/2025				
2/10/2025				
3/10/2025				
4/10/2025				
5/10/2025				
6/10/2025				
7/10/2025				
8/10/2025				
9/10/2025				
10/10/2025				
11/10/2025				
12/10/2025				
13/10/2025				
14/10/2025				
15/10/2025				
16/10/2025			**1**	
17/10/2025				
18/10/2025				
19/10/2025				
20/10/2025				
21/10/2025				
22/10/2025				
23/10/2025				
24/10/2025				
25/10/2025				
26/10/2025				
27/10/2025				
28/10/2025				
29/10/2025				
30/10/2025				
31/10/2025				

* - Adjusted average with sensor fault data removed

Appendix B. Willowdale WQMS Locations


N
RHB2
RHB3
HV07T
HV49T
Willowdale Turbidity Monitors
Major Dams
Streams
Willowdale Mine Footprint (Section 6)
0 0.33 0.65 1.3 2 2.6
Kilometers

Appendix C. WQMS General Arrangement

ANTENNA

SOLAR PANEL

DATA TRANSMISSION TO IOT

DATA OUTLET

POWER INLET

40 X 60 MM CABLE DUCT

20 AMP MPPT
SOLAR CHARGER

40 X 60 MM CABLE DUCT

SIERRA WIRELESS FX30

40 X 60 MM CABLE DUCT

12 V, 120 AH LI-ION BATTERY

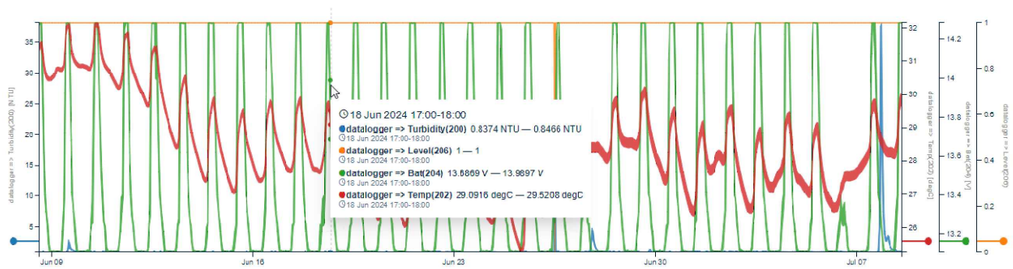
DATA INLET

SENSOR

STREAM DRY

SENSOR

STREAM FLOWING



REV.	REMARKS	DATE	DESIGNED	DRAWN	CHECKED	APPROVED	REFERENCE DRAWINGS
0	ISSUE FOR APPROVAL	05.07.2024	A.K.	S.A.	A.K.	A.K.	

ALL DIMENSIONS IN MILLIMETRES U.N.O.
LEVELS ARE IN METRES ON AHD U.N.O.
DO NOT SCALE DRAWING
IF IN DOUBT - ASK
TOLERANCES ISO2768-m U.N.O.

CLIENT

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WA - 512, 1A QUEEN ST FREEMANTLE WA 6160
(08) 6245 9843
waterservices@scidev.com.au
www.scidev.com.au
SCIDEV

TITLE
IOT TURBIDITY MONITORING STATION
SITE LAYOUT
GENERAL ARRANGEMENT

SHEET 1 OF 2

SCALE NTS OR AS SHOWN

DRAWING NO.
HI0090 - ALCOA WQMS

SHEET SIZE
A3

REV.
1